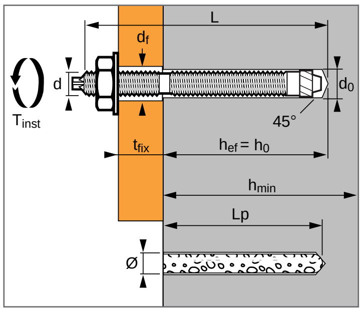
SPIT MAXIMA

Zinc coated steel

ETA Option 7
n° 03/0007



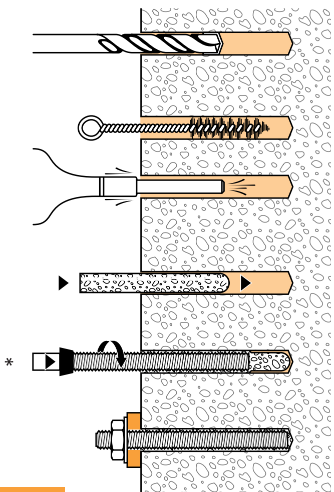
APPLICATION

- 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



Bonded anchor in glass capsule

Technical data

SPIT MAXIMA	Max. anchor depth (mm) h_{ef}	Max. thick of part to be fixed (mm) t_{fix}	Min thick of base material (mm) h_{min}	Ø thread (mm) d	Drilling depth (mm) h_0	Ø drill bit (mm) d_0	Ø clearance (mm) d_f	Total rod lenth (mm) L	Total capsule torque (mm) L_p	Max. tighten (Nm) T_{inst}	Code rod	Code capsule
MAXIMA M8	80	15	120	8	80	10	9	110	80	10	050950	051500
MAXIMA M10	90	20	130	10	90	12	12	130	85	20	050960	051510
MAXIMA M12	110	25	160	12	110	14	14	160	107	30	050970	051520
MAXIMA M16	125	35	175	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	270	24	210	28	26	300	200	200	655240	051550
MAXIMA M30	280	70	340	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 anchor

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.

the right fixing

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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.

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
V_{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}	8,5	11,9	17,4	26,4	37,4	55,4	70,3

γ_{Mc} = 2,16

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}	6,0	8,5	12,5	18,9	26,7	39,6	50,2

γ_F = 1,4 ; γ_{Mc} = 2,16

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

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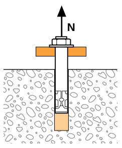
SPIT CC- Method (values issued from ETA)

TENSILE in kN

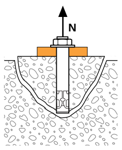


Pull out resistance for dry, wet (1) and flooded (2) concrete

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

$N^0_{Rd,p}$	Design pull-out resistance in dry and wet concrete						
Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	80	90	110	125	170	210	280
-40°C to +40°C	7,4	11,6	18,5	27,8	34,7	53,2	64,8
-40°C to +80°C	4,2	7,4	11,6	18,5	23,1	34,7	44,0
	Design pull-out for flooded concrete						
-40°C to +40°C	-	-	15,8	23,8	29,7	45,6	55,5
-40°C to +80°C	-	-	9,9	15,8	19,8	29,7	37,7

γ_{Mc} = 2,16 (wet) ; γ_{Mc} = 2,52 (flooded)

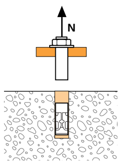


Concrete cone resistance for dry, wet (1) and flooded (2) concrete

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

$N^0_{Rd,c}$	Design pull-out resistance in dry and wet concrete						
Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	80	90	110	125	170	210	280
-40°C to +40°C	7,4	11,6	18,5	27,8	34,7	53,2	64,8
-40°C to +80°C	4,2	7,4	11,6	18,5	23,1	34,7	44,0
	Design pull-out for flooded concrete						
-40°C to +40°C	-	-	15,8	23,8	29,7	45,6	55,5
-40°C to +80°C	-	-	9,9	15,8	19,8	29,7	37,7

γ_{Mc} = 2,16 (wet) ; γ_{Mc} = 2,52 (flooded)

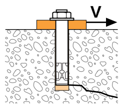


Steel resistance

$N_{Rd,s}$	Steel design tensile resistance						
Anchor size	M8	M10	M12	M16	M20	M24	M30
$N_{Rd,s}$	12,9	19,9	29,2	55	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

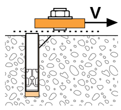


Concrete edge resistance

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

$V^0_{Rd,c}$	Design concrete edge resistance at minimum edge distance (C_{min})						
Anchor size	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
$V^0_{Rd,c}$	2,1	2,7	4,0	5,7	10,1	14,9	26,0

γ_{Mc} = 1,8



Steel resistance

$V_{Rd,s}$	Steel design shear resistance						
Anchor size	M8	M10	M12	M16	M20	M24	M30
$V_{Rd,s}$	6,7	9,5	12,2	23,8	38,7	53,3	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.

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

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

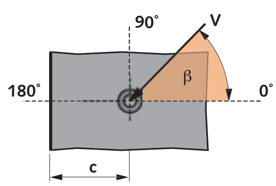
$$\beta_N^{1,5} + \beta_V^{1,5} \leq 1$$

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



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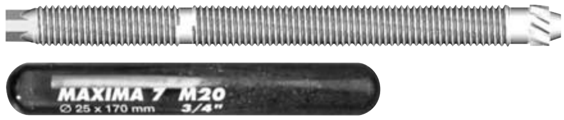
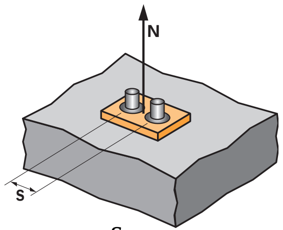


SPIT CC- Method (values issued from ETA)

Ψ_s INFLUENCE OF SPACING FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



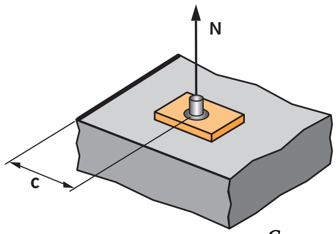
$$\Psi_s = 0,5 + \frac{s}{4.h_{ef}}$$

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



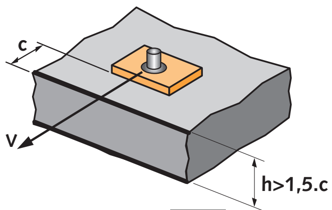
$$\Psi_{c,N} = 0,27 + 0,725.\frac{c}{h_{ef}}$$

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

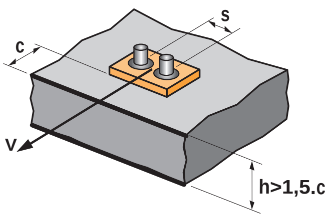


$$\Psi_{s-c,V} = \frac{c}{c_{min}} . \sqrt{\frac{c}{c_{min}}}$$

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

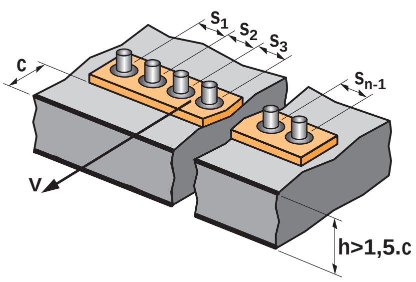


$$\Psi_{s-c,V} = \frac{3.c + s}{6.c_{min}} . \sqrt{\frac{c}{c_{min}}}$$

For 2 anchors fastening

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 other case of fastenings

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

Chemical anchors

the right fixing