

## The fixing system for anchorings in concrete

3  
Chemical fixings



Bridges for traffic signs



Steel constructions

### VERSIONS

- Zinc-plated steel
- Stainless steel

### BUILDING MATERIALS

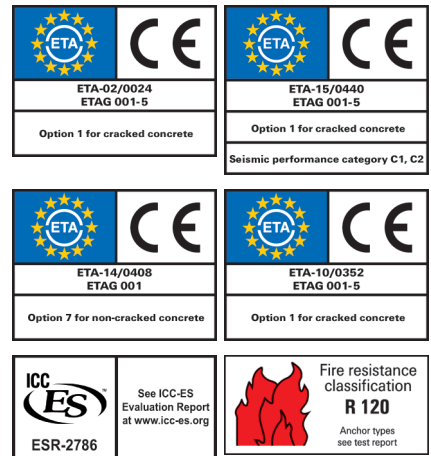
#### Approved for:

- Concrete C20/25 to C50/60, cracked and non-cracked

#### Also suitable for:

- Concrete C12/15

### CERTIFICATES



### ADVANTAGES

- The system comprising threaded rod FIS A and one of the injection mortars FIS V, FIS VW HIGH SPEED, FIS VS LOW SPEED, FIS EB, FIS VL for cracked concrete (M10 to M30) and non-cracked concrete (M6 to M30) or FIS GREEN for non-cracked concrete can be individually selected based on requirements, thus allowing for a wide range of applications.
- Variable anchorage depths allow for ideal adaptation to the load to be applied, and ensure an optimised installation time and use of materials.
- Push-through installation is possible without any special parts through filling the annular gap with injection mortar.
- The wide range of approved steel types allows for use in all corrosion resistance classes and offers maximum application safety.

### APPLICATIONS

- Steelwork constructions
- Timber constructions
- Guard rails
- Façades
- Staircases
- Steel brackets
- Machines
- Masts

### FUNCTIONING

- The system can be used with any of the following injection mortars: FIS V, FIS VW HIGH SPEED, FIS VS LOW SPEED, FIS EB, FIS VL and FIS GREEN.
- The injection system is suitable for pre-positioned and push-through installation when combined with threaded rod FIS A.
- The mortar is extruded bubble free from the drill hole base.
- The mortar bonds the entire surface of the threaded rod with the drill hole wall and seals the drill hole.
- The threaded rod is set manually, by lightly rotating it until it reaches the drill hole base.

### FOR USE WITH



**FIS V mortar**  
see page 113



**FIS GREEN mortar**  
see page 133

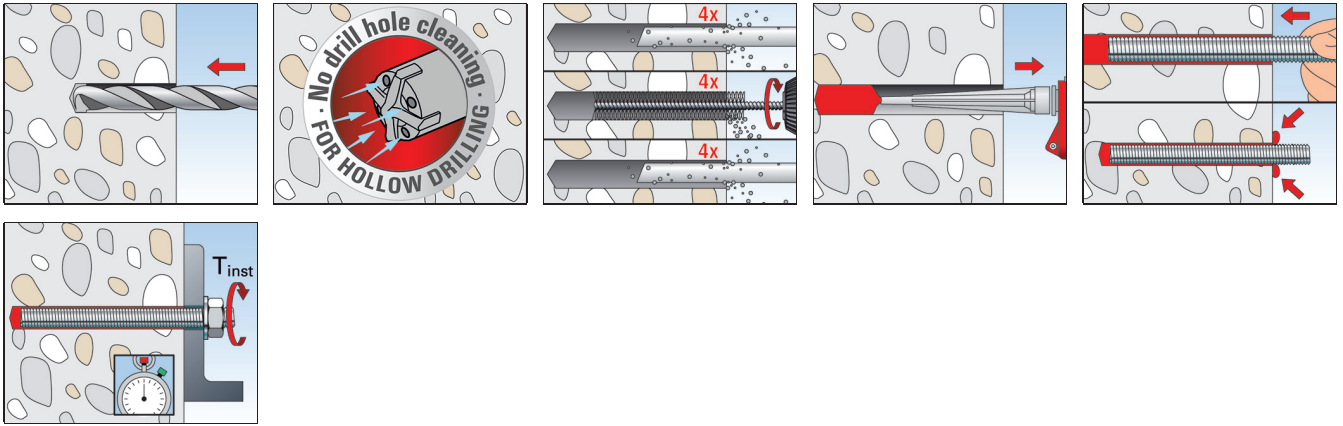


**FIS EB mortar**  
see page 109

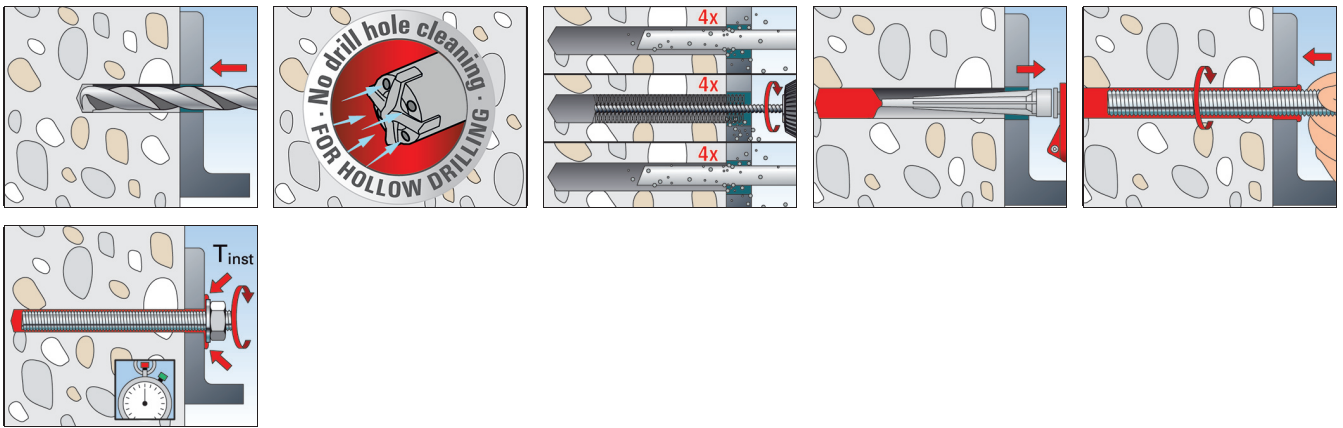


**FIS VL mortar**  
see page 119

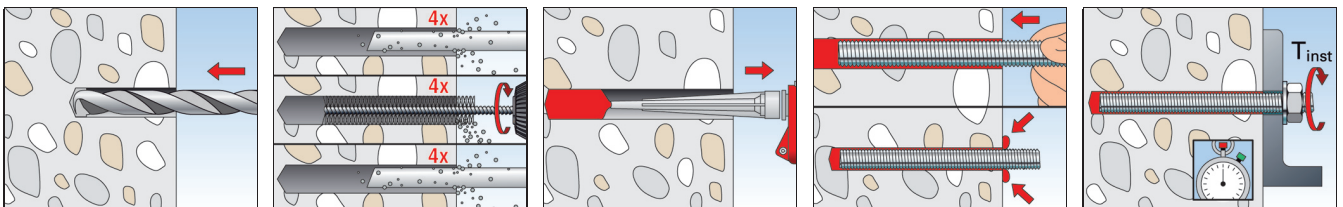
## PRE-POSITIONED INSTALLATION WITH FIS V



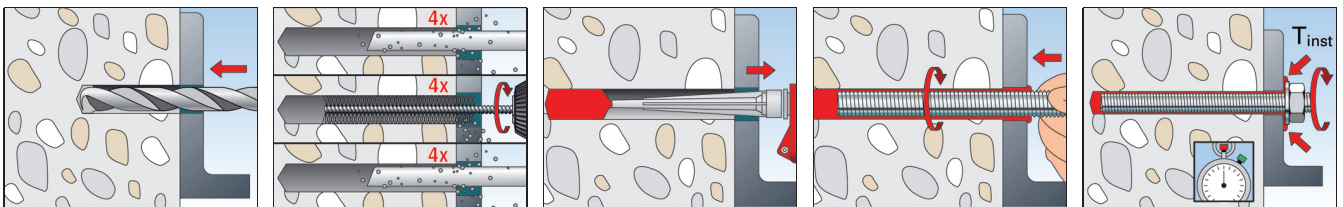
## PUSH-THROUGH INSTALLATION WITH FIS V



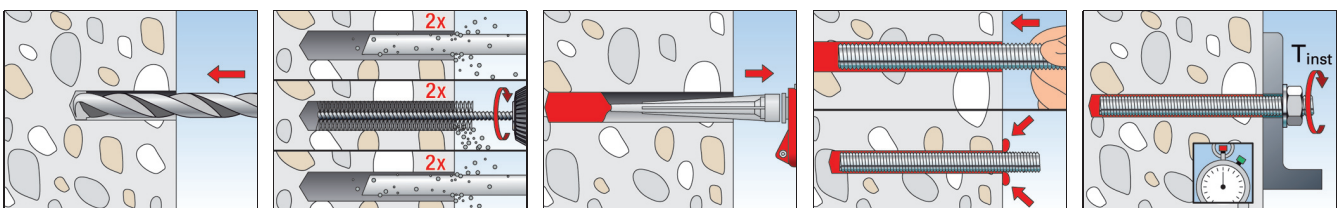
## PRE-POSITIONED INSTALLATION WITH FIS VL



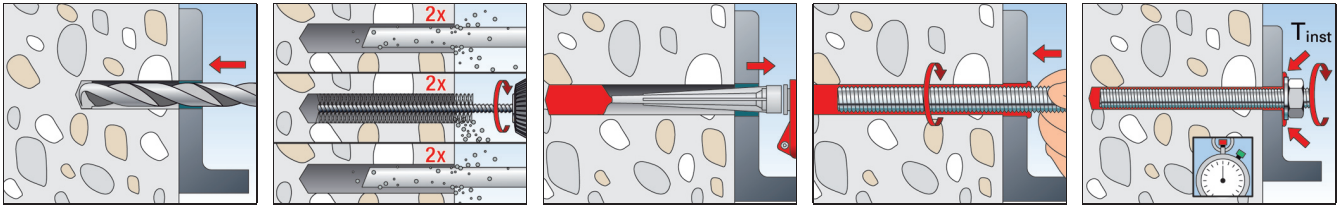
## PUSH-THROUGH INSTALLATION WITH FIS VL



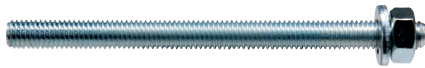
## PRE-POSITIONED INSTALLATION WITH FIS EB, FIS GREEN



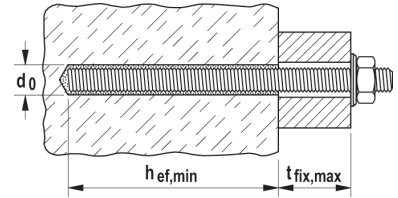
## PUSH-THROUGH INSTALLATION WITH FIS EB, FIS GREEN



## TECHNICAL DATA



Threaded rod FIS A



Item	zinc plated, steel grade 5.8	zinc plated, steel grade 8.8	stainless steel	Approval		Drill hole diameter	Min. / max. anchorage depth FIS V	Min. / max. usable length FIS V	Min. / max. filling quantity FIS V	Sales unit
	Art.-No.	Art.-No.	Art.-No.	ETA	ICC	$d_0$ [mm]	[mm]	[mm]	[scale units]	[pcs]
FIS A M 6 x 70	046204	—	—	■	—	8	50/61	1/12	2	10
FIS A M 6 x 75	090243	—	090437	■	—	8	50/66	1/17	2	20
FIS A M 6 x 85	090272	—	—	■	—	8	50/72	5/27	2	20
FIS A M 6 x 110	090273	—	090439	■	—	8	50/72	30/52	2	20
FIS A M 8 x 90	090274	519390	090440	■	▲	10	60/78	1/19	2 / 3	10
FIS A M 8 x 110	090275	519391	090441	■	▲	10	60/98	1/39	2 / 3	10
FIS A M 8 x 130	090276	519392	090442	■	▲	10	60/118	1/59	2 / 4	10
FIS A M 8 x 175	090277	519393	090443	■	▲	10	60/160	4/104	2 / 5	10
FIS A M 8 x 1000	509214 1)	509222 1)	509230 1)	■	▲	10	60/160	—	2 / 5	10
FIS A M 10 x 110	090278	—	090444	■	▲	12	60/96	1/37	3 / 4	10
FIS A M 10 x 130	090279	—	090447	■	▲	12	60/116	1/57	3 / 5	10
FIS A M 10 x 130	—	524170	—	■	▲	12	60/116	1/57	3 / 5	10
FIS A M 10 x 150	090281	517935	090448	■	▲	12	60/136	1/77	3 / 5	10
FIS A M 10 x 170	044969	519395	044973	■	▲	12	60/156	1/97	3 / 6	10
FIS A M 10 x 190	—	517936	—	■	▲	12	60/176	1/117	3 / 7	10
FIS A M 10 x 200	090282	519396	090449	■	▲	12	60/186	1/127	3 / 7	10
FIS A M 10 x 1000	509215 1)	509223 1)	509231 1)	■	▲	12	60/200	—	3 / 7	10
FIS A M 12 x 120	044971	519397	044974	■	▲	14	70/103	1/34	3 / 5	10
FIS A M 12 x 140	090283	519398	090450	■	▲	14	70/123	1/54	3 / 6	10
FIS A M 12 x 160	090284	517937	090451	■	▲	14	70/143	1/74	3 / 7	10
FIS A M 12 x 180	090285	519399	090452	■	▲	14	70/163	1/94	3 / 7	10
FIS A M 12 x 200	—	517938	—	■	▲	14	70/183	1-114	3 / 8	10
FIS A M 12 x 210	090286	—	090453	■	▲	14	70/193	1/124	3 / 9	10
FIS A M 12 x 260	090287	—	090454	■	▲	14	70/240	4/174	3 / 10	10
FIS A M 12 x 1000	509216 1)	509224 1)	509232 1)	■	▲	14	70/240	—	3 / 10	10
FIS A M 16 x 130	044972	519400	044975	■	▲	18	80/109	1/30	5 / 7	10
FIS A M 16 x 175	090288	519401	090455	■	▲	18	80/154	1/75	5 / 10	10
FIS A M 16 x 200	090289	517939	090456	■	▲	18	80/179	1/100	5 / 11	10
FIS A M 16 x 250	090290	517940	090457	■	▲	18	80/229	1/150	5 / 14	10
FIS A M 16 x 300	090291	519402	090458	■	▲	18	80/279	1/200	5 / 17	10
FIS A M 16 x 1000	509217 1)	509225 1)	509233 1)	■	▲	18	80-320	—	5 / 19	10
FIS A M 20 x 245	090292	519404	090459	■	▲	24	90/220	1/131	11/28	10
FIS A M 20 x 290	090293	519406	090460	■	▲	24	90/265	1/176	11/32	10
FIS A M 20 x 1000	—	519410 1)	519427 1)	■	▲	24	90/400	—	11/48	10
FIS A M 24 x 290	090294	—	090461	■	▲	28	96/260	1/165	15/69	5
FIS A M 24 x 380	090295	—	090462	■	▲	28	96/350	1/255	15/52	5

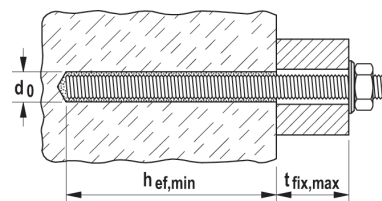
1) Order washer and nut separately.

FIS A M 6 x ... : ETA-Approval in combination with FIS V, FIS VW, FIS VS

## TECHNICAL DATA



Threaded rod FIS A



Item	zinc plated, steel grade 5.8	zinc plated, steel grade 8.8	stainless steel	Approval		Drill hole diameter	Min. / max. anchorage depth FIS V	Min. / max. usable length FIS V	Min. / max. filling quantity FIS V	Sales unit
	Art.-No.	Art.-No.	Art.-No.	ETA	ICC	$d_0$ [mm]	[mm]	[mm]	[scale units]	[pcs]
	gvz	gvz	A4							
<b>FIS A M 24 x 1000</b>	<b>533881</b>	—	—	■	▲	28	96/480	-	15/69	10
<b>FIS A M 30 x 430</b>	<b>090297</b>	—	<b>090464</b>	■	▲	35	120/394	1/275	28/88	5

1) Order washer and nut separately.

FIS A M 6 x ... : ETA-Approval in combination with FIS V, FIS VW, FIS VS

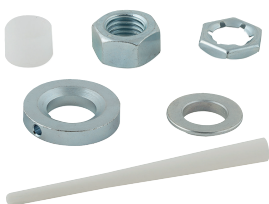
## TECHNICAL DATA



Hexagonal nut and washer

Item	zinc plated, steel grade 8.8	stainless steel	Width across nut $\circ$ SW [mm]	Washer (outer diameter x thickness) [mm]	Match	Sales unit [pcs]
	Art.-No.	Art.-No.				
	gvz	A4				
<b>Nut &amp; washer M8</b>	<b>510509</b>	<b>510513</b>	13	16 x 1,6	FIS A M8	50
<b>Nut &amp; washer M10</b>	<b>510510</b>	<b>510514</b>	17	20 x 2	FIS A M10	50
<b>Nut &amp; washer M12</b>	<b>510511</b>	<b>510515</b>	19	24 x 2,5	FIS A M12	25
<b>Nut &amp; washer M16</b>	<b>510512</b>	<b>510516</b>	24	30 x 3	FIS A M16	20
<b>Nut &amp; washer M20</b>	<b>519737</b>	<b>519738</b>	30	37 x 3	FIS A M20	10

## TECHNICAL DATA



Dynamic Sets for subsequent filling of the annular gap

Item	Art.-No.	For use with injection mortar	Match	Sales unit [pcs]
<b>Dyn-Set M 12</b>	<b>537218</b>	FIS SB, FIS EM, FIS V	FIS A M 12	10
<b>Dyn-Set M 16</b>	<b>537219</b>	FIS SB, FIS EM, FIS V	FIS A M 16	10
<b>Dyn-Set M 20</b>	<b>537220</b>	FIS SB, FIS EM, FIS V	FIS A M 20	10



## LOADS

### Injection system FIS V: Injection mortar FIS V with Threaded rod FIS A <sup>1)</sup>

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) <sup>2) 3) 4) 5) 11)</sup>										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 <sub>cr</sub>	s <sub>min</sub> <sup>8) 9)</sup>	c <sub>min</sub> <sup>8) 9)</sup>	
		h <sub>min</sub> [mm]	h <sub>ef</sub> <sup>6)</sup> [mm]	T <sub>max</sub> [Nm]	N <sub>perm</sub> <sup>7)</sup> [kN]	V <sub>perm</sub> <sup>7)</sup> [kN]	[mm]	[mm]	[mm]	[mm]	[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	270						
		230	200		13,8		85	110	600						
	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							
	FIS A M 16	5.8	120		80		60	11,5	22,3	120			445	240	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	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							

Chemical fixings 3

## LOADS

### Injection system FIS V: Injection mortar FIS V with Threaded rod FIS A <sup>1)</sup>

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) <sup>2) 3) 4) 5) 11)</sup>										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 <sub>min</sub> [mm]	h <sub>ef</sub> <sup>6)</sup> [mm]	T <sub>max</sub> [Nm]	N <sub>perm</sub> <sup>7)</sup> [kN]	V <sub>perm</sub> <sup>7)</sup> [kN]	[mm]	[mm]	[mm]	[mm]	[mm]
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	80,7	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	70,6	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	104,9	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	91,8	590	1620			
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. <sup>10)</sup>

<sup>1)</sup> Also valid for anchor rod RGM in the same property class.

<sup>2)</sup> 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.

<sup>3)</sup> 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.

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

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

<sup>6)</sup> 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.

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

<sup>8)</sup> Minimum possible axial spacings resp. edge distance while reducing the permissible load.

<sup>9)</sup> 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.

<sup>10)</sup> 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).

<sup>11)</sup> 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 <sup>1)</sup>**

zinc plated steel / stainless steel / high corrosion resistant steel

**Chemical fixings 3**

Permissible loads of a single anchor in non-cracked normal concrete (concrete compression zone) of strength class C20/25 (~B25) <sup>2)3)4)5)</sup>										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 <sub>cr</sub>	s <sub>min</sub> <sup>8)9)</sup>	c <sub>min</sub> <sup>8)9)</sup>	
		h <sub>min</sub> [mm]	h <sub>ef</sub> <sup>6)</sup> [mm]	T <sub>max</sub> [Nm]	N <sub>perm</sub> <sup>7)</sup> [kN]	V <sub>perm</sub> <sup>7)</sup> [kN]	[mm]	[mm]	[mm]	[mm]	[mm]				
<b>FIS A M 6</b>	5.8	100	50	5	4,0	2,9	65	50	150	40	40				
		110	60		4,8				180						
		110	72		4,0		220								
	8.8	100	50		4,0	4,6	65	70	150						
		110	60		4,8				180						
		110	72		5,8		220								
	A4-70	100	50		4,0	3,2	60	55	150						
		110	60		4,8				180						
		110	72		5,4		220								
<b>FIS A M 8</b>	5.8	100	60	10	7,9	5,1	90	70	180	40	40				
		110	80		9,0		80	240							
		190	160		40		60	480							
	8.8	100	60		7,9	8,4	90	125	180						
		110	80		10,5		100	115	240						
		190	160		13,9		55	90	480						
	A4-70	100	60		7,9	5,9	90	85	180						
		110	80		9,8		75	240							
		190	160		40		70	480							
	C-70	100	60		7,9	7,3	90	105	180						
		110	80		10,5		100	95	240						
		190	160		12,2		40	80	480						
	<b>FIS A M 10</b>	5.8	100		60	20	9,9	8,6	90			125	180	45	45
			120		90		13,8		115			105	270		
			230		200		45		85			600			
8.8		100	60	9,9	13,3		90	200	180						
		120	90	14,8			125	170	270						
		230	200	22,1			70	115	600						
A4-70		100	60	9,9	9,3		90	135	180						
		120	90	14,8			125	115	270						
		230	200	15,5			45	90	600						
C-70		100	60	9,9	11,6		90	175	180						
		120	90	14,8			125	150	270						
		230	200	19,3			55	105	600						
<b>FIS A M 12</b>	5.8	100	70	40	13,8	12,0	140	175	210	55	55				
		140	110		20,5		165	130	330						
		270	240		55		100	720							
	8.8	100	70		13,8	19,3	140	295	210						
		140	110		21,7		180	230	330						
		270	240		32,1		85	150	720						
	A4-70	100	70		13,8	13,5	140	200	210						
		140	110		21,7		180	150	330						
		270	240		22,5		55	110	720						
	C-70	100	70		13,8	16,9	140	255	210						
		140	110		21,7		180	195	330						
		270	240		28,1		65	135	720						

## LOADS

### Injection system FIS V: Injection mortar FIS V with Threaded rod FIS A <sup>1)</sup>

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) <sup>2)3)4)5)</sup>										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	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	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	80,7	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	56,6	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	70,6	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	104,9	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	73,6	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	91,8	355	385	1620			



## LOADS

### Injection system FIS V: Injection mortar FIS V with Threaded rod FIS A <sup>1)</sup>

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) <sup>2)3)4)5)</sup>										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 <sub>min</sub> [mm]	h <sub>ef</sub> <sup>6)</sup> [mm]	T <sub>max</sub> [Nm]	N <sub>perm</sub> <sup>7)</sup> [kN]	V <sub>perm</sub> <sup>7)</sup> [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. <sup>10)</sup>

<sup>1)</sup> Also valid for anchor rod RGM in the same property class.

<sup>2)</sup> 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.

<sup>3)</sup> 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.

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

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

<sup>6)</sup> 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.

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

<sup>8)</sup> Minimum possible axial spacings resp. edge distance while reducing the permissible load.

<sup>9)</sup> 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.

<sup>10)</sup> 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 VL: Injection mortar FIS VL with Threaded rod FIS A <sup>1)</sup>

zinc plated steel / stainless steel

Permissible loads of a single anchor in cracked normal concrete (concrete tension zone) of strength class C20/25 (~B25) <sup>2) 3) 4) 5) 11)</sup>										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 <sub>cr</sub>	s <sub>min</sub> <sup>8) 9)</sup>	c <sub>min</sub> <sup>8) 9)</sup>	
		h <sub>min</sub> [mm]	h <sub>ef</sub> <sup>6)</sup> [mm]	T <sub>max</sub> [Nm]	N <sub>perm</sub> <sup>7)</sup> [kN]	V <sub>perm</sub> <sup>7)</sup> [kN]	[mm]	[mm]	[mm]	[mm]	[mm]				
M10	5.8	100	60	20	4,5	8,6	90	185	180	45	45				
		120	90		6,7		125	160	270						
		230	200		13,8		110	125	600						
	8.8	100	60		4,5	10,8	90	235	180						
		120	90		6,7	13,3	125	260	270						
		230	200		15,0		180	600							
	A4-70	100	60		4,5		9,3	90	200			180			
		120	90		6,7	125		175	270						
		230	200		15,0	130		600							
	M12	5.8	100		70	40	6,3	12,0	105			255	210	55	55
			140		110		9,9		145			200	330		
			270		240		20,5		140			150	720		
8.8		100	70	6,3	15,1		105	330	210						
		140	110	9,9	19,3		145	345	330						
		270	240	21,5			235	720							
A4-70		100	70	6,3			13,5	105	290	210					
		140	110	9,9	145			230	330						
		270	240	21,5	165			720							
M16		5.8	120	80	60		9,6	22,3	120	445	240	65	65		
			170	125			15,0		185	350	375				
			360	320			37,6		225	960					
	8.8	120	80	9,6		23,0	120	460	240						
		170	125	15,0		35,9	185	600	375						
		360	320	38,3			380	960							
	A4-70	120	80	9,6			23,0	120	460	240					
		170	125	15,0		25,2	185	400	375						
		360	320	38,3			250	960							
	M20	5.8	140	90			120	12,2	29,3	135	530			270	85
			220	170		23,3		225		460	510				
			450	400		54,9		300		1200					
8.8		140	90	12,2	29,3	135		530	270						
		220	170	23,3	56,0	225		785	510						
		450	400	54,9		520		1200							
A4-70		140	90	12,2		29,3		135	530	270					
		220	170	23,3	39,3	225		525	510						
		450	400	54,9		345		1200							

For the design the complete assessment ETA-10/0352 has to be considered. <sup>10)</sup>

<sup>1)</sup> Also valid for anchor rod RGM in the same property class.

<sup>2)</sup> The partial safety factors for material resistance as regulated in the ETA-10/0352 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-10/0352.

<sup>3)</sup> The given loads are valid for injection mortar FIS VL 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-10/0352.

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

<sup>5)</sup> Drill method hammer drilling. For further allowable application conditions see ETA-10/0352.

<sup>6)</sup> For the sizes M10 - M20 the min. anchorage depth and the max. anchorage depth are given. The anchorage depth can be chosen freely between these borders.

<sup>7)</sup> For combinations of tensile loads, shear loads, bending moments as well as reduced edge distances or spacings (anchor groups) see ETA-10/0352.

<sup>8)</sup> Minimum possible axial spacings resp. edge distance while reducing the permissible load.

<sup>9)</sup> 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-10/0352.

<sup>10)</sup> The given loads refer to the European Technical Assessment ETA-10/0352, issue date 10/08/2017. Design of the loads according ETAG 001, Technical Report TR 029 (for static resp. quasi-static loads).

<sup>11)</sup> 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 VL: Injection mortar FIS VL with Threaded rod FIS A <sup>1)</sup>

zinc plated steel / stainless steel

3  
Chemical fixings

Permissible loads of a single anchor in non-cracked normal concrete (concrete compression zone) of strength class C20/25 (~B25) <sup>2)3)4)5)</sup>										Minimum spacings while reducing the load	
Type	Material fixing element	Min. member thickness $h_{min}$ [mm]	Effective anchorage depth $h_{ef}^{6)}$ [mm]	Maximum torque moment $T_{max}$ [Nm]	Permissible tensile load $N_{perm}^{6)}$ [kN]	Permissible shear load $V_{perm}^{6)}$ [kN]	Required edge distance (with one edge) for		Required spacing for  Max. Load $s_{cr}$ [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]			
<b>M6</b>	5.8	100	50	5	3,4	2,9	65	50	150	40	40
			60		4,0				180		
			72		4,8				220		
	8.8	100	50		3,4	4,6		70	150		
			60		4,0				180		
			72		4,8				220		
	A4-70	100	50		3,4	3,2		55	150		
			60		4,0				180		
			72		4,8				220		
<b>M8</b>	5.8	100	60	10	6,6	5,1	90	70	180	40	40
			80		8,8				240		
			160		9,0				480		
	8.8	100	60		6,6	8,4		125	180		
			80		8,8				240		
			160		13,9				480		
	A4-70	100	60		6,6	5,9		85	180		
			80		8,8				240		
			160		9,8				480		
<b>M10</b>	5.8	100	60	20	8,2	8,6	90	125	180	45	45
			90		12,3				270		
			200		13,8				600		
	8.8	100	60		8,2	13,3		200	180		
			90		12,3				270		
			200		22,1				600		
	A4-70	100	60		8,2	9,3		135	180		
			90		12,3				270		
			200		15,5				600		
<b>M12</b>	5.8	100	70	40	11,5	12,0	140	175	210	55	55
			110		18,1				330		
			240		20,5				720		
	8.8	100	70		11,5	19,3		295	210		
			110		18,1				330		
			240		32,1				720		
	A4-70	100	70		11,5	13,5		200	210		
			110		18,1				330		
			240		22,5				720		
<b>M16</b>	5.8	120	80	60	14,3	22,3	160	305	240	65	65
			125		24,9				375		
			320		37,6				960		
	8.8	120	80		14,3	34,4		495	240		
			125		24,9				375		
			320		59,8				960		
	A4-70	120	80		14,3	25,2		350	240		
			125		24,9				375		
			320		42,0				960		

## LOADS

### Injection system FIS VL: Injection mortar FIS VL with Threaded rod FIS A <sup>1)</sup>

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) <sup>2)3)4)5)</sup>										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 <sub>cr</sub>
		h <sub>min</sub> [mm]	h <sub>ef</sub> <sup>6)</sup> [mm]	T <sub>max</sub> [Nm]	N <sub>perm</sub> <sup>6)</sup> [kN]	V <sub>perm</sub> <sup>6)</sup> [kN]	[mm]	[mm]	[mm]	[mm]	[mm]	
M20	5.8	140	90	120	17,1	34,9	170	435	270	85	85	
		220	170		40,3		340	305	510			
		450	400		58,6		110	230	1200			
	8.8	140	90		17,1	41,1	170	525	270			
		220	170		40,3	56,0	340	530	510			
		450	400		93,3	375	350	1200				
	A4-70	140	90		17,1	39,3	170	500	270			
		220	170		40,3		340	350	510			
		450	400		65,5		135	255	1200			
M24	5.8	160	96	150	18,8	45,2	170	540	290	105	105	
		270	210		56,5		50,9	435	400			630
		540	480		84,3		140	295	1440			
	8.8	160	96		18,8	45,2	170	540	290			
		270	210		56,5	80,7	435	685	630			
		540	480		129,3	505	455	1440				
	A4-70	160	96		18,8	45,2	170	540	290			
		270	210		56,5	56,6	435	455	630			
		540	480		94,4	205	320	1440				
M27	5.8	170	108	200	22,5	54,0	195	605	325	125	125	
		310	250		71,5		65,7	495	475			750
		600	540		109,5		200	345	1620			
	8.8	170	108		22,5	54,0	195	605	325			
		310	250		71,5	104,9	495	825	750			
		600	540		154,5	570	560	1620				
	A4-70	170	108		22,5	54,0	195	605	325			
		310	250		71,5	73,6	495	545	750			
		600	540		122,7	315	380	1620				
M30	5.8	190	120	300	26,3	63,2	210	660	360	140	140	
		350	280		89,0		80,6	595	545			840
		670	600		133,8		270	395	1800			
	8.8	190	120		26,3	63,2	210	660	360			
		350	280		89,0	128,2	595	940	840			
		670	600		190,7	700	645	1800				
	A4-70	190	120		26,3	63,2	210	660	360			
		350	280		89,0	89,9	595	620	840			
		670	600		150,0	400	430	1800				

For the design the complete assessment ETA-10/0352 has to be considered. <sup>10)</sup>

<sup>1)</sup> Also valid for anchor rod RGM in the same property class.

<sup>2)</sup> The partial safety factors for material resistance as regulated in the ETA-10/0352 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-10/0352.

<sup>3)</sup> The given loads are valid for injection mortar FIS VL 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-10/0352.

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

<sup>5)</sup> Drill method hammer drilling. For further allowable application conditions see ETA-10/0352.

<sup>6)</sup> 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.

<sup>7)</sup> For combinations of tensile loads, shear loads, bending moments as well as reduced edge distances or spacings (anchor groups) see ETA-10/0352.

<sup>8)</sup> Minimum possible axial spacings resp. edge distance while reducing the permissible load.

<sup>9)</sup> 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-10/0352.

<sup>10)</sup> The given loads refer to the European Technical Assessment ETA-10/0352, issue date 10/08/2017. Design of the loads according ETAG 001, Technical Report TR 029 (for static resp. quasi-static loads).

**LOADS**

**Injection system FIS EB: Injection mortar FIS EB with Threaded rod FIS A <sup>1)</sup>**

zinc plated steel 5.8 / zinc plated steel 8.8 / stainless steel A4-70

Permissible loads of a single anchor in cracked normal concrete (concrete tension zone) of strength class C20/25 (~B25) <sup>2) 3) 4) 9)</sup>										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 <sub>min</sub> [mm]	h <sub>ef</sub> <sup>5)</sup> [mm]	T <sub>max</sub> [Nm]	N <sub>perm</sub> <sup>6)</sup> [kN]	V <sub>perm</sub> <sup>6)</sup> [kN]	[mm]	[mm]	[mm]	[mm]	[mm]
<b>FIS A M8</b>	5.8	100	60	10	3,6	5,1	90	105	180	40	40
		110	80		4,8		100	100	240		
		190	160		9,0		90	90	480		
	8.8	100	60		3,6	7,2	90	155	180		
		110	80		4,8	8,6	100	170	240		
		190	160		9,6		115	480			
	A4-70	100	60		3,6		6,0	90	125		
		110	80		4,8	100		115	240		
		190	160		9,6	90		90	480		
<b>FIS A M10</b>	5.8	100	60	20	4,5	8,6	90	185	180	45	45
		120	90		6,7		115	160	270		
		230	200		13,8		105	125	600		
	8.8	100	60		4,5	9,0	90	190	180		
		120	90		6,7	13,1	115	250	270		
		230	200		15,0		150	600			
	A4-70	100	60		4,5		9,0	90	190		
		120	90		6,7	9,2	115	165	270		
		230	200		15,0		115	600			
<b>FIS A M12</b>	5.8	100	70	40	6,3		12,0	105	255	210	55
		140	110		9,9	140		200	330		
		270	240		20,5	130		150	720		
	8.8	100	70		6,3	12,6	105	270	210		
		140	110		9,9	19,4	140	340	330		
		270	240		21,5		200	720			
	A4-70	100	70		6,3		12,6	105	270	210	
		140	110		9,9	13,7	140	230	330		
		270	240		21,5		150	720			
<b>FIS A M14</b>	5.8	110	75	50	7,9		15,7	115	325	225	60
		160	120		12,6	155		265	360		
		320	280		27,6	145		185	840		
	8.8	110	75		7,9	15,7	115	325	225		
		160	120		12,6	25,1	155	420	360		
		320	280		29,3		250	840			
	A4-70	110	75		7,9		15,7	115	325	225	
		160	120		12,6	18,3	155	295	360		
		320	280		29,3		175	840			
<b>FIS A M16</b>	5.8	120	80	60	7,7		15,3	120	295	240	65
		170	125		12,0	175		350	375		
		360	320		30,6	225		960			
	8.8	120	80		7,7	15,3	120	295	240		
		170	125		12,0	23,9	175	380	375		
		360	320		30,6		320	960			
	A4-70	120	80		7,7		15,3	120	295	240	
		170	125		12,0	23,9	175	380	375		
		360	320		30,6		215	960			

Chemical fixings 3



## LOADS

### Injection system FIS EB: Injection mortar FIS EB with Threaded rod FIS A <sup>1)</sup>

zinc plated steel 5.8 / zinc plated steel 8.8 / stainless steel A4-70

Permissible loads of a single anchor in cracked normal concrete (concrete tension zone) of strength class C20/25 (~B25) <sup>2) 3) 4) 9)</sup>										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 <sub>min</sub> [mm]	h <sub>ef</sub> <sup>5)</sup> [mm]	T <sub>max</sub> [Nm]	N <sub>perm</sub> <sup>6)</sup> [kN]	V <sub>perm</sub> <sup>6)</sup> [kN]	[mm]	[mm]	[mm]	[mm]	[mm]
FIS A M20	5.8	140	90	120	10,8	21,5	135	375	270	85	85
		220	170		20,3	34,9	210	460	510		
		450	400		47,9		300	1200			
	8.8	140	90		10,8	21,5	135	375	270		
		220	170		20,3	40,7	210	540	510		
		450	400		47,9	56,0	435	1200			
	A4-70	140	90		10,8	21,5	135	375	270		
		220	170		20,3	39,4	210	520	510		
		450	400		47,9		285	1200			
FIS A M24	5.8	160	96	150	13,4	32,2	145	545	290	105	105
		270	210		31,4	50,9	250	600	630		
		540	480		71,8		395	1440			
	8.8	160	96		13,4	32,2	145	545	290		
		270	210		31,4	75,4	250	930	630		
		540	480		71,8	80,6	570	1440			
	A4-70	160	96		13,4	32,2	145	545	290		
		270	210		31,4	56,8	250	670	630		
		540	480		71,8		360	1440			
FIS A M27	5.8	170	108	200	16,0	38,5	165	610	325	120	120
		310	250		42,1	65,7	270	715	750		
		600	540		90,9		485	1620			
	8.8	170	108		16,0	38,5	165	610	325		
		310	250		42,1	101,0	270	1150	750		
		600	540		90,9	105,1	700	1620			
	A4-70	170	108		16,0	38,5	165	610	325		
		310	250		42,1	73,7	270	795	750		
		600	540		90,9		445	1620			
FIS A M30	5.8	190	120	300	18,8	45,1	180	665	360	140	140
		350	280		52,4	80,6	300	820	840		
		670	600		112,2		305	555	1800		
	8.8	190	120		18,8	45,1	180	665	360		
		350	280		52,4	125,7	300	1340	840		
		670	600		112,2	128,6	305	805	1800		
	A4-70	190	120		18,8	45,1	180	665	360		
		350	280		52,4	90,2	300	910	840		
		670	600		112,2		305	510	1800		

For the design the complete assessment ETA-15/0440 has to be considered. <sup>8)</sup>

<sup>1)</sup> Also valid for anchor rod RGM in the same property class.

<sup>2)</sup> The partial safety factors for material resistance as regulated in the ETA-15/0440 as well as a partial safety factor for load actions of  $\gamma_L = 1,4$  bare 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-15/0440.

<sup>3)</sup> For higher concrete strength classes up to C50/60 higher permissible loads may be possible.

<sup>4)</sup> Drill method hammer drilling. For further allowable drill methods and application conditions see ETA-15/0440.

<sup>5)</sup> For the sizes M8 - M30 the min. anchorage depth and the max. anchorage depth are given. The anchorage depth can be chosen freely between these borders.

<sup>6)</sup> For combinations of tensile loads and shear loads or for shear loads with lever arm (bending moments) as well as reduced edge distances or spacings (anchor groups) we recommend to use our anchor design software C-FIX.

<sup>7)</sup> Minimum possible axial spacings resp. edge distance while reducing the permissible load.

<sup>8)</sup> The given loads refer to the European Technical Assessment ETA-15/0440, issue date 06/07/2015. Design of the loads according ETAG 001, Technical Report TR 029 (for static resp. quasi-static loads).

<sup>9)</sup> 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 EB: Injection mortar FIS EB with Threaded rod FIS A <sup>1)</sup>

zinc plated steel 5.8 / zinc plated steel 8.8 / stainless steel A4-70

Permissible loads of a single anchor in non-cracked normal concrete (concrete compression zone) of strength class C20/25 (~B25) <sup>2) 3) 4)</sup>										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 <sub>min</sub> [mm]	h <sub>ef</sub> <sup>5)</sup> [mm]	T <sub>max</sub> [Nm]	N <sub>perm</sub> <sup>6)</sup> [kN]	V <sub>perm</sub> <sup>6)</sup> [kN]	[mm]	[mm]	[mm]	[mm]	[mm]
FIS A M8	5.8	100	60	10	7,9	5,1	90	70	180	40	40
		110	80		9,0		80		240		
		190	160		40		480				
	8.8	100	60		7,9	8,6	90	130	180		
		110	80		10,5		100	115	240		
		190	160		13,8		50	90	480		
	A4-70	100	60		7,9	6,0	90	85	180		
		110	80		9,9		40	75	240		
		190	160		40		70	480			
FIS A M10	5.8	100	60	20	9,0	8,6	90	125	180	45	45
		120	90		13,5		115	105	270		
		230	200		13,8		45	95	600		
	8.8	100	60		9,0	13,1	90	200	180		
		120	90		13,5		115	170	270		
		230	200		22,4		80	115	600		
	A4-70	100	60		9,0	9,2	90	135	180		
		120	90		13,5		115	110	270		
		230	200		15,7		45	90	600		
FIS A M12	5.8	100	70	40	12,6	12,0	125	175	210	55	55
		140	110		19,7		155	135	330		
		270	240		20,5		55	120	720		
	8.8	100	70		12,6	19,4	125	295	210		
		140	110		19,7		155	230	330		
		270	240		32,4		95	150	720		
	A4-70	100	70		12,6	13,7	125	200	210		
		140	110		19,7		155	155	330		
		270	240		22,5		55	115	720		
FIS A M14	5.8	110	75	50	14,1	16,6	135	235	225	60	60
		160	120		22,6		170	180	360		
		320	280		27,6		60	145	840		
	8.8	110	75		14,1	26,3	135	390	225		
		160	120		22,6		170	300	360		
		320	280		43,8		120	180	840		
	A4-70	110	75		14,1	18,3	135	260	225		
		160	120		22,6		170	195	360		
		320	280		30,9		65	135	840		
FIS A M16	5.8	120	80	60	17,2	22,3	160	305	240	65	65
		170	125		26,9		210	235	375		
		360	320		37,6		65	175	960		
	8.8	120	80		17,2	34,4	160	495	240		
		170	125		26,9		210	405	375		
		360	320		60,0		150	220	960		
	A4-70	120	80		17,2	25,2	160	350	240		
		170	125		26,9		210	270	375		
		360	320		42,0		80	165	960		

Chemical fixings 3

## LOADS

### Injection system FIS EB: Injection mortar FIS EB with Threaded rod FIS A <sup>1)</sup>

zinc plated steel 5.8 / zinc plated steel 8.8 / stainless steel A4-70

Permissible loads of a single anchor in non-cracked normal concrete (concrete compression zone) of strength class C20/25 (~B25) <sup>2)3)4)</sup>										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 <sub>min</sub> [mm]	h <sub>ef</sub> <sup>5)</sup> [mm]	T <sub>max</sub> [Nm]	N <sub>perm</sub> <sup>6)</sup> [kN]	V <sub>perm</sub> <sup>6)</sup> [kN]	[mm]	[mm]	[mm]	[mm]	[mm]
FIS A M20	5.8	140	90	120	20,5	34,9	170	435	270	85	85
		220	170		40,7		265	305	510		
		450	400		58,6		95	230	1200		
	8.8	140	90		20,5	41,1	170	525	270		
		220	170		40,7	56,0	265	510	1200		
		450	400		93,3	230	290	1200			
	A4-70	140	90		20,5	39,4	170	500	270		
		220	170		40,7		265	350	510		
		450	400		65,7		120	215	1200		
FIS A M24	5.8	160	96	150	18,8	45,2	170	540	290	105	105
		270	210		50,3		370	400	630		
		540	480		84,3		160	295	1440		
	8.8	160	96		18,8	45,2	170	540	290		
		270	210		50,3	80,6	370	675	630		
		540	480		114,9	385	365	1440			
	A4-70	160	96		18,8	45,2	170	540	290		
		270	210		50,3	56,8	370	445	630		
		540	480		94,3	205	270	1440			
FIS A M27	5.8	170	108	200	22,5	54,0	195	605	325	120	120
		310	250		63,1		415	475	750		
		600	540		109,5		200	345	1620		
	8.8	170	108		22,5	54,0	195	605	325		
		310	250		63,1	105,1	415	805	750		
		600	540		136,3	425	450	1620			
	A4-70	170	108		22,5	54,0	195	605	325		
		310	250		63,1	73,7	415	530	750		
		600	540		123,0	315	320	1620			
FIS A M30	5.8	190	120	300	26,3	63,2	210	660	360	140	140
		350	280		78,5		500	545	840		
		670	600		133,8		270	395	1800		
	8.8	190	120		26,3	63,2	210	660	360		
		350	280		78,5	128,6	500	920	840		
		670	600		168,3	540	515	1800			
	A4-70	190	120		26,3	63,2	210	660	360		
		350	280		78,5	90,2	500	605	840		
		670	600		150,1	400	365	1800			

For the design the complete assessment ETA-15/0440 has to be considered. <sup>8)</sup>

<sup>1)</sup> Also valid for anchor rod RGM in the same property class.

<sup>2)</sup> The partial safety factors for material resistance as regulated in the ETA-15/0440 as well as a partial safety factor for load actions of  $\gamma_L = 1,4$  bare 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-15/0440.

<sup>3)</sup> For higher concrete strength classes up to C50/60 higher permissible loads may be possible.

<sup>4)</sup> Drill method hammer drilling. For further allowable drill methods and application conditions see ETA-15/0440.

<sup>5)</sup> For the sizes M8 - M30 the min. anchorage depth and the max. anchorage depth are given. The anchorage depth can be chosen freely between these borders.

<sup>6)</sup> For combinations of tensile loads and shear loads or for shear loads with lever arm (bending moments) as well as reduced edge distances or spacings (anchor groups) we recommend to use our anchor design software C-FIX.

<sup>7)</sup> Minimum possible axial spacings resp. edge distance while reducing the permissible load.

<sup>8)</sup> The given loads refer to the European Technical Assessment ETA-15/0440, issue date 06/07/2015. Design of the loads according ETAG 001, Technical Report TR 029 (for static resp. quasi-static loads).

## LOADS

Injection system FIS GREEN: Injection mortar FIS GREEN with Threaded rod FIS A <sup>1)</sup>

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) <sup>2)3)4)5)</sup>										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 <sub>cr</sub>	s <sub>min</sub> <sup>8)9)</sup>	c <sub>min</sub> <sup>8)9)</sup>	
		h <sub>min</sub> [mm]	h <sub>ef</sub> <sup>6)</sup> [mm]	T <sub>max</sub> [Nm]	N <sub>perm</sub> <sup>7)</sup> [kN]	V <sub>perm</sub> <sup>7)</sup> [kN]	[mm]	[mm]	[mm]	[mm]	[mm]				
M8	5.8	100	60	10	5,7	5,1	90	70	180	40	40				
		110	80		7,6				240						
		190	160		9,0				480						
	8.8	100	60		5,7	8,6	90	130	180						
		110	80		7,6				240						
		190	160		14,3				480						
	A4-70	100	60		5,7	6,0	90	85	180						
		110	80		7,6				240						
		190	160		9,9				480						
	C-70	100	60		5,7	7,4	90	110	180						
		110	80		7,6				240						
		190	160		12,4				480						
M10	5.8	100	60	20	6,7	8,6	90	125	180	45	45				
		120	90		10,1				270						
		230	200		13,8				600						
	8.8	100	60		6,7	13,1	90	200	180						
		120	90		10,1				270						
		230	200		22,4				600						
	A4-70	100	60		6,7	9,2	90	135	180						
		120	90		10,1				270						
		230	200		15,7				600						
	C-70	100	60		6,7	11,4	90	170	180						
		120	90		10,1				270						
		230	200		19,5				600						
	M12	5.8	100		70	40	8,9	12,0	105			175	210	55	55
			140		110		14,0						330		
			270		240		20,5						720		
8.8		100	70	8,9	19,4		105	295	210						
		140	110	14,0					330						
		270	240	30,5					720						
A4-70		100	70	8,9	13,7		105	200	210						
		140	110	14,0					330						
		270	240	22,5					720						
C-70		100	70	8,9	17,1		105	260	210						
		140	110	14,0					330						
		270	240	28,1					720						
M16	5.8	120	80	60	12,0	22,3	125	305	240	65	65				
		170	125		18,7				375						
		360	320		37,6				960						
	8.8	120	80		12,0	28,7	125	405	240						
		170	125		18,7				375						
		360	320		47,9				960						
	A4-70	120	80		12,0	25,2	125	350	240						
		170	125		18,7				375						
		360	320		42,0				960						
	C-70	120	80		12,0	28,7	125	405	240						
		170	125		18,7				375						
		360	320		47,9				960						

Chemical fixings 3

## LOADS

### Injection system FIS GREEN: Injection mortar FIS GREEN with Threaded rod FIS A <sup>1)</sup>

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) <sup>2)3)4)5)</sup>										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 <sub>min</sub> [mm]	h <sub>ef</sub> <sup>6)</sup> [mm]	T <sub>max</sub> [Nm]	N <sub>perm</sub> <sup>7)</sup> [kN]	V <sub>perm</sub> <sup>7)</sup> [kN]	[mm]	[mm]	[mm]	[mm]	[mm]
M20	5.8	140	90	120	14,6	34,9	135	435	270	85	85
		220	170		27,6		190	300	510		
		450	400		58,6		165	195	1200		
	8.8	140	90		14,6	35,0	135	440	270		
		220	170		27,6	56,0	190	525	510		
		450	400		64,8			290	1200		
	A4-70	140	90		14,6			35,0	135		
		220	170		27,6	39,4	190	350	510		
		450	400		64,8			215	1200		
	C-70	140	90		14,6			35,0	135		
		220	170		27,6	49,1	190	455	510		
		450	400		64,8			260	1200		

For the design the complete assessment ETA-14/0408 has to be considered. <sup>10)</sup>

<sup>1)</sup> Also valid for anchor rod RGM in the same property class.

<sup>2)</sup> The partial safety factors for material resistance as regulated in the ETA-14/0408 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-14/0408.

<sup>3)</sup> The given loads are valid for injection mortar FIS GREEN 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-14/0408.

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

<sup>5)</sup> Drill method hammer drilling.

<sup>6)</sup> For the sizes M8 - M20 the min. anchorage depth and the max. anchorage depth are given. The anchorage depth can be chosen freely between these borders.

<sup>7)</sup> For combinations of tensile loads, shear loads, bending moments as well as reduced edge distances or spacings (anchor groups) see ETA-14/0408.

<sup>8)</sup> Minimum possible axial spacings resp. edge distance while reducing the permissible load.

<sup>9)</sup> 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-14/0408.

<sup>10)</sup> The given loads refer to the European Technical Assessment ETA-14/0408, issue date 19/12/2014. Design of the loads according ETAG 001, Technical Report TR 029 (for static resp. quasi-static loads).