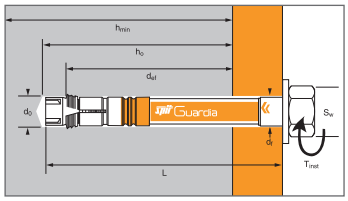


Mechanical anchor for fixing safety barriers and hand rails

ETA
European Technical Approval

ETA Option 7
n° 07/0047



Applications

- Safety barriers and hand rails

Material

- **Headed 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 (type 1,0737) NF EN 10087
- **Plastic ring:** PEHD
- **Washer:** Electroplated steel NF E 25 514

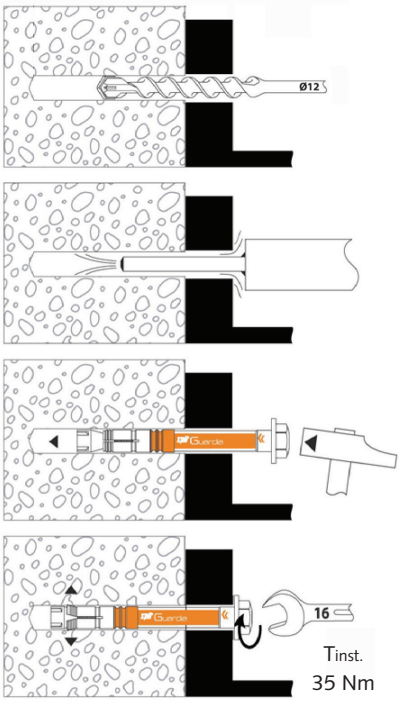
Technical data

SPIT GUARDIA	Minimum anchor depth								
	Min. anchor depth (mm)	Max thick of part to be fixed (mm)	Drilling depth (mm)	Min thick of base material (mm)	Ø drill bit (mm)	Ø clearance (mm)	Total anchor length (mm)	Max. tighten Torque (Nm)	Eurocode
	$h_{ef,min}$	t_{fix}	h_o	h_{min}	d_o	d_f	L	T_{inst}	
12x105/20	70	20	95	150	12	14	104	35	051061

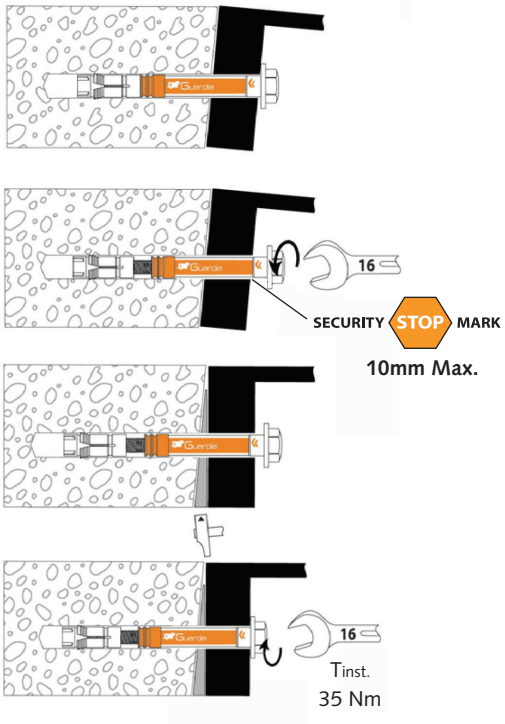
Anchor mechanical properties

		12x105/20
Cone		
f_{uk} (N/mm²)	Min. tensile strength	1000
Threaded part		
f_{uk} (N/mm²)	Min. tensile strength	550
W_{el} (mm³)	Elastic section modulus	50
$M^0_{Rk,s}$ (Nm)	Characteristic bending moment	33
M (Nm)	Recommended bending moment	13,7

Installation



Rail Alignment Adjustment





The loads specified on this page are derived from internal test results. For results derived from CC Methodology, please see overleaf. The data given in the pages "CC - Method" have to be applied.

Ultimate ($N_{Ru,m}$, $V_{Ru,m}$) / 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
Non cracked concrete	
h_{ef}	70
$N_{Ru,m}$	26,2
N_{Rk}	25,6

SHEAR

Anchor size	12x105/20
Non cracked concrete	
$V_{Ru,m}$	20,2
V_{Rk}	14,6

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
Non cracked concrete	
h_{ef}	70
N_{Rd}	17,1

$\gamma_{Mc} = 1,5$

SHEAR

Anchor size	12x105/20
Non cracked concrete	
V_{Rd}	9,7

$\gamma_{Ms} = 1,5$

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	12x105/20
Non cracked concrete	
h_{ef}	70
N_{Rec}	12,2

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

SHEAR

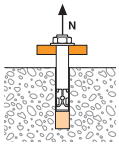
Anchor size	12x105/20
Non cracked concrete	
V_{Rec}	7,0

$\gamma_{Ms} = 1,5$



SPIT CC - Method (values issued from ETA)

TENSILE in kN

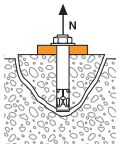


Pull-out resistance

$$N_{Rd,p} = N^{O}_{Rd,p} . f_b$$

$N_{Rd,p}$ Anchor size	Design pull-out resistance 12x105/20
h_{ef}	*70*
$N_{Rd,p}$	-

$\gamma_{Mc} = 1,5$

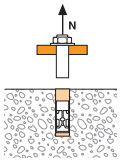


Concrete cone resistance

$$N_{Rd,c} = N^{O}_{Rd,c} . f_b . \Psi_s . \Psi_{c,N}$$

$N_{Rd,c}$ Anchor size	Design cone resistance 12x105/20
h_{ef}	*70*
$N_{Rd,c}$	19,7

$\gamma_{Mc} = 1,5$

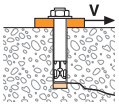


Steel resistance

$N_{Rd,s}$ Anchor size	Design steel tensile resistance 12x105/20
$N_{Rd,s}$	18,0

$\gamma_{Ms} = 1,4$

SHEAR in kN

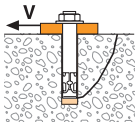


Concrete edge resistance

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

$V_{Rd,c}$ Anchor size	Design concrete edge resistance at minimum edge distance (C_{min}) 12x105/20
h_{ef}	*70*
C_{min}	50
S_{min}	70
$V_{Rd,c}$	3,1

$\gamma_{Mc} = 1,5$

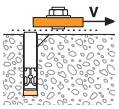


Pryout failure

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

$V_{Rd,cp}$ Anchor size	Design pryout resistance 12x105/20
h_{ef}	*70*
$V_{Rd,cp}$	39,4

$\gamma_{Mcp} = 1,5$



Steel resistance

$V_{Rd,s}$ Anchor size	Design steel shear resistance 12x105/20
$V_{Rd,s}$	9,5

$\gamma_{Ms} = 1,5$

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

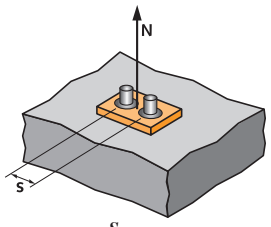
$$V_{Rd} = \min(V_{Rd,c} ; V_{Rd,cp} ; V_{Rd,s})$$
$$\beta_V = V_{Sd} / V_{Rd} \leq 1$$

$$\beta_N + \beta_V \leq 1.2$$



SPIT CC - Method (values issued from ETA)

Ψ_s Influence of spacing for concrete cone resistance in tensile load

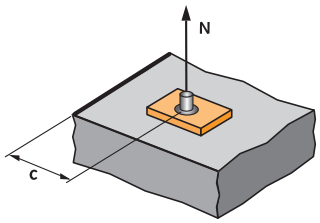


$$\Psi_S = 0{,}5 + \frac{s}{6.h_{ef}}$$

$S_{min} < S < S_{cr,N}$
$S_{cr,N} = 3.h_{ef}$
Ψ_S must be used for each spacing influenced the anchors group.

SPACING S	Reduction factor Ψ_s Non-cracked concrete 12x105/20
70	0,67
80	0,69
90	0,71
100	0,74
110	0,76
120	0,79
130	0,81
140	0,83
160	0,88
190	0,95
100	1,00

$\Psi_{c,N}$ Influence of edge for concrete cone resistance in tensile load

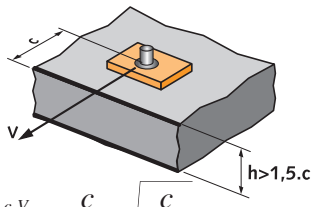


$$\Psi_{c,N} = 0{,}28 + 0{,}48.\frac{c}{h_{ef}}$$

$C_{min} < C < C_{cr,N}$
$C_{cr,N} = 1{,}5.h_{ef}$
$\Psi_{c,N}$ must be used for each distance influenced the anchors group.

EDGE C	Reduction factor $\Psi_{c,N}$ Non-cracked concrete 12x105/20
50	0,62
60	0,69
70	0,76
80	0,83
90	0,90
100	0,97
105	1,00

$\Psi_{s-c,V}$ Influence of spacing and edge distance for concrete edge resistance in shear load

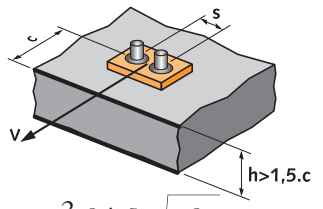


$$\Psi_{s-c,V} = \frac{c}{c_{min}}.\sqrt{\frac{c}{c_{min}}}$$

For single anchor fastening

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

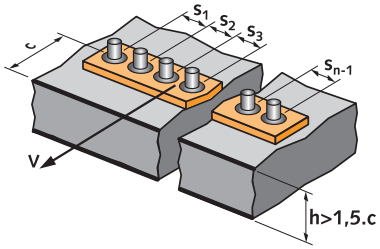


$$\Psi_{s-c,V} = \frac{3.c + s}{6.c_{min}}.\sqrt{\frac{c}{c_{min}}}$$

For 2 anchors

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 or more

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