

The versatile injection mortar for anchorings in masonry and cracked concrete



Rescue ladders



Column bases

BUILDING MATERIALS

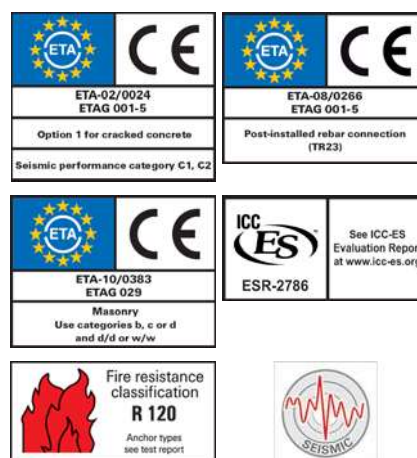
Approved for anchorings in:

- Concrete C20/25 to C50/60, cracked and non-cracked
- Hollow blocks made from lightweight concrete
- Hollow blocks made from concrete
- Vertically perforated brick
- Perforated sand-lime brick
- Solid sand-lime brick
- Aerated concrete
- Solid brick

Approved for:

- Rebar connections
- Remedial wall tie VBS 8
- Weather facing reconstruction system FWS II
- Stand-off installation Thermax

CERTIFICATES



ADVANTAGES

- The FIS V injection mortar has numerous system approvals, such as in cracked and non-cracked concrete, masonry and for special applications. FIS V is thus the universal injection mortar family with guaranteed reliability for practically all areas of application.
- FIS VW HIGH SPEED has a significantly shorter curing time than FIS V, thus also ensuring swift work progress even at low temperatures.
- FIS VS LOW SPEED with extended gelling time prevents premature curing of the mortar at higher temperatures and is ideally suited to large drill hole depths.
- The extensive range of accessories is ideally suited to the FIS V injection mortar family, increases the great flexibility of the system and thus allows for a broad range of applications.

APPLICATIONS

Injection mortar for use with:

- Threaded rods FIS A, see page 146
- Internal threaded anchor RG MI, see page 159
- Rebar anchor FRA, see page 179
- Concrete steel bars, see page 185
- Injection anchor sleeves FIS H, see page 167
- Aerated concrete centring sleeve PBZ, see page PL
- Remedial wall tie VBS 8, see page 187
- Weather facing reconstruction system FWS II, see page 189
- Anchorings in waterfilled drill holes (only FIS V 410 C)

FUNCTIONING

- The FIS V is a 2-component injection mortar based on vinyl ester hybrid.
- Resin and hardener are stored in two separate chambers and are not mixed and activated until extrusion through the static mixer.
- The injection cartridges are quick and easy to use with the fischer dispensers.
- Partially used cartridges can be reused, simply by changing the static mixer.

SEE ALSO



ANCHORS + SLEEVES

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DISPENSER

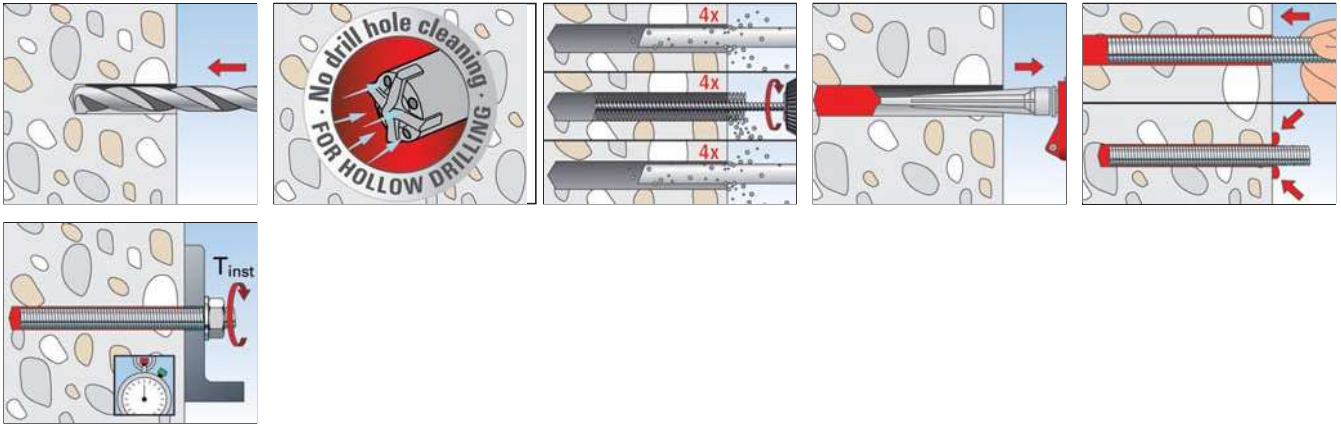
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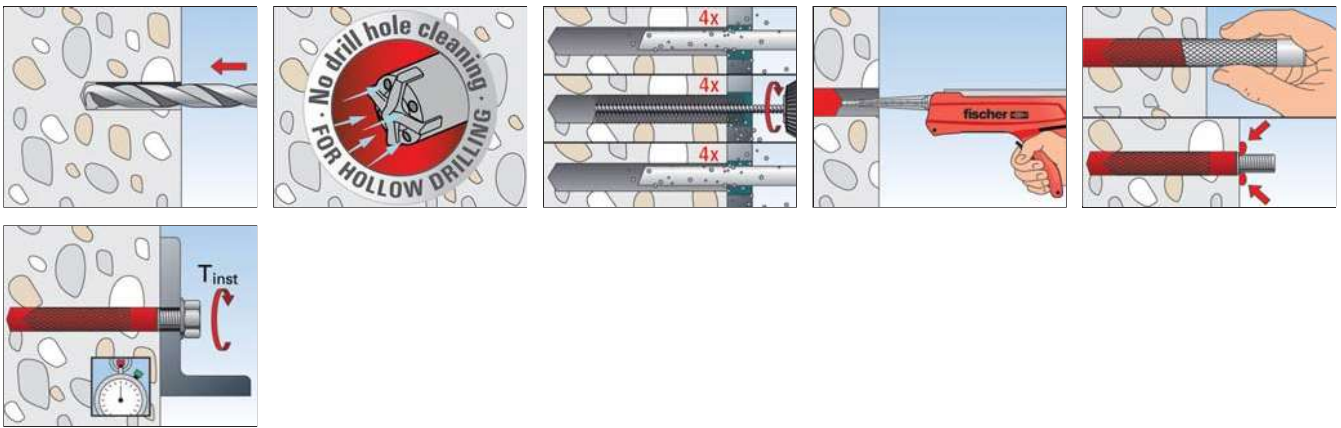
ACCESSORIES

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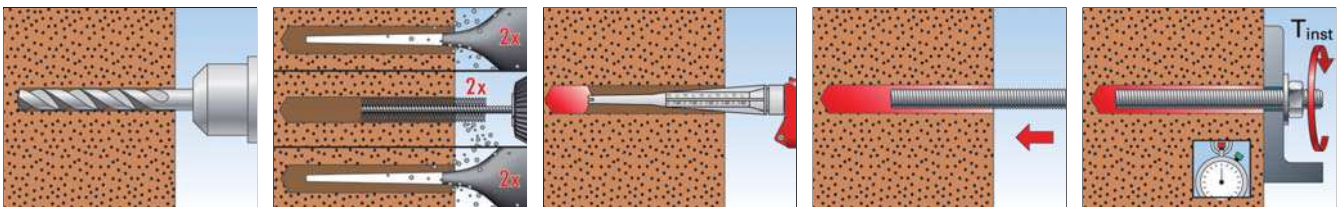
INSTALLATION IN CONCRETE WITH FIS V AND FIS A / RG M



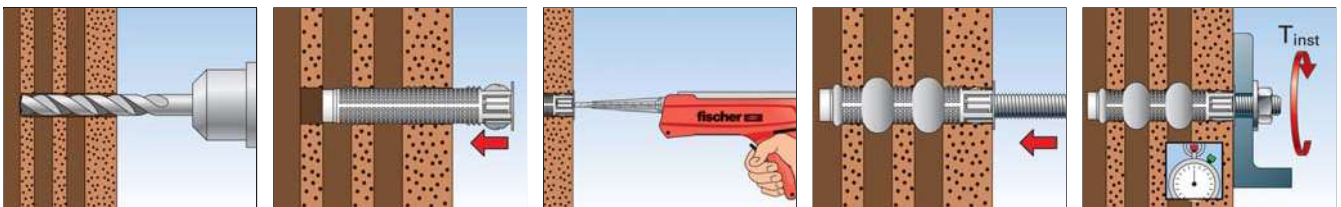
INSTALLATION IN CONCRETE WITH FIS V AND RG M I



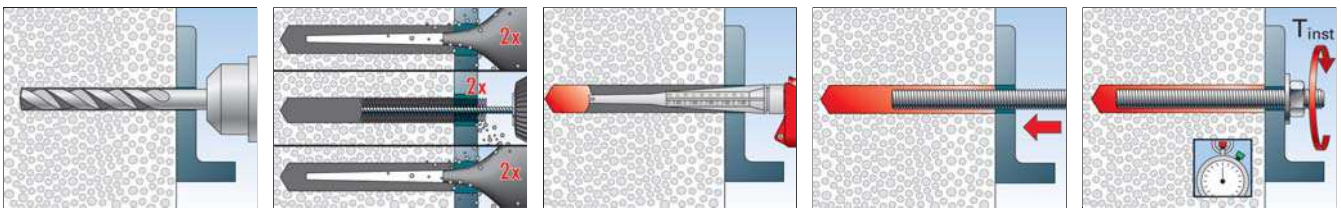
INSTALLATION IN SOLID BRICK WITH FIS V AND FIS A



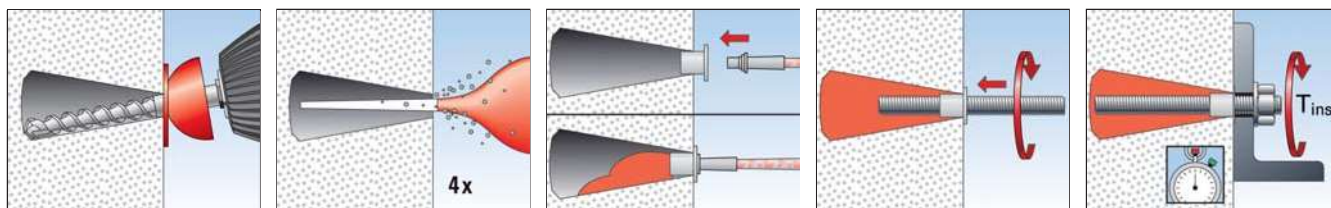
INSTALLATION IN HOLLOW BLOCKS WITH FIS V AND FIS HK + FIS A



INSTALLATION IN AERATED CONCRETE WITH FIS V AND FIS A / RG M



INSTALLATION IN UNDERCUT DRILL HOLE IN AERATED CONCRETE WITH FIS V AND FIS A / RG M



TECHNICAL DATA



Injection mortar **FIS V 300 T**



Injection mortar **FIS V 360 S**



Injection mortar **FIS V 410 C**



Static mixer **FIS MR Plus**

Item	Art.-No.	Approval			Languages on the cartridge	Scale unit	Contents	Sales unit
		DIBt	ETA	ICC				
FIS V 300 T	531573	●	■	▲	USA, RA, BR, MEX	150	1 cartridge 300 ml, 2 x FIS MR Plus	12
FIS V 360 S	094404	●	■	▲	DE, FR, NL, TR, HU, AR	180	1 cartridge 360 ml, 2 x FIS MR Plus	6
FIS V 360 S	094405	●	■	▲	EN, IT, PT, ES, ZH, JA	180	1 cartridge 360 ml, 2 x FIS MR Plus	6
FIS V 360 S	068435	●	■	▲	DA, SV, NO, FI, PL, EL	180	1 cartridge 360 ml, 2 x FIS MR Plus	6
FIS V 360 S	502283	●	■	▲	LT, LV, ET, UK, RU, KK	180	1 cartridge 360 ml, 2 x FIS MR Plus	6
FIS V 360 S	043994	●	■	▲	CS, SK, PL, HU, RO, RU	180	1 cartridge 360 ml, 2 x FIS MR Plus	6
FIS V 410 C	521431	●	■	▲	IT, EN, DE	200	1 cartridge 410 ml, 2 x FIS MR Plus	16
FIS V 410 C	534880	●	■	▲	PL, LT, LV, ET, RU	200	1 cartridge 410 ml, 2 x FIS MR Plus	12
FIS V 410 C	538131	●	■	▲	USA, RA, BR, MEX	200	1 cartridge 410 ml, 2 x FIS MR Plus	12
FIS MR Plus	545853	—	—	—	—	—	10 static mixer FIS MR Plus	10

TECHNICAL DATA



Injection mortar **FIS VW 300 T**



Injection mortar **FIS VW 360 S**



Injection mortar **FIS VW 380 C**



Static mixer **FIS MR Plus**

Item	Art.-No.	Approval		Languages on the cartridge	Scale unit	Contents	Sales unit
		DIBt	ETA				
FIS VW 300 T	507793	●	■	DE, EN, HR, SL, SR, BG	150	1 cartridge 300 ml, 2 x FIS MR Plus	12
FIS VW 300 T	507795	●	■	SV, DA, NO, CS, SK, PL, RU	150	1 cartridge 360 ml, 2 x FIS MR Plus	12
FIS VW 360 S	090753	●	■	DE, EN, FR, IT, NL, ES	180	1 cartridge 360 ml, 2 x FIS MR Plus	6
FIS VW 360 S	043997	●	■	CS, SK, PL, HU, RO, RU	180	1 cartridge 360 ml, 2 x FIS MR Plus	6
FIS VW 360 S	502284	●	■	RU, LT, LV, ET, UK, KK	180	1 cartridge 360 ml, 2 x FIS MR Plus	6
FIS VW 380 C	519328	●	■	CS, SK, PL	190	1 cartridge 380 ml, 2 x FIS MR Plus	12
FIS MR Plus	545853	—	—	—	—	10 static mixer FIS MR Plus	10

TECHNICAL DATA



Injection mortar
FIS VS 100 P



Injection mortar
FIS VS 150 C



Injection mortar
FIS VS 300 T



Injection mortar
FIS VS 360 S



Static mixer **FIS MR Plus**

Item	Art.-No.	Approval			Languages on the cartridge	Scale unit	Contents	Sales unit
		DIBt	ETA	ICC				
FIS VS 100 P	072525	●	■	▲	DE, EN, FR, IT, NL, ES	50	1 cartridge 100 ml, 2 x FIS MR Plus	6
FIS VS 150 C	045302	●	■	▲	DE, EN, FR, IT, NL, ES	70	1 cartridge 145 ml, 1 x FIS MR Plus	6
FIS VS 150 C Set	045303	●	■	▲	DE, EN, FR, IT, NL, ES	70	Set for hollow bricks: 1 cartridge 145 ml, 2 x FIS MR Plus, 6 x FIS H 16 x 85 K	6
FIS VS 300 T	093180	●	■	▲	DE, EN, FR, NL, ES, PT	150	1 cartridge 300 ml, 1 x FIS MR Plus	12
FIS VS 300 T	502285	●	■	▲	RU, LT, LV, ET, UK, KK	150	1 cartridge 300 ml, 1 x FIS MR Plus	12
FIS VS 300 T	044102	●	■	▲	CS, SK, PL, HU, RO, RU, EL	150	1 cartridge 300 ml, 1 x FIS MR Plus	12
FIS VS 300 T	093226	●	■	▲	PL, CS, DA, NO, SV, FI	150	1 cartridge 300 ml, 1 x FIS MR Plus	12
FIS VS 360 S	078664	●	■	▲	EN, ZH, ES, PT, JA	180	1 cartridge 360 ml, 2 x FIS MR Plus	6
FIS MR Plus	545853	—	—	—	—	—	10 static mixer FIS MR Plus	10



FIS V 360 S HWK small



FIS V 360 S HWK big



FIS V 360 S HWK big with dispenser FIS DM S

Item	Art.-No.	Approval			Languages on the cartridge	Contents	Sales unit
		DIBt	ETA	ICC			
FIS V 360 S HWK small	092430	●	■	▲	DE, FR, NL, TR, HU, AR	10 cartridges 360 ml, 20 x FIS MR Plus	1
FIS V 360 S HWK big	091936	●	■	▲	DE, FR, NL, TR, HU, AR	20 cartridges 360 ml, 40 x FIS MR Plus	1
FIS V 360 S HWK big	096554	●	■	▲	EN, IT, PT, ES, ZH, JA	20 cartridges 360 ml, 40 x FIS MR Plus	1
FIS V 360 S HWK big	503027	●	■	▲	CS, SK, PL, HU, RO, RU	12 cartridges 360 ml, 24 x FIS MR Plus, 1 x dispenser FIS DM S	1



FIS VS 300 T in bucket



FIS V 360 S in bucket



FIS V 410 in bucket

Item	Art.-No.	Approval			Languages on the cartridge	Contents	Sales unit
		DIBt	ETA	ICC			
FIS VS 300 T in bucket	512062	●	■	▲	DE, EN, FR, NL, ES, PT	20 cartridges 300 ml, 20 x FIS MR Plus	[pcs] 1
FIS V 360 S in bucket	503025	●	■	▲	EN, IT, PT, ES, ZH, JA	10 cartridges 360 ml, 20 x FIS MR Plus	1
FIS V 410 in bucket	531504	●	■	▲	EN, TR, RU	16 cartridge 410 ml, 32 x FIS MR Plus	1

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Chemical fixings



FIS VS 300 T in bucket



FIS VS 300 T HWK big



FIS VS 300 T HWK small

Item	Art.-No.	Approval			Languages on the cartridge	Contents	Sales unit
		DIBt	ETA	ICC			
FIS VS 300 T in bucket	518539	●	■	▲	CS, SK, PL, HU, RO, EL	20 cartridges 300 ml, 20 x FIS MR Plus	[pcs] 1
FIS VS 300 T HWK big	517645	●	■	▲	DE, EN, FR, NL, ES, PT	20 cartridges 300 ml, 40 x FIS MR Plus	1
FIS VS 300 T HWK small	518832	●	■	▲	DE, EN, FR, NL, ES, PT	10 cartridges 300 ml, 20 x FIS MR Plus	1

CURING TIME FIS V

Cartridge temperature (mortar)	Gelling time	Temperature at anchoring base	Curing time
		- 5°C - ± 0°C	24 hrs.
+ 0°C - + 5°C	13 min.	± 0°C - + 5°C	3 hrs.
+ 5°C - +10°C	9 min.	+ 5°C - +10°C	90 min.
+10°C - +20°C	5 min.	+10°C - +20°C	60 min.
+20°C - +30°C	4 min.	+20°C - +30°C	45 min.
+30°C - +40°C	2 min.	+30°C - +40°C	35 min.

The above times apply from the moment of contact between resin and hardener in the static mixer.
For installation, the cartridge temperature must be at least +5 °C. For longer installation times, i.e. when interruptions occur in work, the mixer should be replaced.

CURING TIME FIS VW HIGH SPEED

Cartridge temperature (mortar)	Gelling time	Temperature at anchoring base	Curing time
		-15°C - -10°C ¹⁾	12 hrs.
		-10°C - - 5°C ¹⁾	8 hrs.
- 5°C - ± 0°C ¹⁾	5 min.	- 5°C - ± 0°C	3 hrs.
0°C - + 5°C	5 min.	± 0°C - + 5°C	90 min.
+ 5°C - +10°C	3 min.	+ 5°C - +10°C	45 min.
+10°C - +20°C	1 min.	+10°C - +20°C	30 min.

¹⁾ Without approval.

The above times apply from the moment of contact between resin and hardener in the static mixer.

For installation, the cartridge temperature must be at least +5 °C. For longer installation times, i.e. when interruptions occur in work, the mixer should be replaced.

CURING TIME FIS VS LOW SPEED

Cartridge temperature (mortar)	Gelling time	Temperature at anchoring base	Curing time
		± 0°C - + 5°C	6 hrs.
+ 5°C - +10°C	20 min.	+ 5°C - +10°C	3 hrs.
+10°C - +20°C	10 min.	+10°C - +20°C	2 hrs.
+20°C - +30°C	6 min.	+20°C - +30°C	60 min.
+30°C - +40°C	4 min.	+30°C - +40°C	30 min.

The above times apply from the moment of contact between resin and hardener in the static mixer.

For installation, the cartridge temperature must be at least +5 °C. For longer installation times, i.e. when interruptions occur in work, the mixer should be replaced.

LOADS

Injection system FIS V: Injection mortar FIS V with Threaded rod FIS A ¹⁾

zinc plated steel / stainless steel / high corrosion resistant steel

Permissible loads of a single anchor in cracked normal concrete (concrete tension zone) of strength class C20/25 (~B25) ²⁾³⁾⁴⁾⁵⁾¹¹⁾										Minimum spacings while reducing the load		
Type	Material fixing element	Min. member thickness h_{min} [mm]	Effective anchorage depth $h_{ef}^{8)}$ [mm]	Maximum torque moment T_{max} [Nm]	Permissible tensile load $N_{perm}^{7)}$ [kN]	Permissible shear load $V_{perm}^{7)}$ [kN]	Required edge distance (with one edge) for		Required spacing for s_{cr} [mm]	Min. spacing $s_{min}^{8)9)}$ [mm]	Min. edge distance $c_{min}^{8)9)}$ [mm]	
							Max. tension load c [mm]	Max. shear load c [mm]				
FIS A M 10	5.8	100	60	20	5,4	8,6	90	185	180	45	45	
		120	90		8,1		125	155				
		230	200		13,8		85	110				
	8.8	100	60		5,4	10,8	90	235	180			
		120	90		8,1	13,3	125	255	270			
		230	200		18,0			150	600			
	A4-70	100	60		5,4	9,3	90	200	180			
		120	90		8,1		125	170	270			
		230	200		15,5		100	115	600			
	C-70	100	60		5,4	10,8	90	235	180			
		120	90		8,1	11,6	125	220	270			
		230	200		18,0			140	600			
FIS A M 12	5.8	100	70	40	7,5	12,0	105	255	210	55	55	
		140	110		11,8		145	195				330
		270	240		20,5		110	135				720
	8.8	100	70		7,5	15,1	105	330	210			
		140	110		11,8	19,3	145	340	330			
		270	240		25,9			200	720			
	A4-70	100	70		7,5	13,5	105	290	210			
		140	110		11,8		145	225	330			
		270	240		22,5		125	145	720			
	C-70	100	70		7,5	15,1	105	330	210			
		140	110		11,8	16,9	145	290	330			
		270	240		25,9			175	720			

LOADS

Injection system FIS V: Injection mortar FIS V with Threaded rod FIS A ¹⁾

zinc plated steel / stainless steel / high corrosion resistant steel

Permissible loads of a single anchor in cracked normal concrete (concrete tension zone) of strength class C20/25 (~B25) ^{2) 3) 4) 5) 11)}										Minimum spacings while reducing the load	
Type	Material fixing element	Min. member thickness	Effective anchorage depth	Maximum torque moment	Permissible tensile load	Permissible shear load	Required edge distance (with one edge) for		Required spacing for	Min. spacing	Min. edge distance
		h_{min} [mm]	$h_{ef}^{6)}$ [mm]	T_{max} [Nm]	$N_{perm}^{7)}$ [kN]	$V_{perm}^{7)}$ [kN]	Max. tension load c [mm]	Max. shear load c [mm]	Max. Load s_{cr} [mm]	$s_{min}^{8) 9)}$ [mm]	$c_{min}^{8) 9)}$ [mm]
FIS A M 16	5.8	120	80	60	11,5	22,3	120	445	240	65	65
		170	125		18,0		185	350	375		
		360	320		37,6		145	195	960		
	8.8	120	80		11,5	23,0	120	460	240		
		170	125		18,0	35,9	185	600	375		
		360	320		46,0		320	960			
	A4-70	120	80		11,5	23,0	120	460	240		
		170	125		18,0	25,2	185	400	375		
		360	320		42,0		165	215	960		
	C-70	120	80		11,5	23,0	120	460	240		
		170	125		18,0	31,4	185	515	375		
		360	320		46,0		270	960			
FIS A M 20	5.8	140	90	120	14,6	29,3	135	530	270	85	85
		220	170		28,0	34,9	225	455	510		
		450	400		58,6		195	260	1200		
	8.8	140	90		14,6	29,3	135	530	270		
		220	170		28,0	56,0	225	780	510		
		450	400		65,8		435	1200			
	A4-70	140	90		14,6	29,3	135	530	270		
		220	170		28,0	39,3	225	520	510		
		450	400		65,5		285	1200			
	C-70	140	90		14,6	29,3	135	530	270		
		220	170		28,0	49,0	225	670	510		
		450	400		65,8		370	1200			
FIS A M 24	5.8	160	96	150	15,5	31,0	145	520	290	105	105
		270	210		33,9	50,9	265	590	630		
		540	480		77,6		330	1440			
	8.8	160	96		15,5	31,0	145	520	290		
		270	210		33,9	67,9	265	825	630		
		540	480		77,6			570	1440		
	A4-70	160	96		15,5	31,0	145	520	290		
		270	210		33,9	56,6	265	670	630		
		540	480		77,6			360	1440		
	C-70	160	96		15,5	31,0	145	520	290		
		270	210		33,9	67,9	265	825	630		
		540	480		77,6			480	1440		
FIS A M 27	5.8	170	108	200	17,4	34,9	165	545	325	125	125
		310	250		40,4	65,7	290	695	750		
		600	540		87,2			390	1620		
	8.8	170	108		17,4	34,9	165	545	325		
		310	250		40,4	80,8	290	885	750		
		600	540		87,2			700	1620		
	A4-70	170	108		17,4	34,9	165	545	325		
		310	250		40,4	73,6	290	795	750		
		600	540		87,2			440	1620		
	C-70	170	108		17,4	34,9	165	545	325		
		310	250		40,4	80,8	290	885	750		
		600	540		87,2			590	1620		

LOADS

Injection system FIS V: Injection mortar FIS V with Threaded rod FIS A ¹⁾

zinc plated steel / stainless steel / high corrosion resistant steel

Permissible loads of a single anchor in cracked normal concrete (concrete tension zone) of strength class C20/25 (~B25) ^{2) 3) 4) 5) 11)}										Minimum spacings while reducing the load	
Type	Material fixing element	Min. member thickness	Effective anchorage depth	Maximum torque moment	Permissible tensile load	Permissible shear load	Required edge distance (with one edge) for		Required spacing for	Min. spacing	Min. edge distance
							Max. tension load c	Max. shear load c			
		h _{min} [mm]	h _{ef} ⁶⁾ [mm]	T _{max} [Nm]	N _{perm} ⁷⁾ [kN]	V _{perm} ⁷⁾ [kN]					
FIS A M 30	5.8	190	120	300	21,5	43,1	180	630	360	140	140
		350	280		50,3	80,6	320	795	840		
		670	600		107,7			440	1800		
	8.8	190	120		21,5	43,1	180	630	360		
		350	280		50,3	100,5	320	1035	840		
		670	600		107,7	128,2		805	1800		
	A4-70	190	120		21,5	43,1	180	630	360		
		350	280		50,3	89,9	320	905	840		
		670	600		107,7			505	1800		
	C-70	190	120		21,5	43,1	180	630	360		
		350	280		50,3	100,5	320	1035	840		
		670	600		107,7	112,2		675	1800		

For the design the complete assessment ETA-02/0024 has to be considered. ¹⁰⁾

¹⁾ Also valid for threaded rod RG M in the same property class.

²⁾ The partial safety factors for material resistance as regulated in the ETA-02/0024 as well as a partial safety factor for load actions of $\gamma_L = 1,4$ are considered. As an single anchor counts e.g. an anchor with a spacing $s \geq 3 \cdot h_{ef}$ and an edge distance $c \geq 1,5 \cdot h_{ef}$. Accurate data see ETA-02/0024.

³⁾ The given loads are valid for injection mortar FIS V for fixations in dry and humid concrete for temperatures in the substrate up to 50 °C (resp. short term up to 80 °C. For drill hole cleaning see ETA-02/0024.

⁴⁾ For higher concrete strength classes up to C50/60 higher permissible loads may be possible.

⁵⁾ Drill method hammer drilling. For further allowable application conditions see ETA-02/0024.

⁶⁾ For the sizes M10 - M30 the min. anchorage depth and the max. anchorage depth are given. The anchorage depth can be chosen freely between these borders.

⁷⁾ For combinations of tensile loads, shear loads, bending moments as well as reduced edge distances or spacings (anchor groups) see ETA-02/0024.

⁸⁾ Minimum possible axial spacings resp. edge distance while reducing the permissible load.

⁹⁾ Minimum possible spacing resp. edge distance while reducing the permissible load for the required minimum member thickness. The combination of minimum edge distance and minimum spacing is not possible. One of both values has to be increased acc. ETA-02/0024.

¹⁰⁾ The given loads refer to the European Technical Assessment ETA-02/0024, issue date 13/02/2017. Design of the loads according ETAG 001, Technical Report TR 029 (for static resp. quasi-static loads).

¹¹⁾ A reinforcement in the concrete to prevent splitting is required. The width of the cracks has to be limited under consideration of the splitting forces at $w_k \sim 0,3$ mm.

LOADS

Injection system FIS V: Injection mortar FIS V with Threaded rod FIS A ¹⁾

zinc plated steel / stainless steel / high corrosion resistant steel

Permissible loads of a single anchor in non-cracked normal concrete (concrete compression zone) of strength class C20/25 (~B25) ²⁾³⁾⁴⁾⁵⁾										Minimum spacings while reducing the load							
Type	Material fixing element	Min. member thickness	Effective anchorage depth	Maximum torque moment	Permissible tensile load	Permissible shear load	Required edge distance (with one edge) for		Required spacing for	Min. spacing	Min. edge distance						
							Max. tension load c	Max. shear load c				Max. Load s _{cr}	s _{min} ⁸⁾⁹⁾	c _{min} ⁸⁾⁹⁾			
		h _{min} [mm]	h _{ef} ⁶⁾ [mm]	T _{max} [Nm]	N _{perm} ⁷⁾ [kN]	V _{perm} ⁷⁾ [kN]	[mm]	[mm]	[mm]	[mm]	[mm]						
FIS A M 6	5.8	100	50	5	4,0	2,9	65	50	150	40	40						
			60		4,8				50			45	180				
			72		4,0		65	70					220				
	8.8	100	50		4,8	4,6			65			65	180				
			60		5,8								220				
			72		4,0		55	150									
	A4-70	100	50		4,8	3,2		60	50			180					
			60		5,4							220					
			72														
	FIS A M 8	5.8	100		60	10	7,9	5,1	90			70	180	40	40		
					80		9,0						40			60	240
					160		7,9		8,4			90					125
8.8		100	60	10,5	100		115	240									
			80	13,9				55		90	480						
			160	7,9					90		85	180					
A4-70		100	60	9,8	5,9		40					70	240				
			80	7,9				90		105			180				
			160	10,5					100		95		240				
C-70		100	60	12,2	7,3		40					80	480				
			80	9,9				8,6		90			125			180	
			160	13,8					115		105					270	
FIS A M 10		5.8	100	60	20		9,9					8,6				90	125
				90			13,8	45		85			600				
				200			9,9		13,3		90		200			180	
		8.8	100	60			14,8	125		170		270					
				90			22,1					70				115	600
				200			9,9		9,3		90		135				180
	A4-70	100	60	14,8		125	115	270									
			90	15,5				45		90		600					
			200	9,9					11,6		90	175	180				
	C-70	100	60	14,8		125	150						270				
			90	19,3				55		105			600				
			200	13,8					12,0		140	175	210				
FIS A M 12	5.8	100	70	40	13,8	12,0	165						130	330	55	55	
			110		20,5			55		100				720			
			240		13,8		140		295		210						
	8.8	100	70		21,7	180		230		330							
			110		32,1					85	150	720					
			240		13,8		140		200			210					
A4-70	100	70	21,7		13,5	180		150				330					
		110	22,5							55	110	720					
		240	13,8				140		255			210					
C-70	100	70	21,7		16,9	180		195				330					
		110	28,1							65	135	720					
		240															

LOADS

Injection system FIS V: Injection mortar FIS V with Threaded rod FIS A ¹⁾

zinc plated steel / stainless steel / high corrosion resistant steel

Permissible loads of a single anchor in non-cracked normal concrete (concrete compression zone) of strength class C20/25 (~B25) ^{2) 3) 4) 5)}										Minimum spacings while reducing the load		
Type	Material fixing element	Min. member thickness	Effective anchorage depth	Maximum torque moment	Permissible tensile load	Permissible shear load	Required edge distance (with one edge) for		Required spacing for	Min. spacing	Min. edge distance	
							Max. tension load c	Max. shear load c				Max. Load s _{cr}
		h _{min} [mm]	h _{ef} ⁶⁾ [mm]	T _{max} [Nm]	N _{perm} ⁷⁾ [kN]	V _{perm} ⁷⁾ [kN]	[mm]	[mm]	[mm]	[mm]	[mm]	
FIS A M 16	5.8	120	80	60	17,2	22,3	160	305	240	65	65	
		170	125		29,9		245	235	375			
		360	320		37,6		65	150	960			
	8.8	120	80		17,2	34,4	160	495	240			
		170	125		29,9	35,9	245	405	375			
		360	320		59,8	135	220	960				
	A4-70	120	80		17,2	25,2	160	350	240			
		170	125		29,9		245	270	375			
		360	320		42,0		70	165	960			
	C-70	120	80		17,2	31,4	160	445	240			
		170	125		29,9		245	350	375			
		360	320		52,3		105	195	960			
FIS A M 20	5.8	140	90	120	20,5	34,9	170	435	270	85	85	
		220	170		48,3		340	300	510			
		450	400		58,6		85	195	1200			
	8.8	140	90		20,5	41,1	170	525	270			
		220	170		48,3	56,0	340	510				
		450	400		93,3	230	290	1200				
	A4-70	140	90		20,5	39,3	170	500	270			
		220	170		48,3		340	345	510			
		450	400		65,5		95	215	1200			
	C-70	140	90		20,5	41,1	170	525	270			
		220	170		48,3	49,0	340	450	510			
		450	400		81,7	140	260	1200				
FIS A M 24	5.8	160	96	150	22,6	45,2	170	540	290	105	105	
		270	210		67,9		50,9	435	390			630
		540	480		84,3		105	250	1440			
	8.8	160	96		22,6	45,2	170	540	290			
		270	210		67,9	80,7	435	675	630			
		540	480		134,5	360	365	1440				
	A4-70	160	96		22,6	45,2	170	540	290			
		270	210		67,9	56,6	435	445	630			
		540	480		94,4	120	270	1440				
	C-70	160	96		22,6	45,2	170	540	290			
		270	210		67,9	70,6	435	580	630			
		540	480		117,7	235	325	1440				
FIS A M 27	5.8	170	108	200	27,0	54,0	195	605	325	125	125	
		310	250		85,8		65,7	495	460			750
		600	540		109,5		125	295	1620			
	8.8	170	108		27,0	54,0	195	605	325			
		310	250		85,8	104,9	495	805	750			
		600	540		174,9	500	450	1620				
	A4-70	170	108		27,0	54,0	195	605	325			
		310	250		85,8	73,6	495	530	750			
		600	540		122,7	155	320	1620				
	C-70	170	108		27,0	54,0	195	605	325			
		310	250		85,8	91,8	495	690	750			
		600	540		153,0	355	385	1620				

Chemical fixings 3

LOADS

Injection system FIS V: Injection mortar FIS V with Threaded rod FIS A ¹⁾

zinc plated steel / stainless steel / high corrosion resistant steel

Permissible loads of a single anchor in non-cracked normal concrete (concrete compression zone) of strength class C20/25 (~B25) ²⁾³⁾⁴⁾⁵⁾										Minimum spacings while reducing the load	
Type	Material fixing element	Min. member thickness	Effective anchorage depth	Maximum torque moment	Permissible tensile load	Permissible shear load	Required edge distance (with one edge) for		Required spacing for	Min. spacing	Min. edge distance
							Max. tension load c	Max. shear load c			
		h _{min} [mm]	h _{ef} ⁶⁾ [mm]	T _{max} [Nm]	N _{perm} ⁷⁾ [kN]	V _{perm} ⁷⁾ [kN]	[mm]	[mm]	[mm]	[mm]	[mm]
FIS A M 30	5.8	190	120	300	31,6	63,2	210	660	360	140	140
		350	280		106,8	80,6	595	525	840		
		670	600		133,8		140	330	1800		
	8.8	190	120		31,6	63,2	210	660	360		
		350	280		106,8	128,2	595	920	840		
		670	600		213,7		610	515	1800		
	A4-70	190	120		31,6	63,2	210	660	360		
		350	280		106,8	89,9	595	600	840		
		670	600		150,0		195	365	1800		
	C-70	190	120		31,6	63,2	210	660	360		
		350	280		106,8	112,2	595	785	840		
		670	600		187,0		445	435	1800		

For the design the complete assessment ETA-02/0024 has to be considered. ¹⁰⁾

¹⁾ Also valid for threaded rod RG M in the same property class.

²⁾ The partial safety factors for material resistance as regulated in the ETA-02/0024 as well as a partial safety factor for load actions of $\gamma_L = 1,4$ are considered. As an single anchor counts e.g. an anchor with a spacing $s \geq 3 \cdot h_{ef}$ and an edge distance $c \geq 1,5 \cdot h_{ef}$. Accurate data see ETA-02/0024.

³⁾ The given loads are valid for injection mortar FIS V for fixations in dry and humid concrete for temperatures in the substrate up to 50 °C (resp. short term up to 80 °C. For drill hole cleaning see ETA-02/0024.

⁴⁾ For higher concrete strength classes up to C50/60 higher permissible loads may be possible.

⁵⁾ Drill method hammer drilling. For further allowable application conditions see ETA-02/0024.

⁶⁾ For the sizes M6 - M30 the min. anchorage depth and the max. anchorage depth are given. The anchorage depth can be chosen freely between these borders.

⁷⁾ For combinations of tensile loads, shear loads, bending moments as well as reduced edge distances or spacings (anchor groups) see ETA-02/0024.

⁸⁾ Minimum possible axial spacings resp. edge distance while reducing the permissible load.

⁹⁾ Minimum possible spacing resp. edge distance while reducing the permissible load for the required minimum member thickness. The combination of minimum edge distance and minimum spacing is not possible. One of both values has to be increased acc. ETA-02/0024.

¹⁰⁾ The given loads refer to the European Technical Assessment ETA-02/0024, issue date 13/02/2017. Design of the loads according ETAG 001, Technical Report TR 029 (for static resp. quasi-static loads).

LOADS

Injection system FIS V: Injection mortar FIS V with Internal threaded anchor RG M I

zinc plated steel / stainless steel

Permissible loads of a single anchor in non-cracked normal concrete (concrete compression zone) of strength class C20/25 (~B25) ^{1) 2) 3)}										Minimum spacings while reducing the load	
Type	Screw material resp. screw surface	Min. member thickness h_{min} [mm]	Effective anchorage depth h_{ef} [mm]	Maximum torque moment T_{max} [Nm]	Permissible tensile load $N_{perm}^{4)}$ [kN]	Permissible shear load $V_{perm}^{4)}$ [kN]	Required edge distance (with one edge) for		Required spacing for Max. Load s_{cr} [mm]	Min. spacing $s_{min}^{5) 6)}$ [mm]	Min. edge distance $c_{min}^{5) 6)}$ [mm]
							Max. tension load c [mm]	Max. shear load c [mm]			
RG M 8 I	5.8	120	90	10	9,0	5,3	70	65	270	55	55
	8.8										
	A4-70										
RG M 10 I	5.8	130	90	20	13,8	8,3	105	90	270	65	65
	8.8										
	A4-70										
RG M 12 I	5.8	170	125	40	20,5	12,1	155	110	375	75	75
	8.8										
	A4-70										
RG M 16 I	5.8	210	160	80	35,7	22,4	240	180	480	95	95
	8.8										
	A4-70										
RG M 20 I	5.8	270	200	120	54,8	35,4	335	245	600	125	125
	8.8										
	A4-70										

For the design the complete assessment ETA-02/0024 has to be considered. ⁷⁾

¹⁾ The partial safety factors for material resistance as regulated in the ETA-02/0024 as well as a partial safety factor for load actions of $\gamma_L = 1,4$ are considered. As an single anchor counts e.g. an anchor with a spacing $s \geq 3 \cdot h_{ef}$ and an edge distance $c \geq 1,5 \cdot h_{ef}$. Accurate data see ETA-02/0024.

²⁾ For higher concrete strength classes up to C50/60 higher permissible loads may be possible.

³⁾ Drill method hammer drilling. For further allowable application conditions see ETA-02/0024.

⁴⁾ For combinations of tensile loads, shear loads, bending moments as well as reduced edge distances or spacings (anchor groups) see ETA-02/0024.

⁵⁾ Minimum possible axial spacings resp. edge distance while reducing the permissible load.

⁶⁾ Minimum possible spacing resp. edge distance while reducing the permissible load for the required minimum member thickness. The combination of minimum edge distance and minimum spacing is not possible. One of both values has to be increased acc. ETA-02/0024.

⁷⁾ The given loads refer to the European Technical Assessment ETA-02/0024, issue date 13/02/2017. Design of the loads according ETAG 001, Technical Report TR 029 (for static resp. quasi-static loads).

LOADS

Injection system FIS V with threaded rod FIS A ⁴⁾

Highest permissible loads¹⁾⁵⁾ for a single anchor in solid brick masonry (without injection anchor sleeve) for pre-positioned or push-through installation.

For the design the complete assessment ETA-10/0383 has to be considered.

Type	Compressive brick-strength f_b [N/mm ²]	Brick raw density ρ [kg/dm ³]	Minimum brick-dimensions ⁶⁾ (L x W x H) [mm]	Min. effective-anchorage depth h_{ef} [mm]	Min. member thickness h_{min} [mm]	Maximum torque $T_{inst,max}$ [Nm]	Permissible tensile load ³⁾ N_{perm} [kN]	Permissible shear load ³⁾ V_{perm} [kN]	Characteristic spacing parallel to bed joint $s_{cr \parallel}$ [mm]	Characteristic spacing perpendicular to bed joint $s_{cr \perp}$ [mm]	Min. spacing ²⁾ $s_{min \parallel} / s_{min \perp}$ [mm]	Characteristic resp. min. edge distance ²⁾ $c_{cr} = c_{min}$ [mm]							
Solid brick Mz, NF acc. to EN 771-1																			
M6	≥ 10	≥ 1,8	240x115x71 (NF)	50	115	4	1,14	0,71	240	75	240 / 75	100							
M8				50		10	1,14	0,71				100							
M10				50		10	1,00	1,14				100							
M10				80		10	1,43	1,14				100							
M10				200		10	3,42	2,43				150							
M12				50		10	0,86	1,14				100							
M12				80		10	1,57	1,14				100							
M12				200		10	2,29	3,29				150							
M6				≥ 20		≥ 1,8	240x115x71 (NF)	50				115	4	1,57	1,14	240	75	240 / 75	100
M8								50					10	1,57	1,14				100
M10								50					10	1,43	1,71				100
M10								80					10	2,00	1,71				100
M10	200	10	3,42		3,43			150											
M12	50	10	1,29		1,57			100											
M12	80	10	2,29	1,57	100														
M12	200	10	3,29	3,43	150														
Solid brick Mz, 2DF acc. to EN 771-1																			
M6	≥ 10	≥ 1,8	240x115x113 (2DF)	50	115	4	0,86	0,71	240	115	120 / 115	60							
M8				50		10	0,86	0,86					100						
M10				100		10	1,29	1,00					100						
M12				100		10	1,57	1,00					100						
M16	≥ 16	≥ 1,8	240x115x113 (2DF)	100	115	10	1,57	0,86	240	115	120 / 115	60							
M6				50		4	1,29	1,14					100						
M8				50		10	1,29	1,43					100						
M10				100		10	2,14	1,57					100						
M12				100		10	2,29	1,57					100						
M16	100	10	2,29	1,43	100														
Solid sand-lime brick KS acc. to EN 771																			
M6	≥ 10	≥ 2,0	250x240x240	50	240	4	1,43	0,71	250	240	80 / 80	60							
M8						10	2,00	1,29					100						
M10						10	2,00	1,29					100						
M12						10	2,00	1,29					100						
M16						10	1,57	1,29					100						
M6	≥ 20	≥ 2,0	250x240x240	50	240	4	2,14	1,14	250	240	80 / 80	60							
M8						10	2,57	1,86					100						
M10						10	2,57	1,86					100						
M12						10	2,57	1,86					100						
M16	10	2,14	1,86	100															
M6	≥ 28	≥ 2,0	250x240x240	50	240	4	2,43	1,43	250	240	80 / 80	60							
M8						10	2,57	2,57					100						
M10						10	2,57	2,57					100						
M12						10	2,57	2,57					100						
M16						10	2,57	2,57					100						

¹⁾ The required partial safety factors for material resistance as well as a partial safety factor for load actions of $\gamma_L = 1,4$ are considered.

²⁾ Minimum feasible spacings resp. edge distance. Details as well as to the distances to joints see assessment.

³⁾ For combinations of tensile loads, shear loads, bending moments as well as reduced edge distances or spacings (anchor groups) see assessment.

⁴⁾ Zinc-plated, stainless steel A4 and high corrosion-resistant steel C.

⁵⁾ The given loads are valid for installation and use of fixations in dry masonry - use category d/d - for temperatures in the substrate up to +50 °C (resp. short term up to 80 °C) and drill hole cleaning according to assessment. The given brick types in combination with the permissible loads are an extract of the assessment.

⁶⁾ Hole patterns see assessment.

LOADS

Injection system FIS V with threaded rod FIS A⁵⁾ and anchor sleeve FIS H..K

Highest permissible loads^{1) 6)} for a single anchor in solid brick masonry (with injection anchor sleeve) for pre-positioned installation. For the design the complete assessment ETA-10/0383 has to be considered.

Type of anchor sleeve with threaded rod	Compressive brick-strength f_b [N/mm ²]	Brick raw density ρ [kg/dm ³]	Minimum brick dimensions ⁹⁾ (L x W x H) [mm]	Min. effective anchorage depth ⁴⁾ h_{ef} [mm]	Min. member thickness h_{min} [mm]	Maximum torque $T_{inst,max}$ [Nm]	Permissible tensile load ³⁾ N_{perm} [kN]	Permissible shear load ³⁾ V_{perm} [kN]	Characteristic spacing parallel to bed joint $s_{cr \parallel}$ [mm]	Characteristic spacing perpendicular to bed joint $s_{cr \perp}$ [mm]	Min. spacing ²⁾ $s_{min \parallel} / s_{min \perp}$ [mm]	Characteristic resp. min. edge distance ²⁾ $c_{cr} = c_{min}$ [mm]
Solid brick Mz, 2DF acc. to EN 771-1												
16x85 M8	≥ 10	≥ 1,8	240x115x113 (2DF)	85	115	10	0,86	0,86	240	115	120 / 115	60
16x85 M10							0,86	1,00				
16x85 M8	≥ 16						1,29	1,43				
16x85 M10							1,29	1,57				
Solid sand-lime brick KS acc. to EN 771												
16x85 M8/M10	≥ 10	≥ 2,0	250x240x240	85	240	10	2,29	1,29	250	240	80 / 80	60
16x85 M8/M10	≥ 20						2,57	1,86				
16x85 M8/M10	≥ 28						2,57	2,57				
Lightweight concrete block Vbl acc. to EN 771-3												
12x85 M6	≥ 4	≥ 1,6	250x240x239	85	240	4	1,00	0,57	250	250	250 / 250	130
12x50 M8				50			0,57	0,86				
12x85 M8				85			1,00	0,86				
16x85 M10				85			1,14	1,00				
20x85 M12				85			1,43	1,29				
12x85 M6				≥ 6			85	1,43				
12x50 M8	50						0,86	1,29				
12x85 M8	85						1,43	1,29				
16x85 M8 / M10	85						1,86	1,57				
20x85 M12 / M16	85						2,14	1,86				
12x85 M6	≥ 8						85	2,00				
12x50 M8				50			1,14	1,71				
12x85 M8		85	2,00	1,71								
16x85 M8 / M10		85	2,43	2,00								
20x85 M12 / M16		85	2,57	2,43								

¹⁾ The required partial safety factors for material resistance as well as a partial safety factor for load actions of $\gamma_L = 1,4$ are considered.

²⁾ Minimum feasible spacings resp. edge distance. Details as well as to the distances to joints see assessment.

³⁾ For combinations of tensile loads, shear loads, bending moments as well as reduced edge distances or spacings (anchor groups) see assessment.

⁴⁾ The maximum anchorage depth is corresponding with the relevant anchor sleeves FIS H..K (see technical data).

⁵⁾ Zinc-plated, stainless steel A4 and high corrosion-resistant steel C.

⁶⁾ The given loads are valid for installation and use of fixations in dry masonry - use category d/d - for temperatures in the substrate up to +50 °C (resp. short term up to 80 °C) and drill hole cleaning according to assessment. The given brick types in combination with the permissible loads are an extract of the assessment.

⁷⁾ Hole patterns see assessment.

LOADS

Injection system FIS V with threaded rod FIS A⁵⁾ and anchor sleeve FIS H..K

Highest permissible loads^{1) 6)} for a single anchor in perforated brick masonry (with injection anchor sleeve) for pre-positioned installation. For the design the complete assessment ETA-10/0383 has to be considered.

Type of anchor sleeve with threaded rod	Compressive brick-strength f_b [N/mm ²]	Brick raw density ρ [kg/dm ³]	Minimum brick-dimensions ⁷⁾ (L x W x H) [mm]	Min. effective anchorage depth ⁴⁾ h_{ef} [mm]	Min. member thickness h_{min} [mm]	Maximum torque $T_{inst,max}$ [Nm]	Permissible tensile load ³⁾ N_{perm} [kN]	Permissible shear load ³⁾ V_{perm} [kN]	Characteristic spacing parallel to bed joint $s_{cr \parallel}$ [mm]	Characteristic spacing perpendicular to bed joint $s_{cr \perp}$ [mm]	Min. spacing ²⁾ $s_{min \parallel} / s_{min \perp}$ [mm]	Characteristic resp. min. edge distance ²⁾ $c_{cr} = c_{min}$ [mm]								
Vertically perforated brick Hlz, shape B acc. to EN 771-1																				
12x50 M6/M8	≥ 4	≥ 1,0	500x175x237 or 370x240x237	50	175	2,0	0,11	0,14	500 resp. 370	240	100 / 100	100								
16x85 M8/M10	≥ 4			85			0,26	0,14												
20x130 M12/M16	≥ 4			130			0,34	0,17												
12x50 M6/M8	≥ 8			50			0,21	0,26												
16x85 M8/M10	≥ 8			85			0,57	0,26												
20x130 M12/M16	≥ 8			130			0,71	0,34												
12x50 M6/M8	≥ 12			50			0,34	0,43												
16x85 M8/M10	≥ 12			85			0,86	0,43												
20x130 M12/M16	≥ 12			130			1,14	0,57												
Vertically perforated brick Hlz, acc. to EN 771-1																				
12x50 M6	≥ 6	≥ 1,4	240x115x113 (2DF)	50	115	2,0	0,21	0,34	240	115	240 / 115	80								
12x85 M8	≥ 6			85			0,34	0,57												
16x85 M8/M10	≥ 6			85			0,21	0,43												
20x85 M12/M16	≥ 6			85			0,26	0,71												
12x50 M6	≥ 16			50			0,57	0,86												
12x85 M8	≥ 16			85			0,86	1,57												
16x85 M8/M10	≥ 16			85			0,57	1,00												
20x85 M12/M16	≥ 16			85			0,71	1,57												
12x50 M6	≥ 28			50			1,00	1,43												
12x85 M8	≥ 28			85			1,57	1,57												
16x85 M8/M10	≥ 28			85			1,00	1,57												
20x85 M12/M16	≥ 28			85			1,29	1,57												
Perforated sand-lime brick KSL acc. to EN 771-2																				
12x50 M6/M8	≥ 12			≥ 1,4			240x175x113	50					175	2,0	0,71	0,71	240	115	100 / 115	60
16x85 M8/M10	≥ 12	85	0,86		1,29	80														
20x85 M12	≥ 12	85	1,00		1,29	60														
12x50 M6/M8	≥ 20	50	1,29		1,14	80														
16x85 M8/M10	≥ 20	85	1,43		2,14															
20x85 M12	≥ 20	85	1,71		2,14															
Lightweight concrete hollow block Hbl acc. to EN 771-3																				
12x50 M6/M8	≥ 2	≥ 1,0	362x240x240	50	240	2,0	0,34	0,26	362	240	100 / 240	60								
16x85 M8/M10	≥ 2			85			0,43	0,26												
20x200 M12/M16	≥ 2			180			0,71	0,26												
12x50 M6/M8	≥ 4			50			0,71	0,57												
16x85 M8/M10	≥ 4			85			0,86	0,57												
20x200 M12/M16	≥ 4			180			1,57	0,57												

¹⁾ The required partial safety factors for material resistance as well as a partial safety factor for load actions of $\gamma_L = 1,4$ are considered.

²⁾ Minimum feasible spacings resp. edge distance. Details as well as to the distances to joints see assessment.

³⁾ For combinations of tensile loads, shear loads, bending moments as well as reduced edge distances or spacings (anchor groups) see assessment.

⁴⁾ The maximum anchorage depth is corresponding with the relevant anchor sleeves FIS H..K (see technical data).

⁵⁾ Zinc-plated, stainless steel A4 and high corrosion-resistant steel C.

⁶⁾ The given loads are valid for installation and use of fixations in dry masonry - use category d/d - for temperatures in the substrate up to +50 °C (resp. short term up to 80 °C) and drill hole cleaning according to assessment. The given brick types in combination with the permissible loads are an extract of the assessment.

⁷⁾ Hole patterns see assessment.

LOADS

Injection system FIS V with threaded rod FIS A⁴⁾

Highest permissible loads^{1) 5)} for a single anchor in aerated concrete.

For the design the complete assessment ETA-10/0383 has to be considered.

Type threaded rod	Compressive brick strength f_b [N/mm ²]	Brick raw density ρ [kg/dm ³]	Minimum brick dimensions (L x W x H) [mm]	Min. effective anchorage depth h_{ef} [mm]	Min. member thickness h_{min} [mm]	Maximum torque $T_{inst,max}$ [Nm]	Permissible tensile load ³⁾ N_{perm} [kN]	Permissible shear load ³⁾ V_{perm} [kN]	Characteristic spacing parallel to bed joint $s_{cr \parallel}$ [mm]	Characteristic spacing perpendicular to bed joint $s_{cr \perp}$ [mm]	Min. spacing ²⁾ $s_{min \parallel} / s_{min \perp}$ [mm]	Characteristic resp. min. edge distance ²⁾ $c_{cr} = c_{min}$ [mm]																
Aerated concrete acc. to EN 771-4																												
M8 ⁶⁾	≥ 2	≥ 0,35	-	100	130	1	0,54	0,43	250	250	250	100																
M10 ⁶⁾							0,54	0,43																				
M12 ⁶⁾							0,71	0,54																				
M16 ⁶⁾	0,71	0,43																										
M8 ⁶⁾	≥ 4	≥ 0,50					-	100					130	1	0,71	0,89	250	250	250	100								
M10 ⁶⁾															1,07	0,71												
M12 ⁶⁾															0,89	0,89												
M16 ⁶⁾	0,71	0,71																										
M8 ⁶⁾	≥ 6	≥ 0,65													-	100					130	1	1,25	1,07	250	250	250	100
M10 ⁶⁾																							1,79	1,07				
M12 ⁶⁾																							1,79	1,25				
M16 ⁶⁾	1,07	1,61																										
M8, M10, M12 ⁷⁾	≥ 2	≥ 0,35	-	75	105	2			0,71	0,89	240	240											240	120				
M8, M10, M12 ⁷⁾	≥ 4	≥ 0,50							1,07	1,61																		
M8, M10, M12 ⁷⁾	≥ 6	≥ 0,65							1,43	2,14																		
M8, M10, M12 ⁷⁾	≥ 2	≥ 0,35							0,89	0,89																		
M8, M10, M12 ⁷⁾	≥ 4	≥ 0,50					1,25	1,61																				
M8, M10, M12 ⁷⁾	≥ 6	≥ 0,65					1,61	2,14																				
M8, M10, M12 ⁷⁾	≥ 2	≥ 0,35					-	95	125	2			0,89	0,89			300	250	300 / 250	150								
M8, M10, M12 ⁷⁾													≥ 4	≥ 0,50														
M8, M10, M12 ⁷⁾													≥ 6	≥ 0,65	1,61	2,14												

¹⁾ The required partial safety factors for material resistance as well as a partial safety factor for load actions of $\gamma_L = 1,4$ are considered.

²⁾ Minimum feasible spacings resp. edge distance. Details as well as to the distances to joints see assessment.

³⁾ For combinations of tensile loads, shear loads, bending moments as well as reduced edge distances or spacings (anchor groups) see assessment.

⁴⁾ Zinc-plated, stainless steel A4 and high corrosion-resistant steel C.

⁵⁾ The given loads are valid for installation and use of fixations in dry masonry - use category d/d - for temperatures in the substrate up to +50 °C (resp. short term up to 80 °C) and drill hole cleaning according to assessment. The given brick types in combination with the permissible loads are an extract of the assessment.

⁶⁾ Cylindrical drill hole. Pre-positioned and push-through installation possible.

⁷⁾ Drill hole to be made with cone drill bit PBB. Pre-positioned installation only.