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-17/0035 of 22 May 2017

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	SORMAT MULTI-MONTI MMS+
Product family to which the construction product belongs	Screw anchor for use in concrete
Manufacturer	Sormat Oy Harjutie 5 21290 RUSKO FINNLAND
Manufacturing plant	Sormat Werk 5 / Sormat Plant 5
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	European Assessment Document (EAD) 330232-00-0601

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Specific Part

1 Technical description of the product

The Screw anchor SORMAT MULTI-MONTI MMS+ 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.

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 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 European Assessment Documents EAD No. 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.

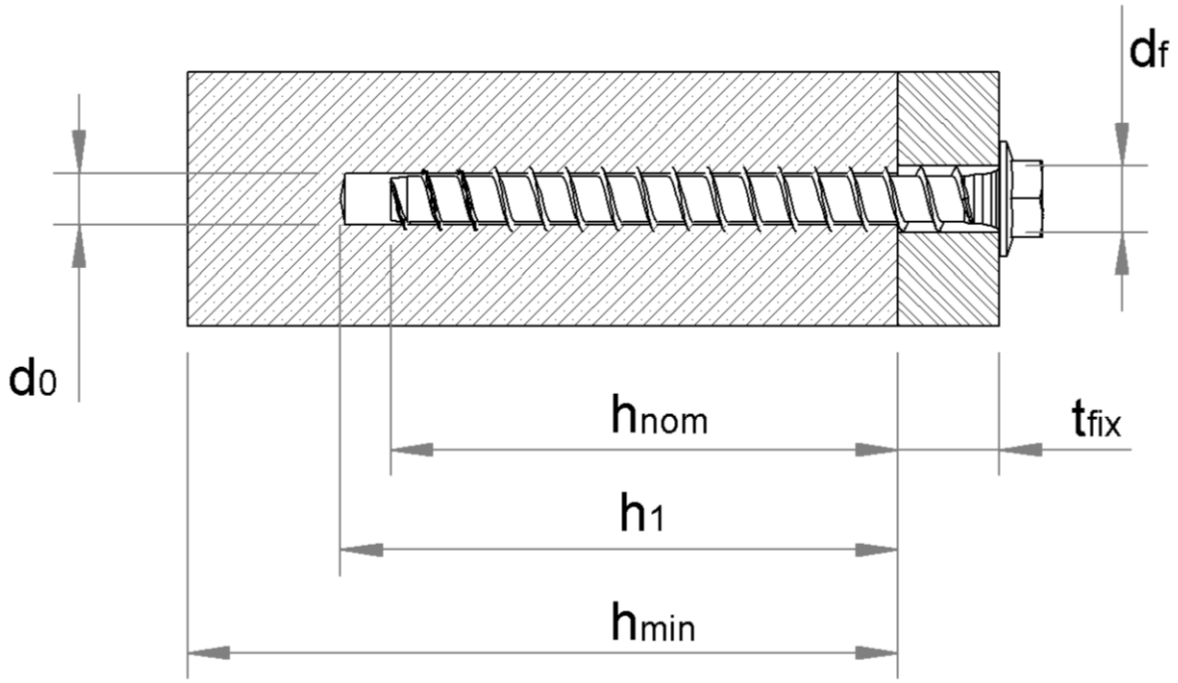
Issued in Berlin on 22 May 2017 by Deutsches Institut für Bautechnik

Andreas Kummerow
Head of Department

beglaubigt:
Baderschneider

Deutsches Institut für Bautechnik DIBt

Installed condition



MMS+ 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

SORMAT MULTI-MONTI MMS+

Product description
Installed condition

Annex A 1

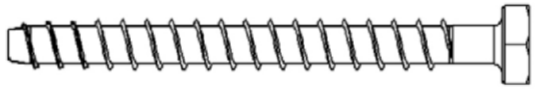
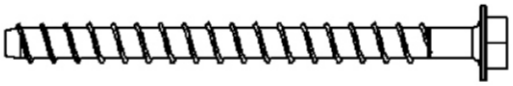
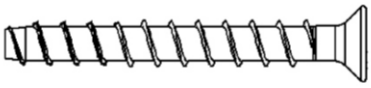
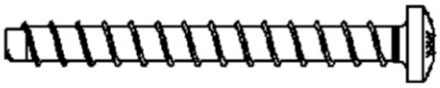
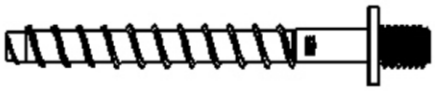
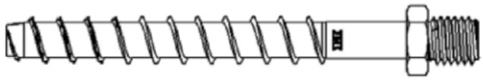
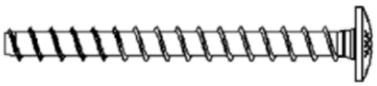
Deutsches Institut für Bautechnik DIBt

Table A1: Material and Dimensions

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

Size MMS+			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

  MMS+ S	1) MMS+ S, with Hexagon Head (size 12 with washer according to DIN 440, galvanized)
  MMS+ SS	2) MMS+ SS, with Hexagon Head and washer, galvanized
  MMS+ F	3) MMS+ F, with Countersunk, galvanized
  MMS+ P	4) MMS+ P, Pan Head, galvanized
  MMS+ I	5) MMS+ I, anchor with metric stud for mounting of nuts, galvanized
  MMS+ SI	6) MMS+ ST, anchor with metric stud, galvanized
  MMS+ MS	7) MMS+ MS, flange head, galvanized
  MMS+ V	8) MMS+ V, metric stud, galvanized

SORMAT MULTI-MONTI MMS+

Product description
Head versions,
dimensions and materials

Annex A 2

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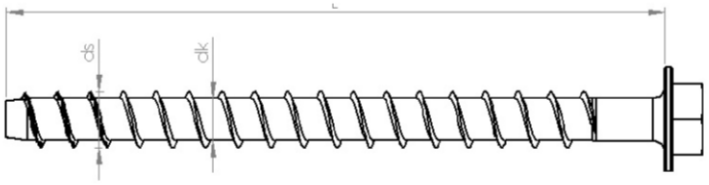
Table A2: Dimensions and head markings

Size MMS+			**6**		**7,5**		**10**		**12**	
			h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}
Embedment depth in concrete		[mm]	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		50		75	
	L ≤	[mm]	500		500		500		500	

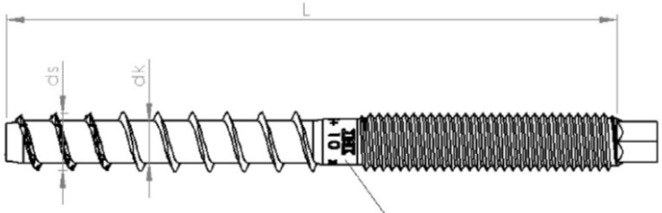
Head marking



MMS+

Head marking:
Factory signs: *H*
Anchor type: MMS+
Anchor size: e.g. 10
Anchor length: e.g. 80

Bolt marking



MMS+

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

SORMAT MULTI-MONTI MMS+

Product description
Dimensions and head markings

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+ 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.
- Non-cracked and cracked concrete: all sizes.

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.
- Anchorages under static and quasi-static actions, under seismic actions and under fire exposure are designed in accordance with EN 1992-4:2017.
- The design of anchorages under shear load according to EN 1992-4:2017, Section 6.2.2 applies for all specified diameters d_f of clearance hole in the fixture in Annex B2, Table B1.

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 must not be possible.
- The head of the anchor must be supported on the fixture and is not damaged.

SORMAT MULTI-MONTI MMS+	Annex B 1
Intended Use Specifications	

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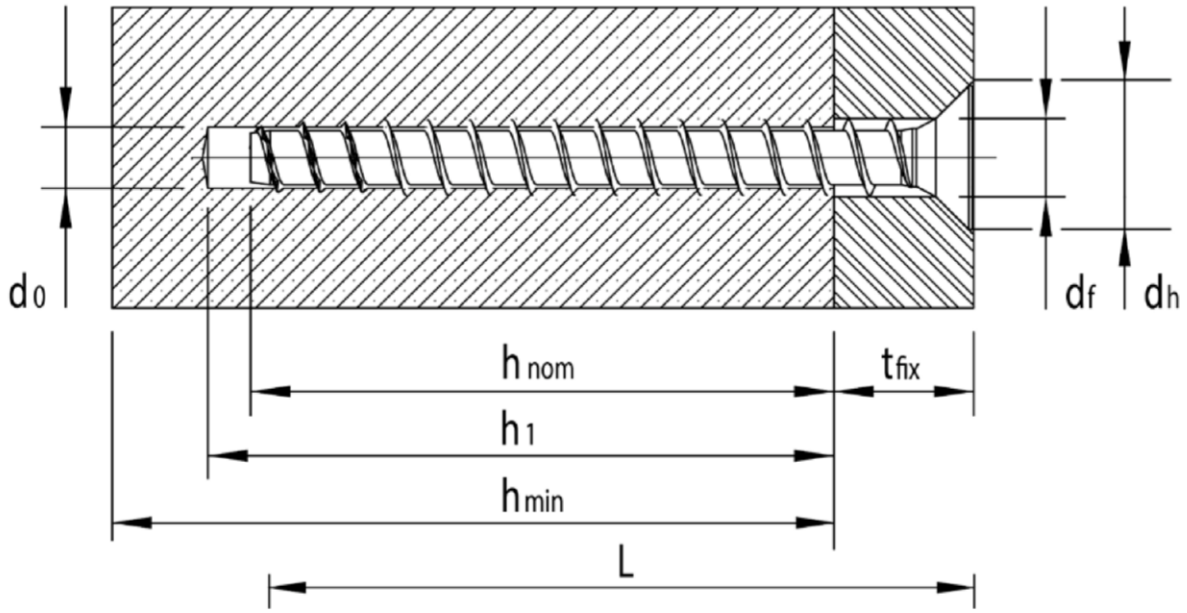
Table B1: Installation parameters MMS+

Size MMS+				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
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 non-cracked concrete	min. spacing	s_{min}	[mm]	30		40		40	50	60	
	min. edge distance	c_{min}	[mm]	30		40		40	50	60	
Recommended installation tool			[Nm]	Impact screw driver, max. power output T_{max} according manufacturer information							
				75	100	100		200		250	
Torque moment for threaded version (type MMS+ V)		T_{inst}	[Nm]	-		15		20		30	



SORMAT MULTI-MONTI MMS+

Intended Use
Installation parameters

Annex B 2

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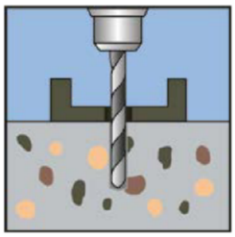
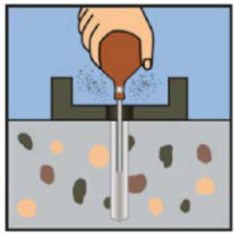
Installation Instructions

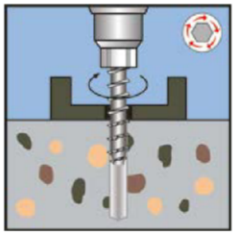
Note the information of the approval!



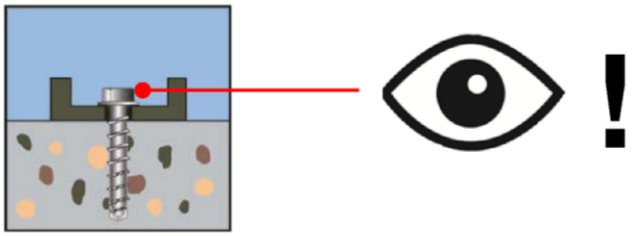
Create borehole using a Rotary Hammer



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 an not damaged

SORMAT MULTI-MONTI MMS+	**Annex B 3**
Intended Use Installation Instruction	

Deutsches Institut für Bautechnik DIBt

Table C1 Characteristic values for static and quasi-static loads

Size MMS+				**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 [1]	45 [1]	35	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_7	-	0,8							
		$M^0_{Rk,s}$	[Nm]	6,7		14,1		34,5		66,8	
Pullout											
Characteristic resistance in non-cracked concrete C20/25		$N_{Rk,p}$	[kN]	4,0	6,0	4,0	9,0	12,0	16,0	20,0	26,0
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	-	1,23							
	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
Factor for k_1	cracked	$k_{cr,N}$	-	7,7							
	non-cracked	$k_{ucr,N}$	-	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]	$1,8\ h_{ef}$							
	spacing	$s_{cr,sp}$	[mm]	$3,6\ h_{ef}$							
Installation safety factor		γ_{inst}	-	1,0							
Concrete pryout failure											
Factor		k_8	-	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

SORMAT MULTI-MONTI MMS+

Performance
Characteristic values for static and quasi-static loads

Annex C 1

Deutsches Institut für Bautechnik DIBt

Table C2 Characteristic values for seismic actions C1

Size MMS+			**10**	**12**	
Embedment depth in concrete		[mm]	h_{nom2}	h_{nom1}	h_{nom2}
			65	75	90
Steel failure for tension and shear resistance					
Characteristic resistance	$N_{Rk,s,eq}$	[kN]	24,1	37,4	
	$V_{Rk,s,eq}$	[kN]	9,6	16,9	
Pullout					
Characteristic in cracked concrete	$N_{Rk,p,eq}$	[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_{inst}	-	1,0		
Concrete pryout failure					
Factor	k_8	-	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	

SORMAT MULTI-MONTI MMS+

Performance
Characteristic values for seismic actions C1

Annex C 2

Deutsches Institut für Bautechnik DIBt

Table C3 Characteristic values under fire exposure

Size MMS+				**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
Characteristic resistance ($F_{Rk,s,fi} = N_{Rk,s,fi} = V_{Rk,s,fi}$)											
Characteristic resistance	R30	$F_{Rk,s,fi30}$	[kN]	0,25	0,4	0,5	1,0	1,5	2,3	3,0	3,9
	R60	$F_{Rk,s,fi60}$	[kN]	0,25	0,4	0,5	0,8	1,4	1,4	2,1	2,1
	R90	$F_{Rk,s,fi90}$	[kN]	0,25	0,4	0,5	0,5	1,0	1,0	1,5	1,5
	R120	$F_{Rk,s,fi120}$	[kN]	0,2	0,3	0,4	0,4	0,8	0,8	1,2	1,2
	R30	$M^0_{Rk,s,fi30}$	[Nm]	0,5		1,1		2,7		5,3	
	R60	$M^0_{Rk,s,fi60}$	[Nm]	0,3		0,6		1,5		2,8	
	R90	$M^0_{Rk,s,fi90}$	[Nm]	0,2		0,4		1,1		2,0	
	R120	$M^0_{Rk,s,fi120}$	[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]	$2\ c_{cr,fi}$							

The characteristic resistance to fire exposure for pull-out failure, concrete cone failure, concrete pry-out failure and concrete edge failure shall be calculated according to EN 1992-4:2017, if no value for $N_{Rk,p}$ is given in the equation D.4 and D.5 the value of $N^0_{Rk,c}$ shall be inserted instead of $N_{R,.p}$.

SORMAT MULTI-MONTI MMS+

Performance
Characteristic values under fire exposure

Annex C 3

Deutsches Institut für Bautechnik DIBt

Table C4 Displacements under tension loads

Size MMS+				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 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
Uncracked 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+				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_{N0}	[mm]	0,14	0,13	0,09	0,11	0,18	0,13	0,18	0,18
		$\delta_{N\infty}$	[mm]	0,20	0,19	0,13	0,16	0,27	0,20	0,27	0,27

SORMAT MULTI-MONTI MMS+

Performance
Displacements

Annex C 4