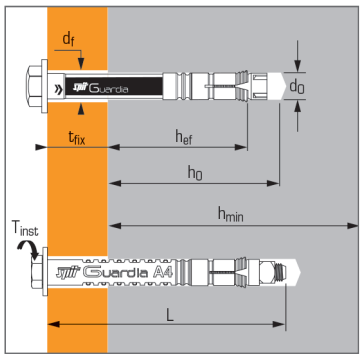
Mechanical anchor, dedicated for safety barriers fixings

ETA Option 7- 07/0047



APPLICATION

- Safety barriers

MATERIAL

Zinc coated version:

- **Bolt :** cold formed steel
NF EN 10263-2 or bar turning steel (type 1,0737) NF EN 10087
- **Cone :** cold formed steel
NF A 35-557
- **Expansion sleeve :** bar turning steel (type 1,0737) NF EN 10087
- **Plastic ring :** PEHD
- **Washer :** electroplated steel
NF E 25 514

Stainless steel version:

- **Bolt :** stainless steel A4-70,
NF EN ISO 3506-1
- **Cone :** stainless steel A4
X2, Cr Ni Mo 17-12-2, NF EN 10 088-1
- **Expansion sleeve :**
stainless steel A4
X2 Cr Ni Mo 17-12-2, NF EN 10 888-1
- **Plastic ring :** Polyacetal
- **Washer :** stainless steel A4
X5 Cr Ni Mo 17-12-2, NF EN 10 088-2

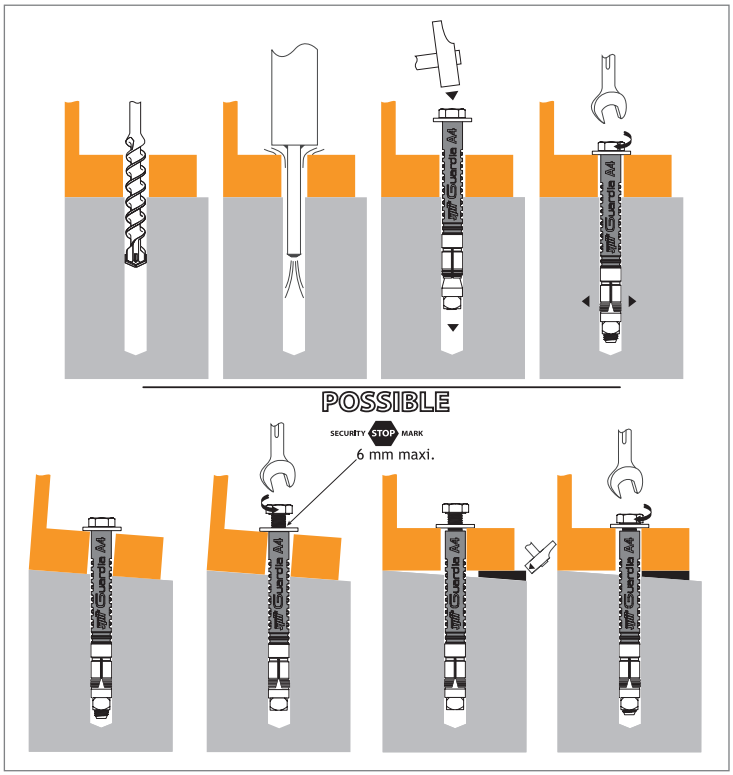
Technical data

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}	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
12X105/20	70	20	150	95	12	14	104	35	051061
12X110/20 A4	70	20	150	100	12	14	110	25	055304

Anchor mechanical properties

Anchor size		12X105/20	12X110/20 A4
Cone			
f_{uk} (N/mm²)	Min. tensile strength	1000	500
Body			
f_{uk} (N/mm²)	Min. tensile strength	550	700
W_{el} (mm³)	Elastic section modulus	50	50
$M^0_{rk,s}$ (Nm)	Characteristic bending moment	33	26
M (Nm)	Recommended bending moment	13,7	10,8

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	12X105/20	12X110/20 A4
Non-cracked concrete (C20/25)		
h_{ef}	**70**	**70**
$N_{Ru,m}$	26,2	24,4
N_{Rk}	25,6	19,5

SHEAR

Anchor size	12X105/20	12X110/20 A4
Non-cracked concrete (C20/25)		
$V_{Ru,m}$	20.2	15,3
V_{Rk}	14,6	12,8

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	12X105/20	12X110/20 A4
Non-cracked concrete (C20/25)		
h_{ef}	**70**	**70**
N_{Rd}	17,1	13

$\gamma_{Mc} = 1,5$

SHEAR

Anchor size	12X105/20	12X110/20 A4
Non-cracked concrete (C20/25)		
V_{Rd}	9,7	8,2

$\gamma_{Ms} = 1,5$ for zinc coated steel and $\gamma_{Ms} = 1,56$ for stainless steel version

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	12X105/20	12X110/20 A4
Non-cracked concrete (C20/25)		
h_{ef}	**70**	**70**
N_{rec}	12,2	9,3

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

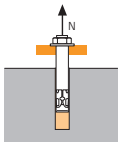
SHEAR

Anchor size	12X105/20	12X110/20 A4
Non-cracked concrete (C20/25)		
V_{rec}	7,0	5,8

$\gamma_{Ms} = 1,5$ for zinc coated steel and $\gamma_{Ms} = 1,56$ for stainless steel version

SPIT CC Method (values issued from ETA)

TENSILE in kN

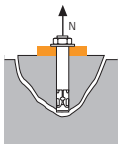


Pull-out resistance

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

$N^{0}_{Rd,p}$		Design pull-out resistance
Anchor size	12X105/20	12X110/20 A4
h_{ef}	**70**	**70**
$N^{0}_{Rd,p}$ (C20/25)	-	13,3

$\gamma_{Mc} = 1,5$

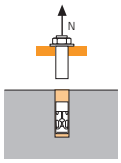


Concrete cone resistance

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

$N^{0}_{Rd,c}$		Design cone resistance
Anchor size	12X105/20	12X110/20 A4
h_{ef}	**70**	**70**
$N^{0}_{Rd,c}$ (C20/25)	19,7	19,7

$\gamma_{Mc} = 1,5$

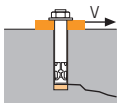


Steel resistance

$N_{Rd,s}$	Steel design tensile resistance	
Anchor size	12X105/20	12X110/20 A4
$N_{Rd,s}$	18,0	13,9

$\gamma_{Ms} = 1,4$ for zinc coated steel and $\gamma_{Ms} = 1,87$ for stainless steel version

SHEAR in kN

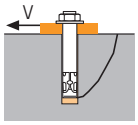


Concrete edge resistance

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

$V^{0}_{Rd,c}$		Design concrete edge resistance at minimum edge distance (C_{min})
Anchor size	12X105/20	12X110/20 A4
h_{ef}	**70**	**70**
C_{min}	50	50
S_{min}	70	70
$V^{0}_{Rd,c}$ (C20/25)	3,1	3,1

$\gamma_{Mc} = 1,5$

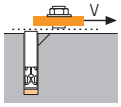


Pryout failure

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

$V^{0}_{Rd,cp}$		Design pryout resistance
Anchor size	12X105/20	12X110/20 A4
h_{ef}	**70**	**70**
$V^{0}_{Rd,cp}$ (C20/25)	39,4	39,4

$\gamma_{Mcp} = 1,5$



Steel resistance

$V_{Rd,s}$	Steel design shear resistance	
Anchor size	12X105/20	12X110/20 A4
$V_{Rd,s}$	9,5	8,2

$\gamma_{Ms} = 1,5$ for zinc coated steel and $\gamma_{Ms} = 1,56$ for stainless steel version

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

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

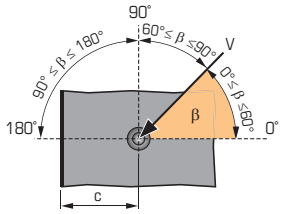
$$\beta_N + \beta_V \leq 1,2$$

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

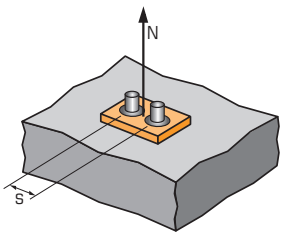
$f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

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



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

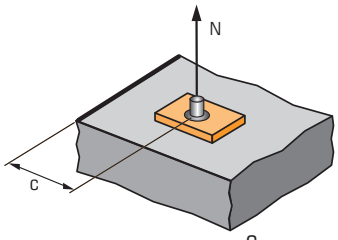
$s_{min} < s < s_{cr,N}$

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

Ψ_s must be used for each spacing influenced the anchors group

SPACING S	Reduction factor Ψ_s Non-cracked concrete	
Anchor size	12X105/20	12X110/20 A4
70	0,67	0,67
80	0,69	0,69
90	0,71	0,71
100	0,74	0,74
110	0,76	0,76
120	0,79	0,79
130	0,81	0,81
140	0,83	0,83
160	0,88	0,88
190	0,95	0,95
210	1,00	1,00

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



$$\Psi_{c,N} = 0{,}28 + 0{,}48 \cdot \frac{c}{h_{ef}}$$

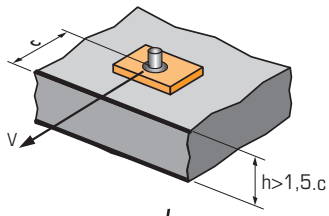
$c_{min} < c < c_{cr,N}$

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

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

EDGE C	Reduction factor $\Psi_{c,N}$ Non-cracked concrete	
Anchor size	12X105/20	12X110/20 A4
50	0,62	0,62
60	0,69	0,69
70	0,76	0,76
80	0,83	0,83
90	0,90	0,90
100	0,97	0,97
105	1,00	1,00

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

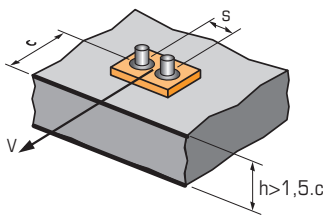


$$\Psi_{s-c,V} = \frac{c}{c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$

For single anchor fastening

Reduction factor $\Psi_{s-c,V}$ 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

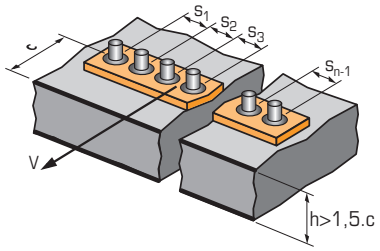


$$\Psi_{s-c,V} = \frac{3.c + s}{6.c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$

For 2 anchors fastening

Reduction factor $\Psi_{s-c,V}$ 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

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