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European Technical Assessment

ETA 20/0641 of 29/12/2020

Technical Assessment Body issuing the ETA: Technical and Test Institute
for Construction Prague

Trade name of the construction product

LE-A4
LE-ZNA4
LE-DA4

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

Product area code: 33
Torque controlled expansion anchor
for use in cracked and uncracked concrete

Manufacturer

Klimas Sp. z o.o.
Kuźnica Kiedrzyńska,
Ul. Wincentego Witosa 135/137,
42-233 Mykanów,
Poland

Manufacturing plant

Klimas Sp. z o.o.

**This European Technical Assessment
contains**

13 pages including 11 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
Mechanical fasteners for use in concrete

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1. Technical description of the product

The LE-A4, LE-ZNA4, LE-DA4 are through-fixing torque-controlled expansion anchors in sizes of M8, M10, M12 and M16. Each type comprises a nut, bolt, washer and expansion sleeve.

The anchors LE-A4 are made from stainless steel.

The anchors LE-ZNA4 and LE-DA4 are made from carbon steel with zinc coating.

The anchor is installed in a drilled hole; tightening the nut draws the cone into the sleeve. The expansion of this sleeve applies the anchorage.

The installed anchor is shown in Annex A 1.

2. Specification of the intended use in accordance with the applicable EAD

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 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, but are to be regarded only as a means for choosing the 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 (static and quasi-static loading)	See Annex C 1 and C 2
Displacement	See Annex C 1 and C 2
Characteristic resistance (seismic performance category C1)	See Annex C 3

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1 according to EN 13501-1
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

According to the Decision 97/463/EC of the European Commission¹, the system 1 of assessment verification of constancy of performance (see Annex V to the Regulation (EU) No 305/2011) apply.

5. Technical details necessary for the implementation of the AVCP system, as provided in the applicable EAD

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Technical and Test Institute for Construction Prague.

Issued in Prague on 29.12.2020

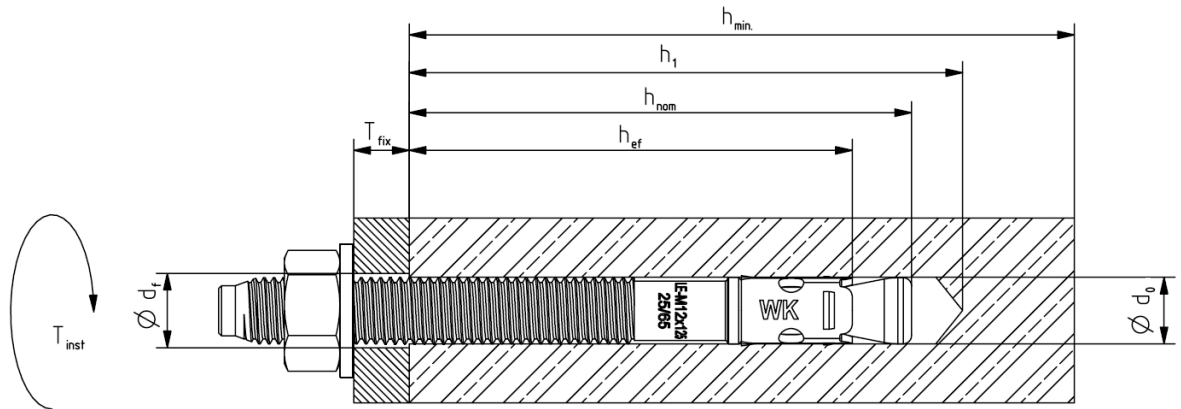
By

Ing. Mária Schaan

Head of the Technical Assessment Body

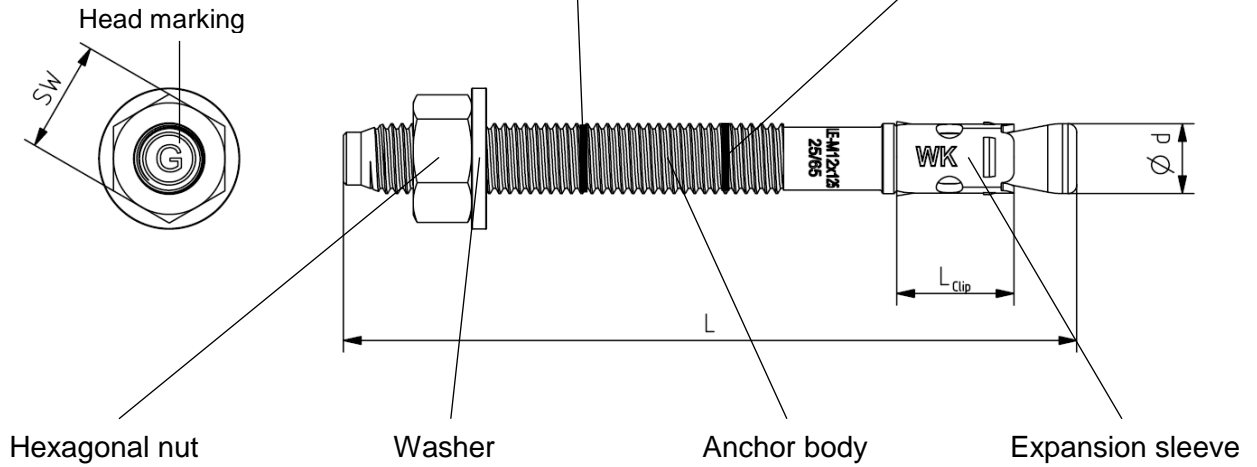
¹ Official Journal of the European Communities L 198/31 25.7.1997

Installed anchor



Components

Optional marking: Standard embedment depth, reduce embedment depth



<p>LE-A4, LE-ZNA4, LE-DA4</p>	<p>Annex A 1</p>
<p>Product description Installed conditions and components</p>	

Table A1 - Materials

Component	Material
LE-A4	
Anchor body	Stainles steel A4
Expansion sleeve	Stainles steel A4
Hexagonal nut	Stainles steel A4 DIN 934 / EN ISO 898-2
Washer	Stainles steel A4 DIN 125 or EN ISO 7089 / DIN 9021A or EN ISO 7093
LE-ZNA4, LE-DA4	
Anchor body	Carbon steel
Expansion sleeve	Stainles steel A4
Hexagonal nut	Steel class 8 DIN 934 / EN ISO 898-2
Washer	Steel DIN 125 or EN ISO 7089 / DIN 9021A or EN ISO 7093
Protection	LE-ZNA4 - Zinc coating ($\geq 5\mu\text{m}$); electroplated acc. to EN ISO 4042 LE-DA4 - flake zinc ($\geq 8\mu\text{m}$) acc. to ISO 2178:2016

Table A2 – Marking

Parameters			M8	M10	M12	M16				
Bolt length:	L	[mm]	60÷255	85÷255	85÷305	105÷345				
Width torque wrench:	SW	[mm]	13	17	19	24				
Head Bolt Marking										
Bolt length [mm]	$L \geq$	20	65	77	90	103	115	128	141	153
Head marking		B	C	D	E	F	G	H	I	J
Bolt length [mm]	$L \geq$	166	178	191	204	217	230	242	255	281
Head marking		K	L	M	N	O	P	Q	R	S

LE-A4, LE-ZNA4, LE-DA4
Product description
 Materials
 Marking
Annex A 2

Specifications of intended use

Anchorage subject to:

- Static and quasi-static load
- Fire exposure
- Seismic performance category C1

Base materials

- Cracked or uncracked concrete.
- Reinforced or unreinforced normal weight concrete of strength class C20/25 at minimum and C50/60 at maximum according EN 206:2013+A1:2016

Use conditions (Environmental conditions)

- Structures subject to dry internal conditions (LE-ZNA4, LE-DA4, LE-A4)
- Use according EN 1993-1-4:2006 + A1:2015, corresponding to corrosion resistance class: CRC III: only LE-A4

Design:

- The anchorages are designed in accordance with the EN 1992-4 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.
- Anchorages under fire exposure have to be designed in accordance with EN 1992-4.
- Anchorages under seismic actions have to be designed in accordance with EN 1992-4.

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 components of the anchor.
- Anchor installation in accordance with the manufacturer's specifications and drawings using the appropriate tools.
- Effective anchoring depth, edge distance and spacing not less than the specified values without minus tolerance.
- In case of aborted drill 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.

LE-A4, LE-ZNA4, LE-DA4

Intended use
Specifications

Annex B 1

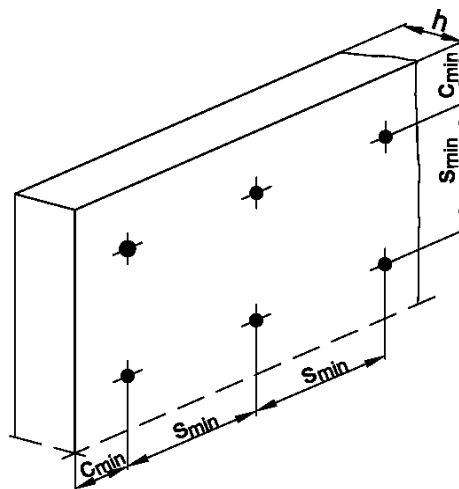
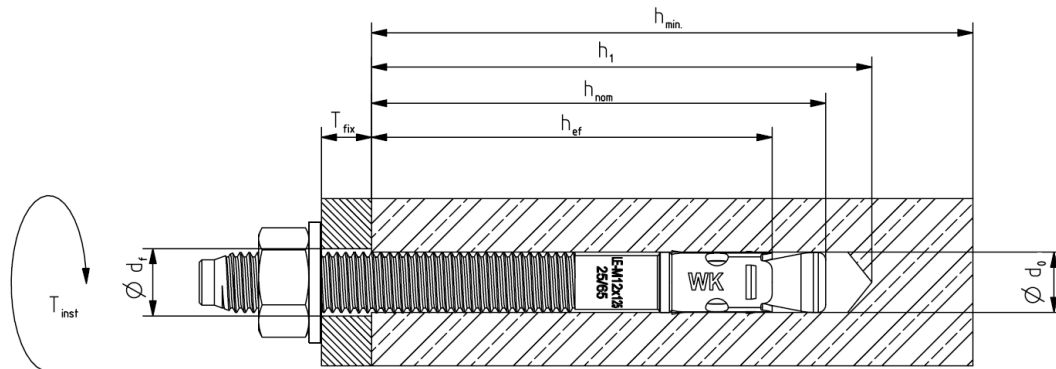
Table B1 - Installation parameters

Installation parameters			M8	M10	M12	M16
drill diameter:	d_o	[mm]	8	10	12	16
Fixture clearance hole diameter:	d_f	[mm]	10	12	14	18
nominal torque:	T_{inst}	[Nm]	20	30	50	100
Width torque wrench:	SW	[mm]	13	17	19	24
Standard embedment						
drill depth:	h_1	[mm]	52	74	88	106
embedment depth:	h_{nom}	[mm]	47	69	80	98
effective depth:	h_{ef}	[mm]	40	60	70	85
Reduced embedment						
drill depth:	h_1	[mm]	-	54	68	86
embedment depth:	h_{nom}	[mm]	-	49	60	78
effective depth:	h_{ef}	[mm]	-	40	50	65

LE-A4, LE-ZNA4, LE-DA4**Intended use**
Installation parameters**Annex B 2**

Table B2 - Installation parameters – Minimum spacing and edge distance

Installation parameters			M8	M10	M12	M16
Standard embedment						
effective depth:	h_{ef}	[mm]	40	60	70	85
Minimum thickness of concrete member:	h_{min}	[mm]	100	120	160	170
Minimum allowable spacing:	s_{min}	[mm]	54	82	109	116
Minimum allowable edge distance:	c_{min}	[mm]	54	82	109	116
Reduced embedment						
effective depth:	h_{ef}	[mm]	-	40	50	65
Minimum thickness of concrete member:	h_{min}	[mm]	-	100	100	130
Minimum allowable spacing:	s_{min}	[mm]	-	54	68	88
Minimum allowable edge distance:	c_{min}	[mm]	-	54	68	88



LE-A4, LE-ZNA4, LE-DA4

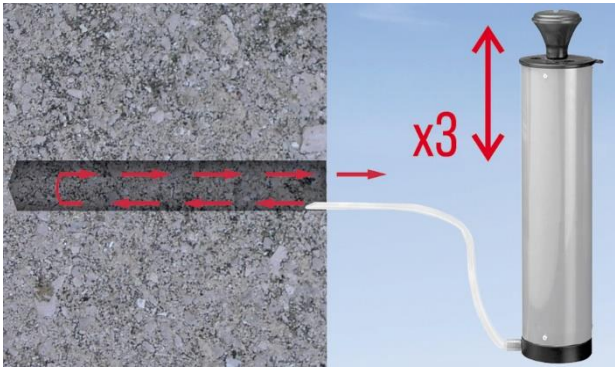
Intended use
Installation parameters

Annex B 3

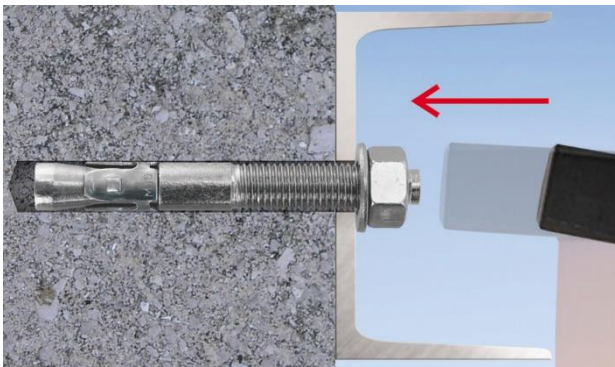
Installation instructions



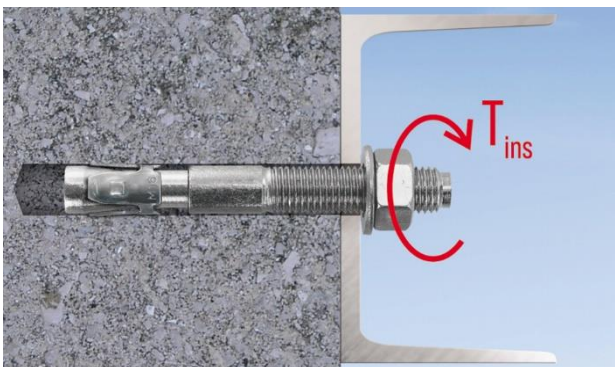
Drill a hole of required diameter and depth



Clear the hole of drilling dust and debris (using blowpump or equivalent method)



Lightly tap the throughbolt through the fixture into hole with a hammer, until fixing depth is reached



Tighten to the recommended torque

LE-A4, LE-ZNA4, LE-DA4

Intended use
Installation instructions

Annex B 4

Table C1 – Characteristic resistance under tension load

Size			M8	M10	M12	M16
STEEL FAILURE - LE-ZNA4, LE-DA4						
Characteristic resistance – reduced part	$N_{Rk,s}$	[kN]	16,2	27,7	38,6	71,9
Partial safety factor class:	$\gamma_{M,s}$	[-]	1,57			
STEEL FAILURE - LE-A4						
Characteristic resistance – reduced part	$N_{Rk,s}$	[kN]	16,7	28,5	39,7	74,0
Partial safety factor class:	$\gamma_{M,s}$	[-]	1,62			
PULL OUT FAILURE						
Characteristic resistance in uncracked concrete C20/25:	$N_{Rk,p}$	[kN]	1)	1)	1)	1)
Characteristic resistance in cracked concrete C20/25:	$N_{Rk,p}$	[kN]	1)	1)	1)	1)
Installation safety factor:	γ_{ins}	[-]	1,0			1,2
Increasing factors for $N_{Rk,c}^0$:	Ψ_c	C30/37	1,04			
		C40/50	1,06			
		C50/60	1,08			
CONCRETE CONE FAILURE AND SPLITTING FAILURE						
Factor for uncracked concrete:	$k_{ucr,N}$	[-]	11,0			
Factor for cracked concrete:	$k_{cr,N}$	[-]	7,7			
Installation safety factor:	γ_{ins}	[-]	1,0			1,2
Concrete cone failure:	$s_{cr,N}$	[mm]	3 x h_{ef}			
	$c_{cr,N}$	[mm]	1.5 x h_{ef}			
Standard embedment						
Effective anchorage depth:	h_{ef}	[mm]	40	60	70	85
Splitting failure:	$s_{cr,sp}$	[mm]	200	300	400	425
	$c_{cr,sp}$	[mm]	100	150	200	215
Reduced embedment						
Effective anchorage depth:	h_{ef}	[mm]	-	40	50	65
Splitting failure:	$s_{cr,sp}$	[mm]	-	200	250	325
	$c_{cr,sp}$	[mm]	-	100	125	165

1) The pull-out failure mode is not decisive

Table C2 – Displacement under tension load

Size LE-ZNA4, LE-DA4			M8	M10	M12	M16
Tension service load in concrete:	N	[kN]	4,1	4,1	5,8	7,2
Displacement:	δ_{N0}	[mm]	1,4	1,4	1,4	1,4
	$\delta_{N\infty}$	[mm]	0,6			
Size LE-A4			M8	M10	M12	M16
Tension service load in concrete:	N	[kN]	4,1	4,1	5,8	7,2
Displacement:	δ_{N0}	[mm]	1,0	1,1	1,4	1,4
	$\delta_{N\infty}$	[mm]	0,5			

LE-A4, LE-ZNA4, LE-DA4**Performances**

Characteristic resistance under tension load
Displacement under tension load

Annex C 1

Table C3 – Characteristic resistance under shear load

Size LE-ZNA4, LE-DA4			M8	M10	M12	M16
STEEL FAILURE WITHOUT LEVER ARM						
Characteristic resistance	$V_{Rk,s}$	[kN]	12,4	19,7	26,6	49,6
Partial safety factor class:	$\gamma_{M,s}$	[-]	1,31			
STEEL FAILURE WITH LEVER ARM						
Characteristic bending moment	$M_{Rk,s}$	[Nm]	25,5	50,8	89,1	226,4
Partial safety factor:	$\gamma_{M,s}$	[-]	1,31			
CONCRETE PRYOUT FAILURE						
Standard embedment						
Pryout factor:	k_8	[-]	1,0	2,0	2,0	2,0
Reduced embedment						
Pryout factor:	k_8	[-]	1,0	1,0	1,0	2,0
Installation safety factor:	γ_{ins}	[-]	1,0			
CONCRETE EDGE FAILURE						
Effective length of anchor:	l_f	[mm]	40	40 / 60	50 / 70	65 / 85
Outside diameter of anchor:	d_{nom}	[mm]	8	10	12	16
Installation safety factor:	γ_{ins}	[-]	1,0			

Size LE-A4			M8	M10	M12	M16
STEEL FAILURE WITHOUT LEVER ARM						
Characteristic resistance	$V_{Rk,s}$	[kN]	12,8	20,3	25,9	48,6
Partial safety factor class:	$\gamma_{M,s}$	[-]	1,35			
STEEL FAILURE WITH LEVER ARM						
Characteristic bending moment	$M_{Rk,s}$	[Nm]	26,2	52,3	91,7	233,1
Partial safety factor:	$\gamma_{M,s}$	[-]	1,35			
CONCRETE PRYOUT FAILURE						
Standard embedment						
Pryout factor:	k_8	[-]	1,0	2,0	2,0	2,0
Reduced embedment						
Pryout factor:	k_8	[-]	1,0	1,0	1,0	2,0
Installation safety factor:	γ_{ins}	[-]	1,0			
CONCRETE EDGE FAILURE						
Effective length of anchor:	l_f	[mm]	40	40 / 60	50 / 70	65 / 85
Outside diameter of anchor:	d_{nom}	[mm]	8	10	12	16
Installation safety factor:	γ_{ins}	[-]	1,0			

Table C4 – Displacement under shear load

Size LE-ZNA4, LE-DA4			M8	M10	M12	M16
Tension service load in concrete:	V	[kN]	6,1	9,6	12,7	19,7
Displacement:	δ_{V0}	[mm]	1,9	2,1	2,2	2,2
	$\delta_{V\infty}$	[mm]	2,9	3,1	3,2	3,2
Size LE-A4			M8	M10	M12	M16
Tension service load in concrete:	V	[kN]	6,6	10,7	12,3	19,3
Displacement:	δ_{V0}	[mm]	1,2	1,7	2,0	2,0
	$\delta_{V\infty}$	[mm]	1,8	2,6	2,9	2,9

LE-A4, LE-ZNA4, LE-DA4**Performances**

Characteristic resistance under shear load
Displacement under shear load

Annex C 2

Table C5 – Characteristic resistances loads - seismic performance category C1

Size LE-ZNA4, LE-DA4			M8	M10	M12	M16
TENSION LOAD STEEL FAILURE						
Characteristic resistance	$N_{Rk,s,C1}$	[kN]	16,2	27,7	38,6	71,9
Partial safety factor	$\gamma_{Ms,s,C1}$	[-]	1,57			
TENSION LOAD PULLOUT FAILURE						
Characteristic resistance	$N_{Rk,p,C1}$	[kN]	8,5	8,5	12,0	18,0
Installation safety factor	γ_{inst}	[-]	1,0	1,0	1,0	1,2
SHEAR LOAD STEEL FAILURE WITHOUT LEVER ARM						
Characteristic resistance	$V_{Rk,s,C1}$	[kN]	8,2	13,6	20,7	39,7
Partial safety factor	$\gamma_{Ms,C1}$	[-]	1,31			
Size LE-A4			M8	M10	M12	M16
TENSION LOAD STEEL FAILURE						
Characteristic resistance	$N_{Rk,s,C1}$	[kN]	16,7	28,5	39,7	74,0
Partial safety factor	$\gamma_{Ms,s,C1}$	[-]	1,62			
TENSION LOAD PULLOUT FAILURE						
Characteristic resistance	$N_{Rk,p,C1}$	[kN]	8,5	8,5	12,0	18,0
Installation safety factor	γ_{inst}	[-]	1,0	1,0	1,0	1,2
SHEAR LOAD STEEL FAILURE WITHOUT LEVER ARM						
Characteristic resistance	$V_{Rk,s,C1}$	[kN]	7,2	11,0	17,1	33,0
Partial safety factor	$\gamma_{Ms,C1}$	[-]	1,35			

LE-A4, LE-ZNA4, LE-DA4

Performances

Characteristic resistances loads - seismic performance category C1

Annex C 3

Table C6 – Characteristic values of resistance to tension load under fire exposure

Size LE-ZNA4, LE-DA4			M8	M10	M12	M16
Min. Effective anchorage depth:	h_{ef}	[mm]	40	40	50	65
Characteristic fire resistance duration at 30 minutes						
Steel failure	$N_{Rk,s,fi(30)}$	[kN]	0,4	0,9	1,7	3,1
Pull-Out Failure	$N_{Rk,p,fi(30)}$	[kN]	2,2	2,2	3,1	4,5
Concrete Cone Failure	$N_{Rk,c,fi(30)}$	[kN]	1,9	1,9	3,4	6,6
Characteristic fire resistance duration at 60 minutes						
Steel failure	$N_{Rk,s,fi(60)}$	[kN]	0,3	0,8	1,3	2,4
Pull-Out Failure	$N_{Rk,p,fi(60)}$	[kN]	2,2	2,2	3,1	4,5
Concrete Cone Failure	$N_{Rk,c,fi(60)}$	[kN]	1,9	1,9	3,4	6,6
Characteristic fire resistance duration at 90 minutes						
Steel failure	$N_{Rk,s,fi(90)}$	[kN]	0,3	0,6	1,1	2,0
Pull-Out Failure	$N_{Rk,p,fi(90)}$	[kN]	2,2	2,2	3,1	4,5
Concrete Cone Failure	$N_{Rk,c,fi(90)}$	[kN]	1,9	1,9	3,4	6,6
Characteristic fire resistance duration at 120 minutes						
Steel failure	$N_{Rk,s,fi(120)}$	[kN]	0,2	0,5	0,8	1,6
Pull-Out Failure	$N_{Rk,p,fi(120)}$	[kN]	1,7	1,7	2,4	3,6
Concrete Cone Failure	$N_{Rk,c,fi(120)}$	[kN]	1,6	1,6	2,7	5,2
Spacing						
Spacing	$S_{cr,N}$	[mm]	$4 \times h_{ef}$			
	S_{min}	[mm]	54	54	68	88
Edge distance	$C_{cr,N}$	[mm]	$2 \times h_{ef}$			
	C_{min}	[mm]	2 x h_{ef} , however if the fire attack is from more than one side, the edge distance of the anchor has to be ≥ 300 mm and $\geq 2 \times h_{ef}$			

$\gamma_{M,fi}$ - partial safety factor for resistance under fire exposure (usually $\gamma_{M,fi} = 1.0$)

Table C7 – Characteristic values of resistance to shear load under fire exposure

Size LE-ZNA4, LE-DA4			M8	M10	M12	M16
Characteristic fire resistance duration at 30 minutes						
Steel Failure without lever arm	$V_{Rk,s,fi(30)}$	[kN]	0,4	0,9	1,7	3,1
Steel Failure with lever arm	$M_{Rk,s,fi(30)}$	[Nm]	0,4	1,1	2,6	6,7
Characteristic fire resistance duration at 60 minutes						
Steel Failure without lever arm	$V_{Rk,s,fi(60)}$	[kN]	0,3	0,8	1,3	2,4
Steel Failure with lever arm	$M_{Rk,s,fi(60)}$	[Nm]	0,3	1,0	2,0	5,0
Characteristic fire resistance duration at 90 minutes						
Steel Failure without lever arm	$V_{Rk,s,fi(90)}$	[kN]	0,3	0,6	1,1	2,0
Steel Failure with lever arm	$M_{Rk,s,fi(90)}$	[Nm]	0,3	0,7	1,7	4,3
Characteristic fire resistance duration at 120 minutes						
Steel Failure without lever arm	$V_{Rk,s,fi(120)}$	[kN]	0,2	0,5	0,8	1,6
Steel Failure with lever arm	$M_{Rk,s,fi(120)}$	[Nm]	0,2	0,6	1,3	3,3
Concrete pryout failure R30-R120						
Characteristic resistance	$V_{Rk,cp,fi}$	[kN]	Concrete pryout failure according to EN 1992-4			
Spacing	S_{min}	[mm]	54	54	68	88
Edge distance	C_{min}	[mm]	54	54	68	88

LE-A4, LE-ZNA4, LE-DA4

Performances
Characteristic values of resistance under fire exposure

Annex C 4

Table C8 – Characteristic values of resistance to tension load under fire exposure

Size LE-A4			M8	M10	M12	M16
Min. Effective anchorage depth:	h_{ef}	[mm]	40	40	50	65
Characteristic fire resistance duration at 30 minutes						
Steel failure	$N_{Rk,s,fi(30)}$	[kN]	0,7	1,5	2,5	4,7
Pull-Out Failure	$N_{Rk,p,fi(30)}$	[kN]	2,2	2,2	3,1	4,5
Concrete Cone Failure	$N_{Rk,c,fi(30)}$	[kN]	1,9	1,9	3,4	6,6
Characteristic fire resistance duration at 60 minutes						
Steel failure	$N_{Rk,s,fi(60)}$	[kN]	0,6	1,2	2,1	3,9
Pull-Out Failure	$N_{Rk,p,fi(60)}$	[kN]	2,2	2,2	3,1	4,5
Concrete Cone Failure	$N_{Rk,c,fi(60)}$	[kN]	1,9	1,9	3,4	6,6
Characteristic fire resistance duration at 90 minutes						
Steel failure	$N_{Rk,s,fi(90)}$	[kN]	0,4	0,9	1,7	3,1
Pull-Out Failure	$N_{Rk,p,fi(90)}$	[kN]	2,2	2,2	3,1	4,5
Concrete Cone Failure	$N_{Rk,c,fi(90)}$	[kN]	1,9	1,9	3,4	6,6
Characteristic fire resistance duration at 120 minutes						
Steel failure	$N_{Rk,s,fi(120)}$	[kN]	0,4	0,8	1,3	2,5
Pull-Out Failure	$N_{Rk,p,fi(120)}$	[kN]	1,7	1,7	2,4	3,6
Concrete Cone Failure	$N_{Rk,c,fi(120)}$	[kN]	1,6	1,6	2,7	5,2
Spacing						
Spacing	$S_{cr,N}$	[mm]	$4 \times h_{ef}$			
	S_{min}	[mm]	54	54	68	88
Edge distance	$C_{cr,N}$	[mm]	$2 \times h_{ef}$			
	C_{min}	[mm]	2 x h_{ef} , however if the fire attack is from more than one side, the edge distance of the anchor has to be ≥ 300 mm and $\geq 2 \times h_{ef}$			

$\gamma_{M,fi}$ - partial safety factor for resistance under fire exposure (usually $\gamma_{M,fi} = 1.0$)

Table C9 – Characteristic values of resistance to shear load under fire exposure

Size LE-A4			M8	M10	M12	M16
Characteristic fire resistance duration at 30 minutes						
Steel Failure without lever arm	$V_{Rk,s,fi(30)}$	[kN]	0,7	1,5	2,5	4,7
Steel Failure with lever arm	$M_{Rk,s,fi(30)}$	[Nm]	0,7	1,9	3,9	10,0
Characteristic fire resistance duration at 60 minutes						
Steel Failure without lever arm	$V_{Rk,s,fi(60)}$	[kN]	0,6	1,2	2,1	3,9
Steel Failure with lever arm	$M_{Rk,s,fi(60)}$	[Nm]	0,6	1,5	3,3	8,3
Characteristic fire resistance duration at 90 minutes						
Steel Failure without lever arm	$V_{Rk,s,fi(90)}$	[kN]	0,4	0,9	1,7	3,1
Steel Failure with lever arm	$M_{Rk,s,fi(90)}$	[Nm]	0,4	1,2	2,6	6,7
Characteristic fire resistance duration at 120 minutes						
Steel Failure without lever arm	$V_{Rk,s,fi(120)}$	[kN]	0,4	0,8	1,3	2,5
Steel Failure with lever arm	$M_{Rk,s,fi(120)}$	[Nm]	0,4	1,0	2,1	5,3
Concrete pryout failure R30-R120						
Characteristic resistance	$V_{Rk,cp,fi}$	[kN]	Concrete pryout failure according to EN 1992-4			
Spacing	S_{min}	[mm]	54	54	68	88
Edge distance	C_{min}	[mm]	54	54	68	88

LE-A4, LE-ZNA4, LE-DA4

Performances
Characteristic values of resistance under fire exposure

Annex C 5