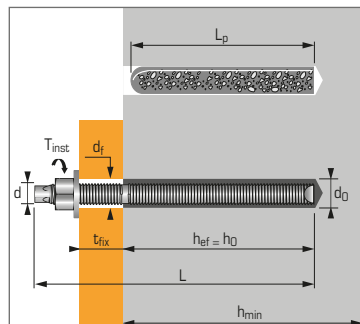


Bonded anchor in glass capsule - heavy loads, for use in non-cracked concrete



ETA Option 7-18/0197



APPLICATION

- Fixing steel framed structures
- Fixing machinery
- Fixing of storage silos, refinery pipework supports
- Fixing motorway signs
- Fixing safety barriers

MATERIAL

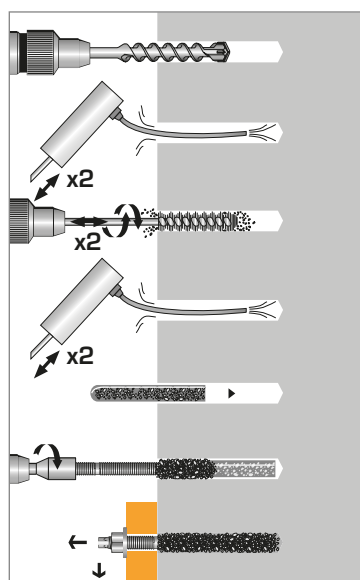
Zinc coated steel version :

- **Stud M8-M30 :**
Steel grade 5.8 as per ISO 898-1
- **Nut :** Steel grade 6 or 8
NF EN 20898-2
- **Washer :** Steel DIN 513
- **Protection :** zinc coated 5 µm min.
NF E25-009

Stainless steel version :

- **Stud M8-M24:**
A4-70 as per ISO 3506-1
- **Nut :** Stainless steel A4-80,
NF EN 10088-3
- **Washer :** Stainless steel A4,
NF EN 20898-2

INSTALLATION



Technical data

Anchor size	Min. anchor depth	Max. thick. of part to be fixed	Min. thick. of base material	Thread Ø	Drilling depth	Drilling Ø	Clearance Ø	Total stud length	Total capsule length	Tighten torque	Code threaded studs		Code capsules
	(mm) h_{ef}	(mm) t_{fix}	(mm) h_{min}	(mm) d	(mm) h₀	(mm) d₀	(mm) d_f	(mm) L	(mm) L_p	(Nm) T_{inst}	zinc coated st.	stainless st. A4	
M8X110	80	15	110	8	80	10	9	110	80	10	060215	060222	060204
M10X130	90	20	120	10	90	12	12	130	85	20	060216	060223	060205
M12X160	110	25	140	12	110	14	14	160	107	40	060217	060224	060206
M16X190	125	35	160	16	125	18	18	190	107	80	060218	060225	060207
M20X260	170	65	220	20	170	22	22	260	162	120	060219	060226	060208
M24X300	210	63	265	24	210	26	26	300	200	180	060220	060227	060209
M30X380	280	70	350	30	280	32	33	380	260	300	060221	-	060210

Anchor mechanical properties

Anchor size		M8	M10	M12	M16	M20	M24	M30
A_s (mm ²)	Stressed cross-section	36,6	58,0	84,3	157,0	227,0	330,0	530,0
W_{el} (mm ³)	Elastic section modulus	31,2	62,3	109,2	277,5	482,4	845,5	1721,0
Zinc coated steel stud, grade 5.8								
f_{uk} (N/mm ²)	Min. tensile strength	520	520	520	520	520	520	520
f_{yk} (N/mm ²)	Yield strength	420	420	420	420	420	420	420
M⁰_{rk,s} (Nm)	Characteristic bending moment	19,5	39,0	68,0	173,0	301,0	528,0	1074,0
M (Nm)	Recommended bending moment	8,0	15,9	27,8	70,7	122,9	215,4	438,3
Stainless steel stud, A4-70								
f_{uk} (N/mm ²)	Min. tensile strength	700	700	700	700	700	700	-
f_{yk} (N/mm ²)	Yield strength	350	350	350	350	350	350	-
M⁰_{rk,s} (Nm)	Characteristic bending moment	26,2	52,3	91,7	233,1	405,2	710,3	-
M (Nm)	Recommended bending moment	10,7	21,4	37,4	95,1	165,4	289,9	-

Setting time

Temperature	Curing time	
	Dry concrete	Wet concrete
T ≥ 30°C	10 min.	20 min.
5°C < T ≤ 20°C	20 min.	40 min.
0°C < T ≤ 5°C	1 hour	2 hours
≥ 0°C	5 hours	10 hours



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	M8	M10	M12	M16	M20	M24	M30
h_{ef}	80	90	110	125	170	210	280
$N_{Ru,m}$	19,9	31,7	45,2	77,9	148,5	209,3	328,8
N_{Rk}	18,0	29,0	42,0	75,4	117,5	174,2	263,9

SHEAR

Anchor size	M8	M10	M12	M16	M20	M24	M30
$V_{Ru,m}$	10,8	16,8	25,2	46,8	73,2	105,6	168
V_{Rk}	9,0	14,0	21,0	39,0	61,0	88,0	140,0

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
(Grade 5.8)

TENSILE

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	80	90	110	125	170	210	280
N_{Rd}	12,0	19,3	28,0	50,3	78,3	116,1	146,6

$\gamma_{Mc} = 1,5$ for M8 to M24 and $\gamma_{Mc} = 1,8$ for M30

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

SHEAR

Anchor size	M8	M10	M12	M16	M20	M24	M30
V_{Rd}	7,2	11,2	16,8	31,2	48,8	70,4	112,0

$\gamma_{Ms} = 1,25$

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
(Grade 5.8)

TENSILE

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	80	90	110	125	170	210	280
N_{rec}	8,6	13,8	20,0	35,9	56,0	82,9	104,7

$\gamma_F = 1,4$; $\gamma_{Mc} = 1,5$ for M8 to M24 and $\gamma_{Mc} = 1,8$ for M30

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

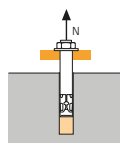
SHEAR

Anchor size	M8	M10	M12	M16	M20	M24	M30
V_{rec}	5,1	8,0	12,0	22,3	34,9	50,3	80,0

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

SPIT CC Method (values issued from ETA)

TENSILE in kN

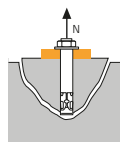


→ Pull-out resistance
for dry, wet ⁽¹⁾ concrete

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

$N_{Rd,p}^0$	Design pull-out resistance for 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	16,1	22,6	33,2	50,3	78,3	116,1	146,6
-40°C to +80°C	13,4	18,8	27,6	41,9	67,6	100,3	131,9

$\gamma_{Mc} = 1,5$ for M8 to M24 and $\gamma_{Mc} = 1,8$ for M30

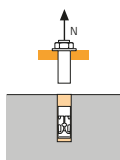


→ Concrete cone resistance
for dry, wet ⁽¹⁾ concrete

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

$N_{Rd,c}^0$	Design pull-out resistance for 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 +80°C	24,0	28,7	38,8	47,0	74,5	102,3	131,2

$\gamma_{Mc} = 1,5$ for M8 to M24 and $\gamma_{Mc} = 1,8$ for M30



→ Steel resistance

$N_{Rd,s}$	Steel design tensile resistance						
Anchor size	M8	M10	M12	M16	M20	M24	M30
Stud Zn. 5.8 grade	12,0	19,3	28,0	52,0	81,3	118,0	186,7
Stud A4-70	13,9	21,4	31,6	58,8	92,0	132,1	-

Stud Zn. 5.8 grade: $\gamma_{Ms} = 1,5$

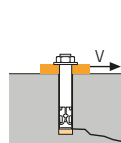
Stud A4-70: $\gamma_{Ms} = 1,87$

⁽¹⁾ The concrete in the area of the anchorage is water saturated. Water must be evacuated before setting.

$$N_{Rd} = \min(N_{Rd,p}; N_{Rd,c}; N_{Rd,s})$$

$$\beta_N = N_{Sd} / N_{Rd} \leq 1$$

SHEAR in kN

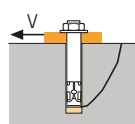


→ Concrete edge resistance

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

$V_{Rd,c}^0$	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
$V_{Rd,c}^0$	2,5	3,3	4,8	6,9	12,1	17,9	31,2

$\gamma_{Mc} = 1,5$

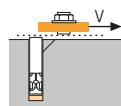


→ Pryout failure
for dry, wet ⁽¹⁾ and flooded ⁽²⁾ concrete

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

$V_{Rd,cp}^0$	Design pryout resistance for 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	32,2	45,2	66,4	93,9	149,0	204,5	314,9
-40°C to +80°C	26,8	37,7	55,3	83,8	135,3	200,6	314,9

$\gamma_{Mcp} = 1,5$



→ Steel resistance

$V_{Rd,s}$	Steel design shear resistance						
Anchor size	M8	M10	M12	M16	M20	M24	M30
Stud Zn. 5.8 grade	7,2	11,2	16,8	31,2	48,8	70,4	112,0
Stud A4-70	8,3	12,8	19,2	35,3	55,1	79,5	-

Stud Zn. 5.8 grade: $\gamma_{Ms} = 1,25$

Stud A4-70: $\gamma_{Ms} = 1,56$

$$V_{Rd} = \min(V_{Rd,c}; V_{Rd,cp}; V_{Rd,s})$$

$$\beta_V = V_{Sd} / V_{Rd} \leq 1$$

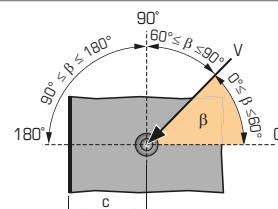
$$\beta_N + \beta_V \leq 1,2$$

f_b INFLUENCE OF CONCRETE

Anchor size	M8 to M30
C25/30	1,06
C30/37	1,14
C50/60	1,34

$f_{\beta,V}$ 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

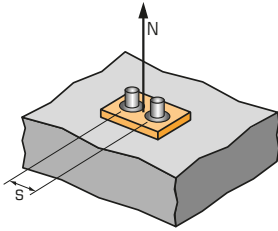




MAXIMA+

SPIT CC Method (values issued from ETA)

Ψ_s INFLUENCE OF SPACING FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_s = 0,5 + \frac{S}{4 \cdot h_{ef}}$$

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

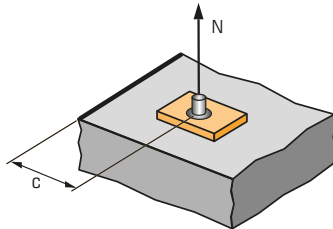
$$s_{cr,N} = 2 \cdot h_{ef}$$

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

SPACING S		Reduction factor Ψ_s Non-cracked concrete			
Anchor size		M8	M10	M12	M16
40		0,63			
45		0,64	0,63		
55		0,67	0,65	0,63	
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		
Anchor size		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



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

$$C_{min} < C < C_{cr,N}$$

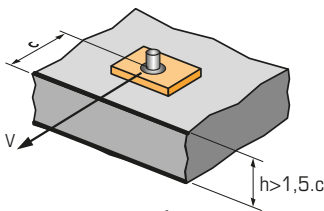
$$C_{cr,N} = h_{ef}$$

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

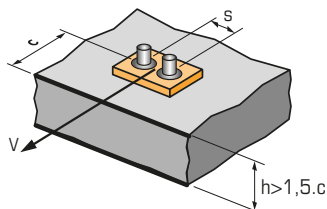
EDGE C		Reduction factor $\Psi_{c,N}$ Non-cracked concrete			
Anchor size		M8	M10	M12	M16
40		0,63			
45		0,68	0,63		
55		0,77	0,71	0,63	
65		0,86	0,79	0,70	0,66
85		1,00	0,95	0,83	0,76
90			1,00	0,86	0,79
110				1,00	0,91
125					1,00

EDGE C		Reduction factor $\Psi_{c,N}$ Non-cracked concrete		
Anchor size		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

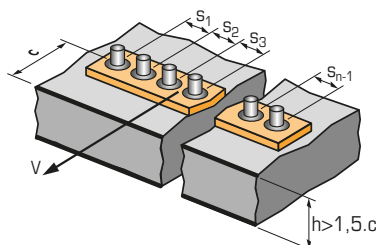
$\Psi_{s-c,V}$ INFLUENCE OF SPACING AND EDGE DISTANCE FOR CONCRETE EDGE RESISTANCE IN SHEAR LOAD



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



$$\Psi_{s-c,V} = \frac{3 \cdot C + S}{6 \cdot C_{min}} \cdot \sqrt{\frac{C}{C_{min}}}$$



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

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

$$\Psi_{s-c,V} = \frac{3 \cdot C + S_1 + S_2 + S_3 + \dots + S_{n-1}}{3 \cdot n \cdot C_{min}} \cdot \sqrt{\frac{C}{C_{min}}}$$