HECO SCHRAUBEN

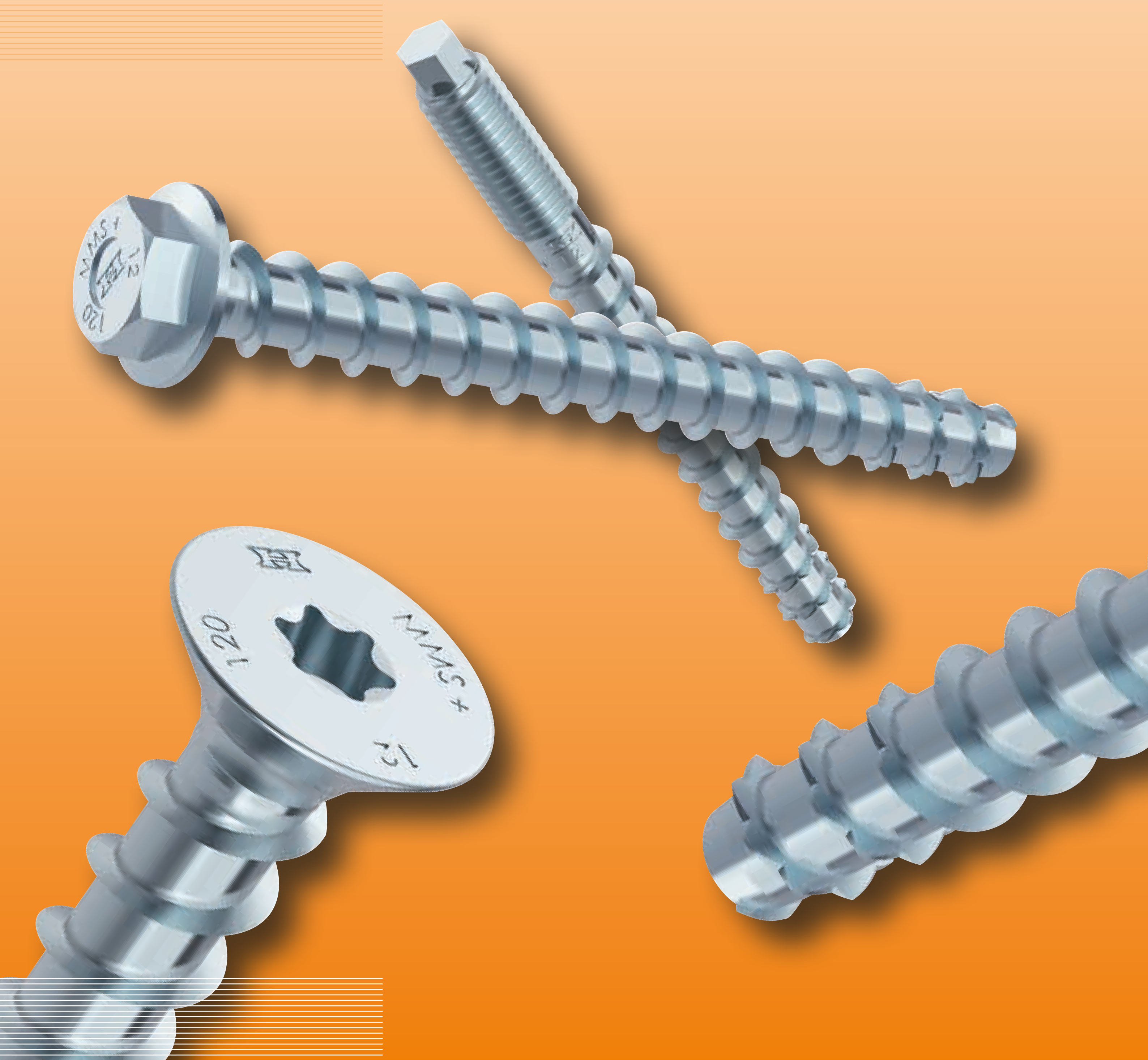
European Technical Assessment – Option 1 for cracked concrete

ETA-15/0784

MULTI-MONTI®-plus

European Technical Assessment ETA-15/0784

Screw anchor for use in cracked and uncracked concrete



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-15/0784 of 19 May 2016

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	MULTI-MONTI-plus
Product family to which the construction product belongs	Screw anchor of size 6, 7.5, 10 and 12 mm for use in cracked and uncracked concrete
Manufacturer	HECO-Schrauben GmbH & Co. KG Dr.-Kurt-Steim-Straße 28 78713 Schramberg DEUTSCHLAND
Manufacturing plant	HECO-Schrauben GmbH & Co. KG Werk Schramberg
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	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.

The European Technical Assessment is issued by the Technical Assessment Body in its official language. Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document and shall be identified as such.

Communication of this European Technical Assessment, including transmission by electronic means, shall be in full. However, partial reproduction may only be made with the written consent of the issuing Technical Assessment Body. Any partial reproduction shall be identified as such.

This European Technical Assessment may be withdrawn by the issuing Technical Assessment Body, in particular pursuant to information by the Commission in accordance with Article 25(3) of Regulation (EU) No 305/2011.

Specific Part

1 Technical description of the product

The Screw anchor MULTI-MONTI-plus is an anchor in size 6, 7.5, 10 and 12 mm made of galvanised steel. 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.

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 under static and quasi-static loading	See Annex C 1
Characteristic resistance under seismic loading category C1	See Annex C 2
Displacements under tension and shear loads	See Annex C 4

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

3.3 Safety in use (BWR 4)

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

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

In accordance with guideline for European technical approval ETAG 001, April 2013 used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011 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

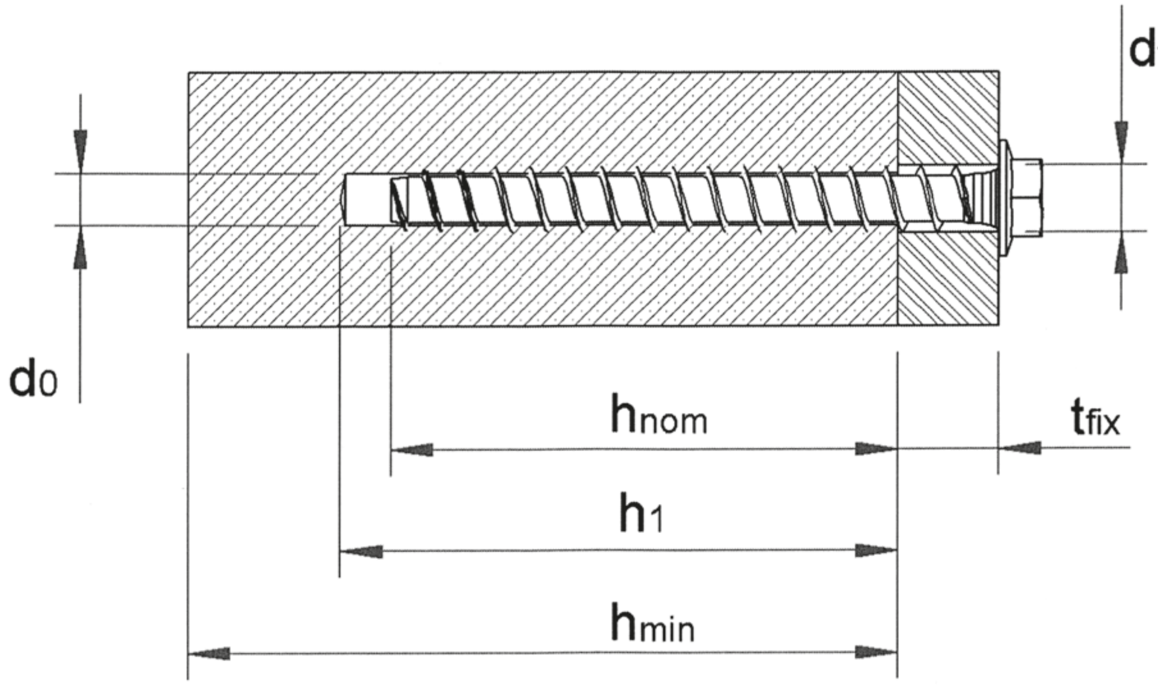
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Deutsches Institut für Bautechnik.

Issued in Berlin on 19 May 2016 by Deutsches Institut für Bautechnik

Uwe Bender
Head of Department

beglaubigt:
Tempel

Installed condition



MMS-plus SS (Head Version hexagon with washer size 6, 7.5, 10 and 12)

d_0	=	nominal borehole diameter
h_{nom}	=	nominal anchorage depth
h_1	=	borehole depth
h_{min}	=	minimum thickness of concrete member
t_{fix}	=	thickness of fixture
d_f	=	diameter of clearance hole in the fixture

MULTI-MONTI-plus

Product description
Installed condition

Annex A 1

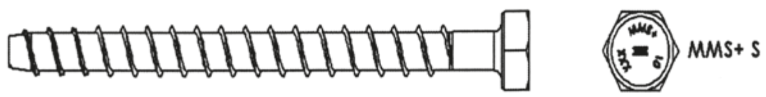
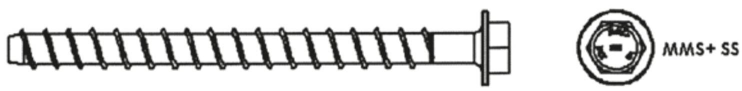
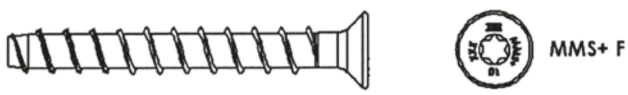
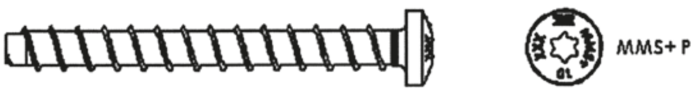
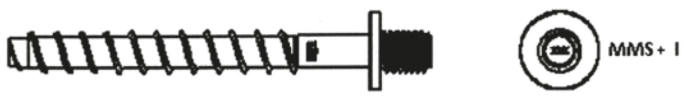
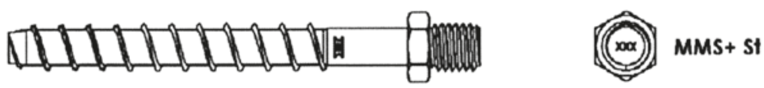
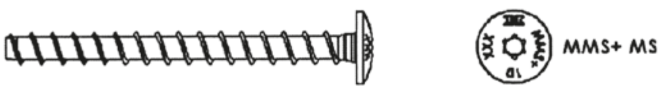
Deutsches Institut für Bautechnik DIBt

Table A1: Material and Dimensions

Type	Marking / Material
1, 2, 3, 4, 5, 6, 7, 8	screw anchor / steel [1)]

Size MMS-plus			6	7,5	10	12
nominal value of the characteristic yield strength	f_{yk}	[N/mm²]	640	640	640	640
nominal value of the characteristic tensile strength	f_{uk}	[N/mm²]	800	800	800	800
elongation at rupture	A_5	[%]	≤ 8			

1) galvanized steel according to EN 10263-4:2001

	1) MULTI-MONTI-plus S, with Hexagon Head (size 12 with washer according to DIN 440, galvanized)
	2) MULTI-MONTI-plus SS, with Hexagon Head and washer, galvanized
	3) MULTI-MONTI-plus F, with Countersunk, galvanized
	4) MULTI-MONTI-plus P, small Pan Head, galvanized
	5) MULTI-MONTI-plus I, anchor with metric stud for mounting of nuts, galvanized
	6) MULTI-MONTI-plus ST, anchor with metric stud galvanized
	7) MULTI-MONTI-plus MS, flat Pan Head, galvanized
	8) MULTI-MONTI-plus V, metric stud, galvanized

MULTI-MONTI-plus

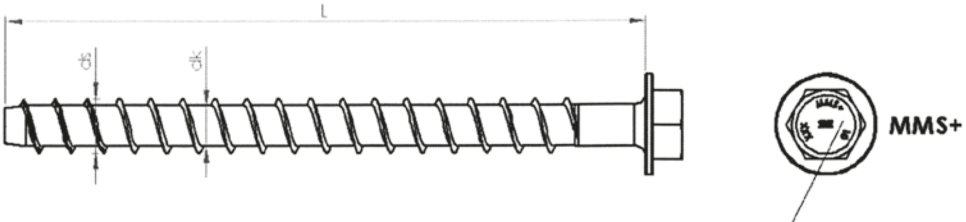
Product description
Head versions,
dimensions and materials

Annex A 2

Table A2: Dimensions and head markings

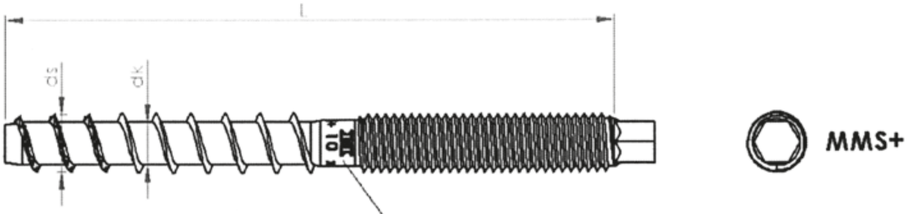
Size MMS-plus			6		7,5		10		12	
Embedment depth in concrete		[mm]	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}
			35	45	35	55	50	65	75	90
Thread diameter	d_s	[mm]	6,65		7,75		10,5		12,6	
Bolt diameter	d_k	[mm]	4,3		5,45		7,3		9,05	
Length	L ≥	[mm]	35		35		60		80	
	L ≤	[mm]	500		500		500		500	

Head marking



Head marking:
Factory signs: *H*
Anchor type: MMS+
Anchor size: e.g. 10
Anchor length L

Bolt marking



Marking
Factory signs: *H*
Anchor type: MMS+
Anchors size: e.g. 10
Anchor length L

MULTI-MONTI-plus

Product description
Dimensions and head markings

Annex A 3

Specifications of intended use

Use of the anchoring:

- Static and quasi static loads: all sizes.
- Seismic action category C1:

  MMS-plus all Versions, size 10 with maximum embedment depth (h_{nom2}) and size 12 with the embedment depth $h_{nom\ 1}$ and $h_{nom\ 2}$.
- Fire exposure: all sizes.

Base Materials:

- Reinforced or non-reinforced normal weight concrete according to EN 206-1:2000.
- Strength classes C20/25 to C50/60 according to EN 206-1:2000.
- Uncracked and cracked concrete

Conditions of use (Environmental conditions):

- Structures subject to dry internal conditions.

Design:

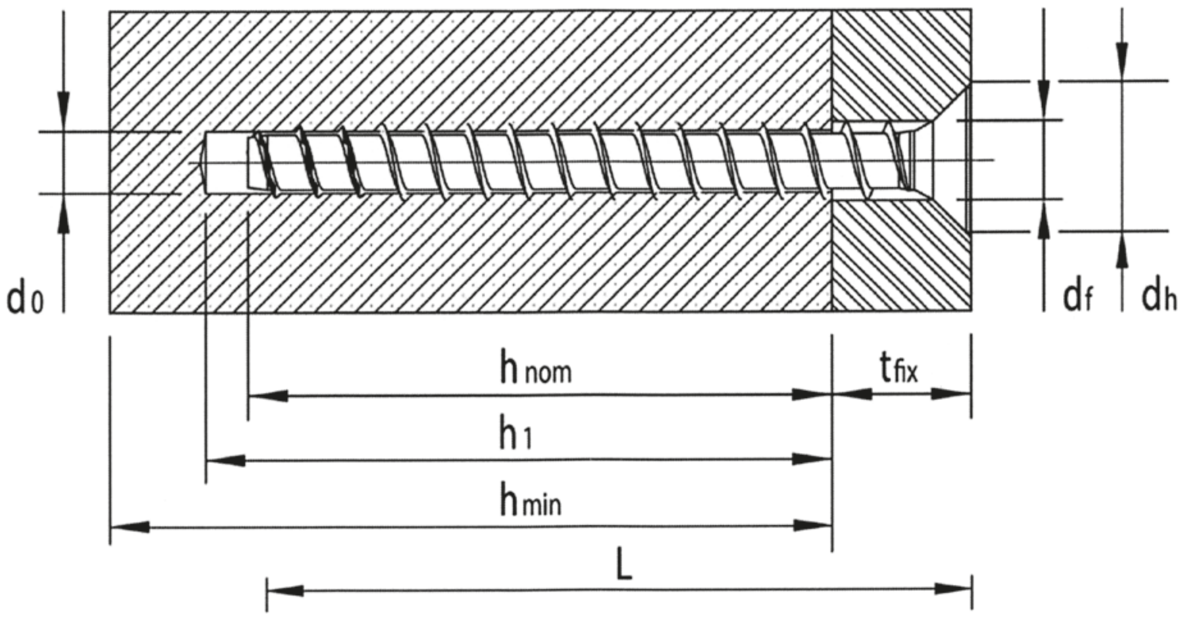
- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored. The position of the anchor is indicated on the design drawings (e. g. position of the anchor relative to reinforcement or to supports, etc.).
- Anchorages under static or quasi-static actions are designed for design method A in accordance with:
  - ETAG 001, Annex C, August 2010 or
  - CEN/TS 1992-4:2009.
- The design of the anchoring under seismic action have to be carried out in accordance with:
  - EOTA Technical Report TR 045, February 2013.
  - Anchoring's have to be placed outside of critical places like plastic hinges.
  - A distance mounting or mounting with mortar layer is not allowed.
- The design of the anchoring under fire exposure have to be carried in accordance with:
  - EOTA Technical Report TR 020, Mai 2014 or
  - CEN/TS 1992-4:2009, Annex D.
  - 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.
- After installation further turning of the anchor is not possible.
- The head of the anchor shall be fully supported on the fixture and shall not be damaged.

Table B1: Installation parameters MMS-plus

Size MMS-plus			6		7,5		10		12	
Embedment depth in concrete		[mm]	h_{nom1} 35	h_{nom2} 45	h_{nom1} 35	h_{nom2} 55	h_{nom1} 50	h_{nom2} 65	h_{nom1} 75	h_{nom2} 90
Nominal drill diameter	d_0	[mm]	5		6		8		10	
Drill bit cutting diameter	$d_{cut} \leq$	[mm]	5,40		6,40		8,45		10,45	
Depth of borehole	$h_1 \geq$	[mm]	40	50	40	65	60	75	85	100
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	7		9		12		14	
Diameter countersunk	d_h	[mm]	11,5		15,5		19,5		24	
Min. thickness of the concrete member	h_{min}	[mm]	100		100		100	115	125	150
Cracked and uncracked concrete: min. spacing	s_{min}	[mm]	30		40		40	50	60	
Cracked and uncracked concrete: min. edge distance	c_{min}	[mm]	30		40		40	50	60	
Recommended installation tool			Impact screw driver, max. power output T_{max} according to manufacturer information							
		[Nm]	75	100	100		200		200	
Torque moment for threaded version (type Multi-Monti-plus V)	$T_{inst} \leq$	[Nm]	-		15		25		30	

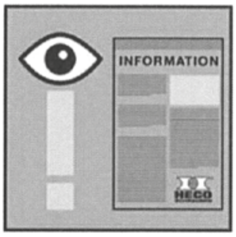


MULTI-MONTI-plus

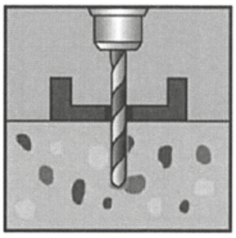
Intended Use
Installation parameters

Annex B 2

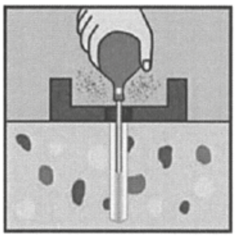
Installation Instructions



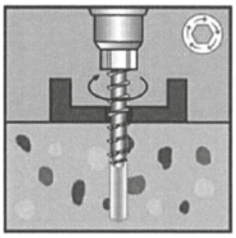
Note the information of the approval!



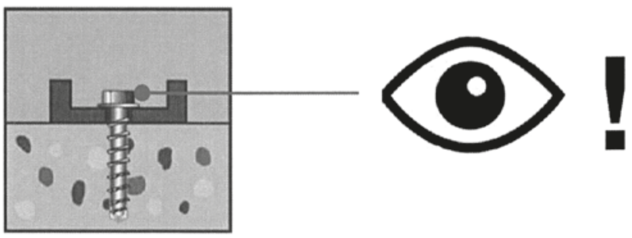
Create borehole using a Rotary Hammer



clean borehole, e.g. with blowing out



Install of the screw anchor with an impact wrench or by hand



Check: The anchor head is fully supported on the fixture and is not damaged

MULTI-MONTI-plus	**Annex B 3**
Intended Use Installation Instruction	

Table C1 Characteristic values for static and quasi-static loads

Size MMS-plus				6		7,5		10		12	
Embedmend depth in concrete			[mm]	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}
				35 [1]	45	35 [1]	55	50	65	75	90
Steel failure for tension- and shear resistance											
Characteristic resistance		$N_{Rk,s}$	[kN]	10,8		17,6		32,1		49,9	
		$V_{Rk,s}$	[kN]	4,1		6,1		13,7		24,1	
		k_2 [2]	-	0,8							
		$M^0_{Rk,s}$	[Nm]	6,7		14,1		34,5		66,8	
Partial safety factor		γ_{Ms}	-	1,5							
Pullout											
Characteristic resistance in uncracked concrete C20/25		$N_{Rk,p}$	[kN]	5,0	6,0	4,0	9,0	12,0	16,0	20,0	25,0
Characteristic resistance in cracked concrete C20/25		$N_{Rk,p}$	[kN]	1,0	1,5	2,0	4,0	6,0	9,0	12,0	16,0
Increasing factor for concrete	C30/37	Ψ_c	-	1,22							
	C40/50			1,41							
	C50/60			1,55							
Concrete cone failure and splitting failure											
Effective anchorage depth		h_{ef}	[mm]	26	35	26	43	36	50	57	70
Factor for	cracked	k_{cr} [2]	-	7,2							
	uncracked	k_{ucr} [2]	-	10,1							
Concrete cone	edge distance	$c_{cr,N}$	[mm]	$1{,}5\ h_{ef}$							
	spacing	$s_{cr,N}$	[mm]	$3\ h_{ef}$							
Splitting	edge distance	$c_{cr,sp}$	[mm]	$1{,}8\ h_{ef}$							
	spacing	$s_{cr,sp}$	[mm]	$3{,}6\ h_{ef}$							
Installation safety factor		γ_2 [3] = γ_{inst} [2]	-	1,0							
Concrete pryout failure											
k-factor		k [3] = k_3 [2]	-	1,0							2,0
Concrete edge failure											
Effective length of the anchor under shear loading		$l_{ef} = h_{ef}$	[mm]	26	35	26	43	36	50	57	70
Effective diameter of the anchor		d_{nom}	[mm]	5		6		8		10	

[1] Only for non-structural applications
[2] Parameter only relevant for the design according to CEN/TS 1992-4:2009
[3] Parameter only relevant for the design according to ETAG 001, Annex C

Table C2 Characteristic values for seismic actions C1

Size MMS-plus			10	12	
Enbedment depth in concrete		[mm]	h_{nom2}	h_{nom1}	h_{nom2}
			65	75	90
Steel failure for tension- and shear resistance					
Characteristic resistance	$N_{Rk,s,seis}$	[kN]	24,1	37,4	
	$V_{Rk,s,seis}$	[kN]	9,6	16,9	
Pullout					
Characteristic resistance in cracked concrete	$N_{Rk,p,seis}$	[kN]	6,8	9,0	12,0
Concrete cone failure					
Effective anchorage depth	h_{ef}	[mm]	50	57	70
Concrete cone edge distance	$c_{cr,N}$	[mm]	$1,5\ h_{ef}$		
Concrete cone spacing	$s_{cr,N}$	[mm]	$3\ h_{ef}$		
Installation safety factor	γ_2	-	1,0		
Concrete pryout failure					
k-Factor	k	-	1,0		2,0
Concrete edge failure					
Effective length of the anchor under shear loading	$l_{ef} = h_{ef}$	[mm]	50	57	70
Effective diameter of the anchor	d_{nom}	[mm]	8	10	

MULTI-MONTI-plus

Performance
Characteristic values for seismic actions C1

Annex C 2

Deutsches Institut für Bautechnik

DIBt

Table C3 Characteristic values under fire exposure

Size MMS-plus				**6**		**7,5**		**10**		**12**	
Enbedment depth in concrete			[mm]	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}
				35	45	35	55	50	65	75	90
Characteristic resistance											
Characteristic resistance	R30	$F_{Rk,fi}$	[kN]	0,25	0,4	0,5	1,0	1,5	2,3	3,0	3,9
	R60	$F_{Rk,fi}$	[kN]	0,25	0,4	0,5	0,8	1,4	1,4	2,1	2,1
	R90	$F_{Rk,fi}$	[kN]	0,25	0,4	0,5	0,5	1,0	1,0	1,5	1,5
	R120	$F_{Rk,fi}$	[kN]	0,2	0,3	0,4	0,4	0,8	0,8	1,2	1,2
	R30	$M^0_{Rk,s,fi}$	[Nm]	0,5		1,1		2,7		5,3	
	R60	$M^0_{Rk,s,fi}$	[Nm]	0,3		0,6		1,5		2,8	
	R90	$M^0_{Rk,s,fi}$	[Nm]	0,2		0,4		1,1		2,0	
	R120	$M^0_{Rk,s,fi}$	[Nm]	0,2		0,3		0,9		1,6	
Edge distance											
	R30 to R120	$c_{cr,fi}$	[mm]	2 h_{ef}							
Spacing											
	R30 to R120	$s_{cr,fi}$	[mm]	2 $c_{cr,fi}$							

MULTI-MONTI-plus

Performance
Characteristic values under fire exposure

Annex C 3

Table C4 Displacements under tension loads

Size MMS-plus				6		7,5		10		12	
Embedment depth in concrete			[mm]	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}
				35	45	35	55	50	65	75	90
Uncracked concrete C20/25 to C50/60	tension	N	[kN]	1,9	3,0	1,9	5,3	5,7	7,9	10,7	12,8
	displacement	δ_{N0}	[mm]	0,11	0,11	0,06	0,12	0,06	0,07	0,05	0,19
		$\delta_{N\infty}$	[mm]	0,30	0,28	0,38	1,03	0,75	0,72	0,74	0,60
Cracked concrete C20/25 to C50/60	tension	N	[kN]	0,5	0,7	0,9	2,0	2,9	4,3	5,7	6,4
	displacement	δ_{N0}	[mm]	0,01	0,02	0,03	0,04	0,03	0,09	0,05	0,02
		$\delta_{N\infty}$	[mm]	0,14	0,09	0,12	0,11	0,08	0,09	0,07	0,22

Table C5 Displacements under shear loads

Size MMS-plus				6		7,5		10		12	
Embedment depth in concrete			[mm]	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}
				35	45	35	55	50	65	75	90
Cracked and uncracked concrete C20/25 to C50/60	shear load	V	[kN]	2	2	4	4	8	8	12	12
	displacement	δ_{V0}	[mm]	0,14	0,13	0,09	0,11	0,18	0,13	0,18	0,18
		$\delta_{V\infty}$	[mm]	0,20	0,19	0,13	0,16	0,27	0,20	0,27	0,27

MULTI-MONTI-plus

Performance
Displacements

Annex C 4

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

50745-06/2016