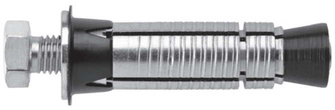
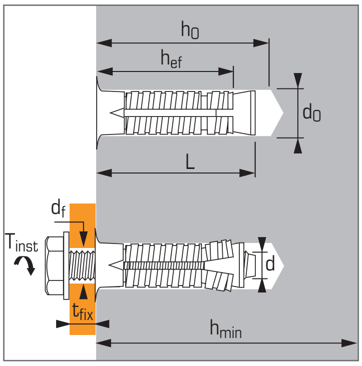


High expansion shield anchor, for use in concrete and solid & hollow masonries

Technical Assessment SOCOTEC
N° KX 0827



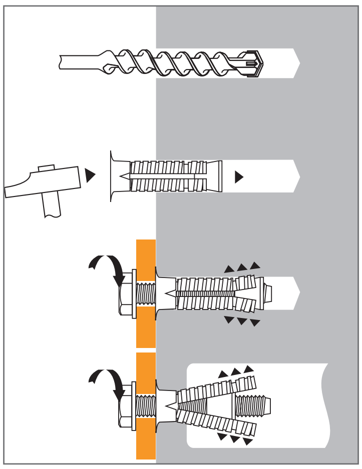
APPLICATION

- Industrial doors
- Storage racking
- Signs
- Security shutters
- Gate & fence posts
- Spiral staircase

MATERIAL

- **Sleeve :** S300Pb NFA 35561
- **Expansion cone :** S300Pb NFA 35561
- **Screw :** class 8.8 NF EN 20898-1
- **Washer :** Fe 360, NF EN 10025
- **Protection :** Zinc coating NFE 25009, passivation NFA 91472

INSTALLATION



Technical data

Anchor size	Min. anchor depth (mm) h_{ef}	Max. thick. of part to be fixed (mm) t_{fix}	Thread diameter (mm) d	Drilling depth (mm) h_0	Drilling diameter (mm) d_0	Min. thick. of base material (mm) h_{min}	Clearance diameter (mm) d_f	Total anchor length (mm) L	Tighten torque concrete screw 5.8 (Nm) T_{inst}	Tighten torque concrete screw 8.8 (Nm) T_{inst}	Tighten torque bricks (Nm) T_{inst}	Code
Shield only												
M6X50	37	–	M6	60	12	100	8	50	8	10	5	050399
M8X55	42	–	M8	65	14	100	10	55	15	25	7,5	050401
M10X65	52	–	M10	75	16	100	12	65	30	50	13	050402
M12X80	62	–	M12	90	20	125	14	80	50	80	23	073560
Type B (supplied with screw grade 8.8 and premounted washer)												
M6X50/10 B	37	10	M6	60	12	100	8	60	-	10	5	050404
M6X50/25 B		25						70				050405
M8X55/10 B	42	10	M8	65	14	100	10	60	-	25	7,5	050406
M8X55/25 B		25						80				050407
M8X55/40 B		40						90				050408
M10X65/10 B	52	10	M10	75	16	100	12	75	-	50	13	073640
M10X65/25 B		25						90				073650
M10X65/50 B		50						110				073660
M12X80/10 B	62	10	M12	90	20	125	14	90	-	80	23	073680
M12X80/25 B		25						110				073690

Anchor mechanical properties

Anchor size		M6	M8	M10	M12
Screw grade 5.8					
f_{uk} (N/mm²)	Min. tensile strength	520	520	520	520
f_{yk} (N/mm²)	Yield strength	420	420	420	420
$M^0_{rk,s}$ (Nm)	Characteristic bending moment	7,9	19,5	38,9	68,1
M (Nm)	Recommended bending moment	3,2	7,8	15,6	28,4
Screw grade 8.8					
f_{uk} (N/mm²)	Min. tensile strength	800	800	800	800
f_{yk} (N/mm²)	Yield strength	640	640	640	640
$M^0_{rk,s}$ (Nm)	Characteristic bending moment	12,2	30,0	59,8	104,8
M (Nm)	Recommended bending moment	5,0	12,4	24,8	43,7
As (mm²)	Stressed cross-section	20,1	36,6	58	84,3
W_{el} (mm²)	Elastic section modulus	12,7	31,2	62,3	109,2

Recommended loads (N_{rec}, V_{rec}) in masonries in kN

TENSILE

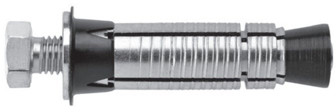
Base material / Anchor size	M6	M8	M10	M12
Engineering clay bricks BP 300 (fc > 30 N/mm²)				
N_{rec}	1,9	2,4	3,0	3,0
Clay bricks (fc = 11 N/mm²)				
N_{rec}	0,7	1,1	1,1	2,0
Solid concrete blocks B 120 (fc = 13,5 N/mm²)				
N_{rec}	0,4	0,95	1,25	1,9
Hollow clay bricks not rendered				
N_{rec}	0,15	0,15	*	*
Hollow clay bricks rendered				
N_{rec}	1,2	1,2	1,2	1,2
Hollow concrete blocks not rendered				
N_{rec}	0,2	0,2	*	*
Hollow concrete blocks rendered				
N_{rec}	1,25	1,75	1,85	2,2

*not recommended

SHEAR

Base material / Anchor size	M6	M8	M10	M12
Engineering clay bricks BP 300 (fc > 30 N/mm²)				
V_{rec}	1,0	1,9	3,0	4,4
Clay bricks (fc = 11 N/mm²)				
V_{rec}	0,85	1,9	3,0	4,4
Solid concrete blocks B 120 (fc = 13,5 N/mm²)				
V_{rec}	0,5	1,75	2,2	3,15
Hollow clay bricks not rendered				
V_{rec}	0,5	0,5	*	*
Hollow clay bricks rendered				
V_{rec}	1,6	2,0	2,5	3,0
Hollow concrete blocks not rendered				
V_{rec}	0,8	0,8	*	*
Hollow concrete blocks rendered				
V_{rec}	1,6	2,0	2,5	3,0

*not recommended



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
Screw grade 5.8				
h_{ef}	**37**	**42**	**52**	**62**
$N_{Ru,m}$	11,6	18,7	28,5	36,1
N_{Rk}	10,4	14	21,4	27,1
Screw grade 8.8				
h_{ef}	**37**	**42**	**52**	**62**
$N_{Ru,m}$	14,4	18,7	28,5	36,1
N_{Rk}	10,8	14	21,4	27,1

SHEAR

Anchor size	M6	M8	M10	M12
Screw grade 5.8				
$V_{Ru,m}$	6,2	11,4	18,1	26,3
V_{Rk}	5,2	9,5	15,1	21,9
Screw grade 8.8				
$V_{Ru,m}$	9,7	17,5	27,8	39,6
V_{Rk}	8,1	14,6	23,2	33,0

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

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

TENSILE

Anchor size	M6	M8	M10	M12
Screw grade 5.8				
h_{ef}	**37**	**42**	**52**	**62**
N_{Rd}	5,0	6,7	10,2	12,9
Screw grade 8.8				
h_{ef}	**37**	**42**	**52**	**62**
N_{Rd}	5,1	6,7	10,2	12,9

$\gamma_{Mc} = 2,1$

SHEAR

Anchor size	M6	M8	M10	M12
Screw grade 5.8				
V_{Rd}	4,2	7,6	12,1	17,5
Screw grade 8.8				
V_{Rd}	6,5	11,7	18,6	26,4

$\gamma_{Ms} = 1,25$

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

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

TENSILE

Anchor size	M6	M8	M10	M12
Screw grade 5.8				
h_{ef}	**37**	**42**	**52**	**62**
N_{rec}	3,5	4,8	7,3	9,2
Screw grade 8.8				
h_{ef}	**37**	**42**	**52**	**62**
N_{rec}	3,7	4,8	7,3	9,2

$\gamma_F = 1,4$; $\gamma_{Mc} = 2,1$

SHEAR

Anchor size	M6	M8	M10	M12
Screw grade 5.8				
V_{rec}	2,5	4,5	7,2	10,4
Screw grade 8.8				
V_{rec}	4,6	8,3	13,3	18,9

$\gamma_F = 1,4$; $\gamma_{Ms} = 1,5$ for srew grade 5.8 and $\gamma_{Ms} = 1,25$ for srew grade 8.8

Recommended loads (N_{rec}, V_{rec}) in hollow concrete slab in kN

Anchor size	Hollow concrete slab TYPE DSL 20* (wall thickness : 20 mm)		
	N_{rec}	V_{rec}	
Min. steel quality of screw	**5.8**	**5.8**	**8.8**
PRIMA M6	2,50	1,40	2,10
PRIMA M8	2,75	2,50	3,90
PRIMA M10	3,00	4,00	6,20

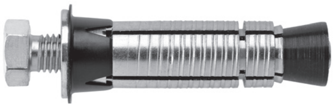
*kp1 trade mark (supplier for hollow concrete slab)

Fire behaviour

Fire design tensile loads in hollow concrete slab (kN) (with electro-galvanized screws, strength class ≥ 5.8)

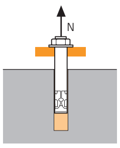
Fire duration $F_{Rdu,fi}$	30 min.	1 h	1 h 30 min.	2 h
M8	1,09	0,89	0,68	0,58
M10	1,21	1,12	1,04	1
M12	1,21	1,12	1,04	1

These performances have been determined from fire tests No. 3.2/16-257-1



SPIT CC Method

TENSILE in kN

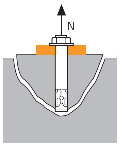


Pull-out resistance

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

$N^0_{Rd,p}$				Design pull-out resistance
Anchor size	M6	M8	M10	M12
h_{ef}	37	42	52	62
$N^0_{Rd,p}$ (C20/25)	5,0	-	-	-

$\gamma_{Mc} = 2{,}1$

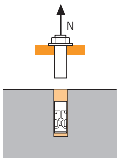


Concrete cone resistance

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

$N^0_{Rd,c}$				Design cone resistance
Anchor size	M6	M8	M10	M12
h_{ef}	37	42	52	62
$N^0_{Rd,c}$ (C20/25)	5,4	6,5	9,0	11,7

$\gamma_{Mc} = 2{,}1$

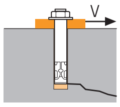


Steel resistance

$N_{Rd,s}$				Steel design tensile resistance
Anchor size	M6	M8	M10	M12
Screw grade 5.8				
$N_{Rd,s}$	4,0	7,3	11,6	16,9
Screw grade 8.8				
$N_{Rd,s}$	5,1	9,2	14,5	21,1

$\gamma_{Ms} = 1{,}5$

SHEAR in kN

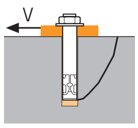


Concrete edge resistance

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

$V^0_{Rd,c}$				Design concrete edge resistance at minimum edge distance (C_{min})
Anchor size	M6	M8	M10	M12
h_{ef}	37	42	52	62
C_{min}	50	55	60	65
S_{min}	60	70	80	110
$V^0_{Rd,c}$ (C20/25)	3,2	4,0	4,9	6,2

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

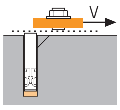


Pryout failure

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

$V^0_{Rd,cp}$				Design pryout resistance
Anchor size	M6	M8	M10	M12
h_{ef}	37	42	52	62
$V^0_{Rd,cp}$ (C20/25)	7,6	9,1	12,6	32,8

$\gamma_{Mcp} = 1{,}5$



Steel resistance

$V_{Rd,s}$				Steel design shear resistance
Anchor size	M6	M8	M10	M12
Screw grade 5.8				
$V_{Rd,s}$	4,2	7,6	12,1	17,5
Screw grade 8.8				
$V_{Rd,s}$	6,5	11,7	18,6	26,4

$\gamma_{Ms} = 1{,}25$

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

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

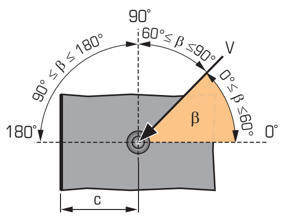
$$\beta_N + \beta_V \le 1{,}2$$

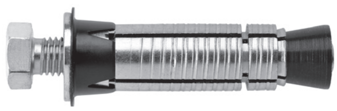
f_b INFLUENCE OF CONCRETE

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

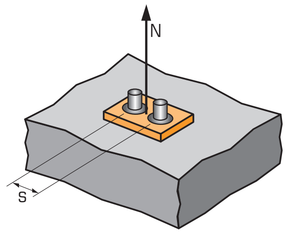
Angle β [°]	$f_{\beta,V}$
0 to 55	1
60	1,1
70	1,2
80	1,5
90 to 180	2





SPIT CC Method

Ψ_s INFLUENCE OF SPACING FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



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

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

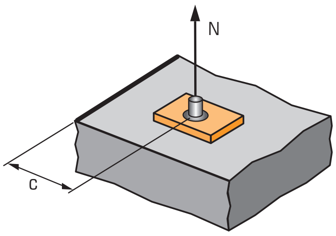
$s_{cr,N} = 3.h_{ef}$

Ψ_s must be used for each spacing influenced the anchors group

SPACING S — Reduction factor Ψ_s, Non-cracked concrete

Anchor size	M6	M8	M10	M12
60	0,77			
70	0,82	0,78		
80	0,86	0,82	0,76	
90	0,91	0,86	0,79	
100	0,95	0,90	0,82	
110	1,00	0,94	0,85	0,80
125		1,00	0,90	0,84
155			1,00	0,92
185				1,00

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



$$\Psi_{c,N} = 0,24 + 0,5 . \frac{c}{h_{ef}}$$

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

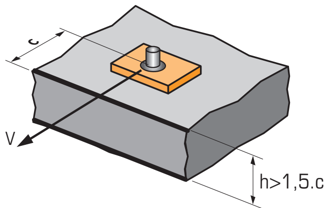
$c_{cr,N} = 1,5.h_{ef}$

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

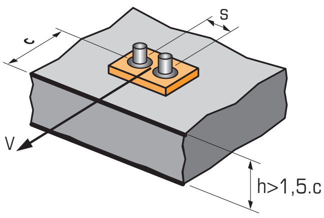
EDGE C — Reduction factor $\Psi_{c,N}$, Non-cracked concrete

Anchor size	M6	M8	M10	M12
50	0,92			
55	0,98	0,89		
60	1,00	0,95	0,82	
65		1,00	0,87	0,76
80			1,00	0,89
95				1,00

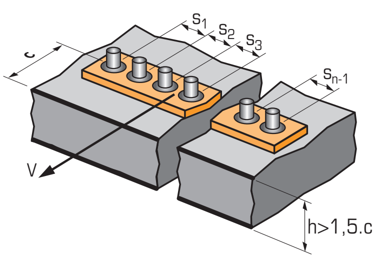
$\Psi_{s-c,V}$ INFLUENCE OF SPACING AND EDGE DISTANCE FOR CONCRETE EDGE RESISTANCE IN SHEAR LOAD



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



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



For single anchor fastening

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

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