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European Technical Assessment

ETA-05/0169 of 29/01/2015

English translation prepared by CSTB - Original version in French language

General Part

Nom commercial *Trade name*	**FM744**
Famille de produit *Product family*	**Cheville métallique en acier inoxydable, à expansion par vissage à couple contrôlé, de fixation dans le béton non fissuré :** **diamètres M8, M10, M12 et M16** ***Torque-controlled expansion anchor, made of galvanized steel, for use in non-cracked concrete:*** ***sizes M6, M8, M10 and M12***
Titulaire *Manufacturer*	FRIULSIDER Via Trieste,1 I 33048 San Giovanni al Natisone (UDINE) ITALIE
Usine de fabrication *Manufacturing plants*	FRIULSIDER Via Trieste,1 I 33048 San Giovanni al Natisone (UDINE) ITALIE
Cette evaluation contient: *This Assessment contains*	12 pages incluant 9 annexes qui font partie intégrante de cette évaluation 12 *pages including 9 annexes which form an integral part of this assessment*
Base de l'ETE *Basis of ETA*	ETAG 001, Version April 2013, utilisée en tant que EAD *ETAG 001, Edition April 2013 used as EAD*
Cette evaluation remplace: *This Assessment replaces*	ATE 05/0169 valide du 01/09/2010 au 31/08/2015 *ETA-05/0169 with validity from 01/09/2010 to 31/08/2015*

Specific Part

1 Technical description of the product

The Friulsider FM744 anchor in the range of M6 to M12 is an anchor made of galvanised steel which is placed into a drilled hole and anchored by torque-controlled expansion.

The illustration and the description of the product are given in Annexes A.

2 Specification of the intended use

The performances given in Section 3 are only valid if the anchor is used in compliance with the specifications and conditions given in Annexes 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 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

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Characteristic tension resistance acc. ETAG001, Annex C	See Annex C1
Characteristic shear resistance acc. ETAG001, Annex C	See Annex C2
Characteristic tension resistance acc. CEN/TS 1992-4	See Annex C3
Characteristic shear resistance acc. CEN/TS 1992-4	See Annex C4
Displacements	See Annex C5

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Anchorages satisfy requirements for Class A1

3.3 Hygiene, health and the environment (BWR 3)

Regarding dangerous substances contained in this European technical approval, there may be requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the Construction Products Directive, these requirements need also to be complied with, when and where they apply.

3.4 Safety in use (BWR 4)

For Basic requirement Safety in use the same criteria are valid as for Basic 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)

For the sustainable use of natural resources no performance was determined for this product.

3.8 General aspects relating to fitness for use

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

4 Assessment and verification of constancy of performance (AVCP)

According to the Decision 96/582/EC of the European Commission[1], as amended, 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 or 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

Technical details necessary for the implementation of the Assessment and verification of constancy of performance (AVCP) system are laid down in the control plan deposited at Centre Scientifique et Technique du Bâtiment.

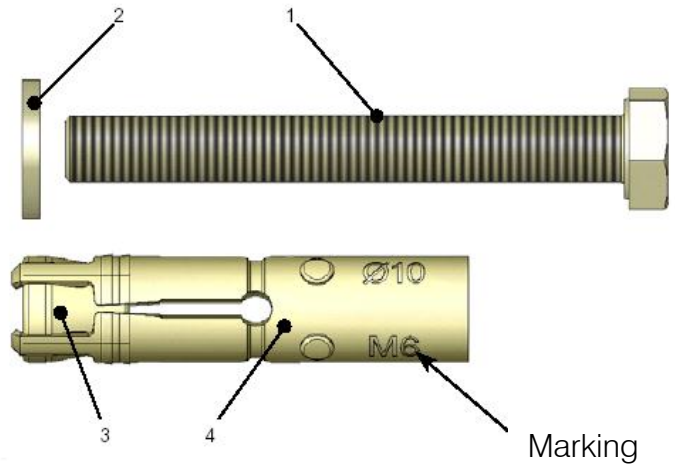
The manufacturer shall, on the basis of a contract, involve a notified body approved in the field of anchors for issuing the certificate of conformity CE based on the control plan.

The original French version is signed by

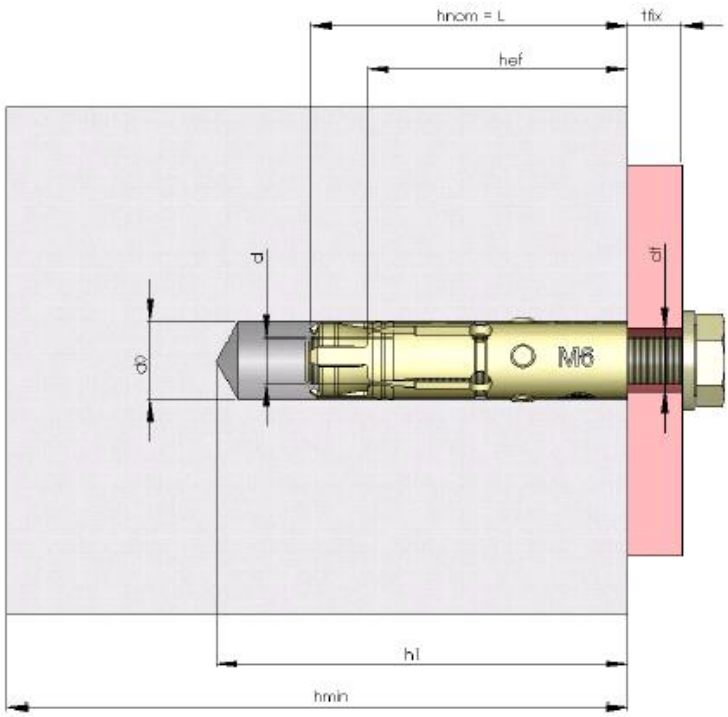
Charles Baloche
Technical Director

1 Official Journal of the European Communities L 254 of 08.10.1996

Schemas of the assembled anchor and of the anchor in use:



1. Screw
2. Washer
3. Cone
4. Expansion sleeve



h_{ef} : effective embedment depth
h_{nom} : embedment depth
h_1 : drilling hole depth
t_{fix} : fixture thickness

FM744 torque-controlled expansion anchor	**Annex A1**
Product description Assembled and in-use anchor	

Assembled anchor: bolt and expansion sleeve

Table 1: Dimensions

Anchor type / marking	h_{nom} [mm]	d [mm]	D [mm]	H [mm]	t_w	L_{screw}
FM744 Ø10 M6	40	6	10	9,5	1,6	50
FM744 Ø14 M8	50	8	14	13,5	1,6	60
FM744 Ø16 M10	60	10	16	14,5	2	80
FM744 Ø20 M12	80	12	20	18,5	2,5	90

h_{nom} = overall anchor embedment depth in the concrete
d = diameter of the threaded part of the screw
D = external diameter of the expansion sleeve
H = length of the cone
t_w = thickness of the washer
L_{screw} = length of the screw

The marking is made on the sleeve.

Table 2: Materials

Part	Designation	Material	Protection
1	Screw	Grade 8.8 ISO 898/1	Galvanised (≥ 5 μm)
2	Washer	DIN 125/1	
3	Cone	Cold formed Medium carbon steel	
4	Expansion sleeve	Cold formed Low carbon steel	

Specifications of intended use

Anchorages subject to:

- Static and quasi-static loads.

Base materials:

- Non-cracked concrete.
- Reinforced or unreinforced normal weight concrete of strength classes C20/25 at least to C50/60 at most according to EN 206: 2000-12.

Use conditions (Environmental conditions):

- Structures subject to dry indoor conditions, indoor with temporary condensation.

Design:

- The anchorages are designed in accordance with the ETAG001 Annex C “Design Method for Anchorages” or CEN/TS 1992-4-4 " Design of fastenings for use in concrete” 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.

Installation:

- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of 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 and using the appropriate tools.
- Effective anchorage depth, edge distances and spacing not less than the specified values without minus tolerances.
- Hole drilling by hammer drill.
- Cleaning of the hole of drilling dust.
- Application of specified torque moment using a calibrated torque wrench.
- In case of aborted hole, drilling of new hole at a minimum distance of twice the depth of the aborted hole, or smaller distance provided the aborted drill hole is filled with high strength mortar and no shear or oblique tension loads in the direction of aborted hole.

Table 3: Installation data

	Marking of the anchor	embedment depth h_{ef} [mm]	drill hole diameter d_{cut} [mm]	depth of drill hole h_1 [mm]	fixture thickness t_{fix} (*) [mm]	setting torque T_{inst} [Nm]	concrete member thickness h_{min} [mm]	clearance hole diameter d_f [mm]	minimum spacing s_{min} [mm]	minimum edge distance c_{min} [mm]
M6	FM744 Ø10 M6	33.5	10	55	12	6	100	8	35	35
M8	FM744 Ø14 M8	41.0	14	65	15	15	100	10	40	40
M10	FM744 Ø16 M10	50.0	16	75	20	30	100	12	50	50
M12	FM744 Ø20 M12	66.5	20	95	15	50	135	14	70	70

(*) : t_{fix} value refers to standard screw 8.8 delivered with the expansion sleeve. The thickness of the fixture can vary by using different lengths of screws from same grade and same coating.

Table 4: Characteristic values for tension loads in case of static and quasi static loading for design method A acc. ETAG001, Annex C

				M6 *	M8	M10	M12
Steel failure							
Characteristic resistance		$N_{Rk,s}$	[kN]	16,1	29,3	46,4	67,4
Partial safety factor		γ_{Ms} 1)	[-]	1,50			
Pullout failure $N_{Rk,p} = \Psi_c \times N^0_{Rk,p}$							
Characteristic resistance in non-cracked concrete C20/25		$N^0_{Rk,p}$	[kN]	**6** *	**12**	**-***	**-***
Partial safety factor for non-cracked concrete		γ_{Mp} 1)	[-]	1,5 2)			
Increasing factor for N_{RK} in concrete	C30/37	Ψ_c	[-]	1,22			
	C40/50		[-]	1,41			
	C50/60		[-]	1,55			
Concrete cone failure and splitting failure							
Effective embedment depth		h_{ef}	[mm]	33,5 *	41	50	66,5
Partial safety factor for non-cracked concrete		$\gamma_{Mc} = \gamma_{Msp}$ 1)	[-]	1,5 2)			
Increasing factor for N_{RK} in concrete	C30/37	Ψ_c	[-]	1,22			
	C40/50		[-]	1,41			
	C50/60		[-]	1,55			
Char. spacing	concrete cone	$s_{cr,N}$	[mm]	101	123	150	200
	splitting	$s_{cr,sp}$	[mm]	200	250	300	400
Char. edge distance	concrete cone	$c_{cr,N}$	[mm]	50	62	75	100
	splitting	$c_{cr,sp}$	[mm]	100	125	150	200

* Use restricted to anchoring of structural components statically indeterminated

-* pull-out failure is not a decisive failure mode for size M10 and M12.

1) In absence of other national regulations

2) The value contains an installation safety factor $\gamma_2 = 1.0$

FM744 torque-controlled expansion anchor

Annex C1

Design according to ETAG001, Annex C

Characteristic resistance under tension loads

Table 5: Characteristic values for shear loads in case of static and quasi static loading for design method A acc. ETAG001, Annex C

			M6 *	M8	M10	M12
Steel failure without lever arm						
Characteristic resistance	$V_{Rk,s}$	[kN]	7,4	14,6	21,5	32,0
Partial safety factor	γ_{Ms} [1)]	[-]	1,25			
Steel failure with lever arm						
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	12	30	60	105
Partial safety factor	γ_{Ms} [1)]	[-]	1,25			
Concrete pry-out failure						
Factor in equation (5.6) of ETAG001, Annex C, § 5.2.3.3	k	[-]	1,0	1,0	1,0	2,0
Partial safety factor	γ_{Mc} [1)]	[-]	1,5 [2)]			
Concrete edge failure						
Effective length of anchor under shear loading	l_f	[mm]	34	41	50	67
Outside diameter of anchor	d_{nom}	[mm]	10	14	16	20
Partial safety factor	γ_{Mc} [1)]	[-]	1,5 [2)]			

[1)] In absence of other national regulations

[2)] The value contains an installation safety factor $\gamma_2 = 1.0$

Table 6: Characteristic values for tension loads in case of static and quasi static loading for design method A acc. CEN/TS 1992-4

				M6 *	M8	M10	M12
Steel failure							
Characteristic resistance		$N_{Rk,s}$	[kN]	16,1	29,3	46,4	67,4
Partial safety factor		γ_{Ms} 1)	[-]	1,59			
Pullout failure $N_{Rk,p} = \Psi_c \times N^0_{Rk,p}$							
Characteristic resistance in non-cracked concrete C20/25		$N^0_{Rk,p}$	[kN]	**6** *	**12**	**-***	**-***
Partial safety factor for non-cracked concrete		γ_{Mp} 1)	[-]	1,5 2)			
Increasing factor for N_{RK} in concrete	C30/37	Ψ_c	[-]	1,22			
	C40/50		[-]	1,41			
	C50/60		[-]	1,55			
Concrete cone failure and splitting failure							
Effective embedment depth		h_{ef}	[mm]	33,5 *	41	50	66,5
Factor for non-cracked concrete		k_{ucr}	[-]	10,1			
Partial safety factor for non-cracked concrete		$\gamma_{Mc}=\gamma_{Msp}$ 1)	[-]	1,5 2)			
Increasing factor for N_{RK} in concrete	C30/37	Ψ_c	[-]	1,22			
	C40/50		[-]	1,41			
	C50/60		[-]	1,55			
Char. spacing	concrete cone	$s_{cr,N}$	[mm]	101	123	150	200
	splitting	$s_{cr,sp}$	[mm]	200	250	300	400
Char. edge distance	concrete cone	$c_{cr,N}$	[mm]	50	62	75	100
	splitting	$c_{cr,sp}$	[mm]	100	125	150	200

* Use restricted to anchoring of structural components statically indeterminated

-* pull-out failure is not a decisive failure mode for size M10 and M12.

1) In absence of other national regulations

2) The value contains an installation safety factor $\gamma_2 = 1.0$

FM744 torque-controlled expansion anchor

Annex C3

Design according to CEN/TS 1992-4

Characteristic resistance under tension loads

Table 7: Characteristic values for shear loads in case of static and quasi static loading for design method A acc. CEN/TS 1992-4

			M6	M8	M10	M12
Steel failure without lever arm						
Characteristic resistance	$V_{Rk,s}$	[kN]	7,4	14,6	21,5	32,0
Factor considering ductility	k_2	[-]	0,8			
Partial safety factor	γ_{Ms} [1)]	[-]	1,25			
Steel failure with lever arm						
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	12	30	60	105
Partial safety factor	γ_{Ms} [1)]	[-]	1,25			
Concrete pry-out failure						
Factor in equation (16) of CEN TS 1992-4-4, § 6.2.2.3	k_3	[-]	1,0	1,0	1,0	2,0
Partial safety factor	γ_{Mc} [1)]	[-]	1,5 [2)]			
Concrete edge failure						
Effective length of anchor under shear loading	l_f	[mm]	40	36	43	62
Outside diameter of anchor	d_{nom}	[mm]	10	14	16	20
Partial safety factor	γ_{Mc} [1)]	[-]	1,5 [2)]			

[1)] In absence of other national regulations

[2)] The value contains an installation safety factor $\gamma_2 = 1.0$

Table 8: Displacements under tension loading

			M8	M10	M12	M16
Tension load in non-cracked concrete C20/25		**[kN]**	**2,9**	**5,7**	**8,5**	**13,0**
Displacement	δ_{N0}	[mm]	0,5	0,6	0,8	1,2
	$\delta_{N\infty}$	[mm]	0,6	0,6	0,8	1,2

			M8	M10	M12	M16
Tension load in non-cracked concrete C50/60		**[kN]**	**4,4**	**8,9**	**13,1**	**20,2**
Displacement	δ_{N0}	[mm]	0,7	1,0	1,4	2,1
	$\delta_{N\infty}$	[mm]	0,7	1,0	1,4	2,1

Table 9: Displacements under shear loading

			M8	M10	M12	M16
Shear load in non-cracked concrete C20/25 to C50/60		**[kN]**	**4,2**	**8,3**	**12,3**	**18,3**
Displacement	δ_{V0}	[mm]	2,5	3,3	2,9	3,5
	$\delta_{V\infty}$	[mm]	3,75 (+0,7)	4,95 (+1,2)	4,35 (+1,2)	5,25 (+1,2)

* Displacement : the table shows the deformation to be expected from the anchor itself, whilst the bracket value indicates the movement between the anchor body and the hole drilled in the concrete member or the hole in the fixture.

Additional displacement due to annular gap between anchor and fixture is to be taken into account.