FIX Z XTREM - A4

stainless steel version 1/6

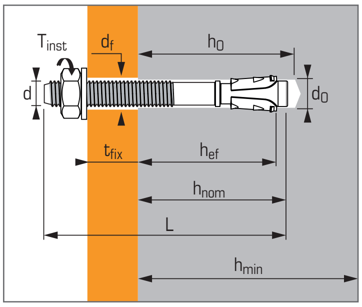
Torque controlled expansion anchor, for use in cracked and non-cracked concrete

ETA European Technical Assessment

ETA Option 1- 15/0388

INOX STAINLESS STEEL

XTREM



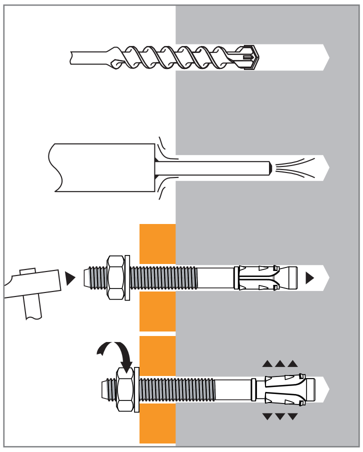
APPLICATION

- Safety barriers
- Cladding brackets
- Curtain-walls
- 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	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 mate-rial (mm) h_{min}	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 mate-rial (mm) h_{min}	Thread Ø (mm) d	Drilling Ø (mm) d_0	Clear-ance Ø (mm) d_f	Total anchor length (mm) L	Tighten torque (Nm) T_{inst}	Code
8X55/5	0	48	55	-	65	100	35	42	5	52	100	8	8	9	56	20	058616
8X70/20-7	1			7					20						71		058617
8X90/40-27	3			27					40						91		058618
10X70/10	1	60	68	-	75	120	40	48	10	55	100	10	10	12	70	45	058619
10X95/35-15	2			15					35						95		058620
10X105/45-25	3			25					45						105		058621
10X130/70-50	4			50					70						130		058622
12X95/20	1	70	80	-	90	140	50	60	20	70	100	12	12	14	95	75	058623
12X110/35-15	2			15					35						110		058624
12X120/45-25	3			25					45						120		058625
12X140/65-45	4			45					65						140		058626
16X120/20	1	85	98	-	110	170	65	78	20	90	130	12	16	18	120	110	058627
16X140/40-20	2			20					40						140		058628

Anchor mechanical properties

Anchor size		M8	M10	M12	M16
Cross-section above cone					
f_{uk} (N/mm²)	Min. tensile strength	900	830	720	720
f_{yk} (N/mm²)	Yield strength	800	670	580	580
A_0 (mm²)	Stressed cross-section	22,9	35,3	52,8	103,8
Threaded part					
f_{uk} (N/mm²)	Min. tensile strength	750	730	730	600
f_{yk} (N/mm²)	Yield strength	680	580	580	480
A_s (mm²)	Stressed cross-section	36,6	58	84,3	156
W_{el} (mm³)	Elastic section modulus	31,2	62,3	109,2	277,5
$M^0_{rk,s}$ (Nm)	Characteristic bending moment	25,0	44,9	77,5	187,5
M (Nm)	Recommended bending moment	10,0	18,0	31,0	75,0

FIX Z XTREM - A4

2/6 stainless steel version

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	M8	M10	M12	M16
Non-cracked concrete (C20/25)				
$h_{ef,min}$	**35**	**40**	**50**	**65**
$N_{Ru,m}$	12,5	16,6	23,2	34,5
N_{Rk}	8,0	12,4	17,4	25,8
$h_{ef,max}$	**48**	**60**	**70**	**85**
$N_{Ru,m}$	22,0	26,4	36,3	52,0
N_{Rk}	17,2	23,4	30,7	44,2
Cracked concrete (C20/25)				
$h_{ef,min}$	**35**	**40**	**50**	**65**
$N_{Ru,m}$	12,5	11,7	16,3	24,1
N_{Rk}	7,5	8,7	12,2	18,0
$h_{ef,max}$	**48**	**60**	**70**	**85**
$N_{Ru,m}$	15,9	20,2	28,2	39,5
N_{Rk}	14,7	11,3	21,4	32,0

SHEAR

Anchor size	M8	M10	M12	M16
Cracked & non-cracked concrete (C20/25)				
$V_{Ru,m}$	18,2	25,7	39,6	67,5
V_{Rk}	17,3	18,7	28,2	51,9

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	M8	M10	M12	M16
Non-cracked concrete (C20/25)				
$h_{ef,min}$	**35**	**40**	**50**	**65**
N_{Rd}	5,3	8,3	11,6	17,2
$h_{ef,max}$	**48**	**60**	**70**	**85**
N_{Rd}	11,5	15,6	20,5	29,5
Cracked concrete (C20/25)				
$h_{ef,min}$	**35**	**40**	**50**	**65**
N_{Rd}	5,0	5,8	8,1	12,0
$h_{ef,max}$	**48**	**60**	**70**	**85**
N_{Rd}	9,8	7,5	14,3	21,3

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

SHEAR

Anchor size	M8	M10	M12	M16
Cracked & non-cracked concrete (C20/25)				
V_{Rd}	11,5	12,5	18,8	29,7

$\gamma_{Ms} = 1{,}5$ for M8 to M12 and $\gamma_{Ms} = 1{,}75$ 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	M8	M10	M12	M16
Non-cracked concrete (C20/25)				
$h_{ef,min}$	**35**	**40**	**50**	**65**
N_{rec}	3,8	5,9	8,3	12,3
$h_{ef,max}$	**48**	**60**	**70**	**85**
N_{rec}	8,2	11,1	14,6	21,0
Cracked concrete (C20/25)				
$h_{ef,min}$	**35**	**40**	**50**	**65**
N_{rec}	3,6	4,1	5,8	8,6
$h_{ef,max}$	**48**	**60**	**70**	**85**
N_{rec}	7,0	5,4	10,2	15,2

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

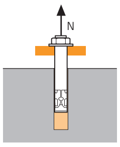
SHEAR

Anchor size	M8	M10	M12	M16
Cracked & non-cracked concrete (C20/25)				
V_{rec}	8,2	8,9	13,4	21,2

$\gamma_F = 1{,}4$; $\gamma_{Ms} = 1{,}5$ for M8 to M12 and $\gamma_{Ms} = 1{,}75$ for M16

SPIT CC Method (values issued from ETA)

TENSILE in kN

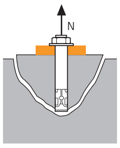


Pull-out resistance

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

$N^0_{Rd,p}$			Design pull-out resistance	
Anchor size	M8	M10	M12	M16
Non-cracked concrete (C20/25)				
$h_{ef,min}$	**35**	**40**	**50**	**65**
$N^0_{Rd,p}$	6,0	-	-	-
$h_{ef,max}$	**48**	**60**	**70**	**85**
$N^0_{Rd,p}$	8,0	13,3	20,0	26,7
Cracked concrete (C20/25)				
$h_{ef,min}$	**35**	**40**	**50**	**65**
$N^0_{Rd,p}$	2,0	-	-	-
$h_{ef,max}$	**48**	**60**	**70**	**85**
$N^0_{Rd,p}$	2,7	6,0	10,7	13,3

$\gamma_{Mc} = 1,5$

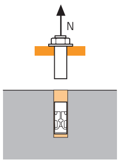


Concrete cone resistance

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

$N^0_{Rd,c}$			Design cone resistance	
Anchor size	M8	M10	M12	M16
Non-cracked concrete (C20/25)				
$h_{ef,min}$	**35**	**40**	**50**	**65**
$N^0_{Rd,c}$	6,8	8,3	11,6	17,2
$h_{ef,max}$	**48**	**60**	**70**	**85**
$N^0_{Rd,c}$ ($h_{ef,max}$)	10,9	15,2	19,2	25,7
Cracked concrete (C20/25)				
$h_{ef,min}$	**35**	**40**	**50**	**65**
$N^0_{Rd,c}$	4,8	5,8	8,1	12,0
$h_{ef,max}$	**48**	**60**	**70**	**85**
$N^0_{Rd,c}$	7,6	10,7	13,4	18,0

$\gamma_{Mc} = 1,5$



Steel resistance

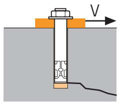
$N_{Rd,s}$			Steel design tensile resistance	
Anchor size	M8	M10	M12	M16
$N_{Rd,s}$	9,2	20,5	29,7	43,2

M8 : $\gamma_{Ms} = 1,81$; M10 and M12 : $\gamma_{Ms} = 1,76$; M16 : $\gamma_{Ms} = 2,11$

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

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

SHEAR in kN

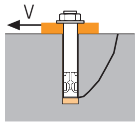


Concrete edge resistance

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

$V^0_{Rd,c}$			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**	**40**	**50**	**65**
C_{min}	60	60	60	90
$V^0_{Rd,c}$	4,9	5,2	5,5	10,4
$h_{ef,max}$	**48**	**60**	**70**	**85**
C_{min}	60	60	60	90
$V^0_{Rd,c}$	5,2	5,6	5,9	11,0
Cracked concrete (C20/25)				
$h_{ef,min}$	**35**	**40**	**50**	**65**
C_{min}	60	55	60	80
$V^0_{Rd,c}$	3,5	3,7	3,9	6,3
$h_{ef,max}$	**48**	**60**	**70**	**85**
C_{min}	60	55	60	80
$V^0_{Rd,c}$	3,7	3,5	4,2	6,7

$\gamma_{Mc} = 1,5$

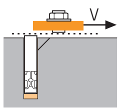


Pryout failure

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

$V^0_{Rd,cp}$			Design pryout resistance	
Anchor size	M8	M10	M12	M16
Non-cracked concrete (C20/25)				
$h_{ef,\ min}$	**35**	**40**	**50**	**65**
$V^0_{Rd,cp}$	6,8	8,3	11,6	34,4
$h_{ef,\ max}$	**48**	**60**	**70**	**85**
$V^0_{Rd,cp}$	10,9	30,5	38,4	51,4
Cracked concrete (C20/25)				
$h_{ef,\ min}$	**-**	**40**	**50**	**65**
$V^0_{Rd,cp}$	4,8	5,8	8,1	24,1
$h_{ef,\ max}$	**48**	**60**	**70**	**85**
$V^0_{Rd,cp}$	7,6	21,3	26,9	36,0

$\gamma_{Mcp} = 1,5$



Steel resistance

$V_{Rd,s}$			Steel design shear resistance	
Anchor size	M8	M10	M12	M16
$V_{Rd,s}$	8,2	12,7	19,2	29,7

M8 to M12 : $\gamma_{Ms} = 1,5$; M16 : $\gamma_{Ms} = 1,75$

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

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

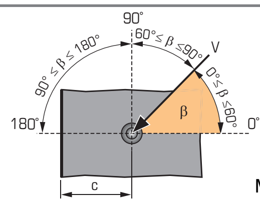
$$\beta_N + \beta_V \leq 1,2$$

f_b INFLUENCE OF CONCRETE

Concrete class	f_b		Concrete class	f_b	
	M8	M10-M16		M8	M10-M16
C25/30	1,12	1,05	C40/50	1,41	1,15
C30/37	1,22	1,08	C45/55	1,48	1,18
C35/45	1,32	1,12	C50/60	1,58	1,20

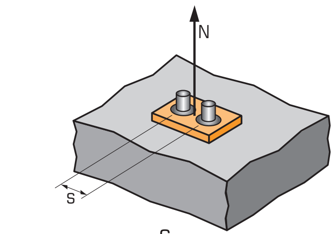
$f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

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

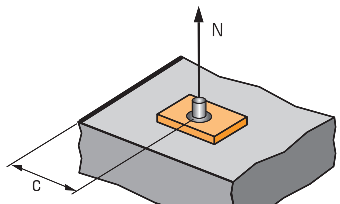
SPACING S — Reduction factor Ψ_s — Minimum anchorage depth

Anchor size	M8	M10	M12	M16
55	-	0,65		
60	0,79	0,75	0,70	
75	0,86	0,81	0,75	
90	0,93	0,88	0,80	0,73
105	1,00	0,94	0,85	0,77
120		1,00	0,90	0,81
150			1,00	0,88
180				0,96
195				1,00

SPACING S — Reduction factor Ψ_s — Maximum anchorage depth

Anchor size	M8	M10	M12	M16
50	0,67			
55	0,69	0,65		
60	0,71	0,67	0,64	
75	0,76	0,71	0,68	
90	0,81	0,75	0,71	0,68
110	0,88	0,81	0,76	0,72
130	0,95	0,86	0,81	0,75
145	1,00	0,90	0,85	0,78
180		1,00	0,93	0,85
210			1,00	0,91
255				1,00

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



$$\Psi_{c,N} = 0{,}26 + 0{,}49 . \frac{c}{h_{ef}}$$

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

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

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

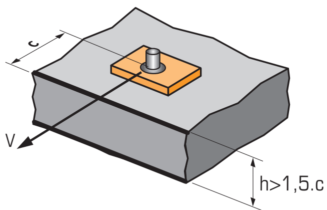
EDGE C — Reduction factor $\Psi_{c,N}$ — Minimum anchorage depth

Anchor size	M8	M10	M12	M16
55	-	0,93		
60	1,00	1,00	0,85	
70			0,95	
80			1,00	0,86
90				0,94
100				1,00

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

Anchor size	M8	M10	M12	M16
55	0,82			
60	0,87	0,75		
70	0,97	0,83	0,75	
80	1,00	0,91	0,82	
90		1,00	0,89	0,78
100			0,96	0,84
105			1,00	0,87
130				1,00

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

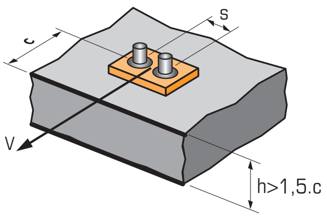


$$\Psi_{s\text{-}c,V} = \frac{c}{c_{min}} . \sqrt{\frac{c}{c_{min}}}$$

For single anchor fastening

Reduction factor $\Psi_{s\text{-}c,V}$ — Cracked & non-cracked concrete

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
$\Psi_{s\text{-}c,V}$	1,00	1,31	1,66	2,02	2,41	2,83	3,26	3,72	4,19	4,69	5,20	5,72

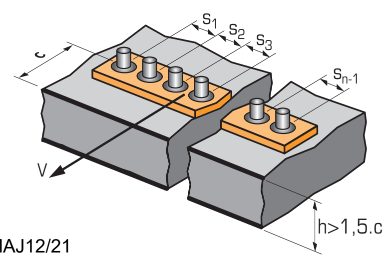


$$\Psi_{s\text{-}c,V} = \frac{3.c + s}{6.c_{min}} . \sqrt{\frac{c}{c_{min}}}$$

For 2 anchors fastening

Reduction factor $\Psi_{s\text{-}c,V}$ — Cracked & non-cracked concrete

s / c_{min} \ 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

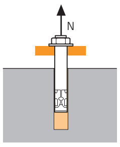


For 3 anchors fastening and more

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

SPIT CC Method (values issued from ETA - Seismic category C1)

TENSILE in kN

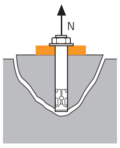


¬ Pull-out resistance

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

$N^0_{Rd,p,C1}$				Design pull-out resistance
Anchor size	M8	M10	M12	M16
Category C1 - Single anchor				
h_{ef}	**45**	**60**	**70**	**85**
$N^0_{Rd,p,C1}$ (C20/25)	2,7	4,9	10,7	13,3
Category C1 - Group of anchors [(1)]				
h_{ef}	**45**	**60**	**70**	**85**
$N^0_{Rd,p,C1}$ (C20/25)	2,3	4,2	9,1	11,3

(1) when more than one anchor of the group is submitted to tensile load
$\gamma_{Mc} = 1{,}5$

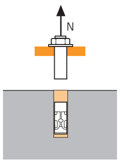


¬ Concrete cone resistance

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

$N^0_{Rd,c,C1}$				Design cone resistance
Anchor size	M8	M10	M12	M16
Category C1 - Single anchor				
h_{ef}	**45**	**60**	**70**	**85**
$N^0_{Rd,c,C1}$ (C20/25)	5,9	9,1	11,4	15,3
Category C1 - Group of anchors [(1)]				
h_{ef}	**45**	**60**	**70**	**85**
$N^0_{Rd,c,C1}$ (C20/25)	5,2	8,0	10,1	13,5

(1) when more than one anchor of the group is submitted to tensile load
$\gamma_{Mc} = 1{,}5$

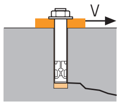


¬ Steel resistance

$N_{Rd,s,C1}$				Steel design tensile resistance
Anchor size	M8	M10	M12	M16
$N_{Rd,s,C1}$	9,2	25,7	37,4	64,6

(1) when more than one anchor of the group is submitted to tensile load
M8 : $\gamma_{Ms} = 1{,}81$; M10 and M12 : $\gamma_{Ms} = 1{,}4$; M16 : $\gamma_{Ms} = 1{,}41$

SHEAR in kN

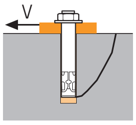


¬ Concrete edge resistance

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

$V^0_{Rd,c,C1}$				Design concrete edge resistance at minimum edge distance (C_{min})
Anchor size	M8	M10	M12	M16
Category C1 - Single anchor				
h_{ef}	**45**	**60**	**70**	**85**
C_{min}	60	55	60	80
$V^0_{Rd,c,C1}$ (C20/25)	3,7	3,5	4,2	6,7
Category C1 - Group of anchors [(1)]				
h_{ef}	**45**	**60**	**70**	**85**
C_{min}	60	55	60	80
$V^0_{Rd,c,C1}$ (C20/25)	3,1	3,0	3,6	5,7

(1) when more than one anchor of the group is submitted to shear load
$\gamma_{Mc} = 1{,}5$

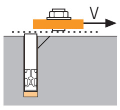


¬ Pryout failure

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

$V^0_{Rd,cp,C1}$				Design pryout resistance
Anchor size	M8	M10	M12	M16
Category C1 - Single anchor				
h_{ef}	**45**	**60**	**70**	**85**
$V^0_{Rd,cp,C1}$ (C20/25)	5,9	18,1	22,9	30,6
Category C1 - Group of anchors [(1)]				
h_{ef}	**45**	**60**	**70**	**85**
$V^0_{Rd,cp,C1}$ (C20/25)	5,2	16,0	20,2	27,0

(1) when more than one anchor of the group is submitted to shear load
$\gamma_{Mc} = 1{,}5$



¬ Steel resistance [(2)]

$V_{Rd,s,C1}$				Steel design shear resistance
Anchor size	M8	M10	M12	M16
Category C1 - Single anchor				
$V_{Rd,s,C1}$	3,8	8,1	11,9	19,3
Category C1 - Group of anchors [(1)]				
$V_{Rd,s,C1}$	3,2	6,9	10,1	16,4

(1) when more than one anchor of the group is submitted to shear load
(2) In case of no hole clearance between anchor and fixture
M8 to M12 : $\gamma_{Ms} = 1{,}5$; M16: $\gamma_{Ms} = 1{,}75$

$$N_{Rd,C1} = \min(N_{Rd,p,C1}\ ;\ N_{Rd,c,C1}\ ;\ N_{Rd,s,C1})$$
$$\beta_N = N_{Sd} / N_{Rd,C1} \leq 1$$

$$V_{Rd,C1} = \min(V_{Rd,c,C1}\ ;\ V_{Rd,cp,C1}\ ;\ V_{Rd,s,C1})$$
$$\beta_V = V_{Sd} / V_{Rd,C1} \leq 1$$

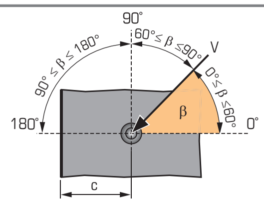
$$\beta_N + \beta_V \leq 1{,}2$$

f_b INFLUENCE OF CONCRETE

Concrete class	f_b		Concrete class	f_b	
	M8	M10-M16		M8	M10-M16
C25/30	1,12	1,05	C40/50	1,41	1,15
C30/37	1,22	1,08	C45/55	1,48	1,18
C35/45	1,32	1,12	C50/60	1,58	1,20

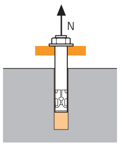
$f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

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 - Seismic category C2)

TENSILE in kN



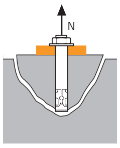
Pull-out resistance

$N_{Rd,p,C2} = N^0_{Rd,p,C2} \cdot f_b$

$N^0_{Rd,p,C2}$ — Design pull-out resistance

Anchor size	M10	M12	M16
Category C2 - Single anchor			
h_{ef}	**60**	**70**	**85**
$N^0_{Rd,p,C2}$ (C20/25)	1,7	4,0	9,7
Category C2 - Group of anchors (1)			
h_{ef}	**60**	**70**	**85**
$N^0_{Rd,p,C2}$ (C20/25)	1,5	3,4	8,3

(1) when more than one anchor of the group is submitted to tensile load
$\gamma_{Mc} = 1,5$



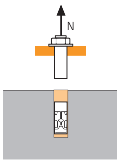
Concrete cone resistance

$N_{Rd,c,C2} = N^0_{Rd,c,C2} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$N^0_{Rd,c,C2}$ — Design cone resistance

Anchor size	M10	M12	M16
Category C2 - Single anchor			
h_{ef}	**60**	**70**	**85**
$N^0_{Rd,c,C2}$ (C20/25)	9,1	11,4	15,3
Category C2 - Group of anchors (1)			
h_{ef}	**60**	**70**	**85**
$N^0_{Rd,c,C2}$ (C20/25)	8,0	10,1	13,5

(1) when more than one anchor of the group is submitted to tensile load
$\gamma_{Mc} = 1,5$



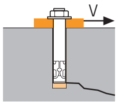
Steel resistance

$N_{Rd,s,C2}$ — Steel design tensile resistance

Anchor size	M10	M12	M16
$N_{Rd,s,C2}$	24,0	34,9	60,7

(1) when more than one anchor of the group is submitted to tensile load
M10 and M12 : $\gamma_{Ms} = 1,4$; M16 : $\gamma_{Ms} = 1,41$

SHEAR in kN



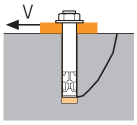
Concrete edge resistance

$V_{Rd,c,C2} = V^0_{Rd,c,C2} \cdot f_b \cdot f_{\beta,V} \cdot \Psi_{S\text{-}C,V}$

$V^0_{Rd,c,C2}$ — Design concrete edge resistance at minimum edge distance (C_{min})

Anchor size	M10	M12	M16
Category C2 - Single anchor			
h_{ef}	**60**	**70**	**85**
C_{min}	60	60	80
$V^0_{Rd,c,C2}$ (C20/25)	3,5	4,2	6,7
Category C2 - Group of anchors (1)			
h_{ef}	**60**	**70**	**85**
C_{min}	60	60	80
$V^0_{Rd,c,C2}$ (C20/25)	3,0	3,6	5,7

(1) when more than one anchor of the group is submitted to shear load
$\gamma_{Mc} = 1,5$



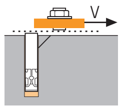
Pryout failure

$V_{Rd,cp,C2} = V^0_{Rd,cp,C2} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$V^0_{Rd,cp,C2}$ — Design pryout resistance

Anchor size	M10	M12	M16
Category C2 - Single anchor			
h_{ef}	**60**	**70**	**85**
$V^0_{Rd,cp,C2}$ (C20/25)	18,1	22,9	30,6
Category C2 - Group of anchors (1)			
h_{ef}	**60**	**70**	**85**
$V^0_{Rd,cp,C2}$ (C20/25)	16,0	20,2	27,0

(1) when more than one anchor of the group is submitted to shear load
$\gamma_{Mc} = 1,5$



Steel resistance (2)

$V_{Rd,s,C2}$ — Steel design shear resistance

Anchor size	M10	M12	M16
Category C2 - Single anchor			
$V_{Rd,s,C2}$	5,7	8,4	20,2
Category C2 - Group of anchors (1)			
$V_{Rd,s,C2}$	4,9	7,2	17,2

(1) when more than one anchor of the group is submitted to shear load
(2) In case of no hole clearance between anchor and fixture
M10 and M12 : $\gamma_{Ms} = 1,5$; M16: $\gamma_{Ms} = 1,75$

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$$\beta_N = N_{Sd} / N_{Rd,C2} \leq 1$$

$$V_{Rd,C2} = \min(V_{Rd,c,C2} \,;\, V_{Rd,cp,C2} \,;\, V_{Rd,s,C2})$$
$$\beta_V = V_{Sd} / V_{Rd,C2} \leq 1$$

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

f_b INFLUENCE OF CONCRETE

Concrete class	f_b		Concrete class	f_b	
	M8	M10-M16		M8	M10-M16
C25/30	1,12	1,05	C40/50	1,41	1,15
C30/37	1,22	1,08	C45/55	1,48	1,18
C35/45	1,32	1,12	C50/60	1,58	1,20

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

Angle β [°]	$f_{\beta,V}$
0 to 55	1
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