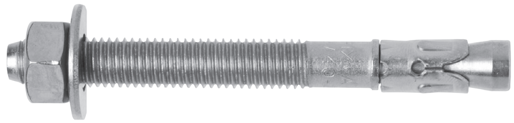


FIX Z - A4

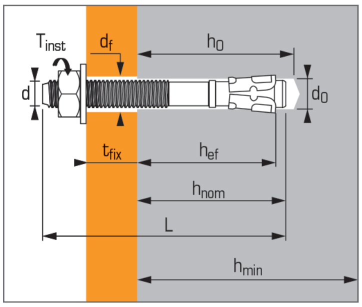
stainless steel version 1/4

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

European Technical Assessment
ETA Option 1- 04/0010

INOX STAINLESS STEEL

FM APPROVED
FIX Z A4 M10



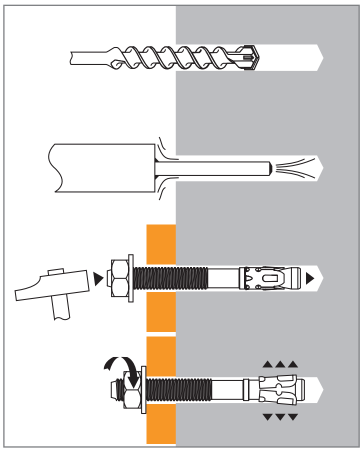
APPLICATION

- 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

INSTALLATION



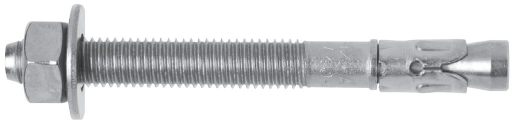
Technical data

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

* Do not belong to ETA

Anchor mechanical properties

Anchor size		M6	M8	M10	M12	M16
Cross-section above cone						
f_{uk} (N/mm²)	Min. tensile strength	900	900	900	900	880
f_{yk} (N/mm²)	Yield strength	780	780	780	780	750
As (mm²)	Stressed cross-section	-	24,6	41,9	58,1	107,5
Threaded part						
f_{uk} (N/mm²)	Min. tensile strength	620	620	620	620	580
f_{yk} (N/mm²)	Yield strength	420	420	420	420	330
As (mm²)	Stressed cross-section	20,1	36,6	58	84,3	157
W_{el} (mm³)	Elastic section modulus	12,71	31,23	62,3	109,17	277,47
$M^0_{rk,s}$ (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



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

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

*Derived from test results

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

TENSILE

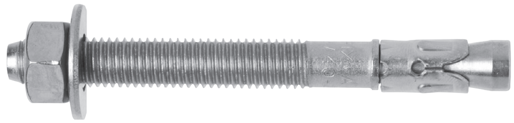
Anchor size	M6	M8	M10	M12	M16
Non-cracked concrete (C20/25)					
$h_{ef,min}$	**25,6**	**35**	**42**	**50**	**64**
N_{rec}	1,7	3,8	4,7	6,5	11,5
$h_{ef,max}$	**35**	**48**	**58**	**70**	**86**
N_{rec}	2,7	8,2	9,1	10,2	21,0
Cracked concrete (C20/25)					
$h_{ef,min}$	**-**	**35**	**42**	**50**	**64**
N_{rec}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

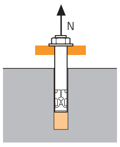
Anchor size	M6	M8	M10	M12	M16
Cracked & non-cracked concrete (C20/25)					
V_{rec}	2,9	8,2	11,9	17,2	20,4

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



SPIT CC Method (values issued from ETA)

TENSILE in kN



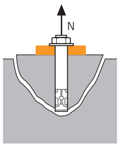
Pull-out resistance

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

$N^0_{Rd,p}$ — 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)					
$N^0_{Rd,p}$	($h_{ef,min}$)	6,0	6,0	8,0	13,3
$N^0_{Rd,p}$	($h_{ef,max}$)	8,0	10,7	10,7	20,0
Cracked concrete (C20/25)					
$N^0_{Rd,p}$	($h_{ef,min}$)	2,0	4,0	5,0	8,0
$N^0_{Rd,p}$	($h_{ef,max}$)	2,7	5,0	6,0	10,7

$\gamma_{Mc} = 1,5$



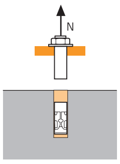
Concrete cone resistance

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

$N^0_{Rd,c}$ — 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)					
$N^0_{Rd,c}$	($h_{ef,min}$)	7,0	9,1	11,9	17,2
$N^0_{Rd,c}$	($h_{ef,max}$)	11,2	14,8	19,7	26,8
Cracked concrete (C20/25)					
$N^0_{Rd,c}$	($h_{ef,min}$)	5,0	6,5	8,5	12,3
$N^0_{Rd,c}$	($h_{ef,max}$)	8,0	10,6	14,1	19,1

$\gamma_{Mc} = 1,5$



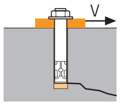
Steel resistance

$N_{Rd,s}$ — 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

SHEAR in kN



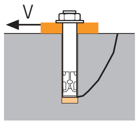
Concrete edge resistance

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

$V^0_{Rd,c}$ — 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
$V^0_{Rd,c}$	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
$V^0_{Rd,c}$	3,7	4,4	8,2	11,8

$\gamma_{Mc} = 1,5$



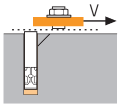
Pryout failure

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

$V^0_{Rd,cp}$ — Design pryout resistance

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

$\gamma_{Mcp} = 1,5$



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

$$N_{Rd} = \min(N_{Rd,p}\ ;\ N_{Rd,c}\ ;\ N_{Rd,s})$$
$$\beta_N = N_{Sd} / N_{Rd} \leq 1$$

$$V_{Rd} = \min(V_{Rd,c}\ ;\ V_{Rd,cp}\ ;\ V_{Rd,s})$$
$$\beta_V = V_{Sd} / V_{Rd} \leq 1$$

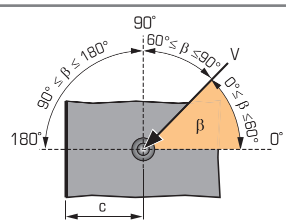
$$\beta_N + \beta_V \leq 1,2$$

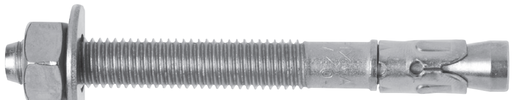
f_b INFLUENCE OF CONCRETE

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

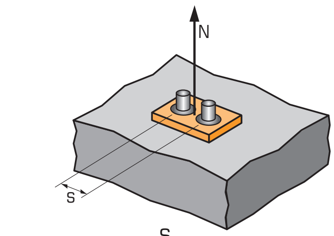
Angle β [°]	$f_{\beta,V}$
0 to 55	1
60	1,1
70	1,2
80	1,5
90 to 180	2





SPIT CC Method (values issued from ETA)

Ψ_s INFLUENCE OF SPACING FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



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

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

$s_{cr,N} = 3.h_{ef}$

Ψ_S must be used for each spacing influenced the anchors group

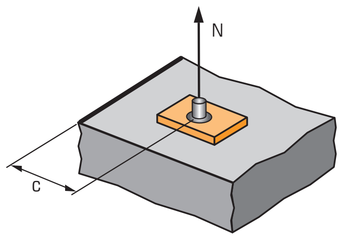
SPACING S — Reduction factor Ψ_s — Minimum anchorage depth

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



$$\Psi_{c,N} = 0{,}5 + 0{,}33 \cdot \frac{c}{h_{ef}}$$

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

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

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

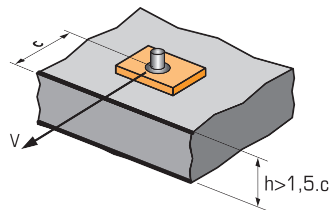
EDGE C — Reduction factor $\Psi_{c,N}$ — Minimum anchorage depth

Anchor size	M8	M10	M12	M16
60	1,00			
65		1,00		
100			1,00	
100				1,00

EDGE C — Reduction factor $\Psi_{c,N}$ — Maximum anchorage depth

Anchor size	M8	M10	M12	M16
60	0,91			
65	0,95	0,91		
72	1,00	0,96		
80		1,00		
90			0,94	
105			1,00	0,90
130				1,00

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

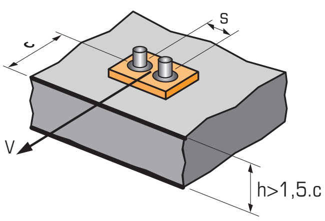


$$\Psi_{s-c,V} = \frac{c}{c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$

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

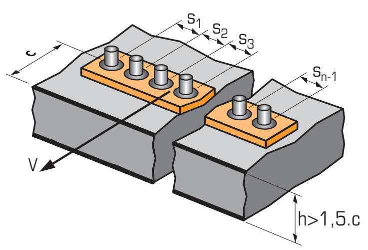


$$\Psi_{s-c,V} = \frac{3.c + s}{6.c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$

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

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