TECHNICAL DATA SHEET

CHEMICAL ANCHOR ONE

Product description

ESSVE ONE is a styrene-free vinylester resin that is delivered in a 2-component foil tube cartridge system. This high-performance product may be used in combination with a hand-, battery- or pneumatic tool and a static mixer. It was designed especially for the anchoring of threaded rods, reinforcing bars or internal threaded rod sleeves into concrete (also porous and light) as well as masonry. Based on the excellent viscous behaviour the application in hollow masonry material, in combination with a perforated plastic sleeve, is obvious. ESSVE ONE is characterised, by a huge range of applications with an installation temperature range 0°C up to +40°C and an application temperature range -40°C to +120°C after full curing. As well as by high chemical resistance for applications in extreme ambiences e.g. in swimming pools (chlorine) or in closeness to the sea (salt). The wide range of certificates, national and international approvals, allows nearly every application.

Properties and benefits

- European Technical Assessment for use in concrete (cracked and uncracked): ETA-18/0617
- European Technical Assessment for use in masonry: ETA-18/0642
- US-approval acc. to AC 308 for use in concrete (ICC-ES): ESR-2539
- Certificated for drinking water applications acc. to NSF/ANSI Standard 61
- Fire resistance test report: EBB 170019-24
- Installation in water-filled bore holes (e.g. rain water)
- Overhead application
- Low odour
- Suitable for attachment points with small edge- and anchor spacing distances due to an anchoring free of expansion forces (e.g. compared to wedge anchors)
- High chemical resistance
- High bending and pressure strength

Applications samples

Suitable for the fixation of facades, roofs, wood constructions, metal constructions; metal profile, columns, beams, consoles, railings, sanitary devices, cable trays, piping

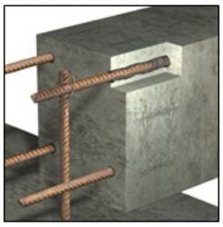
Handling and storage

Storage: Store in a cold and dark place, storage temperature: from +5°C up to +25 °C

Shelf life: Minimum 3 months for foil tubes.

Cartridge can be reused up to the end of the shelf life by replacing the static mixer or resealing cartridge with the sealing cap

Applications and intended use



Base material:
Cracked and uncracked concrete, light-concrete, porous-concrete, solid masonry, hollow brick, natural stone (Attention! natural stone, can discolour; shall be checked in advance);
Anchor elements:
Threaded rods (zinc plated or hot dip, stainless steel and high corrosion resistance steel), reinforcing bars, internal threaded rods, profiled rod, steel section with undercuts (e.g. perforated section)
Temperature range:
Installation temperature 0°C up to +40°C
Cartridge temperature min. +5°C; optimal +20°C
Base material temperature after full curing: -40°C to +120°C

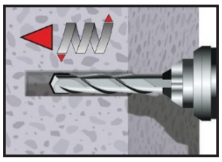
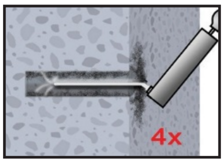
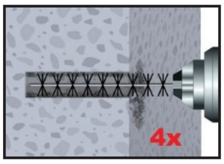
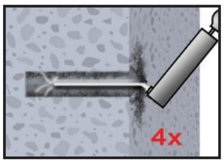
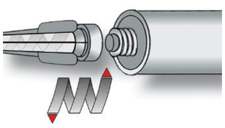
Mortar properties

Properties	Test Method	Result
UV resistance		Pass
Water tightness	EN 12390-8	0 mm
Temperature stability		120 °C
pH-value		> 12
Density		1,77 kg / dm³
Compressive strength	EN 196-1	100 N / mm²
Flexural strength	EN 196-1	15 N / mm²
E modulus	EN 196-1	14000 N / mm²
Shrinkage		< 0,3 %
Hardness Shore D		90
Electrical resistance	IEC 93	$3{,}6\ 10^{9}\ \Omega\cdot m$
Thermal conductivity	IEC 60093	0,65 W/m·K

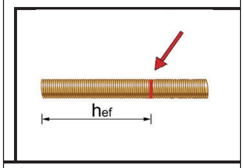
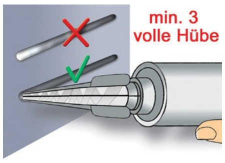
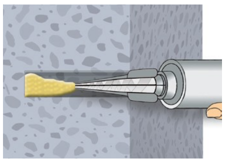
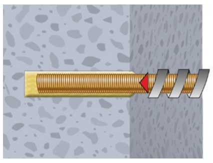
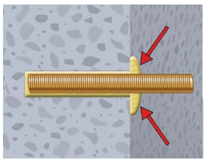
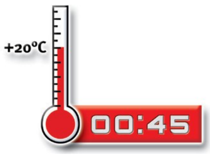
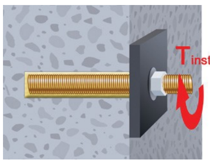
Curing time

Temperature of base material	Gelling- and working time	Full curing time in dry base material	Full curing time in wet base material
0 °C to +4°C	45 Min.	7 h	14 h
+5 °C to +9°C	25 Min.	2 h	4 h
+10 °C to +19°C	15 Min.	80 Min.	160 Min.
+20 °C to 29°C	6 Min.	45 Min.	90 Min.
+30 °C to 34°C	4 Min.	25 Min.	50 Min.
+35 °C to 39°C	2 Min.	20 Min.	40 Min.
+40°C	1,5 Min.	15 Min.	30 Min.

Usage instructions – concrete

	1. Drill with hammer drill mode a hole into the base material to the size and embedment depth required by the selected anchor (see page 6). In case of aborted drill hole: the drill hole shall be filled with mortar
 or	**Attention! Standing water must be removed before cleaning.** 2a. Starting from the bottom or back of the bore hole, blow the hole clean with compressed air (min. 6 bar) or a hand pump (see page 6) a minimum of four times. If the bore hole ground is not reached an extension shall be used. The hand pump [1] can only be used in uncracked concrete either for anchor sizes up to bore hole diameter 20 mm or embedment depth up to 240mm. Compressed air (min. 6 bar) can be used for all sizes in cracked and uncracked concrete. [1] It is permitted to blow bore holes with diameter between 14mm and 20mm and an embedment depth up to 240mm also in cracked concrete with hand pump.
	2b. Check brush diameter (page 6) and attach the brush to a drilling machine or a battery screwdriver. Brush the hole with an appropriate sized wire brush > $d_{b,min}$ (see page 6) a minimum of four times. If the bore hole ground is not reached with the brush, a brush extension shall be used.
 or	2c. Finally blow the hole clean again with compressed air (min. 6 bar) or a hand pump a minimum of four times. If the bore hole ground is not reached an extension shall be used. The hand pump [1] can only be used in uncracked concrete either for anchor sizes up to bore hole diameter 20 mm or embedment depth up to 240mm. Compressed air (min. 6 bar) can be used for all sizes in cracked and uncracked concrete. **After cleaning, the bore hole has to be protected against re-contamination in an appropriate way, until dispensing the mortar in the bore hole. If necessary, the cleaning has to be repeated directly before dispensing the mortar. In-flowing water must not contaminate the bore hole again.** [1] It is permitted to blow bore holes with diameter between 14mm and 20mm and an embedment depth up to 240mm also in cracked concrete with hand pump.
	3. Attach a supplied static-mixing nozzle to the cartridge and load the cartridge into the correct dispensing tool. After every working interruption longer than the recommended working time as well as for new cartridges, a new static-mixer shall be used.

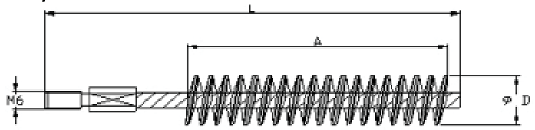
Usage instructions – concrete

	4. Prior to inserting the anchor rod into the filled bore hole, the position of the embedment depth shall be marked on the anchor rods.
	5. 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.
	6. Starting from the bottom resp. back of the cleaned anchor hole fill the hole up to approximately two-thirds with adhesive. Slowly withdraw of the static mixing nozzle as the hole is filled avoids creating air pockets. For embedment larger than 190mm an extension nozzle shall be used. For overhead and horizontal installation in bore holes bigger than 20mm resp. deeper than 240mm a piston plug shall be used. Observe the gel-/ working times given.
	7. Push the threaded rod or reinforcing bar 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 fo-reign material.
	8. Be sure that the anchor is fully seated at the bottom of the hole and that excess mortar is visible at the top of the hole. If these requirements are not maintained, the application has to be renewed.
	9. Allow the adhesive to cure to the specified time prior to applying any load or torque. Do not move or load the anchor until it is fully cured.
	10. After full curing, the add-on part can be installed with the max. torque by using a calibrated torque wrench.

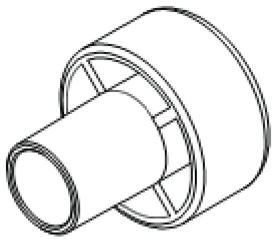
Cleaning of the drill hole – concrete

MAC - Hand pump (volume 750 ml)
Drill bit diameter (d0); 10 mm to 20 mm
Drill hole depth (h0) < 10 ds
Only uncracked concrete

CAC - compressed air tool (min. 6 bar)
Drill bit diameter (d0): all diameters



Steel brush
Drill bit diameter (d0): all diameters



Piston plug for overhead or horizontal installation
Drill bit diameter (d0): 18 mm to 40 mm

Threaded rod	Rebar	Bore hole-∅	Brush-∅	Min. brush-∅	Piston plug
(mm)	**(mm)**	**(mm)**	**d_b (mm)**	**$d_{b,min}$ (mm)**	**(No.)**
M 8		10,0	12,0	10,5	not necessary
M 10	8,0	12,0	14,0	12,5	
M 12	10,0	14,0	16,0	14,5	
	12,0	16,0	18,0	16,5	
M 16	14,0	18,0	20,0	18,5	
	16,0	20,0	22,0	20,5	
M 20	20,0	24,0	26,0	24,5	# 24
M 24		28,0	30,0	28,5	# 28
M 27	25,0	32,0	34,0	32,5	# 32
M 30	28,0	35,0	37,0	35,5	# 35
	32,0	40,0	41,5	40,5	# 38

ESSVE GET IT DONE

Setting parameter – concrete

Anchor size (Threaded rod)				**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
Edge distance		C_{cr,N_1}	[mm]	92	126	152	188	253	291	312	329
Min. edge distance	5,0 x d	C_{min}	[mm]	40	50	60	80	100	120	135	150
Axial distance		S_{cr,N_1}	[mm]	184	252	304	376	506	582	624	658
Min. axial distance	5,0 x d	S_{min}	[mm]	40	50	60	80	100	120	135	150
Embedment depth		h_{ef}	[mm]	80	90	110	125	170	210	250	270
Min. part thickness		h_{min}	[mm]	h_{ef} + 30 mm			$h_{ef} + 2d_0$				
Anchor diameter		d	[mm]	8	10	12	16	20	24	27	30
Drill diameter		d_0	[mm]	10	12	14	18	24	28	32	35
Max. installation torque		$T_{inst.}$	[Nm]	10	20	40	60	120	150	200	250

Anchor size (Rebar)				**Ø8**	**Ø10**	**Ø12**	**Ø14**	**Ø16**	**Ø20**	**Ø25**	**Ø28**	**Ø32**
Edge distance		C_{cr,N_1}	[mm]	92	126	152	173	188	253	303	323	341
Min. edge distance	5,0 x d	C_{min}	[mm]	40	50	60	70	80	100	125	140	160
Axial distance		S_{cr,N_1}	[mm]	184	252	304	346	376	506	606	646	682
Min. axial distance	5,0 x d	S_{min}	[mm]	40	50	60	70	80	100	125	140	160
Embedment depth		h_{ef}	[mm]	80	90	110	115	125	170	210	250	270
Min. part thickness		h_{min}	[mm]	h_{ef} + 30 mm	$h_{ef} + 2d_0$							
Anchor diameter		d	[mm]	8	10	12	14	16	20	25	28	32
Drill diameter		d_0	[mm]	12	14	16	18	20	24	32	35	40
Max. installation torque		$T_{inst.}$	[Nm]	10	20	40	50	60	120	150	200	250

Performance data – concrete

All data is based on Technical Assessment ETA 18/0617 (published 2018-07-12) and applies for:

- Correct installation according to ETA
- No edge distance and spacing influence. It's advised to use our calculation software ESSVE CS for more complicated design situations
- One typical embedment depth, as specified in the table. Including the minimum base material thickness dependant on this embedment depth
- Concrete C 20/25, $f_{ck,cube}$ = 25 N/mm²
- Temperature range I (min. base material temp. -40°C, max. long/short term base material temp.: +24°C/40°C)
- Steel failure mode is denoted with ***underline italics***
- Undersized hot dip galvanized threaded rods (e.g. 5.8U and 8.8U) have a reduced stress area in accordance with ISO 10684 Annex A. This lowers the steel capacity for M8 and M10, larger sizes are not affected
- The Design Resistance includes the partial safety factor for material γ_M and optimal installation safety factor (γ_{inst}), (e.g. dry/wet concrete rather than water-filled hole)
- The Recommended Loads use an overall partial safety factor for action γ = 1.4, which is an approximation of Eurocode EN 1990

Performance data – concrete

ESSVE ONE - Typical embedment depth

		M8	M10	M12	M16	M20	M24	M27	M30
Effective embedment depth, h_{ef}	[mm]	80	90	110	125	170	210	240	270
Minimum concrete thickness, h_{min}	[mm]	110	120	140	161	218	266	304	340

ESSVE ONE - Characteristic resistance, uncracked concrete, typical embedment depth

			M8	M10	M12	M16	M20	M24	M27	M30
Tension N_{Rk}	[kN]	5.8	*18.0*	33.9	49.8	70.6	111.9	153.7	187.8	224.0
		8.8	20.1	33.9	49.8	70.6	111.9	153.7	187.8	224.0
		A4-70	20.1	33.9	49.8	70.6	111.9	153.7	-	-
		HDG 5.8U	*17.0*	*27.0*	Same as for 5.8					
		HDG 8.8U	20.1	33.9	Same as for 8.8					

			M8	M10	M12	M16	M20	M24	M27	M30
Shear V_{Rk}	[kN]	5.8	*9.0*	*15.0*	*21.0*	*39.0*	*61.0*	*88.0*	*115.0*	*140.0*
		8.8	*15.0*	*23.0*	*34.0*	*63.0*	*98.0*	*141.0*	*184.0*	*224.0*
		A4-70	*13.0*	*20.0*	*30.0*	*55.0*	*86.0*	*124.0*	-	-
		HDG 5.8U	*8.0*	*13.0*	Same as for 5.8					
		HDG 8.8U	*14.0*	*22.0*	Same as for 8.8					

ESSVE ONE - Characteristic resistance, cracked concrete, typical embedment depth

			M8	M10	M12	M16	M20	M24	M27	M30
Tension N_{Rk}	[kN]	5.8	8.0	14.1	22.8	34.6	58.7	87.1	132.3	159.7
		8.8	8.0	14.1	22.8	34.6	58.7	87.1	132.3	159.7
		A4-70	8.0	14.1	22.8	34.6	58.7	87.1	-	-
		HDG 5.8U	8.0	14.1	Same as for 5.8					
		HDG 8.8U	8.0	14.1	Same as for 8.8					

			M8	M10	M12	M16	M20	M24	M27	M30
Shear V_{Rk}	[kN]	5.8	*9.0*	*15.0*	*21.0*	*39.0*	*61.0*	*88.0*	*115.0*	*140.0*
		8.8	16.1	*23.0*	*34.0*	69.1	117.5	*141.0*	*184.0*	*224.0*
		A4-70	*13.0*	*20.0*	*30.0*	*55.0*	*86.0*	*124.0*	-	-
		HDG 5.8U	*8.0*	*13.0*	Same as for 5.8					
		HDG 8.8U	16.1	*22.0*	Same as for 8.8					

Performance data – concrete

ESSVE ONE - Typical embedment depth

		M8	M10	M12	M16	M20	M24	M27	M30
Effective embedment depth, h_{ef}	[mm]	80	90	110	125	170	210	240	270
Minimum concrete thickness, h_{min}	[mm]	110	120	140	161	218	266	304	340

ESSVE ONE - Design resistance, non-cracked concrete, typical embedment depth

			M8	M10	M12	M16	M20	M24	M27	M30
Tension N_{Rd}	[kN]	5.8	*12.0*	18.8	27.6	39.2	62.2	85.4	104.3	124.5
		8.8	13.4	18.8	27.6	39.2	62.2	85.4	104.3	124.5
		A4-70	13.4	18.8	27.6	39.2	62.2	85.4	-	-
		HDG 5.8U	*11.3*	*18.0*	Same as for 5.8					
		HDG 8.8U	13.4	18.8	Same as for 8.8					

			M8	M10	M12	M16	M20	M24	M27	M30
Shear V_{Rd}	[kN]	5.8	*7.2*	*12.0*	*16.8*	*31.2*	*48.8*	*70.4*	*92.0*	*112.0*
		8.8	*12.0*	*18.4*	*27.2*	*50.4*	*78.4*	*112.8*	*147.2*	*179.2*
		A4-70	*8.3*	*12.8*	*19.2*	*35.3*	*55.1*	*79.5*	-	-
		HDG 5.8U	*6.4*	*10.4*	Same as for 5.8					
		HDG 8.8U	*11.2*	*17.6*	Same as for 8.8					

ESSVE ONE - Design resistance, cracked concrete, typical embedment depth

			M8	M10	M12	M16	M20	M24	M27	M30
Tension N_{Rd}	[kN]	5.8	5.4	7.9	12.7	19.2	32.6	48.4	73.5	88.7
		8.8	5.4	7.9	12.7	19.2	32.6	48.4	73.5	88.7
		A4-70	5.4	7.9	12.7	19.2	32.6	48.4	-	-
		HDG 5.8U	5.4	7.9	Same as for 5.8					
		HDG 8.8U	5.4	7.9	Same as for 8.8					

			M8	M10	M12	M16	M20	M24	M27	M30
Shear V_{Rd}	[kN]	5.8	*7.2*	*12.0*	*16.8*	*31.2*	*48.8*	*70.4*	*92.0*	*112.0*
		8.8	10.7	*18.4*	*27.2*	46.1	78.3	*112.8*	*147.2*	*179.2*
		A4-70	*8.3*	*12.8*	*19.2*	*35.3*	*55.1*	*79.5*	-	-
		HDG 5.8U	*6.4*	*10.4*	Same as for 5.8					
		HDG 8.8U	10.7	*17.6*	Same as for 8.8					

Performance data – concrete

ESSVE ONE - Typical embedment depth

		M8	M10	M12	M16	M20	M24	M27	M30
Effective embedment depth, h_{ef}	[mm]	80	90	110	125	170	210	240	270
Minimum concrete thickness, h_{min}	[mm]	110	120	140	161	218	266	304	340

ESSVE ONE - Recommended loads, non-cracked concrete, typical embedment depth

			M8	M10	M12	M16	M20	M24	M27	M30
Tension N_{rec}	[kg]	5.8	*870*	1370	2010	2855	4525	6215	7595	9065
		8.8	975	1370	2010	2855	4525	6215	7595	9065
		A4-70	975	1370	2010	2855	4525	6215	-	-
		HDG 5.8U	*825*	*1310*	Same as for 5.8					
		HDG 8.8U	975	1370	Same as for 8.8					

			M8	M10	M12	M16	M20	M24	M27	M30
Shear V_{rec}	[kg]	5.8	*520*	*870*	*1220*	*2270*	*3550*	*5125*	*6700*	*8155*
		8.8	*870*	*1340*	*1980*	*3670*	*5710*	*8215*	*10720*	*13050*
		A4-70	*605*	*930*	*1400*	*2565*	*4015*	*5785*	-	-
		HDG 5.8U	*465*	*755*	Same as for 5.8					
		HDG 8.8U	*815*	*1280*	Same as for 8.8					

ESSVE ONE - Recommended loads, cracked concrete, typical embedment depth

			M8	M10	M12	M16	M20	M24	M27	M30
Tension N_{rec}	[kg]	5.8	390	570	920	1395	2375	3520	5350	6460
		8.8	390	570	920	1395	2375	3520	5350	6460
		A4-70	390	570	920	1395	2375	3520	-	-
		HDG 5.8U	390	570	Same as for 5.8					
		HDG 8.8U	390	570	Same as for 8.8					

			M8	M10	M12	M16	M20	M24	M27	M30
Shear V_{rec}	[kg]	5.8	*520*	*870*	*1220*	*2270*	*3550*	*5125*	*6700*	*8155*
		8.8	780	*1340*	*1980*	3355	5705	*8215*	*10720*	*13050*
		A4-70	*605*	*930*	*1400*	*2565*	*4015*	*5785*	-	-
		HDG 5.8U	*465*	*755*	Same as for 5.8					
		HDG 8.8U	780	*1280*	Same as for 8.8					

Fire resistance – concrete

The table shows the decisive tensile fire resistance $N_{Rk,fi}$ of a one side fire exposure in uncracked concrete (minimum strength class C20/25). The tensile fire resistance $N_{Rk,fi}$ apply for a single anchor under tensile load with an edge distance greater than $c_{cr} = 2\ h_{ef}$ and a minimum spacing distance of $s = 2\ c_{cr} = 4\ h_{ef}$ to the adjacent anchor. Adhering to these edge and spacing distances ensures that a concrete cone failure is not decisive.

The resistance is applicable for anchor rods with a strength class of at least 5.8 (EN 1993-1-8:2005 +AC:2009). The same fire resistances can be assumed for threaded rods of stainless steel (A4) and high corrosion resistant steel (HCR) with a strength class of 70 (EN ISO 3506-1:2009).

If the edge distance c is chosen in a way, that steel failure / pull-out is determined in the fire design, the following resistance values can be also applied on anchors under shear load.

ESSVE ONE – Fire resistance $N_{Rk,fi}$ in uncracked C20/25 concrete (Test report EBB 170019-24)

Anchors Size	M8	M10	M12	M16	M20	M24	M27	M30
Minimum embedment depth $h_{ef,min}$ [mm]	≥ 80	≥ 90	≥ 110	≥ 125	≥ 170	≥ 210	≥ 250	≥ 280
Fire resistance duration t_u [min]	Fire resistance $N_{Rk,fi}$ [kN]							
R30	1,6	2,6	3,4	6,2	9,8	14,0	18,3	22,3
R60	1,1	1,8	2,6	4,8	7,5	10,8	14,1	17,2
R90	0,6	0,9	1,8	3,4	5,3	7,6	9,9	12,1
R120	0,3	0,5	1,4	2,7	4,2	6,0	7,9	9,6

Setting data – masonry

ESSVE ONE can also be used for anchorages in masonry, both hollow and solid bricks. For application in hollow bricks perforated sleeves need to be used.

solid bricks			M8	M10	M12	M16	IG-M6	IG-M8	IG-M10
nominal drill hole diameter	d_0	[mm]	10	12	14	18	10	12	16
embedment depth	h_{ef}	[mm]	80	90	100	100	90	100	100
bore hole depth	h_0	[mm]	80	90	100	100	90	100	100
diameter of clearance hole in fixture	d_f	[mm]	9	12	14	18	7	9	12
diameter of steel brush	$d_b \geq$	[mm]	12	14	16	20	12	14	18

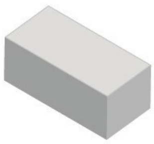
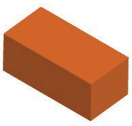
hollow and solid bricks			M8	M8	M10	M12	M16	IG-M6	IG-M8	IG-M10
perforated sleeve			12x80	16x85 16x130 16x200	16x85 16x130 16x200	20x85 20x130 20x200	20x85 20x130 20x200	16x85 16x130 16x200	20x85 20x130 20x200	20x85 20x130 20x200
nominal drill hole diameter	d_0	[mm]	12	16	16	20	20	16	20	20
embedment depth	h_{ef}	[mm]	80	85 130 200	85 130 200	85 130 200	85 130 200	85 130 200	85 130 200	85 130 200
bore hole depth	h_0	[mm]	85	90 135 205	90 135 205	90 135 205	90 135 205	90 135 205	90 135 205	90 135 205
diameter of clearance hole in fixture	d_f	[mm]	9	9	12	14	18	7	9	12
diameter of steel brush	$d_b \geq$	[mm]	14	18	18	22	22	18	22	22

Performance data – masonry

The technical data sheet contains a selection of the most common masonry bricks, more bricks can be found in the masonry ETA.

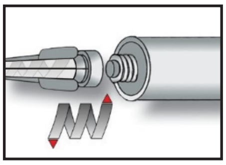
It is also possible to use the chemical anchor for stones not found in the ETA, but then construction site tests are necessary to obtain a load capacity, the results can be compared with similar bricks from the ETA, contact our technical support for assistance.

Common bricks from the masonry ETA:

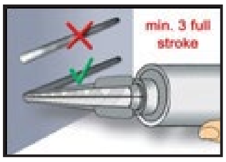
Type	Product	Dimensions l x b x h [mm]	Compressive strength [N/mm²]	Density [kg/dm³]	Producer
autoclaved aerated concrete AAC		≥ 499 x 240 x 249	≥ 6	≥ 0,6	e.g. Porrit (D)
solid calcium silica brick KS-NF		≥ 240 x 115 x 71	≥ 10	≥ 2,0	e.g. Wemding (D)
solid light weight concrete brick		≥ 300 x 123 x 248	≥ 2	≥ 0,6	e.g. Bisotherm (D)
solid clay brick Mz-1DF		≥ 240 x 115 x 55	≥ 10	≥ 1,6	e.g. Unipor (D)

Installation instructions – solid masonry

Preparation of cartridge

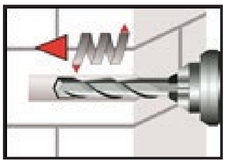


1. Remove the cap and attach the supplied static-mixing nozzle to the cartridge and load the cartridge into the correct dispensing tool. In case of a foil tube cartridge, cut off the clip before use. For every working interruption longer than the recom-mended working time (Table B4) as well as for new cartridges, a new static-mixer shall be used.

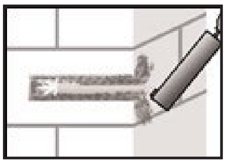
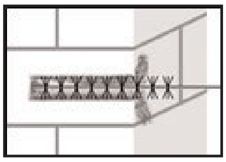
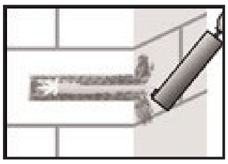


2. Initial adhesive is not suitable for fixing the anchor. Prior to dispensing into the anchor hole, squeeze out separately a minimum of three full strokes, for foil tube cartridges six full strokes and discard non-uniformly mixed adhesive components until the mortar shows a consistent grey colour.

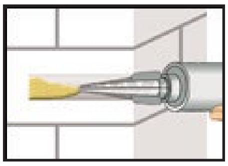
Installation in solid masonry (without sleeve)



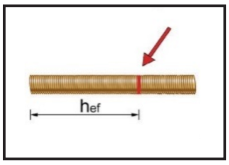
3. Holes to be drilled perpendicular to the surface of the base material by using a hard-metal tipped hammer drill bit. Drill a hole, with drilling method according to Annex C4-C45, into the base material, with nominal drill hole diameter and bore hole depth according to the size and embedment depth required by the selected anchor. In case of aborted drill hole the drill hole shall be filled with mortar.

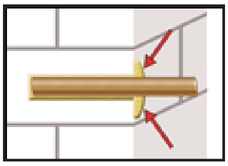
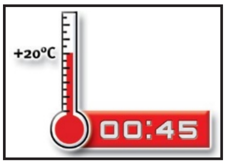
4. Blow out from the bottom of the bore hole two times. Attach the brush to a drilling machine or a battery screwdriver, brush the hole clean two times, and finally blow out the hole again two times.



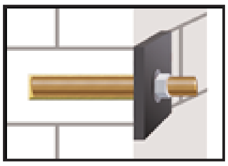
5. Starting from the bottom or back of the cleaned anchor hole, fill the hole up to min two-thirds with adhesive. Slowly withdraw the static mixing nozzle will avoid crea-ting air pockets. Observe the gel-/ working times given in Table B4.



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 dis-tribution of the adhesive until the embedment depth is reached. The anchor shall be free of dirt, grease, oil or other foreign material.

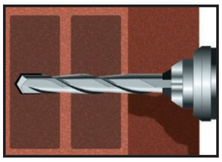
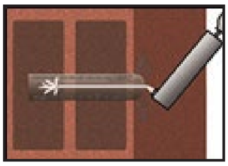
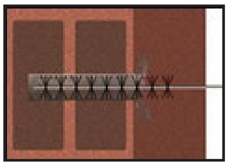
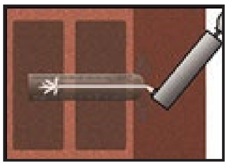
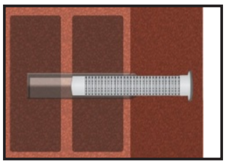
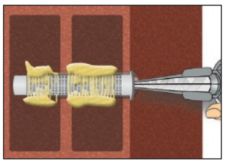
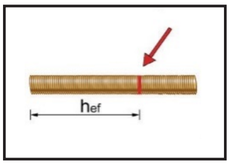
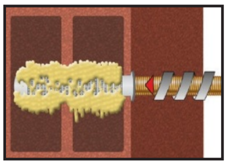
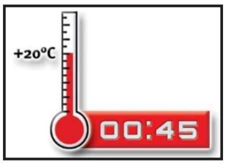
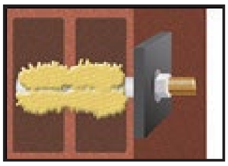



7. Be sure that the anular gap is fully filled with mortar. If no excess mortar is visible at the top of the hole, the application has to be renewed.
8. Allow the adhesive to cure to the specified curing time prior to applying any load or torque. Do not move or load the anchor until it is fully cured (attend Table B4).



9. After full curing, the fixture can be installed with up to the max. installation tor-que (see parameters of brick Annex C4 to Annex C45) by using a calibrated torque wrench.

Installation instructions – hollow masonry

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, with drill method according to Annex C4 - C45, into the base material, with nominal drill hole diameter and bore hole depth according to the size and embedment depth required by the selected anchor.
  	4. Blow out from the bottom of the bore hole two times. Attach the brush to a drilling machine or a battery screwdriver, brush the hole clean two times, and finally blow out the hole again two times.
	5. Insert the perforated sleeve flush with the surface of the masonry or plaster. Only use sleeves that have the right length. Never cut the sleeve.
	6. Starting from the bottom or back fill the sleeve with adhesive. For embedment depth equal to or larger than 130 mm an extension nozzle shall be used. For quantity of mortar attend cartridges label installation instructions. Observe the gel-/ working times given in Table B4.
 	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 shall 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 B4).
	9. After full curing, the fixture can be installed with up to the max. installation torque (See parameters of brick Annex C4 to Annex C45) by using a calibrated torque wrench.

Cleaning – masonry

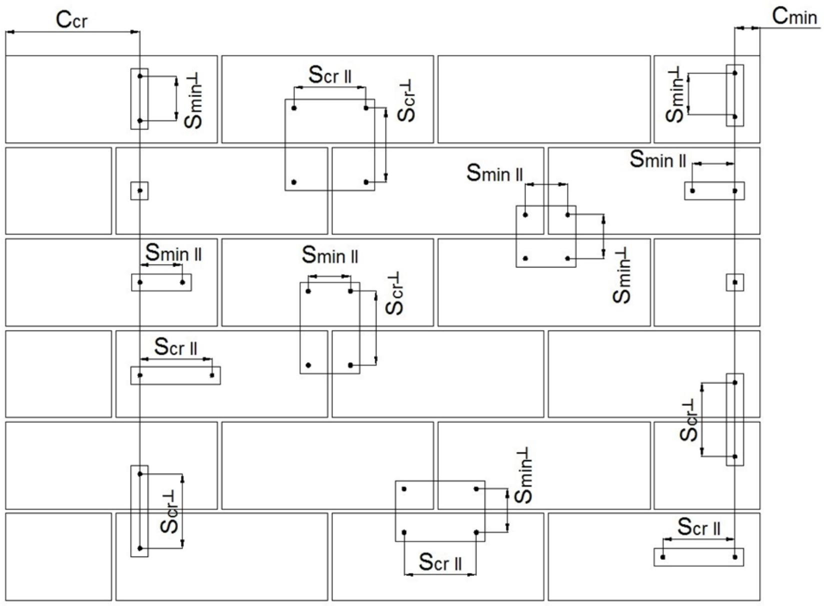
- Brush:

- Blower

Calculation of recommended loads

The recommended loads are only valid under the following conditions. For a more detailed design see ETA:

- dry environment
- spacing s ≥ s_{cr}
- edge distance c ≥ c_{cr}
- masonry mortar of strength class M2,5 to M9
- no prestressing force on the wall
- visible joints
- vertical joints are filled with mortar
- steel strength of anchor rod 5.8 or higher
- the partial safety factors for material and load are already considered
- no interaction of tension and shear loads considered



Recommended loads in masonry

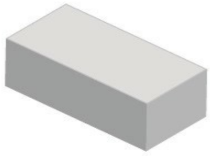
autocalved aerated concrete AAC		**dimensions** ≥ 499 x 249 x 240 mm	**compressive strength** ≥ 6 N/mm²	**density** ≥ 0,6 kg/dm³	**producer** e.g. Porit (D)

			M8	M10	M12	M16	IG M6	IG M8	IG M10
perforated sleeve			-	-	-	-	-	-	-
anchorage depth	h_{ef}	mm	80	90	100	100	90	100	100
minimum wall thickness	h_{min}	mm	240						
installation torque	T_{inst}	Nm	2						
drilling method			hammer drilling						
critical edge distance	c_{cr}	mm	120	135	150	150	135	150	150
critical axial distance parallel to horizontal joint	$s_{cr,II}$	mm	240	270	300	300	270	300	300
critical axial distance perpendicular to horizontal joint	$s_{cr,T}$	mm	240	270	300	300	270	300	300
minimal edge distance [2]	c_{min}	mm	75						
minimal axial distance [2]	s_{min}	mm	100						
recommended tension load [1]	N_{zul}	kN	0,89	1,43	1,79	2,32	1,43	1,79	2,32
recommended vertical shear load [1]	$V_{vert.}$	kN	2,14	3,03	3,57	3,57	1,79	3,21	3,57
recommended horizontal shear load [1]	$V_{hori.}$	kN	1,29	1,68	2,13	2,32	1,44	1,88	2,01

[1] Conditions and assumptions for the recommended loads, see page 16

[2] Reduction factors, see ETA

Recommended loads in masonry

solid calcium silica brick KS-NF		dimensions	compressive strength	density	producer
		≥ 240 x 115 x 71	≥ 10 N/mm²	≥ 2,0 kg/dm³	e.g. Wemding (D)

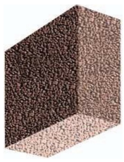
usage without perforated sleeve			M8	M10	M12	M16	IG M6	IG M8	IG M10
perforated sleeve			-	-	-	-	-	-	-
anchorage depth	h_{ef}	mm	80	90	100	100	90	100	100
minimum wall thickness	h_{min}	mm	115	240	240	240	240	240	240
installation torque	T_{inst}	Nm	2						
drilling method			hammer drilling						
critical edge distance	c_{cr}	mm	120	135	150	150	135	150	150
critical axial distance parallel to horizontal joint	$s_{cr,II}$	mm	240	270	300	300	270	300	300
critical axial distance perpendicular to horizontal joint	$s_{cr,T}$	mm	240	270	300	300	270	300	300
minimal edge distance [2)]	c_{min}	mm	60						
minimal axial distance [2)]	s_{min}	mm	120						
recommended tension load [1)]	N_{zul}	kN	1,53	1,53	1,53	1,43	1,53	1,53	1,43
recommended vertical shear load [1)]	$V_{vert.}$	kN	1,14						
recommended horizontal shear load [1)]	$V_{hori.}$	kN	1,14						

usage with perforated sleeve			M8	M8	M10	M12	M16	IG M6	IG M8	IG M10
perforated sleeve			12	16	16	20	20	16	20	20
anchorage depth	h_{ef}	mm	80	85; 130; 200						
minimum wall thickness	h_{min}	mm	115	h_{ef} + 30mm						
installation torque	T_{inst}	Nm	2							
drilling method			hammer drilling							
critical edge distance	c_{cr}	mm	120	127,5						
critical axial distance parallel to horizontal joint	$s_{cr,II}$	mm	240	255						
critical axial distance perpendicular to horizontal joint	$s_{cr,T}$	mm	240	255						
minimal edge distance [2)]	c_{min}	mm	60							
minimal axial distance [2)]	s_{min}	mm	120							
recommended tension load [1)]	N_{zul}	kN	1,53	1,43	1,43	1,14	1,14	1,43	1,14	1,14
recommended vertical shear load [1)]	$V_{vert.}$	kN	1,14							
recommended horizontal shear load [1)]	$V_{hori.}$	kN	1,14							

1) Conditions and assumptions for the recommended loads, see page 16

2) Reduction factors, see ETA

Recommended loads in masonry

solid light weight concrete brick LAC		**dimensions** ≥ 300 x 123x 248	**compressive strength** ≥ 2 N/mm²	**density** ≥ 0,6 kg/dm³	**producer** e.g. Bisotherm (D)

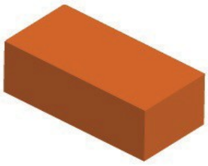
usage without perforated sleeve			M8	M10	M12	M16	IG M6	IG M8	IG M10
perforated sleeve			-	-	-	-	-	-	-
anchorage depth	h_{ef}	mm	80	90	100	100	90	100	100
minimum wall thickness	h_{min}	mm	300						
installation torque	T_{inst}	Nm	2						
drilling method			hammer drilling						
critical edge distance	c_{cr}	mm	120	135	150	150	135	150	150
critical axial distance parallel to horizontal joint	$s_{cr,II}$	mm	240	270	300	300	270	300	300
critical axial distance perpendicular to horizontal joint	$s_{cr,T}$	mm	240	270	300	300	270	300	300
minimal edge distance [2]	c_{min}	mm	60						
minimal axial distance [2]	s_{min}	mm	120						
recommended tension load [1]	N_{zul}	kN	0,86	0,86	1,00	0,86	0,86	1,00	0,86
recommended vertical shear load [1]	$V_{vert.}$	kN	0,86						
recommended horizontal shear load [1]	$V_{hori.}$	kN	0,60	0,78	0,86	0,86	0,67	0,86	0,86

usage with perforated sleeve			M8	M8	M10	M12	M16	IG M6	IG M8	IG M10
perforated sleeve			12	16	16	20	20	16	20	20
anchorage depth	h_{ef}	mm	80	85; 130; 200						
minimum wall thickness	h_{min}	mm	300							
installation torque	T_{inst}	Nm	2							
drilling method			hammer drilling							
critical edge distance	c_{cr}	mm	120	127,5						
critical axial distance parallel to horizontal joint	$s_{cr,II}$	mm	240	255						
critical axial distance perpendicular to horizontal joint	$s_{cr,T}$	mm	240	255						
minimal edge distance [2]	c_{min}	mm	60							
minimal axial distance [2]	s_{min}	mm	120							
recommended tension load [1]	N_{zul}	kN	0,71	0,86	0,86	0,71	0,71	0,86	0,71	0,71
recommended vertical shear load [1]	$V_{vert.}$	kN	0,86							
recommended horizontal shear load [1]	$V_{hori.}$	kN	0,67	0,81	0,81	0,86	0,86	0,81	0,86	0,86

[1] Conditions and assumptions for the recommended loads, see page 16

[2] Reduction factors, see ETA

Recommended loads in masonry

solid clay brick Mz-1DF		**dimensions** ≥ 240 x 115 x 55	**compressive strength** ≥ 10 N/mm²	**density** ≥ 1,6 kg/dm³	**producer** e.g. Unipor (D)

usage without perforated sleeve			M8	M10	M12	M16	IG M6	IG M8	IG M10
perforated sleeve			-	-	-	-	-	-	-
anchorage depth	h_{ef}	mm	80	90	100	100	90	100	100
minimum wall thickness	h_{min}	mm	115	240	240	240	240	240	240
installation torque	T_{inst}	Nm	14						
drilling method			hammer drilling						
critical edge distance	c_{cr}	mm	120	135	150	150	135	150	150
critical axial distance parallel to horizontal joint	$s_{cr,II}$	mm	240	270	300	300	270	300	300
critical axial distance perpendicular to horizontal joint	$s_{cr,T}$	mm	240	270	300	300	270	300	300
minimal edge distance [2]	c_{min}	mm	60						
minimal axial distance [2]	s_{min}	mm	120						
recommended tension load [1]	N_{zul}	kN	1,29	1,57	1,71	1,71	1,57	1,71	1,71
recommended vertical shear load [1]	$V_{vert.}$	kN	1,43	1,43	1,43	2,29	1,43	1,43	2,29
recommended horizontal shear load [1]	$V_{hori.}$	kN	1,43						

usage with perforated sleeve			M8	M8	M10	M12	M16	IG M6	IG M8	IG M10
perforated sleeve			12	16	16	20	20	16	20	20
anchorage depth	h_{ef}	mm	80	85; 130; 200						
minimum wall thickness	h_{min}	mm	115	h_{ef} + 30mm						
installation torque	T_{inst}	Nm	14							
drilling method			hammer drilling							
critical edge distance	c_{cr}	mm	120	127,5						
critical axial distance parallel to horizontal joint	$s_{cr,II}$	mm	240	255						
critical axial distance perpendicular to horizontal joint	$s_{cr,T}$	mm	240	255						
minimal edge distance [2]	c_{min}	mm	60							
minimal axial distance [2]	s_{min}	mm	120							
recommended tension load [1]	N_{zul}	kN	1,29	1,43						
recommended vertical shear load [1]	$V_{vert.}$	kN	1,43	1,43						
recommended horizontal shear load [1]	$V_{hori.}$	kN	1,43							

[1] Conditions and assumptions for the recommended loads, see page 16

[2] Reduction factors, see ETA

Chemical resistance

Chemical Agent	Concentration	Resistant	Not Resistant
Accumulator acid		✓	
Acetic acid	40		✓
Acetic acid	10	✓	
Acetone	10		✓
Ammonia, aqueous solution	5	✓	
Aniline	100		✓
Beer		✓	
Benzene (kp 100-140°F)	100	✓	
Benzol	100		✓
Boric Acid, aqueous solution		✓	
Calcium carbonate, suspended in water	all	✓	
Calcium chloride, suspended in water		✓	
Calcium hydroxide, suspended in water		✓	
Carbon tetrachloride	100	✓	
Caustic soda solution	10	✓	
Citric acid	all	✓	
Chlorine water, swimming pool	all	✓	
Diesel oil	100	✓	
Ethyl alcohol, aqueous solution	50		✓
Formic acid	100		✓
Formaldehyde, aqueous solution	30	✓	
Freon		✓	
Fuel Oil		✓	
Gasoline (premium grade)	100	✓	
Glycol (Ethylene glycol)		✓	
Hydraulic fluid	conc.	✓	
Hydrochloric acid (Muriatic Acid)	conc.		✓
Hydrogen peroxide	30		✓
Isopropyl alcohol	100		✓
Lactic acid	all	✓	
Linseed oil	100	✓	
Lubricating oil	100	✓	
Magnesium chloride, aqueous solution	all	✓	
Methanol	100		✓
Motor oil (SAE 20 W-50)	100	✓	
Nitric acid	10		✓
Oleic acid	100	✓	
Perchloroethylene	100	✓	
Petroleum	100	✓	
Phenol, aqueous solution	8		✓
Phosphoric acid	85	✓	
Potash lye (Potassium hydroxide)	10	✓	
Potassium carbonate, aqueous solution	all	✓	
Potassium chlorite, aqueous solution	all	✓	
Potassium nitrate, aqueous solution	all	✓	

Continued on the next page

Chemical resistance, continued

Chemical Agent	Concentration	Resistant	Not Resistant
Sea water, salty	all	✓	
Sodium carbonate	all	✓	
Sodium Chloride, aqueous solution	all	✓	
Sodium phosphate, aqueous solution	all	✓	
Sodium silicate	all	✓	
Standard Benzine	100	✓	
Sulfuric acid	10	✓	
Sulfuric acid	70		✓
Tartaric acid	all	✓	
Tetrachloroethylene	100	✓	
Toluene			✓
Trichloroethylene	100		✓
Turpentine	100	✓	

Results shown in the table are applicable to brief periods of chemical contact with full cured adhesive (e.g. temporary contact with adhesive during a spill).