fischer Zykon internally-threaded anchor FZA-I

Anchor design according to fischer specification

1. Types

FZA-I – Internally-threaded anchor (gvz)

FZA-I – Internally-threaded anchor (A4)

Fire resistance classification **F 120**
Anchor types see test report

*) European Technical Approval – Option 1 for cracked concrete

FM APPROVED
from thread M 10

CALCULATION WITH CC COMPUFIX CALCULATION SOFTWARE

Features and Advantages

- European Technical Approval option 1 for cracked an non-cracked concrete.
- Independent controlled and confirmed product characteristics (Approval) gives the required safety guarantees.
- Expansion free fixing allows small spacing and edge distances.
- Depth marking enable visual control and ensures correct function.
- Fire resistance classifications (F 120) according to test report independently proved gives the safety case of fire.
- Formlocking fit in the undercut enables high loads at shallow anchorage depth.

The conditions of use in the European Technical Approval may vary from those of the Technical Handbook.

Materials

Anchor:
- Carbon steel, zinc plated (5 µm) and passivated (gvz)
- Stainless steel of corrosion resistance class III, e.g. A4 (1.4401 optional 1.4571, 1.4362) and according to ASTM/AISI steel grade 316

2. Ultimate resistance of single anchors with large spacing and large edge distance

Mean values

Anchor type			FZA 12x40 M 6 I		FZA 12x50 M 6 I	FZA 14x60 M 8 I		FZA 18x80 M 10 I		FZA 22x100 M 12 I		FZA 22x125 M 12 I	
			gvz [1]	A4 [2]	A4 [2]	gvz [1]	A4 [2]	gvz [1]	A4 [2]	gvz [1]	A4 [2]	gvz [1]	A4 [2]
non-cracked concrete													
tension	≧ C 20/25	N_u [kN]	17.2	13.4	13.4	23.0	18.0	26.9	22.7	63.0	53.2	63.0	53.2
shear	≧ C 20/25	V_u [kN]	9.6	8.4	8.4	17.6	15.4	27.8	24.4	40.5	35.4	40.5	35.4
cracked concrete													
tension	C 20/25	N_u [kN]	12.0		12.0	23.0	18.0	26.9	22.7	47.2		63.0	53.2
tension	C 50/60	N_u [kN]	17.2	13.4	13.4	23.0	18.0	26.9	22.7	63.0	53.2	63.0	53.2
shear	≧ C 20/25	V_u [kN]	9.6	8.4	8.4	17.6	15.4	27.8	24.4	40.5	35.4	40.5	35.4

[1] The values apply to screws with a strength class 8.8

[2] The values apply to screws with a strength class A4 - 70

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3. Characteristic, design and recommended resistance of single anchors with large spacing and large edge distance

3.1 Characteristic resistance

Anchor type			FZA 12x40 M 6 I		FZA 12x50 M 6 I	FZA 14x60 M 8 I		FZA 18x80 M 10 I		FZA 22x100 M 12 I		FZA 22x125 M 12 I	
			gvz [1]	A4 [2]	A4 [2]	gvz [1]	A4 [2]	gvz [1]	A4 [2]	gvz [1]	A4 [2]	gvz [1]	A4 [2]
non-cracked concrete													
tension	C 20/25	N_{Rk} [kN]	14.0	13.5	13.5	22.9	17.9	26.9	22.7	55.4	53.1	63.0	53.1
	≧ C 40/50	N_{Rk} [kN]	17.2	13.5	13.5	22.9	17.9	26.9	22.7	63.0	53.1	63.0	53.1
shear	≧ C 20/25	V_{Rk} [kN]	8.6	6.7	6.7	11.4	9.0	13.4	11.3	31.5	26.6	31.5	26.6
cracked concrete													
tension	C 20/25	N_{Rk} [kN]	9.1		12.7	16.7		25.8	22.7	36.0		50.3	
	C 50/60	N_{Rk} [kN]	14.1	13.5	13.5	22.9	17.9	26.9	22.7	55.8	53.1	63.0	53.1
shear	≧ C 20/25	V_{Rk} [kN]	8.6	6.7	6.7	11.4	9.0	13.4	11.3	31.5	26.6	31.5	26.6

[1] The values apply to screws with a strength class 8.8
[2] The values apply to screws with a strength class A4 - 70

3.2 Design resistance

Anchor type			FZA 12x40 M 6 I		FZA 12x50 M 6 I	FZA 14x60 M 8 I		FZA 18x80 M 10 I		FZA 22x100 M 12 I		FZA 22x125 M 12 I	
			gvz [1]	A4 [2]	A4 [2]	gvz [1]	A4 [2]	gvz [1]	A4 [2]	gvz [1]	A4 [2]	gvz [1]	A4 [2]
non-cracked concrete													
tension	C 20/25	N_{Rd} [kN]	9.4	7.5	7.5	13.1	9.9	13.5	12.6	31.5	29.5	31.5	29.5
	≧ C 40/50	N_{Rd} [kN]	9.8	7.5	7.5	13.1	9.9	13.5	12.6	31.5	29.5	31.5	29.5
shear	≧ C 20/25	V_{Rd} [kN]	5.7	4.5	4.5	7.6	6.0	7.9	7.5	18.5	17.7	18.5	17.7
cracked concrete													
tension	C 20/25	N_{Rd} [kN]	6.1		7.5	11.2	9.9	13.5	12.6	24.0		31.5	29.5
	C 50/60	N_{Rd} [kN]	9.4	7.5	7.5	13.1	9.9	13.5	12.6	31.5	29.5	31.5	29.5
shear	≧ C 20/25	V_{Rd} [kN]	5.7	4.5	4.5	7.6	6.0	7.9	7.5	18.5	17.7	18.5	17.7

[1] The values apply to screws with a strength class 8.8
[2] The values apply to screws with a strength class A4 - 70

3.3 Recommended resistance [3]

Anchor type			FZA 12x40 M 6 I		FZA 12x50 M 6 I	FZA 14x60 M 8 I		FZA 18x80 M 10 I		FZA 22x100 M 12 I		FZA 22x125 M 12 I	
			gvz [1]	A4 [2]	A4 [2]	gvz [1]	A4 [2]	gvz [1]	A4 [2]	gvz [1]	A4 [2]	gvz [1]	A4 [2]
non-cracked concrete													
tension	C 20/25	N_R [kN]	6.7	5.4	5.4	9.3	7.1	9.6	9.0	22.5	21.1	22.5	21.1
	≧ C 40/50	N_R [kN]	7.0	5.4	5.4	9.3	7.1	9.6	9.0	22.5	12.1	22.5	21.1
shear	≧ C 20/25	V_R [kN]	4.1	3.2	3.2	5.4	4.3	5.6	5.4	13.2	12.7	13.2	12.7
cracked concrete													
tension	C 20/25	N_R [kN]	4.3		5.4	8.0	7.1	9.6	9.0	17.1		22.5	21.1
	C 50/60	N_R [kN]	6.7	5.4	5.4	9.3	7.1	9.6	9.0	22.5	21.1	22.5	21.1
shear	≧ C 20/25	V_R [kN]	4.1	3.2	3.2	5.4	4.3	5.6	5.4	13.2	12.7	13.2	12.7

[1] The values apply to screws with a strength class 8.8
[2] The values apply to screws with a strength class A4 - 70
[3] Material safety factors γ_M and safety factor for action γ_L = 1.4 are included. Material safety factor γ_M depends on the failure mode of the anchor.

fischer Zykon internally-threaded anchor FZA-I

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4. Calculation of tension resistance

The decisive design resistance in tension is the lowest value of following failure modes:

Steel failure: $N_{Rd,s}$

Pull-out / pull-through failure: *Failure mode is not decisive*

Concrete cone failure: $N_{Rd,c} = N^0_{Rd,c} \cdot f_{b,N} \cdot f_{s1} \cdot f_{s2} \cdot f_{s3} \cdot f_{c1,A} \cdot f_{c1,B} \cdot f_{c2}$

Concrete splitting failure: *Failure mode is not decisive*

4.1 Steel failure of the highest loaded anchor

Design resistance of single anchor

Anchor type		FZA 12x40 M 6 I		FZA 12x50 M 6 I	FZA 14x60 M 8 I		FZA 18x80 M 10 I		FZA 22x100 M 12 I		FZA 22x125 M 12 I	
		gvz [1]	A4 [2]	A4 [2]	gvz [1]	A4 [2]	gvz [1]	A4 [2]	gvz [1]	A4 [2]	gvz [1]	A4 [2]
design resistance	$N_{Rd,s}$ [kN]	9.8	7.5	7.5	13.1	9.9	13.5	12.6	31.5	29.5	31.5	29.5

[1] The values apply to screws with a strength class 8.8

[2] The values apply to screws with a strength class A4 - 70

4.2 Pull-out/pull-through failure of the highest loaded anchor

Failure mode is not decisive and therefore may be neglected

4.3 Concrete cone failure and splitting of the most unfavourable anchor

Concrete cone failure: $N_{Rd,c} = N^0_{Rd,c} \cdot f_{b,N} \cdot f_{s1} \cdot f_{s2} \cdot f_{s3} \cdot f_{c1,A} \cdot f_{c1,B} \cdot f_{c2}$

Concrete splitting failure: *Failure mode is not decisive*

Design resistance of single anchor

Anchor type		FZA 12x40 M 6 I	FZA 12x50 M 6 I	FZA 14x60 M 8 I	FZA 18x80 M 10 I	FZA 22x100 M 12 I	FZA 22x125 M 12 I
eff. anchorage depth	h_{ef} [mm]	40	50	60	80	100	125
non-cracked concrete							
design resistance	$N^0_{Rd,c}$ [kN]	9.4	13.1	17.2	26.4	37.0	51.7
cracked concrete							
design resistance	$N^0_{Rd,c}$ [kN]	6.1	8.5	11.2	17.2	24.0	33.5

4.3.1 Influence of concrete strength for tension

$$f_{b,N} = \sqrt{\frac{f_{ck,\,cube}}{25}} = \sqrt{\frac{f_{ck,\,cyl}}{20}}$$

Concrete strength class			C 12/15	C 16/20	C 20/25	C 25/30	C 30/37	C 35/45	C 40/50	C 45/55	C 50/60
cylinder compressive strength	$f_{ck,cyl}$	[N/mm²]	12	16	20	25	30	35	40	45	50
cube compressive strength	$f_{ck,cube}$	[N/mm²]	15	20	25	30	37	45	50	55	60
influence factor	$f_{b,N}$	[-]	0.77	0.89	1.00	1.10	1.22	1.34	1.41	1.48	1.55

4.3.2 Concrete cone failure

Characteristic edge distance and spacing for design

Anchor type		FZA 12x40 M 6 I	FZA 12x50 M 6 I	FZA 14x60 M 8 I	FZA 18x80 M 10 I	FZA 22x100 M 12 I	FZA 22x125 M 12 I
h_{ef}		40	50	60	80	100	125
$s_{cr,N}$	[mm]	120	150	180	240	300	375
$c_{cr,N}$	[mm]	60	75	90	120	150	188

4.3.2.1 Influence of spacing / concrete cone failure

$$f_{s1} = f_{s2} = f_{s3} = \left(1.0 + \frac{s}{s_{cr,N}}\right) \cdot 0.5 \leqq 1.0$$

$s/s_{cr,N}$	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5	0.55	0.6	0.65	0.7	0.75	0.8	0.85	0.9	0.95	≧1.0
f_{s1}	0.55	0.58	0.6	0.63	0.65	0.68	0.7	0.73	0.75	0.78	0.8	0.83	0.85	0.88	0.9	0.93	0.95	0.98	1.0

4.3.2.2 Influence of edge distance / concrete cone failure

$$f_{c1,A} = 0.7 + 0.3 \cdot \frac{c}{c_{cr,N}} \leqq 1.0 \qquad f_{c1,B} = f_{c2} = \left(1.0 + \frac{c}{c_{cr,N}}\right) \cdot 0.5 \leqq 1.0$$

$c/c_{cr,N}$	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5	0.55	0.6	0.65	0.7	0.75	0.8	0.85	0.9	0.95	≧1.0
$f_{c1,A}$	0.73	0.75	0.76	0.78	0.79	0.81	0.82	0.84	0.85	0.87	0.88	0.9	0.91	0.93	0.94	0.96	0.97	0.99	1.0
$f_{c1,B}$ f_{c2}	0.55	0.58	0.6	0.63	0.65	0.68	0.7	0.73	0.75	0.78	0.8	0.83	0.85	0.88	0.9	0.93	0.95	0.98	1.0

4.3.3 Concrete splitting failure

Failure mode is not decisive and therefore may be neglected

5. Calculation of shear resistance

The decisive design resistance in shear is the lowest value of the following failure modes:

Steel failure: $V_{Rd,s}$

Pryout failure: $V_{Rd,cp} = N_{Rd,c} \cdot k$

Concrete edge failure: $V_{Rd,c} = V^{o}_{Rd,c} \cdot f_{b,V} \cdot f_{\alpha,V} \cdot f_{s1,V} \cdot f_{s2,V} \cdot f_{c2,V} \cdot f_{h,V} \cdot f_{m}$

5.1 Steel failure for the highest loaded anchor

Design resistance of single anchor

Anchor type		FZA 12x40 M 6 I		FZA 12x50 M 6 I	FZA 14x60 M 8 I		FZA 18x80 M 10 I		FZA 22x100 M 12 I		FZA 22x125 M 12 I	
		gvz [1]	A4 [2]	A4 [2]	gvz [1]	A4 [2]	gvz [1]	A4 [2]	gvz [1]	A4 [2]	gvz [1]	A4 [2]
design resistance	$V_{Rd,s}$ [kN]	5.7	4.5	4.5	7.6	6.0	7.9	7.5	18.5	17.7	18.5	17.7

[1] The values apply to screws with a strength class 8.8

[2] The values apply to screws with a strength class A4 - 70

5.2 Pryout failure for the most unfavourable anchor

$$V_{Rd,cp} = N_{Rd,c} \cdot k$$

k-factor

Anchor type	FZA 12x40 M 6 I	FZA 12x50 M 6 I	FZA 14x60 M 8 I	FZA 18x80 M 10 I	FZA 22x100 M 12 I	FZA 22x125 M 12 I
k	1.3	1.3	2.0	2.0	2.0	2.0

fischer Zykon internally-threaded anchor FZA-I

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5.3 Concrete edge failure for the most unfavourable anchor

$$V_{Rd,c} = V^{0}_{Rd,c} \cdot f_{b,V} \cdot f_{\alpha,V} \cdot f_{s1,V} \cdot f_{s2,V} \cdot f_{c2,V} \cdot f_{h,V} \cdot f_{m}$$

Proof of concrete edge failure is only necessary, if the following condition is met:

- c < max (10 h_{ef} ; 60 d) with d = nominal anchor diameter

Design resistance of single anchor in concrete C 20/25 dependent on edge distance c_1

edge distance [mm]	$V^{0}_{Rd,c}$ [kN]											
	FZA 12x40 M 6 I		FZA 12x50 M 6 I		FZA 14x60 M 8 I		FZA 18x80 M 10 I		FZA 22x100 M 12 I		FZA 22x125 M 12 I	
	non-cracked concrete	cracked concrete	non-cracked concrete	cracked concrete	non-cracked concrete	cracked concrete	non-cracked concrete	cracked concrete	non-cracked concrete	cracked concrete	non-cracked concrete	cracked concrete
35	2.9	2.1										
40	3.5	2.5										
45	4.1	2.9	4.2	3.0								
50	4.7	3.3	4.9	3.4								
55	5.3	3.8	5.5	3.9	5.9	4.2						
60	6.0	4.2	6.2	4.4	6.6	4.7						
65	6.6	4.7	6.9	4.9	7.3	5.2						
70	7.3	5.2	7.6	5.4	8.0	5.7	8.9	6.3				
75	8.0	5.7	8.3	5.9	8.8	6.2	9.7	6.9				
80	8.8	6.2	9.1	6.4	9.6	6.8	10.6	7.5				
85	9.5	6.8	9.9	7.0	10.4	7.4	11.4	8.1				
90	10.3	7.3	10.7	7.6	11.2	8.0	12.3	8.7				
95	11.1	7.9	11.5	8.1	12.1	8.6	13.2	9.4				
100	11.9	8.4	12.3	8.7	12.9	9.2	14.1	10.0	15.3	10.8		
120	15.3	10.9	15.8	11.2	16.5	11.7	18.0	12.7	19.4	13.7		
125	16.2	11.5	16.7	11.8	17.5	12.4	19.0	13.4	20.4	14.5	21.4	15.2
130	17.1	12.1	17.6	12.5	18.4	13.1	20.0	14.2	21.5	15.2	22.5	16.0
135	18.0	12.8	18.6	13.2	19.4	13.7	21.0	14.9	22.6	16.0	23.6	16.7
140	19.0	13.4	19.5	13.8	20.4	14.4	22.1	15.6	23.7	16.8	24.8	17.5
160	22.8	16.2	23.5	16.6	24.5	17.3	26.4	18.7	28.2	20.0	29.4	20.9
180	26.9	19.1	27.7	19.6	28.8	20.4	30.9	21.9	32.9	23.3	34.3	24.3
200	31.2	22.1	32.0	22.7	33.3	23.6	35.6	25.2	37.9	26.8	39.4	27.9
250	42.7	30.2	43.7	31.0	45.3	32.1	48.2	34.2	51.0	36.2	53.0	37.5
300	55.3	39.1	56.5	40.0	58.4	41.4	61.9	43.9	65.3	46.3	67.6	47.9
350	68.8	48.7	70.2	49.7	72.5	51.3	76.6	54.3	80.5	57.0	83.2	58.9
400	83.1	58.9	84.8	60.1	87.4	61.9	92.2	65.3	96.7	68.5	99.7	70.6
450	98.3	69.7	100.3	71.0	103.2	73.1	108.6	76.9	113.6	80.5	117.0	82.9
500	114.3	81.0	116.5	82.5	119.7	84.8	125.8	89.1	131.4	93.1	135.2	95.8
550	131.0	92.8	133.4	94.5	137.0	97.1	143.7	101.8	149.9	106.2	154.1	109.1
600	148.4	105.1	151.1	107.0	155.0	109.8	162.4	115.0	169.2	119.8	173.7	123.0
650	166.5	117.9	169.4	120.0	173.7	123.0	181.7	128.7	189.1	134.0	194.0	137.4
700	185.2	131.2	188.3	133.4	193.0	136.7	201.7	142.9	209.7	148.5	215.0	152.3
750	204.5	144.8	207.9	147.3	213.0	150.8	222.3	157.5	230.9	163.6	236.6	167.6
800					233.5	165.4	243.5	172.5	252.7	179.0	258.8	183.3
850					254.6	180.4	265.3	187.9	275.1	194.9	281.6	199.5
900							287.7	203.8	298.1	211.2	305.0	216.0
950							310.6	220.0	321.7	227.9	328.9	233.0
1000							334.0	236.6	345.8	244.9	353.4	250.3
1100							382.5	270.9	395.5	280.1	403.9	286.1
1200									447.2	316.8	456.5	323.3
1300									500.8	354.8	510.9	361.9

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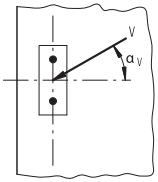
5.3.1 Influence of concrete strength for shear

$$f_{b,V} = \sqrt{\frac{f_{ck,\,cube}}{25}} = \sqrt{\frac{f_{ck,\,cyl}}{20}}$$

Concrete strength class			C 12/15	C 16/20	C 20/25	C 25/30	C 30/37	C 35/45	C 40/50	C 45/55	C 50/60
Cylinder compressive strength	$f_{ck,cyl}$	[N/mm²]	12	16	20	25	30	35	40	45	50
Cube compressive strength	$f_{ck,cube}$	[N/mm²]	15	20	25	30	37	45	50	55	60
Influence factor	$f_{b,V}$	[-]	0.77	0.89	1.00	1.10	1.22	1.34	1.41	1.48	1.55

5.3.2 Influence of load direction

$$f_{\alpha,V} = \sqrt{\frac{1}{(\cos \alpha_V)^2 + (\frac{\sin \alpha_V}{2.5})^2}} \leqq 2.5$$



	0	10	20	30	40	50	60	70	80	90
$f_{\alpha,V}$	1.00	1.01	1.05	1.13	1.24	1.40	1.64	1.97	2.32	2.50

For angle $\alpha \geqq 90°$ the component of the shear load acting away from the edge may be neglected and the proof may be done with the component of the load acting parallel to the edge.

5.3.3 Influence of spacing

$$f_{s1,V} = f_{s2,V} = \frac{1}{6} \cdot \frac{s}{c_1} + \frac{1}{2} \leqq 1.0$$

s/c_1	0.5	0.6	0.7	0.8	0.9	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	≥3.0
$f_{s1,V}$	0.58	0.6	0.62	0.63	0.65	0.67	0.7	0.73	0.77	0.8	0.83	0.87	0.9	0.93	0.97	1.0

5.3.4 Influence of edge distance

Distance to second edge; $c_1 < c_2$

$$f_{c2,V} = \left(\frac{1}{2} + \frac{1}{3} \cdot \frac{c_2}{c_1}\right) \cdot \left(0.7 + 0.3 \cdot \frac{c_2}{1.5 \cdot c_1}\right) \leqq 1.0$$

c_2/c_1	1.0	1.1	1.2	1.3	1.4	≥1.5
$f_{c2,V}$	0.75	0.8	0.85	0.9	0.95	1.0

5.3.5 Influence of member thickness

$$f_{h,V} = \left(\frac{h}{1.5 \cdot c_1}\right)^{0.5} \leqq 1.0$$

h/c_1	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.2	1.3	1.4	≥1.5
$f_{h,V}$	0.26	0.37	0.45	0.52	0.58	0.63	0.68	0.73	0.77	0.82	0.89	0.93	0.97	1.0

5.3.6 Influence of group with ≧ 4 anchors in a row at the edge

f_m

s/c_1	0.25	0.5	1.0	≥2.0
f_m	0.3	0.5	0.75	1.0

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6. Summary of required proof:

6.1 **Tension:** $N_{Sd} \leqq N_{Rd}$ = lowest value of $N_{Rd,s}$; $N_{Rd,p}$; $N_{Rd,c}$; $N_{Rd,sp}$

6.2 **Shear:** $V_{Sd} \leqq V_{Rd}$ = lowest value of $V_{Rd,s}$; $V_{Rd,cp}$; $V_{Rd,c}$

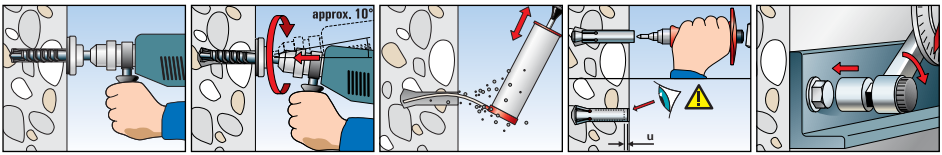
6.3 **Combined tension and shear load:**

$$\frac{N_{Sd}}{N_{Rd}} + \frac{V_{Sd}}{V_{Rd}} \leqq 1.2$$

N_{Sd}; V_{Sd} = tension/shear component of the design load acting on the most unfavourable single anchor

N_{Rd}; V_{Rd} = tension/shear design resistance including safety factors of the most unfavourable single anchor

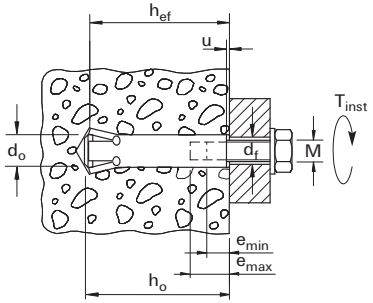
7. Installation details



8. Anchor installation data

Anchor type			FZA 12x40 M 6 I		FZA 12x50 M 6 I	FZA 14x60 M 8 I		FZA 18x80 M 10 I		FZA 22x100 M 12 I		FZA 22x125 M 12 I	
			gvz	A4	A4	gvz	A4	gvz	A4	gvz	A4	gvz	A4
diameter of thread			M 6		M 6	M 8		M 10		M 12		M 12	
nominal drill hole diameter	d_0	[mm]	12		12	14		18		22		22	
drill depth	h_0	[mm]	43		53	63		83		103		127	
effective anchorage depth	h_{ef}	[mm]	40		50	60		80		100		125	
clearance-hole in fixture to be attached	d_f	[mm]	≦ 7		≦ 7	≦ 9		≦ 12		≦ 14		≦ 14	
screw penetration depth	e_{min} / e_{max}	[mm]	8 / 13		8 / 13	11 / 17		13 / 21		15 / 25		15 / 25	
required torque	T_{inst}	[Nm]	8.5		8.5	15		30		60		60	
gap	u	[mm]	0 - 4.0		0 - 4.0	0 - 4.0		0 - 4.5		0 - 4.5		0 - 4.5	
minimum thickness of concrete member	h_{min}	[mm]	100		110	130		160		200		250	
minimum spacing	s_{min}	[mm]	40		50	60		80		100		125	
minimum edge distances	c_{min}	[mm]	35		45	55		70		100		125	

[1] Intermediate values by linear interpolation.



fischer Zykon internally-threaded anchor FZA-I

Anchor design according to fischer specification

9. Mechanical anchor material characteristics

Anchor type			FZA 12x40 M 6 I		FZA 12x50 M 6 I		FZA 14x60 M 8 I		FZA 18x80 M 10 I		FZA 22x100 M 12 I		FZA 22x125 M 12 I	
			gvz	A4	A4		gvz	A4	gvz	A4	gvz	A4	gvz	A4
stressed cross sectional area cone bolt	A_s	[mm²]	24.9		24.9		33.3		42.1		98.5		98.5	
stressed cross sectional area screw	A_s	[mm²]	20.1		20.1		36.6		58.0		84.3		84.3	
resisting moment cone bolt	W	[mm³]	37.5		37.5		65.6		103		297		297	
resisting moment screw	W	[mm³]	12.7		12.7		31.2		62.3		109		109	
design value of bending moment	$M^0_{Rd,s}$	[Nm]	9.8	6.9	9.8	6.9	24.0	16.8	47.8	33.5	84.0	58.7	84.0	58.7
yield strength cone bolt	f_{yk}	[N/mm²]	470	355	355		470	355	375	355	375	355	375	355
tensile strength cone bolt	f_{uk}	[N/mm²]	690	540	540		690	540	640	540	640	540	640	540