INSTYTUT TECHNIKI BUDOWLANEJ

Designated according to Article 29 of Regulation (EU) No 305/2011 and member of EOTA (European Organisation for Technical Assessment)

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European Technical Assessment

ETA-25/1018 of 12/11/2025

General Part

Technical Assessment Body issuing the European Technical Assessment	Instytut Techniki Budowlanej
Trade name of the construction product	EVOLUTION I / EVO I / EVO 1 / EVOLUTION 1 / EV 1, EVOLUTION I (S) / EVO I (S) / EVO 1 (S) / EVOLUTION 1 (S) / EV 1 (S), EVOLUTION I (W) / EVO I (W) / EVO 1 (W) / EVOLUTION 1 (W) / EV 1 (W) and EVO I FB50 / EV 1 FB50, EVO I FB50 (S) / EV 1 FB50 (S), EVO I FB50 (W) / EV 1 FB50 (W)
Product family to which the construction product belongs	Metal injection anchors for use in masonry
Manufacturer	SELENA FM S.A. ul. Legnicka 48A 54-202 Wrocław Poland
Manufacturing plant	Manufacturing Plant No. 3
This European Technical Assessment contains	27 pages including 3 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	European Assessment Document (EAD) 330076-01-0604 "Metal injection anchors for use in masonry"

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Specific Part

1 Technical description of the product

The EVOLUTION I / EVO I / EVO 1 / EVOLUTION 1 / EV 1, EVOLUTION I (S) / EVO I (S) / EVO 1 (S) / EVOLUTION 1 (S) / EV 1 (S), EVOLUTION I (W) / EVO I (W) / EVO 1 (W) / EVOLUTION 1 (W) / EV 1 (W) and EVO I FB50 / EV 1 FB50, EVO I FB50 (S) / EV 1 FB50 (S), EVO I FB50 (W) / EV 1 FB50 (W) are bonded anchor (injection type) consisting of an injection mortar cartridge, a perforated sleeve and an anchor rod with hexagon nut and washer. The steel elements are made of galvanized carbon steel, stainless steel or high corrosion resistant stainless steel.

The anchor rod is placed into a drilled hole previously cleaned and filled with injection mortar and is anchored via the bond between steel element, injection mortar and masonry.

The description of the products is given in Annex A.

2 Specification of the intended use in accordance with the applicable European Assessment Document (EAD)

The performances given in clause 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 or Technical Assessment Body, 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 its assessment

3.1 Performance of the product

3.1.1. Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Characteristic resistance for static and quasi-static loading	Annex C1 – C10
Characteristic resistance and displacements for seismic loading	No performance assessed

3.1.2. Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	No performance assessed
Resistance to fire under tension and shear loading with and without lever arm, minimum edge distances and spacing	No performance assessed

3.1.3. Hygiene, health and the environment (BWR 3)

Essential characteristic	Performance
Content, emission and/or release of dangerous substances	No performance assessed

3.2 Methods used for the assessment

The assessment has been made in accordance with EAD 330076-01-0604.

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

According to Decision 97/177/EC of the European Commission the system 1 of assessment and verification of constancy of performance (see Annex V to the regulation (EU) No 305/2011) applies.

5 Technical details necessary for the implementation of the AVCP system, as provided in the applicable European Assessment Document (EAD)

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited in Instytut Techniki Budowlanej.

For the type testing the results of the tests performed as part of the assessment for the European Technical Assessment shall be used unless there are changes in the production line or plant. In such cases the necessary type testing has to be agreed between Instytut Techniki Budowlanej and the notified body.

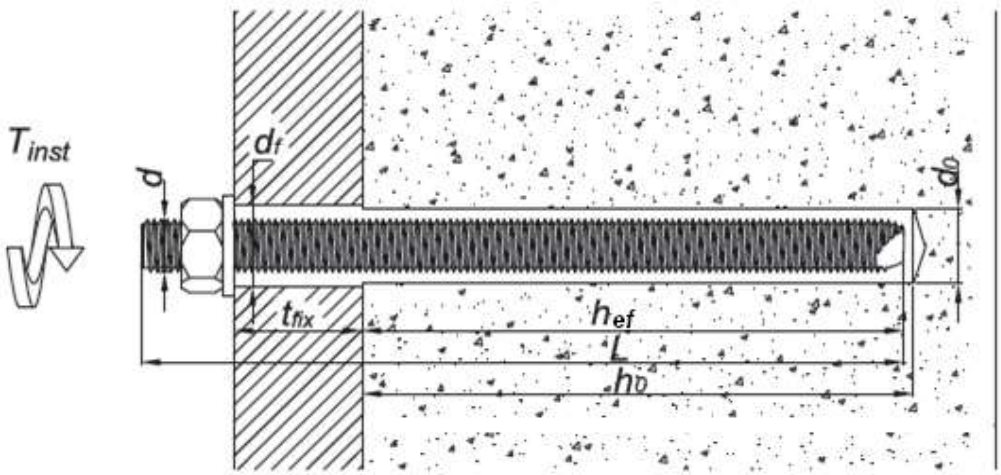
Issued in Warsaw on 12/11/2025 by Instytut Techniki Budowlanej



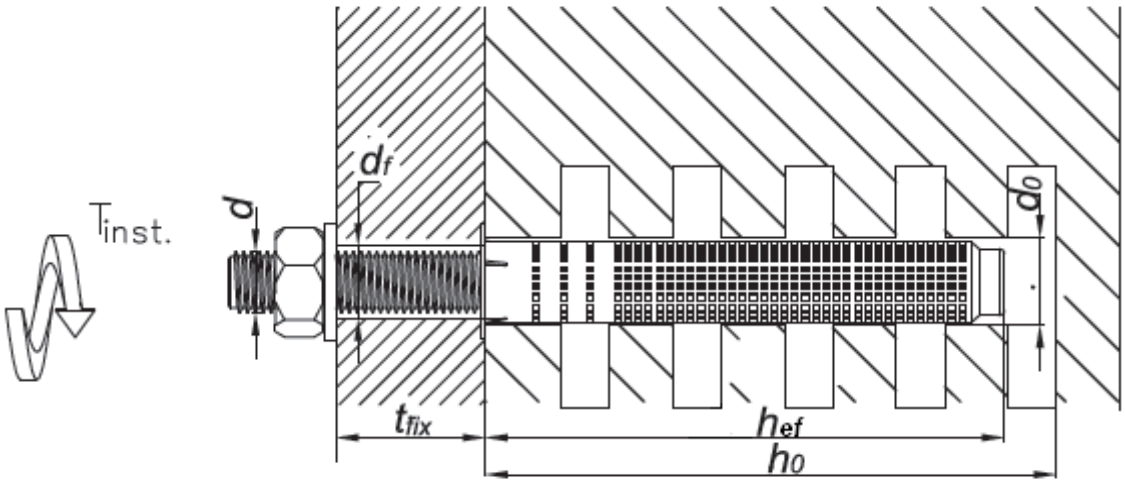
Anna Panek, MSc

Deputy Director of ITB

Anchor rod without perforated sleeve – installation in solid masonry

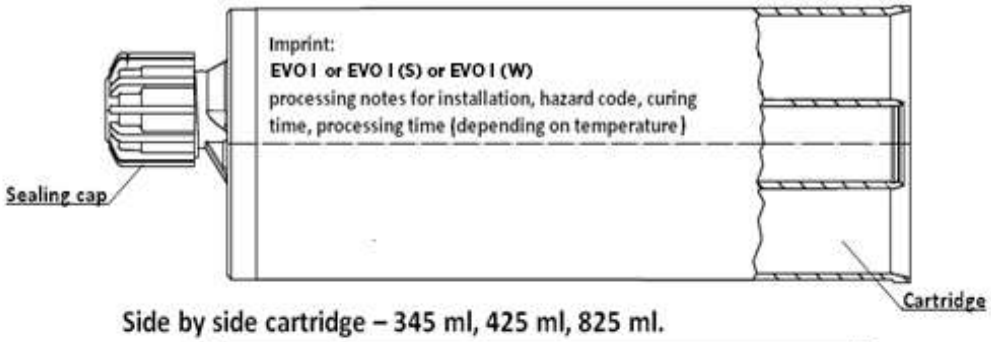


Anchor rod with perforated sleeve – installation in perforated masonry

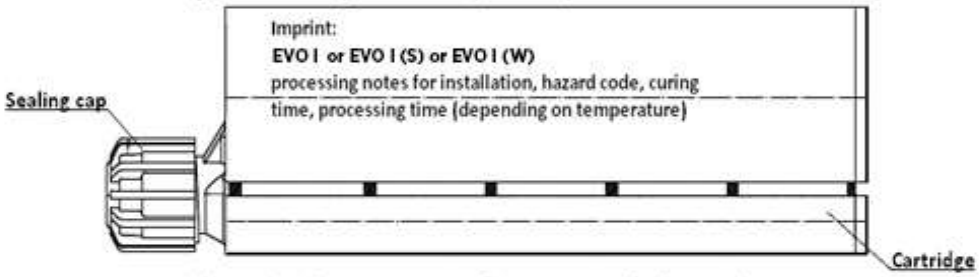


EVOLUTION I / EVO I / EVO 1 / EVOLUTION 1 / EV 1, EVOLUTION I (S) / EVO I (S) / EVO 1 (S) / EVOLUTION 1 (S) / EV 1 (S), EVOLUTION I (W) / EVO I (W) / EVO 1 (W) / EVOLUTION 1 (W) / EV 1 (W) and EVO I FB50 / EV 1 FB50, EVO I FB50 (S) / EV 1 FB50 (S), EVO I FB50 (W) / EV 1 FB50 (W)	**Annex A1** of European Technical Assessment ETA-25/1018
Product description Installation conditions	

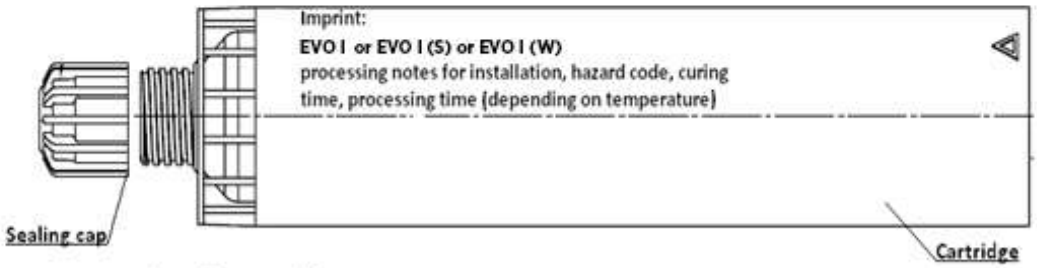
Coaxial cartridge –
150 ml, 280 ml, 300 ml, 310 ml, 330 ml, 380 ml, 400 ml, 410 ml, 420 ml.



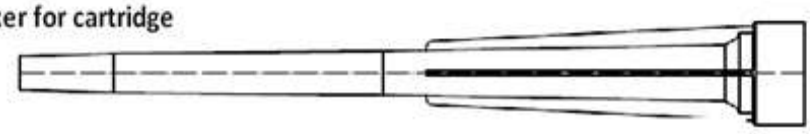
Side by side cartridge – 345 ml, 425 ml, 825 ml.



Cartridge a single component for two part foil capsules –
150 ml, 175 ml, 280ml, 300 ml, 310 ml, 380 ml, 400 ml, 550 ml, 600 ml.



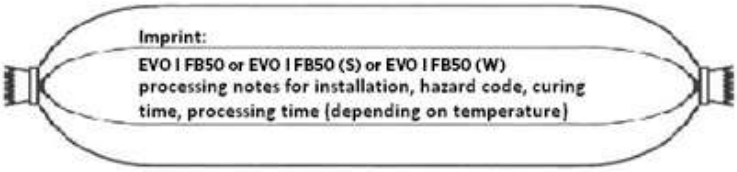
Mixer for cartridge



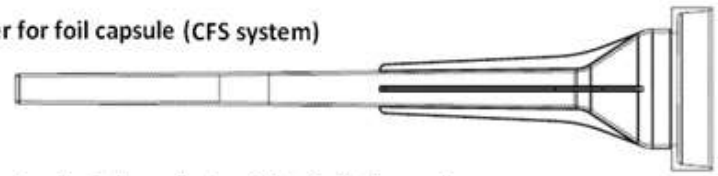
EVOLUTION I / EVO I / EVO 1 / EVOLUTION 1 / EV 1, EVOLUTION I (S) / EVO I (S) / EVO 1 (S) / EVOLUTION 1 (S) / EV 1 (S), EVOLUTION I (W) / EVO I (W) / EVO 1 (W) / EVOLUTION 1 (W) / EV 1 (W) and EVO I FB50 / EV 1 FB50, EVO I FB50 (S) / EV 1 FB50 (S), EVO I FB50 (W) / EV 1 FB50 (W)	**Annex A2** of European Technical Assessment ETA-25/1018
Product description Cartridge type and sizes (1)	

Foil capsule (CFS system) –

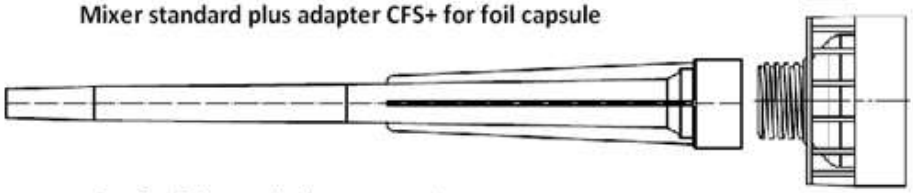
150 ml, 175 ml, 280ml, 300 ml, 310 ml, 380 ml, 400 ml, 550 ml, 600 ml.



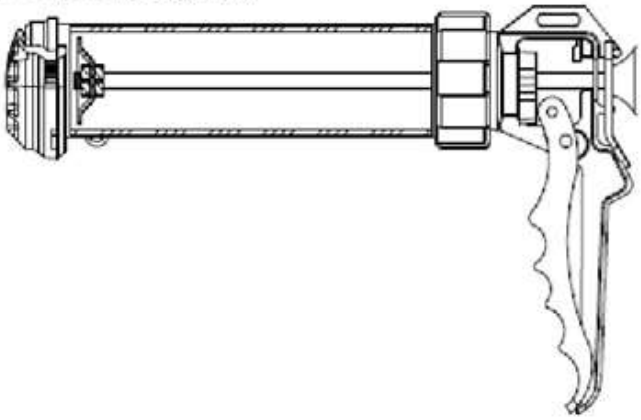
Mixer for foil capsule (CFS system)



Mixer standard plus adapter CFS+ for foil capsule

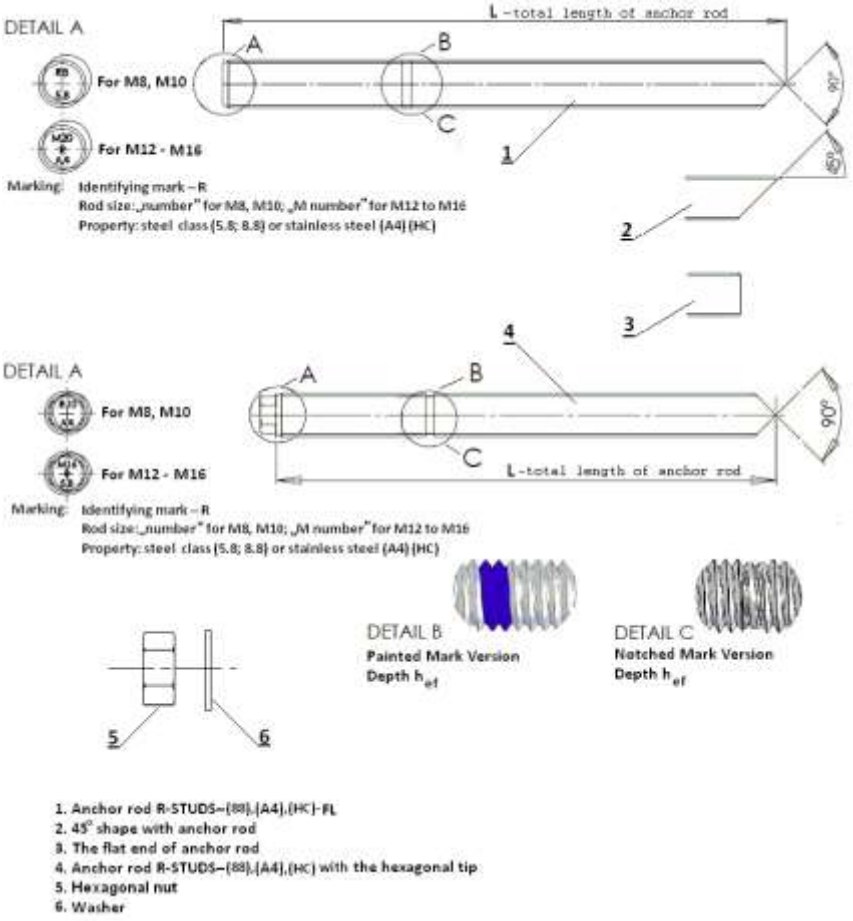


Gun for foil capsule (CFS system)



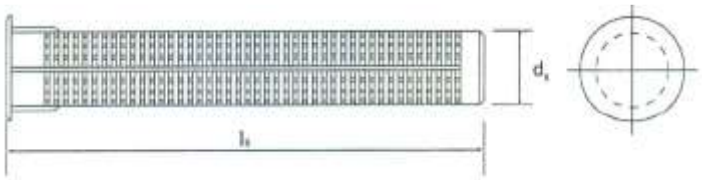
EVOLUTION I / EVO I / EVO 1 / EVOLUTION 1 / EV 1, EVOLUTION I (S) / EVO I (S) / EVO 1 (S) / EVOLUTION 1 (S) / EV 1 (S), EVOLUTION I (W) / EVO I (W) / EVO 1 (W) / EVOLUTION 1 (W) / EV 1 (W) and EVO I FB50 / EV 1 FB50, EVO I FB50 (S) / EV 1 FB50 (S), EVO I FB50 (W) / EV 1 FB50 (W)	**Annex A3** of European Technical Assessment ETA-25/1018
Product description Cartridge type and sizes (2)	

Threaded anchor rods



1. Anchor rod R-STUDS–(88).(A4).(HC)-FL
2. 45° shape with anchor rod
3. The flat end of anchor rod
4. Anchor rod R-STUDS–(88).(A4).(HC) with the hexagonal tip
5. Hexagonal nut
6. Washer

Perforated plastic or metal sleeve



Size of rod			M8	M8	M10	M10	M12	M12	M16
Size of sleeve	d_s x l_s	[mm]	12 x 50	12 x 80	16 x 85	16 x 130	16 x 85	16 x 130	20 x 85

Table A1: Threaded rods

Part	Designation		
	Steel, zinc plated	**Stainless steel (A4)**	**High corrosion resistance stainless steel (HCR)**
Anchor rod	Steel, property class 5.8 to 12.9 acc. to EN ISO 898-1 electroplated ≥ 5 µm acc. to EN ISO 4042 or hot-dip galvanized ≥ 45 µm acc. to EN ISO 10684	Material 1.4401, 1.4404, 1.4571 acc. to EN 10088; property class 70 and 80 (A4-70 and A4-80) acc. to EN ISO 3506	Material 1.4529, 1.4565, 1.4547 acc. to EN 10088; property class 70 acc. to EN ISO 3506
Hexagon nut	Steel, property class 5 to 12 acc. to EN ISO 898-2; electroplated ≥ 5 µm acc. to EN ISO 4042 or hot-dip galvanized ≥ 45 µm acc. to EN ISO 10684	Material 1.4401, 1.4404, 1.4571 acc. to EN 10088; property class 70 and 80 (A4-70 and A4-80) acc. to EN ISO 3506	Material 1.4529, 1.4565, 1.4547 acc. to EN 10088; property class 70 acc. to EN ISO 3506
Washer	Steel, acc. to EN ISO 7089; electroplated ≥ 5 µm acc. to EN ISO 4042 or hot-dip galvanized ≥ 45 µm acc. to EN ISO 10684	Material 1.4401, 1.4404, 1.4571 acc. to EN 10088; corresponding to anchor rod material	Material 1.4529, 1.4565, 1.4547 acc. to EN 10088; corresponding to anchor rod material

Commercial standard threaded rods (in the case of rods made of galvanized steel – standard rods with property class ≤ 8.8 only), with:

- material and mechanical properties according to Table A1,
- confirmation of material and mechanical properties by inspection certificate 3.1 according to EN-10204:2004; the documents shall be stored,
- marking of the threaded rod with the embedment depth.

Note: Commercial standard threaded rods made of galvanized steel with property class above 8.8 are not permitted in some Member States.

Table A2: Injection mortars

Product	**Composition**
EVOLUTION I / EVO I / EVO 1 / EVOLUTION 1 / EV 1 **EVOLUTION I (S) / EVO I (S) / EVO 1 (S) / EVOLUTION 1 (S) / EV 1 (S)** **EVOLUTION I (W) / EVO I (W) / EVO 1 (W) / EVOLUTION 1 (W) / EV 1 (W)** **EVO I FB50 / EV 1 FB50** **EVO I FB50 (S) / EV 1 FB50 (S)** **EVO I FB50 (W) / EV 1 FB50 (W)**	Bonding agent: polyester styrene free resin Hardener: dibenzoyl peroxide Additive: quartz sand (filler) Supplied in three colors: standard, grey (G) and stone (ST)

Specification of intended use

Anchorages subject to:

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

Base materials:

- Solid clay bricks (base material group b), according to Annex B2.
- Autoclaved aerated concrete blocks AAC (base material group d), according to Annex B2.
- Solid silicate bricks (base material group b), according to Annex B2.
- Silicate hollow blocks (base material group c), according to Annex B2.
- Perforated ceramic blocks (base material group c), according to Annexes B2 and B3.
- Lightweight concrete hollow blocks (base material group c), according to Annex B3.
- Mortar strength class M2,5 at minimum according to EN 998-2.
- For smaller brick size or smaller compressive strength in solid masonry or other bricks and blocks in hollow or perforated masonry the characteristic resistance of the anchor may be determined by job site tests according to EOTA Technical Report TR 053 under consideration of the β-factor according to Table C10.

Temperature range:

- Ta: -40°C to +40°C (max. short-term temperature +40°C and max. long-term temperature +24°C).
- Tb: -40°C to +80°C (max. short-term temperature +80°C and max. long-term temperature +50°C).

Use conditions (Environmental conditions):

- Condition w/w: installation in dry or wet base material and use in structures subject to dry or wet environmental conditions.
- Structures subject to dry internal conditions: all materials.
- For all other conditions according to EN 1993-1-4, Annex A, Table A3 corresponding to corrosion resistance class (CRC):
  - stainless steel A4: CRC III,
  - high corrosion resistance steel (HCR): CRC V.

Design:

- Verifiable calculation notes and drawings are prepared taking account the relevant masonry in the region of the anchorage, the loads to be transmitted and their transmission to the supports of the structure. The position of the anchor is indicated on the design drawings.
- The anchorages are designed in accordance with to the EOTA Technical Report TR 054 under the responsibility of an engineer experienced in anchorages and masonry work.

Installation:

- Hole drilling by rotary drill mode (AAC, hollow and perforated masonry) and hammer drill mode (solid masonry)
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.

Table B1: Base materials

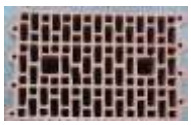
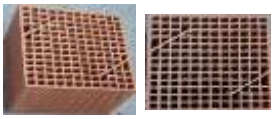
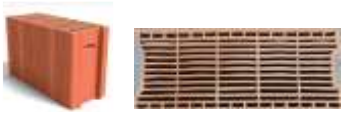
Type and dimensions	Standard
Brick No. 1. Solid clay bricks: 240 x 115 x 71 mm (e.g. Wienerberger Mz 20/2.0) $f_b \geq 20$ N/mm²; $\rho_m \geq 2{,}0$ kg/dm³ 	EN 771-1
Brick No. 2. Autoclaved aerated concrete blocks AAC 7: 599 x 199 x 240 mm $f_b \geq 6$ N/mm²; $\rho_m \geq 0{,}65$ kg/dm³ 	EN 771-4
Brick No. 3. Solid silicate bricks: 240 x 115 x 71 mm (e.g. KS NF 20/2.0) $f_b \geq 20$ N/mm²; $\rho_m \geq 2{,}0$ kg/dm³ 	EN 771-2
Brick No. 4. Silicate hollow blocks: 248 x 240 x 238 mm (e.g. KS Ratio Block 8 DF 12/1.4) $f_b \geq 12$ N/mm²; $\rho_m \geq 1{,}4$ kg/dm³; outer web thickness ≥ 17 mm  	EN 771-2
Brick No. 5. Perforated ceramic blocks: 373 x 240 x 249 mm (e.g. Poroton Hlz 12/0.9 DF) $f_b \geq 12$ N/mm²; $\rho_m \geq 0{,}9$ kg/dm³; outer web thickness ≥ 9 mm  	EN 771-1
Brick No. 6. Perforated ceramic blocks: 373 x 238 x 250 mm (e.g. Wienerberger Porotherm 25 P+W) $f_b \geq 15$ N/mm²; $\rho_m \geq 0{,}8$ kg/dm³; outer web thickness ≥ 10 mm  	EN 771-1
Brick No. 7. Perforated ceramic blocks: 380 x 250 x 238 mm (e.g. Leier Thermopor 38 P+W) $f_b \geq 10$ N/mm²; $\rho_m \geq 0{,}7$ kg/dm³; outer web thickness ≥ 9 mm 	EN 771-1

Table B2: Base materials

Type and dimensions	Standard
Brick No. 8. Perforated ceramic blocks: 375 x 250 x 238 mm (e.g. Kozłowice MEGA-MAX 250/238 P+W) $f_b \geq 15$ N/mm^2; $\rho_m \geq 0{,}8$ kg/dm^3; outer web thickness ≥ 17 mm 	EN 771-1
Brick No. 9. Perforated ceramic blocks: 300 x 375 x 212 mm (e.g. LS Tableau Mono Rect[1]) $f_b \geq 6$ N/mm^2; $\rho_m \geq 0{,}93$ kg/dm^3 	EN 771-1
Brick No. 10. Perforated ceramic blocks: 500 x 200 x 314 mm (e.g. LS Tableau Rect[1]) $f_b \geq 6$ N/mm^2; $\rho_m \geq 0{,}75$ kg/dm^3 	EN 771-1
Brick No. 11. Perforated ceramic blocks: 300 x 300 x 212 mm (e.g. LS Monomur 30[2]) $f_b \geq 6$ N/mm^2; $\rho_m \geq 0{,}865$ kg/dm^3 	EN 771-1
Brick No. 12. Perforated ceramic blocks: 500 x 200 x 314 mm (e.g. SM BGV Thermo[3]) $f_b \geq 6$ N/mm^2; $\rho_m \geq 0{,}659$ kg/dm^3 	EN 771-1
Brick No. 13. Perforated ceramic blocks: 500 x 200 x 314 mm (e.g. SM BGV Thermo Plus[3]) $f_b \geq 6$ N/mm^2; $\rho_m \geq 0{,}755$ kg/dm^3 	EN 771-1
Brick No. 14. Lightweight concrete hollow blocks Hbl: 245 x 245 x 300 mm $f_b \geq 2$ N/mm^2; $\rho_m \geq 0{,}8$ kg/dm^3; outer web thickness ≥ 25 mm 	EN 771-3

[1] The value of N_{Rk} applies only for outer web thickness ≥ 9 mm; otherwise the characteristic resistance shall be determined by job site pull-out tests
[2] According to DTA 16/15-692
[3] According to DTA 16/14-697

Table B3: Installation parameters of anchor rods in solid masonry and AAC (without perforated sleeves)

Size of rod				M8	M10	M12	M16
Nominal diameter		d_{nom}	[mm]	8	10	12	16
Nominal drill hole diameter		d_0	[mm]	10	12	14	18
Diameter of clearance hole of the fixture		$d_f \leq$	[mm]	9	12	14	18
Drill hole depth		h_0	[mm]	85	90	100	110
Effective embedment depth		h_{ef}	[mm]	80	85	95	105
Maximum torque moment	solid masonry	max. T_{inst}	[Nm]	5	8	10	15
	AAC			3	4	6	10
Minimum spacing and edge distance							
Minimum spacing		s_{min}	[mm]	50	50	50	54
Minimum edge distance		c_{min}	[mm]	50	50	50	54

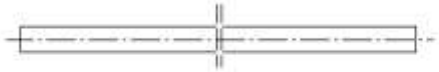
Table B4: Installation parameters of anchor rods with perforated sleeves in hollow or perforated masonry

Size of rod			M8	M8	M10	M10	M12	M12	M16
Size of sleeve	$d_s x l_s$	[mm]	12 x 50	12 x 80	16 x 85	16 x 130	16 x 85	16 x 130	20 x 85
Nominal diameter	d_{nom}	[mm]	8	8	10	10	12	12	16
Nominal drill hole diameter	d_0	[mm]	12	12	16	16	16	16	20
Diameter of clearance hole of the fixture	$d_f \leq$	[mm]	9	9	12	12	14	14	18
Drill hole depth	h_0	[mm]	55	85	90	130	90	130	90
Effective embedment depth	h_{ef}	[mm]	50	80	85	125	85	125	85
Maximum torque moment	max. T_{inst}	[Nm]	3	3	4	4	6	6	10
Minimum spacing and edge distance									
Minimum spacing	s_{min}	[mm]	100	100	100	100	100	100	120
Minimum edge distance	c_{min}	[mm]	100	100	100	100	100	100	120

Table B5: Maximum processing time and minimum curing time

Mortar temperature	Base material temperature	Maximum processing time [min.]			Minimum curing time [min.]		
		EVOLUTION I / EVO I / EVO 1 / EVOLUTION 1 / EV 1 and EVO I FB50 / EV 1 FB50	EVOLUTION I (S) / EVO I (S) / EVO 1 (S) / EVOLUTION 1 (S) / EV 1 (S) and EVO I FB50 (S) / EV 1 FB50 (S)	EVOLUTION I (W) / EVO I (W) / EVO 1 (W) / EVOLUTION 1 (W) / EV 1 (W) and EVO I FB50 (W) / EV 1 FB50 (W)	EVOLUTION I / EVO I / EVO 1 / EVOLUTION 1 / EV 1 and EVO I FB50 / EV 1 FB50	EVOLUTION I (S) / EVO I (S) / EVO 1 (S) / EVOLUTION 1 (S) / EV 1 (S) and EVO I FB50 (S) / EV 1 FB50 (S)	EVOLUTION I (W) / EVO I (W) / EVO 1 (W) / EVOLUTION 1 (W) / EV 1 (W) and EVO I FB50 (W) / EV 1 FB50 (W)
5°C	-20°C	-	-	45	-	-	1440
5°C	-10°C	-	-	20	-	-	480
5°C	0°C	45	120	7	240	1080	120
5°C	5°C	25	60	5	120	720	60
10°C	10°C	15	45	2	90	480	45
15°C	15°C	9	25	1,5	60	360	30
20°C	20°C	5	15	1	45	240	15
25°C	30°C	2	7	-	30	90	-
25°C	35°C	-	6	-	-	60	-
25°C	40°C	-	5	-	-	45	-

Additional mixer extension



*Variable length from 300mm up to 1000mm.

Manual blower pump



Steel brush

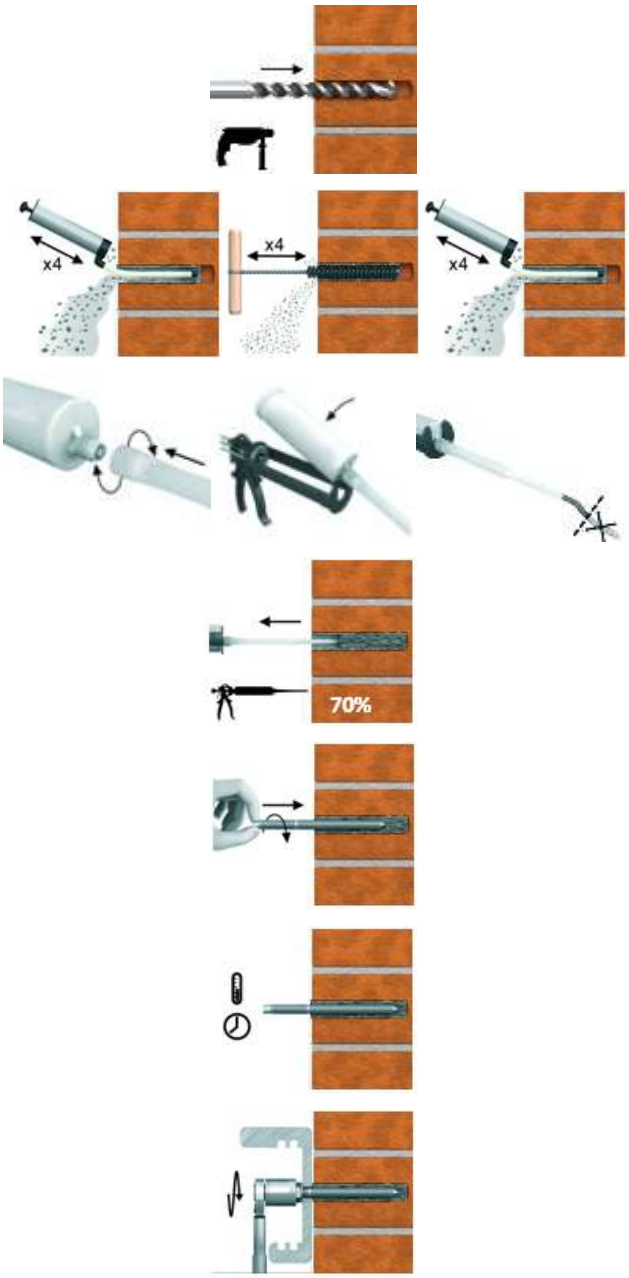


Brush diameter for solid masonry

Size of rod			M8	M10	M12	M16
Brush diameter	d_b	[mm]	12	14	16	20

Brush diameter for hollow or perforated masonry

Size of rod			M8	M10	M12	M16
Brush diameter	d_b	[mm]	12	16	16	20

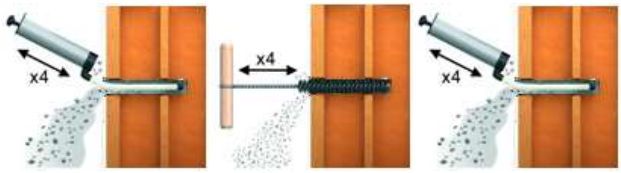


1. Drill the hole to the required diameter and depth (hammer drilling for solid masonry and rotary drilling for AAC).
2. Clean the hole with brush and hand pump: at least four blowing operations then four brushing operations followed again by four blowing operations.
3. Insert cartridge into gun and attach nozzle. Dispense to waste until an even color is obtained.
4. Insert the mixing nozzle to the far end the hole and inject the mortar, slowly withdrawing the nozzle as the hole is filled to 70% of it's depth.
5. Immediately insert the stud, slowly and with slight twisting motion. Remove any excess mortar around the hole before it sets.
6. Leave the fixing undisturbed until the minimum curing time elapses.
7. Attach the fixture and tighten the nut (max. torque moment acc. to Table B3).

EVOLUTION I / EVO I / EVO 1 / EVOLUTION 1 / EV 1, EVOLUTION I (S) / EVO I (S) / EVO 1 (S) / EVOLUTION 1 (S) / EV 1 (S), EVOLUTION I (W) / EVO I (W) / EVO 1 (W) / EVOLUTION 1 (W) / EV 1 (W) and EVO I FB50 / EV 1 FB50, EVO I FB50 (S) / EV 1 FB50 (S), EVO I FB50 (W) / EV 1 FB50 (W)	**Annex B7** of European Technical Assessment ETA-25/1018
Intended use Installation instruction – solid masonry and AAC	



1. Drill the hole to the required diameter and depth using a rotary machine.



2. Clean the hole with brush and hand pump: at least four blowing operations then two brushing operations followed again by four blowing operations.



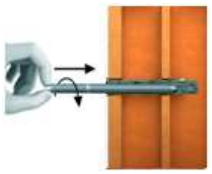
3. Introduce the perforated sleeve of suitable dimension.



4. Insert cartridge into gun and attach nozzle. Dispense to waste until an even color is obtained.



5. Insert the nozzle to the end of the sleeve and inject the mortar so long till the sleeve will fill into 100% of depth.



6. Immediately insert the stud, slowly and with slight twisting motion. Remove any excess mortar around the hole before it sets.



7. Leave the fixing undisturbed until minimum curing time elapses.



8. Attach the fixture and tighten the nut (max. torque moment acc. to Table B4).

EVOLUTION I / EVO I / EVO 1 / EVOLUTION 1 / EV 1, EVOLUTION I (S) / EVO I (S) / EVO 1 (S) / EVOLUTION 1 (S) / EV 1 (S), EVOLUTION I (W) / EVO I (W) / EVO 1 (W) / EVOLUTION 1 (W) / EV 1 (W) and EVO I FB50 / EV 1 FB50, EVO I FB50 (S) / EV 1 FB50 (S), EVO I FB50 (W) / EV 1 FB50 (W)	**Annex B8** of European Technical Assessment ETA-25/1018
Intended use Installation instruction – hollow and perforated masonry	

Table C1: Characteristic resistance under tension and shear loading

Density / Compressive strength	Sleeve	Anchor size	Effective embedment depth	Characteristic resistance	Characteristic resistance
ρ_m / f_b	d_s x l_s	M	h_{ef}	N_{Rk} [1)]	V_{Rk} [2)]
[kg/dm³] / [N/mm²]	[-]	[-]	[mm]	[kN]	[kN]
Brick No. 1					
$\rho_m \geq 2,0$ / $f_b \geq 20$	without	M8	80	6,0	3,5
		M10	85	7,0	5,0
		M12	95	7,0	7,0
		M16	105	7,0	7,0
Brick No. 2					
$\rho_m \geq 0,65$ / $f_b \geq 6$	without	M8	80	1,5	1,5
		M10	85	1,5	1,5
		M12	95	2,0	2,0
		M16	105	2,5	2,5
Brick No. 3					
$\rho_m \geq 2,0$ / $f_b \geq 20$	without	M8	80	5,0	3,5
		M10	85	5,0	5,0
		M12	95	5,0	5,0
		M16	105	5,0	5,0
Brick No. 4					
$\rho_m \geq 1,4$ / $f_b \geq 12$	12 x 50	M8	50	2,0	2,0
	12 x 80	M8	80	2,0	2,0
	16 x 85	M10	85	2,5	2,5
	16 x 125	M10	125	3,5	2,5
	16 x 85	M12	85	2,5	2,5
	16 x 125	M12	125	3,0	2,5
	20 x 85	M16	85	2,5	2,5
Brick No. 5					
$\rho_m \geq 0,9$ / $f_b \geq 12$	12 x 50	M8	50	2,0	2,0
	12 x 80	M8	80	2,0	2,0
	16 x 85	M10	85	3,0	2,5
	16 x 125	M10	125	3,0	2,5
	16 x85	M12	85	3,5	2,5
	16 x 125	M12	125	3,5	2,5
	20 x 85	M16	85	4,0	2,5

Partial safety factor γ_M = 2,0 for AAC (Brick No. 2) and γ_{Ms} = 2,5 for other base materials (in the absence of other national regulation)

[1)] $N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,s}$

[2)] $V_{Rk} = V_{Rk,b} = V_{Rk,c} = V_{Rk,s}$

Table C2: Characteristic resistance under tension and shear loading

Density / Compressive strength	Sleeve	Anchor size	Effective embedment depth	Characteristic resistance	Characteristic resistance
ρ_m / f_b	d_s x l_s	M	h_{ef}	N_{Rk} 1)	V_{Rk} 2)
[kg/dm³] / [N/mm²]	[-]	[-]	[mm]	[kN]	[kN]
Brick No. 6					
$\rho_m \geq 0,8$ / $f_b \geq 15$	12 x 50	M8	50	1,2	1,2
	12 x 80	M8	80	1,5	1,5
	16 x 85	M10	85	2,0	2,0
	16 x 125	M10	125	2,5	2,5
	16 x 85	M12	85	3,0	2,5
	16 x 125	M12	125	3,0	2,5
	20 x 85	M16	85	2,0	2,0
Brick No. 7					
$\rho_m \geq 0,7$ / $f_b \geq 10$	12 x 50	M8	50	1,2	1,2
	12 x 80	M8	80	1,5	1,5
	16 x 85	M10	85	2,0	2,0
	16 x 125	M10	125	2,5	2,5
	16 x 85	M12	85	3,0	2,5
	16 x 125	M12	125	3,0	2,5
	20 x 85	M16	85	2,0	2,0
Brick No. 8					
$\rho_m \geq 0,8$ / $f_b \geq 15$	12 x 50	M8	50	1,5	1,5
	12 x 80	M8	80	2,0	2,0
	16 x 85	M10	85	3,0	2,5
	16 x 125	M10	125	3,0	2,5
	16 x 85	M12	85	3,5	2,5
	16 x 125	M12	125	3,5	2,5
	20 x 85	M16	85	3,5	2,5
Brick No. 9					
$\rho_m \geq 0,93$ / $f_b \geq 6$	12 x 50	M8	50	0,75	0,75
	12 x 80	M8	80	0,75	0,75
	16 x 85	M10	85	1,5	1,5
	16 x 125	M10	125	1,5	1,5
	16 x 85	M12	85	1,5	1,5
	16 x 125	M12	125	1,5	1,5
	20 x 85	M16	85	1,2	1,2

Partial safety factor $\gamma_M = 2,5$ (in the absence of other national regulation)

1) $N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,s}$

2) $V_{Rk} = V_{Rk,b} = V_{Rk,c} = V_{Rk,s}$

Table C3: Characteristic resistance under tension and shear loading

Density / Compressive strength	Sleeve	Anchor size	Effective embedment depth	Characteristic resistance	Characteristic resistance
ρ_m / f_b	d_s x l_s	M	h_{ef}	N_{Rk} 1)	V_{Rk} 2)
[kg/dm³] / [N/mm²]	[-]	[-]	[mm]	[kN]	[kN]
Brick No. 10					
$\rho_m \geq 0,75$ / $f_b \geq 6$	12 x 50	M8	50	1,0	0,9
	12 x 80	M8	80	1,0	1,0
	16 x 85	M10	85	1,5	1,5
	16 x 125	M10	125	1,5	1,5
	16 x 85	M12	85	1,5	1,5
	16 x 125	M12	125	1,5	1,5
	20 x 85	M16	85	1,2	1,2
Brick No. 11					
$\rho_m \geq 0,865$ / $f_b \geq 6$	12 x 50	M8	50	0,75	0,75
	12 x 80	M8	80	0,9	0,9
	16 x 85	M10	85	1,2	1,2
	16 x 125	M10	125	1,2	1,2
	16 x 85	M12	85	1,2	1,2
	16 x 125	M12	125	1,2	1,2
	20 x 85	M16	85	1,2	1,2
Brick No. 12					
$\rho_m \geq 0,659$ / $f_b \geq 6$	12 x 50	M8	50	0,9	0,9
	12 x 80	M8	80	0,9	0,9
	16 x 85	M10	85	1,5	1,5
	16 x 125	M10	125	1,2	1,2
	16 x 85	M12	85	1,5	1,5
	16 x 125	M12	125	1,5	1,5
	20 x 85	M16	85	1,5	1,5
Brick No. 13					
$\rho_m \geq 0,755$ / $f_b \geq 6$	12 x 50	M8	50	1,0	0,9
	12 x 80	M8	80	1,0	1,0
	16 x 85	M10	85	1,0	0,9
	16 x 125	M10	125	1,0	0,9
	16 x 85	M12	85	1,2	1,2
	16 x 125	M12	125	1,2	1,2
	20 x 85	M16	85	1,2	1,2

Partial safety factor $\gamma_M = 2,5$ (in the absence of other national regulation)

1) $N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,s}$

2) $V_{Rk} = V_{Rk,b} = V_{Rk,c} = V_{Rk,s}$

Table C4: Characteristic resistance under tension and shear loading

Density / Compressive strength	Sleeve	Anchor size	Effective embedment depth	Characteristic resistance	Characteristic resistance
ρ_m / f_b	d_s x l_s	M	h_{ef}	N_{Rk} 1)	V_{Rk} 2)
[kg/dm³] / [N/mm²]	[-]	[-]	[mm]	[kN]	[kN]
Brick No. 14					
$\rho_m \geq 0,8$ / $f_b \geq 2$	12 x 50	M8	50	1,0	1,0
	12 x 80	M8	80	1,5	1,5
	16 x 85	M10	85	2,0	2,0
	16 x 125	M10	125	2,0	2,0
	16 x 85	M12	85	2,5	2,5
	16 x 125	M12	125	3,0	2,5
	20 x 85	M16	85	3,5	2,5

Partial safety factor γ_M = 2,5 for other base materials (in the absence of national regulation)

1) $N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,s}$

2) $V_{Rk} = V_{Rk,b} = V_{Rk,c} = V_{Rk,s}$

Table C5: Characteristic bending moment

Size of rod				M8	M10	M12	M16
Characteristic bending moment	$M^0_{Rk,s}$	Nm	5.8	19	37	65	166
			6.8	22	45	79	200
			8.8	30	60	105	266
			10.9	37	75	131	333
			12.9	45	90	157	400
			A4-70	26	52	92	232
			A4-80	30	60	105	266
			70	26	52	92	233
Partial safety factor	γ_{Ms}	-	5.8	1,25			
			6.8	1,25			
			8.8	1,25			
			10.9	1,50			
			12.9	1,50			
			A4-70	1,56			
			A4-80	1,33			
			70	1,56			

Table C6: Displacements under tension loading

Brick No. 1					
Size of rod		M8	M10	M12	M16
δ_{N0}	[mm]	0,11	0,12	0,15	0,16
$\delta_{N\infty}$	[mm]	0,36	0,36	0,36	0,36
Brick No. 2					
Size of rod		M8	M10	M12	M16
δ_{N0}	[mm]	0,05	0,07	0,10	0,11
$\delta_{N\infty}$	[mm]	0,19	0,19	0,20	0,22
Brick No. 3					
Size of rod		M8	M10	M12	M16
δ_{N0}	[mm]	0,13	0,15	0,15	0,18
$\delta_{N\infty}$	[mm]	0,36	0,36	0,36	0,36
Brick No. 4					
Size of rod		M8	M10	M12	M16
δ_{N0}	[mm]	0,10	0,13	0,15	0,18
$\delta_{N\infty}$	[mm]	0,36	0,36	0,36	0,36
Brick No. 5					
Size of rod		M8	M10	M12	M16
δ_{N0}	[mm]	0,14	0,13	0,24	0,18
$\delta_{N\infty}$	[mm]	0,36	0,36	0,48	0,36
Brick No. 6					
Size of rod		M8	M10	M12	M16
δ_{N0}	[mm]	0,09	0,27	0,14	0,16
$\delta_{N\infty}$	[mm]	0,36	0,54	0,36	0,36
Brick No. 7					
Size of rod		M8	M10	M12	M16
δ_{N0}	[mm]	0,05	0,16	0,30	0,28
$\delta_{N\infty}$	[mm]	0,36	0,36	0,60	0,56
Brick No. 8					
Size of rod		M8	M10	M12	M16
δ_{N0}	[mm]	0,08	0,10	0,10	0,27
$\delta_{N\infty}$	[mm]	0,36	0,36	0,36	0,54

Equation $N = N_{Rk} / \gamma_F \times \gamma_M$, with $\gamma_F = 1,4$

Table C7: Displacements under tension loading

Brick No. 9					
Size of rod		M8	M10	M12	M16
δ_{N0}	[mm]	0,06	0,04	0,07	0,10
$\delta_{N\infty}$	[mm]	0,36	0,36	0,36	0,36
Brick No. 10					
Size of rod		M8	M10	M12	M16
δ_{N0}	[mm]	0,04	0,05	0,08	0,12
$\delta_{N\infty}$	[mm]	0,36	0,36	0,36	0,36
Brick No. 11					
Size of rod		M8	M10	M12	M16
δ_{N0}	[mm]	0,04	0,05	0,08	0,12
$\delta_{N\infty}$	[mm]	0,36	0,36	0,36	0,36
Brick No. 12					
Size of rod		M8	M10	M12	M16
δ_{N0}	[mm]	0,06	0,08	0,08	0,15
$\delta_{N\infty}$	[mm]	0,36	0,36	0,36	0,36
Brick No. 13					
Size of rod		M8	M10	M12	M16
δ_{N0}	[mm]	0,04	0,04	0,10	0,07
$\delta_{N\infty}$	[mm]	0,36	0,36	0,36	0,36
Brick No. 14					
Size of rod		M8	M10	M12	M16
δ_{N0}	[mm]	0,22	0,25	0,30	0,20
$\delta_{N\infty}$	[mm]	0,44	0,50	0,60	0,40

Equation $N = N_{Rk} / \gamma_F \times \gamma_M$, with $\gamma_F = 1,4$

Table C8: Displacements under shear loading

Brick No. 1					
Size of rod		M8	M10	M12	M16
δ_{V0}	[mm]	0,29	0,33	0,34	0,42
$\delta_{V\infty}$	[mm]	0,44	0,50	0,51	0,63
Brick No. 2					
Size of rod		M8	M10	M12	M16
δ_{V0}	[mm]	0,15	0,16	0,22	0,23
$\delta_{V\infty}$	[mm]	0,23	0,24	0,33	0,35
Brick No. 3					
Size of rod		M8	M10	M12	M16
δ_{V0}	[mm]	0,21	0,22	0,25	0,25
$\delta_{V\infty}$	[mm]	0,32	0,33	0,38	0,38
Brick No. 4					
Size of rod		M8	M10	M12	M16
δ_{V0}	[mm]	0,10	0,13	0,16	0,20
$\delta_{V\infty}$	[mm]	0,15	0,20	0,24	0,30
Brick No. 5					
Size of rod		M8	M10	M12	M16
δ_{V0}	[mm]	0,18	0,22	0,25	0,25
$\delta_{V\infty}$	[mm]	0,27	0,33	0,38	0,38
Brick No. 6					
Size of rod		M8	M10	M12	M16
δ_{V0}	[mm]	0,18	0,21	0,23	0,19
$\delta_{V\infty}$	[mm]	0,27	0,32	0,35	0,29
Brick No. 7					
Size of rod		M8	M10	M12	M16
δ_{V0}	[mm]	0,24	0,20	0,34	0,26
$\delta_{V\infty}$	[mm]	0,36	0,30	0,51	0,39
Brick No. 8					
Size of rod		M8	M10	M12	M16
δ_{V0}	[mm]	0,11	0,13	0,36	0,27
$\delta_{V\infty}$	[mm]	0,17	0,20	0,54	0,41

Equation $N = N_{Rk} / \gamma_F \times \gamma_M$, with $\gamma_F = 1,4$

Table C9: Displacements under shear loading

Brick No. 9					
Size of rod		M8	M10	M12	M16
δ_{V0}	[mm]	0,12	0,15	0,22	0,21
$\delta_{V\infty}$	[mm]	0,18	0,23	0,33	0,32
Brick No. 10					
Size of rod		M8	M10	M12	M16
δ_{V0}	[mm]	0,11	0,14	0,15	0,25
$\delta_{V\infty}$	[mm]	0,17	0,21	0,23	0,38
Brick No. 11					
Size of rod		M8	M10	M12	M16
δ_{V0}	[mm]	0,14	0,15	0,25	0,20
$\delta_{V\infty}$	[mm]	0,21	0,23	0,38	0,30
Brick No. 12					
Size of rod		M8	M10	M12	M16
δ_{V0}	[mm]	0,09	0,11	0,24	0,26
$\delta_{V\infty}$	[mm]	0,14	0,17	0,36	0,39
Brick No. 13					
Size of rod		M8	M10	M12	M16
δ_{V0}	[mm]	0,10	0,14	0,17	0,21
$\delta_{V\infty}$	[mm]	0,15	0,21	0,26	0,32
Brick No. 14					
Size of rod		M8	M10	M12	M16
δ_{V0}	[mm]	0,24	0,35	0,32	0,34
$\delta_{V\infty}$	[mm]	0,36	0,53	0,48	0,51

Equation $N = N_{Rk} / \gamma_F \times \gamma_M$, with $\gamma_F = 1,4$

Table C10: β-factor for job site tests

Base material	Size of rod	β-factor
Brick No. 1	M8 to M16	0,71
Brick No. 2	M8 to M16	0,59
Brick No. 3 to 14	M8 to M16	0,71

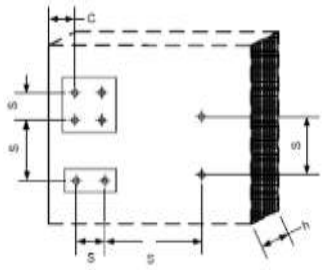


Table C11: Brick No. 1 to 3 - edge distance and spacing for tension load

d_{nom}	$s_{cr,N}$	$c_{cr,N}$	$s_{cr,min}$	$c_{cr,min}$
[mm]	[mm]	[mm]	[mm]	[mm]
8	20 x d_{nom}	10 x d_{nom}	50	50
10	20 x d_{nom}	10 x d_{nom}	50	50
12	20 x d_{nom}	10 x d_{nom}	50	50
16	20 x d_{nom}	10 x d_{nom}	50 [1] / 54 [2]	50 [1] / 54 [2]

[1] for element 1 and 3
[2] for element 2

Table C12: Brick No. 4 to 14 - edge distance and spacing for tension load

$d_{nom} + d_s \times L_s$	$s_{cr,N}$	$c_{cr,N}$	$s_{cr,min}$	$c_{cr,min}$
[mm]	[mm]	[mm]	[mm]	[mm]
8 + 12 x 50	$l_{unit,max}$	0,5 x $l_{unit,max}$	100	100
8 + 12 x 80	$l_{unit,max}$	0,5 x $l_{unit,max}$	100	100
10 + 16 x 85	$l_{unit,max}$	0,5 x $l_{unit,max}$	100	100
10 + 16 x 125	$l_{unit,max}$	0,5 x $l_{unit,max}$	100	100
12 + 16 x 85	$l_{unit,max}$	0,5 x $l_{unit,max}$	100	100
12 + 16 x 125	$l_{unit,max}$	0,5 x $l_{unit,max}$	100	100
16 + 20 x 85	$l_{unit,max}$	0,5 x $l_{unit,max}$	120	120

Table C13: Brick No. 1 to 3 - edge distance and spacing for shear load

d_{nom}	$s_{cr,cv}$	$c_{cr,cv}$
[mm]	[mm]	[mm]
8	20 x d_{nom}	20 x d_{nom}
10	20 x d_{nom}	20 x d_{nom}
12	20 x d_{nom}	20 x d_{nom}
16	20 x d_{nom}	20 x d_{nom}

Table C14: Brick No. 4 to 14 - edge distance and spacing for shear load

$d_{nom} + d_s \times L_s$	$s_{cr,cv}$	$c_{cr,cv}$
[mm]	[mm]	[mm]
8 + 12 x 50	$l_{unit,max}$	$l_{unit,max}$
8 + 12 x 80	$l_{unit,max}$	$l_{unit,max}$
10 + 16 x 85	$l_{unit,max}$	$l_{unit,max}$
10 + 16 x 125	$l_{unit,max}$	$l_{unit,max}$
12 + 16 x 85	$l_{unit,max}$	$l_{unit,max}$
12 + 16 x 125	$l_{unit,max}$	$l_{unit,max}$
16 + 20 x 85	$l_{unit,max}$	$l_{unit,max}$

$l_{unit,max}$ – max. length of masonry unit