Hilti HIT-RE 500 V3 mortar with HIS-(R)N sleeve

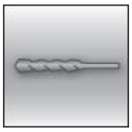
Injection mortar system		Benefits
	Hilti HIT-RE 500 V3 330 ml, 500 ml and 1400 ml foil pack	- **SAFEset** technology: hammer drilling and borehole cleaning in one step with Hilti hollow drill bit - **SAFEset** technology: highest reliability in diamond coring with Hilti Roughening tool - suitable for cracked/non-cracked concrete C 20/25 to C 50/60 - high loading capacity - suitable for dry and water saturated concrete - under water application - Fastest curing epoxy mortar to speed up construction process - Long working time to allow installation of big diameters and/or deep embedment depths even at higher temperatures - Cures down to -5°C - odourless epoxy
	Statik mixer	
	HIS-(R)N sleeve	

Base material


Concrete (non-cracked)

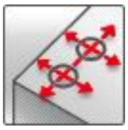

Concrete (cracked)

Installation conditions

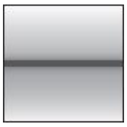

Hammer drilled holes


Diamond drilled holes

SAFEset
Hilti SAFEset technology


Small edge distance and spacing

Load conditions


Static/ quasi-static


Seismic ETA-C1

Other information


European Technical Assessment

CE
CE conformity


PROFIS Anchor design Software

A4 316
Corrosion resistance

Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European Technical Assessment	CSTB	ETA-16/0143 / 2016-04-18

Basic loading data (for a single anchor)

Static and quasi-static resistance

All data in this section applies to
- Correct setting (See setting instruction)
- No edge distance and spacing influence
- *Steel* failure
- Screw strength class 8.8
- Base material thickness, as specified in the table
- Embedment depth, as specified in the table
- Concrete C 20/25, $f_{ck,cube}$ = 25 N/mm²
- Temperate range I
  (min. base material temperature -40°C, max. long term/short term base material temperature: +24°C/40°C)
- Installation temperature range -5°C to +40°C

Embedment depth and base material thickness

Anchor size		M8	M10	M12	M16	M20
Embedment depth	[mm]	90	110	125	170	205
Base material thickness	[mm]	120	150	170	230	270

For hammer drilled holes and hollow drill bit and diamond coring with roughening1):

Mean ultimate resistance

Anchor size			M8	M10	M12	M16	M20
Non cracked concrete							
Tensile $N_{Ru,m}$	HIS-N	[kN]	*26,3*	*48,3*	*70,4*	*131,0*	*121,8*
Shear $V_{Ru,m}$	HIS-N	[kN]	*13,7*	*24,2*	*35,7*	*66,2*	*60,9*
Cracked concrete							
Tensile $N_{Ru,m}$	HIS-N	[kN]	*26,3*	*48,3*	66,8	105,9	*121,8*
Shear $V_{Ru,m}$	HIS-N	[kN]	*13,7*	*24,2*	*35,7*	*66,2*	*60,9*

1) Roughening tools are available for element sizes M10 – M20.

Characteristic resistance

Anchor size			M8	M10	M12	M16	M20
Non cracked concrete							
Tensile N_{Rk}	HIS-N	[kN]	*25,0*	*46,0*	*67,0*	111,9	*116,0*
Shear V_{Rk}	HIS-N	[kN]	*13,0*	*23,0*	*34,0*	*63,0*	*58,0*
Cracked concrete							
Tensile N_{Rk}	HIS-N	[kN]	*25,0*	41,5	50,3	79,8	105,7
Shear V_{Rk}	HIS-N	[kN]	*13,0*	*23,0*	*34,0*	*63,0*	*58,0*

Design resistance

Anchor size			M8	M10	M12	M16	M20
Non cracked concrete							
Tensile N_{Rd}	HIS-N	[kN]	*16,7*	*30,7*	*44,7*	83,3	*77,3*
Shear V_{Rd}	HIS-N	[kN]	*10,4*	*18,4*	*27,2*	*50,4*	*46,4*
Cracked concrete							
Tensile N_{Rd}	HIS-N	[kN]	*16,7*	27,7	33,5	53,2	70,4
Shear V_{Rd}	HIS-N	[kN]	*10,4*	*18,4*	*27,2*	*50,4*	*46,4*

Recommended loads [a)]

Anchor size			M8	M10	M12	M16	M20
Non cracked concrete							
Tensile N_{rec}	HIS-N	[kN]	11,9	21,9	31,9	53,3	55,2
Shear V_{rec}	HIS-N	[kN]	7,4	13,1	19,4	36,0	33,1
Cracked concrete							
Tensile N_{rec}	HIS-N	[kN]	11,9	19,8	24,0	38,0	50,3
Shear V_{rec}	HIS-N	[kN]	7,4	13,1	19,4	36,0	33,1

a) With overall partial safety factor for action γ = 1,4. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

For diamond drilling:

Mean ultimate resistance

Anchor size			M8	M10	M12	M16	M20
Non cracked concrete							
Tensile $N_{Ru,m}$	HIS-N	[kN]	*26,3*	*48,3*	*70,4*	*131,3*	*121,8*
Shear $V_{Ru,m}$	HIS-N	[kN]	*13,7*	*24,2*	*35,7*	*66,2*	*60,9*

Characteristic resistance

Anchor size			M8	M10	M12	M16	M20
Non cracked concrete							
Tensile N_{Rk}	HIS-N	[kN]	*25,0*	*46,0*	*67,0*	111,9	*116,0*
Shear V_{Rk}	HIS-N	[kN]	*13,0*	*23,0*	*34,0*	*63,0*	*58,0*

Design resistance

Anchor size			M8	M10	M12	M16	M20
Non cracked concrete							
Tensile N_{Rd}	HIS-N	[kN]	*16,7*	26,9	39,2	62,2	*77,3*
Shear V_{Rd}	HIS-N	[kN]	*10,4*	*18,4*	*27,2*	*50,4*	*46,4*

Recommended loads [a)]

Anchor size			M8	M10	M12	M16	M20
Non cracked concrete							
Tensile N_{rec}	HIS-N	[kN]	11,9	19,2	28,0	44,4	55,2
Shear V_{rec}	HIS-N	[kN]	7,4	13,1	19,4	36,0	33,1

a) With overall partial safety factor for action γ = 1,4. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

Seismic resistance C1

All data in this section applies to:
- Correct setting (See setting instruction)
- No edge distance and spacing influence
- *Steel* failure
- Screw strength class 8.8
- Base material thickness, as specified in the table
- One typical embedment depth, as specified in the table
- Concrete C 20/25, $f_{ck,cube}$ = 25 N/mm²
  Temperate range I
  (min. base material temperature -40°C, max. long term/short term base material temperature: +24°C/40°C)
- Installation temperature range -5°C to +40°C
- α_{gap} = 1,0 (no hole clearance between anchor and fixture); in case of connections with hole clearance, α_{gap} = 0,5 has to be used

Embedment depth and base material thickness

Anchor size		M8	M10	M12	M16	M20
Embedment depth	[mm]	90	110	125	170	205
Base material thickness	[mm]	120	150	170	230	270

For hammer drilled holes and hollow drill bit:

Characteristic resistance

Anchor size			M8	M10	M12	M16	M20
Cracked concrete							
Tensile N_{Rk}	HIS-N	[kN]	25,0	35,3	42,8	67,8	89,8
Shear V_{Rk}	HIS-N	[kN]	*9,0*	*16,0*	*27,0*	*41,0*	*39,0*

Design resistance

Anchor size			M8	M10	M12	M16	M20
Cracked concrete							
Tensile N_{Rd}	HIS-N	[kN]	*16,7*	23,5	28,5	45,2	59,9
Shear V_{Rd}	HIS-N	[kN]	*7,2*	*12,8*	*21,6*	*32,8*	*31,2*

Service temperature range

Hilti HIT-RE 500 V3 injection mortar may be applied in the temperature ranges given below. An elevated base material temperature may lead to a reduction of the design bond resistance.

Temperature range	Base material temperature	Maximum long term base material temperature	Maximum short term base material temperature
Temperature range I	-40 °C to +40 °C	+24 °C	+40 °C
Temperature range II	-40 °C to +70 °C	+43 °C	+70 °C

Max short term base material temperature
Short-term elevated base material temperatures are those that occur over brief intervals, e.g. as a result of diurnal cycling.

Max long term base material temperature
Long-term elevated base material temperatures are roughly constant over significant periods of time.

Materials

Mechanical properties

Anchor size			M8	M10	M12	M16	M20
Nominal tensile strength f_{uk}	HIS-N	[N/mm²]	490	490	490	490	490
	Screw 8.8	[N/mm²]	800	800	800	800	800
	HIS-RN	[N/mm²]	700	700	700	700	700
	Screw A4-70	[N/mm²]	700	700	700	700	700
Yield strength f_{yk}	HIS-N	[N/mm²]	390	390	390	390	390
	Screw 8.8	[N/mm²]	640	640	640	640	640
	HIS-RN	[N/mm²]	350	350	350	350	350
	Screw A4-70	[N/mm²]	450	450	450	450	450
Stressed cross-section A_s	HIS-(R)N	[mm²]	51,5	108,0	169,1	256,1	237,6
	Screw	[mm²]	36,6	58	84,3	157	245
Moment of resistance W	HIS-(R)N	[mm³]	145	430	840	1595	1543
	Screw	[mm³]	31,2	62,3	109	277	541

Material quality

Part	Material
internally threaded sleeves [a] HIS-N	C-steel 1.0718, steel galvanized ≥ 5µm
internally threaded sleeves [b] HIS-RN	stainless steel 1.4401 and 1.4571

a) related fastening screw: strength class 8.8, A5 > 8% Ductile
steel galvanized ≥ 5µm
b) related fastening screw: strength class 70, A5 > 8% Ductile
stainless steel 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362

Anchor dimensions

Anchor size		M8	M10	M12	M16	M20
Internal sleeve HIS-N / HIS-RN		**M8x90**	**M10x110**	**M12x125**	**M16x170**	**M20x205**
Anchor embedment depth	[mm]	90	110	125	170	205

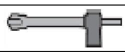
Setting

Installation equipment

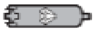
Anchor size	M8	M10	M12	M16	M20
Rotary hammer	TE 2 – TE 16		TE 40 – TE 70		
Other tools	compressed air gun, set of cleaning brushes, dispenser, roughening tools TE-YRT				
Additional Hilti recommended tools	DD EC-1, DD 100 … DD xxx [a)]				

a) For anchors in diamond drilled holes load values for combined pull-out and concrete cone resistance have to be reduced (see section "Setting instruction")

Parameters of cleaning and setting tools

Element	Drill and clean				Installation	
HIS-(R)N	Hammer drilling	Hollow drill bit TE-CD, TE-YD	Diamond coring	Diamond coring with roughening tool TE-YRT	Brush	Piston plug
						
Size	d_0 [mm]	d_0 [mm]	d_0 [mm]	d_0 [mm]	HIT-RB	HIT-SZ
M8	14	14	14	-	14	14
M10	18	18	18	18	18	18
M12	22	22	22	22	22	22
M16	28	28	28	28	28	28
M20	32	32	32	32	32	32

Associated components for the use of Hilti Roughening tool TE-YRT

Diamond coring		Roughening tool TE-YRT	Wear gauge RTG…
			
d_0 [mm]		d_0 [mm]	size
Nominal	measured		
18	17,9 to 18,2	18	18
20	19,9 to 20,2	20	20
22	21,9 to 22,2	22	22
25	24,9 to 25,2	25	25
28	27,9 to 28,2	28	28
30	29,9 to 30,2	30	30
32	31,9 to 32,2	32	32
35	34,9 to 35,2	35	35

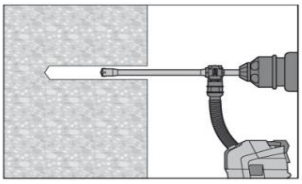
Minimum roughening time $t_{roughen}$ ($t_{roughen}$ [sec] = h_{ef} [mm] / 10)

h_{ef} [mm]	$t_{roughen}$ [sec]
0 to 100	10
101 to 200	20
201 to 300	30
301 to 400	40
401 to 500	50
501 to 600	60

Setting instruction

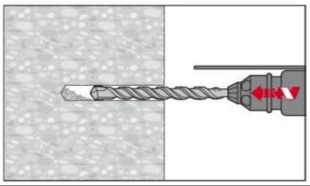
Bore hole drilling

a) Hilti hollow drill bit — For dry and wet concrete only.



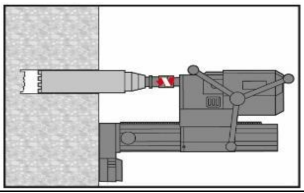
Drill hole to the required embedment depth with an appropriately sized Hilti TE-CD or TE-YD hollow drill bit with Hilti vacuum attachment. This drilling system removes the dust and cleans the bore hole during drilling when used in accordance with the user's manual.
After drilling is complete, proceed to the "injection preparation" step in the instructions for use.

b) Hammer drilling — Dry or wet concrete and installation in flooded holes (no sea water).



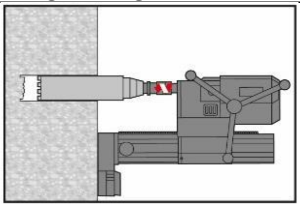
Drill Hole to the required embedment depth with a hammer drill set in rotation-hammer mode using an appropriately sized carbide drill bit.

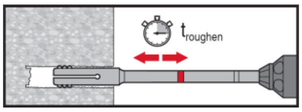
c) Diamond coring — For dry and wet concrete only.



Diamond coring is permissible when diamond core drilling machine and the corresponding core bit are used.

d) Diamond coring followed by roughening with Hilti rough. tool — For dry and wet concrete only.





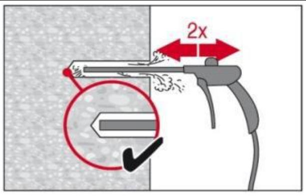
Diamond coring is permissible when suitable diamond core drilling machines and the corresponding core bits are used.

Before roughening the borehole needs to be dry. Check usability of the roughening tool with the wear gauge RTG.
Roughen the borehole over the whole length to the required hef.

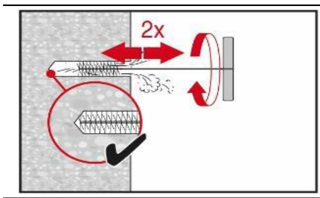
Bore hole cleaning

Just before setting an anchor, the bore hole must be free of dust and debris. Inadequate hole cleaning = poor load values.

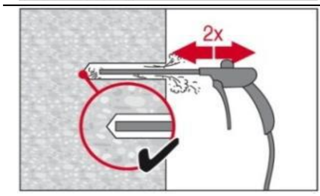
a) Compressed air cleaning (CAC) — For all drill hole diameters d_0 and all drill hole depths h_0.



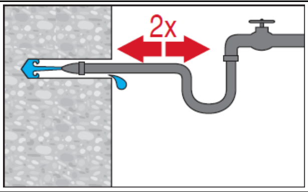
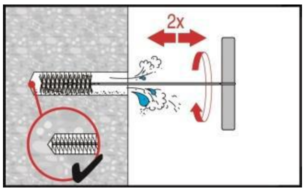
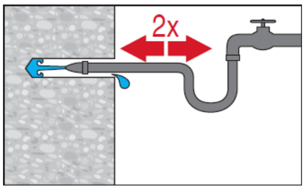
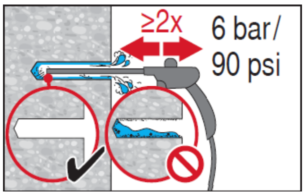
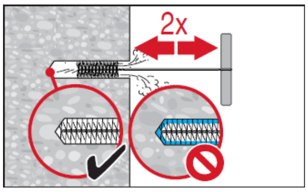
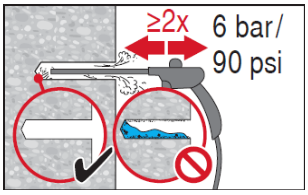
Blow 2 times from the back of the hole (if needed with nozzle extension) over the whole length with oil-free compressed air (min. 6 bar at 6 m^3/h) until return air stream is free of noticeable dust. For drill hole diameters ≥ 32 mm the compressor has to supply a minimum air flow of 140 m^3/h.



Brush 2 times with the specified brush by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it. The brush must produce natural resistance as it enters the drill hole (brush Ø ≥ drill hole Ø) - if not the brush is too small and must be replaced with the proper brush diameter.

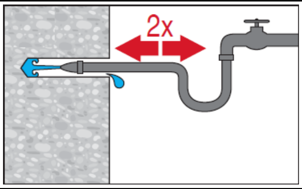


Blow again with compressed air 2 times until return air stream is free of noticeable dust.

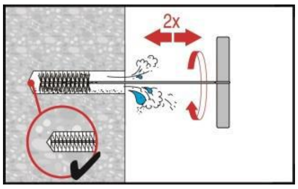
b) Cleaning of hammer drilled flooded holes and diamond cored holes	For all bore hole diameters d_0 and all bore hole depth h_0
	Flush 2 times the hole by inserting a water hose (water-line pressure) to the back of the hole until water runs clear.
	Brush 2 times with the specified brush size by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it. The brush must produce natural resistance as it enters the bore hole - if not the brush is too small and must be replaced with the proper brush diameter.
	Flush again 2 times the hole by inserting a water hose (water-line pressure) to the back of the hole until water runs clear.
	Blow 2 times from the back of the hole (if needed with nozzle extension) over the hole length with oil-free compressed air (min. 6 bar at 6 m^3/h) until return air stream is free of noticeable dust and water. Bore hole diameter ≥ 32 mm the compressor must supply a minimum air flow of 140 m^3/hour.
	Brush 2 times with the specified brush size by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it. The brush must produce natural resistance as it enters the bore hole - if not the brush is too small and must be replaced with the proper brush diameter.
	Blow again with compressed air 2 times until return air stream is free of noticeable dust and water.

c) Cleaning of diamond cored holes followed by roughening

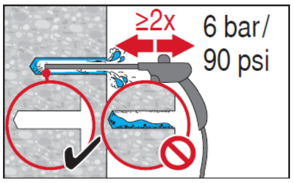
For all drill hole diameters d_0 and all drill hole depths h_0.



Flush 2 times by inserting a water hose (water-line pressure) to the back of the hole until water runs clear.

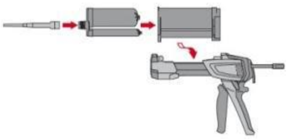


Brush 2 times with the specified brush by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it. The brush must produce natural resistance as it enters the drill hole (brush Ø ≥ drill hole Ø) - if not the brush is too small and must be replaced with the proper brush diameter.

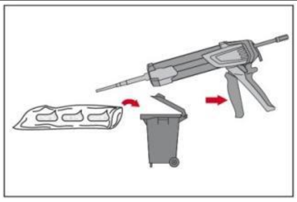


Blow 2 times from the back of the hole (if needed with nozzle extension) over the whole length with oil-free compressed air (min. 6 bar at 6 m³/h) until return air stream is free of noticeable dust and water. For drill hole diameters ≥ 32 mm the compressor has to supply a minimum air flow of 140 m³/h.

Injection preparation



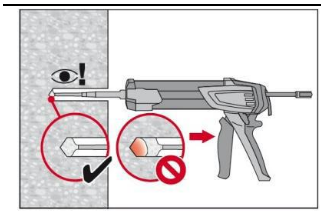
Tightly attach new Hilti mixing nozzle HIT-RE-M to foil pack manifold (snug fit). Do not modify the mixing nozzle. Observe the instruction for use of the dispenser and mortar.
Check foil pack holder for proper function. Do not use damaged foil packs / holders.
Insert foil pack into foil pack holder and put holder into HIT-dispenser.



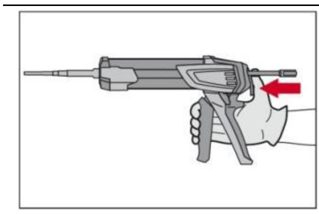
The foil pack opens automatically as dispensing is initiated. Discard initial adhesive. Depending on the size of the foil pack an initial amount of adhesive has to be discarded.
Discard quantities are: 3 strokes for 330 ml foil pack, 4 strokes for 500 ml foil pack, 65 ml for 1400 ml foil pack.

Inject adhesive

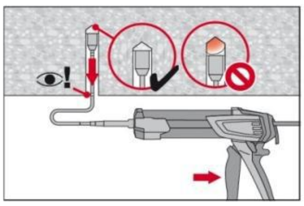
From the back of the drill hole without forming air voids



Inject the adhesive starting at the back of the hole, slowly withdrawing the mixer with each trigger pull.
Fill holes approximately 2/3 full. It is required that the annular gap between the anchor and the concrete is completely filled with adhesive along the embedment length.

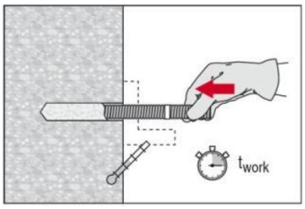


After injection is completed, depressurize the dispenser by pressing the release trigger. This will prevent further adhesive discharge from the mixer.

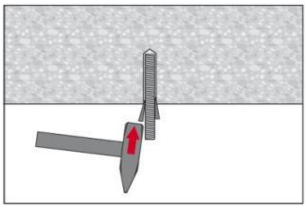


Overhead installation and/or installation with embedment depth h_{ef} > 250mm.
For overhead installation the injection is only possible with the aid of extensions and piston plugs. Assemble HIT-RE-M mixer, extension(s) and appropriately sized piston plug HIT-SZ. Insert piston plug to back of the hole and inject adhesive. During injection the piston plug will be naturally extruded out of the bore hole by the adhesive pressure.

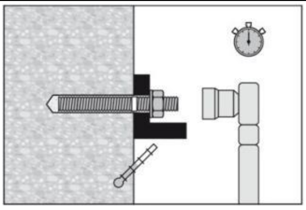
Setting the element Just before setting an anchor, the drill hole must be free of dust and debris.



Before use, verify that the element is dry and free of oil and other contaminants.
Mark and set element to the required embedment depth untill working time t_{work} has elapsed.



For overhead installation use piston plugs and fix embedded parts with e.g. wedges HIT-OHW.



Loading the anchor: after required curing time t_{cure} the anchor can be loaded.
The applied installation torque shall not exceed T_{max}.

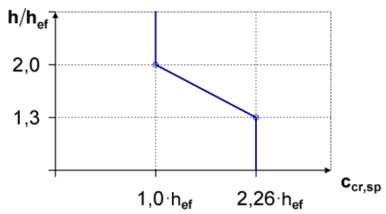
For detailed information on installation see instruction for use given with the package of the product.

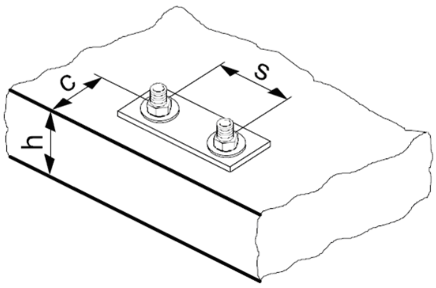
Curing time for general conditions

Temperature of the base material T	Working time t_{work}	Minimum curing time t_{cure} 1)
-5 °C to -1 °C	2 h	168 h
0 °C to 4 °C	2 h	48 h
5 °C to 9 °C	2 h	24 h
10 °C to 14 °C	1,5 h	16 h
15 °C to 19 °C	1 h	16 h
20 °C to 24 °C	30 min	7 h
25 °C to 29 °C	20 min	6 h
30 °C to 34 °C	15 min	5 h
35 °C to 39 °C	12 min	4,5 h
40 °C	10 min	4 h

1) The curing time data are valid for dry base material only. In wet base material the curing times must be doubled.

Setting details

Anchor size			M8	M10	M12	M16	M20
Nominal diameter of drill bit	d_0	[mm]	14	18	22	28	32
Diameter of element	d	[mm]	12,5	16,5	20,5	25,4	27,6
Effective anchorage and drill hole depth	h_{ef}	[mm]	90	110	125	170	205
Minimum base material thickness	h_{min}	[mm]	120	150	170	230	270
Diameter of clearance hole in the fixture	d_f	[mm]	9	12	14	18	22
Thread engagement length; min - max	h_s	[mm]	8-20	10-25	12-30	16-40	20-50
Minimum spacing	s_{min}	[mm]	60	75	90	115	130
Minimum edge distance	c_{min}	[mm]	40	45	55	65	90
Critical spacing for splitting failure	$s_{cr,sp}$		$2\ c_{cr,sp}$				
Critical edge distance for splitting failure [a]	$c_{cr,sp}$	[mm]	**$1,0 \cdot h_{ef}$** for $h / h_{ef} \geq 2,0$ **$4,6\ h_{ef} - 1,8\ h$** for $2,0 > h / h_{ef} > 1,3$ **$2,26\ h_{ef}$** for $h / h_{ef} \leq 1,3$	 			
Critical spacing for concrete cone failure	$s_{cr,N}$		$2\ c_{cr,N}$				
Critical edge distance for concrete cone failure [c]	$c_{cr,N}$		$1,5\ h_{ef}$				
Torque moment [c]	T_{max}	[Nm]	10	20	40	80	150



For spacing (edge distance) smaller than critical spacing (critical edge distance) the design loads have to be reduced.

a) h: base material thickness ($h \geq h_{min}$)

b) The critical edge distance for concrete cone failure depends on the embedment depth h_{ef} and the design bond resistance. The simplified formula given in this table is on the save side.

c) This is the maximum recommended torque moment to avoid splitting failure during installation for anchors with minimum spacing and/or edge distance.