

TSM High Performance

TSM High Performance

Material available in different versions

- zinc-plated steel
- zinc flake coating steel
- stainless steel A4
- stainless steel HCR

Base material

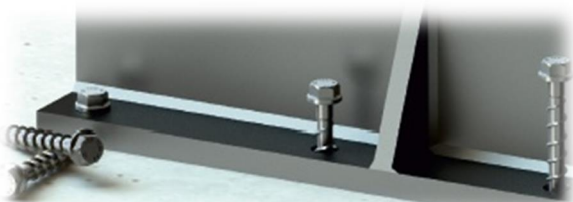
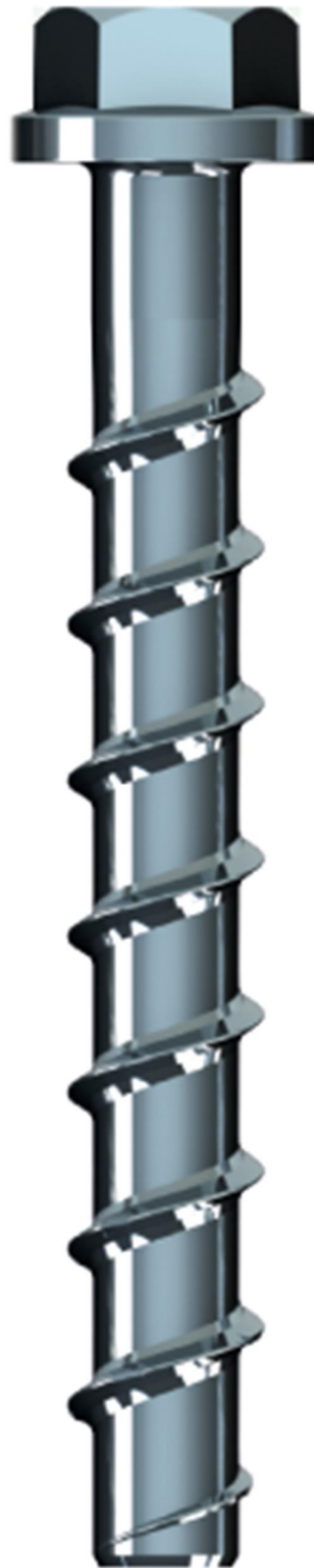
- reinforced and unreinforced normal concrete
- approval for concrete from C20/25 to C50/60
- cracked and non-cracked concrete

Product features

- quick and safe installation
- high load capacity
- can be loaded immediately
- adjustment possible
- fireproof (see below)

Applications

- fastening of high rack
- railing systems for bridge construction
- fire control plate fastening for tunnel construction



TSM High Performance

Single fastening

Technical characteristic without fire exposure for single fastening TSM / TSM A4 / TSM HCR

Screw size TSM high performance		TSM 6			TSM 8			TSM 10			TSM 12			TSM 14		
nominal embedment depth	h_{nom} [mm]	$h_{nom,1}$	$h_{nom,2}$	$h_{nom,3}$	$h_{nom,1}$	$h_{nom,2}$	$h_{nom,3}$	$h_{nom,1}$	$h_{nom,2}$	$h_{nom,3}$	$h_{nom,1}$	$h_{nom,2}$	$h_{nom,3}$	$h_{nom,1}$	$h_{nom,2}$	$h_{nom,3}$
		40	55		45	55	65	55	75	85	65	85	100	75	100	115
nominal diameter of drill bit	d_0 [mm]	6			8			10			12			14		
depth of drill hole	h_1 min [mm]	45	60		55	65	75	65	85	95	75	95	110	85	110	125
effective anchorage depth	h_{ef} [mm]	31	44		35	43	52	43	60	68	50	67	80	58	79	92
diameter of clearance hole in the fixture	d_f max [mm]	8			12			14			16			18		
permissible tension load in cracked concrete ^{1);2)}	N_{zul} [kN]	1,0	1,9		2,4	4,3	5,7	4,3	8,0	9,6	5,7	9,4	12,3	7,6	12,0	15,1
permissible shear load in cracked concrete ^{2);3)}	V_{zul} [kN]	3,0	4,0		3,5	4,8	6,4	4,8	15,9	19,2	6,1	18,8	24,0	7,6	24,1	30,3
perm. tension load in non-cracked concrete ^{1);2)}	N_{zul} [kN]	1,9	4,3		3,6	5,7	7,6	5,7	9,5	12,0	7,6	13,2	17,2	10,6	17,0	21,2
perm. shear load in non-cracked concrete ^{2);3)}	V_{zul} [kN]	4,0	4,0		5,0	6,8	9,0	6,8	19,4	19,4	8,5	24,0	24,0	10,6	32,0	32,0
permissible bending resistance	M_{zul} [kN]	6,2			14,9			32,0			64,6			105,7		
minimum edge distance	C_{min} [mm]	40			50			50			70			70		
minimum spacing	S_{min} [mm]	40			50			50			70			70		
minimum base material thickness	h_{min} [mm]	100			120			130			150			170		
installation torque	T_{inst} [Nm]	10			20			40			60			80		
maximum torque (with Impact screw driver)	[Nm]	160			300			400			500			500		
ETA seismic C1	C1	x			x			yes			x			yes		

¹⁾ The partial safety factor for material resistance from the approval $\gamma_M = 1.5$ as well as a partial safety factor for load actions $\gamma_F = 1.4$ were considered for determining the load

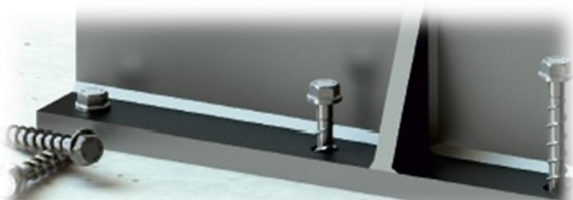
²⁾ These values apply without influence of the spacings and edge distances

³⁾ For the calculation of the permissible load a partial safety factor of $\gamma_{M,1} = 1.25$ for steel failure was taken account.

technical characteristics under fire exposure for single fastening TSM, TSM A4 und TSM HCR

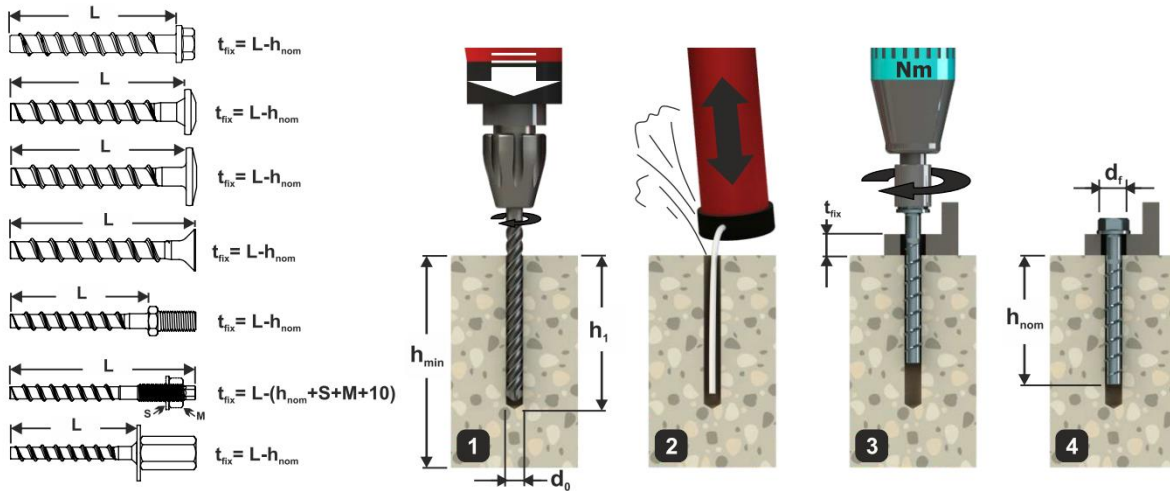
screw size TSM high performance		TSM 6			TSM 8			TSM 10			TSM 12			TSM 14			
nominal embedment depth	h_{nom} [mm]	$h_{nom,1}$	$h_{nom,2}$	$h_{nom,3}$	$h_{nom,1}$	$h_{nom,2}$	$h_{nom,3}$	$h_{nom,1}$	$h_{nom,2}$	$h_{nom,3}$	$h_{nom,1}$	$h_{nom,2}$	$h_{nom,3}$	$h_{nom,1}$	$h_{nom,2}$	$h_{nom,3}$	
		40	55		45	55	65	55	75	85	65	85	100	75	100	115	
permissible load under tensile and shear use ($F_{zul,fi} = N_{zul,fi} = V_{zul,fi}$)																	
fire resistance class																	
R 30	permissible load	$F_{zul,fi 30}$ [kN]	0,5	0,9	1,3	2,3	2,3	2,3	4,1	4,3	3,0	5,0	6,7	3,9	8,8	9,1	
R 60		$F_{zul,fi 60}$ [kN]	0,5	0,8	1,3	1,7	1,7	2,3	3,3	3,3	3,0	5,0	5,8	3,9	8,2	8,2	
R 90		$F_{zul,fi 90}$ [kN]	0,5	0,6	1,3	1,1	1,1	2,3	2,2	2,2	3,0	4,2	4,2	3,9	5,9	5,9	
R 120		$F_{zul,fi 120}$ [kN]	0,4	0,4	0,7	0,7	0,7	1,7	1,7	1,7	2,4	3,4	3,4	3,1	4,8	4,8	
R 30		$M_{zul,fi 30}$ [Nm]	0,7			2,4			5,9			12,3			20,4		
R 60		$M_{zul,fi 60}$ [Nm]	0,6			1,8			4,5			9,7			15,9		
R 90		$M_{zul,fi 90}$ [Nm]	0,5			1,2			3,0			7,0			11,6		
R 120		$M_{zul,fi 120}$ [Nm]	0,3			0,9			2,3			5,7			9,4		
edge distance																	
R 30 bis R 120	$C_{cr,fi}$ [mm]	$2 \times h_{ef}$															
the edge distance must be at least 300 mm if the fire stress of more than one side attacks																	
spacing																	
R 30 bis R 120	$S_{cr,fi}$ [mm]	$2 \times C_{cr,fi}$															
concrete pry-out failure																	
R 30 bis R 120	k [-]	1,0															
for wet concrete, the anchoring depth must be increased by at least 30 mm																	

¹⁾ The partial safety factor for material resistance from the approval $\gamma_M = 1.0$ as well as a partial safety factor for load actions $\gamma_F = 1.0$ were considered

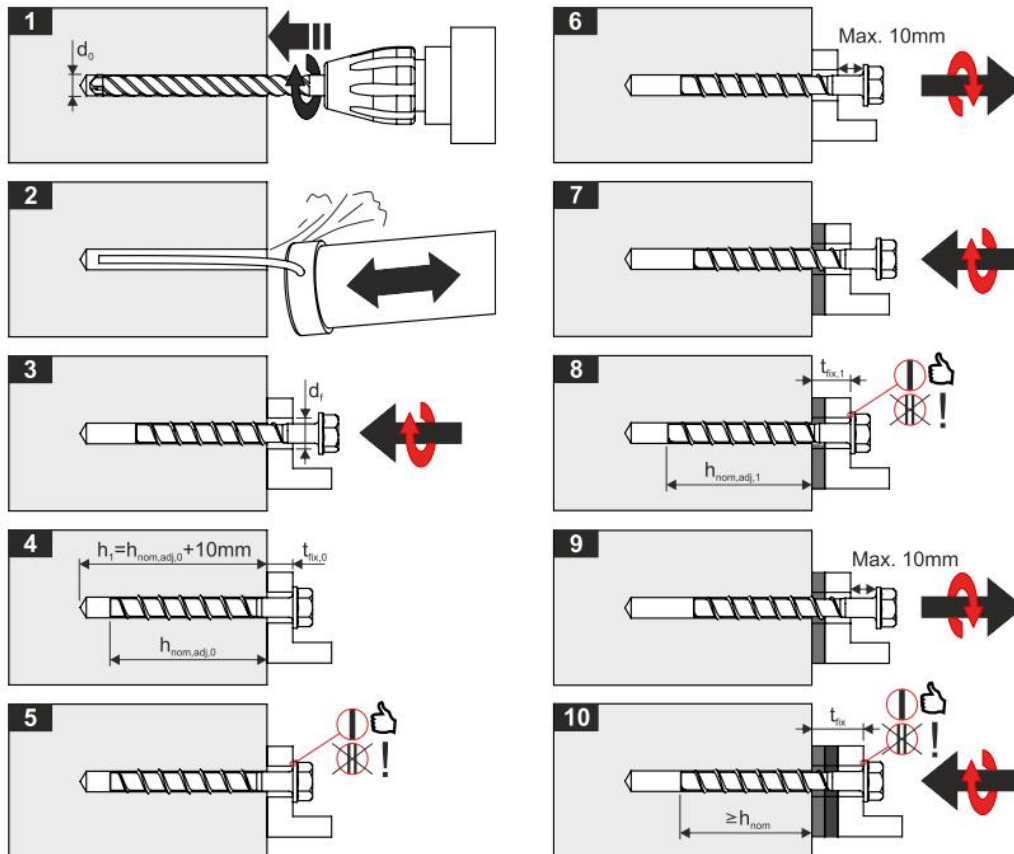


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Installation instruction:

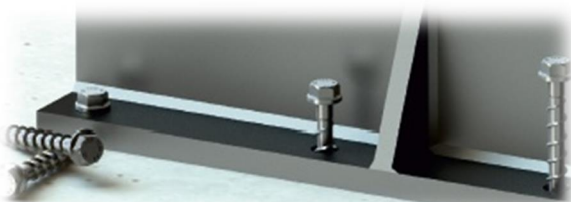


Installation instruction with adjustment, only for the sizes 8 to 14



Important!!!

- The anchor may be adjusted maximum two times while the anchor may turn back at most 10 mm.
- The total allowed thickness of shims added during the adjustment process is 10mm.
- The final embedment depth after adjustment process must be equal or larger than h_{nom}.



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Multiple fastening

Technical characteristic without fire exposure for multiple fastening TSM / TSM A4 / TSM HCR					
Screw size TSM high performance			TSM 5	TSM 6	
nominal embedment depth	h_{nom}	[mm]	35	35	55
nominal diameter of drill bit	d_0	[mm]	5	6	
depth of drill hole	h_1	min [mm]	40	40	60
effective anchorage depth	h_{ef}	[mm]	27	27	44
diameter of clearance hole in the fixture	d_f	max [mm]	7	8	
permissible tension load in cracked concrete ^{1);2)}	N_{zul}	[kN]	0,6	0,6	3,6
permissible shear load in cracked concrete ^{2);3)}	V_{zul}	[kN]	2,4	2,4	4
perm. tension load in non-cracked concrete ^{1);2)}	N_{zul}	[kN]	0,6	0,6	3,6
perm. shear load in non-cracked concrete ^{2);3)}	V_{zul}	[kN]	2,5	3,4	4
minimum edge distance	C_{min}	[mm]	35	35	40
minimum spacing	S_{min}	[mm]	35	35	40
minimum base material thickness	h_{min}	[mm]	80	80	100
installation torque	T_{inst}	[Nm]	8	10	
maximum torque (with Impact screw driver)		[Nm]	140	160	

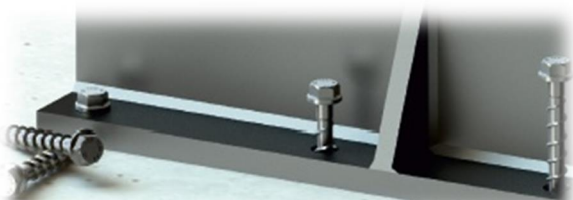
¹⁾ The partial safety factor for material resistance from the approval $\gamma_M = 1.5$ as well a partial safety factor for load actions $\gamma_F = 1.4$ were considered for determining the load.

²⁾ These values apply without influence of the spacings and edge distances.

³⁾ For the calculation of the permissible load a partial safety factor of $\gamma_{s,1.25}$ for steel failure was taken account.

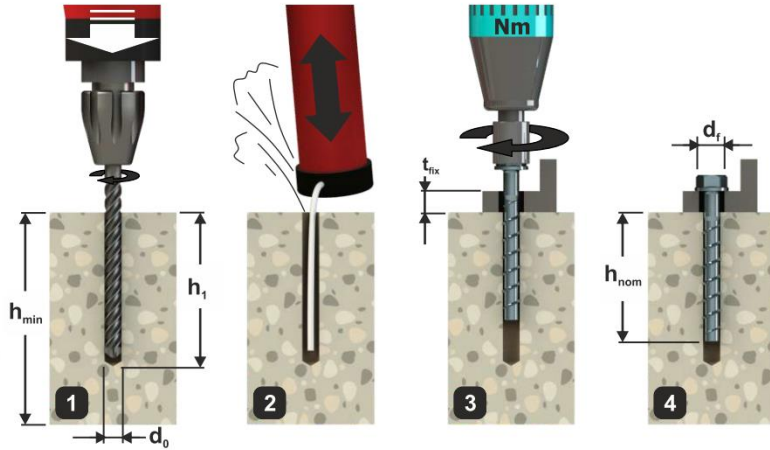
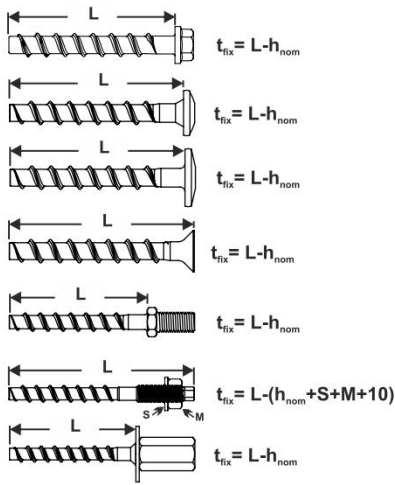
technical characteristics under fire exposure for multiple fastening TSM / TSM A4 / TSM HCR							
screw size TSM high performance			TSM 6		TSM 6 A4 / HCR		
nominal embedment depth	h_{nom}	[mm]	35	55	35	55	
permissible load under tensile and shear use ($F_{zul,fi} = N_{zul,fi} = V_{zul,fi}$)							
fire resistance class							
R 30	permissible load	$F_{zul,fi 30}$	[kN]	0,4	0,9	0,4	1,2
R 60		$F_{zul,fi 60}$	[kN]	0,4	0,8	0,4	1,2
R 90		$F_{zul,fi 90}$	[kN]	0,4	0,6	0,4	1,2
R 120		$F_{zul,fi 120}$	[kN]	0,3	0,4	0,3	0,8
R 30		$M_{zul,fi 30}$	[Nm]	0,7		0,9	
R 60		$M_{zul,fi 60}$	[Nm]	0,6		0,9	
R 90		$M_{zul,fi 90}$	[Nm]	0,5		0,9	
R 120		$M_{zul,fi 120}$	[Nm]	0,3		0,6	
edge distance							
R 30 bis R 120		$C_{cr,fi}$	[mm]	2 x h_{ef}			
the edge distance must be at least 300 mm if the fire stress of more than one side attacks							
spacing							
R 30 bis R 120	$S_{cr,fi}$	[mm]	2 x $C_{cr,fi}$				
concrete pry-out failure							
R 30 bis R 120	k	[-]	1,0				
for wet concrete, the anchoring depth must be increased by at least 30 mm							

¹⁾ The partial safety factor for material resistance from the approval $\gamma_M = 1.0$ as well a partial safety factor for load actions $\gamma_F = 1.0$ were considered.



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Installation instruction:

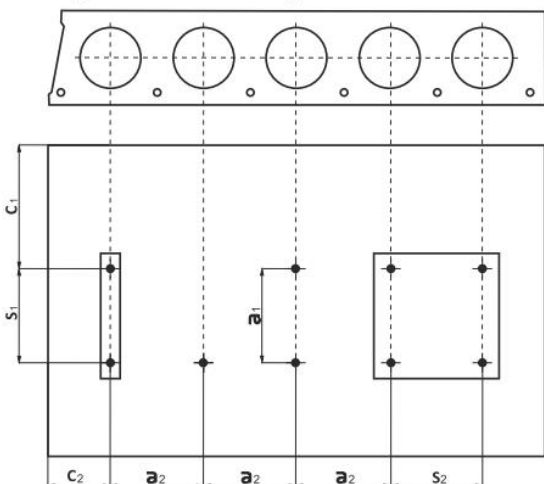
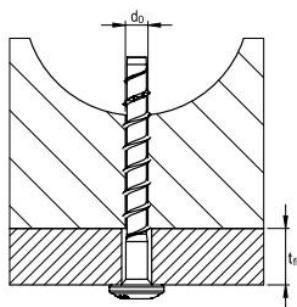
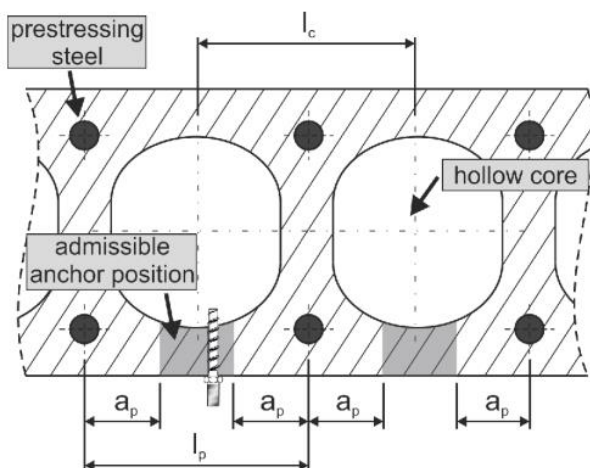


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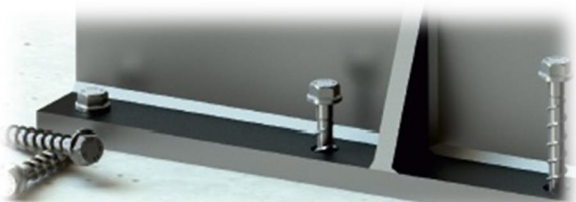
Multiple fastening in hollow core slabs

Technical characteristics without fire exposure in prestressed hollow core slabs		TSM / TSM A4 / TSM HCR		
screw size TSM high performance		TSM 6		
bottom flange thickness	d_b [mm]	min 25	min 30	min 35
nominal diameter of drill bit	d_o [mm]	6		
depth of drill hole	h_1 min [mm]	30	35	40
clearance hole diameter	d_f max [mm]	8		
permissible tension load	F_{zul} [kN]	0,4	0,8	1,2
minimum edge distance	C_{min} [mm]	100		
minimum spacing	S_{min} [mm]	100		
minimum distance between anchor groups	a_{min} [mm]	100		
core distance	l_c min [mm]	100		
prestressing steel distance	l_p min [mm]	100		
dist. between anchor position & prestressing steel	a_p min [mm]	50		
hollow core width (w)				
bridge width (e)	(w/e) max [mm]	4,2		
installation torque	T_{inst} [Nm]	10		
max. torque (for impact screw driver)	[Nm]	160		

¹The partial safety factor for material resistance from the approval $\gamma_M = 1.5$ as well a partial safety factor for load actions $\gamma_F = 1.4$ were considered for determining the load.

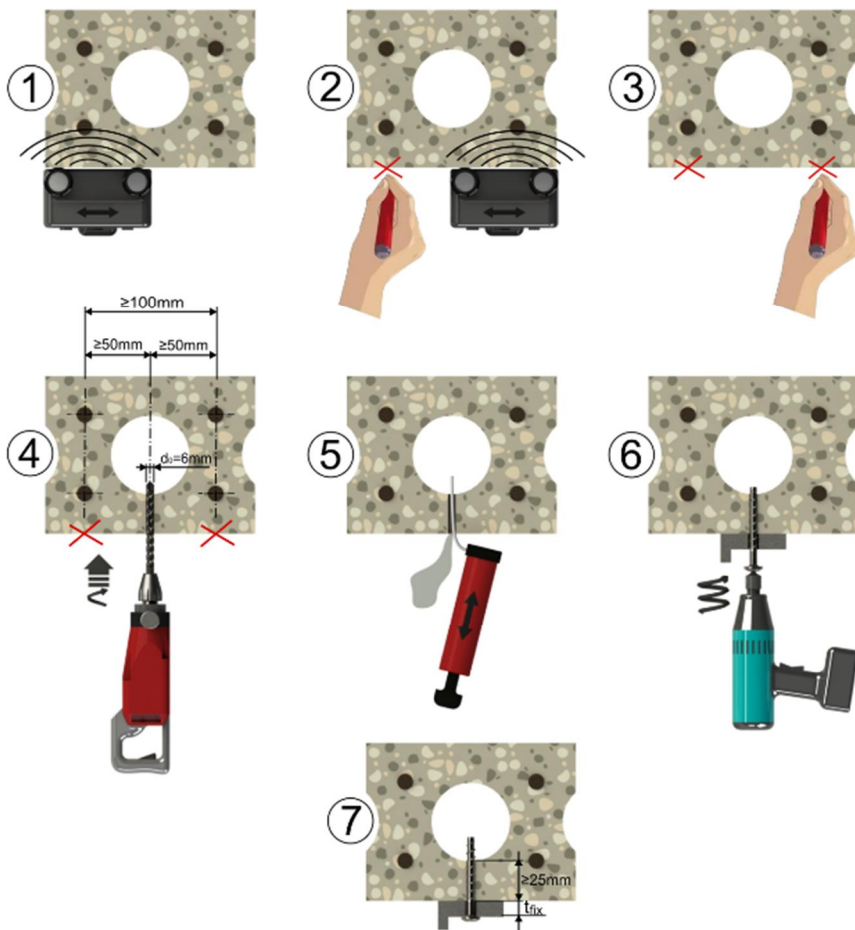


C_1, C_2 = edge distance
 S_1, S_2 = anchor spacing
 a_1, a_2 = distance between anchor groups



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Installation instruction



- 1-3 locate prestressing steel with the reinforcement bar detector and mark the location
- 4- create hole in the permissible anchoring area
- 5- clean hole
- 6- screw in the concrete screw
- 7- screw head must fully contact the fixture



TSM *High Performance*

recommended impact screw driver

screw size	Recommended impact wrench
TSM 5	Milwaukee C 12 IW (1/2" drive, battery, max. torque 136 Nm)
	Milwaukee C 12ID (TORX drive, battery, max. torque 96 Nm)
	Würth ASS 10-A (1/2" drive, battery, max. torque 105 Nm)
TSM 6	Milwaukee C 12 IW (1/2" drive, battery, max. torque 136 Nm)
	Milwaukee C 12ID (TORX drive, battery, max. torque 96 Nm)
	DeWalt DEDC 840 KB (1/2" drive, battery, max. torque 160 Nm)
	Würth ASS 14 (1/4" drive, battery, max. torque 136 Nm 150 Nm)
TSM 8 - TSM 10	Milwaukee C 18 IW (1/2" drive, battery, max. torque 250 Nm)
	Bosch GDS 18E (1/2" drive, AC power, max. torque 250 Nm)
	Makita 6905H (1/2" drive, AC power, max. torque 300 Nm)
	Würth ASS 18 (1/2" drive, battery, max. torque 180 Nm)
	Würth ESS (1/2" drive, AC power, max. torque 250 Nm)
TSM 12 - TSM 14	Milwaukee HD 28 IW (1/2" drive, battery, max. torque 440 Nm)
	Bosch GDS 18E (1/2" drive, AC power, max. torque 250 Nm)
	Makita 6905H (1/2" drive, AC power, max. torque 300 Nm)
	Würth ASS 18 HT (1/2" drive, battery, max. torque 610 Nm)
	Würth ESS (1/2" drive, AC power, max. torque 250 Nm)

