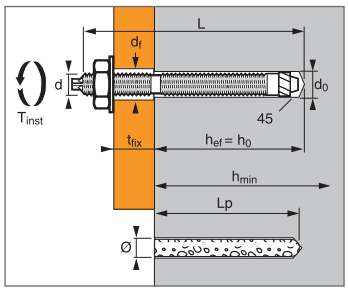
European Technical Approval

ETA Option 7
n° 03/0008



Bonded anchor in glass capsule

Technical data

SPIT MAXIMA	Max. anchor depth (mm)	Max. thick of part to be fixed (mm)	Min thick of base material (mm)	Ø thread (mm)	Drilling depth (mm)	Ø drill bit (mm)	Ø clearance (mm)	Total rod length (mm)	Total capsule length (mm)	Max. tighten torque (Nm)	Eurocode rod	Eurocode capsule
	h_{ef}	t_{fix}	h_{min}	d	h_o	d_o	d_f	L	L_p	T_{inst}		
MAXIMA M8	80	15	110	8	80	10	9	110	80	10	050950	051500
MAXIMA M10	90	20	120	10	90	12	12	130	85	20	050960	051510
MAXIMA M12	110	25	150	12	110	14	14	160	107	30	050970	051520
MAXIMA M16	125	35	160	16	125	18	18	190	107	60	050980	051530
MAXIMA M20	170	65	220	20	170	25	22	260	162	120	655220	051540
MAXIMA M24	210	63	300	24	210	28	26	300	200	200	655240	051550
MAXIMA M30	280	70	350	30	280	35	33	380	260	400	050940	051560

Anchor mechanical properties

		M8	M10	M12	M16	M20	M24	M30
Threaded part								
f_{uk} (N/mm²)	Min. tensile strength	600	600	600	600	520	520	520
f_{yk}(N/mm²)	Yield strength	420	420	420	420	420	420	420
As (mm²)	Stressed cross-section	36,6	58	84,3	157	227	326,9	522,8
W_{el} (mm³)	Elastic section modulus	31,2	62,3	109,2	277,5	482,4	833,7	1686,0
$M^0_{Rk,s}$ (Nm)	Characteristic bending moment	22	45	78	200	301	520	1052
M (Nm)	Recommended bending moment	9,0	18,4	31,8	81,6	122,9	212,2	429,4

Setting time before tightening torque and applying a load

Ambient temperature (°C)	SPIT MAXIMA resin	
	Dry concrete	Wet concrete
T ≥ 20°c	20 min.	40 min.
10°c < T < 20°c	30 min.	60 min.
0°c < T ≤ 10°c	1 hour	2 hours
-5°c < T ≤ 0°c	5 hours	10 hours

Chemical resistance of the SPIT MAXIMA resin

Chemical substances	Concentration (%)	Resistance
Nitric acid	< 20	(+)
Nitric acid	20 - 70	(o)
Phosphoric acid	< 10	(+)
Sulphurous acid	100	(o)
Sulphuric acid	≤ 30	(+)
Ethyl alcohol	≤ 15	(+)
Beer	100	(+)
Carbon dioxide	100	(+)
Engine petrol without benzene	100	(o)
Hydrogen fluoride	≤ 20	(+)
Ammonia	100	(+)

Chemical substances	Concentration (%)	Resistance
Ethylene glycol	100	(+)
Heptane	100	(o)
Hexane	100	(o)
Methanol	≤ 15	(o)
Carbon monoxide	100	(+)
Washing powder	100	(+)
Perchloroethylene	100	(o)
Hydrogen peroxide	≤ 40	(o)
Caustic potash	100	(+)
Cement in suspension	saturated solution	(+)

Resistant (+): the samples in contact with the substances did not show any visible 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.

* Using the installation tool available in each box of studs.

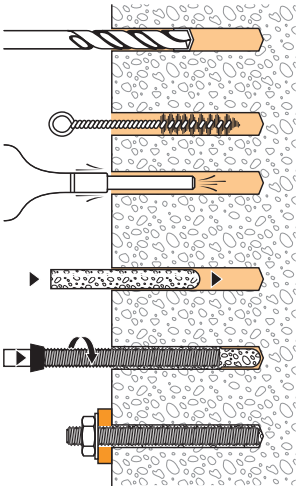
Applications

- Fixing steel framed structures
- Fixing machinery (resistant to vibration)
- Fixing of storage silos, refinery pipework supports
- Fixing motorway signs
- Fixing safety barriers

Material

- **Threaded rod M8-M16:** cold formed steel NF A35-053
- **Threaded rod M20-M30:** 11 SMnPb37 - NFA 35-561
- **Nut:** Steel, EN 20898-2 grade 6 or 8
- **Washer:** Steel DIN 513
- **Zinc coating 5 µm min.** NF E25-009

Installation



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	M8	M10	M12	M16	M20	M24	M30
h_{ef}	*80*	*90*	*110*	*125*	*170*	*210*	*280*
$N_{Ru,m}$	25,9	44,1	67,2	93,2	105,4	237,6	297,7
N_{Rk}	18,3	25,7	37,7	57,1	80,8	119,7	151,9

SHEAR

Anchor size	M8	M10	M12	M16	M20	M24	M30
$V_{Ru,m}$	13,1	21,7	23,32	45,2	73,7	114,7	168,3
R_{Rk}	10,8	15,8	19,6	37,2	69,5	96,6	146,5

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	M20	M24	M30
h_{ef}	*80*	*90*	*110*	*125*	*170*	*210*	*280*
N_{Rd}	10,2	14,3	20,9	31,7	44,9	66,5	84,4

γ_{Mc} = 1,8

SHEAR

Anchor size	M8	M10	M12	M16	M20	M24	M30
V_{Rd}	7,6	11,0	13,7	26,0	46,3	64,4	97,7

γ_{Ms} = 1,43 for M8 to M16 and γ_{Ms} = 1,5 for M20 to M30

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	M8	M10	M12	M16	M20	M24	M30
h_{ef}	*80*	*90*	*110*	*125*	*170*	*210*	*280*
N_{Rec}	7,3	10,2	14,9	22,7	32,0	47,5	60,3

γ_{F} = 1,4 ; γ_{Mc} = 1,8

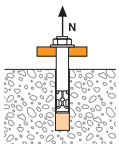
SHEAR

Anchor size	M8	M10	M12	M16	M20	M24	M30
V_{Rec}	5,4	7,9	9,8	18,6	33,1	46,0	69,8

γ_{F} = 1,4 ; γ_{Ms} = 1,43 for M8 to M16 and γ_{Ms} = 1,5 for M20 to M30

SPIT CC - Method (values issued from ETA)

TENSILE in kN

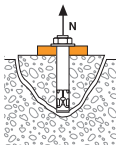


Pull out resistance for dry, wet (1) and flooded (2) concrete

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

$N^0_{Rd,p}$ Anchor size	Design pull-out resistance in dry and wet concrete M8	M10	M12	M16	M20	M24	M30
h_{ef}	*80*	*90*	*110*	*125*	*170*	*210*	*280*
-40°C to +40°C	8,9	13,9	22,2	33,3	41,7	63,9	77,8
-40°C to +80°C	5,0	8,9	13,9	22,2	27,8	41,7	52,8
	Design pull-out resistance for flooded concrete						
-40°C to +40°C	-	-	19,0	28,6	35,7	54,8	66,7
-40°C to +80°C	-	-	11,9	19,0	23,8	35,7	45,2

γ_{Mc} = 1,8 (wet) ; γ_{Mc} = 2,1 (flooded)

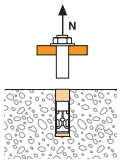


Concrete cone resistance for dry, wet (1) and flooded (2) concrete

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

$N^0_{Rd,c}$ Anchor size	Design cone resistance in dry and wet concrete M8	M10	M12	M16	M20	M24	M30
h_{ef}	*80*	*90*	*110*	*125*	*170*	*210*	*280*
-40°C to +40°C	8,9	13,9	22,2	33,3	41,7	63,9	77,8
-40°C to +80°C	5,0	8,9	13,9	22,2	27,8	41,7	52,8
	Design cone resistance for flooded concrete						
-40°C to +40°C	-	-	19,0	28,6	35,7	54,8	66,7
-40°C to +80°C	-	-	11,9	19,0	23,8	35,7	45,2

γ_{Mc} = 1,8 (wet) ; γ_{Mc} = 2,1 (flooded)

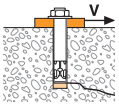


Steel resistance

$N_{Rd,s}$ Anchor size	Design steel tensile resistance M8	M10	M12	M16	M20	M24	M30
$N_{Rd,s}$	12,9	19,9	29,2	55,0	79,2	114,1	181,9

γ_{Ms} = 1,71 for M8 to M16 and γ_{Ms} = 1,49 for M20 to M30

SHEAR in kN

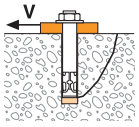


Concrete edge resistance

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

$V^0_{Rd,c}$ Anchor size	Design concrete edge resistance at minimum edge distance (C_{min}) M8	M10	M12	M16	M20	M24	M30
h_{ef}	*80*	*90*	*110*	*125*	*170*	*210*	*280*
C_{min}	40	45	55	65	85	105	140
S_{min}	40	45	55	65	85	105	140
$V^0_{Rd,c}$	2,5	3,3	4,8	6,9	12,1	17,9	31,2

γ_{Mc} = 1,5

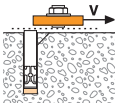


Pryout failure

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

$V^0_{Rd,cp}$ Anchor size	Design pryout resistance in dry and wet concrete M8	M10	M12	M16	M20	M24	M30
h_{ef}	*80*	*90*	*110*	*125*	*170*	*210*	*280*
-40°C to +40°C	21,3	33,3	53,3	80,0	100,0	153,3	186,7
-40°C to +80°C	12,0	21,3	33,3	53,3	66,7	100,0	126,7
	Design pryout resistance for flooded concrete						
-40°C to +40°C	-	-	53,3	80,0	100,0	153,3	186,7
-40°C to +80°C	-	-	33,3	53,3	66,7	100,0	126,7

γ_{Mcp} = 1,5



Steel resistance

$V_{Rd,s}$ Anchor size	Design steel shear resistance M8	M10	M12	M16	M20	M24	M30
$V_{Rd,s}$	7,7	11,8	17,7	32,8	39,3	56,6	90,7

γ_{Ms} = 1,43 for M8 to M16 and γ_{Ms} = 1,5 for M20 to M30

(1) The concrete in the area of the anchorage is water statured.

(2) The concrete is wet, and the hole is full of water. The resin can be injected without remove water.

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

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

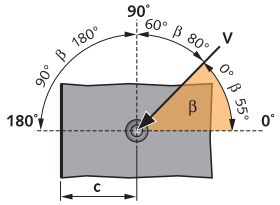
$$\beta_N + \beta_V \leq 1.2$$

f_B Influence of Concrete

Anchor size	M8	M10	M12	M16	M20	M24	M30
C20/25	1	1	1	1	1	1	1
C30/37	1	1	1	1	1,18	1,07	1,27
C50/60	1	1	1	1	1,53	1,22	1,79

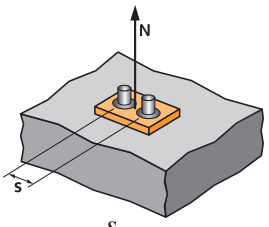
$f_{\beta,V}$ Influence of Shear Loading Direction

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



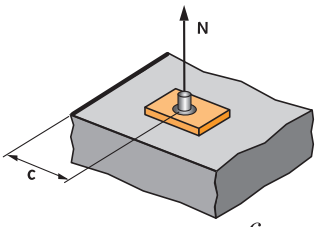
$$\Psi_S = 0{,}5 + \frac{s}{4.h_{ef}}$$

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

SPACING S	Reduction factor Ψ_s Non-cracked concrete			
	M8	M10	M12	M16
40	0,63			
45	0,64	0,63		
55	0,67	0,65	0,63	0,61
65	0,70	0,68	0,65	0,63
85	0,77	0,74	0,69	0,67
105	0,83	0,79	0,74	0,71
140	0,94	0,89	0,82	0,78
160	1,00	0,94	0,86	0,82
180		1,00	0,91	0,86
220			1,00	0,94
250				1,00

SPACING S	Reduction factor Ψ_s Non-cracked concrete		
	M20	M24	M30
85	0,63		
105	0,65	0,63	
140	0,71	0,67	0,63
160	0,74	0,69	0,64
180	0,76	0,71	0,66
220	0,82	0,76	0,70
250	0,87	0,80	0,72
300	0,94	0,86	0,77
340	1,00	0,90	0,80
370		0,94	0,83
450		1,00	0,90
560			1,00

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



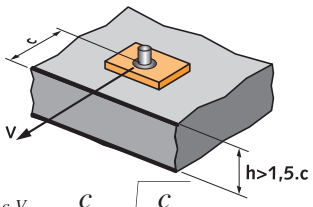
$$\Psi_{c,N} = 0{,}27 + 0{,}725 . \frac{c}{h_{ef}}$$

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

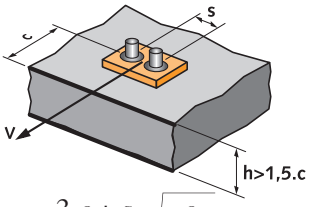
EDGE C	Reduction factor $\Psi_{c,N}$ Non-cracked concrete			
	M8	M10	M12	M16
40	0,63			
45	0,68	0,63		
55	0,77	0,71	0,63	
65	0,86	0,79	0,70	0,66
85	1,00	0,95	0,83	0,76
90		1,00	0,86	0,79
110			1,00	0,91
125				1,00

EDGE C	Reduction factor $\Psi_{c,N}$ Non-cracked concrete		
	M20	M24	M30
85	0,63		
105	0,72	0,63	
120	0,78	0,68	
140	0,87	0,75	0,63
170	1,00	0,86	0,71
210		1,00	0,81
250			0,92
280			1,00

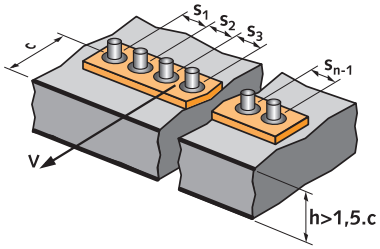
$\Psi_{s-c,V}$ Influence of spacing and edge distance for concrete edge resistance in shear load



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



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



For single anchor fastening

$\frac{C}{C_{min}}$	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

Factor $\Psi_{s-c,V}$ Non-cracked concrete

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

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