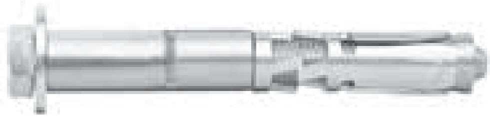


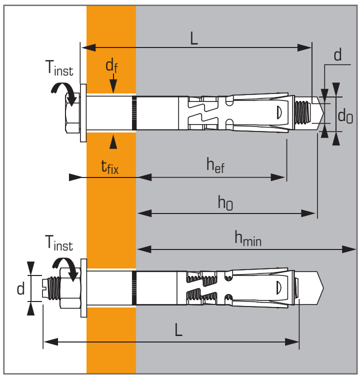
TRIGA Z XTREM

zinc coated steel version

High security, high performance fixing for use in cracked and non-cracked concrete

European Technical Assessment

ETA Option 1- 05/0044



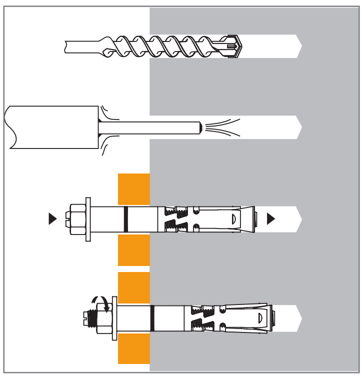
APPLICATION

- Safety critical loads
- Overhead crane rails
- Steel columns and walkways
- Wall plates
- Safety rail

MATERIAL

- **Bolt :** class 8.8 NF EN 20898-1
- **Threaded stud :** class 8.8 NF EN 20898-1
- **Nut :** class 8 NF EN 20898-2
- **Wascher :** F12T4 as per NF A37501
- **Sleeve :** TS37-a BK extended as per NF A49341
- **Expansion cone :** 35 MF6Pb
- **Expansion sleeve :** 355 MC as per NF EN 10-149-2
- **Protection :** min. zinc coating 5 µm

INSTALLATION



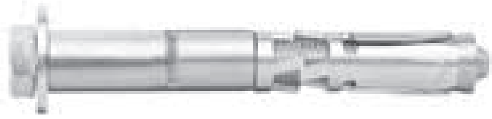
Technical data

Anchor size	Min. anchor depth (mm) h_{ef}	Max. thick. of part to be fixed (mm) t_{fix}	Min. thick. of base material (mm) h_{min}	Thread diameter (mm) d	Drilling depth (mm) h_0	Drilling diameter (mm) d_0	Clearance diameter (mm) d_f	Total anchor length (mm) L	Tighten torque (Nm) T_{inst}	Code
V6-10/5		5						65		050673
V6-10/20	50	20	100	M6	70	10	12	80	15	050674
E6-10/50		50						117		050675
V8-12/1*		1						65		050677
V8-12/10		10						80		050678
V8-12/20		20						90		050679
V8-12/50		50						120		053001
E8-12/20	60	20	120	M8	80	12	14	99	25	050681
E8-12/35		35						114		050683
E8-12/55		55						134		050684
E8-12/95		95						174		050685
V10-15/1*		1						75		050687
V10-15/10		10						95		050688
V10-15/20		20						105		050689
V10-15/55		55						140		053003
E10-15/20	70	20	140	M10	90	15	17	114	50	050691
E10-15/35		35						129		050692
E10-15/55		55						149		050693
E10-15/100		100						194		050694
V12-18/10		10						105		050696
V12-18/25		25						120		050697
V12-18/55		55						150		053004
E12-18/25	80	25	160	M12	105	18	20	132	80	050698
E12-18/45		45						152		050699
E12-18/65		65						172		050701
E12-18/100		100						207		050702
V16-24/10		10						130		050704
V16-24/25		25						145		050705
V16-24/50		50						170		050710
E16-24/25	100	25	200	M16	131	24	26	159	120	050706
E16-24/55		55						189		050707
E16-24/100		100						234		050708
V20-28/25		25						170		050711
E20-28/25	125	25	250	M20	157	28	31	192	200	050712
E20-28/60		60						227		050713
E20-28/100		100						267		050714
TF V8-12/16	60	16	120	M8	80	12	14	85	25	050686
TF V8-12/26	60	26	120	M8	80	12	14	95	25	053002
TF V10-15/27	70	27	140	M10	90	15	17	105	50	050695
TF V12-18/40*	80	40	160	M12	105	18	20	130	80	050715
E12-18/0*	80	-	160	M12	105	18	-	120	80	050669
E12-18/A*	80	-	160	M12	105	18	-	162	80	050703
E12-18/QC*	80	-	160	M12	105	18	-	178	80	050671

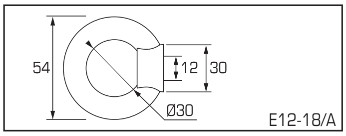
* Do not belong to ETA

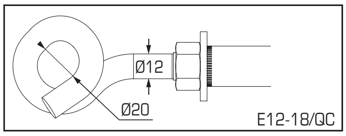
Anchor mechanical properties

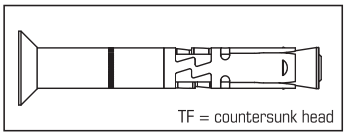
Anchor size		M6	M8	M10	M12	M16	M20
f_{uk} (N/mm²)	Min. tensile strength	800	800	800	800	800	830
f_{yk} (N/mm²)	Yield strength	640	640	640	640	640	660
$S_{eq,V}$ (mm²)	Equivalent stressed cross-section bolt version	39,2	76,1	108,8	175,3	335,1	520,2
$S_{eq,E}$ (mm²)	Equivalent stressed cross-section threaded stud version	35,2	61,8	82,0	104,1	183,3	277,3
W_{el} (mm³)	Elastic section modulus	12,7	31,2	62,3	109,2	277,5	541,0
$M^0_{rk,s}$ (Nm)	Characteristic bending moment	12,2	30,0	59,8	104,8	266,4	538,8
M (Nm)	Recommended bending moment	5,8	12,4	24,8	43,5	110,7	216,0

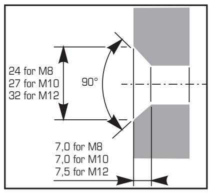


Special products









Recommended loads in kN			
Anchor size	TENSILE ≥ C20/25	OBLIQUE ≥ C20/25	SHEAR ≥ C20/25
E12-18/A	3,4	2,4* *(30≤ α ≤45°)	Not recommended
E12-18/QC	4,0	1,0	0,5
TF V8-12/16	The resistance given for the bolt version with the same diameter can be used		
TF V8-12/26			
TF V10-15/27			
TF V12-18/40			

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 (3/6 to 6/6).

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	M20
Non-cracked concrete (C20/25)						
h_{ef}	**50**	**60**	**70**	**80**	**100**	**125**
$N_{Ru,m}$	18,2	27,5	45,9	54,4	103,6	124,4
N_{Rk}	16,0	19,9	36,0	34,2	61,9	85,9
Cracked concrete (C20/25)						
h_{ef}	**50**	**60**	**70**	**80**	**100**	**125**
$N_{Ru,m}$	15,1	20,3	33,3	50,3	88,5	113,3
N_{Rk}	11,5	14,8	26,5	36,6	70,4	90,1

SHEAR

Anchor size		M6	M8	M10	M12	M16	M20
Cracked & non-cracked concrete (C20/25)							
Type V/T	$V_{Ru,m}$	29,2	41,7	68,0	95,7	159,0	228,2
	V_{Rk}	25,9	38,6	58,8	83,3	141,6	206,0
Type E	$V_{Ru,m}$	20,0	26,2	43,1	57,0	116,0	135,9
	V_{Rk}	15,7	22,0	36,4	52,0	110,0	124,9

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	M6	M8	M10	M12	M16	M20
Non-cracked concrete (C20/25)						
h_{ef}	**50**	**60**	**70**	**80**	**100**	**125**
N_{Rd}	10,7	13,2	24,0	22,8	41,3	57,3
Cracked concrete (C20/25)						
h_{ef}	**50**	**60**	**70**	**80**	**100**	**125**
N_{Rd}	7,7	9,9	17,7	24,4	47,0	60,1

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

SHEAR

Anchor size		M6	M8	M10	M12	M16	M20
Cracked & non-cracked concrete (C20/25)							
Type V/T	V_{Rd}	20,7	30,8	47,0	66,6	113,3	164,8
Type E	V_{Rd}	12,6	17,6	29,1	41,6	88,0	99,9

$\gamma_{Ms} = 1{,}25$

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	M20
Non-cracked concrete (C20/25)						
h_{ef}	**50**	**60**	**70**	**80**	**100**	**125**
N_{rec}	7,6	9,5	17,1	16,3	29,5	40,9
Cracked concrete (C20/25)						
h_{ef}	**50**	**60**	**70**	**80**	**100**	**125**
N_{rec}	5,5	7,0	12,6	17,4	33,5	42,9

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

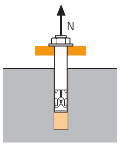
SHEAR

Anchor size		M6	M8	M10	M12	M16	M20
Cracked & non-cracked concrete (C20/25)							
Type V/T	V_{rec}	14,8	22,0	33,6	47,6	80,9	117,7
Type E	V_{rec}	9.0	12,5	20,8	29,7	62,9	71,4

$\gamma_F = 1{,}4$; $\gamma_{Ms} = 1{,}25$

SPIT CC Method (values issued from ETA)

TENSILE in kN

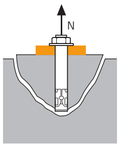


Pull-out resistance

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

$N^0_{Rd,p}$						Design pull-out resistance
Anchor size	M6	M8	M10	M12	M16	M20
Non-cracked concrete						
h_{ef}	**50**	**60**	**70**	**80**	**100**	**125**
$N^0_{Rd,p}$ (C20/25)	-	13,3	-	-	-	-
Cracked concrete						
h_{ef}	**50**	**60**	**70**	**80**	**100**	**125**
$N^0_{Rd,p}$ (C20/25)	3,3	8	10,6	-	-	-

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

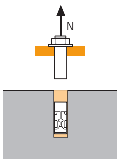


Concrete cone resistance

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

$N^0_{Rd,c}$						Design cone resistance
Anchor size	M6	M8	M10	M12	M16	M20
Non-cracked concrete						
h_{ef}	**50**	**60**	**70**	**80**	**100**	**125**
$N^0_{Rd,c}$ (C20/25)	11,9	15,6	19,7	24,0	33,6	47,0
Cracked concrete						
h_{ef}	**50**	**60**	**70**	**80**	**100**	**125**
$N^0_{Rd,c}$ (C20/25)	8,5	11,2	14,1	17,2	24,0	33,5

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

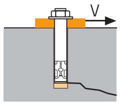


Steel resistance

$N_{Rd,s}$						Steel design tensile resistance
Anchor size	M6	M8	M10	M12	M16	M20
$N_{Rd,s}$	10,7	19,5	30,9	44,9	83,7	130,7

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

SHEAR in kN

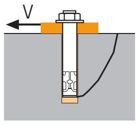


Concrete edge resistance

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

$V^0_{Rd,c}$						Design concrete edge resistance at minimum edge distance (C_{min})
Anchor size	M6	M8	M10	M12	M16	M20
Non-cracked concrete						
h_{ef}	**50**	**60**	**70**	**80**	**100**	**125**
C_{min}	50	60	70	80	100	150
S_{min}	100	100	160	200	220	300
$V^0_{Rd,c}$ (C20/25)	3,4	4,9	6,8	9,3	13,6	26,1
Cracked concrete						
h_{ef}	**50**	**60**	**70**	**80**	**100**	**125**
C_{min}	50	60	70	80	100	150
S_{min}	100	100	160	200	220	300
$V^0_{Rd,c}$ (C20/25)	2,4	3,5	4,8	6,6	9,7	18,7

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

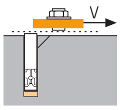


Pryout failure

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

$V^0_{Rd,cp}$						Design pryout resistance
Anchor size	M6	M8	M10	M12	M16	M20
Non-cracked concrete						
h_{ef}	**50**	**60**	**70**	**80**	**100**	**125**
$V^0_{Rd,cp}$ (C20/25)	11,9	31,2	39,4	48,1	67,2	93,9
Cracked concrete						
h_{ef}	**50**	**60**	**70**	**80**	**100**	**125**
$V^0_{Rd,cp}$ (C20/25)	8,5	22,3	28,1	34,3	48,0	67,1

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



Steel resistance

$V_{Rd,s}$						Steel design shear resistance
Anchor size	M6	M8	M10	M12	M16	M20
$V_{Rd,s}$ (Type V/TF)	18,7	26,1	39,3	58,2	93,8	138,8
$V_{Rd,s}$ (Type E)	11,4	15,2	24,8	37,9	74,5	87,9

$\gamma_{Ms} = 1{,}25$

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

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

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

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

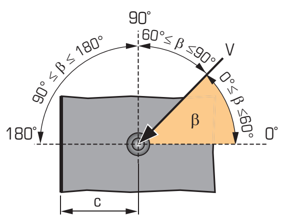
$$\beta_N + \beta_V \leq 1{,}2$$

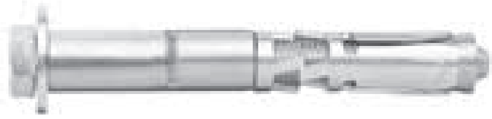
f_b INFLUENCE OF CONCRETE

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

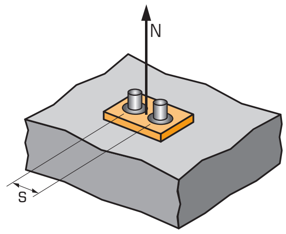
Angle β [°]	$f_{\beta,V}$
0 to 55	1
60	1,1
70	1,2
80	1,5
90 to 180	2





SPIT CC Method (values issued from ETA)

Ψ_s INFLUENCE OF SPACING FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



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

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

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

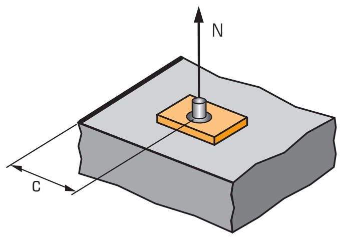
Ψ_s must be used for each spacing influenced the anchors group.

SPACING S

Reduction factor Ψ_s
Cracked & non-cracked concrete

Anchor size	M6	M8	M10	M12	M16	M20
50	0,67					
60	0,70	0,67				
70	0,73	0,69	0,67			
80	0,77	0,72	0,69	0,67		
100	0,83	0,78	0,74	0,71	0,67	
125	0,92	0,85	0,80	0,76	0,71	0,67
150	1,00	0,92	0,86	0,81	0,75	0,70
180		1,00	0,93	0,88	0,80	0,74
210			1,00	0,94	0,85	0,78
240				1,00	0,90	0,82
300					1,00	0,90
375						1,00

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



$$\Psi_{c,N} = 0{,}25 + 0{,}5 \,.\, \frac{c}{h_{ef}}$$

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

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

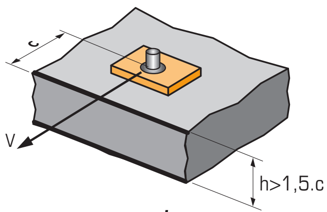
$\Psi_{c,N}$ must be used for each distance influenced the anchors group.

EDGE C

Reduction factor $\Psi_{c,N}$
Cracked & non-cracked concrete

Anchor size	M6	M8	M10	M12	M16	M20
50	0,75					
60	0,85	0,75				
70	0,95	0,83	0,75			
80	1,00	0,92	0,82	0,75		
90		1,00	0,89	0,81		
100			0,96	0,88	0,75	
120				1,00	0,85	
150					1,00	0,85
170						0,93
190						1,00

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

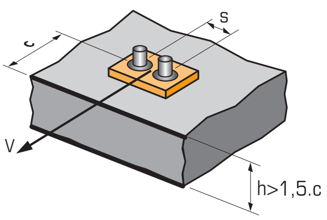


$$\Psi_{s\text{-}c,V} = \frac{c}{c_{min}} \,.\, \sqrt{\frac{c}{c_{min}}}$$

For single anchor fastening

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

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

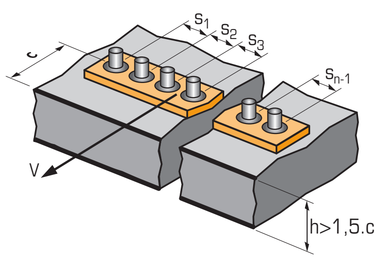


$$\Psi_{s\text{-}c,V} = \frac{3.c + s}{6.c_{min}} \,.\, \sqrt{\frac{c}{c_{min}}}$$

For 2 anchors fastening

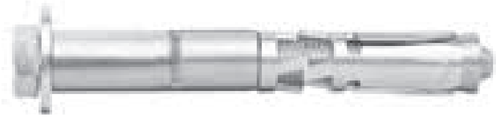
Reduction factor $\Psi_{s\text{-}c,V}$
Cracked & non-cracked concrete

$\frac{s}{c_{min}}$ \ $\frac{c}{c_{min}}$	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



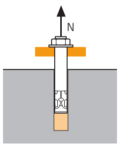
For 3 anchors fastening and more

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



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

TENSILE in kN

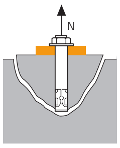


Pull-out resistance

$N_{Rd,p,C1} = N^{0}_{Rd,p,C1} \cdot f_b$

$N^{0}_{Rd,p,C1}$	Design pull-out resistance		
Anchor size	M10	M12	M16
Category C1 - Single anchor			
h_{ef}	**70**	**80**	**100**
$N^{0}_{Rd,p,C1}$ (C20/25)	6,1	17,2	24,0
Category C1 - Group of anchors [1]			
h_{ef}	**70**	**80**	**100**
$N^{0}_{Rd,p,C1}$ (C20/25)	5,2	14,6	20,4

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

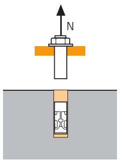


Concrete cone resistance

$N_{Rd,c,C1} = N^{0}_{Rd,c,C1} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$N^{0}_{Rd,c,C1}$	Design cone resistance		
Anchor size	M10	M12	M16
Category C1 - Single anchor			
h_{ef}	**70**	**80**	**100**
$N^{0}_{Rd,c,C1}$ (C20/25)	11,9	14,6	20,4
Category C1 - Group of anchors [1]			
h_{ef}	**70**	**80**	**100**
$N^{0}_{Rd,c,C1}$ (C20/25)	10,5	12,9	18,0

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

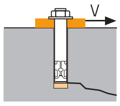


Steel resistance

$N_{Rd,s,C1}$	Steel design tensile resistance		
Anchor size	M10	M12	M16
$N_{Rd,s,C1}$	30,7	44,7	84,0

[1] when more than one anchor of the group is submitted to tensile load
$\gamma_{Ms} = 1,5$

SHEAR in kN

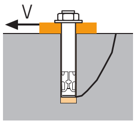


Concrete edge resistance

$V_{Rd,c,C1} = V^{0}_{Rd,c,C1} \cdot f_b \cdot f_{\beta,V} \cdot \Psi_{S\text{-}C,V}$

$V^{0}_{Rd,c,C1}$	Design concrete edge resistance at minimum edge distance (C_{min})		
Anchor size	M10	M12	M16
Category C1 - Single anchor			
h_{ef}	**70**	**80**	**100**
C_{min}	70	80	100
S_{min}	160	200	220
$V^{0}_{Rd,c,C1}$ (C20/25)	4,6	6,1	9,7
Category C1 - Group of anchors [1]			
h_{ef}	**70**	**80**	**100**
C_{min}	70	80	100
S_{min}	160	200	220
$V^{0}_{Rd,c,C1}$ (C20/25)	3,9	5,2	8,3

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

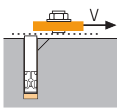


Pryout failure

$V_{Rd,cp,C1} = V^{0}_{Rd,cp,C1} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$V^{0}_{Rd,cp,C1}$	Design pryout resistance		
Anchor size	M10	M12	M16
Category C1 - Single anchor			
h_{ef}	**70**	**80**	**100**
$V^{0}_{Rd,cp,C1}$ (C20/25)	23,9	29,2	40,8
Category C1 - Group of anchors [1]			
h_{ef}	**70**	**80**	**100**
$V^{0}_{Rd,cp,C1}$ (C20/25)	21,1	25,8	36,0

[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	M10	M12	M16
Category C1 - Single anchor			
$V_{Rd,s,C1}$	13,7	22,7	48,4
Category C1 - Group of anchors [1]			
$V_{Rd,s,C1}$	11,6	19,3	41,2

[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
$\gamma_{Ms} = 1,25$

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

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

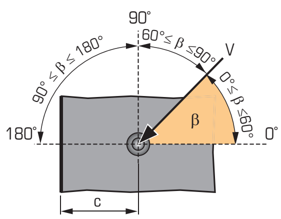
$$\beta_N + \beta_V \leq 1,2$$

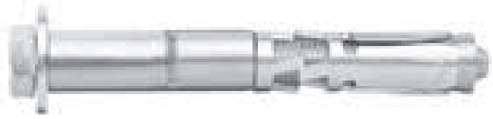
f_b INFLUENCE OF CONCRETE

Concrete class	f_b	Concrete class	f_b
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

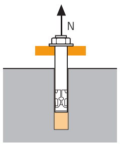
Angle β [°]	$f_{\beta,V}$
0 to 55	1
60	1,1
70	1,2
80	1,5
90 to 180	2





SPIT CC Method (values issued from ETA - Seismic category C2)

TENSILE in kN



Pull-out resistance

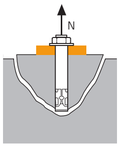
$$N_{Rd,p,C2} = N^0_{Rd,p,C2} \cdot f_b$$

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

Anchor size	M10	M12	M16
Category C2 - Single anchor			
h_{ef}	**70**	**80**	**100**
$N^0_{Rd,p,C2}$ (C20/25)	3,5	6,3	11,0
Category C2 - Group of anchors (1)			
h_{ef}	**70**	**80**	**100**
$N^0_{Rd,p,C2}$ (C20/25)	3,0	5,3	9,4

(1) when more than one anchor of the group is submitted to tensile load

$\gamma_{Mc} = 1,5$



Concrete cone resistance

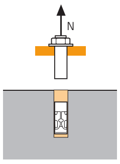
$$N_{Rd,c,C2} = N^0_{Rd,c,C2} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$$

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

Anchor size	M10	M12	M16
Category C2 - Single anchor			
h_{ef}	**70**	**80**	**100**
$N^0_{Rd,c,C2}$ (C20/25)	9,5	11,9	16,0
Category C2 - Group of anchors (1)			
h_{ef}	**70**	**80**	**100**
$N^0_{Rd,c,C2}$ (C20/25)	8,4	10,5	14,1

(1) when more than one anchor of the group is submitted to tensile load

$\gamma_{Mc} = 1,5$



Steel resistance

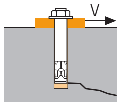
$N_{Rd,s,C2}$ — Steel design tensile resistance

Anchor size	M10	M12	M16
$N_{Rd,s,C2}$	30,7	44,7	84,0

(1) when more than one anchor of the group is submitted to tensile load

$\gamma_{Ms} = 1,5$

SHEAR in kN



Concrete edge resistance

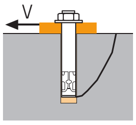
$$V_{Rd,c,C2} = V^0_{Rd,c,C2} \cdot f_b \cdot f_{\beta,V} \cdot \Psi_{S\text{-}C,V}$$

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

Anchor size	M10	M12	M16
Category C2 - Single anchor			
h_{ef}	**70**	**80**	**100**
C_{min}	65	100	100
S_{min}	50	100	100
$V^0_{Rd,c,C2}$ (C20/25)	4,0	5,3	8,4
Category C2 - Group of anchors (1)			
h_{ef}	**70**	**80**	**100**
C_{min}	70	80	100
S_{min}	50	100	100
$V^0_{Rd,c,C2}$ (C20/25)	3,4	4,5	7,1

(1) when more than one anchor of the group is submitted to shear load

$\gamma_{Mc} = 1,5$



Pryout failure

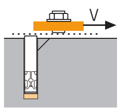
$$V_{Rd,cp,C2} = V^0_{Rd,cp,C2} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$$

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

Anchor size	M10	M12	M16
Category C2 - Single anchor			
h_{ef}	**70**	**80**	**100**
$V^0_{Rd,cp,C2}$ (C20/25)	19,0	23,9	32,0
Category C2 - Group of anchors (1)			
h_{ef}	**70**	**80**	**100**
$V^0_{Rd,cp,C2}$ (C20/25)	16,7	21,1	28,2

(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			
$V_{Rd,s,C2}$	11,6	22,7	46,5
Category C2 - Group of anchors (1)			
$V_{Rd,s,C2}$	9,9	19,3	39,5

(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

$\gamma_{Ms} = 1,25$

$$N_{Rd,C2} = \min(N_{Rd,p,C2} \,;\, N_{Rd,c,C2} \,;\, N_{Rd,s,C2})$$

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

$$V_{Rd,C2} = \min(V_{Rd,c,C2} \,;\, V_{Rd,cp,C2} \,;\, V_{Rd,s,C2})$$

$$\beta_V = V_{Sd} / V_{Rd,C2} \leq 1$$

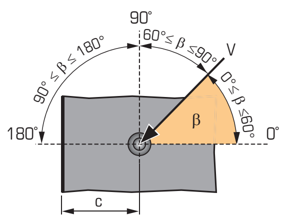
$$\beta_N + \beta_V \leq 1,2$$

f_b INFLUENCE OF CONCRETE

Concrete class	f_b	Concrete class	f_b
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



Mechanical anchors