Deutsches Institut für Bautechnik

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Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

Designated according to Article 29 of Regulation (EU) No 305/2011 and member of EOTA (European Organisation for Technical Assessment)

European Technical Assessment

ETA-20/0627 of 6 November 2020

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	Akalm bonded anchor AIT-VMK-SF
Product family to which the construction product belongs	Bonded fastener for use in concrete
Manufacturer	Akalm (Shandong) Building Technology Co., Ltd. No. 3 Shencheng Road, Economic Development-Zone, Sishui Country Jining City SHANDONG VOLKSREPUBLIK CHINA
Manufacturing plant	Plant (Shandong)
This European Technical Assessment contains	14 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	EAD 330499-01-0601, Edition 4/2020

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Specific Part

1 Technical description of the product

The "Akalm bonded anchor AIT-VMK-SF" consists of a cartridge with injection mortar VMK-SF and a threaded rod for ASK with washer and hexagon nut in the range of M10 to M20.

The threaded rod is placed into a drilled hole filled with injection mortar and is anchored via bond between threaded rod, injection mortar and concrete.

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 to tension load (static and quasi-static loading)	See Annex B 2, C 1
Characteristic resistance to shear load (static and quasi-static loading)	See Annex C 2
Displacements under short-term and long-term loading	See Annex C 3
Characteristic resistance and displacements for seismic performance categories C1 and C2	No performance assessed

3.2 Hygiene, health and the environment (BWR 3)

Essential characteristic	Performance
Content, emission and/or release of dangerous substances	No performance assessed

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

In accordance with the European Assessment Document EAD 330499-01-0601 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 at Deutsches Institut für Bautechnik.

Issued in Berlin on 6 November 2020 by Deutsches Institut für Bautechnik

Dipl.-Ing. Beatrix Wittstock
Head of Section

beglaubigt:
Baderschneider

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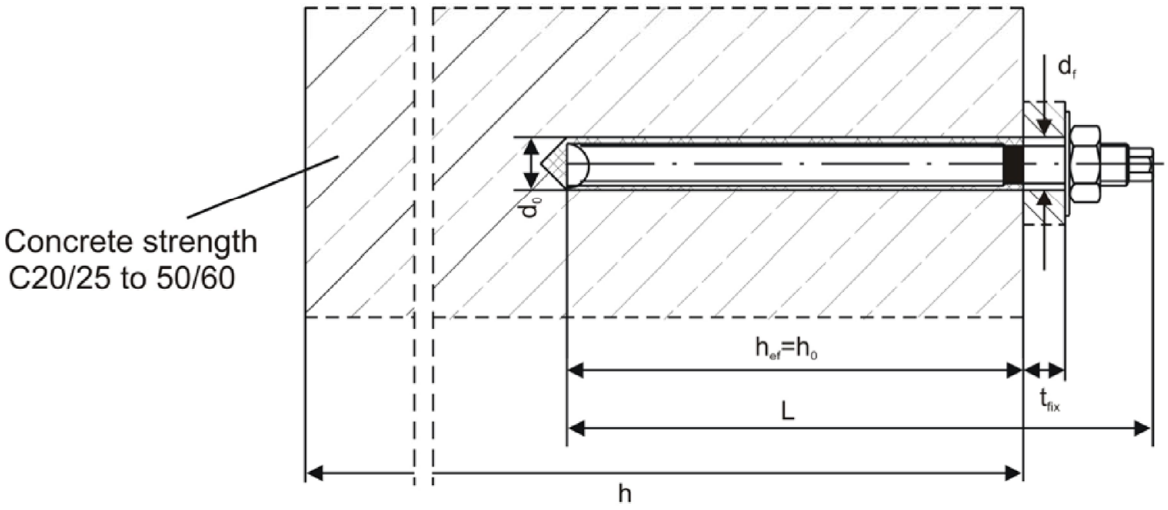
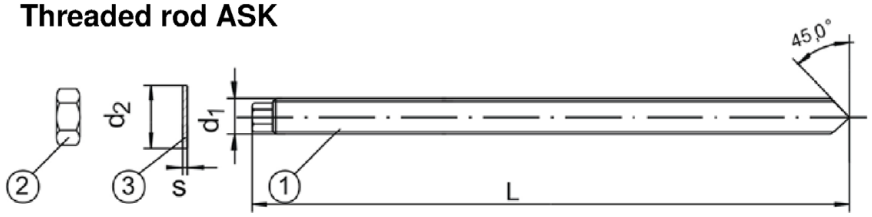
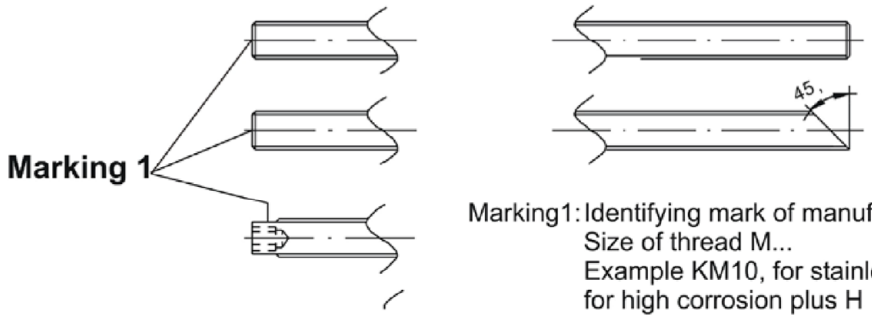
Installation conditions

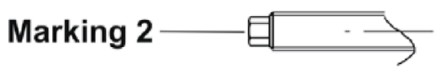


Threaded rod ASK





Marking1: Identifying mark of manufacturing plant K
Size of thread M...
Example KM10, for stainless steel plus E,
for high corrosion plus H



Marking2: Example:  , for stainless steel plus E,
for high corrosion plus H

Table A1: Dimensions

Anchor size			M10	M12	M16	M20
Threaded rod	Ø d_1	[mm]	M10	M12	M16	M20
	L ≥	[mm]	100	120	140	200
	h_{ef}	[mm]	90	110	125	170

Akalm bonded anchor AIT-VMK-SF

Product description
Installation conditions, threaded rod ASK

Annex A 1

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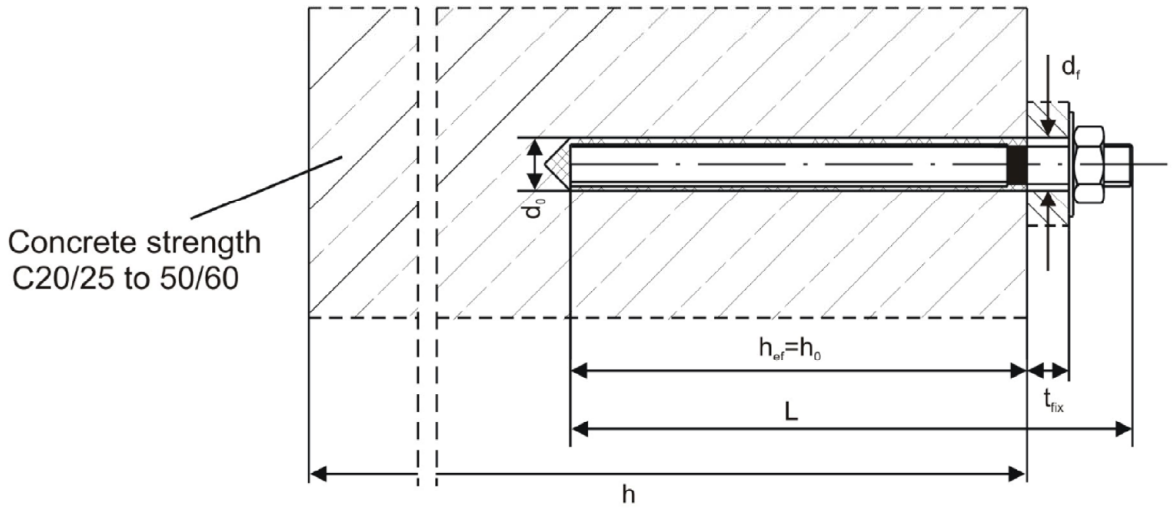
Installation conditions



Commercial threaded rod

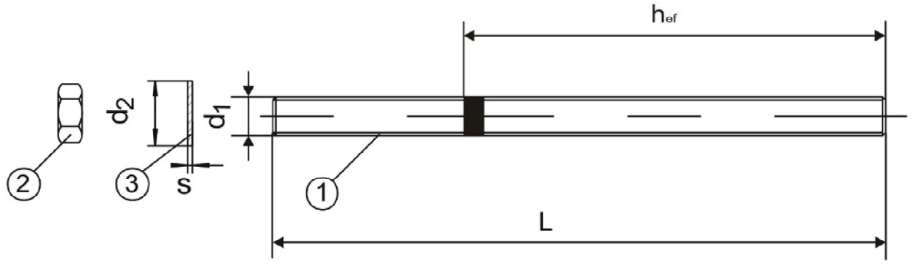


Table A2: Dimensions

Anchor size			M10	M12	M16	M20
Threaded rod	Ø d_1	[mm]	M10	M12	M16	M20
	$h_{ef,min}$	[mm]	60	70	80	90
	$h_{ef,max}$	[mm]	100	120	160	200

Akalm bonded anchor AIT-VMK-SF

Product description
Installation conditions, threaded rod (commercial standard rod)

Annex A 2

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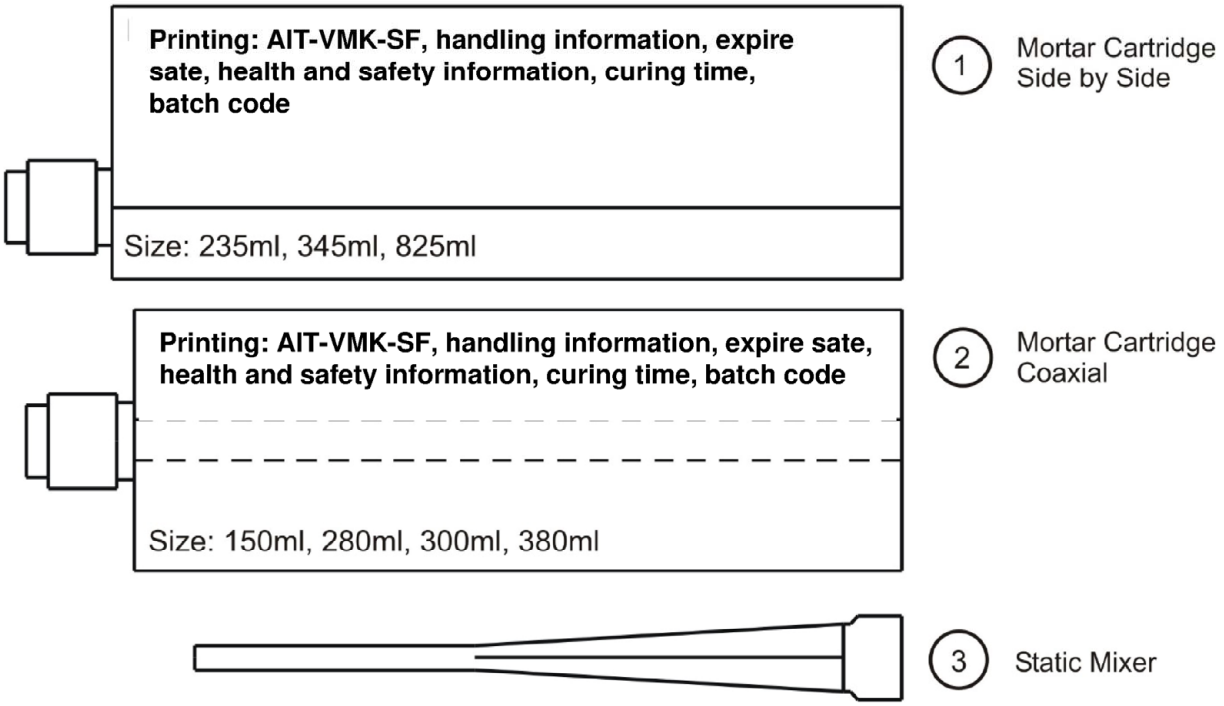
Cartridges



Akalm bonded anchor AIT-VMK-SF	**Annex A 3**
Product description Cartridges / Static mixer	

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Table A3: Materials

Part	Designation	Steel, zinc plated ≥ 5 µm plated acc. to EN ISO 4042:2018	Steel, hot-dip galvanised ≥ 40 µm acc. to EN ISO 1461:2009
1	Threaded rod	Steel acc. to EN 10087:2019 or EN 10263:2017, Property class 4.6, 5.8, 8.8, acc. to EN ISO 898-1:2013	Steel acc. to EN 10087:2019 or EN 10263:2017, Property class 4.6, 5.8, 8.8, acc. to EN ISO 898-1:2013
2	Hexagon nut acc. to EN ISO 4032:2012	Steel acc. to EN10087:1998 or EN 10263:2001 Property class 4, 5, 8 acc. to EN ISO 898-2:2012	Steel acc. to EN10087:1998 or EN 10263:2001 Property class 4, 5, 8 acc. to EN ISO 898-2:2012
3	Washer acc. to EN ISO 887:2006 EN ISO 7089:2000 EN ISO 7093:2000 EN ISO 7094:2000	Steel, galvanised	Steel, hot-dip galvanised

Part	Designation	Stainless steel A4	High corrosion resistant steel (HCR)
1	Threaded rod	Stainless steel, 1.4401, 1.4404, 1.4571 acc. to EN 10088-1:2014 Porperty class 70 acc. to EN ISO 3506-1:2009	High corrosion resistant steel 1.4529, 1.4565 acc. to EN 10088-1:2014 Porperty class 70 acc. to EN ISO 3506-1:2009
2	Hexagon nut acc. to EN ISO 4032:2012	Stainless steel, 1.4401, 1.4404, 1.4571 acc. to EN 10088-1:2014 Porperty class 70 acc. to EN ISO 3506-1:2009	High corrosion resistant steel 1.4529, 1.4565 acc. to EN 10088-1:2014 Porperty class 70 acc. to EN ISO 3506-1:2009
3	Washer acc. to EN ISO 887:2006 EN ISO 7089:2000 EN ISO 7093:2000 EN ISO 7094:2000	Stainless steel, 1.4401, 1.4404, 1.4571 acc. to EN 10088-1:2014	High corrosion resistant steel 1.4529, 1.4565 acc. to EN 10088-1:2014

Akalm bonded anchor AIT-VMK-SF

Product description
Materials

Annex A 4

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Specifications of intended use

Anchorages subject to:

- Static and quasi-static loads: M10 to M20

Base materials:

- Compacted, reinforced or unreinforced normal weight concrete without fibres according to EN 206:2013 + A1:2016.
- Strength classes C20/25 to C50/60 according to EN 206:2013 + A1:2016.
- Non-cracked concrete: M10 to M20

Temperature Range:

- I: -40°C to +40°C
  (max long term temperature +24 °C and max short term temperature +40 °C)
- II: -40°C to +60°C
  (max long term temperature +43 °C and max short term temperature +60 °C)
- III: -40°C to +80°C
  (max long term temperature +50 °C and max short term temperature +80 °C)

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions (all materials).
- For all other conditions according to EN 1993-1-4:2006+A1:2015 corresponding to corrosion resistance class:
  - Stainless steel Stahl A4 according to Annex A 4, Table A3: CRC III
  - High corrosion resistance steel HCR according to Annex A 4, Table A3: CRC V

Design:

- Anchorages have to be 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 anchorages are designed in accordance to EN 1992-4:2018 and Technical Report TR 055, Edition February 2018

Installation:

- Anchor installation carried out by appropriately qualified personnel and under the supervision of the of the person responsible for technical matters of the site.
- Use category 1: dry or wet concrete (not in flooded holes)
- Hole drilling by hammer drilling.
- In case of aborted hole: The hole shall be filled with mortar.
- Marking and keeping the effective anchorage depth
- Overhead installation is allowed.

Commercial standard threaded rods, washers and hexagon nuts may also be used if the following requirements are fulfilled:

- Material and mechanical properties acc. to Annex A3
- Inspection certificate 3.1 acc. to EN 10204:2004, the documents should be stored
- Marking of the embedment depth

Akalm bonded anchor AIT-VMK-SF	**Annex B 1**
Intended Use Specifications	

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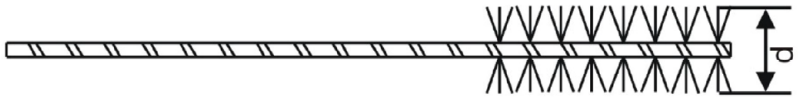
Table B1: Installation parameters

Anchor size			M10	M12	M16	M20
Nominal diameter of drill hole	d_0	[mm]	12	14	18	24
Effective embedment depth (h_{ef} = drill hole depth L (see Annex A1))	$h_{ef,min}$	[mm]	see Annex A1 and A2			
	$h_{ef,max}$	[mm]				
Diameter of clearance hole in fixture	d_f	[mm]	12	14	18	22
Diameter of steel brush	d	[mm]	13	16	20	27
Installation torque	max. T_{inst}	[Nm]	20	30	50	80
Minimum member thickness	h_{min}	[mm]	$(h_{ef}+40)$mm			
Minimum edge distance	c_{min}	[mm]	100	100	100	100
Minimum spacing	s_{min}	[mm]	120	140	160	200

Steel brush



Blow Pump ABK (Standard Cleaning)

Dispenser

Table B2: Maximum processing time and minimum curing time

Temperature in the anchorage base [°C]	Maximum processing time [min]	Minimum curing time in dry concrete [min]	Minimum curing time in wet concrete [min]
0 – 5	25	180	360
5 – 20	12	90	180
20 – 30	4	45	90
30 - 40	3	25	50
>40	2	15	30

Akalm bonded anchor AIT-VMK-SF

Intended Use
Installation parameters / Cleaning and setting tools / Processing time / Curing time

Annex B 2

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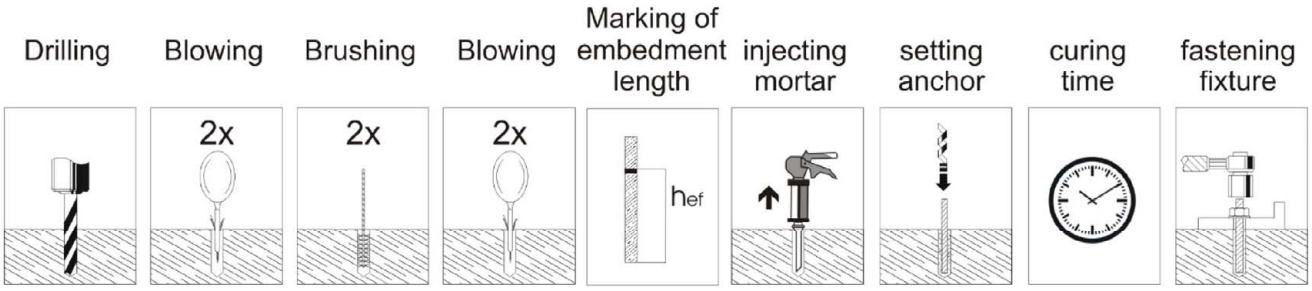
Installation instructions



Step

1	2	3	4	5	6	7	8	9

Step	Installation instructions
1	Drill the hole. Drill hole diameter and drill hole depth, see Annex B 3
2	Clean the drill hole: Blow out the drill hole two times, using a hand pump
3	Check brush diameter (Annex B 3) Brush the drill hole a minimum of two times. For drill hole diameter ≥ 24 mm (M20) attach the brush to a drilling machine or a battery screwdriver. If the bore hole ground is not reached with the brush use an extension.
4	Clean the drill hole: Blow out the drill hole two times, using a hand pump
5	Marking of the embedment depth.
6	Twist off the sealing cap Twist on the static mixer (the spiral in the static mixer must be clearly visible) Load the cartridge into the dispenser The first swings of mortar (appr. 10 cm strand) shall be discarded until the color of the mortar has turned into a uniform grey. The hole shall be uniformly filled starting from the hole bottom, in order to avoid entrapment of air. During pressing-out the mixer shall be slowly removed bit by bit. The drill hole shall be filled with the minimum quantity of the injection mortar given in the manufacturer's installation instruction (approximately 2/3 of the drill hole). **Overhead installation: Insert the static mixer to the back of the hole and inject adhesive. It is required that the bore hole is completely filled with adhesive approximately 2/3 of the drill hole.**
7	The anchor rod shall be pressed by manual turning into the mortar-filled hole up to the marked anchorage depth. If work is interrupted for a time exceeding the indicated processing time of the cartridge, the static mixer has to be replaced. **Overhead installation: It is required that the annular gap between the anchor and the concrete is completely filled with adhesive along the embedment length. Afterwards fix the anchor rod with e.g. wedges.**
8	Wait for the specified curing time (see Annex B 3)
9	Mounting the fixture, T_{inst}, see Annex B 3

Akalm bonded anchor AIT-VMK-SF

Intended Use
Installation instructions

Annex B 3

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Table C1: Characteristic values for tension load

Steel Failure			**M10**	**M12**	**M16**	**M20**
Characteristic Resistance, Steel, strength class 4.6	$N_{Rk,s}$	[kN]	23,2	33,7	62,8	98,0
Partial Factor Steel, strength class 4.6	$\gamma_{Ms,N}$	[-]	2,0			
Characteristic Resistance, Steel, strength class 5.8	$N_{Rk,s}$	[kN]	29,0	42,2	78,5	122,5
Partial Factor Steel, strength class 5.8	$\gamma_{Ms,N}$	[-]	1,5			
Characteristic Resistance, Steel, strength class 8.8	$N_{Rk,s}$	[kN]	46,4	67,4	125,6	196,0
Partial Factor Steel, strength class 8.8	$\gamma_{Ms,N}$	[-]	1,5			
Characteristic Resistance, Stainless Steel A4 and HCR, class 70	$N_{Rk,s}$	[kN]	40,6	59,0	109,9	171,5
Partial Factor Stainless Steel A4 and HCR, class 70	$\gamma_{Ms,N}$	[-]	1,87			
Combined pull-out and concrete cone failure			**M10**	**M12**	**M16**	**M20**
Temperature Range I: 40/24°C, Dry and Wet Concrete	$\tau_{Rk,ucr}$	[N/mm²]	7,0	6,0	5,0	4,0
Temperature Range II: 60/43°C, Dry and Wet Concrete	$\tau_{Rk,ucr}$	[N/mm²]	7,0	6,0	5,0	4,0
Temperature Range III: 80/50°C, Dry and Wet Concrete	$\tau_{Rk,ucr}$	[N/mm²]	6,3	5,4	4,5	3,6
Characteristic bond resistance For cracked concrete	$\tau_{Rk,cr}$	[N/mm²]	No performance assessed			
Increasing factor ψ_c for concrete	C30/37		1,10			
	C40/50		1,18			
	C50/60		1,25			
Reduction factor	ψ^0_{sus}	[-]	No performance assessed			
Concrete cone failure						
Factor for uncracked concrete	$k_{ucr,N}$	[-]	11,0			
Factor for cracked concrete	$k_{cr,N}$	[-]	No performance assessed			
Edge Distance	$c_{cr,N}$	[mm]	$1{,}5 \cdot h_{ef}$			
Spacing	$s_{cr,N}$	[mm]	$2 \cdot c_{cr,N}$			
Splitting Failure						
Edge Distance	$c_{cr,sp}$	[mm]	$c_{cr,sp} = h_{ef} \cdot \left(\frac{\tau_{Rk,ucr}}{8}\right)^{0,4} \cdot \left(3{,}1 - 0{,}7 \cdot \frac{h}{h_{ef}}\right)$			
Spacing	$s_{cr,sp}$	[mm]	$2 \cdot c_{Cr,Sp}$			
Installation factor	γ_{inst}	[-]	1,4			

Akalm bonded anchor AIT-VMK-SF

Performances
Characteristic values for tension load

Annex C 1

Deutsches Institut für Bautechnik DIBt

Table C2: Characteristic values for shear load

Steel Failure without lever arm			**M10**	**M12**	**M16**	**M20**
Characteristic Resistance, Steel, strength class 4.6	$V^0_{Rk,s}$	[kN]	11,6	16,9	31,4	49,0
Characteristic Resistance, Steel, strength class 5.8	$V^0_{Rk,s}$	[kN]	14,5	21,1	39,3	61,3
Characteristic Resistance, Steel, strength class 8.8	$V^0_{Rk,s}$	[kN]	23,2	33,7	62,8	98,0
Characteristic Resistance, Stainless Steel A4 and HCR, class 70	$V^0_{Rk,s}$	[kN]	20,3	29,5	55,0	85,8
Dutility factor	k_7	[-]	1,0			
Steel Failure with lever arm			**M10**	**M12**	**M16**	**M20**
Bending Moment, Steel, strength class 4.6	$M^0_{Rk,s}$	[Nm]	25,6	45,0	117,2	228,6
Bending Moment, Steel, strength class 5.8	$M^0_{Rk,s}$	[Nm]	32,0	56,3	146,5	285,7
Bending Moment, Steel, strength class 8.8	$M^0_{Rk,s}$	[Nm]	51,2	90,0	234,4	457,1
Bending Moment, Stainless Steel A4 and HCR, class 70	$M^0_{Rk,s}$	[Nm]	44,8	78,8	205,1	400,0
Partial factors						
Steel, strength class 4.6	$\gamma_{Ms,V}$	[-]	1,67			
Steel, strength class 5.8	$\gamma_{Ms,V}$	[-]	1,25			
Steel, strength class 8.8	$\gamma_{Ms,V}$	[-]	1,25			
A4 und HCR, strength class 70	$\gamma_{Ms,V}$	[-]	1,56			
Pryout failure						
Factor	k_8	[-]	1,0 for $h_{ef} \leq 60$mm 2,0 for $h_{ef} > 60$mm			
Concrete Edge failure						
Effective length of fastener	l_f	[mm]	min (h_{ef}; 12 * d_{nom})			
Outside diameter of fastener	d_{nom}	[mm]	10	12	16	20
Installation factor	γ_{inst}	[-]	1,0			

Akalm bonded anchor AIT-VMK-SF

Performances
Characteristic values for shear load

Annex C 2

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Table C3: Displacements under tension and shear loads

Displacements under tension loads			**M10**	**M12**	**M16**	**M20**
Temperature Range I: 40°C / 24°C	Load	[kN]	3,0	2,5	2,0	1,6
	δ_{N0}	[mm]	1,6	1,5	1,4	1,3
	$\delta_{N\infty}$	[mm]	2,4	2,3	2,1	2,0
Temperature Range II: 60°C / 43°C	Load	[kN]	3,0	2,5	2,0	1,6
	δ_{N0}	[mm]	1,6	1,5	1,4	1,3
	$\delta_{N\infty}$	[mm]	2,4	2,3	2,1	2,0
Temperature Range III: 80°C / 50°C	Load	[kN]	2,5	2,2	1,8	1,4
	δ_{N0}	[mm]	1,5	1,5	1,4	1,3
	$\delta_{N\infty}$	[mm]	2,3	2,2	2,0	2,0
Displacements under shear loads			**M10**	**M12**	**M16**	**M20**
	δ_{V0}	[mm]	No Performance assessed			
	$\delta_{V\infty}$	[mm]	No Performance assessed			

Akalm bonded anchor AIT-VMK-SF

Performances
Displacements under tension and shear loads

Annex C 3