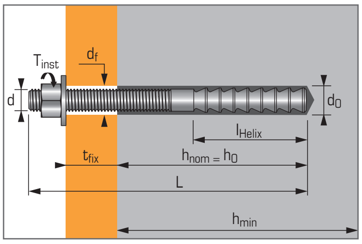
Vinylester resin - For use in cracked & non-cracked concrete and seismic performance C1&C2 categories

European Technical Assessment
ETA Option 1- 17/0514

XTREM
TROPICAL VERSION



Technical data

Anchor size	Anchor depth (mm) h_{ef} min.	Anchor depth (mm) h_{ef} max.	Thickness of part to be fixed (mm) t_{fix} max.	Thickness of part to be fixed (mm) t_{fix} min.	Min. thick. of base material (mm) h_{min}	Thread Ø (mm) d	Drilling Ø (mm) d_0	Clearance Ø (mm) d_f	Total anchor length (mm) L	Tighten torque (Nm) T_{inst}	Code XTREM anchor rod
M12X150	60	108	77	29	h_{ef} +30 mm	12	14	14	150	30	060191
M12X205	60	144	132	48		12	14	14	205	30	060192
M16X200	95	144	89	40	h_{ef} +2d_0	16	18	18	200	50	060193
M16X250	95	192	139	42		16	18	18	248	50	060194
M20X270	100	180	151	71		20	22	22	270	150	060195
M20X330	100	240	211	71		20	22	22	330	150	060196

VIPER XTREM cartridge 280 ml	060187
VIPER XTREM cartridge 410 ml	060189 / 060188
VIPER XTREM TR cartridge (Tropical version) 410 ml	060201
VIPER XTREM cartridge 825 ml	060190

APPLICATION

- Steel profiles
- Fixing machinery (resistant to vibration)
- Storage tanks, pipes
- Signs
- Guard rails
- Electrical insulated fixings

WRAS APPROVED PRODUCT

Anchor mechanical properties

Anchor size		M12	M16	M20
XTREM anchor rod				
f_{uk} (N/mm²)	Min. tensile strength	800	800	800
f_{yk} (N/mm²)	Yield strength	640	640	640
$M^0_{rk,s}$ (Nm)	Characteristic bending moment	105	266	519
M (Nm)	Recommended bending moment	42	106	207

MATERIAL

Resin :
Vinylester resin, dual component cartridge

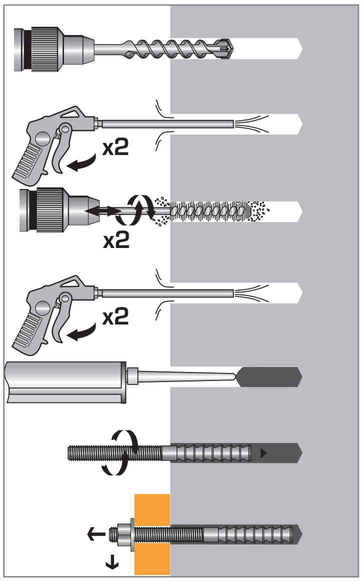
XTREM anchor rod zinc coated steel version:

- **Anchor rod :** Steel grade 8.8 cold form steel NF A35-053
- **Nut :** Steel grade 6 or 8 NF EN 20898-2
- **Washer :** Steel DIN 513
- **Protection :** zinc coated 5 µm min. NF E25-009

Setting time

Temperature	Max. time for installation Standard version	Max. time for installation Tropical version	Curing time Standard version	Curing time Tropical version
-10°C ▶ -5°C	90 min.	-	24 h	-
-4°C ▶ 0°C	50 min.	-	240 min.	-
1°C ▶ 5°C	25 min.	60 min.	120 min.	240 min.
6°C ▶ 10°C	15 min.	40 min.	90 min.	180 min.
11°C ▶ 20°C	7 min.	15 min.	60 min.	120 min.
21°C ▶ 30°C	4 min.	8 min.	45 min.	60 min.
31°C ▶ 40°C	2 min.	4 min.	30 min.	60 min.

INSTALLATION*



***Premium cleaning :**
- 2 blowing with compressed air
- 2 brushing with brushed fitted on a drilling machine
- 2 blowing with compressed air

Chemical resistance of the SPIT VIPER resin

Chemical substances	Concentration (%)	Resistance
Acetic acid	50-75	(o)
Acetic acid	0-50	(+)
Acetone	10	(+)
Ammonium hydroxide or Ammoniac	20	(o)
Ammonium hydroxide or Ammoniac	5	(+)
Bromine water	5	(+)
Chlorine water	0-100	(+)
Citric acid	0-100	(+)
Concentrated phosphoric acid	100	(+)
Deionized water	0-100	(+)
Demineralized water		(+)
Diesel fuel	0-100	(+)
Ethyl alcohol (Ethanol)	10	(o)
Ethylene glycol	0-100	(+)
Formic acid	10	(+)
Fuel	100	(+)
Heavy motor oil	100	(+)

Chemical substances	Concentration (%)	Resistance
Heptane	100	(+)
Hexane	100	(o)
Hydrochloric acid	25	(o)
Hydrochloric acid	15	(+)
Lactic acid	0-100	(+)
Nitric acid	feb-15	(o)
Phosphoric acid	80	(+)
Phosphoric acid, vapor and condensed		(+)
Sea water	0-100	(+)
Sodium carbonate	10	(+)
Sodium chloride	0-100	(+)
Sodium hydroxide (or Caustic soda)	25	(o)
Sulfuric acid	71-75	(o)
Sulfuric acid	0-70	(+)
Sulfuric acid	Fumes	(+)
Sulfuric acid / Phosphoric acid	10:20	(+)
Turpentine (oil)		(o)

Resistant (+): the samples in contact with the substances did not show any Screwible damage such as cracks, attacked surfaces, burst corners nor large swelling. **Sensitive (o):** use with care regarding exposure of the field of usage, precautions to be taken. The samples in contact with the substance slightly attacked the material.

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).

Number of sealings per cartridge

Anchor size	M12	M16	M20
Drilling diameter (mm)	14	18	22
Drilling depth (mm)	80	90	110
Number of sealings per cartridge			
VIPER 825 ml	77	48	26
VIPER 410 ml	38	24	13
VIPER 280 ml	26	16	9

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	M12	M16	M20
Non-cracked concrete (C20/25)			
h_{ef}	**60**	**96**	**100**
$N_{Ru,m}$	33,5	66,5	82,6
N_{Rk}	28,3	56,1	69,6
Cracked concrete (C20/25)			
h_{ef}	**60**	**96**	**100**
$N_{Ru,m}$	31,2	56,4	63,6
N_{Rk}	26,4	51,3	58,1

SHEAR

Anchor size	M12	M16	M20
Cracked & non-cracked concrete (C20/25)			
$V_{Ru,m}$	37	70	108
V_{Rk}	34	63	98

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 (stud grade 10.9)

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

TENSILE

Anchor size	M12	M16	M20
Non-cracked concrete (C20/25)			
h_{ef}	**60**	**96**	**100**
N_{Rd}	18,8	37,4	46,4
Cracked concrete (C20/25)			
h_{ef}	**60**	**96**	**100**
N_{Rd}	17,6	34,2	38,7

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

SHEAR

Anchor size	M12	M16	M20
Cracked & non-cracked concrete (C20/25)			
V_{Rd}	27	50,4	78,4

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

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 (stud grade 10.9)

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

TENSILE

Anchor size	M12	M16	M20
Non-cracked concrete (C20/25)			
h_{ef}	**60**	**96**	**100**
N_{rec}	13,5	26,7	33,1
Cracked concrete (C20/25)			
h_{ef}	**60**	**96**	**100**
N_{rec}	12,6	24,4	27,6

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

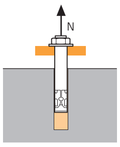
SHEAR

Anchor size	M12	M16	M20
Cracked & non-cracked concrete (C20/25)			
V_{rec}	19,3	36	56

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

SPIT CC Method (values issued from ETA)

TENSILE in kN

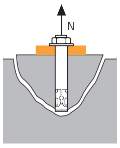


Pull-out resistance for dry and wet concrete [1]

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

$N^0_{Rd,p}$		Design pull-out resistance	
Anchor size	**M12**	**M16**	**M20**
$h_{ef,\ min}$	**60**	**96**	**100**
$h_{ef,\ max}$	**144**	**192**	**240**
Non-cracked concrete (C20/25)			
$N^0_{Rd,p}$ ($h_{ef,\ min}$)	25,6	54,7	71,2
Cracked concrete (C20/25)			
$N^0_{Rd,p}$ ($h_{ef,\ min}$)	25,6	51,5	58,6

$\gamma_{Mc} = 1,5$

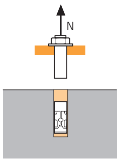


Concrete cone resistance for dry and wet concrete [1]

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

$N^0_{Rd,c}$		Design cone resistance	
Anchor size	**M12**	**M16**	**M20**
$h_{ef,\ min}$	**60**	**96**	**100**
$h_{ef,\ max}$	**144**	**192**	**240**
Non-cracked concrete (C20/25)			
$N^0_{Rd,c}$ ($h_{ef,min}$)	15,6	31,6	33,6
$N^0_{Rd,c}$ ($h_{ef,max}$)	58,1	89,4	124,9
Cracked concrete (C20/25)			
$N^0_{Rd,c}$ ($h_{ef,min}$)	11,2	22,6	24,0
$N^0_{Rd,c}$ ($h_{ef,max}$)	41,5	63,9	89,2

$\gamma_{Mc} = 1,5$



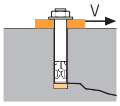
Steel resistance

$N_{Rd,s}$		Steel design tensile resistance	
Anchor size	**M12**	**M16**	**M20**
Xtrem anchor rod Zn.	33,3	59,3	93,3

$\gamma_{Ms} = 1,5$

[1] The concrete in the area of the anchorage is water statured. The anchor may be installed in flooded holes, but the figures above cannot be used, you must use the values given in the ETA for the category 2.

SHEAR in kN

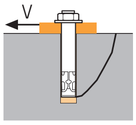


Concrete edge resistance

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

$V^0_{Rd,c}$		Design concrete edge resistance at minimum edge distance (C_{min})	
Anchor size	**M12**	**M16**	**M20**
$h_{ef,\ min}$	**60**	**96**	**100**
$h_{ef,\ max}$	**144**	**192**	**240**
C_{min}	50	60	120
S_{min}	50	60	120
Non-cracked concrete (C20/25)			
$V^0_{Rd,c}$ ($h_{ef,min}$)	3,5	5,6	17,0
$V^0_{Rd,c}$ ($h_{ef,max}$)	4,5	6,9	21,7
Cracked concrete (C20/25)			
$V^0_{Rd,c}$ ($h_{ef,min}$)	2,5	4,0	12,2
$V^0_{Rd,c}$ ($h_{ef,max}$)	3,2	4,9	15,5

$\gamma_{Mc} = 1,5$

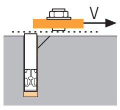


Pryout failure

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

$V^0_{Rd,cp}$		Design pryout resistance	
Anchor size	**M12**	**M16**	**M20**
$h_{ef,\ min}$	**60**	**96**	**100**
$h_{ef,\ max}$	**144**	**192**	**240**
Non-cracked concrete (C20/25)			
$V^0_{Rd,cp}$ ($h_{ef,min}$)	31,2	63,2	67,2
$V^0_{Rd,cp}$ ($h_{ef,max}$)	51,3	109,4	142,4
Cracked concrete (C20/25)			
$V^0_{Rd,cp}$ ($h_{ef,min}$)	15,1	35,4	48,0
$V^0_{Rd,cp}$ ($h_{ef,max}$)	51,3	102,9	117,3

$\gamma_{Mcp} = 1,5$



Steel resistance

$V_{Rd,s}$		Steel design shear resistance	
Anchor size	**M12**	**M16**	**M20**
Xtrem anchor rod Zn.	27,2	50,4	78,4

$\gamma_{Ms} = 1,25$

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

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

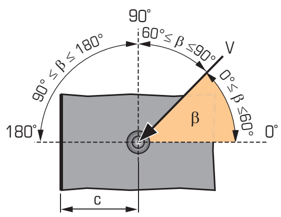
$$\beta_N + \beta_V \le 1,2$$

f_b INFLUENCE OF CONCRETE

Concrete class	f_b Cracked & non-cracked concrete		
	M12	M16	M20
C25/30	1,02	1,02	1,07
C30/37	1,08	1,08	1,17
C40/50	1,15	1,15	1,32
C50/60	1,19	1,19	1,42

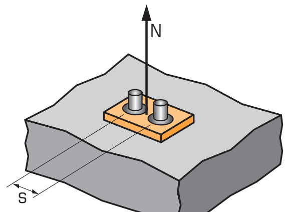
$f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

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



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

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

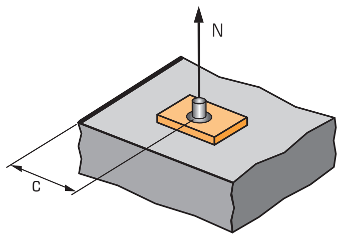
$s_{cr,N} = 3.h_{ef}$

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

SPACING S — Reduction factor Ψ_s — Cracked & non-cracked concrete

Anchor size	M12	M16	M20
40	0,61		
50	0,64		
60	0,67	0,60	
80	0,72	0,64	
100	0,78	0,67	0,67
150	0,92	0,76	0,75
200	1,00	0,85	0,83
240	1,00	0,92	0,90
300	1,00	1,00	1,00
360		1,00	1,00
480			1,00
600			1,00

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



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

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

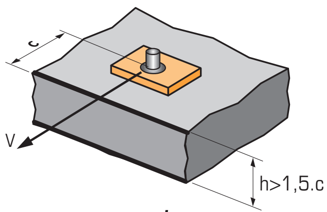
$c_{cr,N} = 1,5.h_{ef}$

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

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

Anchor size	M12	M16	M20
40	0,58		
45	0,63	0,48	
50	0,67	0,51	0,50
65	0,79	0,59	0,58
80	0,92	0,67	0,65
120	1,00	0,88	0,85
150		1,00	1,00
180		1,00	1,00
240			1,00
300			1,00

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

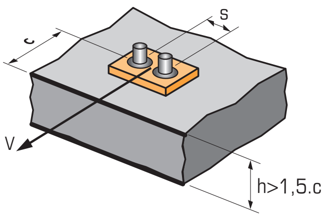


$$\Psi_{s\text{-}c,V} = \frac{c}{c_{min}} \,.\, \sqrt{\frac{c}{c_{min}}}$$

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

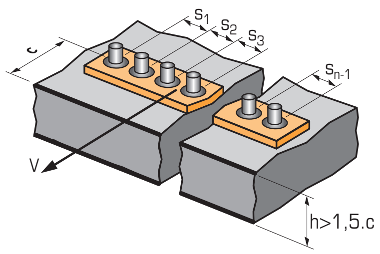


$$\Psi_{s\text{-}c,V} = \frac{3.c + s}{6.c_{min}} \,.\, \sqrt{\frac{c}{c_{min}}}$$

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

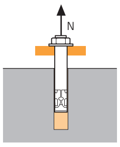


For 3 anchors fastening and more

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

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

TENSILE in kN

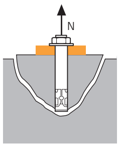


Pull-out resistance

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

$N^0_{Rd,p,C1}$		Design pull-out resistance	
Anchor size	M12	M16	M20
Category C1 - Single anchor			
h_{ef}	**60**	**96**	**120**
$N^0_{Rd,p,C1}$ (C20/25)	25,6	43,8	49,8
Category C1 - Group of anchors [1]			
h_{ef}	**60**	**96**	**120**
$N^0_{Rd,p,C1}$ (C20/25)	21,8	37,2	42,4

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

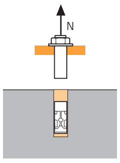


Concrete cone resistance

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

$N^0_{Rd,c,C1}$		Design cone resistance	
Anchor size	M12	M16	M20
$h_{ef,\ min}$	**60**	**96**	**100**
$h_{ef,\ max}$	**144**	**192**	**240**
Category C1 - Single anchor			
$N^0_{Rd,c,C1}$ ($h_{ef,min}$)	9,5	19,2	20,4
$N^0_{Rd,c,C1}$ ($h_{ef,max}$)	35,3	54,3	75,8
Category C1 - Group of anchors [1]			
$N^0_{Rd,c,C1}$ ($h_{ef,min}$)	8,4	16,9	18,0
$N^0_{Rd,c,C1}$ ($h_{ef,max}$)	31,1	47,9	66,9

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



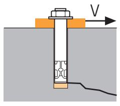
Steel resistance

$N_{Rd,s,C1}$		Steel design tensile resistance	
Anchor size	M12	M16	M20
Xtrem anchor rod Zn.	33,3	59,3	93,3

$\gamma_{Ms} = 1,5$

[1] The concrete in the area of the anchorage is water statured. The anchor may be installed in flooded holes, but the figures above cannot be used, you must use the values given in the ETA for the category 2.

SHEAR in kN

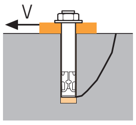


Concrete edge resistance

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

$V^0_{Rd,c,C1}$		Design concrete edge resistance at minimum edge distance (C_{min})	
Anchor size	M12	M16	M20
$h_{ef,\ min}$	**60**	**96**	**100**
$h_{ef,\ max}$	**144**	**192**	**240**
C_{min}	50	60	120
S_{min}	50	60	120
Category C1 - Single anchor			
$V^0_{Rd,c,C1}$ ($h_{ef,min}$)	2,5	4,0	12,2
$V^0_{Rd,c,C1}$ ($h_{ef,max}$)	3,0	4,6	14,5
Category C1 - Group of anchors [1]			
$V^0_{Rd,c,C1}$ ($h_{ef,min}$)	2,2	3,4	10,3
$V^0_{Rd,c,C1}$ ($h_{ef,max}$)	2,6	3,9	12,3

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

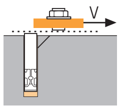


Pryout failure

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

$V^0_{Rd,cp,C1}$		Design pryout resistance	
Anchor size	M12	M16	M20
Category C1 - Single anchor			
h_{ef}	**60**	**96**	**100**
$V^0_{Rd,cp,C1}$ ($h_{ef,min}$)	19,0	38,4	40,8
$V^0_{Rd,cp,C1}$ ($h_{ef,max}$)	51,3	86,9	100,5
Category C1 - Group of anchors [1]			
h_{ef}	**60**	**96**	**100**
$V^0_{Rd,cp,C1}$ ($h_{ef,min}$)	16,7	33,9	36,0
$V^0_{Rd,cp,C1}$ ($h_{ef,max}$)	43,6	73,8	85,5

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



Steel resistance

$V_{Rd,s,C1}$		Steel design tensile resistance	
Anchor size	M12	M16	M20
Category C1 - Single anchor			
Xtrem anchor rod Zn.	18,9	35,2	54,9
Category C1 - Group of anchors [1]			
Xtrem anchor rod Zn.	16,0	29,9	46,6

[1] when more than one anchor of the group is submitted to shear load
$\gamma_{Ms} = 1,25$

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

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

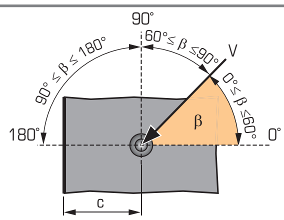
$$\beta_N + \beta_V \leq 1,2$$

f_b INFLUENCE OF CONCRETE

Concrete class		f_b Cracked & non-cracked concrete	
	M12	M16	M20
C25/30	1,02	1,02	1,07
C30/37	1,08	1,08	1,17
C40/50	1,15	1,15	1,32
C50/60	1,19	1,19	1,42

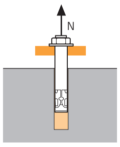
$f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

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



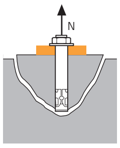
Résistance à la rupture extraction-glissement

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

$N^0_{Rd,p,C2}$	Design pull-out resistance		
Anchor size	M12	M16	M20
Category C2 - Single anchor			
h_{ef}	**60**	**96**	**120**
$N^0_{Rd,p,C2}$ (C20/25)	10,6	30,6	29,3
Category C2 - Group of anchors (1)			
h_{ef}	**60**	**96**	**120**
$N^0_{Rd,p,C2}$ (C20/25)	9,0	26,0	24,9

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

$\gamma_{Mc} = 1,5$



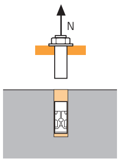
Concrete cone resistance

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

$N^0_{Rd,c,C2}$	Design cone resistance		
Anchor size	M12	M16	M20
$h_{ef,\ min}$	**60**	**96**	**100**
$h_{ef,\ max}$	**144**	**192**	**240**
Category C2 - Single anchor			
$N^0_{Rd,c,C2}$ ($h_{ef,min}$)	9,5	19,2	20,4
$N^0_{Rd,c,C2}$ ($h_{ef,max}$)	35,3	54,3	75,8
Category C2 - Group of anchors (1)			
$N^0_{Rd,c,C2}$ ($h_{ef,min}$)	8,4	16,9	18,0
$N^0_{Rd,c,C2}$ ($h_{ef,max}$)	31,1	47,9	66,9

(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	M12	M16	M20
Xtrem anchor rod Zn.	33,3	59,3	93,3

$\gamma_{Ms} = 1,5$

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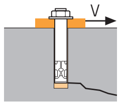
SHEAR in kN



Concrete edge resistance

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$V^0_{Rd,c,C2}$	Design concrete edge resistance at minimum edge distance (C_{min})		
Anchor size	M12	M16	M20
$h_{ef,\ min}$	**60**	**96**	**100**
$h_{ef,\ max}$	**144**	**192**	**240**
C_{min}	50	60	120
S_{min}	50	60	120
Category C2 - Single anchor			
$V^0_{Rd,c,C2}$ ($h_{ef,min}$)	2,5	4,0	12,2
$V^0_{Rd,c,C2}$ ($h_{ef,max}$)	3,0	4,6	14,5
Category C2 - Group of anchors (1)			
$V^0_{Rd,c,C2}$ ($h_{ef,min}$)	2,2	3,4	10,3
$V^0_{Rd,c,C2}$ ($h_{ef,max}$)	2,6	3,9	12,3

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

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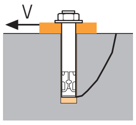

Pryout failure

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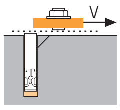
$V^0_{Rd,cp,C2}$	Design pryout resistance		
Anchor size	M12	M16	M20
Category C2 - Single anchor			
h_{ef}	**60**	**96**	**100**
$V^0_{Rd,cp,C2}$ ($h_{ef,min}$)	19,0	38,4	40,8
$V^0_{Rd,cp,C2}$ ($h_{ef,max}$)	21,4	61,8	57,0
Category C2 - Group of anchors (1)			
h_{ef}	**60**	**96**	**100**
$V^0_{Rd,cp,C2}$ ($h_{ef,min}$)	16,7	33,9	36,0
$V^0_{Rd,cp,C2}$ ($h_{ef,max}$)	18,2	52,5	48,4

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

$\gamma_{Mcp} = 1,5$



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