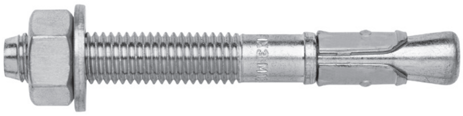


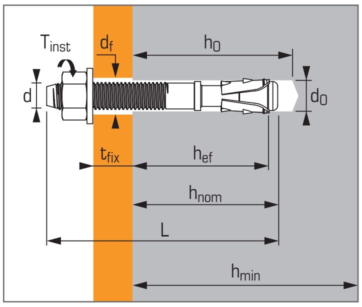
FIX3

zinc coated steel version 1/4

Torque controlled expansion anchor, for use in non-cracked concrete

European Technical Assessment

ETA Option 7- 13/0005



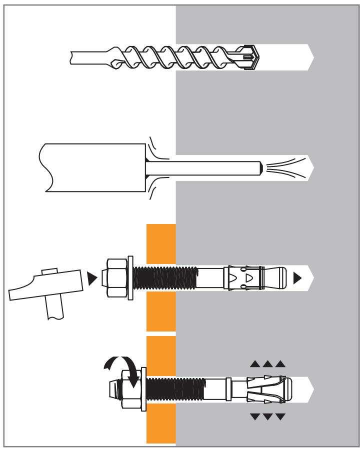
APPLICATION

- Steel and timber framework and beams
- Lift guide rails
- Industrial doors and gates
- Brickwork support angles
- Storage systems

MATERIAL

- **Body M6-M20 :** cold formed steel, NFA 35-053 / zinc electroplated (5 µm)
- **Sleeve :** cold formed steel, NFA 35-231
- **Nut :** steel strength grade 6 or 8, ISO 898-2
- **Washer :** steel, NF E 25513

INSTALLATION



Technical data

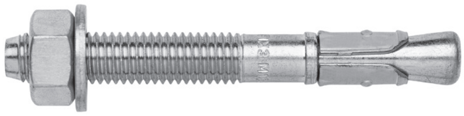
Anchor size	Letter marking	Minimum anchorage depth: Min. anchor depth (mm) h_{ef}	Embed. depth (mm) h_{nom}	Max. thick. of part to be fixed (mm) t_{fix}	Drilling depth (mm) h_0	Min. thick. of base material (mm) h_{min}	Maximum anchorage depth: Max. anchor depth (mm) h_{ef}	Embed. depth (mm) h_{nom}	Max. thick. of part to be fixed (mm) t_{fix}	Drilling depth (mm) h_0	Min. thick. of base material (mm) h_{min}	Thread diameter (mm) d	Drilling diameter (mm) d_0	Clearance diameter (mm) d_f	Total anchor length (mm) L	Tighten torque (Nm) T_{inst}	Code
6X45/5*	-			5					-						45	10	050510
6X55/15*	-	25,6	35	15	41	100	35	45	5	51	100	6	6	8	55		050520
6X85/45*	-			45					35						85		050530
8X55/5	-		-	5					-						55		057450
8X70/20-10	C			20					10						70		057451
8X90/40-30	E			40					30						90		057452
8X100/50-40	F	30	38	50	50	80	40	48	40	60	80	8	8	9	100	15	057453
8X115/65-55	G			65					55						115		057454
8X130/80-70	H			80					70						130		057455
8X160/110-100	J			110					100						160		057456
10X65/5	-			5					-						65		057460
10X75/15-5	C			15					5						75		057461
10X85/25-15	D			25					15						85		057462
10X95/36-26	E	40	50	36	60	100	50	60	26	70	100	10	10	12	95	30	057463
10X110/50-40	F			50					40						110		057464
10X125/65-55	G			65					55						125		057465
10X140/80-70	I			80					70						140		057466
10X160/100-90	J			100					90						160		057467
12X80/5	-			5					-						80		057470
12X100/25-10	F			25					10						100		057471
12x115/40-25	G			40					25						115		057472
12x125/50-35	H			50					35						125		057473
12X140/65-50	I	50	62	65	75	100	65	77	50	90	130	12	12	14	140	50	057474
12X160/85-70	J			85					70						160		057664
12X180/105-90	L			105					90						180		057576
12X220/145-130	O			145					130						220		057477
16X100/5	-			5					-						100		057480
16X125/30-15	G			30					15						125		057481
16X150/55-40	I			55					40						150		057482
16X170/75-60	K	65	80	75	95	130	80	95	60	110	160	16	16	18	170	100	057483
16X185/90-75	L			90					75						185		057484
16X235/140-125*	-			140					125						235		057485
20X150/10	-			10					-						150		057490
20X170/30	K	100	113	30	130	200	-	-	-	-	-	20	20	22	170	160	057491
20X220/80	O			80					-						220		057492
Large Washer (LW)																	
12X300/200*	-			200					-						290		057674
16X300/205/190*	-			205					190						300		057678

* Do not belong to ETA

Anchor mechanical properties

Anchor size		M6	M8	M10	M12	M16	M20
Cross-section above cone							
f_{uk} (N/mm²)	Min. tensile strength	700	750	750	750	700	600
f_{yk} (N/mm²)	Yield strength	580	600	600	600	570	580
As (mm²)	Stressed cross-section	-	23,8	34,7	56,1	103,9	165,1
Threaded part							
f_{uk} (N/mm²)	Min. tensile strength	600	650	650	650	600	500
f_{yk} (N/mm²)	Yield strength	420	420	420	420	480	410
As (mm²)	Stressed cross-section	20,1	36,6	58	84,3	157	245
W_{el} (mm³)	Elastic section modulus	12,71	31,23	62,3	109,17	277,47	540,9
$M^0_{rk,s}$ (Nm)	Characteristic bending moment	9	24	49	85	200	315,7
M (Nm)	Recommended bending moment	3,7	9,8	20,0	34,7	81,6	90,5

MAJ10/21



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	M6	M8	M10	M12	M16	M20
Minimum anchorage depth						
h_{ef}	**25**	**30**	**40**	**50**	**65**	**100**
$N_{Ru,m}$	6,0	11,5	17,3	26,1	43,6	60,1
N_{Rk}	4,5	8,7	12,3	21,5	35,1	45,0
Maximum anchorage depth						
h_{ef}	**35**	**40**	**50**	**65**	**80**	**-**
$N_{Ru,m}$	9,4	17,4	24,6	37,8	52,7	-
N_{Rk}	7,0	15,7	20,2	31,7	47,0	-

SHEAR

Anchor size	M6	M8	M10	M12	M16	M20
$V_{Ru,m}$	6,8	14,3	22,6	32,8	56,5	85,0
V_{Rk}	2,9	10,0	13,7	27,4	36,5	71,1

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	M6	M8	M10	M12	M16	M20
Minimum anchorage depth						
h_{ef}	**25**	**30**	**40**	**50**	**65**	**100**
N_{Rd}	2,5	5,8	8,2	14,3	23,4	30,0
Maximum anchorage depth						
h_{ef}	**35**	**40**	**50**	**65**	**80**	**-**
N_{Rd}	3,8	10,5	13,5	21,1	31,3	-

$\gamma_{Mc} = 1,5$

SHEAR

Anchor size	M6	M8	M10	M12	M16	M20
V_{Rd}	2,3	8,0	11,0	21,9	29,2	47,4

$\gamma_{Ms} = 1,25$ for M6 to M16 and $\gamma_{Ms} = 1,5$ for M20

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

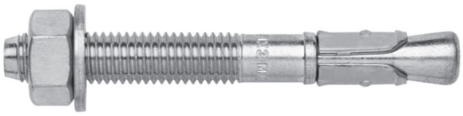
Anchor size	M6	M8	M10	M12	M16	M20
Minimum anchorage depth						
h_{ef}	**25**	**30**	**40**	**50**	**65**	**100**
N_{rec}	1,7	4,2	5,9	10,2	16,7	21,4
Maximum anchorage depth						
h_{ef}	**35**	**40**	**50**	**65**	**80**	**-**
N_{rec}	2,7	7,5	9,6	15,1	22,4	-

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

SHEAR

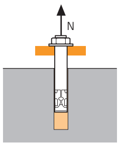
Anchor size	M6	M8	M10	M12	M16	M20
V_{rec}	1,7	5,7	7,8	15,7	20,9	33,9

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



SPIT CC Method (values issued from ETA)

TENSILE in kN

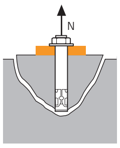


Pull-out resistance

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

$N^0_{Rd,p}$		Design pull-out resistance			
Anchor size	M8	M10	M12	M16	M20
Minimum anchorage depth					
h_{ef}	**30**	**40**	**50**	**65**	**100**
$N^0_{Rd,p}$ (C20/25)	5,0	-	-	-	-
Maximum anchorage depth					
h_{ef}	**40**	**50**	**65**	**80**	**-**
$N^0_{Rd,p}$ (C20/25)	-	-	-	-	-

$\gamma_{Mc} = 1,5$

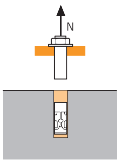


Concrete cone resistance

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

$N^0_{Rd,c}$		Design cone resistance			
Anchor size	M8	M10	M12	M16	M20
Minimum anchorage depth					
h_{ef}	**30**	**40**	**50**	**65**	**100**
$N^0_{Rd,c}$ (C20/25)	5,5	8,5	11,9	17,6	33,6
Maximum anchorage depth					
h_{ef}	**40**	**50**	**65**	**80**	**-**
$N^0_{Rd,c}$ (C20/25)	8,5	11,9	17,6	24,0	-

$\gamma_{Mc} = 1,5$

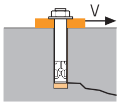


Steel resistance

$V_{Rd,s}$		Steel design tensile resistance			
Anchor size	M8	M10	M12	M16	M20
$V_{Rd,s}$	11,9	17,3	28,1	48,5	66,1

$\gamma_{Ms} = 1,5$ for M8 to M16 and $\gamma_{Ms} = 1,5$ for M20

SHEAR in kN

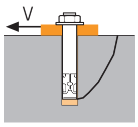


Concrete edge resistance

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

$V^0_{Rd,c}$		Design concrete edge resistance at minimum edge distance (C_{min})			
Anchor size	M8	M10	M12	M16	M20
Minimum anchorage depth					
h_{ef}	**30**	**40**	**50**	**65**	**100**
C_{min}	50	65	100	100	100
S_{min}	40	50	100	100	160
$V^0_{Rd,c}$ (C20/25)	2,7	4,6	9,7	11,1	13,0
Maximum anchorage depth					
h_{ef}	**40**	**50**	**65**	**80**	**-**
C_{min}	55	65	70	105	-
S_{min}	45	60	70	90	-
$V^0_{Rd,c}$ (C20/25)	3,3	4,8	6,0	12,5	-

$\gamma_{Mc} = 1,5$

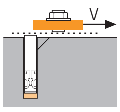


Pryout failure

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

$V^0_{Rd,cp}$		Design pryout resistance			
Anchor size	M8	M10	M12	M16	M20
Minimum anchorage depth					
h_{ef}	**30**	**40**	**50**	**65**	**100**
$V^0_{Rd,cp}$ (C20/25)	5,5	8,5	11,9	35,2	67,2
Maximum anchorage depth					
h_{ef}	**40**	**50**	**65**	**80**	**-**
$V^0_{Rd,cp}$ (C20/25)	8,5	11,9	35,2	48,0	-

$\gamma_{Mcp} = 1,5$



Steel resistance

$V_{Rd,s}$		Steel design shear resistance			
Anchor size	M8	M10	M12	M16	M20
$V_{Rd,s}$	8,0	11,0	21,9	29,2	40,7

$\gamma_{Ms} = 1,25$ for M8 to M16 and $\gamma_{Ms} = 1,5$ for M20

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

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

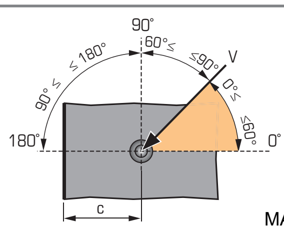
$$\beta_N + \beta_V \leq 1,2$$

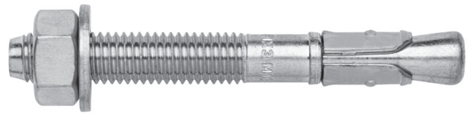
f_b INFLUENCE OF CONCRETE

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

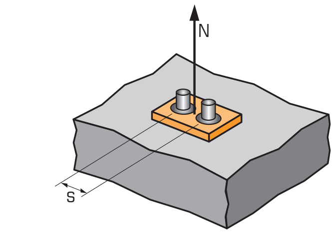
Angle β [°]	$f_{\beta,V}$
0 to 55	1
60	1,1
70	1,2
80	1,5
90 to 180	2





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

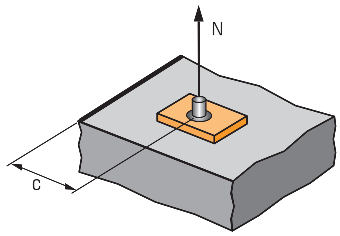
SPACING S — Reduction factor Ψ_s — Minimum anchorage depth

Anchor size	M8	M10	M12	M16	M20
40	0,72				
50	0,78	0,71			
65	0,86	0,77			
90	1,00	0,88			
100		0,92	0,83	0,76	
120		1,00	0,90	0,81	
130			0,93	0,83	0,72
150			1,00	0,88	0.83
180				0,96	0,90
195				1,00	0,93
225					1,00

SPACING S — Reduction factor Ψ_s — Maximum anchorage depth

Anchor size	M8	M10	M12	M16
45	0,69			
60	0,75	0,70		
70	0,79	0,73	0,68	
90	0,88	0,80	0,73	0,69
100	0,92	0,83	0,76	0,71
120	1,00	0,90	0,81	0,75
150		1,00	0,88	0,81
195			1,00	0,91
220				0,96
240				1,00

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



$$\Psi_{c,N} = 0,23 + 0,51 \cdot \frac{c}{h_{ef}}$$

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

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

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

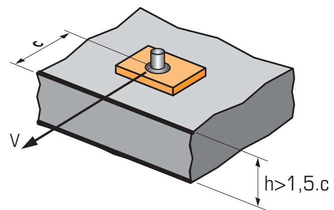
EDGE C — Reduction factor $\Psi_{c,N}$ — Minimum anchorage depth

Anchor size	M8	M10	M12	M16	M20
50	1,00				
65		1,00			
100			1,00		
100				1,00	
120					1,00

EDGE C — Reduction factor $\Psi_{c,N}$ — Maximum anchorage depth

Anchor size	M8	M10	M12	M16
55	0,93			
60	1,00			
65		0,89		
70		0,94	0,78	
75		1,00	0,82	
100			1,00	
105				0,90
110				0,93
120				1,00

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

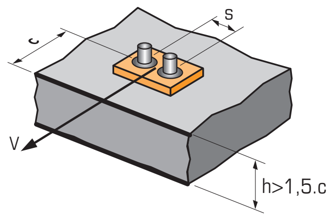


$$\Psi_{s-c,V} = \frac{c}{c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$

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

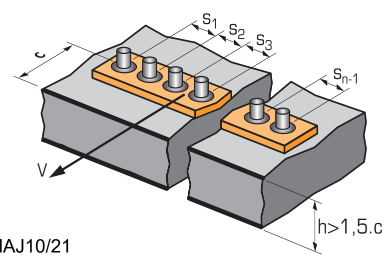


$$\Psi_{s-c,V} = \frac{3.c + s}{6.c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$

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

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