

# SPIT FIX3

## Zinc coated steel



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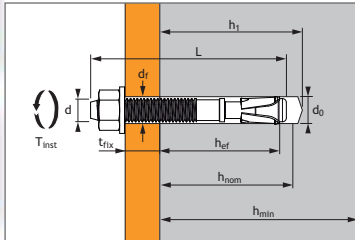


ETA Option 7

n° 13/0005

➤ Torque controlled expansion anchor, made of zinc coated steel for use in non cracked concrete

### Technical data



Pre-assembled anchor

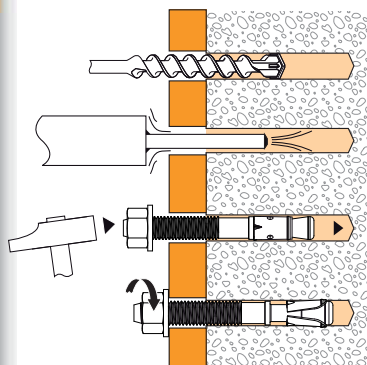
### APPLICATION

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

### MATERIAL

- Bolt M8-M20: Cold formed NFA 35-053 / Zinc electroplates (5 µm)
- Sleeve: Cold formed, NFA 35-231
- Washer: NF E25 513
- Hexagonal nut: Steel strength grade 6 or 8, ISO 898-2

### INSTALLATION



SPIT FIX3	Letter marking	Minimum anchor depth					Maximum anchor depth					Ø thread	Ø drill bit	Ø clearance	Total anchor length (mm)	Max. tighten torque (Nm)	Code
		Min. anchor depth (mm)	Depth before expans (mm)	Max thick of part to be fixed (mm)	Drilling Depth (mm)	Min thick of base material (mm)	Max. anchor depth (mm)	Depth before expans (mm)	Max thick of part to be fixed (mm)	Drilling Depth (mm)	Min thick of base material (mm)						
		hef,min	hnom	tfix	h1	hmin	hef,max	hnom	tfix	h1	hmin						
M6x45/5*				5				-							45		050510
M6x55/15*		25,6	35	20	41	100	35	45	10	51	100	6	6	8	55	10	050520
M6x85/45*				50				40							85		050530
M6x64 percée*				-				-							64		056100
M8x55/5	-			5				-							55		057450
M8x70/20-10	C			20				10							70		057451
M8x90/40-30	E			40				30							90		057452
M8x100/50-40	F	30	38	50	50	80	40	48	40	60	80	8	8	9	110	15	057453
M8x115/65-55	G			65				55							115		057454
M8x130/80-70	H			80				70							130		057455
M8x160/110-100	J			110				100							160		057456
M10x65/5	-			5				-							65		057460
M10x75/15-5	C			15				5							75		057461
M10x85/25-15	D			25				15							85		057462
M10x95/36-26	E			36				26							95		057463
M10x110/50-40	F	40	50	50	60	100	50	60	40	70	100	10	10	12	110	30	057464
M10x125/65-55	G			65				55							125		057465
M10x140/80-70	I			80				70							140		057466
M10x160/100-90	J			100				90							160		057467
M12x80/5	-			5				-							80		057470
M12x100/25-10	F			25				10							100		057471
M12x115/40-25	G			40				25							115		057472
M12x125/50-35	H			50				35							125		057473
M12x140/65-50	I	50	62	65	75	100	65	77	50	90	130	12	12	14	140	50	057474
M12x160/85-70	J			85				70							160		057475
M12x180/105-90	L			105				90							180		057476
M12x220/145-130	O			145				130							220		057477
M12x290/215-200*	-			215				200							290		057478
M16x100/5	-			5				-							100		057480
M16x125/30-15	G			30				15							125		057481
M16x150/55-40	I			55				40							150		057482
M16x170/75-60	K	65	80	75	95	130	80	95	60	110	160	16	16	18	170	100	057483
M16x185/90-75	L			90				75							185		057484
M16x235/140-125*	-			140				125							235		057485
M16x300/200*	-			200				178							300		057486
M20x125/10	J			10				-							125		057490
M20x165/50-25	N	75	93	50	110	150	100	118	25	135	200	20	20	22	165	160	057491
M20x220/105-80	N			105				80							220		057492

\* do not belongs to ETA

### Anchor mechanical properties

	M6	M8	M10	M12	M16	M20
<b>Cross-section above cone</b>						
$f_{uk}$ (N/mm <sup>2</sup> ) Min. tensile strength	700	750	750	750	700	600
$f_{yk}$ (N/mm <sup>2</sup> ) Yield strength	580	600	600	600	570	570
$A_s$ (mm <sup>2</sup> ) Stressed cross-section	-	23,8	34,7	56,1	103,9	172
<b>Threaded part</b>						
$f_{uk}$ (N/mm <sup>2</sup> ) Min. tensile strength	600	650	650	650	600	580
$f_{yk}$ (N/mm <sup>2</sup> ) Yield strength	480	520	520	520	480	480
$A_s$ (mm <sup>2</sup> ) Stressed cross-section	20,1	36,6	58	84,3	157	245
$W_{el}$ (mm <sup>3</sup> ) 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	376
$M$ (Nm) Recommended bending moment	3,7	9,8	20,0	34,7	81,6	153,5

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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	M6	M8	M10	M12	M16	M20
<b>Minimum anchorage depth</b>						
$h_{ef}$	25	30	40	50	65	75
$N_{Ru,m}$	6,0	10,3	15,5	23,3	39,0	40,6
$N_{Rk}$	4,5	7,5	12,8	17,8	26,4	32,7
<b>Maximum anchorage depth</b>						
$h_{ef}$	35	40	50	65	80	100
$N_{Ru,m}$	9,4	15,6	22,0	33,8	47,1	69,0
$N_{Rk}$	7,0	12,8	17,8	26,4	36,1	50,4

#### SHEAR

Anchor size	M6	M8	M10	M12	M16	M20
$V_{Ru,m}$	6,8	14,3	22,6	32,8	56,5	85,2
$V_{Rk}$	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
<b>Minimum anchorage depth</b>						
$h_{ef}$	25	30	40	50	65	75
$N_{Rd}$	2,5	5,0	8,5	11,9	17,6	21,8
<b>Maximum anchorage depth</b>						
$h_{ef}$	35	40	50	65	80	100
$N_{Rd}$	3,8	8,5	11,9	17,6	24,0	33,6

$\gamma_{Mc} = 1,5$

#### SHEAR

Anchor size	M6	M8	M10	M12	M16	M20
$V_{Rd}$	2,3	8,0	11,0	21,9	29,2	47,4
$\gamma_{Ms} = 1,25$ (M6-M16)						
$\gamma_{Ms} = 1,5$ (M20)						

### 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

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

#### TENSILE

Anchor size	M6	M8	M10	M12	M16	M20
<b>Minimum anchorage depth</b>						
$h_{ef}$	25	30	40	50	65	75
$N_{Rec}$	1,7	3,5	6,1	8,5	12,6	15,6
<b>Maximum anchorage depth</b>						
$h_{ef}$	35	40	50	65	80	100
$N_{Rec}$	2,7	6,1	8,5	12,6	17,2	24,0

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

#### SHEAR

Anchor size	M6	M8	M10	M12	M16	M20
$V_{Rec}$	1,7	5,7	7,8	15,7	20,9	33,9
$\gamma_{Ms} = 1,25$						

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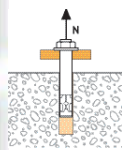
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## SPIT CC- Method (values issued from ETA)

### TENSILE in kN

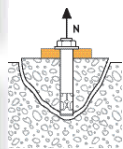


→ Pull-out resistance

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

Anchor size	Design pull-out resistance				
	M8	M10	M12	M16	M20
<b>Minimum anchorage depth</b>					
$h_{ef}$	30	40	50	65	75
$N_{Rd,p}^O$ (C20/25)	5,0	-	-	-	-
<b>Maximum anchorage depth</b>					
$h_{ef}$	40	50	65	80	100
$N_{Rd,p}^O$ (C20/25)	-	-	-	-	-

$\gamma_{Mc} = 1,5$

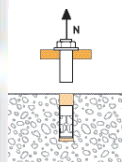


→ Concrete cone resistance

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

Anchor size	Design cone resistance				
	M8	M10	M12	M16	M20
<b>Minimum anchorage depth</b>					
$h_{ef}$	30	40	50	65	75
$N_{Rd,c}^O$ (C20/25)	5,5	8,5	11,9	17,6	21,8
<b>Maximum anchorage depth</b>					
$h_{ef}$	40	50	65	80	100
$N_{Rd,c}^O$ (C20/25)	8,5	11,9	17,6	24,0	33,6

$\gamma_{Mc} = 1,5$



→ Steel resistance

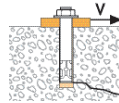
Anchor size	Steel design tensile resistance				
	M8	M10	M12	M16	M20
$N_{Rd,s}$	11,9	17,3	28,1	48,5	73,7

$\gamma_{Ms} = 1,5$  (M8-M16)  
 $\gamma_{Ms} = 1,4$  (M20)

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

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

### SHEAR in kN

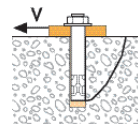


→ Concrete edge resistance

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

Anchor size	Design concrete edge resistance at minimum edge distance ( $C_{min}$ )				
	M8	M10	M12	M16	M20
<b>Minimum anchorage depth</b>					
$h_{ef}$	30	40	50	65	75
$C_{min}$	50	65	100	100	115
$S_{min}$	40	50	100	100	100
$V_{Rd,c}^O$ (C20/25)	2,7	4,6	9,7	11,1	15,1
<b>Maximum anchorage depth</b>					
$h_{ef}$	40	50	65	80	100
$C_{min}$	55	65	70	105	120
$S_{min}$	45	60	70	90	100
$V_{Rd,c}^O$ (C20/25)	3,3	4,8	6,0	12,5	17,0

$\gamma_{Mc} = 1,5$

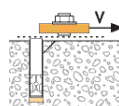


→ Pryout failure

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

Anchor size	Design pryout resistance				
	M8	M10	M12	M16	M20
<b>Minimum anchorage depth</b>					
$h_{ef}$	30	40	50	65	75
$V_{Rd,cp}^O$ (C20/25)	5,5	8,5	11,9	35,2	43,6
<b>Maximum anchorage depth</b>					
$h_{ef}$	40	50	65	80	100
$V_{Rd,cp}^O$ (C20/25)	8,5	11,9	35,2	48,0	67,2

$\gamma_{Mc,p} = 1,5$



→ Steel resistance

Anchor size	Steel design shear resistance				
	M8	M10	M12	M16	M20
$V_{Rd,s}$	8,0	11,0	21,9	29,2	47,4

$\gamma_{Ms} = 1,25$  (M8-M16)  
 $\gamma_{Ms} = 1,5$  (M20)

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

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

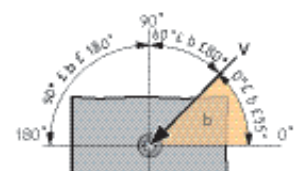
$$B_N + B_V \leq 1,2$$

### $f_B$ 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

### $f_{B,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

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



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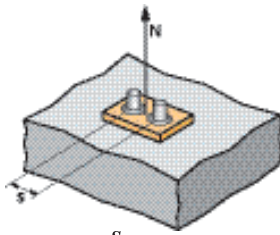
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### SPIT CC- Method (values issued from ETA)

#### $\Psi_s$ INFLUENCE OF SPACING FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_s = 0,5 + \frac{s}{6 \cdot h_{ef}}$$

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

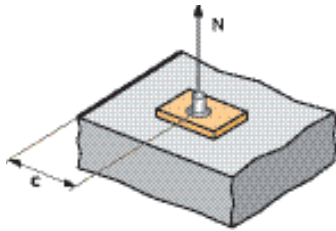
$s_{cr,N} = 3 \cdot h_{ef}$

$\Psi_s$  must be used for each spacing influenced the anchors group.

SPACING S	Reduction factor $\Psi_s$ Minimum anchorage depth				
	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	0,72
120		1,00	0,90	0,81	0,77
150			1,00	0,88	0,83
180				0,96	0,90
195				1,00	0,93
225					1,00

SPACING S	Reduction factor $\Psi_s$ Maximum anchorage depth				
	M8	M10	M12	M16	M20
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	0,67
120	1,00	0,90	0,81	0,75	0,70
150		1,00	0,88	0,81	0,75
195			1,00	0,91	0,83
220				0,96	0,87
240				1,00	0,90
300					1,00

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



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

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

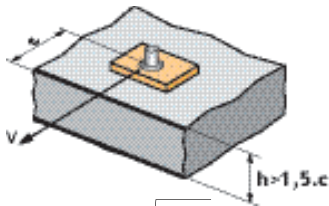
$c_{cr,N} = 1,5 \cdot h_{ef}$

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

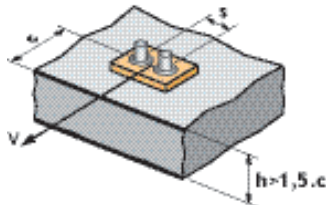
EDGE C	Reduction factor $\Psi_{c,N}$ Minimum anchorage depth				
	M8	M10	M12	M16	M20
50	1,00				
65		1,00			
100			1,00		
100				1,00	
115					1,00

EDGE C	Reduction factor $\Psi_{c,N}$ Maximum anchorage depth				
	M8	M10	M12	M16	M20
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	0,84
130					0,89
150					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

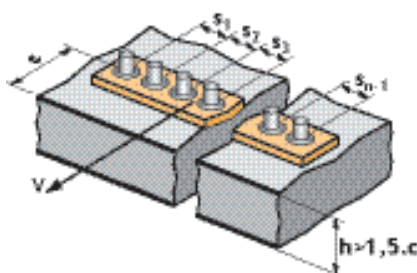
$\frac{c}{c_{min}}$	Factor $\Psi_{s-c,V}$ Non-cracked concrete											
	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
$\Psi_{s-c,V}$	1,00	1,31	1,66	2,02	2,41	2,83	3,26	3,72	4,19	4,69	5,20	5,72

##### For 2 anchors fastening

$\frac{s}{c_{min}}$	$\frac{c}{c_{min}}$	Factor $\Psi_{s-c,V}$ Non-cracked concrete											
		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	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	1,0	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	1,0	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	1,0	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	1,0	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

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



Mechanical anchors