Deutsches Institut für Bautechnik

Approval body for construction products and types of construction

Bautechnisches Prüfamt

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European Technical Assessment ETA-15/0249 of 7 May 2015

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the European Technical Assessment:	Deutsches Institut für Bautechnik
Trade name of the construction product	Atrion Injection system AVM-Top Quattro for Masonry
Product family to which the construction product belongs	Injection system for use in masonry
Manufacturer	Adolf Würth GmbH & Co. KG Reinhold-Würth-Straße 12-17 74653 Künzelsau DEUTSCHLAND
Manufacturing plant	Adolf Würth GmbH & Co. KG, Plant 1 Germany
This European Technical Assessment contains	17 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	Guideline for European technical approval of "Metal Injection Anchors for Use in Masonry", ETAG 029, April 2013, used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011.

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Specific Part

1 Technical description of the product

The Atrion Injection mortar AVM-Top Quattro for masonry is a bonded anchor (injection type) consisting of a mortar cartridge with injection mortar AVM-Top Quattro, a perforated sleeve and an anchor rod with hexagon nut and washer in the range of M8 to M12. The steel elements are made of zinc coated steel or stainless steel.

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

The product description is given in Annex A.

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

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 verifications and assessment methods on which this 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.

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 for tension and shear loads	See Annex C 1
Characteristic resistance for bending moments	See Annex C 2
Displacements under shear and tension loads	See Annex C 2
Reduction Factor for job site tests (β-Factor)	See Annex C 2
Edge distances and spacings	See Annex C 3

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Anchorages satisfy requirements for Class A1
Resistance to fire	No performance determined (NPD)

3.3 Hygiene, health and the environment (BWR 3)

Not applicable.

3.4 Safety in use (BWR 4)

The essential characteristics regarding Safety in use are included under the Basic Works Requirement Mechanical resistance and stability.

3.5 Protection against noise (BWR 5)

Not applicable.

3.6 Energy economy and heat retention (BWR 6)

Not applicable.

3.7 Sustainable use of natural resources (BWR 7)

The sustainable use of natural resources was not investigated.

3.8 General aspects

The verification of durability is part of testing the essential characteristics. Durability is only ensured if the specifications of intended use according to Annex B are taken into account.

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

According to Decision of the Commission of 17 February 1997 (97/177/EC) (OJ L 073 of 14.03.97 p. 24-25), the system of assessment and verification of constancy of performance (see Annex V and Article 65 Paragraph 2 to Regulation (EU) No 305/2011) given in the following table applies.

Product	Intended use	Level or class	System
Metal injection anchors for use in masonry	For fixing and/or supporting to masonry, structural elements (which contributes to the stability of the works) or heavy units	—	1

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

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Deutsches Institut für Bautechnik.

Issued in Berlin on 7 May 2015 by Deutsches Institut für Bautechnik

Uwe Bender
Head of Department

beglaubigt:
Baderschneider

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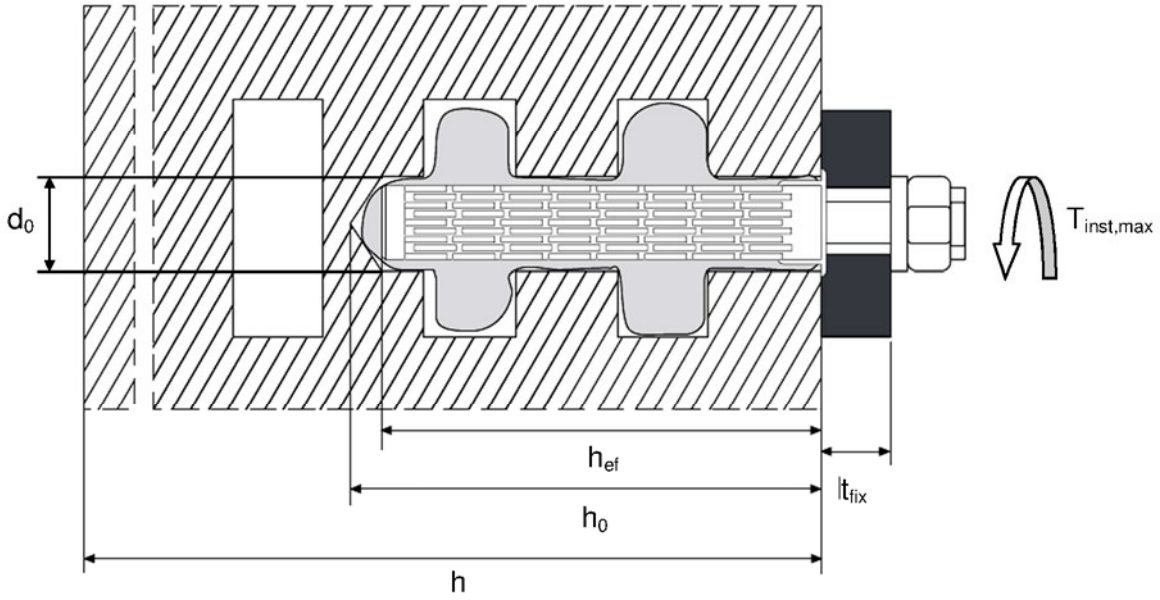
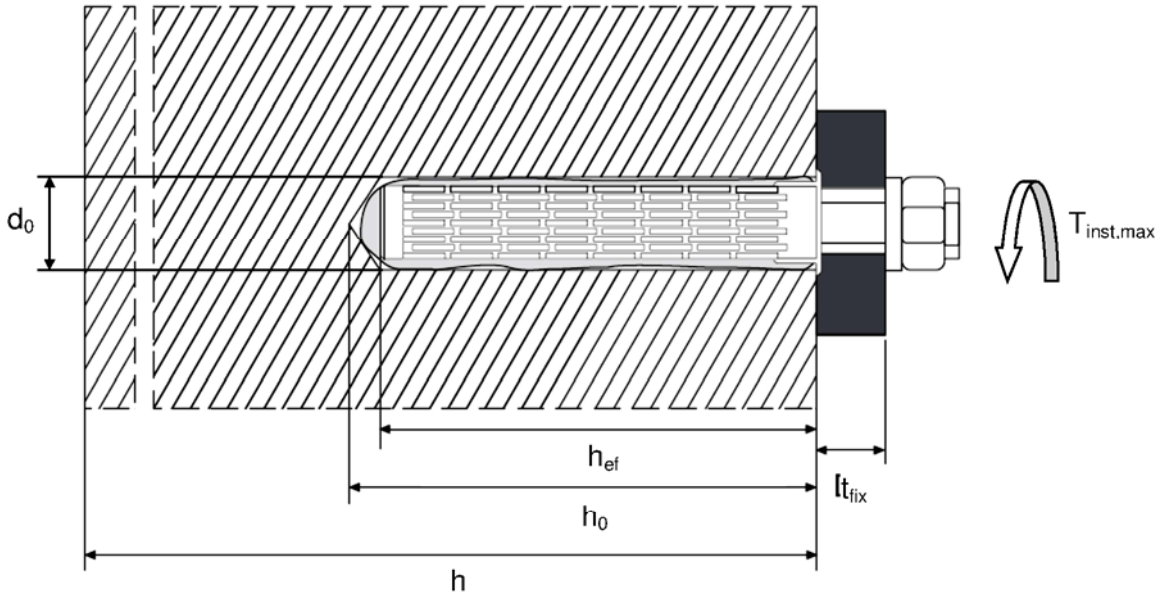
Installation in hollow brick; threaded rod with sleeve



Installation in solid brick; threaded rod with or without sleeve



h_{ef} = effective setting depth
h_0 = bore hole depth
t_{fix} = thickness of fixture
d_0 = bore hole diameter
T_{inst} = torque moment

Atrion Injection System AVM-Top Quattro for masonry	**Annex A 1**
Product description Installed condition	

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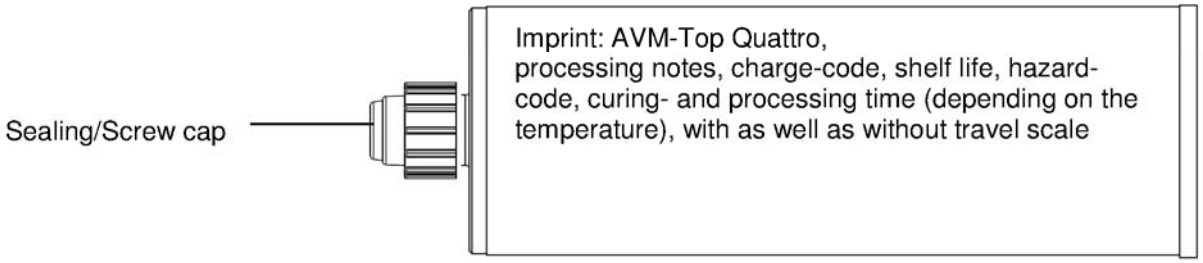
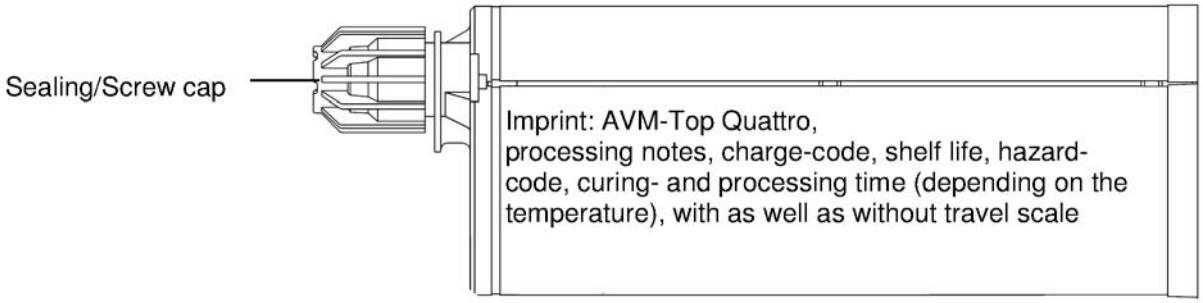
Cartridge: AVM-Top Quattro

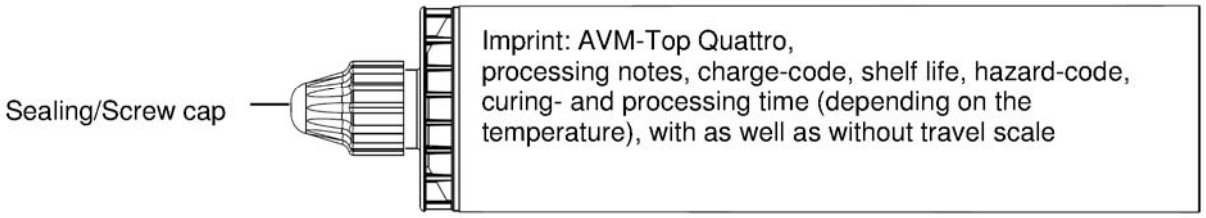
150 ml, 280 ml, 300 ml up to 333 ml and 380 ml up to 420 ml cartridge (Type: coaxial)



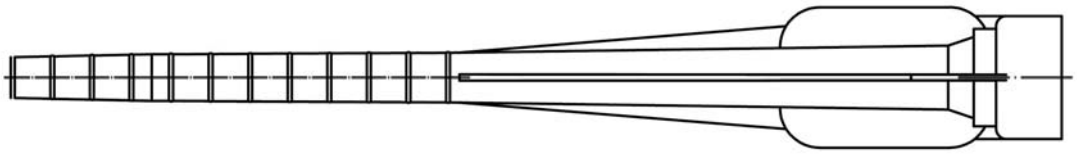
235 ml, 345 ml and 825 ml cartridge (Type: "side-by-side")



165 ml and 300 ml cartridge (Type: "foil tube")



Static Mixer



Atrion Injection System AVM-Top Quattro for masonry	Annex A 2
Product description Injection system	

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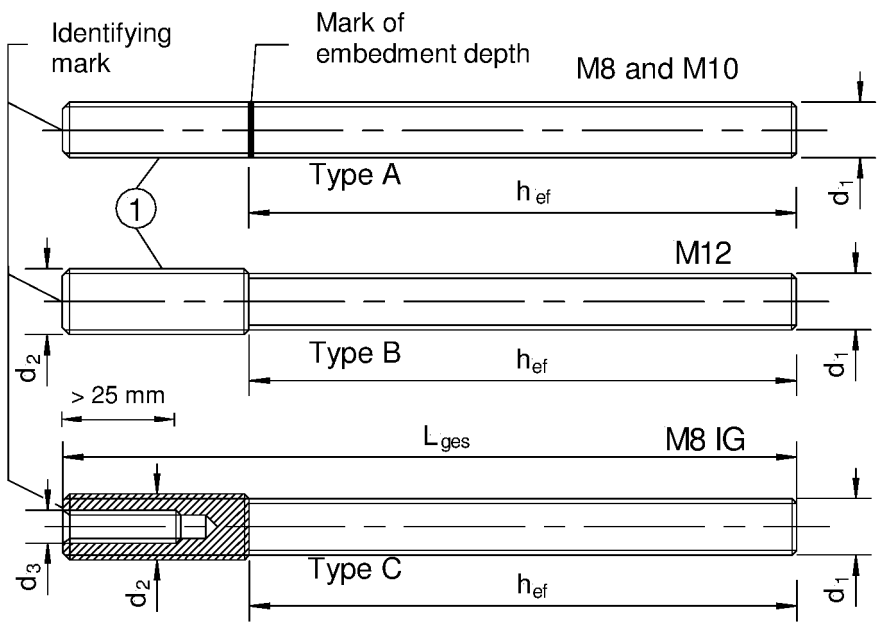
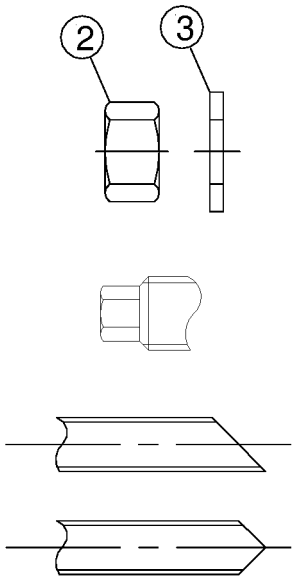
Threaded rod M8, M8 IG, M10, M12*





* M10 at bonding area

With mark (Type A, B, C):
- Identifying mark: CVM; thread size: M
- additional with stainless steel: A4
- e.g. CVM M8 A4

Commercial standard rod (only Type A) with:
- Materials, dimensions and mechanical properties acc. to Table A2
- Inspection certificate 3.1 acc. to EN 10204:2004
- Marking of embedment depth

Sleeve (Plastic) SH 13 / 100 and SH 15 / 100

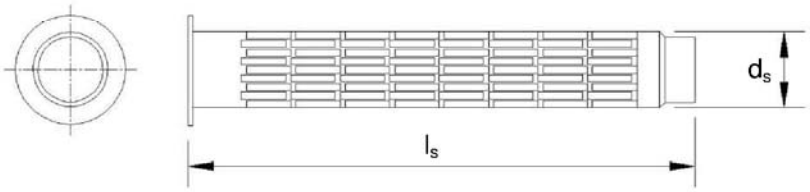


Table A1: Sizes threaded rod and sleeve (mm)

Threaded rods							Sleeves		
Size	d_1	d_2	d_3	h_{ef}	L_{min}	L_{max}	Size	d_s	l_s
[mm]								[mm]	[mm]
M8	8	8	-	80	100	500	SH13/100	13	100
M8 IG	10	12	8	90	110	500	SH15/100	15	100
M10	10	10	-	90	110	500	SH15/100	15	100
M12*	10	12	-	90	110	500	SH15/100	15	100

Atrion Injection System AVM-Top Quattro for masonry

Product description
Threaded rod and Sleeve

Annex A 3

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Table A2: Materials

Part	Designation	Material
Steel, zinc plated ≥ 5 µm acc. to EN ISO 4042:1999 or Steel, hot-dip galvanised ≥ 40 µm acc. to EN ISO 1461:2009 and EN ISO 10684:2004+AC:2009		
1	Anchor rod	Steel, EN 1993-1-8:2005+AC2009 or EN 10263:2001 Strength class 5.8, 8.8 EN 1993-1-8:2005+AC:2009 A_5 > 8% fracture elongation $f_{uk} = f_{ub}$ $f_{yk} = f_{yb}$
2	Hexagon nut, EN ISO 4032:2012	Strength class 5 (for class 5.8 rod) EN ISO 898-2:2012 Strength class 8 (for class 8.8 rod) EN ISO 898-2:2012
3	Washer, EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000, or EN ISO 7094:2000	Steel, zinc plated or hot-dip galvanised
Stainless steel		
1	Anchor rod	Material 1.4401 / 1.4404 / 1.4571, EN 10088-1:2005, Strength class 70 EN ISO 3506-1:2009 A_5 > 8% fracture elongation $f_{uk} = R_{m,min}$ $f_{yk} = R_{p0,2,min}$
2	Hexagon nut, EN ISO 4032:2012	Material 1.4401 / 1.4404 / 1.4571 EN 10088-1:2005, Strength class 70 (for class 70 rod) EN ISO 3506-2:2009
3	Washer, EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000, or EN ISO 7094:2000	Material 1.4401, 1.4404 or 1.4571, EN 10088-1:2005

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Specifications of intended use

Anchorages subject to:

- Static and quasi-static loads

Base materials:

- Solid brick masonry (Use category b), according to Annex B 2.

  Note: The characteristic resistance are also valid for larger brick sizes and larger compressive strength of the masonry unit.
- Hollow brick masonry (use category c), according to Annex B 2.
- Mortar strength class of the masonry M2,5 at minimum according to EN 998-2:2010.
- For other bricks in solid masonry and in hollow or perforated masonry, the characteristic resistance of the anchor may be determined by job site tests according to ETAG 029, Annex B under consideration of the β-factor according to Annex C 2, Table C4.

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):

- Dry and wet structure (regarding injection mortar).
- Structures subject to dry internal conditions (zinc coated steel, stainless steel or high corrosion resistant steel).
- Structures subject to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal condition, if no particular aggressive conditions exist (stainless steel or high corrosion resistant steel).
- Structures subject to external atmospheric exposure and to permanently damp internal condition, if other particular aggressive conditions exist (high corrosion resistant steel).

  Note: Particular aggressive conditions are e.g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with extreme chemical pollution (e.g. in desulphurization plants or road tunnels where de-icing materials are used).

Use categories in respect of installation and use:

- Category d/d.
- Category w/w.

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 the ETAG 029, Annex C, Design method A under the responsibility of an engineer experienced in anchorages and masonry work.

Installation:

- Dry or wet structures.
- Hole drilling by rotary drill mode.
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.

Atrion Injection System AVM-Top Quattro for masonry	**Annex B 1**
Intended Use Specifications	

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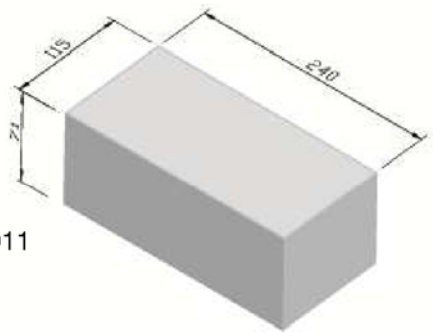
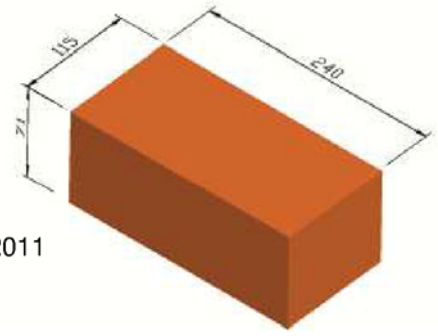
Types of brick and dimensions (Dimensions in mm)

Brick No. 1



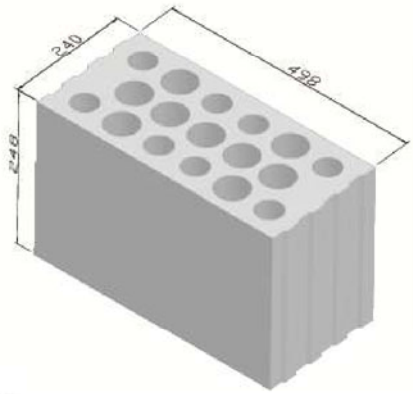
Calcium silicate masonry
KSV – NF
acc. to EN 771-1:2011
$\rho \geq 1{,}8$ [kg/dm³]
$f_b \geq 8$ [N/mm²]

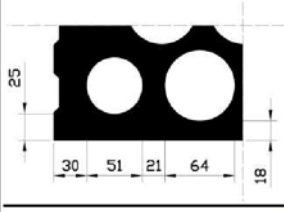
Brick No. 2



Clay masonry
Mz – NF
acc. to EN 771-1:2011
$\rho \geq 1{,}8$ [kg/dm³]
$f_b \geq 12$ [N/mm²]

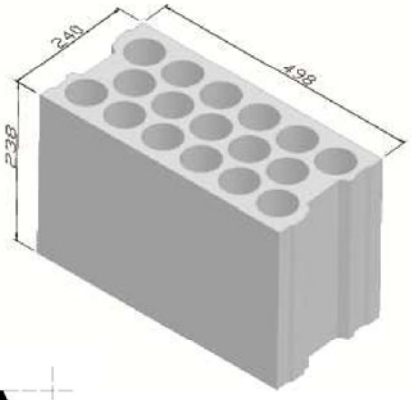
Brick No. 3

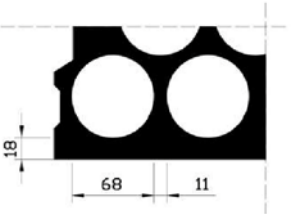




Calcium silicate masonry
KSL-R-12-1,2-16DF
acc. to EN 771-1:2011
$\rho \geq 1{,}2$ [kg/dm³]
$f_b \geq 12$ [N/mm²]

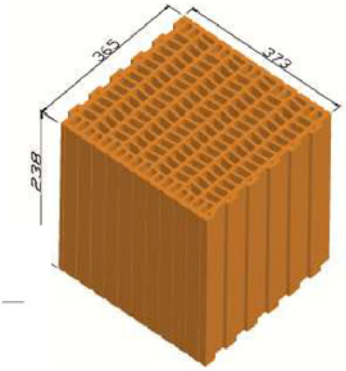
Brick No. 4

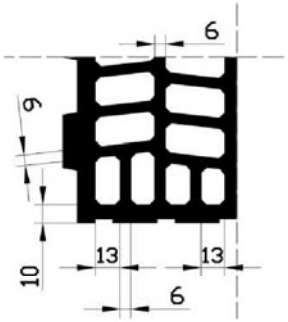




Calcium silicate masonry
KSL-12-1,2-16DF
acc. to EN 771-2:2011
$\rho \geq 1{,}2$ [kg/dm³]
$f_b \geq 12$ [N/mm²]

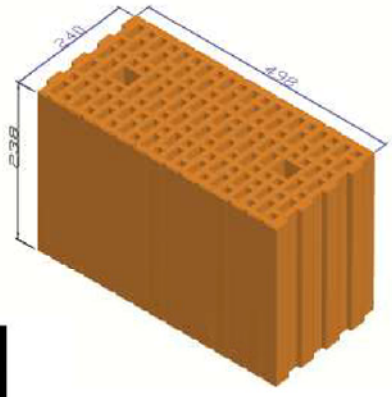
Brick No. 5

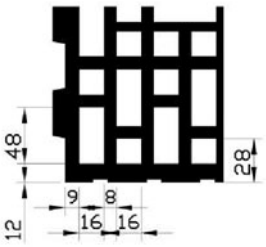




Clay masonry
Hlz-12-0,8-xxDF
acc. to Z-17.1-383
$\rho \geq 0{,}8$ [kg/dm³]
$f_b \geq 12$ [N/mm²]

Brick No. 6





Clay masonry
Hlz-12-0,9-16DF N+F
acc. to EN 771-1:2011
$\rho \geq 0{,}9$ [kg/dm³]
$f_b \geq 12$ [N/mm²]

Atrion Injection System AVM-Top Quattro for masonry

Intended Use
Types of brick and dimensions

Annex B 2

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Installation

Cleaning Brush

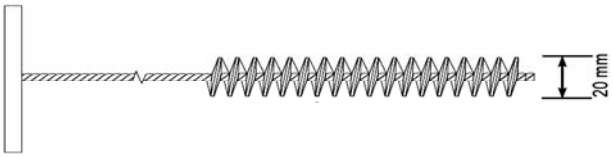

Table B1: Installation parameters in solid masonry (without sleeve)

Threaded rod			M8	M8 IG	M10	M12
Nominal drill hole diameter	d_0	[mm]	10	12	12	12
Embedment depth	h_{ef}	[mm]	80	90	90	90
Bore hole depth	h_0	[mm]	85	95	95	95
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	9	14	12	14
Diameter of nylon brush	$d_b \geq$	[mm]	20			
Torque moment	T_{inst}	[Nm]	2			

Table B2: Installation parameters in solid and hollow masonry (with sleeve)

Threaded rod			M8	M8 IG	M10	M12
Sleeve			SH 13x100	SH 15x100	SH 15x100	SH 15x100
Nominal drill hole diameter	d_0	[mm]	14	16	16	16
Embedment depth sleeve	h_{nom}	[mm]	100	100	100	100
Embedment depth rod	h_{ef}	[mm]	80	90	90	90
Bore hole depth	h_0	[mm]	105	105	105	105
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	9	14	12	14
Diameter of nylon brush	$d_b \geq$	[mm]	20			
Torque moment	T_{inst}	[Nm]	2			

Table B3: Minimum curing time

Base material temperature	Gelling- / working time	Minimum curing time in dry base material[1)]
+ 5 °C to +9 °C	25 min	2 h
+ 10 °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 +40 °C	2 min	20 min

[1)] In wet base material the curing time **must** be doubled

Atrion Injection System AVM-Top Quattro for masonry

Intended Use
Installation parameters and cleaning brush
Gelling and Curing times

Annex B 3

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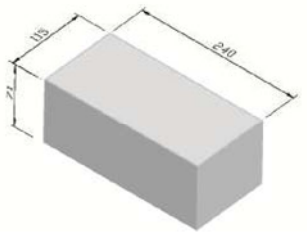
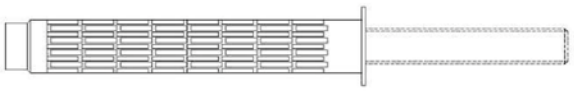
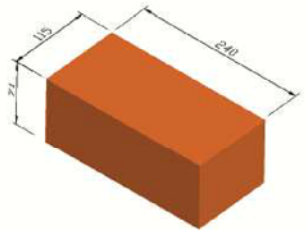
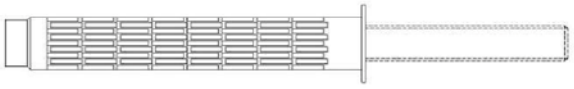
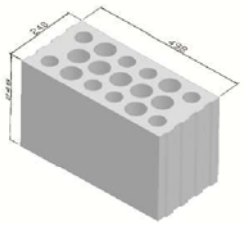
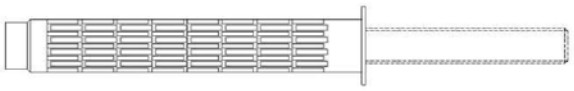
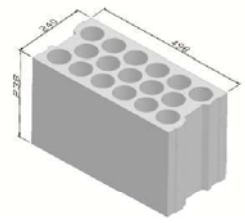
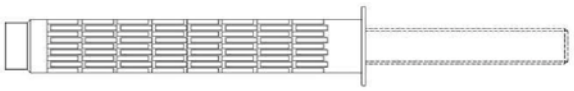
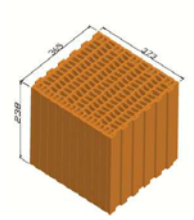
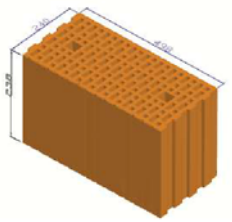
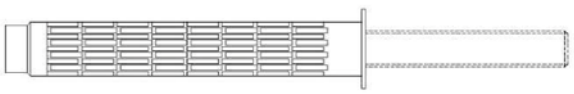
Table B4: Allocation of anchor rods[1)], sleeves[1)] and bricks

Bricks	Valid anchor rods and sleeves * M10 at bonding area
 No 1	 M8; M8IG; M10; M12*  SH 13x100 SH 15x100
 No 2	 M8; M8IG; M10; M12*  SH 13x100 SH 15x100
 No 3	 SH 13x100
 No 4	 SH 13x100 SH 15x100
 No 5	 SH 13x100 SH 15x100
 No 6	 SH 13x100

1) Other combination can be use after job side test acc. to ETAG 029, Annex B.
The β-factors for this job side test are given in Table C4

Atrion Injection System AVM-Top Quattro for masonry

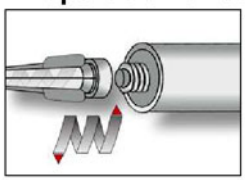
Intended Use
Allocation of anchor rods, sleeves and bricks

Annex B 4

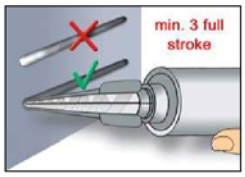
Deutsches Institut für Bautechnik DIBt

Installation instructions

Preparation of cartridge

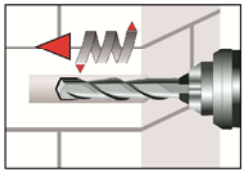


1. Remove the cap and attach the supplied static-mixing nozzle to the cartridge and load the cartridge into the correct dispensing tool. Cut off the foil tube clip before use.For every working interruption longer than the recommended working time (Table B3) as well as for new cartridges, a new static-mixer shall be used.

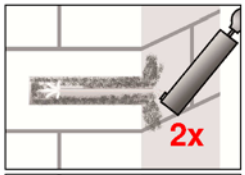


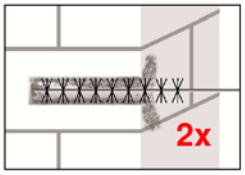
2. Place in the cartridge to an appropriate dispenser tool.
Prior to dispensing into the anchor hole, squeeze out separately a minimum of three full strokes and discard non-uniformly mixed adhesive components until the mortar shows a consistent grey colour.

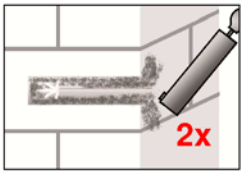
Installation in solid masonry (without sleeve)



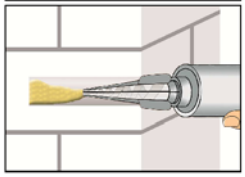
3. Holes to be drilled perpendicular to the surface of the base material by using a hard-metal tipped hammer drill bit. Drill a hole, by rotary drill mode, into the base material, with nominal drill hole diameter and bore hole depth acc. to the size and embedment depth required by the selected anchor. In case of aborted drill hole the drill hole shall be filled with mortar



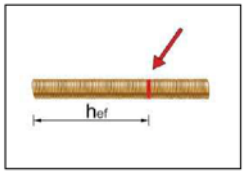


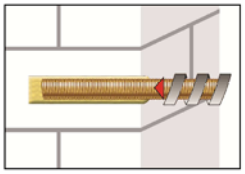


4. Blow from the bottom of the bore hole two times. Brush the hole clean two times, and finally blow out the hole again two times.

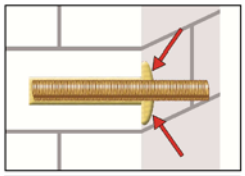


5. Starting from the bottom or back of the cleaned anchor hole fill the hole up to min two-thirds with adhesive. Slowly withdraw the static mixing nozzle as the hole fills to avoid creating air pockets.
Observe the gel-/ working times given in Table B3.

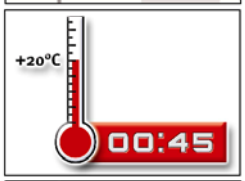




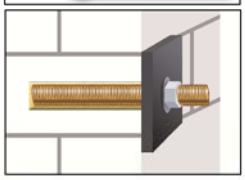
6. The position of the embedment depth shall be marked on the threaded rod. Push the threaded rod into the anchor hole while turning slightly to ensure positive distribution of the adhesive until the embedment depth is reached. The anchor should be free of dirt, grease, oil or other foreign material.



7. Be sure that the anular gap is fully filled with mortar. If no excess mortar is visible at the top of the hole, the application has to be renewed.



8. Allow the adhesive to cure to the specified curing time prior to applying any load or torque. Do not move or load the anchor until it is fully cured (attend Table B3).



9. After full curing, the fixture can be installed with the max. torque (Table B1 or B2) by using a calibrated torque wrench.

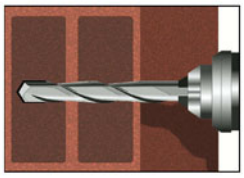
Atrion Injection System AVM-Top Quattro for masonry

Intended Use
Installation instructions (solid brick)

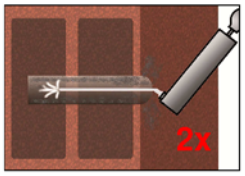
Annex B 5

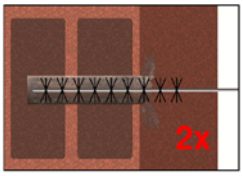
Deutsches Institut für Bautechnik DIBt

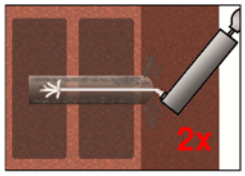
Installation in solid and hollow masonry (with sleeve)



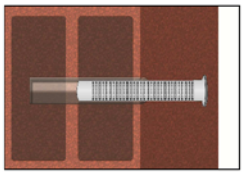
3. Holes to be drilled perpendicular to the surface of the base material by using a hard-metal tipped hammer drill bit. Drill a hole, by rotary drill mode, into the base material, with nominal drill hole diameter and bore hole depth acc. to the size and embedment depth required by the selected anchor. In case of aborted drill hole the drill hole shall be filled with mortar



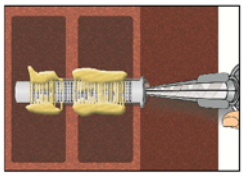




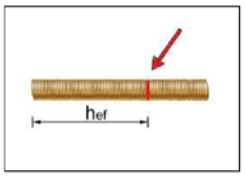
4. Blow from the bottom of the bore hole two times. Brush the hole clean two times, and finally blow out the hole again two times.

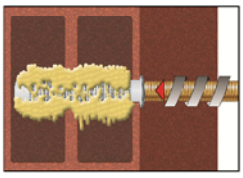


5. Insert the perforated sleeve into the bore hole. Make sure that the sleeve fits well into the hole. Never cut the sleeve! Only use sleeves that have the right length.

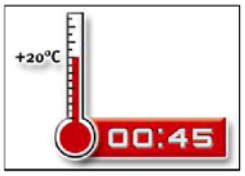


6. Starting from the bottom or back fill the sleeve completely with adhesive. For quantity of mortar attend cartridge label.
Observe the gel-/ working times given in Table B3.

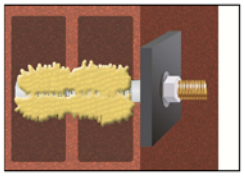




7. The position of the embedment depth shall be marked on the threaded rod. Push the threaded rod into the anchor hole while turning slightly to ensure positive distribution of the adhesive until the embedment depth is reached. The anchor should be free of dirt, grease, oil or other foreign material.



8. Allow the adhesive to cure to the specified curing time prior to applying any load or torque. Do not move or load the anchor until it is fully cured (attend Table B3).



9. After full curing, the fixture can be installed with the max. torque (Table B2) by using a calibrated torque wrench.

Atrion Injection System AVM-Top Quattro for masonry	**Annex B 6**
Intended Use Installation instructions (hollow brick)	

Deutsches Institut für Bautechnik DIBt

Table C1: Characteristic values of resistance for tension and shear loads

Brick No.	Desity ρ [kg/dm³] Com-pressive strength f_b [N/mm²]	Sleeve	Anchor size	Effective Embed-ment depth h_{ef}	Characteristic resistance							
					Use category							
					dry / dry (d/d)				wet / wet (w/w)			
					Ta: 24°C/40°C		Tb: 50°C/80°C		Ta: 24°C/40°C		Tb: 50°C/80°C	
				[mm]	N_{Rk} [1)]	V_{Rk} [2,3)]	N_{Rk} [1)]	V_{Rk} [2,3)]	N_{Rk} [1)]	V_{Rk} [2,3)]	N_{Rk} [1)]	V_{Rk} [2,3)]
					[kN]		[kN]		[kN]		[kN]	
1	ρ ≥ 1,8 f_b ≥ 8	without	M8	80	4,0	4,0	3,0	3,0	3,0	3,0	2,5	2,5
		without	M8 IG; M10; M12	90	5,0	5,0	4,5	4,5	4,0	4,0	3,5	3,5
		SH 13x100	M8	80	5,0	5,0	4,5	4,5	4,5	4,5	3,5	3,5
		SH 15x100	M8 IG; M10; M12	90	7,0	7,0	6,0	6,0	5,0	5,0	4,5	4,5
2	ρ ≥ 1,8 f_b ≥ 12	without	M8	80	4,0	4,0	3,0	3,0	3,5	3,5	3,0	3,0
		without	M8 IG; M10; M12	90	5,0	5,0	4,5	4,5	5,0	5,0	4,0	4,0
		SH 13x100	M8	80	3,5	3,5	3,0	3,0	3,5	3,5	2,5	2,5
		SH 15x100	M8 IG; M10; M12	90	4,5	4,5	3,5	3,5	4,5	4,5	3,5	3,5
3	ρ ≥ 1,2 f_b ≥ 12	SH 13x100	M8	80	3,5	2,5	3,5	2,5	3,0	2,0	3,0	2,0
4	ρ ≥ 1,2 f_b ≥ 12	SH 13x100	M8	80	2,5	2,0	2,5	2,0	2,0	1,5	2,0	1,5
		SH 15x100	M8 IG; M10; M12	90	3,0	2,5	3,0	2,5	2,0	2,0	2,0	2,0
5	ρ ≥ 0,8 f_b ≥ 12	SH 13x100	M8	80	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0
		SH 15x100	M8 IG; M10; M12	90	2,0	2,5	2,0	2,5	2,0	2,5	2,0	2,5
6	ρ ≥ 0,9 f_b ≥ 12	SH 13x100	M8	80	3,0	2,0	3,0	2,0	2,5	2,0	2,5	2,0

1) For design according to ETAG 029, Annex C: $N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,s}$
2) For design according to ETAG 029, Annex C: $V_{Rk} = V_{Rk,b} = V_{Rk,s}$
3) $V_{Rk,c}$ according to ETAG 029, Annex C

Atrion Injection System AVM-Top Quattro for masonry

Performances
Characteristic values of resistance for tension load and shear load values

Annex C 1

Deutsches Institut für Bautechnik DIBt

Table C2: Characteristic values of resistance for bending moments

			M8	M8 IG[1)]	M10	M12[1)]
Characteristic bending moment, Steel, property class 5.8	$M_{Rk,s}$	[Nm]	19	37	37	37
Characteristic bending moment, Steel, property class 8.8	$M_{Rk,s}$	[Nm]	30	60	60	60
Characteristic bending moment, Stainless steel A4, property class 70	$M_{Rk,s}$	[Nm]	26	52	52	52

[1)] M10 at bonding area

Table C3: Displacement under shear and tension load

Brick-No.	N [kN]	δ_{N0} [mm]	$\delta_{N\infty}$ [mm]	V [kN]	δ_{V0} [mm]	$\delta_{V\infty}$ [mm]
1	$\frac{N_{Rk}}{1,4 \times \gamma_M}$	0,1	0,2	$\frac{V_{Rk}}{1,4 \times \gamma_M}$	$\frac{V_{Rk}\ [kN]}{2,0\ [kN/mm]}$	1,5 δ_{V0}
2						
3					0,7	1,1
4						
5						
6						

Table C4: β-factors for job site tests according to ETAG 029, Annex B

Brick-No.	Installation & use	β-factor	
		Ta: 24°C / 40°C	Tb: 50°C / 80°C
1-2	d/d	0,66	0,53
3-6		0,92	
1	w/w (incl. w/d)	0,53	0,42
2		0,61	0,49
3		0,74	
4		0,74	
5		0,86	
6		0,86	

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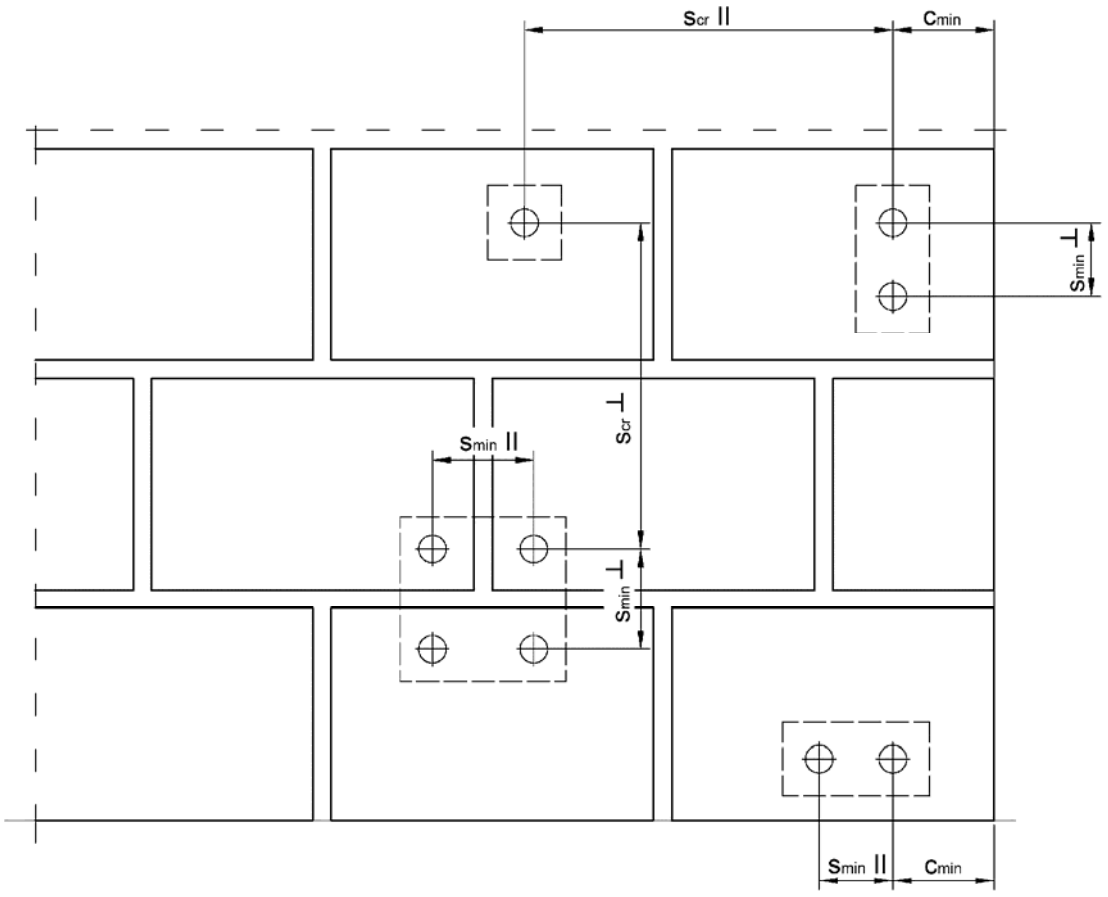
Table C5: Edge distances and spacings

Brick No.	Anchor size					
	M8			M8 IG, M10, M12		
	$c_{min} = c_{cr}$ [mm]	$s_{min,II} = s_{cr,II}$ [1] [mm]	$s_{min,\perp} = s_{cr,\perp}$ [2] [mm]	$c_{min} = c_{cr}$ [mm]	$s_{min,II} = s_{cr,II}$ [1] [mm]	$s_{min,\perp} = s_{cr,\perp}$ [2] [mm]
1	120 (150)[3]	240 (300)[3]	240 (300)[3]	135 (150)[3]	270 (300)[3]	270 (300)[3]
2	120 (150)[3]	240 (300)[3]	240 (300)[3]	135 (150)[3]	270 (300)[3]	270 (300)[3]
3	100	498	248	100	498	248
4	100	498	238	100	498	238
5	100	373	238	100	373	238
6	100	498	238	100	498	238

[1] s_{II} : Spacing parallel to the bearing joint
[2] $s_{\perp}$: Spacing perpendicular to the bearing joint
[3] with perforated sleeve



Atrion Injection System AVM-Top Quattro for masonry

Performances
Edge distances and spacings

Annex C 3