

## The solid injection mortar for standard applications in cracked concrete and masonry

3  
Chemical fixings



High-bay warehouses



Air conditioning units

### BUILDING MATERIALS

#### Approved for anchorings in:

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

#### Also suitable for:

- Rebar connections
- Concrete C12/15
- Hollow blocks made from concrete
- Aerated concrete

### ASSESSMENT/APPROVAL



### ADVANTAGES

- The FIS VL is approved for use in cracked concrete and masonry, and achieves a high load-bearing capacity in these conditions.
- The injection mortar, based on vinyl ester resin, allows for anchorings in water-filled drill holes (410 ml cartridges only), thus allowing for rapid progress.
- The temperature resistance of the FIS VL injection mortar of -40 °C to +120 °C allows for a solid load level even when subjected to high temperature demands, thus providing great flexibility.
- FIS VL HIGHSPEED has a significantly shorter curing time than FIS VL, thus also ensuring swift work progress even at low temperatures.

### APPLICATIONS

#### Injection mortar for use with:

- Threaded rods FIS A, see page 160 (concrete) and page 178 (masonry)
- Internal threaded anchor RG MI, see page 147
- Injection anchor sleeves FIS H, see page 193

### FUNCTIONING

- The FIS VL is a 2-component injection mortar based on vinyl ester.
- Resin and hardener are stored in two separate chambers and are not mixed and activated until extrusion through the static mixer.
- The 410 ml coaxial cartridge can be easily used with the fischer FIS AC dispenser.
- Partially used cartridges can be reused, simply by changing the static mixer.
- Related accessories for use in concrete and masonry can be found on page 138.

### FOR USE WITH

Equipment for  
concrete  
from page 160

Equipment for  
masonry  
from page 186

## TECHNICAL DATA



Injection mortar **FIS VL 410 C**



Static mixer **FIS MR**



**FIS VL 410 C HWK**



**FIS VL 410 C in bucket**

Item	Art.-No.	Approval ETA	Languages on the cartridge	Scale unit	Contents	Sales unit [pcs]
<b>FIS VL 300 T with clip</b>	<b>537149</b>	■	P, E, GB	150	1 cartridge 300 ml, 2 x FIS MR	12
<b>FIS VL 300 T with clip</b>	<b>538583</b>	■	CZ, SK	150	1 cartridge 300 ml, 2 x FIS MR	10
<b>FIS VL 300 T HIGH SPEED with clip</b>	<b>538585</b>	■	CZ, SK	150	1 cartridge 380 ml, 2 x FIS MR	10
<b>FIS VL 300 T</b>	<b>539461</b>	■	GB, F, E, P, RO, UAE	150	1 cartridge 300 ml, 2 x FIS MR	12
<b>FIS VL 300 T in bucket</b>	<b>539462</b>	■	GB, F, E, P, RO, UAE	150	20 cartridges 300 ml, 40 x FIS MR	1
<b>FIS VL 300 T HWK big</b>	<b>538589</b>	■	CZ, SK	150	20 cartridges 300 ml, 40 x FIS MR	1
<b>FIS VL 410 C</b>	<b>539463</b>	■	GB, F, E, P, RO, UAE	200	1 cartridge 410 ml, 2 x FIS MR	12
<b>FIS VL 410 C</b>	<b>538584</b>	■	CZ, SK	200	1 cartridge 410 ml, 2 x FIS MR	12
<b>FIS VL 410 C HIGH SPEED</b>	<b>538586</b>	■	CZ, SK	200	1 cartridges 410 ml, 1 x FIS MR	12
<b>FIS VL 410 C in bucket</b>	<b>538549</b>	■	D, F, NL, GB, TR	200	16 cartridges 410 ml, 32 x FIS MR	1
<b>FIS VL 410 C in bucket</b>	<b>539464</b>	■	GB, F, E, P, RO, UAE	200	16 cartridges 410 ml, 32 x FIS MR	1
<b>FIS VL 410 C HWK big</b>	<b>538590</b>	■	CZ, SK	200	16 cartridges 410 ml, 32 x FIS MR	1

## CURING TIME FIS VL

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 VL HIGH SPEED

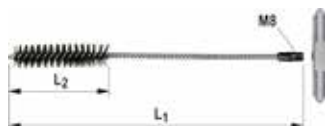
Cartridge temperature (mortar)	Gelling time	Temperature at anchoring base	Curing time
		-15°C - -10°C <sup>1)</sup>	12 hrs.
		-10°C - - 5°C <sup>1)</sup>	8 hrs.
- 5°C - ± 0°C <sup>1)</sup>	5 min.	- 5°C - ± 0°C	3 hrs.
0°C - + 5°C	5 min.	± 0°C - + 5°C	90 min.
+ 5°C - +10°C	3 min.	+ 5°C - +10°C	45 min.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

<sup>1)</sup> 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.

## ACCESSORIES DRILL HOLE CLEANING



Cleaning brush **BS**

Item	Art.-No.	Length L1 [mm]	Length L2 [mm]	Brush diameter [mm]	For drill diameter [mm]	Sales unit [pcs]
<b>BS ø 8</b>	<b>078177</b>	120	50	9	8	1
<b>BS ø 10</b>	<b>078178</b>	120	50	11	10	1
<b>BS ø 12</b>	<b>078179</b>	150	80	13	12	1
<b>BS ø 14</b>	<b>078180</b>	250	80	16	14	1
<b>BS ø 16/18</b>	<b>078181</b>	250	80	20	16/18	1
<b>BS ø 20/22</b>	<b>052277</b>	180	80	25	20/22	1
<b>BS ø 24</b>	<b>078182</b>	300	100	26	24	1
<b>BS ø 25</b>	<b>097806</b>	300	100	27	25	1
<b>BS ø 28</b>	<b>078183</b>	350	100	30	28	1
<b>BS ø 35</b>	<b>078184</b>	400	100	40	30/32/35	1
<b>FIS brush extension</b>	<b>508791</b>	-	-	-	-	1
<b>SDS Chuck</b>	<b>530332</b>	-	-	-	-	1



Compressed-air cleaning tool **ABP**



Blow-out pump **ABG**

Item	Art.-No.	Match	Sales unit [pcs]
<b>Compressed-air cleaning tool ABP</b>	<b>059456</b>	FIS A M 16 - M 30	1
<b>Blow-out pump ABG</b>	<b>089300</b>	-	1

## DISPENSER



Dispenser **FIS DM S**



Cordless dispenser **FIS DD S**



Dispenser **FIS AM**

Item	Art.-No.	Adapted for	Performance data	Sales unit [pcs]
<b>FIS DM S</b>	<b>511118</b>	FIS V 360 S, FIS HB 345 S, FIS HB 150 C, FIS EM 390 S, FIS VS 150 C, FIS P 360 S, FIS P 300 T, FIS SB 390 S, FIS PM 360 S, FIS VL 300 T and 1K-cartridges	-	1
<b>FIS DD S</b>	<b>543629</b>	FIS V 360 S, FIS HB 345 S, FIS EM 390 S, FIS VS 300 T, FIS P 300 T, FIS SB 390 S, FIS PM 360 S, FIS VL 300 T and 1K-cartridges	-	1
<b>Battery Pack</b>	<b>543946</b>	FIS DD S	Battery pack 7,2 V - Li-ION	1
<b>FIS AM</b>	<b>058000</b>	FIS V 360 S, FIS HB 345 S, FIS HB 150 C, FIS EM 390 S, FIS VS 150 C, FIS VW 360 S, FIS P 360 S, FIS P 300 T, FIS SB 390 S, FIS PM 360 S, FIS VL 300 T and 1K-cartridges	-	1



Pneumatic dispenser **FIS AP**



Dispenser **FIP**



Dispenser **KPM 3**

Item	Art.-No.	Adapted for	Performance data	Sales unit [pcs]
<b>FIS AP</b>	<b>058027</b>	FIS V 360 S, FIS HB 345 S, FIS HB 150 C, FIS EM 390 S, FIS VS 150 C, FIS VW 360 S, FIS P 360 S, FIS P 300 T, FIS SB 390 S, FIS PM 360 S, FIS VL 300 T and 1K-cartridges	Recommended pressure 6 bar air consumption max. 40 l/min	1
<b>FIP</b>	<b>042741</b>	FIS P 380 C, FIS V 410 C, FIS P Plus 380 C, FIS VL 410 C	–	1
<b>KP M 3</b>	<b>541441</b>	FIS VS 150 C, FIS HB 150 C, FIS VS 300 T, FIS VW 300 T, FIS P 300 T, FIS P Plus 380 C, FIS V 410 C, FIS VL 300 T and 1K-cartridges	–	1

## The fixing system for anchorings in concrete



3  
Chemical fixings



Bridges for traffic signs



Steel constructions

### VERSIONS

- Zinc-plated steel
- Stainless steel

### BUILDING MATERIALS

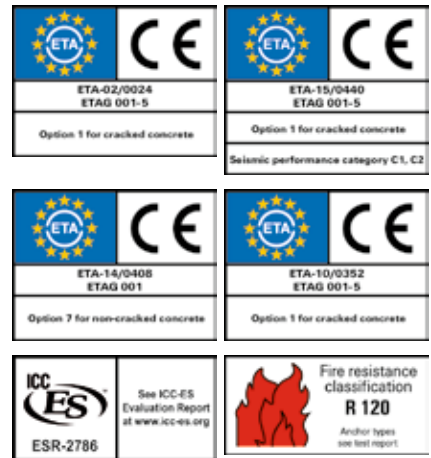
#### Approved for:

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

#### Also suitable for:

- Concrete C12/15

### ASSESSMENT/APPROVAL



### 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 130



**FIS GREEN mortar**  
see page 151

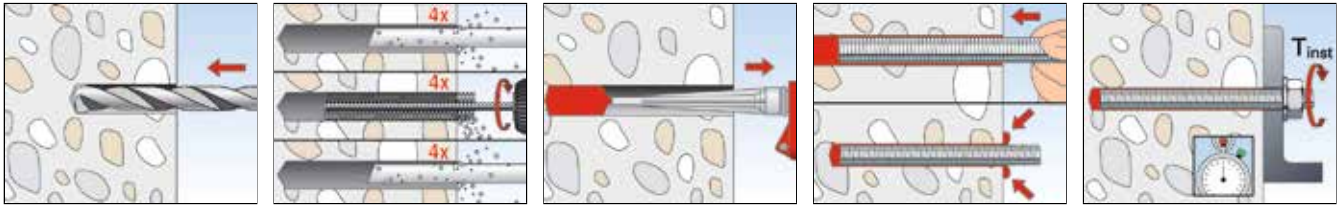


**FIS EB mortar**  
see page 126

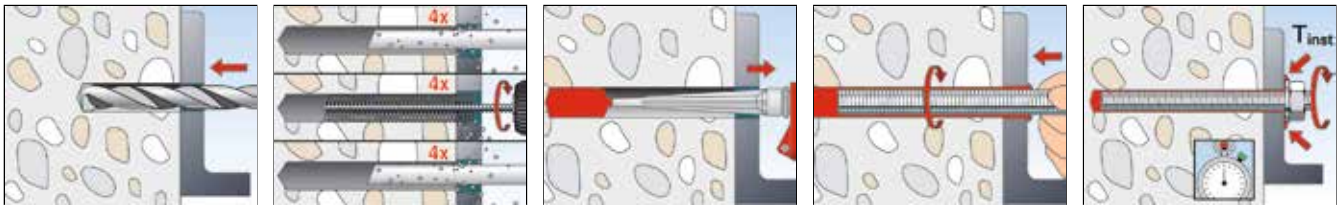


**FIS VL mortar**  
see page 136

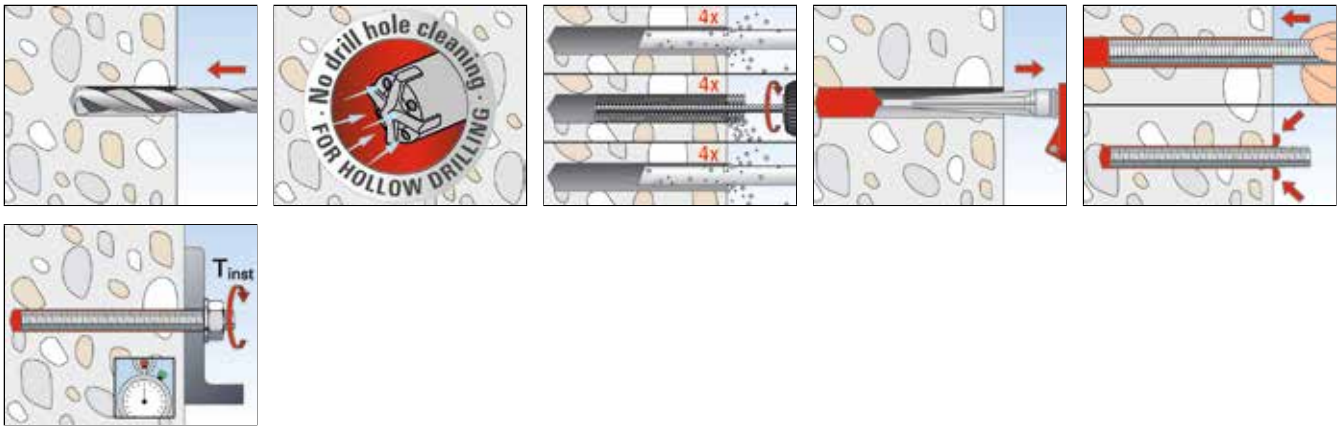
## PRE-POSITIONED INSTALLATION



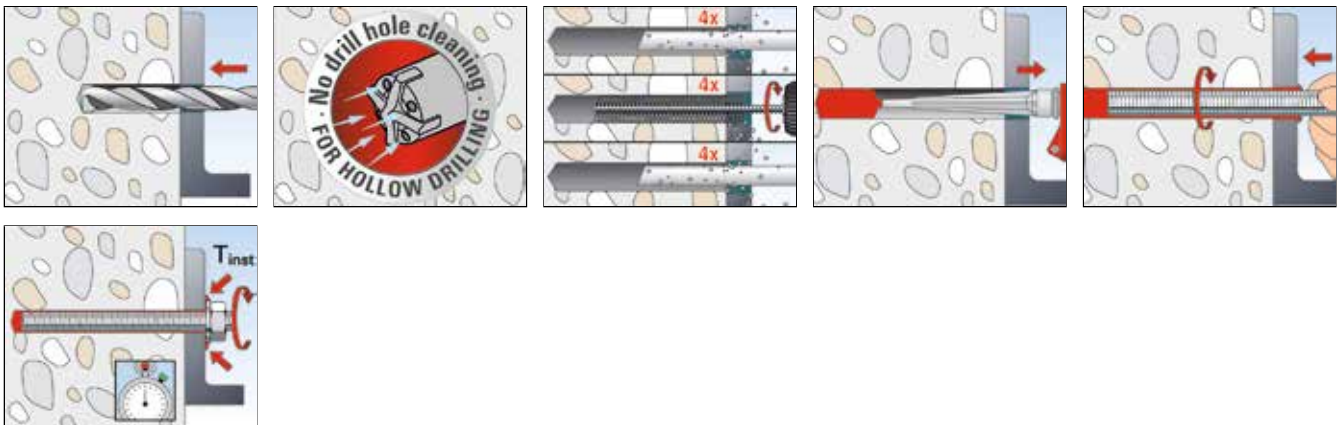
## PUSH-THROUGH INSTALLATION



## PRE-POSITIONED INSTALLATION WITH FIS V



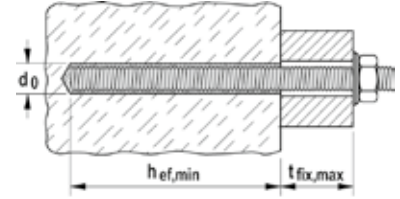
## PUSH-THROUGH INSTALLATION WITH FIS V



## TECHNICAL DATA



Threaded rod FIS A



3  
Chemical fixings

Item	zinc plated, steel grade 5.8	zinc plated, steel grade 8.8	stainless steel	Approval		Drill hole diameter d <sub>0</sub> [mm]	Min. / max. anchorage depth FIS V [mm]	Min. / max. usable length FIS V [mm]	min. / max. filling quantity FIS V [scale units]	Sales unit [pcs]
	Art.-No.	Art.-No.	Art.-No.	ETA	ICC					
	gvz	gvz	A4							
FIS A M 6 x 70	046204 1)	—	—	■	—	8	50/61	1/12	2	10
FIS A M 6 x 75	090243 1)	—	090437 1)	■	—	8	50/66	1/17	2	20
FIS A M 6 x 85	090272 1)	—	—	■	—	8	50/72	5/27	2	20
FIS A M 6 x 110	090273 1)	—	090439 1)	■	—	8	50/72	30/52	2	20
FIS A M 8 x 90	090274 1)	519390 1)	090440 1)	■	▲	10	60/78	1/19	2 / 3	10
FIS A M 8 x 110	090275 1)	519391 1)	090441 1)	■	▲	10	60/98	1/39	2 / 3	10
FIS A M 8 x 130	090276 1)	519392 1)	090442 1)	■	▲	10	60/118	1/59	2 / 4	10
FIS A M 8 x 175	090277 1)	519393 1)	090443 1)	■	▲	10	60/160	4/104	2 / 5	10
FIS A M 8 x 1000	509214 1) 2)	509222 1) 2)	509230 1) 2)	■	▲	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	524170	090447	■	▲	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 2)	509223 2)	509231 2)	■	▲	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 2)	509224 2)	509232 2)	■	▲	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 2)	509225 2)	509233 2)	■	▲	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 2)	519427 2)	■	▲	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
FIS A M 24 x 1000	533881	—	—	■	▲	28	96/480	—	15/69	10
FIS A M 30 x 430	090297	—	090464	■	▲	35	120/394	1/275	28/88	5

1) Not approved for cracked concrete.

2) 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

	zinc plated, steel grade 8.8 Art.-No.	stainless steel Art.-No.	Width across nut ○ SW [mm]	Washer (outer diameter x thickness) [mm]	Match	Sales unit [pcs]
Item	gvz	A4				
<b>Nut &amp; washer M8</b>	<b>510509</b>	<b>510513</b>	13	16 x 1,6	FIS A M 8	50
<b>Nut &amp; washer M10</b>	<b>510510</b>	<b>510514</b>	17	20 x 2	FIS A M 10	50
<b>Nut &amp; washer M12</b>	<b>510511</b>	<b>510515</b>	19	24 x 2,5	FIS A M 12	25
<b>Nut &amp; washer M16</b>	<b>510512</b>	<b>510516</b>	24	30 x 3	FIS A M 16	20
<b>Nut &amp; washer M20</b>	<b>519737</b>	<b>519738</b>	30	37 x 3	FIS A M 20	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 VL with threaded rod FIS A (property class 5.8)

Highest permissible loads for a single anchor<sup>1) 6)</sup> in concrete C20/25<sup>4)</sup>

For the design the complete European Technical Assessment ETA-10/0352 has to be considered.

Type	Min. effective anchorage depth $h_{ef,min}$ [mm]	Max. effective anchorage depth $h_{ef,max}$ [mm]	Min. member thickness $h_{min}$ [mm]	Max. torque moment $T_{inst,max}$ [Nm]	Cracked concrete				Non-cracked concrete			
					Permissible tensile load $N_{perm}^{3)}$ [kN]	Permissible shear load $V_{perm}^{3)}$ [kN]	Min. spacing $s_{min}^{2)}$ [mm]	Min. edge distance $c_{min}^{2)}$ [mm]	Permissible tensile load $N_{perm}^{3)}$ [kN]	Permissible shear load $V_{perm}^{3)}$ [kN]	Min. spacing $s_{min}^{2)}$ [mm]	Min. edge distance $c_{min}^{2)}$ [mm]
FIS A M6 (5.8)	50		100	5,0					3,4	2,9	40	40
		72	102	5,0					4,8	2,9	40	40
FIS A M8 (5.8)	60		100	10,0					6,6	5,1	40	40
		160	190	10,0					8,7	5,1	40	40
FIS A M10 (5.8)	60		100	20,0	4,5	8,6	45	45	8,2	8,6	45	45
		200	230	20,0	13,8	8,6	45	45	13,8	8,6	45	45
FIS A M12 (5.8)	70		100	40,0	6,3	12,0	55	55	11,5	12,0	55	55
		240	270	40,0	20,1	12,0	55	55	20,1	12,0	55	55
FIS A M16 (5.8)	80		116	60,0	9,6	22,3	65	65	14,3	22,3	65	65
		320	356	60,0	37,4	22,3	65	65	37,4	22,3	65	65
FIS A M20 (5.8)	90		138	120,0	12,2	29,3	85	85	17,1	34,9	85	85
		400	448	120,0	54,9	34,9	85	85	58,3	34,9	85	85
FIS A M24 (5.8)	96		152	150,0					18,8	45,2	105	105
		480	536	150,0					84,0	50,9	105	105
FIS A M27 (5.8)	108		168	200,0					22,5	54,0	125	125
		540	600	200,0					109,3	65,7	125	125
FIS A M30 (5.8)	120		190	300,0					26,3	63,2	140	140
		600	670	300,0					133,6	80,6	140	140

<sup>1)</sup> The partial safety factors for material resistance as regulated in the ETAG001 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  $s \geq 3 \times h_{ef}$  and an edge distance  $c \geq 1,5 \times h_{ef}$ .

<sup>2)</sup> Minimum possible axial spacings resp. edge distance while reducing the permissible load.

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

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

<sup>6)</sup> The given loads are valid for temperatures in the substrate up to +50 °C (resp. short term up to 80 °C). Erection of the drill hole by hammer drilling with best possible drill hole cleaning according assessment. The anchor may be installed in dry or wet concrete. For installations in flooded holes see assessment.

## LOADS

Injection system FIS VL with threaded rod FIS A (property class 8.8)

Highest permissible loads for a single anchor<sup>1) 6)</sup> in concrete C20/25<sup>4)</sup>

For the design the complete European Technical Assessment ETA-10/0352 has to be considered.

Type	Min. effective anchorage depth $h_{ef,min}$ [mm]	Max. effective anchorage depth $h_{ef,max}$ [mm]	Min. member thickness $h_{min}$ [mm]	Max. torque moment $T_{inst,max}$ [Nm]	Cracked concrete				Non-cracked concrete			
					Permissible tensile load $N_{perm}^{3)}$ [kN]	Permissible shear load $V_{perm}^{3)}$ [kN]	Min. spacing $s_{min}^{2)}$ [mm]	Min. edge distance $c_{min}^{2)}$ [mm]	Permissible tensile load $N_{perm}^{3)}$ [kN]	Permissible shear load $V_{perm}^{3)}$ [kN]	Min. spacing $s_{min}^{2)}$ [mm]	Min. edge distance $c_{min}^{2)}$ [mm]
FIS A M6 (8.8)	50		100	5,0					3,4	4,6	40	40
		72	102	5,0					4,8	4,6	40	40
FIS A M8 (8.8)	60		100	10,0					6,6	8,6	40	40
		160	190	10,0					13,9	8,6	40	40
FIS A M10 (8.8)	60		100	20,0	4,5	10,8	45	45	8,2	13,1	45	45
		200	230	20,0	15,0	13,1	45	45	22,1	13,1	45	45
FIS A M12 (8.8)	70		100	40,0	6,3	15,1	55	55	11,5	19,4	55	55
		240	270	40,0	21,5	19,4	55	55	32,1	19,4	55	55
FIS A M16 (8.8)	80		116	60,0	9,6	23,0	65	65	14,3	34,4	65	65
		320	356	60,0	38,3	36,0	65	65	59,8	36,0	65	65
FIS A M20 (8.8)	90		138	120,0	12,2	29,3	85	85	17,1	41,1	85	85
		400	448	120,0	54,9	56,0	85	85	93,3	56,0	85	85
FIS A M24 (8.8)	96		152	150,0					18,8	45,2	105	105
		480	536	150,0					129,3	80,6	105	105
FIS A M27 (8.8)	108		168	200,0					22,5	54,0	125	125
		540	600	200,0					154,5	105,1	125	125
FIS A M30 (8.8)	120		190	300,0					26,3	63,2	140	140
		600	670	300,0					190,7	128,6	140	140

<sup>1)</sup> The partial safety factors for material resistance as regulated in the ETAG001 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  $s \geq 3 \times h_{ef}$  and an edge distance  $c \geq 1,5 \times h_{ef}$ .

<sup>2)</sup> Minimum possible axial spacings resp. edge distance while reducing the permissible load.

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

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

<sup>6)</sup> The given loads are valid for temperatures in the substrate up to +50 °C (resp. short term up to 80 °C). Erection of the drill hole by hammer drilling with best possible drill hole cleaning according assessment. The anchor may be installed in dry or wet concrete. For installations in flooded holes see assessment.

## LOADS

Injection system FIS VL with threaded rod FIS A (property class A4-70)

**Highest permissible loads for a single anchor**<sup>1) 6)</sup> in concrete C20/25<sup>4)</sup>

For the design the complete European Technical Assessment ETA-10/0352 has to be considered.

Type	Min. effective anchorage depth $h_{ef,min}$ [mm]	Max. effective anchorage depth $h_{ef,max}$ [mm]	Min. member thickness $h_{min}$ [mm]	Max. torque moment $T_{inst,max}$ [Nm]	Cracked concrete				Non-cracked concrete			
					Permissible tensile load $N_{perm}^{3)}$ [kN]	Permissible shear load $V_{perm}^{3)}$ [kN]	Min. spacing $s_{min}^{2)}$ [mm]	Min. edge distance $c_{min}^{2)}$ [mm]	Permissible tensile load $N_{perm}^{3)}$ [kN]	Permissible shear load $V_{perm}^{3)}$ [kN]	Min. spacing $s_{min}^{2)}$ [mm]	Min. edge distance $c_{min}^{2)}$ [mm]
FIS A M6 (A4-70)	50		100	5,0					3,4	3,2	40	40
		72	102	5,0					4,8	3,2	40	40
FIS A M8 (A4-70)	60		100	10,0					6,6	6,0	40	40
		160	190	10,0					9,8	6,0	40	40
FIS A M10 (A4-70)	60		100	20,0	4,5	9,2	45	45	8,2	9,2	45	45
		200	230	20,0	15,0	9,2	45	45	15,5	9,2	45	45
FIS A M12 (A4-70)	70		100	40,0	6,3	13,7	55	55	11,5	13,7	55	55
		240	270	40,0	21,5	13,7	55	55	22,5	13,7	55	55
FIS A M16 (A4-70)	80		116	60,0	9,6	23,0	65	65	14,3	25,2	65	65
		320	356	60,0	38,3	25,2	65	65	42,0	25,2	65	65
FIS A M20 (A4-70)	90		138	120,0	12,2	29,3	85	85	17,1	39,4	85	85
		400	448	120,0	54,9	39,4	85	85	65,5	39,4	85	85
FIS A M24 (A4-70)	96		152	150,0					18,8	45,2	105	105
		480	536	150,0					94,4	56,8	105	105
FIS A M27 (A4-70)	108		168	200,0					22,5	54,0	125	125
		540	600	200,0					122,7	73,7	125	125
FIS A M30 (A4-70)	120		190	300,0					26,3	63,2	140	140
		600	670	300,0					150,0	90,2	140	140

<sup>1)</sup> The partial safety factors for material resistance as regulated in the ETAG001 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  $s \geq 3 \times h_{ef}$  and an edge distance  $c \geq 1,5 \times h_{ef}$ .

<sup>2)</sup> Minimum possible axial spacings resp. edge distance while reducing the permissible load.

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

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

<sup>6)</sup> The given loads are valid for temperatures in the substrate up to +50 °C (resp. short term up to 80 °C). Erection of the drill hole by hammer drilling with best possible drill hole cleaning according assessment. The anchor may be installed in dry or wet concrete. For installations in flooded holes see assessment.