Declaration of Performance

1404-CPR-3038

1. Unique identification code of the product-type: Bonded injection type anchor Mungo smartline SP100 for use in non-cracked concrete

2. Manufacturer: Mungo Befestigungstechnik AG, Bornfeldstrasse 2, CH-4600 Olten/Switzerland

3. System/s of AVCP: System 1

4. Intended use or use/es:

Product	Intended use
Bonded 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.

5. European Assessment Document: EAD 330499-00-0601, Bonded fasteners for use in concrete
European Technical Assessment: ETA-18/0535 of 15/06/2018
Technical Assessment Body: ETA-Danmark A/S
Notified body/ies: 1404 - ZAG

6. Declared performance:
Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Characteristic resistance for tension loads	See appendix, especially Annex C1
Characteristic resistance for shear loads	See appendix, especially Annex C3
Displacement	See appendix, especially Annex C2 and C3

Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Anchorages satisfy requirements for Class A1 (see appendix Annex C4)
Resistance to fire	No performance assessed

The performance of the product identified above is in conformity with the set of declared performance/s. This declaration of performance is issued, in accordance with Regulation (EU) No 305/2011, under the sole responsibility of the manufacturer identified above.

Singed for and on behalf of the manufacturer by:

Dipl.-Ing. Massimo Pirozzi
Head of Engineering

p.p.a. Massimo Pirozzi

Olten, 2019-01-07

This DoP Has been prepared in different languages. In case there is a dispute on the interpretation the English version shall always prevail.
The Appendix includes voluntary and complementary information in English language exceeding the (language as neutrally specified) legal requirements.

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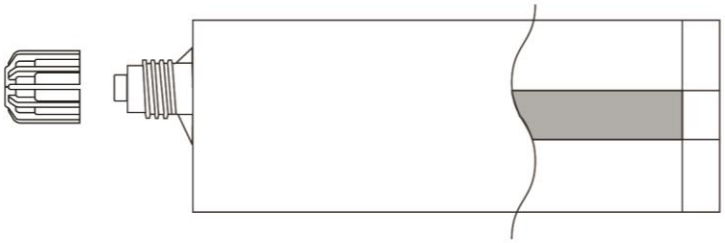
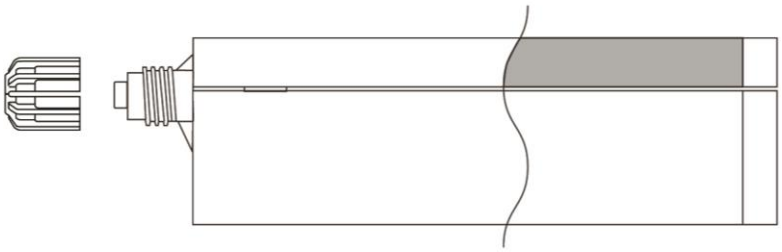
Injection Mortar : SmartLine SP 100 Resin System

Foil Bag Cartridge
165ml - 410ml

Coaxial Cartridge
280ml, 380ml - 410ml



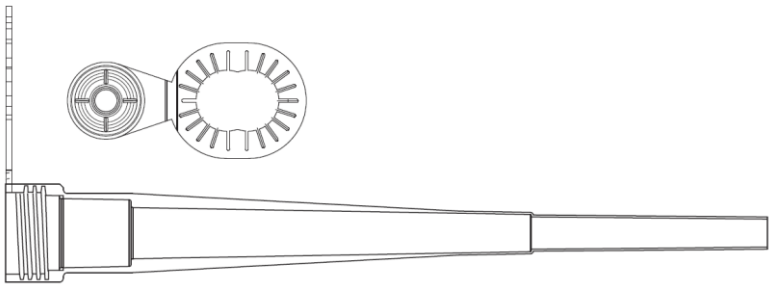
Side by Side Cartridge
235ml - 825ml



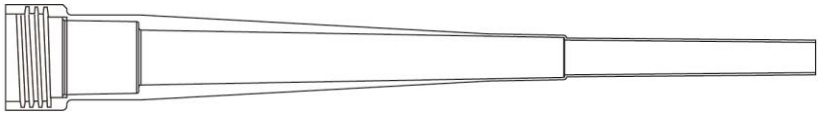
Marking:

SmartLine SP 100
Batch code, either expiry date or manufacturing date with shelf life

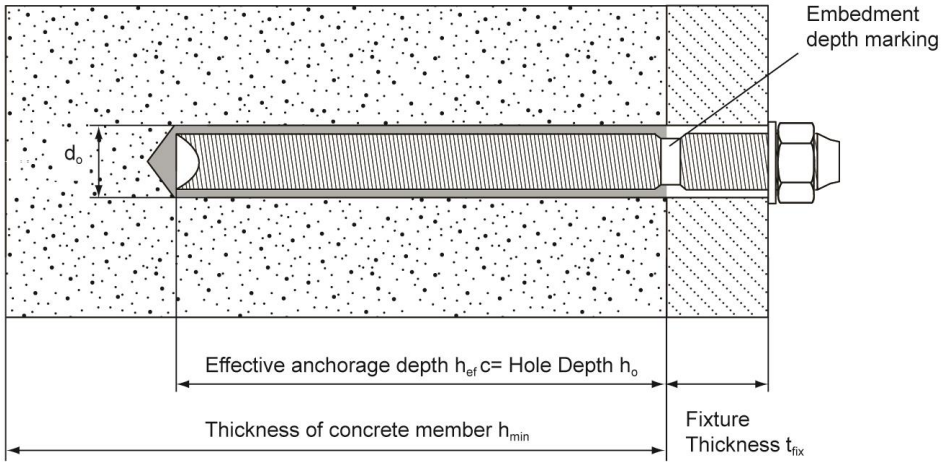
Mixer with hanger



Mixer



SmartLine SP 100	Annex A1 of European Technical Assessment ETA-18/0535
Product and intended use	



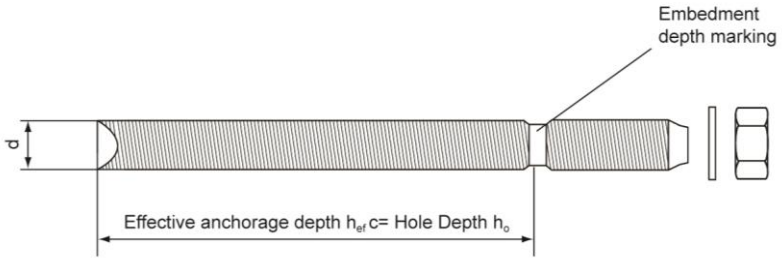


Table A1: Threaded rod dimensions

Anchor size			**M8**	**M10**	**M12**	**M16**
Diameter of anchor rod	d	[mm] =	8	10	12	16
Range of anchor depth h_{ef}	min	[mm] =	60	60	70	80
and bore hole depth h_0	max	[mm] =	160	200	240	320
Nominal anchorage depth	h_{ef}	[mm] =	80	90	110	125
Nominal diameter of drill bit	d_0	[mm] =	10	12	14	18
Diameter of clearance hole in the fixture	d_f	[mm] ≤	9	12	14	18
Diameter of steel brush	d_b	[mm] ≤	12	13,3	14,9	19,35
Installation torque moment	T_{inst}	[Nm] =	8	10	15	25
Minimum thickness of concrete member	h_{min}	[mm]	h_{ef} + 30 mm ≥ 100 mm			h_{ef} + 2d_0
Minimum spacing	S_{min}	[mm] =	0,5 h_{ef}			
Minimum edge distance	C_{min}	[mm] =	0,5 h_{ef}			

SmartLine SP 100	**Annex A2** of European Technical Assessment ETA-18/0535
Threaded rod types and dimensions	

Table A2: Threaded rod materials

Designation	Material
Threaded rods made of zinc coated steel	
Threaded rod M8 – M16	Strength class 5.8, 8.8, 10.9 EN ISO 898-1 Steel galvanized ≥ 5µm EN ISO 4042 Hot dipped galvanized ≥ 45µm EN ISO 10684
Washer ISO 7089	Steel galvanized EN ISO 4042; hot dipped galvanized EN ISO 10684
Nut EN ISO 4032	Strength class 8 EN ISO 898-2 Steel galvanized ≥ 5µm EN ISO 4042 Hot dipped galvanized ≥ 45µm EN ISO 10684
Threaded rods made of stainless steel	
Threaded rod M8 – M16	Strength class 70 EN ISO 3506-1; Stainless steel 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362 en 10088
Washer ISO 7089	Stainless steel 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362 en 10088
Nut EN ISO 4032	Strength class 70 EN ISO 3506-1; Stainless steel 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362 en 10088
Threaded rods made of high corrosion resistant steel	
Threaded rod M8 – M16	R_m = 800 N/mm^2; $R_{p0,2}$=640 N/mm^2 High corrosion resistant steel 1.4529, 1.4565 EN 10088
Washer ISO 7089	High corrosion resistant steel 1.4529, 1.4565 EN 10088
Nut EN ISO 4032	Strength class 70 EN ISO 3506-2; High corrosion resistant steel 1.4529, 1.4565 EN 10088

Use:
The anchors are intended to be used for anchorages for which requirements for mechanical resistance and stability and safety in use in the sense of the Basic Requirements 1 and 4 of Regulation 305/2011 (EU) shall be fulfilled and failure of anchorages made with these products would compromise the stability of the works, cause risk to human life and/or lead to considerable economic consequences.

Anchors subject to:
- Static and quasi-static loads: sizes from M8 to M16.

Base materials:
- Reinforced or unreinforced normal weight concrete of strength class C20/25 at minimum to C50/60 at maximum according to EN 206-1.
- Non cracked concrete: sizes from M8 to M16

Temperature range:
The anchors may be used in the following temperature range:
(a) Winter version: max short term temperature + 40 °C and max long term temperature + 24 °C;
(b) Standard version: max short term temperature + 80 °C and max long term temperature + 50 °C.

Use conditions (Environmental conditions):
Elements made of galvanized steel and stainless steel may be used in structures subject to the following conditions:
- Internal dry conditions
- Dry internal conditions, external atmospheric exposure (including industrial and marine environment) or exposure in permanently damp internal conditions if no particular aggressive conditions exist.
- dry internal conditions, external atmospheric exposure, in permanently damp internal conditions or in other particular aggressive conditions - e.g. permanent, alternating immersion in seawater, splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with chemical pollution (e.g. in desulphurization plants or road tunnels where de-icing materials are used).

Installation:
The anchors may be installed in:
- Dry or wet concrete (use category 1): sizes from M8 to M16.
- Flooded holes with the exception of seawater (use category 2): sizes from M8 to M16.
- All the diameters may be used overhead: sizes from M8 to M16.
- The anchor is suitable for hammer drilled holes: sizes from M8 to M16.

Proposed design methods:
- Static and quasi-static load: EOTA Technical Report TR029 (September 2010) or FprEN 1992-4

SmartLine SP 100	**Annex B1**
Intended use – Specification	of European Technical Assessment ETA-18/0535

Table B1: Installation data

Threaded rod And rebar	Size	Nominal drill bit diameter d_o (mm)	Steel Brush	Cleaning methods	
				Manual cleaning (MAC)	Compressed air cleaning (CAC)
Studs 	M8	10	12mm	Yes … $h_{ef} \leq 80$ mm	Yes
	M10	12	14mm	Yes … $h_{ef} \leq 100$mm	
	M12	14	16mm	Yes … $h_{ef} \leq 120$mm	
	M16	18	20mm	Yes … $h_{ef} \leq 160$mm	

Manual Cleaning (MAC):
SmartLine SP 100 hand pump recommended for
Blowing out bore holes with diameters $d_o \leq 24$ mm and bore holes depth $h_o \leq 10d$

Compressed air cleaning (CAC):
Recommended air nozzle with an Orifice opening of minimum 3,5mm in diameter.

Table B2: Minimum curing time

Minimum base material temperature C°	Gel time (working time) In dry/wet concrete	Cure time
-5°C ≤ $T_{base\ material}$ < 0°C	40 min	180 min
0°C ≤ $T_{base\ material}$ < 10°C	20 min	90 min
10°C ≤ $T_{base\ material}$ < 20°C	9 min	60 min
20°C ≤ $T_{base\ material}$ < 30°C	5 min	30 min
30°C ≤ $T_{base\ material}$ ≤ 40°C	3 min	20 min

The temperature of the bond material must be ≥ 20°C

SmartLine SP 100	Annex B2 of European Technical Assessment ETA-18/0535
Intended use - data	

Table B3 - parameters: drilling, hole cleaning and installation

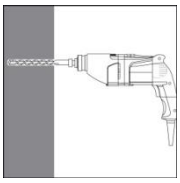
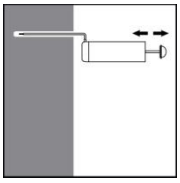
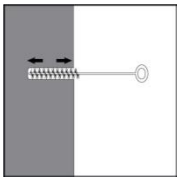
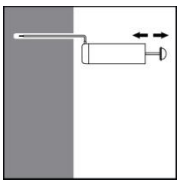
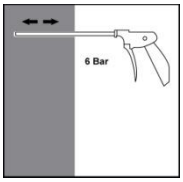
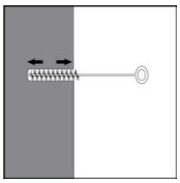
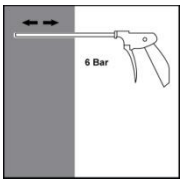
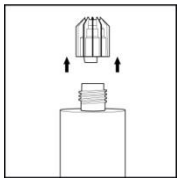
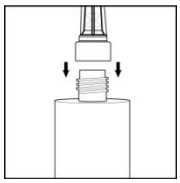
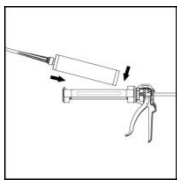
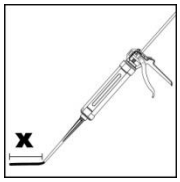
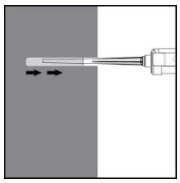
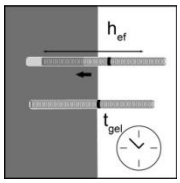
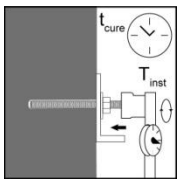
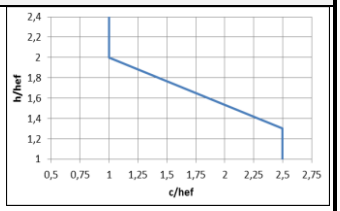
Bore hole drilling		
		Drill hole in the substrate to the required embedment depth using the appropriately sized carbide drill bit.
Bore hole cleaning Just before setting an anchor, the bore hole must be free of dust and debris.		
a) Manual air cleaning (MAC) for all bore hole diameters $d_o \leq 24$mm and bore hole depth $h_o \leq 10d$		
	**X 4**	The SmartLine SP 100 manual pump shall be used for blowing out bore holes up to diameters $d_o \leq 24$mm and embedment depths up to $h_{ef} \leq 10d$. Blow out at least 4 times from the back of the bore hole, using an extension if needed.
	**X 4**	Brush 4 times with the specified brush size (see Table B1) by inserting the SmartLine SP 100 steel brush to the back of the hole (if needed with an extension) in a twisting motion and removing it.
	**X 4**	Blow out again with manual pump at least 4 times.
b) Compressed air cleaning (CAC) for all bore hole diameters d_o and all bore hole depths		
	**X 2**	Blow 2 times from the back of the hole (if needed with a nozzle extension) over the whole length with oil-free compressed air (min. 6 bar at 6 m³/h).
	**X 2**	Brush 2 times with the specified brush size (see Table B1) by inserting the SmartLine SP 100 steel brush to the back of the hole (if needed with an extension) in a twisting motion and removing it.
	**X 2**	Blow out again with compressed air at least 2 times.

Table B4 - parameters: drilling, hole cleaning and installation	
	Remove the threaded cap from the cartridge.
	Tightly attach the supplied mixing nozzle. Do not modify the mixer in any way. Made sure the mixing element is inside the mixer. Use only the supplied mixer.
	Insert the cartridge into the dispenser gun.
	Discard the initial trigger pulls of adhesive. Depending on the size of the cartridge, an initial amount of adhesive mix must be discarded. Discard quantities are - 5cm for between 150ml, 300ml & 400ml Foil Pack - 10cm for all other cartridges
	Inject the adhesive starting at the back of the hole, slowly withdrawing the mixer with each trigger pull. Fill holes approximately 2/3 full, to ensure that the annular gap between the anchor and the concrete is completely filled with adhesive along the embedment depth.
	Before use, verify that the threaded rod is dry and free of contaminants. Install the threaded rod to the required embedment depth during the open gel time t_{gel} has elapsed. The working time t_{gel} is given in Table B2.
	The anchor can be loaded after the required curing time t_{cure} (see Table B2). The applied torque shall not exceed the values T_{max} given in Table A1.

SmartLine SP 100	**Annex B4**
Procedure (2)	of European Technical Assessment ETA-18/0535

Table C1: Design method A, characteristic tension load values

SmartLine SP 100 with threaded rods			M8	M10	M12	M16
Steel failure						
Characteristic resistance, class 5.8	$N_{Rk,s}$	[kN]	**18**	**29**	**42**	**79**
Characteristic resistance, class 8.8	$N_{Rk,s}$	[kN]	**29**	**46**	**67**	**126**
Partial safety factor	$\gamma_{Ms,N}$ [1]	[-]	1,5			
Characteristic resistance, class 10.9	$N_{Rk,s}$	[kN]	**36**	**58**	**84**	**157**
Partial safety factor	$\gamma_{Ms,N}$ [1]	[-]	1,4			
Characteristic resistance, A4-70	$N_{Rk,s}$	[kN]	**26**	**41**	**59**	**110**
Partial safety factor	$\gamma_{Ms,N}$ [1]	[-]	1,87			
Characteristic resistance, HCR	$N_{Rk,s}$	[kN]	**29**	**46**	**67**	**126**
Partial safety factor	$\gamma_{Ms,N}$ [1]	[-]	1,5			
Combined Pull-out and Concrete cone failure [2]						
Diameter of threaded rod	d	[mm]	8	10	12	16
Characteristic bond resistance in non-cracked concrete C20/25 – dry or wet concrete						
Temperature range a [3] : **40°C/24°C**	$\tau_{Rk,ucr}$	[N/mm²]	**6,0**	**5,5**	**5,0**	**4,0**
Temperature range b [3] : **80°C/50°C**	$\tau_{Rk,ucr}$	[N/mm²]	**4,5**	**4,0**	**3,5**	**3,0**
Partial safety factor – dry or wet concrete	$\gamma_{Mp}=\gamma_{Mc}$ [1]	[-]	2,1[5]	1,8[6]		
Characteristic bond resistance in non-cracked concrete C20/25 – flooded holes						
Temperature range a [3] : **40°C/24°C**	$\tau_{Rk,ucr}$	[N/mm²]	**5,0**	**4,0**	**4,0**	**3,5**
Temperature range Ib [3] : **80°C/50°C**	$\tau_{Rk,ucr}$	[N/mm²]	**3,5**	**3,0**	**3,0**	**3,0**
Partial safety factor – flooded holes	$\gamma_{Mp}=\gamma_{Mc}$ [1]	[-]	2,1[5]			
Increasing factor for $\tau_{Rk,ucr}$ in non-cracked concrete	ψ_c	C30/37	1,08			
		C40/50	1,15			
		C50/60	1,19			
Splitting failure[2]						
Edge distance $c_{cr,sp}$ [mm] for		h / h_{ef} [4] ≥ 2,0	**1,0 h_{ef}**			
		2,0 > h / h_{ef} [4] > 1,3	**5,28 h_{ef} - 2,14 h**			
		h / h_{ef} [4] ≤ 1,3	**2,5 h_{ef}**			
Spacing	$s_{cr,sp}$	[mm]	2 $c_{cr,sp}$			
Partial safety factor – dry or wet concrete	$\gamma_{Msp}=\gamma_{Mc}$ [1]	[-]	2,1[5]	1,8[6]		
Partial safety factor – flooded holes	$\gamma_{Msp}=\gamma_{Mc}$ [1]	[-]	2,1[5]			



[1] In absence of national regulations
[2] Calculation of concrete and splitting, see annex B1
[3] Explanations, see annex B1
[4] h concrete member thickness, h_{ef} effective anchorage depth
[5] The partial safety factor γ_{inst}=1,4 included
[6] The partial safety factor γ_{inst}=1,2 included

Table C2: Displacements under tension load

SmartLine SP 100 with threaded rods			M8	M10	M12	M16
Temperature range a [7]: 40°C / 24°C						
Admissible service load	F	[kN]	9,0	10,4	13,2	16,1
Displacement	δ_{N0}	[mm]	0,22	0,21	0,19	0,25
Displacement	$\delta_{N\infty}$	[mm]	-	-	0,29	-
Temperature range b [7]: 80°C / 50°C						
Admissible service load	F	[kN]	6,8	7,5	9,2	12,1
Displacement	δ_{N0}	[mm]	0,35	0,33	0,30	0,40
Displacement	$\delta_{N\infty}$	[mm]	-	-	0,38	-

[7] Explanation see annex B1

Table C3: Design method A, Characteristic shear load values

SmartLine SP 100 with threaded rods			M8	M10	M12	M16
Steel failure without lever arm						
Characteristic resistance, class 5.8	$V^0_{Rk,s}$	[kN]	**9**	**15**	**21**	**39**
Characteristic resistance, class 8.8	$V^0_{Rk,s}$	[kN]	**15**	**23**	**34**	**63**
Characteristic resistance, class 10.9	$V^0_{Rk,s}$	[kN]	**18**	**29**	**42**	**79**
Characteristic resistance, A4-70	$V^0_{Rk,s}$	[kN]	**13**	**20**	**30**	**55**
Characteristic resistance, HCR	$V^0_{Rk,s}$	[kN]	**15**	**23**	**34**	**62,8**
Steel failure with lever arm						
Characteristic resistance, class 5.8	$M^0_{Rk,s}$	[Nm]	**19**	**37**	**66**	**167**
Characteristic resistance, class 8.8	$M^0_{Rk,s}$	[Nm]	**30**	**60**	**105**	**266**
Characteristic resistance, class 10.9	$M^0_{Rk,s}$	[Nm]	**38**	**75**	**131**	**333**
Characteristic resistance, A4-70	$M^0_{Rk,s}$	[Nm]	**26**	**53**	**92**	**233**
Characteristic resistance, HCR	$M^0_{Rk,s}$	[Nm]	**30**	**60**	**105**	**266**
Partial safety factor steel failure						
grade 5.8 or 8.8	$\gamma_{Ms,V}$ [1)]	[-]	1,25			
grade 10.9	$\gamma_{Ms,V}$ [1)]	[-]	1,50			
A4-70	$\gamma_{Ms,V}$ [1)]	[-]	1,56			
HCR	$\gamma_{Ms,V}$ [1)]	[-]	1,25			
Concrete pryout failure						
Factor in equation (27) of CEN/TS 1992-4-5, 6.3.3	k_3	[-]	2,0			
Partial safety factor	γ_{Mc} [1)]	[-]	2,1 [5)]	1,8 [6)]		
Concrete edge failure						
Partial safety factor	γ_{Mc} [1)]	[-]	2,1 [5)]	1,8 [6)]		

[1)] In absence of national regulations
[5)] The partial safety factor γ_{inst}=1,4 included
[6)] The partial safety factor γ_{inst}=1,2 included.

Table C4: Displacements under shear load

SmartLine SP 100 with threaded rods			M8	M10	M12	M16
Displacement [8)]	δ_{V0}	[mm/kN]	0,06	0,06	0,05	0,04
Displacement [8)]	$\delta_{V\infty}$	[mm/kN]	0,09	0,08	0,08	0,06

[8)] Calculation of displacement under service load: V_{sd} design value of shear load
Displacement under short term loading = $\delta_{V0} \cdot V_{sd}/1,4$
Displacement under short term loading = $\delta_{V\infty} \cdot V_{sd}/1,4$

Table C5: Resistance to fire

HARMONIZED TECHNICAL SPECIFICATION: ETAG 001 PART 1 PARAGRAPH 5.2.2 AND TECHNICAL REPORT TR020	
ESSENTIAL CHARACTERISTICS	**PERFORMANCE**
Resistance to fire	No performance assessed

Table C6: Reaction to fire

HARMONIZED TECHNICAL SPECIFICATION: ETAG 001 PART 1 PARAGRAPH 5.2.1	
ESSENTIAL CHARACTERISTICS	**PERFORMANCE**
Reaction to fire	In the final application, the thickness of the mortar layer is about 1 to 2 mm and most of the mortar is material classified class A1 according to EC Decision 96/603/EC. Therefore, it may be assumed that the bonding material (synthetic mortar or a mixture of synthetic mortar and cementitious mortar) in connection with the metal anchor in the end use application do not contribute to fire growth or to the fully developed fire and they have no influence to the smoke hazard.