



ZAVOD ZA
GRADBENIŠTVO
SLOVENIJE

SLOVENIAN
NATIONAL BUILDING
AND CIVIL ENGINEERING
INSTITUTE



član EOTA
Member of EOTA

Dimičeva 12
1000 Ljubljana, Slovenija

Tel.: +386 (0)1-280 44 72, 280 45 37

Fax: +386 (0)1-280 44 84

E-pošta: info.ta@zag.si

http://www.zag.si

European Technical Assessment

ETA-13/0367
of 25.02.2015

English version prepared by ZAG

I GENERAL PART

Komercialno ime

Trade name

FM753 Nautilus hrg

Imetnik tehnične ocene

Holder of Technical Assessment

FRIULSIDER S.p.A.

via Trieste 1

33048 San Giovanni al Natisone (UD)

Italy

Družina proizvoda

Product family

**Torzijsko kontrolirano zatezno galvansko
pocinkano kovinsko sidro velikosti M6, M8, M10,
M12, M16 in M20 za vgradnjo v nerazpokani beton**

*Torque controlled expansion anchor made of galvanised steel of
sizes M6, M8, M10, M12, M16 and M20 for use in non-cracked
concrete*

Proizvodni obrat

Manufacturing plant

FRIULSIDER S.p.A.

via Trieste 1

33048 San Giovanni al Natisone (UD)

Italy

Ta Evropska tehnična ocena vsebuje

*This European Technical Assessment
contains*

11 strani vključno s 7 prilogami, ki so sestavni del te
ocene

*11 pages including 7 annexes, which form an integral part of the
document*

Ta Evropska tehnična ocena je
izdana na podlagi Uredbe (EU) št.
305/2001 na osnovi

*This European Technical Assessment is
issued in accordance to Regulation (EU)
No 305/2011, on the basis of*

Smernice za evropska tehnična soglasja ETAG 001 –
del 1 in 2, izdaja 2013, ki se uporablja kot EAD

*Guideline for European Technical Approval ETAG 001 – part 1
and 2, edition 2013, used as EAD*

Ta ocena zamenjuje

This Assessment replaces

ETA-13/0367 izdano dne 24.05.2013

ETA-13/0367 issued on 24.05.2013

Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document and should be identified as such.

Communication of this European Technical Assessment, including transmission by electronic means, shall be in full (excepted the confidential Annex(es) referred to above). However, partial reproduction may be made, with the written consent of the issuing Technical Assessment Body. Any partial reproduction has to be identified as such.

II SPECIFIC PART OF THE EUROPEAN TECHNICAL ASSESSMENT

1 Technical description of the product

The FM753 Nautilus hrg in the range of M6, M8, M10, M12, M16 and M20 is an anchor made of galvanised steel, which is placed into a drilled hole and anchored by torque-controlled expansion.

For the installed anchor see Figure given in Annex A1.

2 Specification and intended use

The performances given in Chapter 3 are only valid if the anchor is used in compliance with the specifications and conditions given in Annex B.

The provisions made in this European Technical Assessment are based on an assumed working life of the anchor of 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the manufacturer, 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 this assessment

3.1 Mechanical resistance and stability (BWR 1)

The basic work requirements for mechanical resistance and stability are listed in Annexes C1 and C2.

3.2 Safety in case of fire (BWR 2)

No performance determined.

3.3 Hygiene, health and environment (BWR 3)

Regarding dangerous substances contained in this European Technical Assessment, there may be requirements applicable to the products falling within its scope (e.g. transported European legislation and national laws, regulations and administrative provisions). In order to meet provisions of the regulation (EU) No 305/2011, these requirements need also to be complied with, when they apply.

3.4 Safety in use (BWR 4)

For basic work requirement safety in use the same criteria are valid as for basic work requirement mechanical resistance and stability.

3.5 Protection against noise (BWR 5)

Not relevant.

3.6 Energy economy and heat retention (BWR 6)

Not relevant.

3.7 Sustainable use of natural resources (BWR 7)

No performance determined.

3.8 General aspects relating to fitness for use

Durability and serviceability are only ensured if specifications of intended use according to Annex B1 are kept.

4 Assessment and verification of constancy of performance

According to the decision 96/582/EC of the European Commission¹ the system of assessment and verification of constancy of performance (see Annex V to regulation (EU) No 305/2011) given in the following table apply.

Product	Intended use	Level of class	System
Metal anchors for use in concrete	For fixing and/or supporting to concrete, structural elements (which contributes to the stability of the works) or heavy units	-	1

5 Technical details necessary for the implementation of the AVCP system

5.1 Tasks for the manufacturer

The manufacturer shall exercise permanent internal control of production of concerned product. All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures, including records of results performed. This production control system shall ensure that the product is in conformity with this European Technical Assessment.

The manufacturer may only use raw materials stated in the technical documentation of this European Technical Assessment.

The factory production control shall be in accordance with the Control plan which is a part of the technical documentation of this European Technical Assessment. The Control plan² is laid down in the context of the factory production control system operated by the manufacturer and deposited at Slovenian National Building and Civil Engineering Institute (ZAG Ljubljana). The results of factory production Control shall be recorded and evaluated in accordance with the provisions of the control plan.

The manufacturer shall, on the basis of a contract, involve a body, which is notified for the tasks referred to in a section 4 in the field of anchors in order to undertake the actions laid down in section 5.2. For this purpose the Control plan referred to in sections 5.1 and 5.2 shall be handed over by the manufacturer to the notified body involved.

The manufacturer shall make a Declaration of performance, stating that the construction product is in conformity with the provisions of this European Technical Assessment.

¹ Official Journal of the European Communities L 254 of 8.10.1996

² The Control plan is a confidential part of the technical documentation of this European Technical Assessment, but not published together with the ETA, and handed over only to the notified body or bodies involved in the procedure of attestation of conformity.

5.2 Tasks for the notified bodies

The notified body shall retain the essential points of its actions defined in Annex V of Regulation (EU) No. 305/2011 for system 1 and state results obtained and conclusions drawn in a written report.

The notified certification body involved by the manufacturer shall issue an EC certificate of constancy of performance the product stating the conformity with the provisions of this European Technical Assessment.

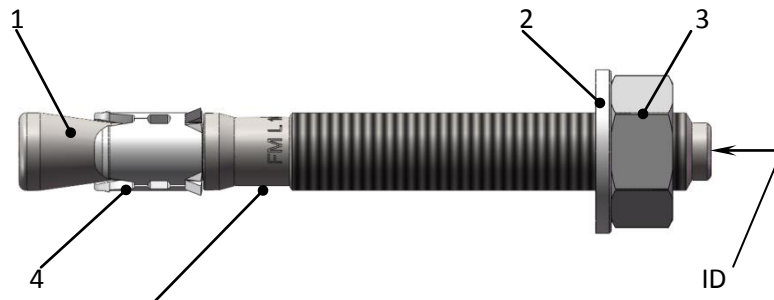
In cases where the provisions of the European Technical Assessment and its Control plan are no longer fulfilled the notified body shall withdraw the certificate of constancy of performance and inform the Slovenian National Building and Civil Engineering Institute (ZAG Ljubljana) without delay.

Issued in Ljubljana on 25.02.2015

Signed by:

Franc Capuder, M.Sc., Research Engineer

Head of Service of TAB



1. Anchor bolt (body)
2. Washer
3. Nut
4. Expansion sleeve

Marking: "FM" = identification name of producer and trade name of anchor
 "R" = identification letter short length of anchor only for reduced embedment depth
 or "L" = long thread
 or "S" = short thread
 "d_{nom}" = nominal diameter of anchor
 "t_{fix}" = max thickness of fixture
 e.g.: **FM L 10/20** (anchor size M10x90 - t_{fix} = 20 mm)

Figure A1: FM753 Nautilus hrg anchor

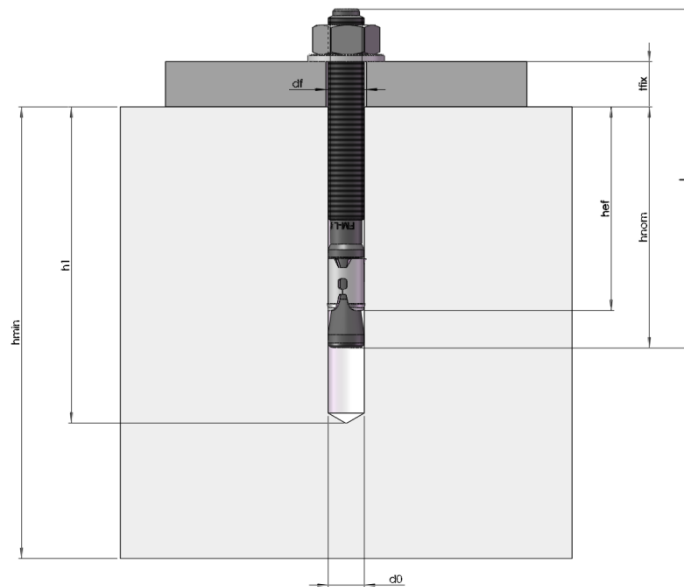
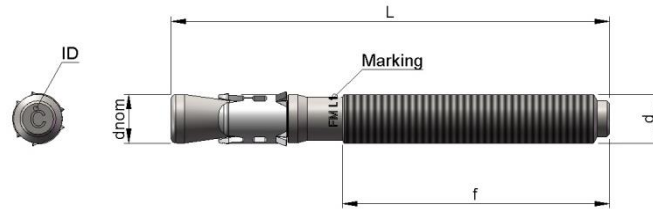


Figure A2: Installed FM753 Nautilus hrg anchor

<p>FM753 Nautilus hrg</p>	<p>Annex A1</p>
<p>Product description</p> <p>Product and intended use</p>	

Table A1: Dimensions

d	dxL	Marking	ID	L [mm]	d _{nom} [mm]	f [mm]
M6	M6x45	FM-R 6/3	A	47	6	20
	M6x65	FM-L 6/15	B	65		40
	M6x85	FM-L 6/35	C	85		60
	M6x100	FM-L 6/50	D	100		60
M8	M8x50	FM-R 8/5	A	53	8	22
	M8x65	FM-L 8/7	B	65		37
	M8x75	FM-L 8/15	C	75		47
	M8x90	FM-L 8/30	D	90		62
	M8x115	FM-L 8/55	E	115		82
	M8x135	FM-L 8/75	F	135		87
	M8x165	FM-L 8/105	G	165		87
	M10x60	FM-R 10/5	A	63		10
M10x75	FM-L 10/5	B	78	43		
M10x90	FM-L 10/20	C	90	55		
M10x100	FM-L 10/30	I	100	65		
M10x120	FM-L 10/50	D	120	85		
M10x145	FM-L 10/75	E	145	85		
M10x170	FM-L 10/100	F	173	85		
M10x210	FM-L 10/140	G	210	85		
M12	M12x80	FM-R 12/7	A	80	12	40
	M12x100	FM-L 12/10	B	100		58
	M12x110	FM-L 12/20	C	110		68
	M12x135	FM-L 12/45	D	135		93
	M12x160	FM-L 12/70	E	160		93
	M12x185	FM-L 12/100	F	188		93
	M12x200	FM-L 12/115	G	200		93
	M12x220	FM-L 12/135	H	220		93
	M12x240	FM-L 12/155	I	240		93
	M12x255	FM-L 12/170	L	255		93
	M12x285	FM-L 12/200	M	285		93
	M12x300	FM-L 12/215	N	300		93
M12x325	FM-L 12/240	P	325	93		
M12x355	FM-L 12/270	Q	355	93		
M16	M16x110	FM-R 16/15	P	110	16	53
	M16x125	FM-S 16/10	A	125		68
	M16x145	FM-S 16/30	B	145		88
	M16x175	FM-S 16/60	C	175		88
	M16x215	FM-S 16/100	D	215		88
	M16x230	FM-S 16/115	E	230		88
	M16x250	FM-S 16/135	F	250		88
	M16x270	FM-S 16/155	G	270		88
	M16x285	FM-S 16/170	H	285		88
M16x320	FM-S 16/205	I	320	88		
M20	M20x170	FM-S 20/30	A	170	20	65
	M20x215	FM-S 20/75	B	215		65
	M20x260	FM-S 20/120	C	260		65
	M20x280	FM-S 20/140	D	280		65

FM753 Nautilus hrg**Product description**
Dimensions**Annex A2**

Table A1: Materials

Part	Component	Material	Coating
1	Anchor body (bolt)	Cold formed or machined steel according to EN ISO 898/1	Galvanised $\geq 10 \mu\text{m}$ "Nautilus high resistance grey opaque"
2	Washer	Steel according to DIN 125/1 – 140 HV	
3	Hexagonal nut	Steel grade 8 according to DIN 934	
4	Expansion sleeve	Stainless steel AISI 316 according to EN 10088/2	

FM753 Nautilus hrg

Product description
Materials

Annex A3

Specifications of intended use

Anchorage subjected to:

- Static, quasi static load.

Base materials:

- Non-cracked concrete.
- Reinforced and unreinforced normal weight concrete of strength class C20/25 at minimum and C50/60 at maximum according to EN 206-1:2000/A2:2005.

Use conditions (Environmental conditions):

- The anchor may be used in concrete subject to dry internal conditions

Design:

- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- Anchorages under static and quasi-static actions are designed in accordance with ETAG 001, Annex C, design method A, Edition August 2010 or CEN/TS 1992-4-4.
- Verifiable calculation notes and drawings are prepared taking into account of the load 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.).

Installation:

- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters on the site.
- Use of the anchor only as supplied by the manufacturer without exchanging the components of an anchor.
- Anchor installation in accordance with the manufacturer's specifications and drawings using the appropriate tools.
- Thickness of the fixture corresponding to the range of required thickness values for the type of anchor.
- Checks before placing the anchor to ensure that the strength class of the concrete in which the anchor is to be placed is in the range given and is not lower than that of the concrete to which the characteristic loads apply for.
- Check of concrete being well compacted, e.g. without significant voids.
- Cleaning of the hole of drilling dust.
- Anchor installation ensuring the specified embedment depth.
- Keeping of the edge distance and spacing to the specified values without minus tolerances.
- Positioning of the drill holes without damaging the reinforcement.
- 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 drill hole is filled with high strength mortar and if under shear or oblique tension load it is not to the anchor in the direction of load application.
- Application of the torque moment given in Annex B2 or C1 using a calibrated torque wrench.

FM753 Nautilus hrg	Annex B1
Intended use Specification	

Table B1: Installation data

d	dxL	t _{fix} h _{ef,RED} [mm]	t _{fix} h _{ef,STD} [mm]	h ₁ [mm]	h _{nom} [mm]	h _{ef} [mm]	d ₀ [mm]	d _{cut,max} [mm]	d _f [mm]	h _{min} [mm]	T _{inst} [Nm]	sw [mm]
M6	M6x45	3	-	45	36	30	6		7	100	6	10
	M6x65	(20)	15	50	41	35						
	M6x85	(40)	35									
	M6x100	(55)	50									
M8	M8x50	5	-	50	38	30	8	8,45	9	100	15	13
	M8x65	(15)	7	60	48	40						
	M8x75	(25)	15									
	M8x90	(40)	30									
	M8x115	(65)	55									
	M8x135	(85)	75									
	M8x165	(115)	105									
M10	M10x60	5	-	55	44	35	10	10,45	12	100	25	17
	M10x75	(20)	5	70	59	50						
	M10x90	(35)	20									
	M10x100	(45)	30									
	M10x120	(65)	50									
	M10x145	(90)	75									
	M10x170	(115)	100									
M10x210	(155)	140										
M12	M12x80	7	-	70	56	45	12	12,5	14	100	50	19
	M12x100	(25)	10	85	71	60				120		
	M12x110	(35)	20									
	M12x135	(60)	45									
	M12x160	(85)	70									
	M12x185	(115)	100									
	M12x200	(130)	115									
	M12x220	(150)	135									
	M12x240	(170)	155									
	M12x255	(185)	170									
	M12x285	(215)	200									
	M12x300	(230)	215									
	M12x325	(255)	240									
M12x355	(285)	270										
M16	M16x110	15	-	95	76	65	16	16,5	18	130	100	24
	M16x125	(30)	10	115	96	85				170		
	M16x145	(50)	30									
	M16x175	(80)	60									
	M16x215	(120)	100									
	M16x230	(135)	115									
	M16x250	(155)	135									
	M16x270	(175)	155									
	M16x285	(190)	170									
	M16x320	(225)	205									
M20	M20x170	-	30	130	115	95	20	20,5	22	200	150	30
	M20x215	-	75									
	M20x260	-	120									
	M20x280	-	140									

(..) = t_{fix} by reduced embedment depth h_{ef,RED}

FM753 Nautilus hrg

Intended use
Installation data

Annex B2

Table C1: **Characteristic values for Tension loads in case of static and quasi-static loading for design method A acc. ETAG 001-Annex C or CEN/TS1992-4-4**

Essential characteristics			Performance											
			M6-1	M6-2	M8-1	M8-2	M10-1	M10-2	M12-1	M12-2	M16-1	M16-2	M20	
Installation parameters														
d_0	Nominal diameter of drill bit	[mm]	6		8		10		12		16		20	
h_{ef}	Effective anchorage depth	[mm]	30*	35*	30*	40	35*	50	45	60	65	85	95	
h_{min}	Minimum thickness of concrete member	[mm]	100		100		100		100	120	130	170	200	
T_{inst}	Torque moment	[Nm]	6		15		25		50		100		150	
s_{min}	Minimum spacing	[mm]	45	50	45	55	50	55	120	90	140	130	200	
c_{min}	Minimum edge distance	[mm]	45	50	45	55	50	55	80	90	100	130	145	
Tension steel failure mode														
$N_{Rk,s}$	Characteristic tension steel failure	[kN]	11		17		28		33		72		108	
γ_{MsN}	Partial safety factor	[-]	1,5		1,4		1,4		1,4		1,5		1,5	
Pull-out failure mode														
$N_{Rk,p}$	Characteristic pull-out failure in non-cracked concrete	[kN]	5	6	6	12	6	12	12	- ¹⁾	- ¹⁾	35	40	
γ_2	Partial safety factor	[-]	1,0											
γ_{Mp}		[-]	1,5											
$s_{cr,N}$	Characteristic spacing	[mm]	$3 \times h_{ef}$											
$c_{cr,N}$	Characteristic edge distance	[mm]	$1,5 \times h_{ef}$											
$\psi_{C,C30/37}$	Increasing factor for $N_{Rk,p}$ in non-cracked concrete	[-]	1,07				1,10				1,22			
$\psi_{C,C40/50}$		[-]	1,14				1,20				1,41			
$\psi_{C,C50/60}$		[-]	1,20				1,30				1,55			
Concrete Cone failure mode														
k_{ucr}	Factor for non-cracked concrete CEN/TS 1992-4-4 §. 6.2.1.4	[-]	10,1											
γ_{Mc}	Partial safety factor	[-]	1,5											
Splitting failure mode														
$s_{cr,sp}$	Characteristic spacing	[mm]	$3 \times h_{ef}$											
$c_{cr,sp}$	Characteristic edge distance	[mm]	$1,5 \times h_{ef}$											
γ_{Msp}	Partial safety factor	[-]	1,5											
Displacement under tension load														
Non-cracked concrete C20/25														
N	Service tension load	[kN]	2,4	2,9	2,9	5,7	2,9	5,7	5,7	11,2	12,6	16,7	19,0	
δ_{N0}	Short term displacement	[mm]	0,21	0,33	0,09	1,6	0,07	0,35	0,10	0,12	0,03	0,03	0,05	
$\delta_{N\infty}$	Long term displacement	[mm]	1,6	1,6	1,6	1,6	1,6	1,6	1,6	1,6	1,6	1,6	1,6	

Use restricted to anchoring of structural components statically indetermined

¹⁾ Pull – through failure is not decisive**FM753 Nautilus hrg****Design acc. to ETAG 001-Annex C or CEN/TS 1992-4-4**
Characteristic resistance under Tension loads – BWR 1**Annex C1**

Table C2: **Characteristic values for Shear loads in case of static and quasi-static loading for design method A acc. ETAG 001-Annex C or CEN/TS 1992-4-4**

Essential characteristics			Performance										
			M6-1	M6-2	M8-1	M8-2	M10-1	M10-2	M12-1	M12-2	M16-1	M16-2	M20
Shear steel failure													
$V_{Rk,s}$	Characteristic shear steel failure	[kN]	6,5		9,2		13,9		20,1		42,6		51,5
$M^0_{Rk,s}$	Bending moment characteristic failure	[Nm]	12		24		49		72		193		338
K_2	Factor considering ductility	[-]	0,8										
γ_{MsV}	Partial safety factor	[-]	1,5										
Shear concrete pry-out and edge failure													
k	Factor in equation (5.6) of ETAG 001 Annex C § 5.2.3.3	[mm]	1,0						2,0				
K_3	Factor in equation (16) of CEN/TS 1992-4-4 § 6.2.2.3	[mm]	1,0						2,0				
l_{ef}	Effective anchorage depth	[mm]	30	35	30	40	35	50	45	60	65	85	95
d_{nom}	Diameter of anchor	[mm]	6		8		10		12		16		20
γ_{Mc}	Partial safety factor	[-]	1,5										
Displacement under shear load													
V	Service shear load	[kN]	3,1		4,4		6,6		9,6		20,3		24,5
δ_{v0}	Short term displacement	[mm]	2,1		2,0		2,6		2,8		3,0		2,6
$\delta_{v\infty}$	Long term displacement	[mm]	3,1		3,1		3,9		4,2		4,4		4,0

FM753 Nautilus hrg

Design acc. to ETAG 001-Annex C or CEN/TS 1992-4-4
 Characteristic resistance under Shear loads – BWR 1

Annex C2