



Declaration of Performance n. 1109-CPD-0080 
According to the Regulation EU No 305/2011

AJE01 - AJE31

Torque-controlled wedge anchor for cracked and non-cracked concrete, certified for use in high seismic hazard zones

Manufacturer: Tecfi S.p.A. - S.S. Appia, km 193 - 81050 Pastorano (CE), Italia - rdc@tecfi.it

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1109-CPD-0080
Revision n. 2.01
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Printed on 03/01/2023

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1 - Intended use

Product-type:	Metal anchor for use in concrete
Anchor type:	Torque controlled expansion anchor for use in cracked and non-cracked concrete under static, quasi-static or seismic action (performance category C2)
Technical description of the product:	see Table 2.a
Specification of the intended use in accordance with the applicable EAD:	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.
Base material:	Reinforced or unreinforced normal weight concrete of strength class C20/25 at minimum to C50/60 at maximum according to EN 206-1.
Installation:	Hole drilling by rotary plus hammer mode: M8, M10, M12, M16, M20 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. After installation further turning of the anchor is not possible.
Loading:	- Static and quasi-static loads: sizes from M8 to M20. - Seismic loads performance category C2: sizes from M10 to M20
Durability:	The anchor may be used in structures subject to dry internal conditions only. The verifications and assessment methods on which the relevant 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.
Service temperature:	The anchors may be used in the following temperature range: [-40°C ; +80°C]
Resistance to fire:	See tables from 4.f to 4.n
Reaction to fire:	The anchor is classified A1 according to EC Decision 96/603/EC.
European Assessment Document:	ETAG001, part 1, part 2 and Annex E, April 2013 edition used as EAD according to Article 66(3) of the Regulation (EU) No 305/2011.
European Technical Assessment:	ETA 11/0319
Technical Assessment Body:	Deutsches Institut für Bautechnik, Kolonnenstr. 30 B, 10829 Berlin, GERMANY
Design methods:	- Static and quasi-static load: TAG001, Annex C, design method A, Edition August 2010 or CEN/TS 1992-4:2009. - Seismic load: EOTA Technical Report TR045 (February 2013).
Assessment and Verification of Constancy of Performance:	EC Certificate No. 1109-CPD-0080
Notified Body:	IFBT GmbH, Hans-Weigel-Straße 2b, D - 04319 Leipzig, (Germany)
Under the system:	1

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2 - Anchor's components

Table 2.a - AJE 01 and AJE 31 components

Part	Component	Description
1	Cone Bolt	Zinc plated min 5 µm (Cr VI Free) according to ISO 4042 carbon steel cone bolt, minimum tensile strength 800 N/mm ²
2	Hexagonal nut	Zinc plated min 5 µm (Cr VI Free) according to ISO 4042 carbon steel hexagonal nut DIN 934 (or ISO 4032).
3	Washer	Zinc plated min 5 µm (Cr VI Free) according to ISO 4042 carbon steel washer ISO 7089 (AJE01) or ISO 7093-1 (AJE31), hardness class HV 200.
4	Sleeve expansion	Zinc plated min 5 µm (Cr VI Free) according to ISO 4042 carbon steel HRB 80.

Table 2.b - SPS component

1	Seismic Protector®, for seismic performance categories C1 and C2		Zinc plated min 5 µm (Cr VI Free) according to ISO 4042 carbon steel spacer(s).
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3 - Installation

3.1 Installation information

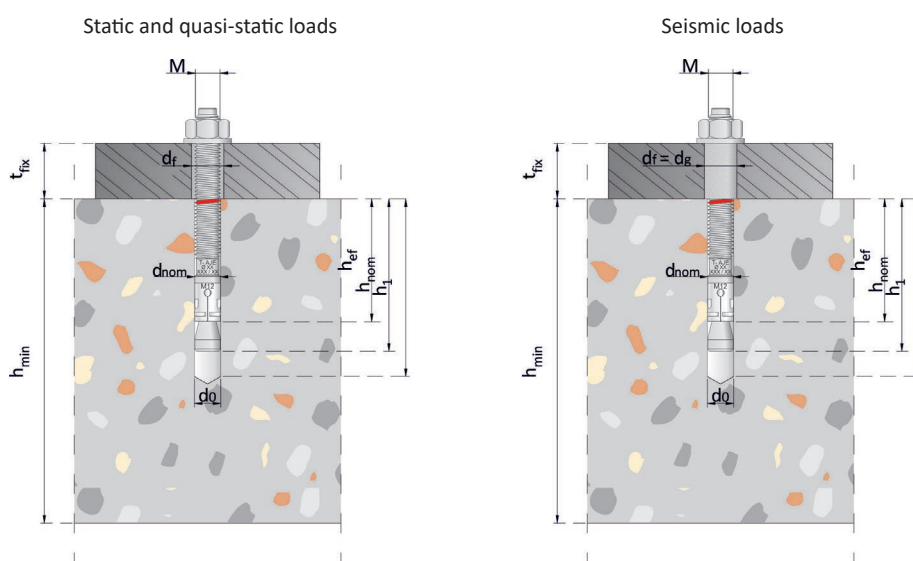


Table 3.a: Installation details

d_{nom} :	Outside diameter of the anchor
d_{cut} :	Maximum cutting diameter of the drill bit
t_{fix} :	Thickness of the fixtures
d_0 :	Diameter of the drill hole
d_f :	Diameter of the clearance hole in the fixture
M :	Diameter of the metric thread
h_{min} :	Minimum thickness of the concrete member
h_{nom} :	Overall anchor embedment depth
h_{ef} :	Anchorage depth
d_g :	Diameter of the Seismic Protector® used to fill the gap between the anchor and the fixture
l_g :	Length of the spacer used to fill the gap between the anchor and the fixture
s_g :	Thickness of the spacer used to fill the gap between the anchor and the fixture

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Table 3.b: Installation data

Anchor			M 8	M 10	M 12	M 16	M 20
Nominal drill hole diameter	d ₀	[mm]	8	10	12	16	20
Maximum cutting diameter of drill bit	d _{cut}	[mm]	8,45	10,45	12,5	16,5	20,55
Installation torque moment	T _{inst}	[Nm]	20	45	60	110	200
Minimum allowable spacing (even in case of fire exposure)	s _{min}	[mm]	80	65	75	130	170
Minimum allowable edge distance	c _{min}	[mm]	80	80	90	130	200
Wrench size	SW	[mm]	13	17	19	24	30
Overall anchor embedment depth	h _{nom}	[mm]	55	70	85	100	115
Minimum thickness of concrete member	h _{min}	[mm]	100	110	140	170	200
Depth of the drilled hole to deepest point	h ₁	[mm]	65	85	105	120	135
Diameter of clearance hole in the fixture	d _f	[mm]	9	12	14	18	22
Thickness of fixture	t _{fix}	[mm]	≤ 160	≤ 160	≤ 270	≤ 320	≤ 320
Nominal length of Seismic Protector® SPS for seismic performance categories C1 and C2	d _g	[mm]	NPD	12	14	18	22
Nominal length of Seismic Protector® SPS for seismic performance categories C1 and C2	l _g	[mm]	NPD	The total length of the spacer must be equal to the thickness of the fixture, with a tolerance of: - for t _{fix} ≤ 120 [mm]: + 0 - 3 [mm]; - for t _{fix} > 120 [mm]: + 0 - 5 [mm]. More steel spacers can be used to reach the total length of the Seismic Protector®.			
Minimum edge distance (fire exposure on one side)	c _{min}	[mm]	2 h _{ef}				
Minimum edge distance (fire exposure if fire attacks from more than one side)	c _{min}	[mm]	If fire attacks from more than one side, the minimum edge distance shall be ≥ 300 mm or ≥ 2 h _{ef}				

Table 3.c: Details of letter code on the head

Letter code on the head of cone bolt*	A	B	C	D	E	F	G	H	I	K	L	M	N	O	P	R	S
Maximum thickness of fixture	5	10	15	20	25	30	35	40	45	50	55	60	65	70	80	90	100

*Per $100 < t_{fix} \leq 200$ there is the number 1 before the letter code

$200 < t_{fix} \leq 300$ there is the number 2 before the letter code

$300 < t_{fix} \leq 400$ there is the number 3 before the letter code

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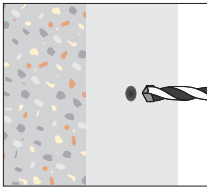
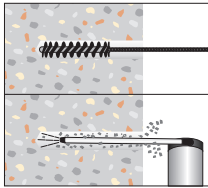
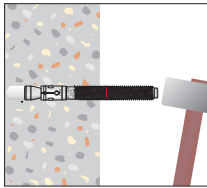
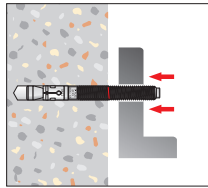
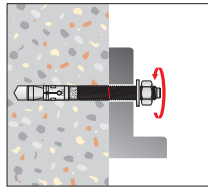
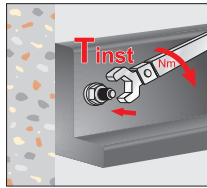
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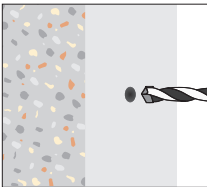
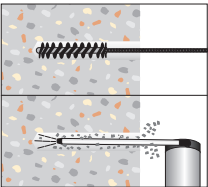
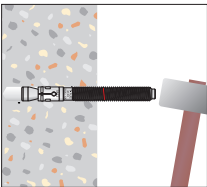
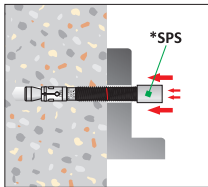
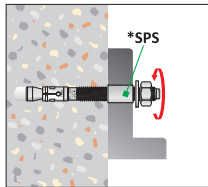
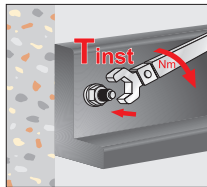


Table 3.d: Installation instructions AJE01 and AJE31 for static and quasi-static loads

Step 1	Step 2	Step 3	Step 4	Step 5	Step 6
					
Step 1	Drill a hole into the concrete in rotary plus hammer mode				
Step 2	Remove the dust into the hole using a brush and a blowing pump				
Step 3 ¹⁾	Hammer the anchor into the hole				
Step 4 ¹⁾	Place the fixture				
Step 5 & 6	Apply the required torque moment T_{inst}				

¹⁾ Through fixing is allowed (place the fixture before placing the anchor)

Table 3.e: Installation instructions AJE01 and AJE31 for seismic performance categories C1 and C2

Step 1	Step 2	Step 3	Step 4	Step 5	Step 6
					
Step 1	Drill a hole into the concrete in rotary plus hammer mode				
Step 2	Remove the dust into the hole using a brush and a blowing pump				
Step 3 ²⁾	Hammer the anchor in the hole				
Step 4 ²⁾ & Step 5 ³⁾	Place the fixture				
Step 6	Apply the required torque moment T_{inst}				

²⁾ Through fixing is allowed (place the fixture before placing the anchor)

³⁾ Size and number of the steel spacers depends on the anchor's diameter and the thickness of fixture

3.2 - Tools for installation

Drill bit			Blowing pump	Seismic Protector®
	AJE anchor size	Drill bit item code	 Item code: DW 01 00 001	 Item code: SPS 01
	Ø 8 (M 8)	EO 01 08 210		
	Ø 10 (M 10)	EO 01 10 210		
	Ø 12 (M 12)	EO 01 12 210		
	Ø 16 (M 16)	EO 01 16 210		
	Ø 20 (M 20)	EO 01 20 210		

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4. Declared performance according to ETAG001 part 1, part 2 and Annex E

Anchor size	M 8	M 10	M 12	M 16	M 20
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Table 4.a: Steel failure

Characteristic resistance	$N_{Rk,s}$	[kN]	16	25	40	70	115
	$V_{Rk,s}$	[kN]	12	20	35	60	95
	$V_{Rk,seis,C1}$	[kN]	NPD	10	17	24	45
	$V_{Rk,seis,C2}$	[kN]	NPD	10	17	24	45
	$M^0_{Rk,s}$	[Nm]	30	60	105	266	519
Partial safety factor	$\gamma_{Ms,N}$	[-]	1,5				

Table 4.b: Pull-out failure

Characteristic resistance in uncracked concrete C20/25	$N_{Rk,p,ucr}$	[kN]	7,5	16	20	Not relevant	
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p,cr}$	[kN]	6	9	16	25	30
Characteristic resistance under seismic performance category C1	$N_{Rk,seis,C1}$	[kN]	NPD	3,2	12,8	25	30
Characteristic resistance under seismic performance category C2	$N_{Rk,seis,C2}$	[kN]	NPD	2,1	3,2	15,1	16,1
Increasing factor for concrete	C30/37	ψ_c	[-]	1,22			
	C40/50			1,41			
	C50/60			1,55			
Installation safety factor	γ_2	[-]	1,20			1,00	

Table 4.c: Concrete cone failure and splitting failure

Effective anchorage depth	h_{ef}	[mm]	45	55	70	75	90
Critical spacing for concrete cone failure	$S_{cr,N}$	[mm]	135	165	210	225	270
Critical edge distance for concrete cone failure	$C_{cr,N}$	[mm]	68	83	105	113	135
Critical spacing for splitting failure	$S_{cr,sp}$	[mm]	200	280	300	430	400
Critical edge distance for splitting failure	$C_{cr,sp}$	[mm]	100	140	150	215	200

Table 4.d: Concrete pry-out failure

k factor	k	[-]	1,0		2,0		
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Table 4.e: Concrete edge failure

Effective length of anchor	$l_f = h_{ef}$	[mm]	45	55	70	75	90
Outside diameter of anchor	d_{nom}	[mm]	8	10	12	16	20



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4. Declared performance according to ETAG001 part 1, part 5 and Annex E

Anchor size	M 8	M 10	M 12	M 16	M 20
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Table 4.f: Steel Failure under fire exposure in concrete C20/25 to C50/60

Characteristic resistance to tension and shear loads	R30	$F_{Rk,s,fi,30}$	[kN]	0,37	0,87	1,69	3,14	4,90
	R60	$F_{Rk,s,fi,60}$	[kN]	0,33	0,75	1,26	2,36	3,68
	R90	$F_{Rk,s,fi,90}$	[kN]	0,26	0,58	1,10	2,04	3,19
	R120	$F_{Rk,s,fi,120}$	[kN]	0,18	0,46	0,84	1,57	2,45
Characteristic bending moments	R30	$M^0_{Rk,s,fi,30}$	[Nm]	0,4	1,1	2,6	6,7	13,0
	R60	$M^0_{Rk,s,fi,60}$	[Nm]	0,3	1,0	2,0	5,0	9,7
	R90	$M^0_{Rk,s,fi,90}$	[Nm]	0,3	0,7	1,7	4,3	8,4
	R120	$M^0_{Rk,s,fi,120}$	[Nm]	0,2	0,6	1,3	3,3	6,5

Table 4.g: Pull-out failure

Characteristic resistance	R 30 to R 90	$N_{Rk,p,fi}$	[kN]	1,5	2,25	4,00	6,25	7,5
	R 120	$N_{Rk,p,fi,120}$	[kN]	1,2	1,8	3,2	5,0	6,0

Table 4.h: Concrete cone failure

Characteristic resistance	R 30 to R 90	$N_{Rk,c,fi}$	[kN]	1,4	2,5	5,6	9,4	13,5
	R 120	$N_{Rk,c,fi,120}$	[kN]	1,1	2,0	4,5	7,5	10,8

Table 4.i: Concrete pry-out failure

he characteristic resistance $V_{Rk,cp,fi,Ri}$ in concrete C20/25 to C50/60 is determined by:

$$V_{Rk,c,fi(90)} = k \times N_{Rk,c,fi(90)} (\leq R90) \text{ e } V_{Rk,c,fi(120)} = k \times N_{Rk,c,fi(120)} (\text{up to R120})$$

Table 4.l: Concrete edge failure

he characteristic resistance $V_{Rk,cp,fi,Ri}$ in concrete C20/25 to C50/60 is determined by:

$$V_{ORk,c,fi(90)} = 0,25 \times V_{ORk,c(R30, R60, R90)} \text{ and } V_{ORk,c,fi(120)} = 0,20 \times V_{ORk,c(R120)} \text{ with}$$

$V_{ORk,c}$ an initial value of the characteristic resistance of a single anchor in cracked concrete C20/25

Table 4.m: Edge distance

R30 to R120	$C_{cr,N}$	[mm]	$2 h_{ef}$
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If fire attack comes from more than one side, the edge distance of the anchor has to be ≥ 300 mm or $\geq 2 h_{ef}$

Table 4.n: Anchor spacing

R30 to R120	$S_{cr,N}$	[mm]	$4 h_{ef}$
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4. Declared performance according to ETAG001 part 1, part 5 and Annex E

Anchor size	M 8	M 10	M 12	M 16	M 20
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Table 4.o: Displacements under static and quasi-static tension loads

Service tension load in uncracked concrete C20/25 to C50/60	N_{ucr}	[kN]	3,30	6,40	7,90	16,70	23,30
Short term displacement	$\delta_{N0,ucr}$	[mm]	0,02	0,01	0,03	0,08	0,05
Long term displacement	$\delta_{N\infty,ucr}$	[mm]	-	-	0,03	-	-
Service tension load in cracked concrete C20/25 to C50/60	N_{cr}	[kN]	2,40	3,60	6,40	11,90	16,70
Short term displacement	$\delta_{N0,cr}$	[mm]	0,10	0,06	0,20	0,21	0,31
Long term displacement	$\delta_{N\infty,cr}$	[mm]	1,02	0,60	0,84	1,40	0,55

Table 4.p: Displacements under static and quasi-static shear loads

Service tension load in cracked and uncracked concrete C20/25 to C50/60	V_r	[kN]	5,7	9,5	16,7	28,6	45,2
Short term displacement	δ_{V0}	[mm]	2,0	2,0	3,0	4,0	6,0
Long term displacement	$\delta_{V\infty}$	[mm]	3,0	4,0	6,0	8,0	10,0

Table 4.p: Displacements for Seismic performance category C2

Damage Limit State - Tension load	$\delta_{N,seis-(DLS)}$	[mm]	NPD	2,39	1,74	3,34	2,48
Ultimate Limit State - Tension load	$\delta_{N,seis-(ULS)}$	[mm]		10,54	15,07	14,26	10,80
Damage Limit State - Shear load	$\delta_{V,seis-(DLS)}$	[mm]		3,45	3,24	4,98	4,56
Ultimate Limit State - Shear load	$\delta_{V,seis-(ULS)}$	[mm]		6,21	8,37	9,00	9,64

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5. Item codes		
Item code	Size ØxL [mm]	t _{fix} [mm]
AJE 01 08 080	8x80	10
AJE 01 08 090	8x90	20
AJE 01 08 110	8x110	40
AJE 01 08 130	8x130	60
AJE 01 08 170	8x170	100
AJE 01 10 095	10x95	10
AJE 01 10 105	10x105	20
AJE 01 10 125	10x125	40
AJE 01 10 145	10x145	60
AJE 01 10 185	10x185	100
AJE 01 10 245	10x245	160
AJE 01 12 115	12x115	10
AJE 01 12 125	12x125	20
AJE 01 12 145	12x145	40
AJE 01 12 165	12x165	60
AJE 01 12 205	12x205	100
AJE 01 12 225	12x225	120
AJE 01 12 245	12x245	140
AJE 01 12 265	12x265	160
AJE 01 12 305	12x305	200
AJE 01 12 350	12x350	245
AJE 01 16 130	16x130	5
AJE 01 16 145	16x145	20
AJE 01 16 165	16x165	40
AJE 01 16 225	16x225	100
AJE 01 20 170	20x170	30
AJE 01 20 200	20x200	60

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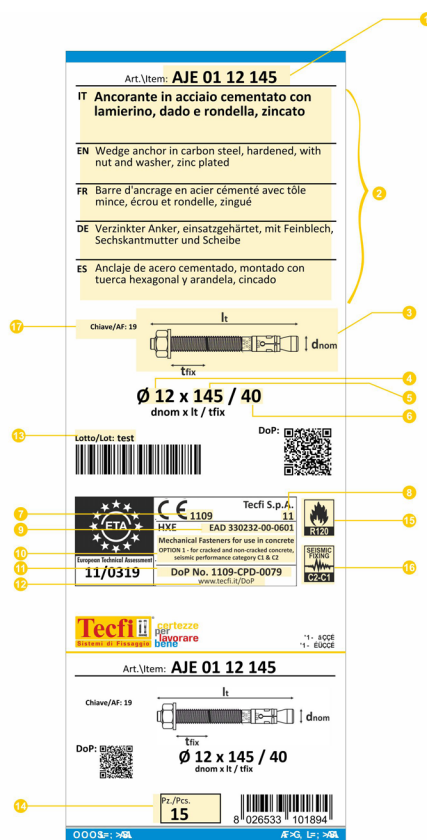
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5 - Label



- | | |
|--|---|
| 1 Item Code | 10 Intended use of the product as laid down in the European standard applied, level of performance declared |
| 2 Descriptions | 11 DoP Number |
| 3 Picture | 12 Link to DoP |
| 4 Anchor Diameter (d_{nom}) | 13 Lot Number |
| 5 Anchor Length (L) | 14 Number of Pieces per Box |
| 6 Maximum Thickness of fixture (t_{fix}) | 15 Fire Resistance |
| 7 Identification number of the Notified Body | 16 Seismic Assessment |
| 8 Last two digits of the year in which the marking was first affixed | 17 Wrench Size / hexalobular socket number |
| 9 European Technical Specification | |

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

Signed for and on behalf of the manufacturer by:

Name and function	Place and date of issue	Signature
President Antonio Guarino	Pastorano, July 17 th 2014	