

Approval body for construction products
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and
Laender Governments



European Technical Assessment

ETA-05/0241
of 12 February 2015

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

KALM Wedge Anchor KDK, KDK-E, KDK-H

Product family
to which the construction product belongs

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

Manufacturer

KALM
Befestigungssysteme GmbH
Marie-Curie-Straße 5
67661 Kaiserslautern
DEUTSCHLAND

Manufacturing plant

KALM
Befestigungssysteme GmbH
Marie-Curie-Straße 5
67661 Kaiserslautern
DEUTSCHLAND

This European Technical Assessment
contains

13 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

Guideline for European technical approval of "Metal
anchors for use in concrete", ETAG 001 Part 2: "Torque
controlled expansion anchors", Edition April 2013,
used as European Assessment Document (EAD)
according to Article 66 Paragraph 3 of Regulation (EU)
No 305/2011.

This version replaces

ETA-05/0241 issued on 23 April 2012

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Specific Part

1 Technical description of the product

The KALM Wedge Anchor KDK, KDK-E, KDK-H is an anchor in the sizes M8, M10, M12 and M16 made of galvanised steel (KDK), stainless steel (KDK-E) or high corrosion resistant steel (KDK-H). The anchor is placed into a drilled hole and anchored by torque-controlled expansion. Product and 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 and C 2
Edge distances and spacing	See Annex C 1
Displacements under tension and shear loads	See Annex C 1 and C 2

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Anchorage satisfy requirements for Class A1
Resistance to fire	See Annex C 3

3.3 Hygiene, health and the environment (BWR 3)

Not applicable.

3.4 Safety in use (BWR 4)

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

3.5 Protection against noise (BWR 5)

Not applicable.

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3.6 Energy economy and heat retention (BWR 6)

Not applicable.

3.7 Sustainable use of natural resources (BWR 7)

The sustainable use of natural resources was not investigated.

3.8 General aspects

The verification of durability is part of testing the essential characteristics. Durability is only ensured if the specifications of intended use according to Annex B are taken into account.

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

According to Decision of the Commission of 24 June 1996 (96/582/EC) (OJ L 254 of 08.10.96 p. 62-65), the system of assessment and verification of constancy of performance (see Annex V and Article 65 Paragraph 2 to Regulation (EU) No 305/2011) given in the following table applies.

Product	Intended use(s)	Level or class	System
Metal anchors for use in concrete (heavy-duty type)	For fixing and/or supporting concrete structural elements or heavy units such as cladding and suspended ceilings	—	1

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

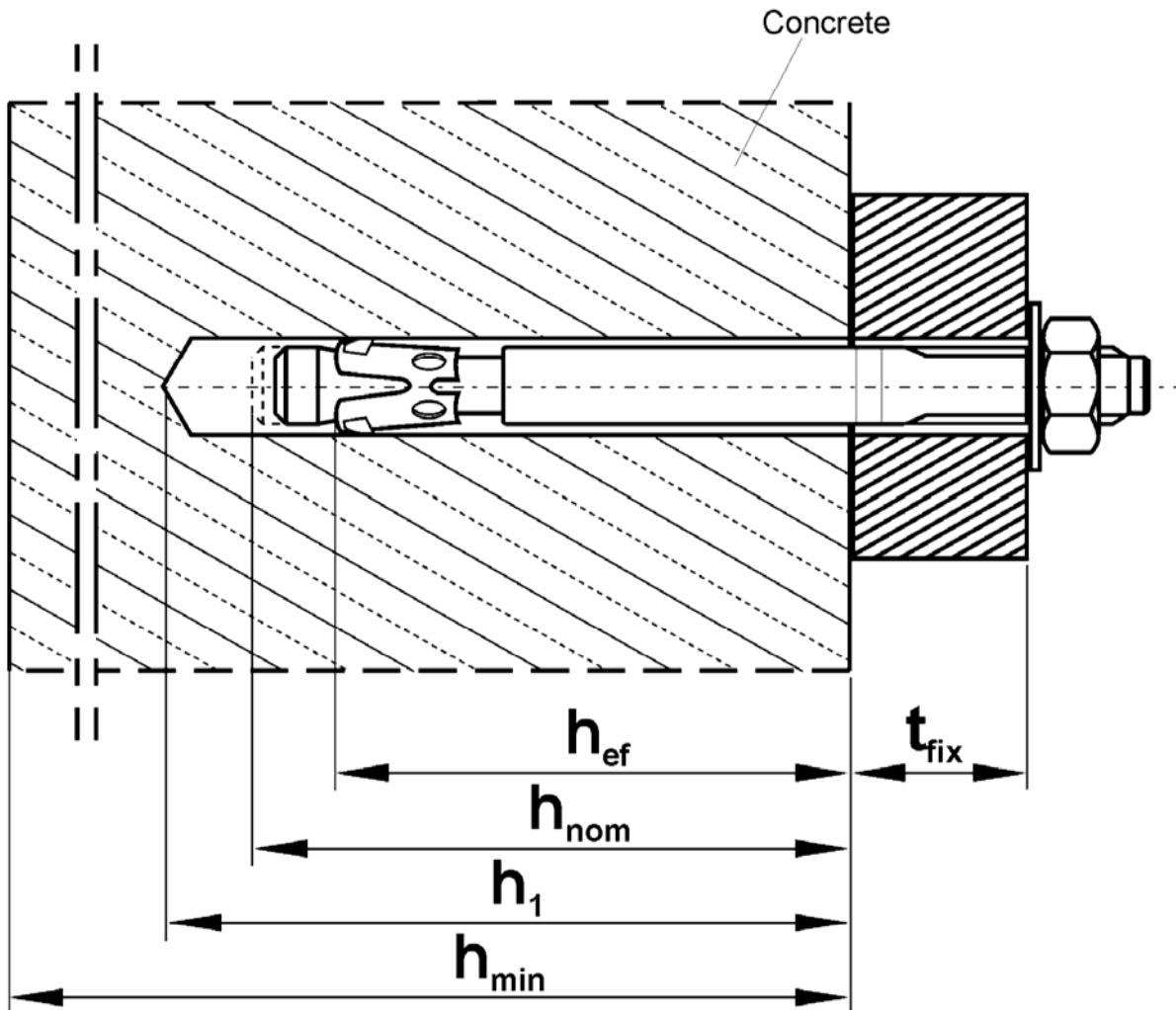
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Deutsches Institut für Bautechnik.

Issued in Berlin on 12 February 2015 by Deutsches Institut für Bautechnik

Uwe Bender
Head of Department

beglaubigt:
Tempel

Installed condition of anchor

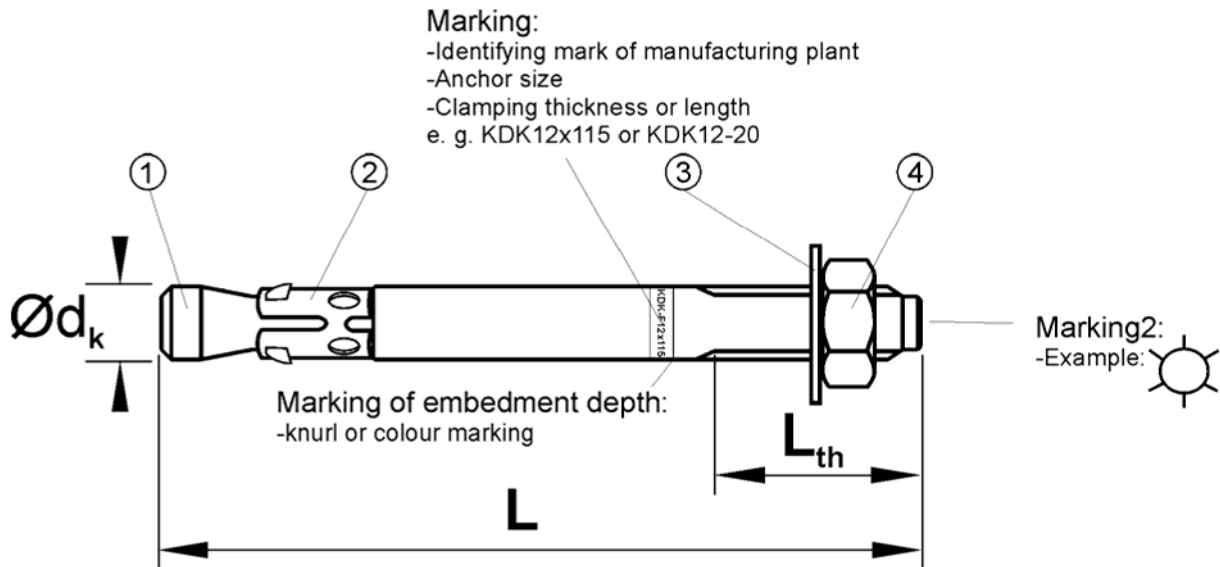


Electronic copy of the ETA by DIBt: ETA-05/0241

K-A-L-M Wedge Anchor KDK, KDK-E, KDK-H

Product description
Installed condition of anchor

Annex A 1



Dimensions

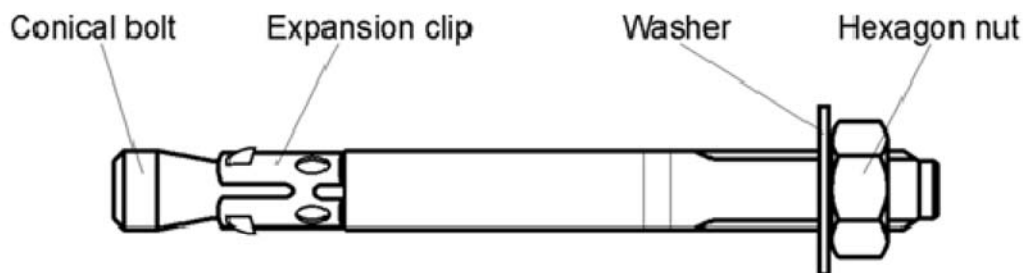
Anchor size	L [mm]		Thread		$\varnothing d_k$
	min.	max.	Size	L_{th}	
M8	65	350	M8	25-120	8
M10	70	410	M10	30-120	10
M12	95	555	M12	35-120	12
M16	115	515	M16	40-120	16

Materials for KDK

Part	Designation	Steel, zinc plated ≥ 5 µm plated acc. to DIN EN ISO 4042
1	Conical bolt	Steel acc. To DIN EN 10277-3 or DIN EN 10263-4
2	Expansion clip	Steel EN 10149-2
3	Hexagon nut	Strength class 8 EN 20898-2
4	Washer	Steel EN 10025-2

Materials for KDK-E, KDK-H

Part	Designation	Stainless steel A4	High corrosion resistant steel (HCR)
1	Conical bolt	Stainless steel, 1.4401, 1.4404, 1.4571, 1.4578, EN 10088, Property class 70, EN ISO 3506	High corrosion resistant steel 1.4529, 1.4565, EN 10088, Property class 70, EN ISO 3506
2	Expansion clip	Stainless steel, 1.4401, 1.4404, 1.4571, 1.4578, EN 10088	Stainless steel, 1.4401, 1.4404, 1.4571, 1.4578, EN 10088
3	Hexagon nut	Stainless steel, 1.4401, 1.4404, 1.4571, EN 10088, Property class 70, EN ISO 3506	High corrosion resistant steel 1.4529, 1.4565, EN 10088, Property class 70, EN ISO 3506
4	Washer	Stainless steel, 1.4401, 1.4404, 1.4571, EN 10088	High corrosion resistant steel 1.4529, 1.4565, EN 10088



Anchor Size		M8	M10	M12	M16	
Nominal characteristic steel ultimate strength	f_{uk} [N/mm ²]	KDK	740	740	740	740
		KDK-E, KDK-H	700	700	700	700
Nominal characteristic steel yield strength	f_{yk} [N/mm ²]	KDK	620	620	620	620
		KDK-E, KDK-H	450	450	450	450

K-A-L-M Wedge Anchor KDK, KDK-E, KDK-H

Product description
Materials

Annex A 3

Specifications of intended use

Anchorage subject to

- Static and quasi-static loads
- Fire exposure

Base Materials

- Reinforced or unreinforced normal weight concrete according to EN 206-1:2000-12
- Strength classes C20/25 to C50/60 according to EN 206-1:2000-12
- Cracked and non-cracked concrete

Use conditions (Environmental conditions)

- Structures subject to dry internal conditions (zinc coated steel, stainless steel, high corrosion resistant steel)
- Structures subject to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal condition, if no particular aggressive conditions exist (stainless steel or high corrosive resistant steel)
- Structures subject to external atmospheric exposure and to permanently damp internal condition, if other particular aggressive conditions exist (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 swimming pools or atmosphere with extreme chemical pollution (e.g. in desulphurization plants or road tunnels where de-icing materials are used)

Design Installation

- 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.)
- Anchorages under static or quasi-static actions are designed in accordance with:
 - ETAG 001, Annex C, design method A, Edition August 2010
- Anchorages under fire exposure are designed in accordance with
 - ETAG 001, Annex C, design method A; EOTA Technical Report TR 020, edition May 2004 (it must be ensured, that local spalling of the concrete cover does not occur)

Installation

- Hole drilling by Hammer drilling
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site

K-A-L-M Wedge Anchor KDK, KDK-E, KDK-H

Intended Use
Specifications

Annex B 1

Installation parameters

Anchor size			M8	M10	M12	M16
Nominal drill hole diameter	$d_0 =$	mm	8	10	12	16
Cutting diameter of drill bit	$d_{cut} \leq$	mm	8,45	10,45	12,5	16,5
Depth of drill hole	$h_1 \geq$	mm	65	70	90	110
Anchor embedment depth	h_{nom}	mm	55	60	80	100
Effective anchorage depth	h_{ef}	mm	45	50	65	80
Thickness of the fixture	t_{fix}	mm	1-285	1-340	1-460	1-400
Diameter of clearance hole in the fixture	$d_f \leq$	mm	9	12	14	18
Torque moment for non-cracked concrete	T_{inst}	Nm	15	30	50	100
Torque moment for cracked concrete	T_{inst}	Nm	20	40	65	130

Minimum thickness of concrete member, minimum spacing and minimum edge distances

Anchor size			M8	M10	M12	M16
Non-cracked concrete						
Minimum member thickness	h_{min}	mm	100	100	130	160
Minimum spacing	s_{min}	mm	50	55	100	90
Minimum edge distance	c_{min}	mm	60	100	150	110

K-A-L-M Wedge Anchor KDK, KDK-E, KDK-H

Intended Use
Installation parameters

Annex B 2

Blow Pump ABK (Standard Cleaning)



Installation instructions

- Drill the hole
- Clean the drill hole.
- Set KDK through the fixture and hit it into the drill hole.
- Tight the nut with a torque moment wrench



K-A-L-M Wedge Anchor KDK, KDK-E, KDK-H

Intended Use
Installation instructions

Annex B 3

Characteristic values for tension load for design method A according to ETAG 001, Annex C

Anchor size			M8	M10	M12	M16
Steel failure – Version KDK						
Characteristic resistance	$N_{Rk,S}$	[kN]	18	29	39	73
Steel failure – Version KDK-E / KDK-H						
Characteristic resistance	$N_{Rk,S}$	[kN]	17	28	40	74
Pullout failure						
Characteristic resistance in $N_{Rk,p}$ in non-cracked concrete	C 20/25	[kN]	9	12	16	20
Characteristic resistance in $N_{Rk,p}$ in cracked concrete	C 20/25	[kN]	3	6	7,5	12
Installation safety factor	γ_2	[-]	1,2			
Increasing factors for $N_{Rk,p}$ for Cracked and non-cracked concrete	ψ_c	C30/37	1,22			
		C40/50	1,41			
		C50/60	1,55			
Concrete cone and splitting failure						
Effective anchorage depth	h_{ef}	[mm]	45	50	65	80
Spacing	$s_{cr,N}$	[mm]	3 x h_{ef}			
	$s_{cr,sp}$	[mm]	220	240	320	400
Edge distance	$c_{cr,N}$	[mm]	1,5 x h_{ef}			
	$c_{cr,sp}$	[mm]	110	120	160	200
Installation safety factor	γ_2	[-]	1,2			

Displacements under tension loads

Anchor size			M8	M10	M12	M16
Tension load in non-cracked concrete	N	[kN]	1,6	3,0	3,6	6,3
Displacements	δ_{N0}	[mm]	0,4	0,5	0,7	0,7
	$\delta_{N\infty}$	[mm]	0,5	1,0	1,5	1,4

K-A-L-M Wedge Anchor KDK, KDK-E, KDK-H

Performances
Characteristic values for tension load

Annex C 1

Characteristic values for shear load for design method A according to ETAG 001, Annex C

Anchor size			M8	M10	M12	M16
Steel failure without lever arm – Version KDK						
Characteristic resistance	$V_{Rk,s}$	[kN]	7	15	20	36
Steel failure without lever arm – Version KDK-E / KDK-H						
Characteristic resistance	$V_{Rk,s}$	[kN]	8	14	20	37
Steel failure with lever arm – Version KDK						
Characteristic bending moment	$M^0_{Rk,s}$	[Nm]	28	55	90	229
Steel failure with lever arm – Version KDK						
Characteristic bending moment	$M^0_{Rk,s}$	[Nm]	26	52	92	233
Concrete pryout failure						
Factor k in equation (5.6) of ETAG 001, Annex C, section 5.2.3.3	k	[-]	1,0		2,0	
Installation safety factor	γ_2	[-]	1,0			
Concrete edge failure						
Effective length of anchor in shear loading	l_f	[mm]	45	50	65	80
Effective outside diameter of anchor	d_{nom}	[mm]	8	10	12	16
Installation safety factor	γ_2	[-]	1,0			

Displacements under shear loads

Anchor size			M8	M10	M12	M16
Shear load in non-cracked concrete	V	[kN]	3,2	7,0	9,3	17,4
Displacement	δ_{v0}	[mm]	0,8	1,3	1,5	3,1
	$\delta_{v\infty}$	[mm]	1,2	2,0	2,3	4,7

K-A-L-M Wedge Anchor KDK, KDK-E, KDK-H

Performances

Characteristic values for shear load

Annex C 2

Characteristic values to tension loads under fire exposure in cracked and non-cracked concrete C20/25 to C50/60 for design method A

Type of anchor/size	KDK gvz, KDK-E, KDK-H															
	M8				M10				M12				M16			
Fire resistance R... duration [min]	30	60	90	120	30	60	90	120	30	60	90	120	30	60	90	120
Characteristic resistance [kN] $N_{Rk,fi} = N_{Rk,s,fi} = N_{Rk,p,fi}$	0,2	0,2	0,2	0,1	0,6	0,5	0,4	0,3	1,1	0,8	0,7	0,6	2,1	1,6	1,4	1,0
Spacing $s_{cr,N,fi}$ [mm]	4 x h_{ef}															
Edge distance $c_{cr,N,fi}$ [mm]	2 x h_{ef}															
	If fire attack is from more than one side, the edge distance of the anchor has to be ≥ 300 mm.															

K-A-L-M Wedge Anchor KDK, KDK-E, KDK-H

Performances
Characteristic values under fire exposure

Annex C 3