HECO SCHRAUBEN

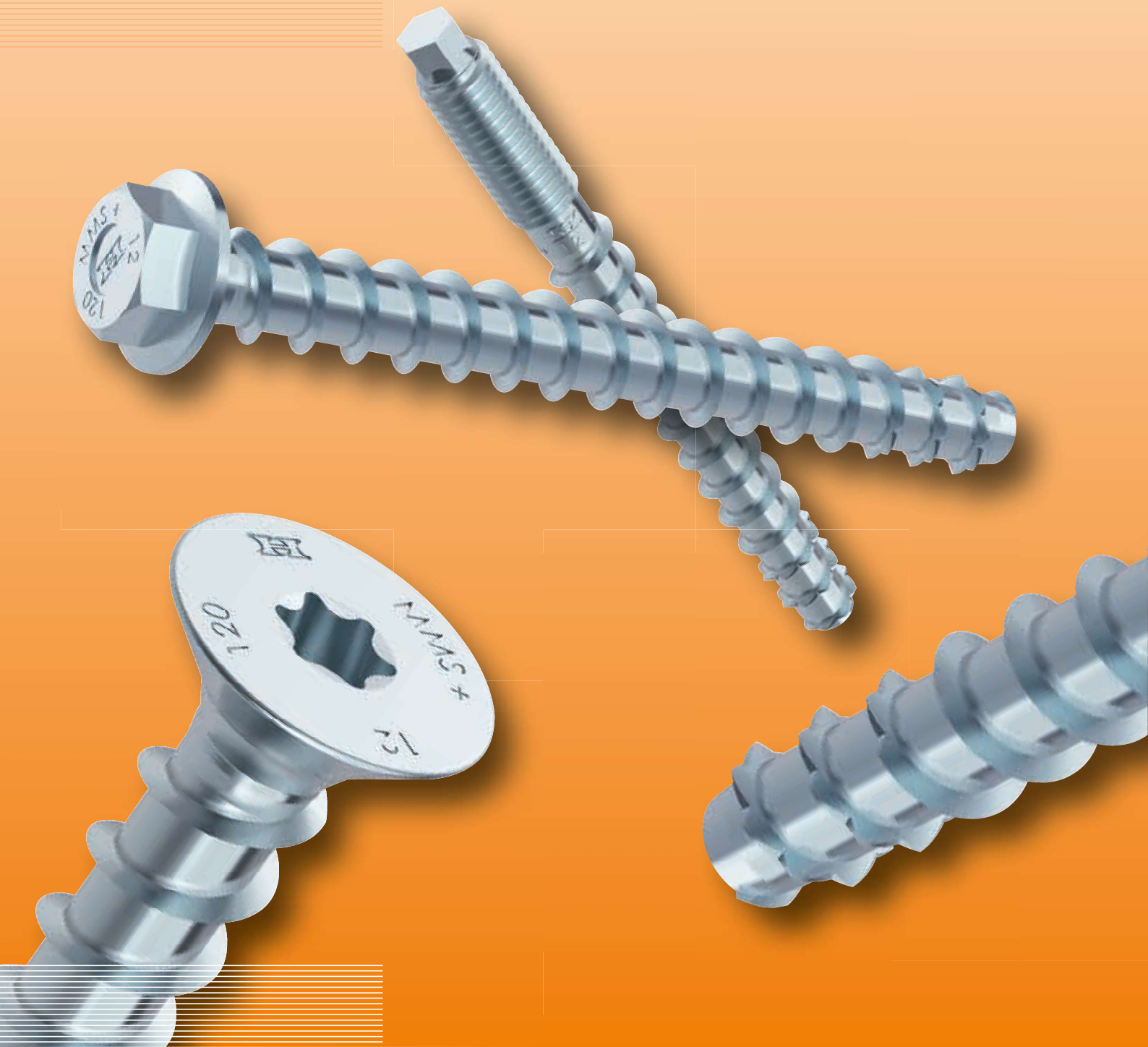
MULTI-MONTI®-plus

European Technical Assessment ETA-15/0784

Screw anchor for use in cracked and uncracked concrete

European Technical Assessment – Option 1 for cracked concrete

ETA-15/0784



Deutsches Institut für Bautechnik

Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

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European Technical Assessment ETA-15/0784 of 23 April 2018

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, 12, 16 and 20 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	EAD 330232-00-0601
This version replaces	ETA-15/0784 issued on 19 May 2016

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Specific Part

1 Technical description of the product

The Screw anchor MULTI-MONTI-plus is an anchor in size 6, 7.5, 10, 12, 16 and 20 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 categories C1 and C2	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	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 the European Assessment Document EAD 330232-00-0601 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.

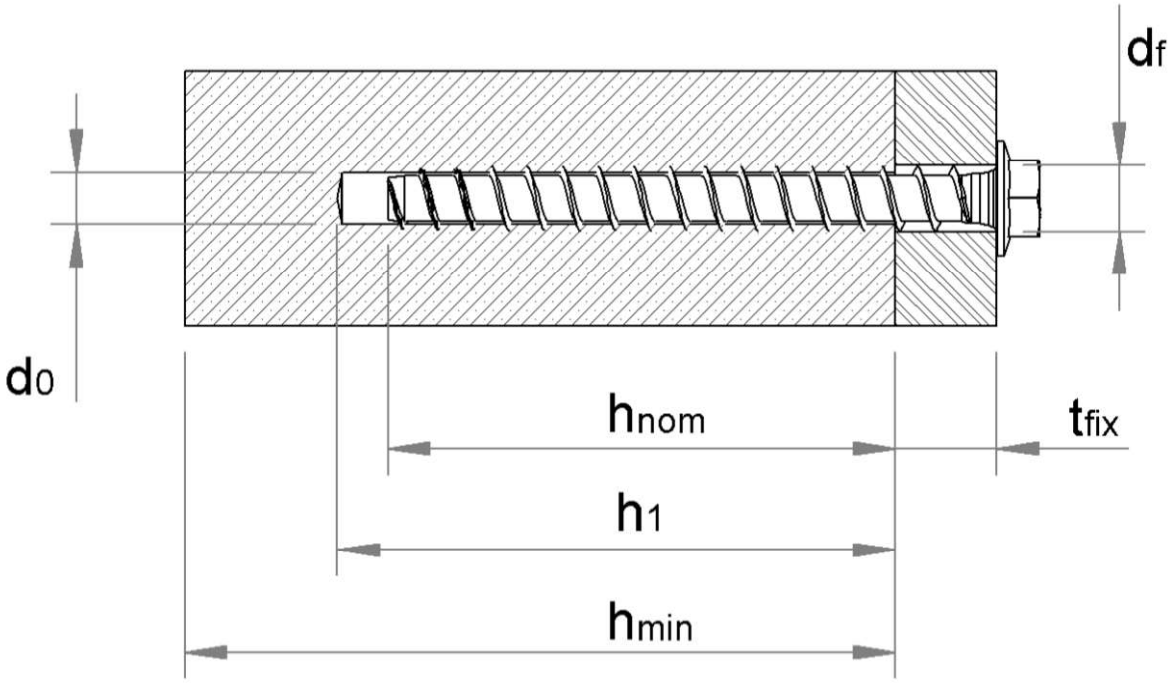
Issued in Berlin on 23 April 2018 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow
Head of Department

beglaubigt:
Tempel

Deutsches Institut für Bautechnik DIBt

Installed condition



MMS-plus SS (Head version hexagon with washer size 6, 7.5, 10, 12, 16 and 20)

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
Product in the installed state

Annex A 1

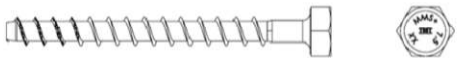
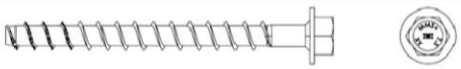
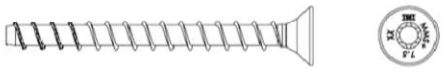
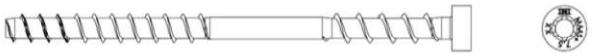
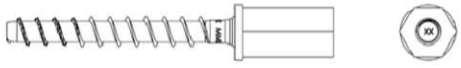
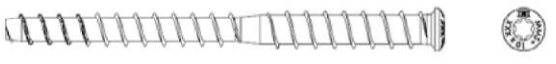
Deutsches Institut für Bautechnik DIBt

Table A1: Material and screw types

Type	Marking / Material
1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	screw anchor / steel [1]

Size MMS-plus			6	7,5	10	12	16	20
nominal value of the characteristic yield strength	f_{yk}	[N/mm²]	640	640	640	640	640	640
nominal value of the characteristic tensile strength	f_{uk}	[N/mm²]	800	800	800	800	800	800
elongation at rupture	A_5	[%]	≤ 8					

1) galvanized steel according EN 10263-4:2001 (multi-layered coating systems are possible)

	1) MULTI-MONTI-plus S, with and without washer (alternative design with cone under the head)
	2) MULTI-MONTI-plus SS, with Hexagon Head and washer (alternative design with cone under the head)
	3) MULTI-MONTI-plus P, PanHead, with small Pan Head
	4) MULTI-MONTI-plus MS, mounting bar-anchor, with large Pan Head
	5) MULTI-MONTI-plus F, with Countersunk
	6) MULTI-MONTI-plus FT, with Countersunk, under head thread and single- or multi-start thread
	7) MULTI-MONTI-plus ZT, with Cylinder Head, under head thread and single- or multi-start thread (alternative forms ST, SST & PT possible)
	8) MULTI-MONTI-plus ST, anchor with metric stud
	9) MULTI-MONTI-plus I, anchor with metric stud for mounting of nuts (pre-assembled with sleeve)
	10) MULTI-MONTI-plus V, anchor with metric stud
	11) MULTI-MONTI-plus DWC, with Pan Head, under head thread and single- or multi-start thread, different diameters compared to the concrete thread (others expression possible)

MULTI-MONTI-plus

Product description
Dimensions and screw types

Annex A 2

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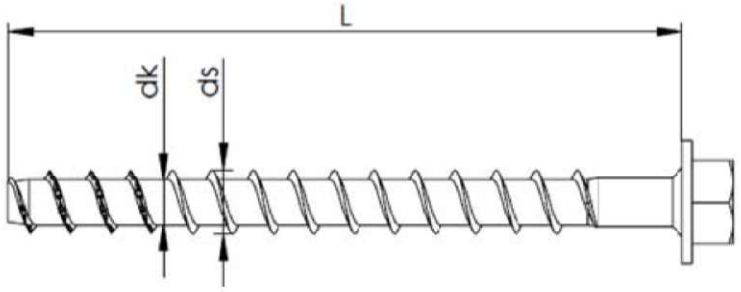
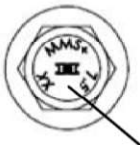
Table A2: Dimensions and head markings

Size MMS-plus			6		7,5		10		12		16		20
			h_{nom}		h_{nom}		h_{nom}		h_{nom}		h_{nom}		h_{nom}
Embedment depth in concrete		[mm]	35	45	35	55	50	65	75	90	100	115	140
Thread diameter	d_s	[mm]	6,65		7,75		10,5		12,6		16,7		21,2
Bolt diameter	d_k	[mm]	4,3		5,45		7,3		9,05		13,3		17,4
Length	L ≥	[mm]	35		35		50		75		100		140
	L ≤	[mm]	500		500		500		600		800		800

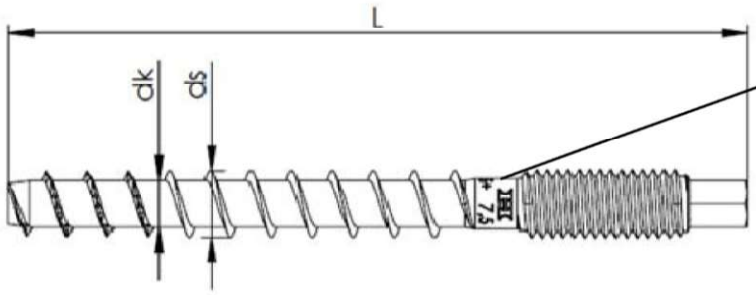
Head marking





Head marking
Factory signs: H
Anchor type: MMS+
Anchor size: z.B. 7,5
Anchor length: z.B. 80

Bolt marking



Marking
Factory signs: H
Anchor type: MMS+
Anchor size: z.B. 7,5
Anchor length: z.B. 80

MULTI-MONTI-plus

Product description
Dimensions and head marking

Annex A 3

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Specifications of intended use

Use of the anchoring:

- Static and quasi static loads: all sizes
- Seismic category C1:
  MMS-plus all Versions, size 10 with maximum embedment depth (h_{nom}), size 12 with both embedment depth (h_{nom}) and size 16 and 20 with maximum embedment depth (h_{nom})
- Seismic category C2:
  MMS-plus all Versions, size 16 and 20 with maximum embedment depth (h_{nom})
- 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
- Cracked and uncracked 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.)
- The design of the anchoring under static or quasi-static actions and fire exposure have to be carried out in accordance with FprEN 1992-4:2017 and EOTA Technical Report TR055
- The design under shear load according to FprEN 1992-4:2017, section 6.2.2 applies to all in appendix B2, table B1 specified diameter df the diameter of clearance hole in the fixture

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
- After installation further turning of the anchor must not be possible
- The head of the anchor is attached to the fixture and is not damaged, respectively the required embedment depth is reached.

MULTI-MONTI-plus	**Annex B 1**
Intended Use Specification	

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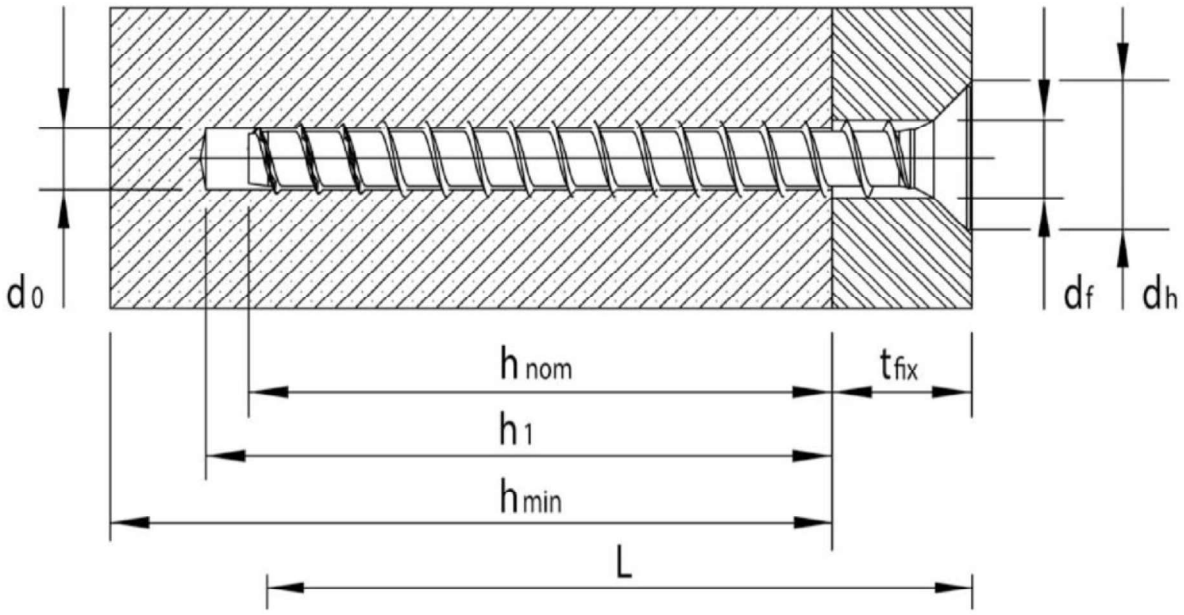
Table B1: Installation parameters MMS-plus

Size MMS-plus			6		7,5		10		12		16		20
			h_{nom}		h_{nom}		h_{nom}		h_{nom}		h_{nom}		h_{nom}
Embedment depth in concrete		[mm]	35	45	35	55	50	65	75	90	100	115	140
Norminal drill diameter	d_0	[mm]	5		6		8		10		14		18
Drill bit cutting-Ø	$d_{cut} \leq$	[mm]	5,40		6,40		8,45		10,45		14,50		18,50
Borehole depth	$h_1 \geq$	[mm]	40	50	40	65	60	75	85	100	115	130	160
Diameter of clearhole in the fixure	$d_f \leq$	[mm]	7		9		12,5		14,5		19		23
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	150		180
cracked and uncracked concrete: min. spacing	s_{min}	[mm]	30		35		35		40		60		80
cracked and uncracked concrete: min. edge distance	c_{min}	[mm]	30		30		35		40		60		80
Recommended installation tool		[Nm]	Impact screw driver, max. power output T_{max} according manufacturer information										
			75	100	120		250		250		600		800
Torque moment for threaded version (MMS-plus V)	T_{inst}	[Nm]	-		15		20		30		55	70	140



MULTI-MONTI-plus

Intended Use
Installation parameters

Annex B 2

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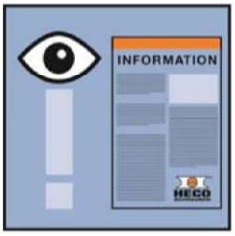
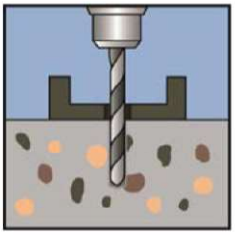
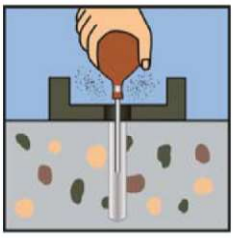
Installation Instractions



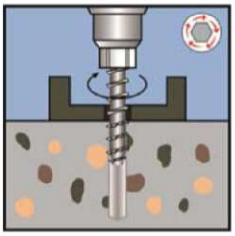
Note the information of the approval!



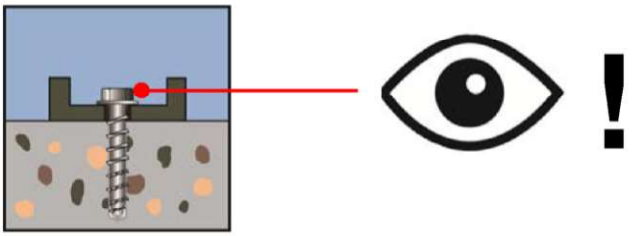
Create borehole using a Rotary Hammer



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 an not damaged

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

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Table C1 Characteristic values for static and quasi-static loading MMS-plus

Size MMS-plus				**6**		**7,5**		**10**		**12**		**16**		**20**
				h_{nom}		h_{nom}		h_{nom}		h_{nom}		h_{nom}		h_{nom}
Embedmend depth in concrete			[mm]	35[1]	45	35[1]	55	50	65	75	90	100	115	140
Steelfailure for Tension- and Shear resistance														
Characteristic resistance		$N_{Rk,s}$	[kN]	10,8		17,6		32,1		49,9		111,1		190,2
Partial safety factor		γ_{Ms}	-	1,50										
Characteristic resistance		$V_{Rk,s}$	[kN]	4,1		6,1		13,7		24,1		50,2		85,3
Partial safety factor		γ_{Ms}	-	1,25										
		k_7 [2]	-	0,8										
Characteristic resistance		$M^0_{Rk,s}$	[Nm]	6,7		14,1		34,5		66,8		207,6		464,3
Pullout														
Characteristic resistance in uncracked concrete C20/25		$N_{Rk,p}$	[kN]	5,5	8	4	- [2]	- [2]		- [2]		- [2]		- [2]
Characteristic resistance in cracked concrete C20/25		$N_{Rk,p}$	[kN]	1	1,5	2	4	6	9	12	16	20	30	44
Increasing factor for concrete	C30/37	Ψ_c	-	1,22										
	C40/50			1,41										
	C50/60			1,58										
Concrete cone failure and splitting failure														
Effective anchorage depth		h_{ef}	[mm]	26	35	26	43	36	50	57	70	77	90	114
Factor for	cracked	$k_{cr,N}$	-	7,7										
	uncracked	$k_{ucr,N}$	-	11,0										
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]	1.5 h_{ef}										
	spacing	$s_{cr,sp}$	[mm]	3 h_{ef}										
Installation safety factor		γ_{inst}	-	1,0										
Concrete pryout failure														
k-Factor		k_8	-	1,0							2,0			
Concrete edge failure														
Effective length of the anchor		$l_f = h_{ef}$	[mm]	26	35	26	43	36	50	57	70	77	90	114
Effective diameter of the anchor		d_{nom}	[mm]	5		6		8		10		14		18

[1] Only for non-structural applications
[2] Pullout is not decisive

MULTI-MONTI-plus

Performance
Characteristic values for static and quasi static tensions load

Annex C 1

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Table C2.1 Characteristic values for seismic actions C1

Size MMS-plus			**10**	**12**		**16**	**20**
			h_{nom}	h_{nom}	h_{nom}	h_{nom}	h_{nom}
Embedment depth in concrete		[mm]	65	75	90	115	140
Steelfailure for Tension- and Shear resistance							
Characteristic resistance	$N_{Rk,s,eq}$	[kN]	24,1	37,4		100,0	142,7
	$V_{Rk,s,eq}$	[kN]	9,6	16,9		45,2	81,0
Pullout							
Characteristic resistance in cracked concrete	$N_{Rk,p,eq}$	[kN]	6,8	9,0	12,0	21,0	33,0
Concrete cone failure							
Effective anchorage depth	h_{ef}	[mm]	50	57	70	90	114
concrete edge distance	$c_{cr,N}$	[mm]	1.5 h_{ef}				
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	$l_f = h_{ef}$	[mm]	50	57	70	90	114
Effective diameter-Ø	d_{nom}	[mm]	8	10		14	18

Table C2.2 Characteristic values for seismic actions C2

Size MMS-plus			**16**	**20**
			h_{nom}	h_{nom}
Embedment depth in concrete		[mm]	115	140
Steelfailure for Tension- and Shear resistance				
Characteristic resistance	$N_{Rk,s,eq}$	[kN]	100,0	142,7
	$V_{Rk,s,eq}$	[kN]	27,6	57,2
Pullout				
Characteristic resistance in cracked concrete	$N_{Rk,p,eq}$	[kN]	14,0	18,1
Concrete cone failure				
Effective anchorage depth	h_{ef}	[mm]	90	114
concrete edge distance	$c_{cr,N}$	[mm]	1.5 h_{ef}	
cone spacing	$s_{cr,N}$	[mm]	3 h_{ef}	
Installation safety factor	γ_2	-	1,0	
Concrete pryout failure				
k-Factor	k	-	2,0	
Concrete edge failure				
Effective length of the anchor under shear loading	$l_f = h_{ef}$	[mm]	90	114
Effective diameter-Ø	d_{nom}	[mm]	14	18

MULTI-MONTI-plus

Performance
Characteristic value for seismic actions C1 and C2

Annex C 2

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Table C3 Characteristic values under fire exposure

Size MMS-plus				**6**		**7,5**		**10**		**12**		**16**		**20**
				h_{nom}		h_{nom}		h_{nom}		h_{nom}		h_{nom}		h_{nom}
Embedment depth in concrete			[mm]	35	45	35	55	50	65	75	90	100	115	140
Characteristic resistance for tension and shear														
Characteristic resistance	R30	$F_{Rk,fi}$	[kN]	0,3	0,4	0,5	1,1	1,4	2,3	3,0	3,9	5,0	7,5	11,0
	R60	$F_{Rk,fi}$	[kN]	0,3	0,4	0,5	0,8	1,4	1,4	2,1	2,1	4,5	4,5	7,7
	R90	$F_{Rk,fi}$	[kN]	0,3	0,4	0,5	0,5	1,0	1,0	1,5	1,5	3,3	3,3	5,6
	R120	$F_{Rk,fi}$	[kN]	0,2	0,3	0,4	0,4	0,8	0,8	1,2	1,2	2,6	2,6	4,5
	R30	$M^0_{Rk,s,fi}$	[Nm]	0,5		1,1		2,7		5,3		16,4		36,6
	R60	$M^0_{Rk,s,fi}$	[Nm]	0,3		0,6		1,5		2,8		8,9		19,8
	R90	$M^0_{Rk,s,fi}$	[Nm]	0,2		0,4		1,1		2,0		6,4		14,2
	R120	$M^0_{Rk,s,fi}$	[Nm]	0,2		0,3		0,9		1,6		5,1		11,4
Edge distance														
	R30 bis R120	$c_{cr,fi}$	[mm]	$2\ h_{ef}$										
Spacing														
	R30 bis R120	$s_{cr,fi}$	[mm]	$2\ c_{cr,fi}$										

MULTI-MONTI-plus

Performance
Characteristic values under fire exposure

Annex C 3

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Table C4 Displacements under tension loads

Size MMS-plus			**6**		**7,5**		**10**		**12**		**16**		**20**
			h_{nom}		h_{nom}		h_{nom}		h_{nom}		h_{nom}		h_{nom}
Embedment depth in concrete		[mm]	35	45	35	55	50	65	75	90	100	115	140
Tension load uncracked concrete	N	[kN]	1,9	3,0	1,9	5,3	5,7	7,9	10,7	12,8	16,2	20,1	29,3
Displacement	δ_{N0}	[mm]	0,11	0,11	0,06	0,12	0,06	0,07	0,05	0,19	0,09	0,09	0,09
	$\delta_{N\infty}$	[mm]	0,30	0,28	0,38	1,03	0,75	0,72	0,74	0,60	0,13	0,13	0,13
Tension load cracked concrete	N	[kN]	0,5	0,7	0,9	2,0	2,9	4,3	5,7	6,4	20,0	30,0	20,95
Displacement	δ_{N0}	[mm]	0,01	0,02	0,03	0,04	0,03	0,09	0,05	0,02	0,09	0,09	0,09
	$\delta_{N\infty}$	[mm]	0,14	0,09	0,12	0,11	0,08	0,09	0,07	0,22	1,38	1,38	0,69

Table C5 Displacements under shear loads

Size MMS-plus			**6**		**7,5**		**10**		**12**		**16**		**20**
			h_{nom}		h_{nom}		h_{nom}		h_{nom}		h_{nom}		h_{nom}
Embedment depth in concrete		[mm]	35	45	35	55	50	65	75	90	100	115	140
Shear load uncracked concrete	V	[kN]	2,0		4,0		8,0		12,0		22,6		42,8
Displacement	δ_{V0}	[mm]	0,14	0,13	0,09	0,11	0,18	0,13	0,18		2,9		3,4
	$\delta_{V\infty}$	[mm]	0,20	0,19	0,13	0,16	0,27	0,20	0,27		4,4		5,1

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Annex C 4

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