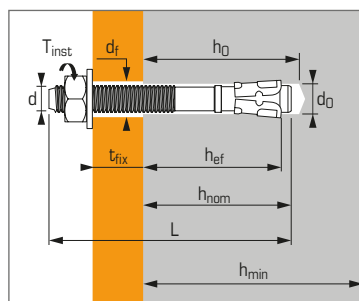




Torque controlled expansion anchor, for use in cracked and non-cracked concrete



FIX Z A4 M10



Technical data

Anchor size	Minimum anchorage depth					Maximum anchorage depth					Thread diameter	Drilling diameter	Clearance diameter	Total anchor length	Tighten torque	Code
	min. anchor depth	Embed. depth	Max. thick. of part to be fixed	Drilling depth	Min. thick. of base material	max. anchor depth	Embed. depth	Max. thick. of part to be fixed	Drilling depth	Min. thick. of base material						
	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(Nm)	
	h_{ef}	h_{nom}	t_{fix}	h_0	h_{min}	h_{ef}	h_{nom}	t_{fix}	h_0	h_{min}	d	d_0	d_f	L	T_{inst}	
6X55/15*	25,6	35	15	41	100	35	45	5	51	100	6	6	8	55	10	054270
8X55/5	35	42	5	52	100	48	55	-	65	100	8	8	9	55	20	050441
8X70/20-7			20					7						70		054610
8X90/40-27			40					27						90		055343
8X130/80-67			80					67						130		050367
10X65/5	42	50	5	62	100	58	66	-	78	116	10	10	12	65	35	050466
10X75/15			15					-						75		054630
10X95/35-20			35					20						95		054640
10X120/60-45			60					45						120		050442
12X80/5	50	60	5	75	100	70	80	-	95	140	12	12	14	80	50	055344
12X100/25-6			25					6						100		055345
12X115/40-21			40					21						115		055394
12X140/65-46			65					46						140		054680
16X125/30-8			30					8						125		050443
16X150/55-33	64	70	55	95	128	86	100	33	117	172	16	16	18	150	100	054700
16X170/75-53			75					53						170		050444

* Do not belong to ETA

APPLICATION

- Steel and timber framework and beams
- Lift guide rails
- Industrial doors and gates
- Brickwork support angles
- Storage systems

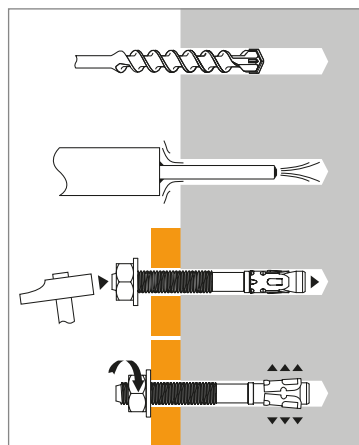
MATERIAL

- Body :**
steel N° 1.4404 (A4), 1.4578, NF EN 10088.3
- Sleeve :**
cold laminated steel N° 1.4404, NF EN 10088.3
- Nut :**
stainless steel A4-80, NF EN 20898-2
- Washer :**
stainless steel A4, NF EN 20898

Anchor mechanical properties

Anchor size		M6	M8	M10	M12	M16
Cross-section above cone						
f_{uk} (N/mm ²)	Min. tensile strength	900	900	900	900	880
f_{yk} (N/mm ²)	Yield strength	780	780	780	780	750
A_s (mm ²)	Stressed cross-section	-	24,6	41,9	58,1	107,5
Threaded part						
f_{uk} (N/mm ²)	Min. tensile strength	620	620	620	620	580
f_{yk} (N/mm ²)	Yield strength	420	420	420	420	330
A_s (mm ²)	Stressed cross-section	20,1	36,6	58	84,3	157
W_{el} (mm ³)	Elastic section modulus	12,71	31,23	62,3	109,17	277,47
$M_{rk,s}$ (Nm)	Characteristic bending moment	9,45	23	46	81	193
M (Nm)	Recommended bending moment	3,7	9,4	18,8	33,1	78,8

INSTALLATION





The loads specified on this page allow judging the product's performances, but cannot be used for the designing. The data given in the pages "CC method" have to be applied (3/4 and 4/4).

Ultimate ($N_{Ru,m}$, $V_{Ru,m}$) and characteristic loads (N_{Rk} , V_{Rk}) in kN

Mean Ultimate loads are derived from test results in admissible service conditions, and characteristic loads are statistically determined.

TENSILE

Anchor size	M6	M8	M10	M12	M16
Non-cracked concrete (C20/25)					
$h_{ef,min}$	25,6	35	42	50	64
$N_{Ru,m}$	4,5	8,0	9,9	13,6	24,1
N_{Rk}	4,5	8,0	9,9	13,6	24,1
$h_{ef,max}$	35	48	58	70	86
$N_{Ru,m}$	9,4	22,0	23,0	26,3	53,6
N_{Rk}	7,0	17,2	19,2	25,1	44,1
Cracked concrete (C20/25)					
$h_{ef,min}$	-	35	42	50	64
$N_{Ru,m}$	-	12,5	13,1	18,6	29,6
N_{Rk}	-	7,5	9,1	14,2	24,8
$h_{ef,max}$	-	48	58	70	86
$N_{Ru,m}$	-	15,9	20,3	29,2	54,2
N_{Rk}	-	14,7	18,8	27,0	49,5

SHEAR

Anchor size	M6	M8	M10	M12	M16
Cracked & non-cracked concrete (C20/25)					
$V_{Ru,m}$	7,4	18,2	29,2	43,2	69,1
V_{Rk}	6,2	17,3	25	36,1	51,3

Design loads (N_{Rd} , V_{Rd}) for one anchor without edge or spacing influence in kN

$$N_{Rd} = \frac{N_{Rk}^*}{\gamma_{Mc}}$$

*Derived from test results

$$V_{Rd} = \frac{V_{Rk}^*}{\gamma_{Ms}}$$

TENSILE

Anchor size	M6	M8	M10	M12	M16
Non-cracked concrete (C20/25)					
$h_{ef,min}$	25,6	35	42	50	64
N_{Rd}	2,5	5,3	6,6	9,1	16,1
$h_{ef,max}$	35	48	58	70	86
N_{Rd}	3,8	11,5	12,8	14,3	29,4
Cracked concrete (C20/25)					
$h_{ef,min}$	-	35	42	50	64
N_{Rd}	-	5,0	6,1	9,5	16,5
$h_{ef,max}$	-	48	58	70	86
N_{Rd}	-	9,8	12,5	18,0	33,0

$\gamma_{Mc} = 1,5$

SHEAR

Anchor size	M6	M8	M10	M12	M16
Cracked & non-cracked concrete (C20/25)					
V_{Rd}	4,1	11,5	16,7	24,1	28,5

$\gamma_{Ms} = 1,5$ for M6 to M12 and $\gamma_{Ms} = 1,8$ for M16

Recommended loads (N_{rec} , V_{rec}) for one anchor without edge or spacing influence in kN

$$N_{rec} = \frac{N_{Rk}^*}{\gamma_M \cdot \gamma_F}$$

*Derived from test results

$$V_{rec} = \frac{V_{Rk}^*}{\gamma_M \cdot \gamma_F}$$

TENSILE

Anchor size	M6	M8	M10	M12	M16
Non-cracked concrete (C20/25)					
$h_{ef,min}$	25,6	35	42	50	64
N_{rec}	1,7	3,8	4,7	6,5	11,5
$h_{ef,max}$	35	48	58	70	86
N_{rec}	2,7	8,2	9,1	10,2	21,0
Cracked concrete (C20/25)					
$h_{ef,min}$	-	35	42	50	64
N_{rec}	-	3,6	4,3	6,8	11,8
$h_{ef,max}$	-	48	58	70	86
N_{rec}	-	7,0	9,0	12,8	23,6

$\gamma_F = 1,4$; $\gamma_{Mc} = 1,5$

SHEAR

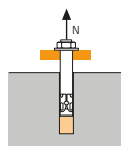
Anchor size	M6	M8	M10	M12	M16
Cracked & non-cracked concrete (C20/25)					
V_{rec}	2,9	8,2	11,9	17,2	20,4

$\gamma_F = 1,4$; $\gamma_{Ms} = 1,5$ for M6 to M12 and $\gamma_{Ms} = 1,8$ for M16



SPIT CC Method (values issued from ETA)

TENSILE in kN

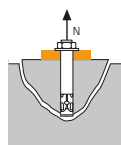


→ Pull-out resistance

$$N_{Rd,p} = N_{Rd,p}^0 \cdot f_b$$

$N_{Rd,p}^0$	Design pull-out resistance			
Anchor size	M8	M10	M12	M16
$h_{ef,min}$	35	42	50	64
$h_{ef,max}$	48	58	70	86
Non-cracked concrete (C20/25)				
$N_{Rd,p}^0$ ($h_{ef,min}$)	6,0	6,0	8,0	13,3
$N_{Rd,p}^0$ ($h_{ef,max}$)	8,0	10,7	10,7	20,0
Cracked concrete (C20/25)				
$N_{Rd,p}^0$ ($h_{ef,min}$)	2,0	4,0	5,0	8,0
$N_{Rd,p}^0$ ($h_{ef,max}$)	2,7	5,0	6,0	10,7

$\gamma_{Mc} = 1,5$

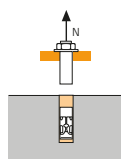


→ Concrete cone resistance

$$N_{Rd,c} = N_{Rd,c}^0 \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$$

$N_{Rd,c}^0$	Design cone resistance			
Anchor size	M8	M10	M12	M16
$h_{ef,min}$	35	42	50	64
$h_{ef,max}$	48	58	70	86
Non-cracked concrete (C20/25)				
$N_{Rd,c}^0$ ($h_{ef,min}$)	7,0	9,1	11,9	17,2
$N_{Rd,c}^0$ ($h_{ef,max}$)	11,2	14,8	19,7	26,8
Cracked concrete (C20/25)				
$N_{Rd,c}^0$ ($h_{ef,min}$)	5,0	6,5	8,5	12,3
$N_{Rd,c}^0$ ($h_{ef,max}$)	8,0	10,6	14,1	19,1

$\gamma_{Mc} = 1,5$



→ Steel resistance

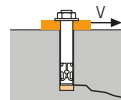
$N_{Rd,s}$	Steel design tensile resistance			
Anchor size	M8	M10	M12	M16
$N_{Rd,s}$	8,5	14,4	20,0	29,7

$\gamma_{Ms} = 1,8$ for M8 to M12 and $\gamma_{Ms} = 2,1$ for M16

$$N_{Rd} = \min(N_{Rd,p} ; N_{Rd,c} ; N_{Rd,s})$$

$$\beta_N = N_{Sd} / N_{Rd} \leq 1$$

SHEAR in kN

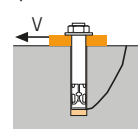


→ Concrete edge resistance

$$V_{Rd,c} = V_{Rd,c}^0 \cdot f_b \cdot f_{\beta,V} \cdot \Psi_{S-C,V}$$

$V_{Rd,c}^0$	Design concrete edge resistance at minimum edge distance (C_{min})			
Anchor size	M8	M10	M12	M16
Non-cracked concrete (C20/25)				
$h_{ef,min}$	35	42	50	64
C_{min}	60	65	100	100
S_{min}	60	75	170	150
$V_{Rd,c}^0$	3,3	4,1	8,7	10,1
Cracked concrete (C20/25)				
$h_{ef,max}$	48	58	70	86
C_{min}	60	65	90	105
S_{min}	50	55	75	90
$V_{Rd,c}^0$	3,7	4,4	8,2	11,8

$\gamma_{Mc} = 1,5$

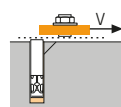


→ Pryout failure

$$V_{Rd,cp} = V_{Rd,cp}^0 \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$$

$V_{Rd,cp}^0$	Design pryout resistance			
Anchor size	M8	M10	M12	M16
Non-cracked concrete (C20/25)				
$h_{ef,min}$	35	42	50	64
$V_{Rd,cp}^0$	7,0	9,1	11,9	34,4
$h_{ef,max}$	48	58	70	86
$V_{Rd,cp}^0$	11,2	14,8	39,4	53,6
Cracked concrete (C20/25)				
$h_{ef,min}$	35	42	50	64
$V_{Rd,cp}^0$	5,0	6,5	8,5	24,6
$h_{ef,max}$	48	58	70	86
$V_{Rd,cp}^0$	8,0	10,6	28,1	38,3

$\gamma_{Mc,p} = 1,5$



→ Steel resistance

$V_{Rd,s}$	Steel design shear resistance			
Anchor size	M8	M10	M12	M16
$V_{Rd,s}$	8,2	13,1	18,9	25,8

$\gamma_{Ms} = 1,5$ for M8 to M12 and $\gamma_{Ms} = 1,8$ for M16

$$V_{Rd} = \min(V_{Rd,c} ; V_{Rd,cp} ; V_{Rd,s})$$

$$\beta_V = V_{Sd} / V_{Rd} \leq 1$$

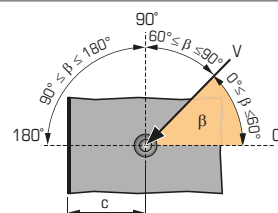
$$\beta_N + \beta_V \leq 1,2$$

f_b INFLUENCE OF CONCRETE

Concrete class	f_b	Concrete class	f_b
C25/30	1,1	C40/50	1,41
C30/37	1,22	C45/55	1,48
C35/45	1,34	C50/60	1,55

$f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

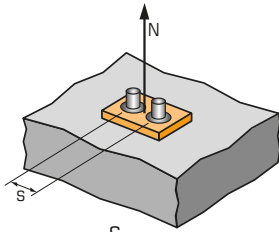
Angle β [°]	$f_{\beta,V}$
0 to 55	1
60	1,1
70	1,2
80	1,5
90 to 180	2





SPIT CC Method (values issued from ETA)

Ψ_s INFLUENCE OF SPACING FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_s = 0,5 + \frac{s}{6 \cdot h_{ef}}$$

$$s_{min} < s < s_{cr,N}$$

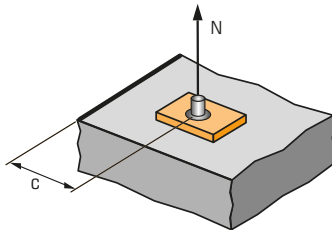
$$s_{cr,N} = 3 \cdot h_{ef}$$

Ψ_s must be used for each spacing influenced the anchors group

SPACING S		Reduction factor Ψ_s Minimum anchorage depth			
Anchor size		M8	M10	M12	M16
60		0,78			
75		0,86	0,80		
100		0,98	0,90	0,83	0,76
105		1,00	0,92	0,85	0,77
110			0,94	0,87	0,79
125			1,00	0,92	0,83
150				1,00	0,89
170					0,94
192					1,00

SPACING S		Reduction factor Ψ_s Maximum anchorage depth			
Anchor size		M8	M10	M12	M16
50		0,67			
55		0,69	0,66		
75		0,76	0,72	0,68	
90		0,81	0,76	0,71	0,67
110		0,88	0,82	0,76	0,71
130		0,95	0,87	0,81	0,75
145		1,00	0,92	0,85	0,78
155			0,95	0,87	0,80
175			1,00	0,92	0,84
205				0,99	0,90
210				1,00	0,91
258					1,00

$\Psi_{c,N}$ INFLUENCE OF EDGE FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_{c,N} = 0,23 + 0,51 \cdot \frac{c}{h_{ef}}$$

$$c_{min} < c < c_{cr,N}$$

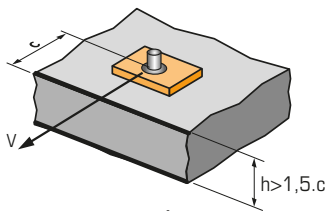
$$c_{cr,N} = 1,5 \cdot h_{ef}$$

$\Psi_{c,N}$ must be used for each distance influenced the anchors group.

EDGE C		Reduction factor $\Psi_{c,N}$ Minimum anchorage depth			
Anchor size		M8	M10	M12	M16
60		1,00			
65			1,00		
100				1,00	1,00

EDGE C		Reduction factor $\Psi_{c,N}$ Maximum anchorage depth			
Anchor size		M8	M10	M12	M16
60		0,87			
65		0,92	0,80		
70		1,00	0,85		
90			1,00	0,89	
105				1,00	0,85
125					0,97
130					1,00

$\Psi_{s-c,V}$ INFLUENCE OF SPACING AND EDGE DISTANCE FOR CONCRETE EDGE RESISTANCE IN SHEAR LOAD



$$\Psi_{s-c,V} = \frac{c}{c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$

→ For single anchor fastening

		Reduction factor $\Psi_{s-c,V}$ Cracked & non-cracked concrete											
$\frac{c}{c_{min}}$		1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
$\Psi_{s-c,V}$		1,00	1,31	1,66	2,02	2,41	2,83	3,26	3,72	4,19	4,69	5,20	5,72

→ For 2 anchors fastening

		Reduction factor $\Psi_{s-c,V}$ Cracked & non-cracked concrete											
$\frac{s}{c_{min}}$	$\frac{c}{c_{min}}$	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
1,0		0,67	0,84	1,03	1,22	1,43	1,65	1,88	2,12	2,36	2,62	2,89	3,16
1,5		0,75	0,93	1,12	1,33	1,54	1,77	2,00	2,25	2,50	2,76	3,03	3,31
2,0		0,83	1,02	1,22	1,43	1,65	1,89	2,12	2,38	2,63	2,90	3,18	3,46
2,5		0,92	1,11	1,32	1,54	1,77	2,00	2,25	2,50	2,77	3,04	3,32	3,61
3,0		1,00	1,20	1,42	1,64	1,88	2,12	2,37	2,63	2,90	3,18	3,46	3,76
3,5			1,30	1,52	1,75	1,99	2,24	2,50	2,76	3,04	3,32	3,61	3,91
4,0				1,62	1,86	2,10	2,36	2,62	2,89	3,17	3,46	3,75	4,05
4,5					1,96	2,21	2,47	2,74	3,02	3,31	3,60	3,90	4,20
5,0						2,33	2,59	2,87	3,15	3,44	3,74	4,04	4,35
5,5							2,71	2,99	3,28	3,71	4,02	4,33	4,65
6,0							2,83	3,11	3,41	3,71	4,02	4,33	4,65

→ For 3 anchors fastening and more

$$\Psi_{s-c,V} = \frac{3 \cdot c + s_1 + s_2 + s_3 + \dots + s_{n-1}}{3 \cdot n \cdot c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$

