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European Technical Assessment

ETA 12/0570 of 29/07/2025

(English language translation, the original version in Czech language)

Technical Assessment Body issuing the ETA: Technical and Test Institute for Construction Prague

Trade name of the construction product	VJ Technology Injection system E410+ EC410+
Product family to which the construction product belongs	Product area code: 33 Bonded injection type anchor for use in uncracked concrete
Manufacturer	VJ Technology Ltd. Brunswick Road 288 Ashford Kent, TN23 1EN United Kingdom
Manufacturing plant(s)	VJ Technology Plant 1
This European Technical Assessment contains	18 pages including 15 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	EAD 330499-02-0601
This version replaces	ETA 12/0570 issued on 22/02/2017

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

1. Technical description of the product

The VJ Technology Injection system E410+, EC410+ for uncracked concrete is a bonded anchor consisting of a cartridge with injection mortar and a steel element. The steel elements consists of a commercial threaded rods, a hexagon nut and a washer. The steel elements are made of galvanized steel or stainless steel.

The steel element is placed into a drilled hole filled with injection mortar and is anchored via the bond between metal part, injection mortar and concrete.

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

2. Specification of the intended use in accordance with the applicable EAD

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 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 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 to tension load (static and quasi-static loading)	Annex C 1, C 2, C 3
Characteristic resistance to shear load (static and quasi-static loading)	Annex C 1, C 4
Displacements under short term and long term loading	Annex C 5
Durability	Annex B 1
Characteristic resistance and displacements for seismic performance categories C1 and C2	NPA

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Satisfy the requirements for performance class A1
Resistance to fire	NPA

3.3 Hygiene, health and environment (BWR 3)

No performance determined.

3.4 General aspects relating to fitness for use

Durability and serviceability are only ensured if the specifications of intended use according to Annex B 1 are kept.

4. Assessment and verification of constancy of performance (AVCP) system applied with reference to its legal base

According to the Decision 96/582/EC of the European Commission[1] the system of assessment verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011) given in the following table applies.

[1] Official Journal of the European Communities L 254 of 08.10.1996

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 construction works) or heavy units	-	1

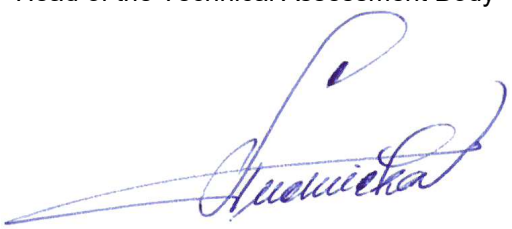
5. Technical details necessary for the implementation of the AVCP system, as provided in the applicable EAD

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 plan is laid down in the context of the factory production control system operated by the manufacturer and deposited at Technický a zkušební ústav stavební Praha, s.p.[2] The results of factory production control shall be recorded and evaluated in accordance with the provisions of the control plan.

Issued in Prague on 29.07.2025

By

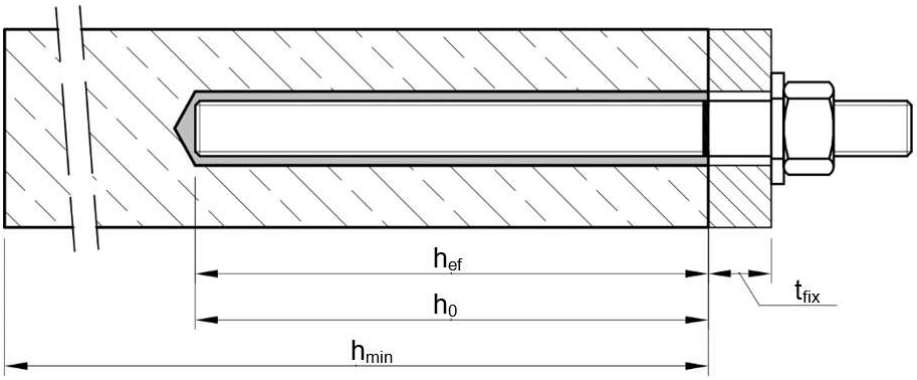
Ing. Jiří Studnička, Ph.D.
Head of the Technical Assessment Body



[2] The control plan is a confidential part of the documentation of the European Technical Assessment, but not published together with the ETA and only handed over to the approved body involved in the procedure of AVCP.

Installation threaded rod M8 up to M24

prepositioned installation or
push through installation (annular gap filled with mortar)

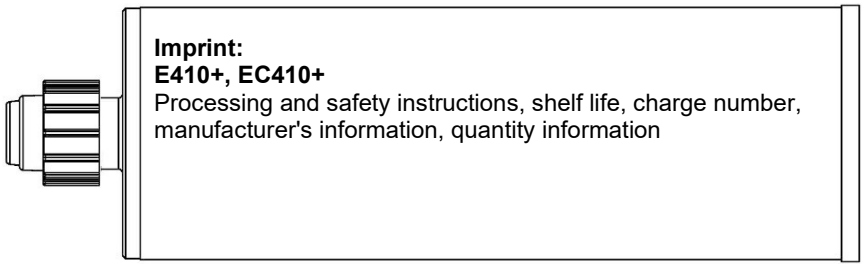


t_{fix} = thickness of fixture
h_{ef} = effective embedment depth
h_{min} = minimum thickness of member
h_0 = depth of drill hole

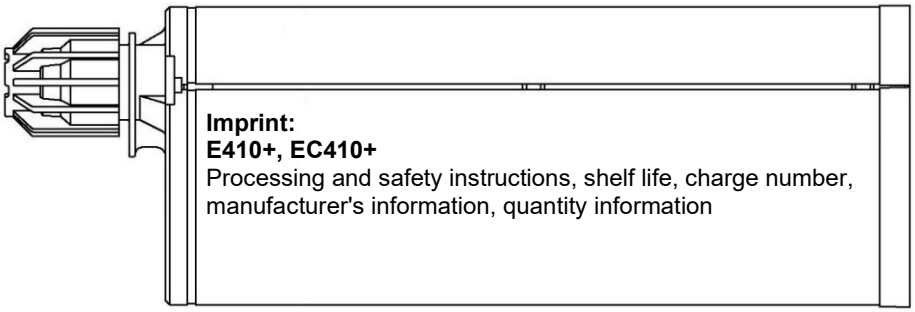
VJ Technology Injection system E410+, EC410+ for concrete	
Product description Installed conditions	**Annex A 1**

Cartridge system

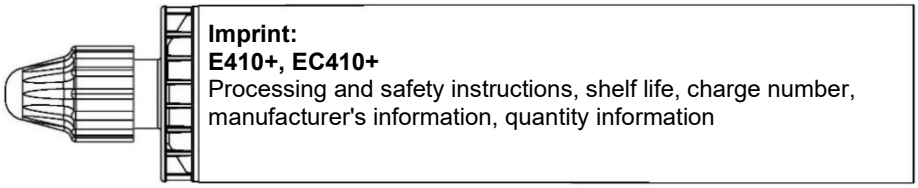
Coaxial Cartridge:
150 ml, 160 ml, 280 ml, 300 ml up to 333 ml and 380 ml up to 420 ml



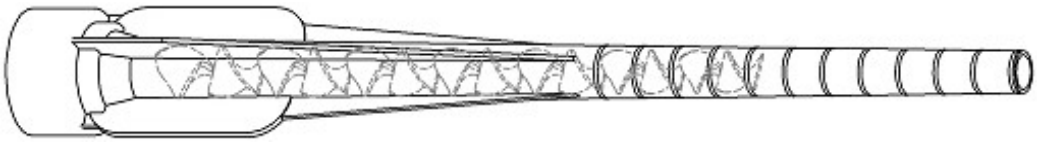
Side-by-Side Cartridge:
235 ml, 345 ml up to 360 ml and 825 ml



Foil Tube Cartridge:
165 ml and 300 ml

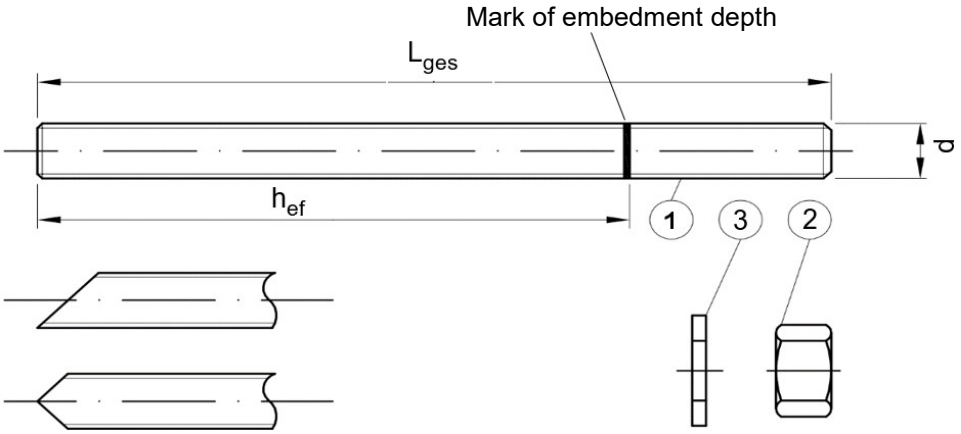


Static mixer SM-14W



VJ Technology Injection system E410+, EC410+ for concrete	
Product description Injection system	**Annex A 2**

Threaded rod M8 up to M24 with washer and hexagon nut



Commercial standard threaded rod with:
- Materials, dimensions and mechanical properties acc. Table A1
- Inspection certificate 3.1 acc. to EN 10204:2004
- Marking of embedment depth

VJ Technology Injection system E410+, EC410+ for concrete	
Product description Threaded rod	**Annex A 3**

Table A1: Materials

Part	Designation	Material				
Steel, zinc plated (Steel acc. to EN ISO 683-4:2018 or EN 10263:2017) - zinc plated ≥ 5 µm acc. to EN ISO 4042:2022 or - hot-dip galvanized ≥ 40 µm acc. to EN ISO 1461:2022 and EN ISO 10684:2004+AC:2009 or - sherardized ≥ 45 µm acc. to EN ISO 17668:2016						
1	Anchor rod	Property class		Characteristic steel ultimate tensile strength	Characteristic steel yield strength	Elongation at fracture
		acc. to EN ISO 898-1:2013	4.6	f_{uk} = 400 N/mm²	f_{yk} = 240 N/mm²	A_5 > 8%
			4.8	f_{uk} = 400 N/mm²	f_{yk} = 320 N/mm²	A_5 > 8%
			5.6	f_{uk} = 500 N/mm²	f_{yk} = 300 N/mm²	A_5 > 8%
			5.8	f_{uk} = 500 N/mm²	f_{yk} = 400 N/mm²	A_5 > 8%
			8.8	f_{uk} = 800 N/mm²	f_{yk} = 640 N/mm²	A_5 > 8%
2	Hexagon nut	acc. to EN ISO 898-2:2022	4	for anchor rod class 4.6 or 4.8		
			5	for anchor rod class 5.6 or 5.8		
			8	for anchor rod class 8.8		
3	Washer	Steel, zinc plated, hot-dip galvanized or sherardized (e.g.: EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000 or EN ISO 7094:2000)				
Stainless steel A2 (Material 1.4301 / 1.4307 / 1.4311 / 1.4567 or 1.4541, acc. to EN 10088-1:2023) **Stainless steel A4** (Material 1.4401 / 1.4404 / 1.4571 / 1.4362 or 1.4578, acc. to EN 10088-1:2023) **High corrosion resistance steel** (Material 1.4529 or 1.4565, acc. to EN 10088-1:2023)						
1	Anchor rod[1)]	Property class		Characteristic steel ultimate tensile strength	Characteristic steel yield strength	Elongation at fracture
		acc. to EN ISO 3506-1:2020	50	f_{uk} = 500 N/mm²	f_{yk} = 210 N/mm²	A_5 > 8%
			70	f_{uk} = 700 N/mm²	f_{yk} = 450 N/mm²	A_5 > 8%
			80	f_{uk} = 800 N/mm²	f_{yk} = 600 N/mm²	A_5 > 8%
2	Hexagon nut[1)]	acc. to EN ISO 3506-1:2020	50	for anchor rod class 50		
			70	for anchor rod class 70		
			80	for anchor rod class 80		
3	Washer	A2: Material 1.4301, 1.4311 / 1.4307 / 1.4567 or 1.4541, EN 10088-1:2023 A4: Material 1.4401, 1.4404 / 1.4571 / 1.4362 or 1.4578, EN 10088-1:2023 HCR: Material 1.4529 or 1.4565, acc. to EN 10088-1:2023 (e.g.: EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000 or EN ISO 7094:2000)				

[1)] Property class 80 only for stainless steel A4 and high corrosion resistant steel HCR

VJ Technology Injection system E410+, EC410+ for concrete

Product description
Materials

Annex A 4

Specifications of intended use

Fasteners subject to (Static and quasi-static loads):

	Working life 50 years		Working life 100 years	
Base material	uncracked concrete	cracked concrete	uncracked concrete	cracked concrete
HD: Hammer drilling CD: Compressed air drilling	M8 to M24	No performance assessed	No performance assessed	No performance assessed
Temperature Range:	I: -40°C to +40°C[1)] II: -40°C to +80°C[2)]		I: -40°C to +40°C[1)] II: -40°C to +80°C[2)]	

[1)] (max. long-term temperature +24°C and max. short-term temperature +40°C)

[2)] (max. long-term temperature +50°C and max. short-term temperature +80°C)

Base materials:

- Compacted reinforced or unreinforced normal weight concrete without fibres according to EN 206:2013 + A2:2021.
- Strength classes C20/25 to C50/60 according to EN 206:2013 + A2:2021

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions (all materials).
- For all other conditions according to EN 1993-1-4:2006+A2:2020 corresponding to corrosion resistance class:
  - Stainless steel A2 according to Annex A 4, Table A1: CRC II
  - Stainless steel A4 according to Annex A 4, Table A1: CRC III
  - High corrosion resistance steel HCR according to Annex A 4, Table A1: CRC V

Design:

- Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored.
  The position of the fastener is indicated on the design drawings (e. g. position of the fastener relative to reinforcement or to supports, etc.).
- Fasteners are designed under the responsibility of an engineer experienced in fasteners and concrete work.
- The fasteners are designed in accordance to EN 1992-4:2018

Installation:

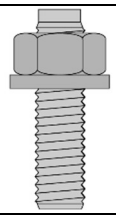
- Dry, wet concrete or flooded bore holes (not sea-water).
- Hole drilling by hammer drill (HD) or compressed air drill mode (CD).
- Overhead installation allowed.
- Fastener installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.

VJ Technology Injection system E410+, EC410+ for concrete	
Intended use Specifications	**Annex B 1**

Table B1: Installation parameters for threaded rod

Anchor size				M8	M10	M12	M16	M20	M24
Diameter of element		$d = d_{nom}$	[mm]	8	10	12	16	20	24
Nominal drill hole diameter		d_0	[mm]	10	12	14	18	24	28
Effective embedment depth		$h_{ef,min}$	[mm]	60	60	70	80	90	96
		$h_{ef,max}$	[mm]	160	200	240	320	400	480
Diameter of clearance hole in the fixture	Prepositioned installation $d_f \leq$		[mm]	9	12	14	18	22	26
	Push through installation $d_f \leq$			12	14	16	20	24	30
Maximum torque moment		max $T_{inst} \leq$	[Nm]	10	20	40	80	120	160
Minimum thickness of member		h_{min}	[mm]	h_{ef} + 30 mm ≥ 100 mm			h_{ef} + $2d_0$		
Minimum spacing		s_{min}	[mm]	40	50	60	80	100	120
Minimum edge distance		c_{min}	[mm]	40	50	60	80	100	120

Table B2: Parameter cleaning and installation tools



Threaded rod	d_0 Drill bit - ∅	d_b Brush - ∅		$d_{b,min}$ min. Brush - ∅
[mm]	[mm]	[mm]		[mm]
M8	10	BR10	12	10,5
M10	12	BR12	14	12,5
M12	14	BR14	16	14,5
M16	18	BR18	20	18,5
M20	24	BR24	26	24,5
M24	28	BR28	30	28,5

Cleaning and installation tools

Hand pump
(Volume 750 ml, Dry/wet: $h_0 \leq 10\ d_{nom}$ (M8 to M16) or $h_0 \leq 10\ d_{nom}$ (M20 + M24)
Flooded holes: $d_0 \leq 20$ mm; $h_0 \leq 10\ d_{nom}$)

Compressed air tool
(min 6 bar)

Brush BR

Brush extension

VJ Technology Injection system E410+, EC410+ for concrete

Intended use
Installation parameters
Parameter anchor and drill sizes, brushes, Cleaning and Installation tools

Annex B 2

Table B3: Working and curing time E410+

Temperature in base material			Maximum working time	Minimum curing time
T			t_{work}	t_{cure}
- 5 °C	to	- 1 °C	90 min	6 h
+ 0 °C	to	+ 4 °C	45 min	3 h
+ 5 °C	to	+ 9 °C	25 min	2 h
+ 10 °C	to	+ 14 °C	20 min	100 min
+ 15 °C	to	+ 19 °C	15 min	80 min
+ 20 °C	to	+ 29 °C	6 min	45 min
+ 30 °C	to	+ 34 °C	4 min	25 min
+ 35 °C	to	+ 39 °C	2 min	20 min
Cartridge temperature			+5°C up to +40°C	

Table B4: Working and curing time EC410+

Temperature in base material			Maximum working time	Minimum curing time
T			t_{work}	t_{cure}
- 10 °C	to	- 6 °C	60 min	4 h
- 5 °C	to	- 1 °C	45 min	2 h
+ 0 °C	to	+ 4 °C	25 min	80 min
+ 5 °C	to	+ 9 °C	10 min	45 min
+ 10 °C	to	+ 14 °C	4 min	25 min
+ 15 °C	to	+ 19 °C	3 min	20 min
+ 20 °C	to	+ 29 °C	2 min	15 min
Cartridge temperature			0°C up to +30°C	

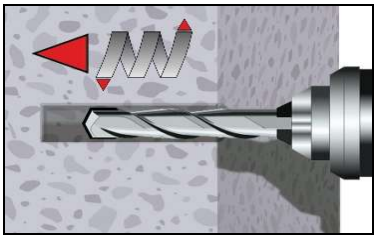
VJ Technology Injection system E410+, EC410+ for concrete

Intended use
Working and curing time

Annex B 3

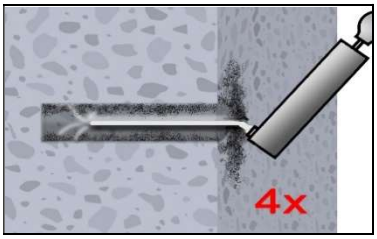
Installation instructions

Drilling of the bore hole

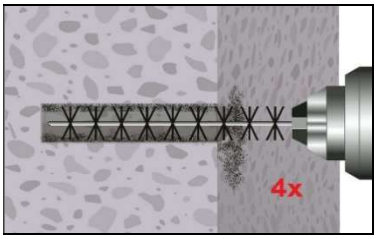


1. **Hammer drilling (HD) / Compressed air drilling (CD)**
Drill a hole to the required embedment depth.
Drill bit diameter according to Table B1.
Aborted drill holes shall be filled with mortar.
Proceed with Step 2 (MAC or CAC).

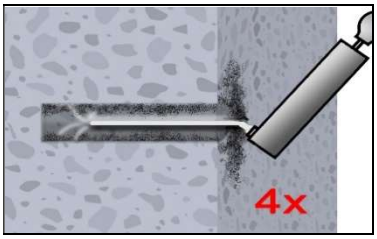
Manual Air Cleaning (MAC)
Dry/wet: for all drill hole diameter and drill hole depth $h_0 \leq 10d_{nom}$ (for M8 to M16) or $h_0 \leq 8d_{nom}$ (for M20 + M24)
Flooded holes: for drill hole diameter $d_0 \leq 20$ mm and drill hole depth $h_0 \leq 10d_{nom}$



Attention! Remove standing water in the borehole before cleaning.
2a. Blow the bore hole clean minimum 4x from the bottom or back by hand pump (Annex B 2).

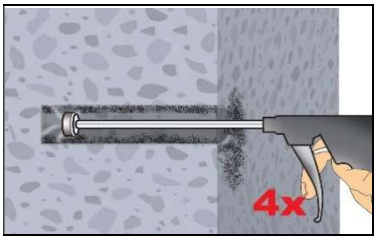


2b. Attach brush BR according to Table B2 to a drilling machine or a cordless screwdriver. Brush the bore hole minimum 4x over the entire embedment depth in a twisting motion (if necessary, use a brush extension).

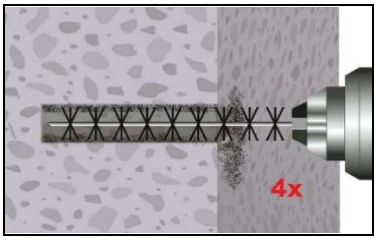


2c. Finally blow the bore hole clean minimum 4x from the bottom or back by hand pump (Annex B 2).

Compressed Air Cleaning (CAC):
All diameter with drilling method HD/CD



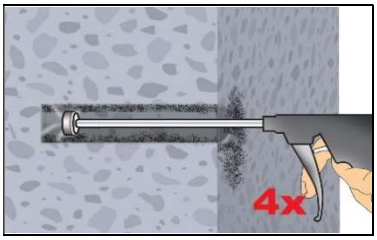
Attention! Standing water in the bore hole must be removed before cleaning.
2a. Blow the bore hole clean minimum 4x with compressed air (min. 6 bar) (Annex B 2) over the entire embedment depth until return air stream is free of noticeable dust. (If necessary, an extension shall be used.)



2b. Attach brush BR according to Table B3 to a drilling machine or a cordless screwdriver. Brush the bore hole minimum 4x over the entire embedment depth in a twisting motion. (If necessary, a brush extension shall be used.)

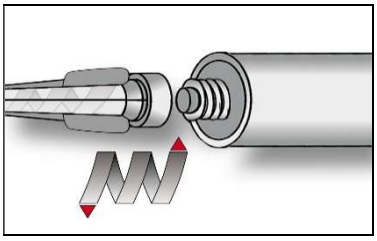
VJ Technology Injection system E410+, EC410+ for concrete	
Intended use Installation instructions	**Annex B 4**

Installation instructions (continuation)

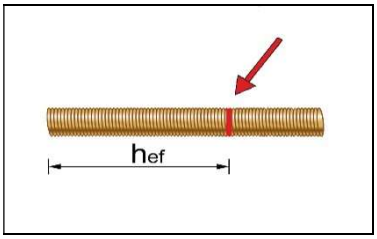


2c. Finally blow the bore hole clean minimum 4x with compressed air (min. 6 bar) (Annex B 2) over the entire embedment depth until return air stream is free of noticeable dust. (If necessary, an extension shall be used.)

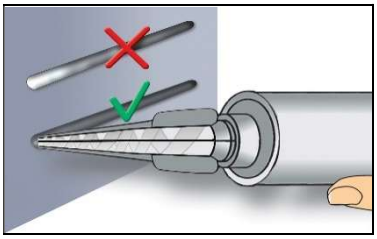
Cleaned bore hole has to be protected against re-contamination in an appropriate way.
If necessary, repeat cleaning process directly before dispensing the mortar. In-flowing water must not contaminate the bore hole again.



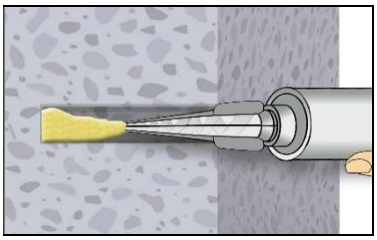
3. Screw on static-mixing nozzle SM-14W and load the cartridge into an appropriate dispensing tool.
If necessary, cut off the foil tube clip before use.
For every working interruption longer than the maximum working time t_{work} (Annex B 3) as well as for new cartridges, a new static-mixer shall be used.



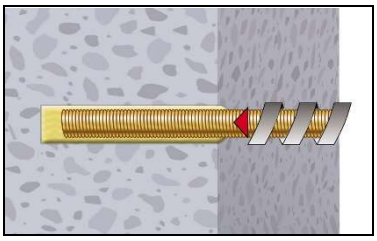
4. Mark embedment depth on the anchor rod.
The anchor rod shall be free of dirt, grease, oil or other foreign material.



5. Not proper mixed mortar is not sufficient for fastening.
Dispense and discard mortar until an uniform grey colour is shown (at least 3 full strokes; for foil tube cartridges min. 6 strokes).



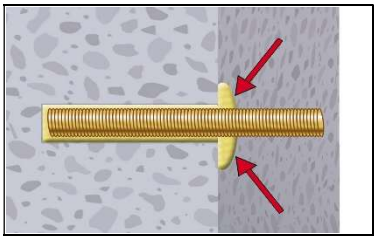
6. Starting at bottom of the hole and fill the hole up to approximately 2/3 with adhesive (If necessary, a mixer nozzle extension shall be used.)
Slowly withdraw of the static mixing nozzle avoid creating air pockets
Observe the temperature related working time t_{work} (Annex B 3).



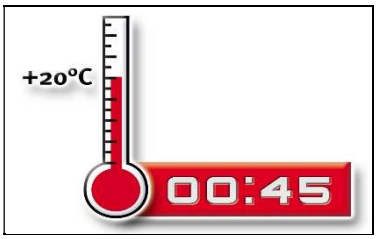
7. Insert the anchor rod while turning slightly up to the embedment mark.

VJ Technology Injection system E410+, EC410+ for concrete	
Intended use Installation instructions (continuation)	**Annex B 5**

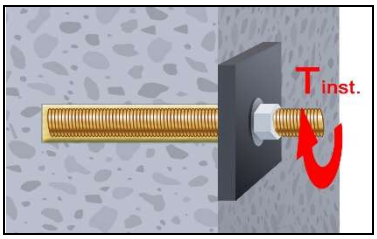
Installation instructions (continuation)



8. Annular gap between anchor rod and base material must be completely filled with mortar. In case of push through installation the annular gap in the fixture must be filled with mortar also.
Otherwise, the installation must be repeated starting from step 6 before the maximum working time t_{work} has expired.



9. Temperature related curing time t_{cure} (Annex B 3) must be observed.
Do not move or load the fastener during curing time.



10. Install the fixture by using a calibrated torque wrench. Observe maximum installation torque (Table B1).

VJ Technology Injection system E410+, EC410+ for concrete	
Intended use Installation instructions (continuation)	**Annex B 6**

Table C1: Characteristic values for steel tension resistance and steel shear resistance of threaded rods

Size				**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Cross section area		A_s	[mm²]	36,6	58	84,3	157	245	353
Characteristic tension resistance, Steel failure [1)]									
Steel, Property class 4.6 and 4.8		$N_{Rk,s}$	[kN]	15 (13)	23 (21)	34	63	98	141
Steel, Property class 5.6 and 5.8		$N_{Rk,s}$	[kN]	18 (17)	29 (27)	42	78	122	176
Steel, Property class 8.8		$N_{Rk,s}$	[kN]	29 (27)	46 (43)	67	125	196	282
Stainless steel A2, A4 and HCR, class 50		$N_{Rk,s}$	[kN]	18	29	42	79	123	177
Stainless steel A2, A4 and HCR, class 70		$N_{Rk,s}$	[kN]	26	41	59	110	171	247
Stainless steel A4 and HCR, class 80		$N_{Rk,s}$	[kN]	29	46	67	126	196	282
Characteristic tension resistance, Partial safety factor [2)]									
Steel, Property class 4.6 and 5.6		$\gamma_{Ms,N}$	[-]	2,0					
Steel, Property class 4.8, 5.8 and 8.8		$\gamma_{Ms,N}$	[-]	1,5					
Stainless steel A2, A4 and HCR, class 50		$\gamma_{Ms,N}$	[-]	2,86					
Stainless steel A2, A4 and HCR, class 70		$\gamma_{Ms,N}$	[-]	1,87					
Stainless steel A4 and HCR, class 80		$\gamma_{Ms,N}$	[-]	1,6					
Characteristic shear resistance, Steel failure [1)]									
Without lever arm	Steel, Property class 4.6 and 4.8	$V^0_{Rk,s}$	[kN]	9 (8)	14 (13)	20	38	59	85
	Steel, Property class 5.6 and 5.8	$V^0_{Rk,s}$	[kN]	11 (10)	17 (16)	25	47	74	106
	Steel, Property class 8.8	$V^0_{Rk,s}$	[kN]	15 (13)	23 (21)	34	63	98	141
	Stainless steel A2, A4 and HCR, class 50	$V^0_{Rk,s}$	[kN]	9	15	21	39	61	88
	Stainless steel A2, A4 and HCR, class 70	$V^0_{Rk,s}$	[kN]	13	20	30	55	86	124
	Stainless steel A4 and HCR, class 80	$V^0_{Rk,s}$	[kN]	15	23	34	63	98	141
With lever arm	Steel, Property class 4.6 and 4.8	$M^0_{Rk,s}$	[Nm]	15 (13)	30 (27)	52	133	260	449
	Steel, Property class 5.6 and 5.8	$M^0_{Rk,s}$	[Nm]	19 (16)	37 (33)	65	166	324	560
	Steel, Property class 8.8	$M^0_{Rk,s}$	[Nm]	30 (26)	60 (53)	105	266	519	896
	Stainless steel A2, A4 and HCR, class 50	$M^0_{Rk,s}$	[Nm]	19	37	66	167	325	561
	Stainless steel A2, A4 and HCR, class 70	$M^0_{Rk,s}$	[Nm]	26	52	92	232	454	784
	Stainless steel A4 and HCR, class 80	$M^0_{Rk,s}$	[Nm]	30	59	105	266	519	896
Characteristic shear resistance, Partial safety factor [2)]									
Steel, Property class 4.6 and 5.6		$\gamma_{Ms,V}$	[-]	1,67					
Steel, Property class 4.8, 5.8 and 8.8		$\gamma_{Ms,V}$	[-]	1,25					
Stainless steel A2, A4 and HCR, class 50 50		$\gamma_{Ms,V}$	[-]	2,38					
Stainless steel A2, A4 and HCR, class 50 70		$\gamma_{Ms,V}$	[-]	1,56					
Stainless steel A4 and HCR, class 80		$\gamma_{Ms,V}$	[-]	1,33					

1) Values are only valid for the given stress area A_s. Values in brackets are valid for undersized threaded rods with smaller stress area A_s for hot-dip galvanised threaded rods according to EN ISO 10684:2004+AC:2009.

2) In absence of national regulation

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Performances
Characteristic values for steel tension resistance and steel shear resistance of threaded rods

Annex C 1

Table C2: Characteristic values of tension loads under static and quasi-static action

Anchor size				**All anchors types and sizes**
Concrete cone failure				
Uncracked concrete		$k_{ucr,N}$	[-]	11,0
Edge distance		$c_{cr,N}$	[mm]	1,5 h_{ef}
Axial distance		$s_{cr,N}$	[mm]	2 $c_{cr,N}$
Splitting				
Edge distance	$h/h_{ef} \geq 2,0$	$c_{cr,sp}$	[mm]	1,0 h_{ef}
	$2,0 > h/h_{ef} > 1,3$			$2 \cdot h_{ef} \left(2,5 - \frac{h}{h_{ef}} \right)$
	$h/h_{ef} \leq 1,3$			2,4 h_{ef}
Axial distance		$s_{cr,sp}$	[mm]	2 $c_{cr,sp}$

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Performances
Characteristic values of tension loads under static and quasi-static action

Annex C 2

Table C3: Characteristic values of tension loads under static and quasi-static action

Anchor size threaded rod					M8	M10	M12	M16	M20	M24
Steel failure										
Characteristic tension resistance			$N_{Rk,s}$	[kN]	$A_s \cdot f_{uk}$ (or see Table C1)					
Partial factor			$\gamma_{Ms,N}$	[-]	See Table C1					
Combined pull-out and concrete failure										
Characteristic bond resistance in uncracked concrete C20/25										
Temperature range	I:	40°C/24°C	Dry and wet concrete	$\tau_{Rk,ucr}$ [N/mm²]	8,5	8,0	8,0	8,0	8,0	8,0
	II:	80°C/50°C			6,5	6,0	6,0	6,0	6,0	6,0
	I:	40°C/24°C	Flooded bore hole		8,5	8,0	8,0	8,0	8,0	8,0
	II:	80°C/50°C			6,5	6,0	6,0	6,0	6,0	6,0
Increasing factor for concrete				ψ_c [-]	$(f_{ck} / 20)^{0,2}$					
Characteristic bond resistance depending on the concrete strength class				$\tau_{Rk,ucr}$ =	$\psi_c \cdot \tau_{Rk,ucr,(C20/25)}$					
Temperature range I: 40°C/24°C			Factor for influence of sustained load for a working life 50 years	ψ^0_{sus} [-]	0,60					
Temperature range II: 80°C/50°C					0,71					
Concrete cone failure										
Relevant parameter					See Table C2					
Splitting										
Relevant parameter					See Table C2					
Installation factor										
Dry and wet concrete				γ_{inst} [-]	1,2					
Flooded bore hole					1,2					

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Performances
Characteristic values of tension loads under static and quasi-static action

Annex C 3

Table C4: Characteristic values of shear loads under static and quasi-static action

Anchor size threaded rod			M8	M10	M12	M16	M20	M24
Steel failure without lever arm								
Characteristic shear resistance Steel, strength class 4.6 and 4.8	$V^0_{Rk,s}$	[kN]	$0,6 \cdot A_s \cdot f_{uk}$ (or see Table C1)					
Characteristic shear resistance Steel, strength class 5.6, 5.8 and 8.8 Stainless Steel A2, A4 and HCR, all classes	$V^0_{Rk,s}$	[kN]	$0,5 \cdot A_s \cdot f_{uk}$ (or see Table C1)					
Partial factor	$\gamma_{Ms,V}$	[-]	See Table C1					
Ductility factor	k_7	[-]	1,0					
Steel failure with lever arm								
Characteristic bending moment	$M^0_{Rk,s}$	[Nm]	$1,2 \cdot W_{el} \cdot f_{uk}$ (or see Table C1)					
Elastic section modulus	W_{el}	[mm³]	31	62	109	277	541	935
Partial factor	$\gamma_{Ms,V}$	[-]	See Table C1					
Concrete pry-out failure								
Factor	k_8	[-]	2,0					
Installation factor	γ_{inst}	[-]	1,0					
Concrete edge failure								
Effective length of fastener	l_f	[mm]	$\min(h_{ef}; 12 \cdot d_{nom})$					
Outside diameter of fastener	d_{nom}	[mm]	8	10	12	16	20	24
Installation factor	γ_{inst}	[-]	1,0					

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Performances
Characteristic values of shear loads under static and quasi-static action

Annex C 4

Table C5: Displacement under tension load[1)]

Anchor size threaded rod			M8	M10	M12	M16	M20	M24
Uncracked concrete C20/25 under static and quasi-static action								
Temperature range I: 40°C/24°C	δ_{N0}-factor	[mm/(N/mm²)]	0,03	0,04	0,05	0,07	0,08	0,10
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,07	0,08	0,08	0,08	0,08	0,10
Temperature range II: 80°C/50°C	δ_{N0}-factor	[mm/(N/mm²)]	0,02	0,03	0,03	0,04	0,04	0,05
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,15	0,17	0,17	0,17	0,17	0,17

1) Calculation of the displacement
$\delta_{N0} = \delta_{N0}\text{-factor} \cdot \tau$; τ: action bond stress for tension
$\delta_{N\infty} = \delta_{N\infty}\text{-factor} \cdot \tau$;

Table C6: Displacement under shear load[1)]

Anchor size threaded rod			M8	M10	M12	M16	M20	M24
For uncracked concrete C20/25								
All temperature ranges	δ_{V0}-factor	[mm/kN]	0,02	0,02	0,01	0,01	0,01	0,01
	$\delta_{V\infty}$-factor	[mm/kN]	0,03	0,02	0,02	0,01	0,01	0,01

1) Calculation of the displacement
$\delta_{V0} = \delta_{V0}\text{-factor} \cdot V$; V: action shear load
$\delta_{V\infty} = \delta_{V\infty}\text{-factor} \cdot V$;

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Performances
Displacements under static and quasi-static action

Annex C 5