HECO SCHRAUBEN

European Technical Assessment – Option 1 for cracked concrete

ETA-05/0010

MULTI-MONTI®

European Technical Assessment ETA-05/0010

Concrete screw made of galvanised steel
for use in concrete

Deutsches Institut für Bautechnik DIBt

Member of EOTA
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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-05/0010 of 21 January 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	HECO MULTI-MONTI MMS
Product family to which the construction product belongs	Concrete screw for use in concrete
Manufacturer	HECO-Schrauben GmbH & Co. KG Dr.-Kurt-Steim-Straße 28 78713 Schramberg
Manufacturing plant	HECO-Schrauben GmbH & Co. KG Dr.-Kurt-Steim-Straße 28 78713 Schramberg
This European Technical Assessment contains	12 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 3: "Undercut anchors", April 2013, used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011.

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Specific Part

1 Technical description of the product

The Concrete Screw HECO MULTI-MONTI MMS is an anchor made of zinc plated steel of sizes 7.5, 10, 12, 14 and 16. The anchor is screwed into a predrilled cylindrical drill hole. The special thread of the anchor cuts an internal thread into the member while setting. The anchorage is characterised by mechanical interlock in the special thread.

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	See Annex C 1 and C 2
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	Anchorages satisfy requirements for Class A1
Resistance to fire	See Annex C 3 and C 4

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.

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

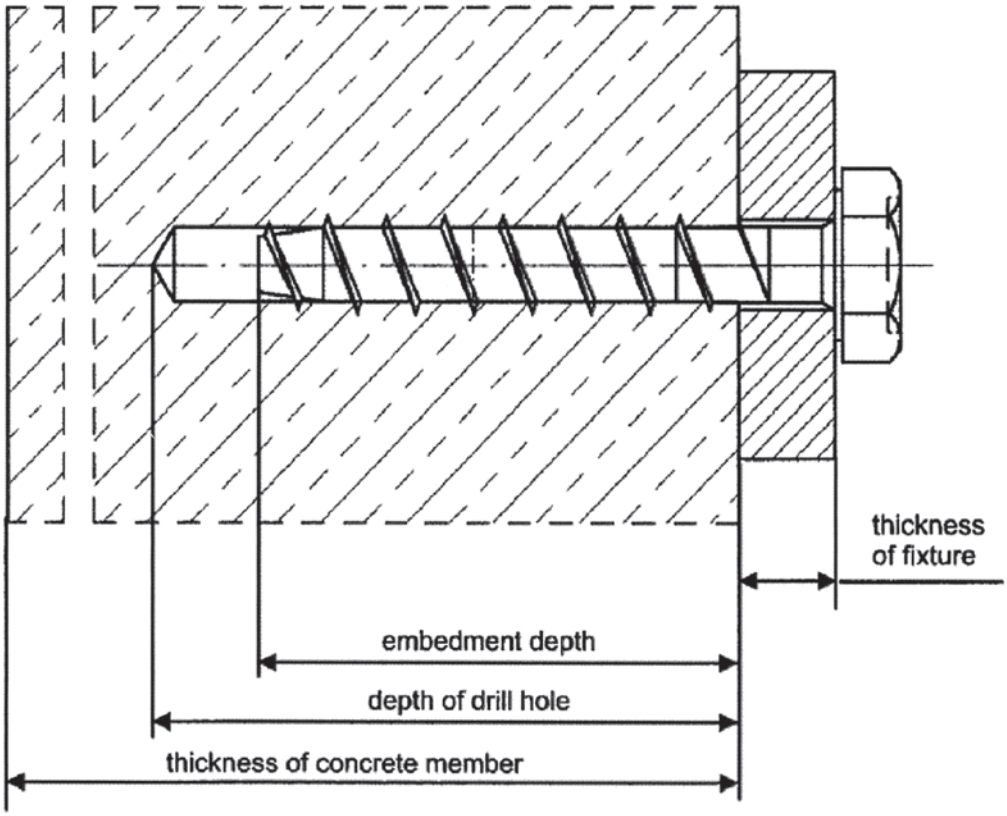
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Deutsches Institut für Bautechnik.

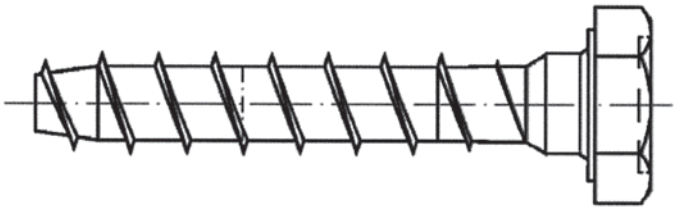
Issued in Berlin on 21 January 2015 by Deutsches Institut für Bautechnik

Andreas Kummerow
p.p. Head of Department

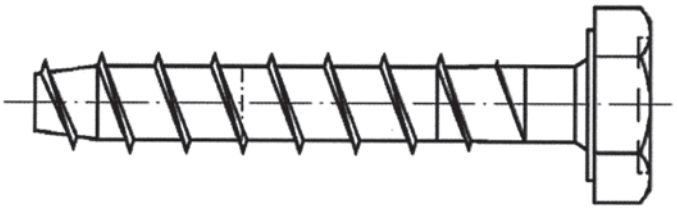
beglaubigt:
Baderschneider

Installed condition



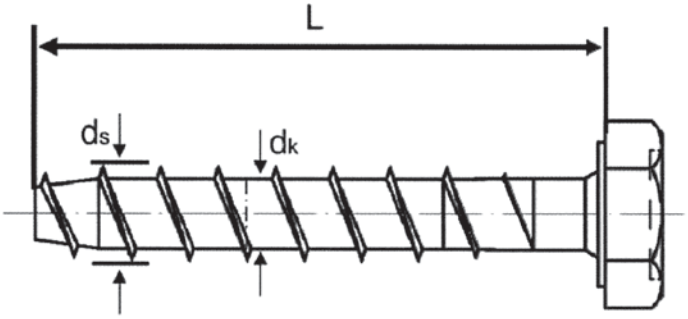


MMS-16



MMS-7,5
MMS-10
MMS-12
MMS-14

HECO MULTI-MONTI MMS	Annex A 1
Product description Product, Installed condition	



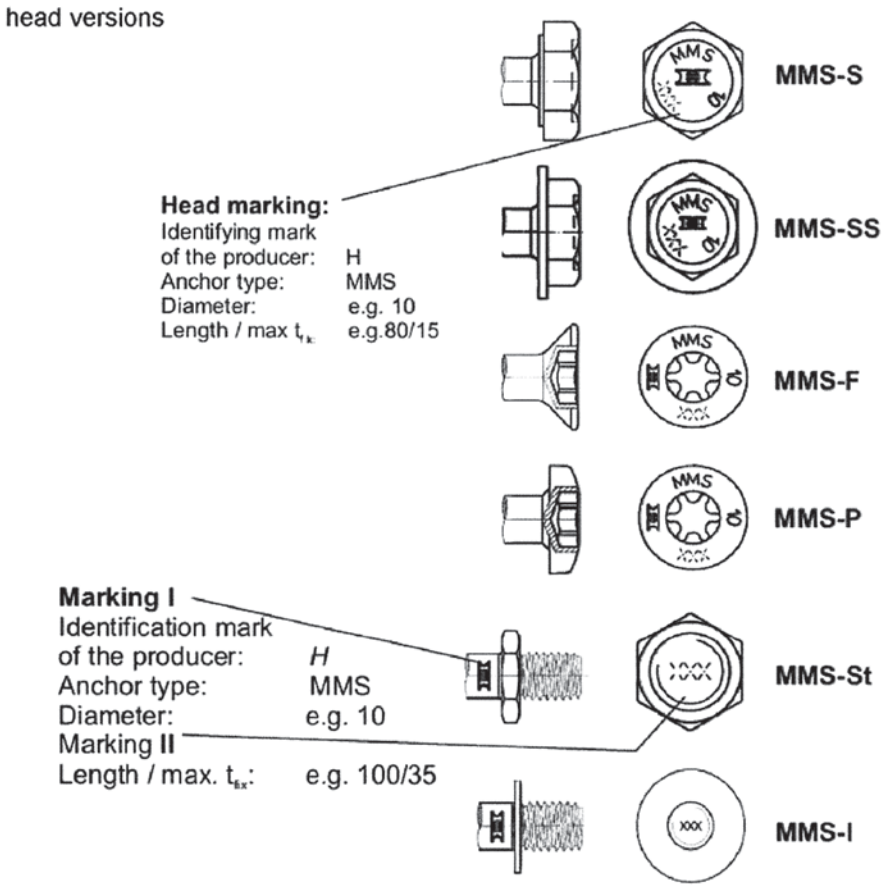


Table A1: Dimensions and Materials

Anchor sizes			MMS-7,5	MMS-10	MMS-12	MMS-14	MMS-16
Length	L ≥	[mm]	60	70	80	100	120
Length	L ≤	[mm]	200	200	400	400	400
Bolt diameter	d_k	[mm]	5,7	7,6	9,4	11,3	13,3
Thread diameter	d_s	[mm]	7,5	10,1	12,0	14,3	16,7
Material			galvanised steel acc. to EN 10263-4:2001				

HECO MULTI-MONTI MMS

Product description
Head Versions,
dimensions and materials

Annex A 2

Specifications of intended use

Anchorages subject to:

- Static and quasi-static loads: all sizes.
- Fire exposure: all sizes.

Base Materials:

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

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions.

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.).
- Anchorages under static or quasi-static actions and under fire exposure are designed for design method A in accordance with:
  - ETAG 001, Annex C, Edition 2010
- In case of requirements for resistance of fire exposure it must be ensured that local spalling of the concrete cover does not occur.

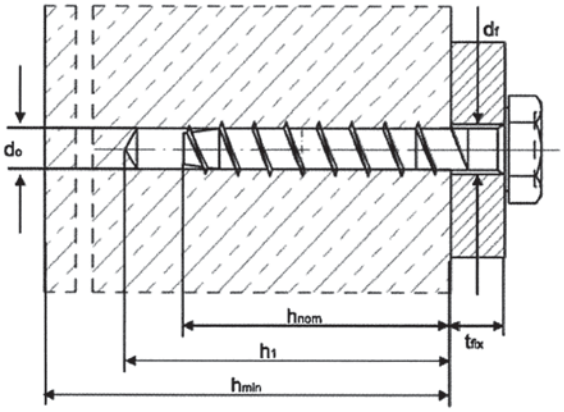
Installation:

- Hole drilling by hammer-drilling only.
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- 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 hole is filled with high strength mortar and if under shear or oblique tension load it is not the direction of the load application.
- The anchor may be used only once.
- The fixture is fully pressed on the concrete surface without intermediate layers.
- Further turning of the anchor is not easy.
- The head of the anchor is fully supported on the fixture and is not damaged.
- MMS-St: reach the required setting depth, securing the anchor against twisting.

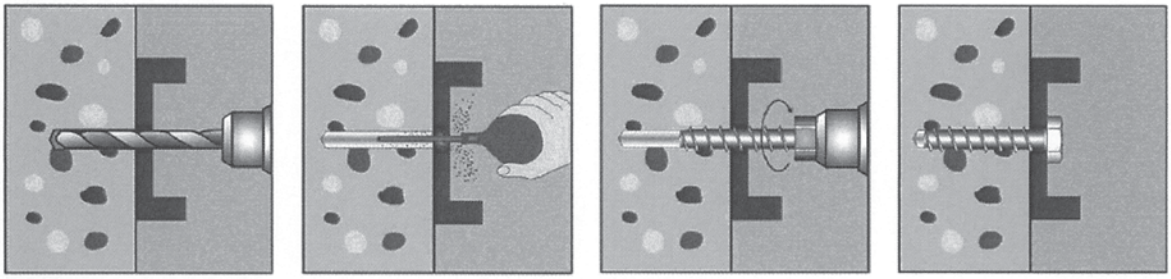
HECO MULTI-MONTI MMS	Annex B 1
Intended Use Specifications	

Table B1: Installation Parameters

Anchor sizes			MMS-7,5	MMS-10	MMS-12	MMS-14	MMS-16
Nominal drill diameter	d_0	[mm]	6,0	8,0	10,0	12,0	14,0
Cutting diameter of the drill bit	$d_{cut} \leq$	[mm]	6,4	8,45	10,45	12,5	14,5
Depth of drill hole	$h_1 \geq$	[mm]	65	75	85	105	130
Embedment depth	$h_{nom} \geq$	[mm]	55	65	75	95	115
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	9,0	12,0	14,0	16,0	18,0
Recommended installation tool			Impact screw driver, max. power output T_{max} according manufacturer information				
			100 Nm	250 Nm	250 Nm	350 Nm	500 Nm



Installation Instruction



Drilling
Drill diameter d_0 and drilling depth h_1 have to be kept

Removal of drill dust
e.g. blowing

Installation
e.g. by hand or with impact screw driver

Complete
verification: head supported to fixture and embedment depth h_{nom}

Table B2: Minimum thickness of concrete member, minimum spacing and minimum edge distances of anchor

Anchor sizes			MMS-7,5	MMS-10	MMS-12	MMS-14	MMS-16
min. thickness of concrete member	h_{min}	[mm]	100	115	125	150	180
cracked and non-cracked concrete							
min. spacing	s_{min} =	[mm]	40	50	60	90	100
min. edge distance	c_{min} =	[mm]	40	50	60	90	100

HECO MULTI-MONTI MMS

Intended Use
Installation Parameters, installation instruction, minimum thickness of concrete member, minimum spacing and minimum edge distance of anchor

Annex B 2

Table C1: Characteristic Values under tension loads

Anchor sizes			MMS-7,5	MMS-10	MMS-12	MMS-14	MMS-16
Steel failure							
Characteristic resistance	$N_{Rk,s}$	[kN]	19,4	16	25	30	43
Partial safety factor	γ_{Ms}	[-]	1,4				
Pullout							
Characteristic resistance in cracked concrete C 20/25	$N_{Rk,p}$	[kN]	5	9	12	20	30
Characteristic resistance in non-cracked concrete C 20/25	$N_{Rk,p}$	[kN]	7,5	12	16	30	40
Increasing factor for concrete	ψ_c	C 30/37	1,22				
		C 40/50	1,41				
		C 50/60	1,55				
Installation safety factor	γ_2	[-]	1,2				
Concrete cone failure, splitting failure							
Effective anchorage depth	h_{ef}	[mm]	40	47,5	54,5	71,5	87,5
Spacing	$s_{cr,N} = s_{cr}$	[mm]	3 h_{ef}				
Edge distance	$c_{cr,N} = c_{cr}$	[mm]	1,5 h_{ef}				
Installation safety factor	γ_2	[-]	1,2				

Table C2: Displacements under tension loads

Anchor sizes			MMS-7,5	MMS-10	MMS-12	MMS-14	MMS-16
Tension load in cracked concrete	N	[kN]	2,0	3,0	4,0	7,2	9,7
Displacements	δ_{N0}	[mm]	0,1	0,1	0,2	0,3	0,4
	$\delta_{N\infty}$	[mm]	0,2	0,3	0,6	0,8	0,8
Tension load in non-cracked concrete	N	[kN]	3,0	4,0	5,3	10,1	13,7
Displacements	δ_{N0}	[mm]	0,1	0,1	0,2	0,3	0,4
	$\delta_{N\infty}$	[mm]	0,2	0,3	0,6	0,8	0,8

Table C3: Characteristic Values under shear loads

Anchor sizes			MMS-7,5	MMS-10	MMS-12	MMS-14	MMS-16
Steel failure without lever arm							
Characteristic resistance	$V_{Rk,s}$	[kN]	6,9	16	23	36	49
Partial safety factor	γ_{Ms}	[-]	1,5				
Steel failure with lever arm							
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	19	38	71	132	217
Partial safety factor	γ_{Ms}	[-]	1,5				
Concrete pryout failure							
Factor 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 the anchor under shear loading	l_f	[mm]	40	47,5	54,5	71,5	87,5
Effective diameter of the anchor	d_{nom}	[mm]	6	8	10	12	14
Installation safety factor	γ_2	[-]	1,0				

Table C4: Displacements under shear loads

Anchor sizes			MMS-7,5	MMS-10	MMS-12	MMS-14	MMS-16
Shear load in cracked and non-cracked concrete	V	[kN]	3,3	8,9	14,7	20,3	28,1
Displacements	δ_{V0}	[mm]	0,8	3,0	3,0	3,0	4,5
	$\delta_{V\infty}$	[mm]	1,2	4,5	4,5	4,5	6,0

Information for design of anchorage under shear load:

In general, the conditions given in ETAG 001, Annex C, section 4.2.2.1 a) and section 4.2.2.2 b) are not fulfilled because the diameter of clearance hole in the fixture according to Table B1 is greater than the values given in Annex C Table 4.1 for the corresponding diameter of the anchor.
However for each specific anchor length the manufacturer may specify the thickness of fixture for which these conditions are fulfilled.

Table C5: Characteristic values to tension loads under fire exposure in cracked and non-cracked concrete C20/25 to C50/60

Anchor sizes				MMS-7,5	MMS-10	MMS-12	MMS-14	MMS-16
Steel failure								
Characteristic resistance	R30	$N_{Rk,s,fi}$	[kN]	1,7	3,4	5,9	8,3	10,8
	R60			1,2	2,5	4,4	6,3	8,1
	R90			0,8	1,7	3,0	4,2	5,4
	R120			0,6	1,2	2,2	3,1	4,1
Characteristic resistance for MMS-St with metric stud	R30	$N_{Rk,s,fi}$	[kN]	1,7	1,8			
	R60			1,2	1,5			
	R90			0,8	1,1			
	R120			0,6	1,0			
Pullout								
Characteristic resistance in concrete C20/25 to C50/60	R30	$N^0_{Rk,p,fi}$	[kN]	1,3	2,3	3,0	5,0	7,5
	R60							
	R90							
	R120			1,0	1,8	2,4	4,0	6,0
Concrete cone failure								
Characteristic resistance in concrete C20/25 to C50/60	R30	$N_{Rk,c,fi}$	[kN]	1,8	2,8	3,9	7,8	12,9
	R60							
	R90							
	R120			1,5	2,2	3,2	6,2	10,3
Spacing		$s_{cr,N}$	[mm]	$4 \times h_{ef}$				
		s_{min}	[mm]	s_{min} acc. to Annex B 2				
Edge distance		$c_{cr,N}$	[mm]	$2 \times h_{ef}$				
		c_{min}	[mm]	$c_{min} = 2 \times h_{ef}$ if fire attack is from more than on side, the edge distance of the anchor has to be bigger than 300 mm.				

Table C6: Characteristic values to shear loads under fire exposure in cracked and non-cracked concrete C20/25 to C50/60

Anchor sizes				MMS-7,5	MMS-10	MMS-12	MMS-14	MMS-16
Steel failure without lever arm								
Characteristic resistance	R30	$V_{Rk,s,fi}$	[kN]	1,7	3,4	5,9	8,3	10,8
	R60			1,2	2,5	4,4	6,3	8,1
	R90			0,8	1,7	3,0	4,2	5,4
	R120			0,6	1,2	2,2	3,1	4,1
Steel failure with lever arm								
Characteristic resistance	R30	$M^0_{Rk,S,fi}$	[Nm]	1,5	4,0	8,8	15,0	22,0
	R60			1,1	3,0	6,6	11,0	17,0
	R90			0,7	2,0	4,4	7,4	11,0
	R120			0,5	1,5	3,3	5,6	8,3

Concrete pryout failure

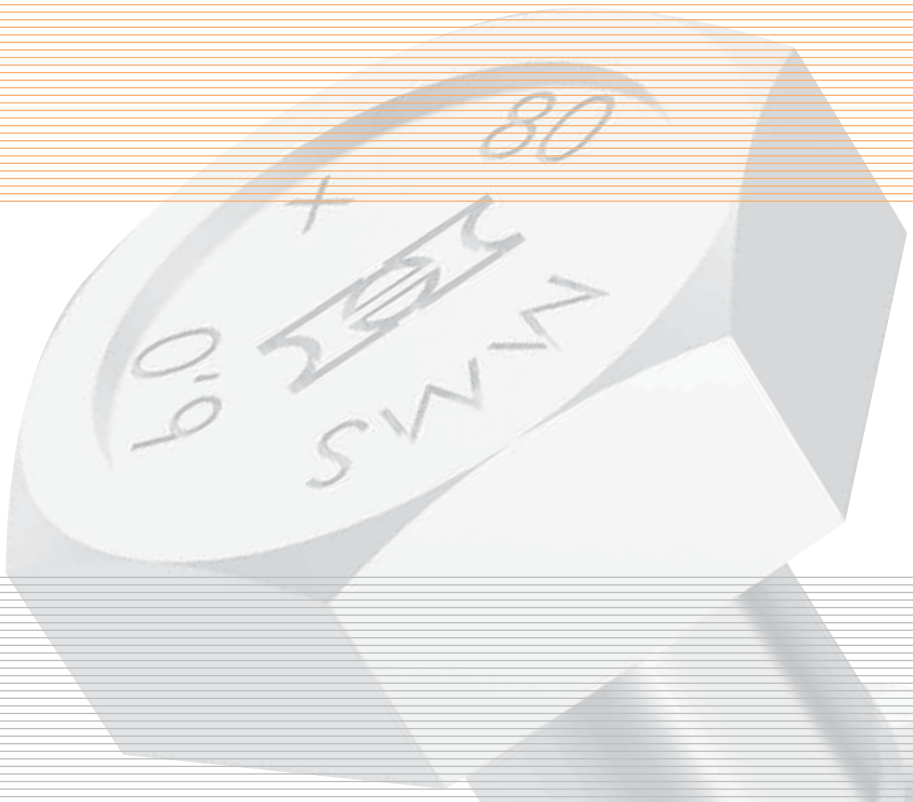
In Equation (5.6) of ETAG 001, Annex C, 5.2.2.3 the k-factor 2,0 (1,0 for MMS-7,5) and the relevant values of $N^0_{Rk,c,fi}$ Table C5 have to be considered.

Concrete edge failure

The initial value $V^0_{Rk,c,fi}$ of the characteristic resistance on concrete C20/25 to C50/60 under fire exposure may be determined by:

$V^0_{Rk,c,fi} = 0{,}25 \times V^0_{Rk,c}$ (R30, R60, R90) $\qquad$ $V^0_{Rk,c,fi} = 0{,}20 \times V^0_{Rk,c}$ (R120)

With $V^0_{Rk,c}$ initial value of the characteristic resistance in cracked concrete C20/25 under normal temperature.



HECO®
SCHRAUBEN

HECO-Schrauben GmbH & Co.KG
Dr.-Kurt-Steim-Straße 28 · D-78713 Schramberg
Tel.: +49 (0) 74 22 / 9 89-0 · Fax: +49 (0) 74 22 / 9 89-200
Mail: info@heco-schrauben.de · www.heco-schrauben.de

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