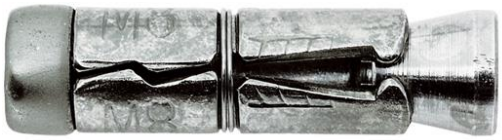
MSS Shield Anchor

Mungo MSS torque controlled anchor with internal thread for use in concrete and solid brick walls



1 APLICATIONS AND INTENDED USE

Intended use:
-All purpose expansion anchor

Base materials:
-Concrete (C20/25 to C50/60)
-Reinforced and unreinforced concrete
-Clay Solid brick wall
-Solid Sand-lime brick wall

Approvals:
-Mungo Lab Testing

Futures:
-Torque controlled expansion
-Zinc plated > 5 µm
-Versatile and reusable application of anchor rods and screws
-Application with metal, scaffolds, facades and other similar constructions

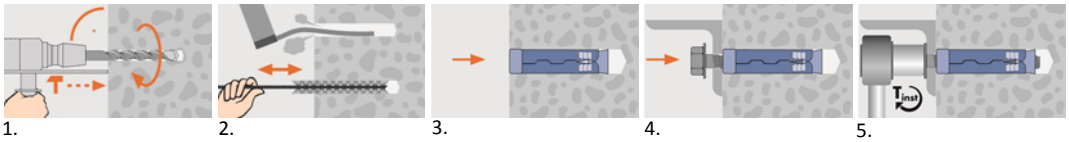
Characteristics:
-Force-controlled anchor with internally thread without screw or bolt allow user specific applications
-Expansion corpus and cone made of steel
-Strong expansion in the depth of the drill hole
-Possible complete disassembling
-The fastener may only be set once

Applications:
-Gap fixing
-Connection assembling
-Floor assembling
-Application on metal, machines, scaffolds, facades and door constructions

1.1 INSTALATION INSTRUCTIONS

1. Drilling the hole by hammer drilling in concrete or solid wall
1. Clean the drill hole
2. Insert the Shield Anchor into the building material
3. Position the building materials and fix it with a screw or threaded rod and corresponding nut
4. Tighten the screw with a torque spanner to the predetermined value

Graphic installation instruction for MSS Shield Anchor



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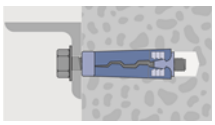

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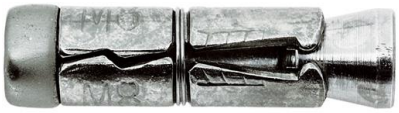
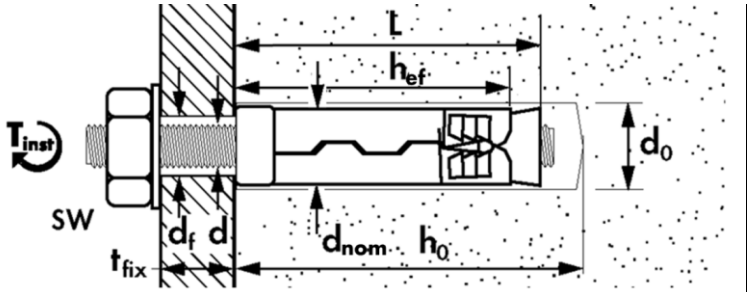
2 PRODUCT INFORMATION

MSS Shield Anchor



Article code	Dimensions [mm]	Internal metric thread d_s	Length of fastener in building material [mm] h_{nom}	Drill depth [mm] h_0	Effective anchorage depth [mm] h_{ef}
1240604	M6 x 45	M6	45	50	37
1240805	M8 x 50	M8	50	55	42
1241006	M10 x 60	M10	60	65	50
1241207	M12 x 75	M12	75	80	62
1241611	M16 x 115	M16	115	120	98

3 INSTALLATION DATA MSS



FASTENER SIZE MSS			M6	M8	M10	M12	M16
Fastener length	L	[mm]	45	50	60	75	115
Internal metric thread	d	[mm]	6	8	10	12	16
Nominal diameter of shaft	d_{nom}	[mm]	11.5	14	16.5	18.5	25.5
Diameter of clearence hole in fixture	d_f	[mm]	6.5	9	11	13	17
Spanner	SW	[mm]	10	13	17	19	24
INSTALLATION PARAMETERS							
Drill hole diameter in substrate	d_0	[mm]	12	14	16	18	25
Dept of drill hole in substrate	h_0	[mm]	50	55	65	80	120
Effective anchorage depth	h_{ef}	[mm]	37	42	50	62	98
Installation torque concrete	T_{inst}	[Nm]	6.5	15	27	50	120
Installation torque solid brick wall	T_{inst}	[Nm]	5	7.5	13	23	—
Minimum thickness of concrete memeber	h_{min}	[mm]	100	100	100	120	150
Minimum edge distance (concrete)	c_{min}	[mm]	50	60	75	80	120
Minimum spacing (concrete)	s_{min}	[mm]	35	40	50	60	95

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3.1 BASIC PERFORMANCE DATA

Basic performance data for MSS in non-cracked concrete C20/25 without influence of edge distance, spacing and splitting failure due to dimensions of concrete member

FASTENER SIZE MSS			M6	M8	M10	M12	M16
Effective anchorage depth	h_{ef}	[mm]	37	42	50	62	98
Drill hole diameter in substrate	d_0	[mm]	12	14	16	18	25
CHARACTERISTIC RESISTANCE							
Tension load concrete C20/25-C50/60	N_{Rk}	[kN]	5.38	9.43	21.68	13.13[3)]	19.45[3)]
Shear load concrete C20/25-C50/60	V_{Rk}^*	[kN]	8.04[1)]	13.75[2)]	17.85[2)]	33.72[1)]	62.80[1)]
Bending moment, threaded rod/screw	M_{Rk}^*	[Nm]	12.2	30.0	59.8	104.8	266.4
DESIGN RESISTANCE							
Tension load concrete C20/25-C50/60	N_{Rd}	[kN]	2.99	5.24	12.04	7.29[3)]	10.81[3)]
Shear load concrete C20/25-C50/60	V_{Rd}^*	[kN]	6.31[2)]	7.64[2)]	9.92[2)]	26.98[1)]	50.24[1)]
Bending moment, threaded rod/screw	M_{Rd}^*	[Nm]	9.76	24.00	47.84	83.84	213.12
RECOMMENDED RESISTANCE							
Tension load concrete C20/25-C50/60	N_{rec}	[kN]	2.14	3.74	8.60	5.21[3)]	7.72[3)]
Shear load concrete C20/25-C50/60	V_{rec}^*	[kN]	4.51[2)]	5.46[2)]	7.09[2)]	19.27[1)]	35.89[1)]
Bending moment, threaded rod/screw	M_{rec}^*	[Nm]	7.0	17.1	34.2	59.9	152.2

[1)] Steel failure
[2)] Pry-out failure
[3)] Pull-out failure
* Threaded rod/screw, steel strength 8.8

4 REDUCE DESIGN RESISTANCE TO TENSION LOADS FOR LIMITED EDGE AND SPACING DISTANCE

REQUIRED PROOFS FOR DESIGN TENSION RESISTANCE FOLLOWING ETAG 001 Annex C:

1. **For use in non-cracked concrete;** $N_{Rd,ucr} = \min(N_{Rd,s}; N_{Rd,p}; N_{Rd,c})$
   For product MSS Shield Anchor, splitting failure $N_{Rd,sp}$ is considered in concrete cone failure $N_{Rd,c}$

2. Reduction design resistance to tension loads is only valid for limited edge distance or limited spacing from one site

3. It may be assumed that splitting failure will not occur, if the edge distance in all directions is $c \geq 1.2\ c_{cr,sp}$ and the member depth is $h \geq 2\ h_{ef}$

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4.1 Steel failure $N_{Rd,s}$

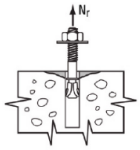
Design resistance of one anchor in case of steel failure.

$N_{Rd,s} = N_{Rk,s} / \gamma_{Ms}$

FASTENER SIZE MSS			M6	M8	M10	M12	M16
DESIGN RESISTANCE IN CASE OF STEEL FAILURE							
Tension load, steel property class 4.6	$N_{Rd,s}$	[kN]	4.02	7.32	11.60	16.86	31.40
Tension load, steel property class 5.8	$N_{Rd,s}$	[kN]	6.73	12.20	19.33	28.13	52.33
Tension load, steel property class 8.8	$N_{Rd,s}$	[kN]	10.72	19.52	30.93	44.96	83.73

In design resistance of steel failure, safety factor based on ETAG 001 Annex C is included.
For separate size of MSS product, metric threaded rod or metric threaded screw of a different type and length can be applied. Above given values for different steel properties are only valued for metric thread.

4.2 Pull-out failure $N_{Rd,p}$

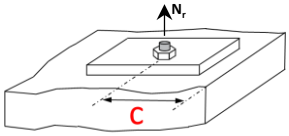


Design resistance in case of failure of one anchor by pull-out.

$N_{Rd,p} = N_{Rk,p} / \gamma_{Mp}$

FASTENER SIZE MSS			M6	M8	M10	M12	M16
PULL-OUT FAILURE, NON-CRACKED CONCRETE C20/25							
Tension load $\gamma_{Mp} = 1,8$	$N_{Rd,p}$	[kN]	2.99	5.24	12.04	7.29	10.81

4.3 Concrete cone failure and splitting failure in case of one limited edge



Design tension resistance of one anchor in case of concrete cone failure/splitting failure ($N_{Rd,c}$) with one limited edge

Reduction factor $\Psi_{edge} = (A_{c,N}/A^0_{c,N}) \cdot \Psi_{s,N}$ for concrete cone/splitting failure is only valid for one limited concrete member edge and without influence of spacing

$N_{Rd,c} = N^0_{Rd,c} \cdot \Psi_{edge}$; $N^0_{Rd,c} = N^0_{Rk,c} / \gamma_{Mc}$

FASTENER SIZE MSS			M6	M8	M10	M12	M16
Drill hole diameter in substrate	d_0	[mm]	12	14	16	18	25
Minimum thickness of concrete memeber	h_{min}	[mm]	100	100	100	120	150
CONCRETE CONE AND SPLITTING FAILURE IN CASE OF LIMITED EDGE, NON-CRACKED CONCRETE C20/25							
Tension load $\gamma_{Mc} = 1,8$	$N^0_{Rd,c}$	[kN]	6.31	7.64	9.92	13.70	27.22
			x	x	x	x	x
			Ψ_{edge}	Ψ_{edge}	Ψ_{edge}	Ψ_{edge}	Ψ_{edge}
Edge distance [mm]		50	0.92				
		55	0.99				
		60	1.00	0.96			
		65	1.00	1.00			
		75	1.00	1.00	1.00		
		80	1.00	1.00	1.00	0.89	
		85	1.00	1.00	1.00	0.93	
		90	1.00	1.00	1.00	0.97	
		95	1.00	1.00	1.00	1.00	
		120	1.00	1.00	1.00	1.00	0.86
		140	1.00	1.00	1.00	1.00	0.96
		160	1.00	1.00	1.00	1.00	1.00

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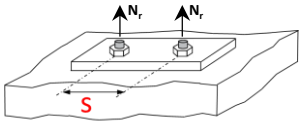
4.4 Concrete cone failure and splitting failure in case of limited spacing



Design tension resistance of one anchor in case of concrete cone failure/splitting failure ($N_{Rd,c}$) with one limited spacing

Reduction factor Ψspacing = ($A_{c,N}/A^0_{c,N}$) for concrete cone/splitting failure is only valid for one limited spacing between anchors and without influence of concrete member edge

$N_{Rd,c} = N^0_{Rd,c} \cdot \Psi_{spacing}$; $N^0_{Rd,c} = N^0_{Rk,c} / \gamma_{Mc}$

FASTENER SIZE MSS			M6	M8	M10	M12	M16
Drill hole diameter in substrate	d_0	[mm]	12	14	16	18	25
Minimum thickness of concrete memeber	h_{min}	[mm]	100	100	100	120	150
CONCRETE CONE AND SPLITTING FAILURE IN CASE OF LIMITED SPACING, NON-CRACKED CONCRETE C20/25							
Tension load γ_{Mc} = 1,8	$N^0_{Rd,c}$	[kN]	6.31	7.64	9.92	13.70	27.22
			x	x	x	x	x
			Ψ_{edge}	Ψ_{edge}	Ψ_{edge}	Ψ_{edge}	Ψ_{edge}
Spacing between anchors [mm]		35	0.58				
		40	0.62	0.59			
		45	0.66	0.62			
		50	0.70	0.66	0.60		
		55	0.75	0.69	0.63		
		60	0.79	0.73	0.66	0.59	
		70	0.88	0.80	0.72	0.64	
		80	0.97	0.88	0.78	0.69	
		95	1.00	1.00	0.88	0.76	0.59
		110	1.00	1.00	0.99	0.84	0.64
		120	1.00	1.00	1.00	0.89	0.67
		140	1.00	1.00	1.00	0.95	0.70
		150	1.00	1.00	1.00	1.00	0.73
		200	1.00	1.00	1.00	1.00	0.76

5 IMPORTANT NOTICE

Values given above are valid under the assumptions of sufficient cleaning of the drill hole and anchoring in non-cracked or cracked concrete. In recommended resistance the partial safety factor for material as well as a partial safety factor for load action γL = 1.4 are considered. For combination of tensile loads, shear loads, bending moments as well as reduced edge distances or spacing's (anchor groups) the data must be recalculated. The data must be checked by the user under the responsibility of an engineer experienced in anchorage and concrete work. This is to ensure there are no errors and all data is complete and accurate and complies with all rules and regulations for the actual conditions and application. Anchor design is performed according to the ETAG 001, Annex C.

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