

# 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> [mm]
		h <sub>min</sub> [mm]	h <sub>ef</sub> <sup>8)</sup> [mm]	T <sub>max</sub> [Nm]	N <sub>perm</sub> <sup>7)</sup> [kN]	V <sub>perm</sub> <sup>7)</sup> [kN]							
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				115			240	
		190	160		14,3				85			90	480
	A4-70	100	60		5,7	6,0	90	85	180				
		110	80		7,6				75			240	
		190	160		9,9				50			70	480
	C-70	100	60		5,7	7,4	90	110	180				
		110	80		7,6				100			240	
		190	160		12,4				70			80	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				55			85	600
	8.8	100	60		6,7	13,1	90	200	180				
		120	90		10,1				110			170	270
		230	200		22,4				115			600	
	A4-70	100	60		6,7	9,2	90	135	180				
		120	90		10,1				110			110	270
		230	200		15,7				65			90	600
	C-70	100	60		6,7	11,4	90	170	180				
		120	90		10,1				110			145	270
		230	200		19,5				95			105	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				70			100	720
	8.8	100	70		8,9	19,4	105	295	210				
		140	110		14,0				130			230	330
		270	240		30,5				150			720	
	A4-70	100	70		8,9	13,7	105	200	210				
		140	110		14,0				130			155	330
		270	240		22,5				85			115	720
	C-70	100	70		8,9	17,1	105	260	210				
		140	110		14,0				130			200	330
		270	240		28,1				115			135	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				115			150	960
	8.8	120	80		12,0	28,7	125	405	240				
		170	125		18,7				375				
		360	320		47,9				160			220	960
	A4-70	120	80		12,0	25,2	125	350	240				
		170	125		18,7				160			270	375
		360	320		42,0				135			165	960
	C-70	120	80		12,0	28,7	125	405	240				
		170	125		18,7				350			375	
		360	320		47,9				160			195	960

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			
		$h_{min}$ [mm]	$h_{ef}^{6)}$ [mm]	$T_{max}$ [Nm]	$N_{perm}^{7)}$ [kN]	$V_{perm}^{7)}$ [kN]	[mm]	[mm]	[mm]	$s_{min}^{8) 9)}$ [mm]	$c_{min}^{8) 9)}$ [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	440	270		
		220	170		27,6	39,4	190	350	510		
		450	400		64,8			215	1200		
	C-70	140	90		14,6	35,0	135	440	270		
		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 a 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).

### Injection system FIS GREEN with threaded rod FIS A<sup>4)</sup>

Highest permissible loads<sup>1)5)</sup> 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-14/0471 has to be considered.

Type	Compressive-brick-strength  $f_b$ [N/mm <sup>2</sup> ]	Brick raw density  $\rho$ [kg/dm <sup>3</sup> ]	Minimum brick dimensions <sup>6)</sup>  (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 <sup>3)</sup>  $N_{perm}$ [kN]	Permissible shear load <sup>3)</sup>  $V_{perm}$ [kN]	Characteristic spacing parallel to bed joint  $s_{cr \parallel}$ [mm]	Characteristic spacing perpendicular to bed joint  $s_{cr \perp}$ [mm]	Min. spacing <sup>2)</sup>  $s_{min \parallel} / s_{min \perp}$ [mm]	Characteristic resp. min. edge distance <sup>2)</sup>  $c_{cr} = c_{min}$ [mm]			
<b>Solid brick Mz, NF acc. to EN 771-1</b>															
M8	≥10	≥1,8	240x115x71 (NF)	50	80	10	0,71	0,71	150	150	150	100			
M10				50	80		0,86	1,14	150	150	150	100			
M10				80	110		1,29	1,14	240	240	240	100			
M10				200	230		3,14	2,43	300	300	300	150			
M12				50	80		0,86	1,14	150	150	150	100			
M12				80	110		1,43	1,14	240	240	240	100			
M12				200	230		2,00	3,29	300	300	300	150			
M8				≥20	≥1,8		240x115x71 (NF)	50	80	0,71	1,14	150	150	150	100
M10								50	80	1,29	1,71	150	150	150	100
M10								80	110	1,71	1,71	240	240	240	100
M10								200	230	3,43	3,43	300	300	300	150
M12								50	80	1,14	1,57	150	150	150	100
M12	80	110	2,00			1,57		240	240	240	100				
M12	200	230	2,86	3,43	300	300	300	150							
<b>Solid sand-lime brick KS acc. to EN 771</b>															
M8	≥10	≥1,8	240x115x71 (NF)	50	80	10	0,71	1,14	150	150	150	100			
M10				50	80		0,71	1,14	150	150	150	100			
M10				80	110		0,86	1,14	240	240	240	100			
M10				200	230		2,57	1,14	300	300	300	150			
M12				50	80		0,57	1,43	150	150	150	100			
M12				80	110		0,86	1,43	240	240	240	100			
M12				200	230		2,57	1,43	300	300	300	150			
M8				≥20	≥1,8		240x115x71 (NF)	50	80	0,71	1,57	150	150	150	100
M10								50	80	0,86	1,57	150	150	150	100
M10								80	110	1,14	1,57	240	240	240	100
M10								200	230	3,43	1,57	300	300	300	150
M12								50	80	0,86	2,00	150	150	150	100
M12	80	110	1,29			2,00		240	240	240	100				
M12	200	230	3,43	2,00	300	300	300	150							

<sup>1)</sup> 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.

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

<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> Zinc-plated, stainless steel A4 and high corrosion-resistant steel C.

<sup>5)</sup> 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.

<sup>6)</sup> Hole patterns see assessment.

# LOADS

## Injection system FIS GREEN with threaded rod FIS A<sup>5)</sup> and anchor sleeve FIS H..K

Highest permissible loads<sup>1) 6)</sup> for a single anchor in solid brick masonry (with injection anchor sleeve) for pre-positioned installation. For the design the complete assessment ETA-14/0471 has to be considered.

Type of anchor sleeve with anchor rod	Compressive-brick-strength  $f_b$ [N/mm <sup>2</sup> ]	Brick raw density  $\rho$ [kg/dm <sup>3</sup> ]	Minimum brick dimensions <sup>6)</sup>  (L x W x H) [mm]	Min. effective anchorage depth <sup>4)</sup>  $h_{ef}$ [mm]	Min. member thickness  $h_{min}$ [mm]	Maximum torque  $T_{inst,max}$ [Nm]	Permissible tensile load <sup>3)</sup>  $N_{perm}$ [kN]	Permissible shear load <sup>3)</sup>  $V_{perm}$ [kN]	Characteristic spacing parallel to bed joint  $s_{cr \parallel}$ [mm]	Characteristic spacing perpendicular to bed joint  $s_{cr \perp}$ [mm]	Min. spacing <sup>2)</sup>  $s_{min \parallel} / s_{min \perp}$ [mm]	Characteristic resp. min. edge distance <sup>2)</sup>  $c_{Cr} = c_{min}$ [mm]
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### Solid sand-lime brick KS acc. to EN 771

12x85 M8	≥ 10	≥ 1,8	240x115x113	85	115	2	0,86	0,86	255	255	255	100
16x85 M10						4	0,57	1,00				
20x85 M12						4	1,57	1,00				
12x85 M8	≥ 20			85	115	2	1,29	1,29				
16x85 M10						4	0,86	1,57				
20x85 M12						4	2,29	1,57				

<sup>1)</sup> 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.

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

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

<sup>5)</sup> Zinc-plated, stainless steel A4 and high corrosion-resistant steel C.

<sup>6)</sup> 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.

<sup>7)</sup> Hole patterns see assessment.

## Injection system FIS GREEN with threaded rod FIS A<sup>5)</sup> and anchor sleeve FIS H..K

Highest permissible loads<sup>1) 6)</sup> for a single anchor in perforated brick masonry (with injection anchor sleeve) for pre-positioned installation. For the design the complete assessment ETA-14/0471 has to be considered.

Type of anchor sleeve with anchor rod	Compressive-brick-strength $f_b$ [N/mm <sup>2</sup> ]	Brick raw density $\rho$ [kg/dm <sup>3</sup> ]	Minimum brick-dimensions <sup>7)</sup> (L x W x H) [mm]	Min. effective-anchorage depth <sup>4)</sup> $h_{ef}$ [mm]	Min. member thickness $h_{min}$ [mm]	Maximum torque $T_{inst,max}$ [Nm]	Permissible tensile load <sup>3)</sup> $N_{perm}$ [kN]	Permissible shear load <sup>3)</sup> $V_{perm}$ [kN]	Characteristic spacing parallel to bed joint $s_{cr \parallel}$ [mm]	Characteristic spacing perpendicular to bed joint $s_{cr \perp}$ [mm]	Min. spacing <sup>2)</sup> $s_{min \parallel} / s_{min \perp}$ [mm]	Characteristic resp. min. edge distance <sup>2)</sup> $c_{cr} = c_{min}$ [mm]
<b>Vertically perforated brick H1z, acc. to EN 771-1</b>												
12x85 M6/M8	≥ 8	≥ 1,4	230x108x55	85	115	2,0	0,57	0,71	230	55	230 / 55	100
16x85 M8/M10												
20x85 M12/M16												
12x85 M6/M8	≥ 10	≥ 0,9	240x175x113	85	175	2,0	0,57	1,14	240	115	240 / 115	120
16x85 M8/M10							0,57	1,57				
20x85 M12/M16							0,71	1,71				
<b>Perforated sand-lime brick KSL acc. to EN 771-2</b>												
12x85 M6/M8	≥ 12	≥ 1,4	240x175x113	85	175	2,0	0,34	0,71	240	115	240 / 115	100
16x85 M8/M10							0,57	1,57				
20x85 M12/M16							0,57	1,29				
12x85 M6/M8	≥ 20	≥ 1,4	240x175x113	85	175	2,0	0,57	1,29	240	115	240 / 115	100
16x85 M8/M10							1,00	2,29				
20x85 M12/M16							1,00	2,14				

<sup>1)</sup> 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.

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

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

<sup>5)</sup> Zinc-plated, stainless steel A4 and high corrosion-resistant steel C.

<sup>6)</sup> 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.

<sup>7)</sup> Hole patterns see assessment.

# LOADS

## Injection system FIS GREEN with threaded rod FIS A<sup>5)</sup> and push-through anchor sleeve FIS H..K

Highest permissible loads<sup>1) 6)</sup> for a single anchor in perforated brick masonry (with push-through anchor sleeve) for push-through installation.

For the design the complete assessment ETA-14/0471 has to be considered.

Type of anchor sleeve with anchor rod	Compressive-brick-strength $f_b$ [N/mm <sup>2</sup> ]	Brick raw density $\rho$ [kg/dm <sup>3</sup> ]	Minimum brick-dimensions <sup>7)</sup> (L x W x H) [mm]	Min. effective-anchorage depth <sup>4)</sup> $h_{ef}$ [mm]	Min. member thickness $h_{min}$ [mm]	Maximum torque $T_{inst,max}$ [Nm]	Permissible tensile load <sup>3)</sup> $N_{perm}$ [kN]	Permissible shear load <sup>3)</sup> $V_{perm}$ [kN]	Characteristic spacing parallel to bed joint $s_{cr \parallel}$ [mm]	Characteristic spacing perpendicular to bed joint $s_{cr \perp}$ [mm]	Min. spacing <sup>2)</sup> $s_{min \parallel} / s_{min \perp}$ [mm]	Characteristic resp. min. edge distance <sup>2)</sup> $c_{Cr} = c_{min}$ [mm]
<b>Vertically perforated brick Hz acc. to EN 771-1</b>												
18x130/200 M10/M12	≥ 8	≥ 0,6	250x370x245	130	370	4	0,43	0,86	250	240	250 / 240	120
22x130/200 M16	≥ 8			110			0,34	0,43				
18x130/200 M10/M12	≥ 10	≥ 0,9	240x175x113	130	175	4	0,71	1,57	240	115	240 / 115	120
22x130/200 M16	≥ 10			110			0,57	1,71				
<b>Perforated sand-lime brick KSL acc. to EN 771-2</b>												
18x130/200 M10/M12	≥ 12	≥ 1,4	240x175x113	110	175	4	0,57	1,57	240	115	240 / 115	100
22x130/200 M16	≥ 12						0,43	1,29				
18x130/200 M10/M12	≥ 20						1,00	2,29				
22x130/200 M16	≥ 20						0,71	2,14				

<sup>1)</sup> 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.

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

<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> The maximum anchorage depth is corresponding with the relevant push-through anchor sleeves FIS H18.. K and FIS H22.. K (see technical data).

<sup>5)</sup> Zinc-plated, stainless steel A4 and high corrosion-resistant steel C.

<sup>6)</sup> 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.

<sup>7)</sup> Hole patterns see assessment.

## Injection system FIS GREEN with threaded rod FIS A<sup>4)</sup>

Highest permissible loads<sup>1)5)</sup> for a single anchor in aerated concrete.

For the design the complete assessment ETA-14/O471 has to be considered.

Type anchor rod	Compressive-brick-strength $f_b$ [N/mm <sup>2</sup> ]	Brick raw density $\rho$ [kg/dm <sup>3</sup> ]	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 <sup>3)</sup> $N_{perm}$ [kN]	Permissible shear load <sup>3)</sup> $V_{perm}$ [kN]	Characteristic spacing parallel to bed joint $s_{cr \parallel}$ [mm]	Characteristic spacing perpendicular to bed joint $s_{cr \perp}$ [mm]	Min. spacing <sup>2)</sup> $s_{min \parallel} / s_{min \perp}$ [mm]	Characteristic resp. min. edge distance <sup>2)</sup> $c_{cr} = c_{min}$ [mm]
<b>Aerated concrete acc. to EN 771-4</b>												
M8	≥ 2	≥ 0,35	-	100	130	1	0,71	0,32	240	115	240 / 115	80
M10						2	0,71	0,32				
M12						2	0,89	0,32				
M16	2	0,89				0,43						
M8	≥ 4	≥ 0,50				1	0,89	0,54				
M10						2	1,07	0,54				
M12						2	1,07	0,54				
M16						2	1,07	0,54				
M8	≥ 6	≥ 0,65				1	1,25	0,89				
M10						2	1,43	0,89				
M12						2	1,43	0,89				
M16						2	1,43	0,71				

<sup>1)</sup> 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.

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

<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> Zinc-plated, stainless steel A4 and high corrosion-resistant steel C.

<sup>5)</sup> 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.