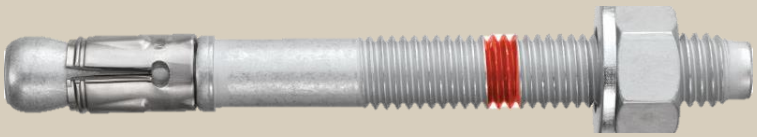
HST-3
EXPANSION ANCHOR

Technical Datasheet

Update: Apr-20



HST3 Expansion anchor

Ultimate-performance expansion anchor for cracked concrete and seismic

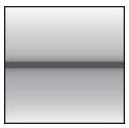
Anchor version		Benefits
	HST3 HST3-R (M8-M24)	- Highest resistance for reduced member thickness, short spacing and edge distances - Increased undercut percentage in combination with optimized coating - Suitable for non-cracked and cracked concrete C 12/15 to C 80/95 - Highly reliable and safe anchor for structural seismic design with ETA C1/C2 approval - Flexibility with two embedment depths included in the ETA
	HST3-BW HST3-R-BW (M8-M24)	- Minimum edge and spacing distances reduced by up to 25% compared to HST - Design tension resistance increased by up to 66% compared to HST - Product and length identification mark facilitates quality control and inspection

Base material

Concrete (non-cracked)

Concrete (cracked)

Load conditions



Static/ quasi-static

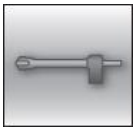
Seismic ETA-C1/C2

Fire resistance

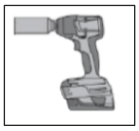
Installation conditions

Hammer drilled holes

Diamond drilled holes



Hollow drill-bit drilling



Impact wrench with adaptative torque module

Other information

European Technical Assessment

CE conformity

PROFIS Anchor design Software

FM approved

Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European technical assessment [a)]	DIBt, Berlin	ETA-98/0001 / 2018-02-09
Fire test report	DIBt, Berlin	ETA-98/0001 / 2018-02-09
Shock approval M10 - M24	BABS, Spiez Laboratory	BZS D 08-602 / 2019-01-29

a) All data given in this section according to ETA-98/0001, issue 2018-02-09.

Static and quasi-static loading (for a single anchor)

All data in this section applies to:

- Correct setting (See setting instruction)
- No edge distance and spacing influence
- *Steel* failure
- Minimum base material thickness
- Concrete C 20/25, $f_{ck,cube}$ = 25 N/mm²

Effective anchorage depth for static

Anchor size			M8	M10		M12		M16		M20	M24
Eff. Anchorage depth	h_{ef}	[mm]	47	40	60	50	70	65	85	101	125

Characteristic resistance

Anchor size			M8	M10		M12		M16		M20	M24
Non-cracked concrete											
Tension N_{Rk}	HST3/HST3-BW	[kN]	12,0	12,8	22,0	17,9	25,0	26,5	39,6	51,3	60,0
	HST3-R/HST3-R-BW		12,0	12,8	22,0	17,9	25,0	26,5	39,6	51,3	60,0
Shear V_{Rk}	HST3/HST3-BW	[kN]	*13,8*	*21,9*	*23,6*	*34,0*	*35,4*	*54,5*	*55,3*	*83,9*	*94,0*
	HST3-R/HST3-R-BW		*15,7*	*25,6*	*25,3*	*31,1*	*36,7*	*48,6*	*63,6*	*97,2*	*115,0*
Cracked concrete											
Tension N_{Rk}	HST3/HST3-BW	[kN]	8,0	9,1	15,0	12,7	20,0	18,9	28,2	36,5	40,0
	HST3-R/HST3-R-BW		8,5	9,1	15,0	12,7	20,0	18,9	28,2	36,5	40,0
Shear V_{Rk}	HST3/HST3-BW	[kN]	*13,8*	*21,9*	*23,6*	*34,0*	*35,4*	*54,5*	*55,3*	*83,9*	*94,0*
	HST3-R/HST3-R-BW		*15,7*	24,3	*25,3*	*31,1*	*36,7*	*48,6*	*63,6*	*97,2*	*115,0*

Design resistance

Anchor size			M8	M10		M12		M16		M20	M24
Non-cracked concrete											
Tension N_{Rd}	HST3/HST3-BW	[kN]	8,0	8,5	14,7	11,9	16,7	17,6	26,4	34,2	40,0
	HST3-R/HST3-R-BW		8,0	8,5	14,7	11,9	16,7	17,6	26,4	34,2	40,0
Shear V_{Rd}	HST3/HST3-BW	[kN]	*11,0*	*17,5*	*18,9*	*27,2*	*28,3*	*43,6*	*44,2*	*67,1*	62,7
	HST3-R/HST3-R-BW		*12,6*	*20,5*	*20,2*	*24,9*	*29,4*	*38,9*	*50,9*	*77,8*	88,5
Cracked concrete											
Tension N_{Rd}	HST3/HST3-BW	[kN]	5,3	6,1	10,0	8,5	13,3	12,6	18,8	24,4	26,7
	HST3-R/HST3-R-BW		5,7	6,1	10,0	8,5	13,3	12,6	18,8	24,4	26,7
Shear V_{Rd}	HST3/HST3-BW	[kN]	*11,0*	16,2	*18,9*	23,6	*28,3*	42,9	*44,2*	*67,1*	62,7
	HST3-R/HST3-R-BW		*12,6*	16,2	*20,2*	23,6	*29,4*	*38,9*	*50,9*	*77,8*	83,9

Recommended loads[a)]

Anchor size			M8	M10		M12		M16		M20	M24
Non-cracked concrete											
Tension N_{Rec}	HST3/HST3-BW	[kN]	5,7	6,1	10,5	8,5	11,9	12,6	18,8	24,4	28,6
	HST3-R/HST3-R-BW		5,7	6,1	10,5	8,5	11,9	12,6	18,8	24,4	28,6
Shear V_{Rec}	HST3/HST3-BW	[kN]	7,9	12,5	13,5	19,4	20,2	31,1	31,6	47,9	44,8
	HST3-R/HST3-R-BW		9,0	14,6	14,5	17,8	21,0	27,8	36,3	55,5	63,2
Cracked concrete											
Tension N_{Rec}	HST3/HST3-BW	[kN]	3,8	4,3	7,1	6,1	9,5	9,0	13,4	17,4	19,0
	HST3-R/HST3-R-BW		4,0	4,3	7,1	6,1	9,5	9,0	13,4	17,4	19,0
Shear V_{Rec}	HST3/HST3-BW	[kN]	7,9	11,6	13,5	16,8	20,2	30,6	31,6	47,9	44,8
	HST3-R/HST3-R-BW		9,0	11,6	14,5	16,8	21,0	27,8	36,3	55,5	59,9

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 loading (for a single anchor)

All data in this section applies to:
- Correct setting (See setting instruction)
- No edge distance and spacing influence
- *Steel* failure
- Minimum base material thickness
- Concrete C 20/25, $f_{ck,cube}$ = 25 N/mm²
- α_{gap} = 1,0 (using Hilti seismic filling set)

Effective anchorage depth for seismic C2 and C1

Anchor size			M8	M10	M12	M16	M20	M24
Eff, Anchorage depth	h_{ef}	[mm]	47	60	70	85	101	-

Characteristic resistance in case of seismic performance C2

Anchor size			M8	M10	M12	M16	M20	M24
Tension $N_{Rk,\,seis}$	HST3 / HST3-BW	[kN]	3,0	10,4	17,9	24,0	31,1	-
	HST3-R / HST3-R-BW		3,4	10,4	17,9	24,0	31,1	-
Shear $V_{Rk,seis}$	HST3 / HST3-BW	[kN]	*9,9*	*19,0*	*28,6*	*48,5*	*84,3*	-
	HST3-R / HST3-R-BW		*9,9*	*17,2*	*27,6*	*42,5*	*67,4*	-

Design resistance in case of seismic performance C2

Anchor size			M8	M10	M12	M16	M20	M24
Tension $N_{Rd,\,seis}$	HST3 / HST3-BW	[kN]	2,0	6,9	11,9	16,0	20,7	-
	HST3-R / HST3-R-BW		2,3	6,9	11,9	16,0	20,7	-
Shear $V_{Rd,seis}$	HST3 / HST3-BW	[kN]	*7,9*	*15,2*	*22,9*	*38,8*	66,3	-
	HST3-R / HST3-R-BW		*7,9*	*13,8*	*22,1*	*34,0*	*53,9*	-

Characteristic resistance in case of seismic performance C1

Anchor size			M8	M10	M12	M16	M20	M24
Tension $N_{Rk,\,seis}$	HST3 / HST3-BW	[kN]	7,5	12,0	17,9	24,0	31,1	-
	HST3-R / HST3-R-BW		7,5	12,0	17,9	24,0	31,1	-
Shear $V_{Rk,seis}$	HST3 / HST3-BW	[kN]	*16,6*	*25,8*	*39,0*	*60,9*	99,4	-
	HST3-R / HST3-R-BW		19,5	*28,4*	44,3	*70,2*	99,4	-

Design resistance in case of seismic performance C1

Anchor size			M8	M10	M12	M16	M20	M24
Tension $N_{Rd, seis}$	HST3 / HST3-BW	[kN]	5,0	8,0	11,9	16,0	20,7	-
	HST3-R / HST3-R-BW		5,0	8,0	11,9	16,0	20,7	-
Shear $V_{Rd,seis}$	HST3 / HST3-BW	[kN]	13,3	20,6	31,2	*48,7*	66,3	-
	HST3-R / HST3-R-BW		15,6	22,7	33,2	54,5	66,3	-

Fire resistance

All data in this section applies to:
- Correct setting (See setting instruction)
- No edge distance and spacing influence
- *Steel* failure
- Minimum base material thickness
- Concrete C 20/25, $f_{ck,cube}$ = 25 N/mm²
- Hilti technical data for concrete strength class C55/67 to C80/95: for a structural element that fullfills the requirements according to DIN EN 1992-1-2 the fire resistance of C20/25 could be assumed.
- partial safety factor for resistance under fire exposure $\gamma_{M,fi}$=1,0 (in absence of other national regulations)

Effective anchorage depth for static

Anchor size			M8	M10		M12		M16		M20	M24
Eff. Anchorage depth	h_{ef}	[mm]	47	40	60	50	70	65	85	101	125

Characteristic resistance

Anchor size			M8	M10		M12		M16		M20	M24
Fire Exposure R30											
Tension $N_{Rk,fi}$	HST3/HST3-BW	[kN]	*0,9*	*1,5*	*2,4*	*2,3*	5,0	*4,4*	7,1	9,1	12,6
	HST3-R/HST3-R-BW		1,9	1,8	3,0	3,2	5,0	4,7	7,1	9,1	12,6
Shear $V_{Rk,fi}$	HST3/HST3-BW	[kN]	*0,9*	*1,5*	*2,4*	*2,3*	*5,2*	*4,4*	*9,7*	*15,2*	*21,9*
	HST3-R/HST3-R-BW		*4,9*	4,7	*11,8*	8,9	*17,1*	*16,9*	*31,9*	37,0	62,8
Fire Exposure R120											
Tension $N_{Rk,fi}$	HST3/HST3-BW	[kN]	*0,6*	*0,8*	*0,9*	*0,8*	*1,3*	*1,5*	*2,4*	*3,8*	*5,4*
	HST3-R/HST3-R-BW		1,5	1,5	2,4	2,5	4,0	3,8	5,6	7,3	10,1
Shear $V_{Rk,fi}$	HST3/HST3-BW	[kN]	*0,6*	*0,8*	*0,9*	*0,8*	*1,5*	*1,5*	*2,4*	*3,8*	*5,4*
	HST3-R/HST3-R-BW		*1,7*	*2,0*	*3,3*	*3,3*	*4,8*	*6,2*	*9,0*	*14,1*	*20,3*

Design resistance

Anchor size			M8	M10		M12		M16		M20	M24
Fire Exposure R30											
Tension $N_{Rd,fi}$	HST3/HST3-BW	[kN]	*0,9*	*1,5*	*2,4*	*2,3*	5,0	*4,4*	7,1	9,1	12,6
	HST3-R/HST3-R-BW		1,9	1,8	3,0	3,2	5,0	4,7	7,1	9,1	12,6
Shear $V_{Rd,fi}$	HST3/HST3-BW	[kN]	*0,9*	*1,5*	*2,4*	*2,3*	*5,2*	*4,4*	*9,7*	*15,2*	*21,9*
	HST3-R/HST3-R-BW		*4,9*	4,7	*11,8*	8,9	*17,1*	*16,9*	*31,9*	37,0	62,8
Fire Exposure R120											
Tension $N_{Rd,fi}$	HST3/HST3-BW	[kN]	*0,6*	*0,8*	*0,9*	*0,8*	*1,3*	*1,5*	*2,4*	*3,8*	*5,4*
	HST3-R/HST3-R-BW		1,5	1,5	2,4	2,5	4,0	3,8	5,6	7,3	10,1
Shear $V_{Rd,fi}$	HST3/HST3-BW	[kN]	*0,6*	*0,8*	*0,9*	*0,8*	*1,5*	*1,5*	*2,4*	*3,8*	*5,4*
	HST3-R/HST3-R-BW		*1,7*	*2,0*	*3,3*	*3,3*	*4,8*	*6,2*	*9,0*	*14,1*	*20,3*

Materials

Mechanical properties

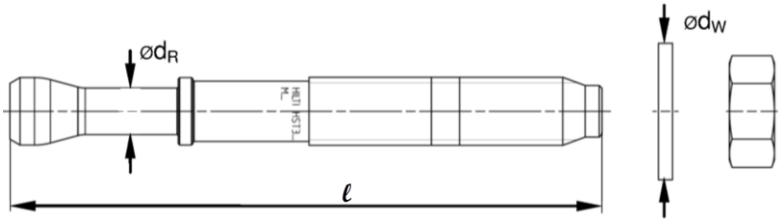
Anchor size			M8	M10	M12	M16	M20	M24
Nominal tensile strength $f_{uk,thread}$	HST3/HST3-BW	[N/mm²]	800	800	800	720	700	530
	HST3-R/HST3-R-BW		720	710	710	650	650	650
Yield strength $f_{yk,thread}$	HST3/HST3-BW	[N/mm²]	640	640	640	576	560	450
	HST3-R/HST3-R-BW		576	568	568	520	520	500
Stressed cross-section A_s		[mm²]	36,6	58,0	84,3	157	245	353
Moment of resistance W		[mm³]	31,2	62,3	109	277	541	935
Char, bending resistance $M^0_{Rk,s}$	HST3/HST3-BW	[Nm]	30	60	105	240	457	595
	HST3-R/HST3-R-BW		27	53	93	216	425	730

Material quality

Part		Material
Expansion sleeve	HST3/HST3-BW	M10, M16: Galvanized or Stainless steel M8, M12, M20, M24: Stainless steel
	HST3-R/HST3-R-BW	Stainless steel A4
Bolt	HST3/HST3-BW	Carbon steel, galvanized, coated (transparent)
	HST3-R/HST3-R-BW	Stainless steel A4, cone coated (transparent)
Washer	HST3/HST3-BW	Galvanized
	HST3-R/HST3-R-BW	Stainless steel A4
Hexagon nut	HST3/HST3-BW	Strength class 8
	HST3-R/HST3-R-BW	Stainless steel A4, coated

Anchor dimensions of HST3, HST3-BW, HST3-R, HST3-R-BW

Anchor size			M8	M10	M12	M16	M20	M24
Maximum length of anchor	$\ell_{max} \leq$	[mm]	260	280	350	475	450	500
Shaft diameter at the cone	d_R	[mm]	5,60	6,94	8,22	11,00	14,62	17,4
Length of expansion sleeve	ℓ_s	[mm]	13,6	16,0	20,0	25,0	28,3	36,0
Diameter of washer	$d_w \geq$	[mm]	15,57	19,48	23,48	29,48	36,38	43,38

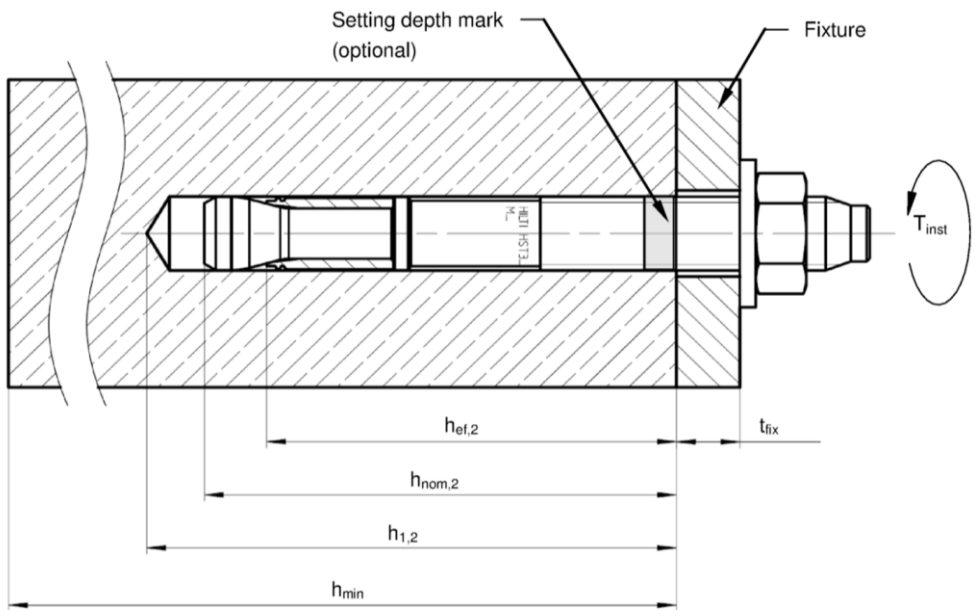


Setting information

Setting details

Anchor size			M8	M10	M12	M16	M20	M24
Nominal diameter of drill bit	d_o	[mm]	8	10	12	16	20	24
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	8,45	10,45	12,5	16,5	20,55	24,55
Effective embedment depth	$h_{ef,1}$	[mm]	-	40	50	65	-	-
	$h_{ef,2}$	[mm]	47	60	70	82	101	125
Drill hole depth[1)]	$h_{1,1} \geq$	[mm]	-	53	68	86	-	-
	$h_{1,2} \geq$		59	73	88	106	124	151
Thread engagement length	$h_{nom,1}$	[mm]	-	48	60	78	-	-
	$h_{nom,2}$	[mm]	54	68	80	98	116	143
Maximum diameter of clearance hole in the fixture	d_f	[mm]	9	12	14	18	22	26
Torque moment	T_{inst}	[Nm]	20	45	60	110	180	300
Maximum thickness of fixture	$t_{fix,max}$	[mm]	195	220	270	370	310	330
Width across	SW	[mm]	13	17	19	24	30	36

1) In case of diamond drilling +5 mm for M8 to M10 and +2 mm for M12 to M24.



Installation equipment

Anchor size	M8	M10	M12	M16	M20	M24
Rotary hammer	TE2(-A) – TE30(-A)				TE40 – TE80	
Diamond coring tool	DD-30W, DD-EC1					
Setting tool	Hilti S7W 6AT 22A – SI-AT-A22			-		
Hollow drill bit	-		TE-CD, TE-YD			
Other tools	hammer, torque wrench, blow out pump					

Setting parameters of HST3 / HST3-R for M8 and M10

Anchor Size			M8			M10			
Concrete class			**C20/25 to C50/60[a] C55/67 to C80/95[b]**		**C12/15[b] C16/20[b]**	**C12/15 to C16/20[a]**	**C20/25 to C50/60[a] C55/67 to C80/95[b]**		**C12/15[b] C16/20[b]**
Effective anchorage depth	h_{ef}	[mm]	47		47	40	60		60
Minimum base material thickness	h_{min}	[mm]	80	100	100	80	100	120	120
Minimum spacing in *non-cracked* concrete	s_{min}	[mm]	35	35	35	50	40	40	70
	for c ≥	[mm]	55	50	65	95	100	60	90
Minimum spacing in *cracked* concrete	s_{min}	[mm]	35	35	35	40	40	40	45
	for c ≥	[mm]	50	50	55	90	100	55	85
Minimum edge distance in *non-cracked* concrete	c_{min}	[mm]	40	40	50	50	60	50	80
	for s ≥	[mm]	50	50	80	190	90	90	120
Minimum edge distance in *cracked* concrete	c_{min}	[mm]	40	40	40	45	60	45	70
	for s ≥	[mm]	50	50	75	180	90	80	120
Critical spacing for splitting failure and concrete cone failure	$s_{cr,sp}$	[mm]	141		188	168	180		240
	$s_{cr,N}$	[mm]	141		141	120	180		180
Critical edge distance for splitting failure and concrete cone failure	$c_{cr,sp}$	[mm]	71		94	84	90		120
	$c_{cr,N}$	[mm]	71		71	60	90		90

Setting parameters of HST3 / HST3-R for M12 and M16

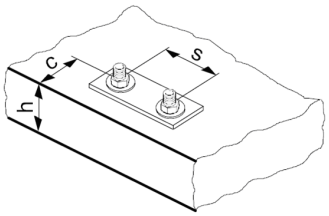
Anchor Size			M12				M16			
Concrete class			**C20/25 to C50/60[a]**	**C20/25 to C50/60[a] C55/67 to C80/95[b]**		**C12/15[b] C16/20[b]**	**C20/25 to C50/20[a]**	**C20/25 to C50/60[a] C55/67 to C80/95[b]**		**C12/15[b] C16/20[b]**
Effective anchorage	h_{ef}	[mm]	50	70		70	65	85		85
Minimum base material	h_{min}	[mm]	100	120	140	140	120	140	160	160
Minimum spacing in *non-cracked* concrete	s_{min}	[mm]	55	50	60	110	75	80	65	90
	for c	[mm]	110	100	70	140	140	130	95	145
Minimum spacing in *cracked* concrete	s_{min}	[mm]	50	50	50	80	65	80	65	70
	for c ≥	[mm]	105	90	70	120	130	130	95	125
Minimum edge distance in *non-cracked* concrete	c_{min}	[mm]	60	60	55	90	65	65	65	110
	for s ≥	[mm]	210	120	110	190	240	180	150	170
Minimum edge distance in *cracked* concrete	c_{min}	[mm]	55	60	55	80	65	65	65	90
	for s ≥	[mm]	210	120	110	170	240	180	150	165
Critical spacing for splitting failure and concrete cone failure	$s_{cr,sp}$	[mm]	180	210		280	208	255		340
	$s_{cr,N}$	[mm]	150	210		210	195	255		255
Critical edge distance for splitting failure and concrete cone failure	$c_{cr,sp}$	[mm]	90	105		140	104	128		170
	$c_{cr,N}$	[mm]	75	105		105	98	128		128

Setting parameters of HST3(-BW) / HST3-R(-BW) for M20 and M24

Anchor Size				M20			M24	
Concrete class				C20/25 to C50/60[a] C55/67 to C80/95[b]		C12/15[b] C16/20[b]	C20/25 to C50/60[a] C55/67 to C80/95[b]	C12/15[b] C16/20[b]
Effective anchorage		h_{ef}	[mm]	101		101	125	125
Minimum base material		h_{min}	[mm]	160	200	200	250	250
Minimum spacing in *non-cracked* concrete	HST3	s_{min}	[mm]	120	90	90	125	180
	HST3-BW	for c ≥	[mm]	180	130	165	255	375
	HST3-R	s_{min}	[mm]	120	90	90	125	180
	HST3-R-BW	for c ≥	[mm]	180	130	165	205	375
Minimum spacing in *cracked* concrete	HST3	s_{min}	[mm]	120	90	90	125	140
	HST3-BW	for c ≥	[mm]	180	130	165	180	325
	HST3-	s_{min}	[mm]	120	90	90	125	140
	HST3-R-BW	for c ≥	[mm]	180	130	140	130	325
Min. edge distance in *non-cracked* concrete	HST3	c_{min}	[mm]	120	80	90	170	260
	HST3-BW	for s ≥	[mm]	180	180	140	295	400
	HST3-R	c_{min}	[mm]	120	80	120	150	260
	HST3-R-BW	for s ≥	[mm]	180	180	270	235	400
Min. edge distance in *cracked* concrete	HST3	c_{min}	[mm]	120	80	100	125	230
	HST3-BW	for s ≥	[mm]	180	180	240	240	295
	HST3-R	c_{min}	[mm]	120	80	100	125	230
	HST3-R-BW	for s ≥	[mm]	180	180	240	140	295
Critical spacing for splitting failure and concrete cone failure		$s_{cr,sp}$	[mm]	384		404	375	500
		$s_{cr,N}$	[mm]	303		303	375	375
Critical spacing for splitting failure and concrete cone failure		$c_{cr,sp}$	[mm]	192		202	188	250
		$c_{cr,N}$	[mm]	152		152	188	188

a) Data covered by ETA-98/0001 issue 2017-20-07.
b) Data covered by Hilti Technical Data

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



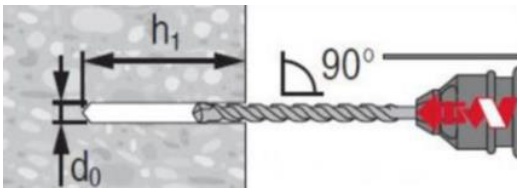
Setting instructions

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

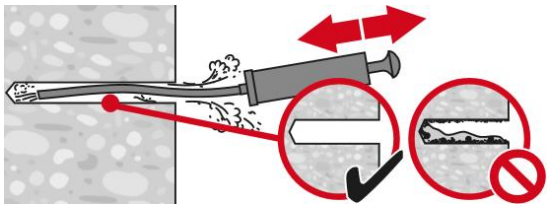
Setting instruction for HST3, HST3-BW, HST3-R, HST3-R-BW

Hammer drilling (M8, M10, M12, M16, M20, M24)

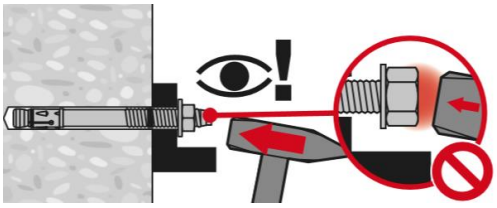
1. Drill the hole



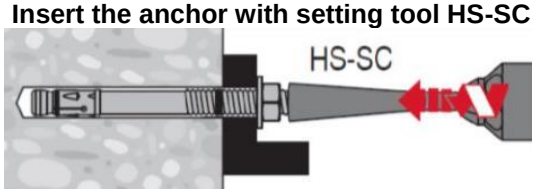
2. Clean the hole



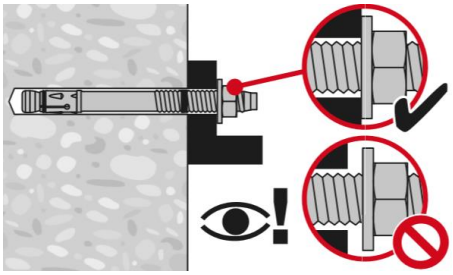
3a. Insert the anchor with hammer



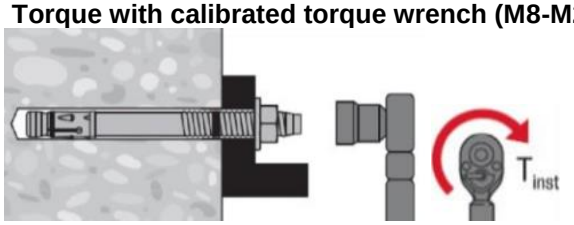
3a. Insert the anchor with setting tool HS-SC



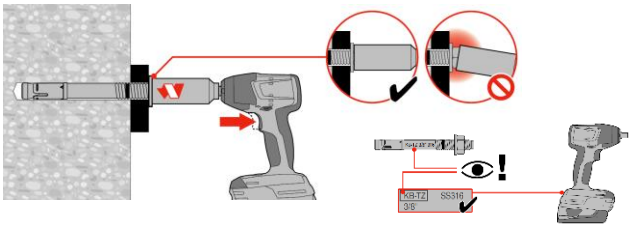
4. Check

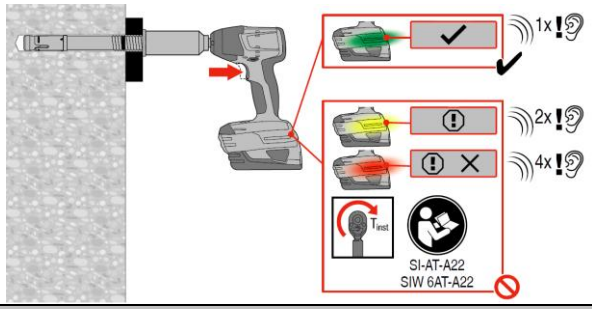


5a. Torque with calibrated torque wrench (M8-M24)



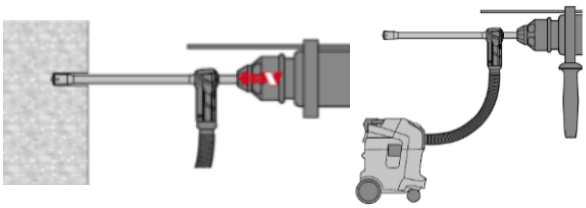
5b. Torque with impact wrench with Adaptative torque module (M8-M12)



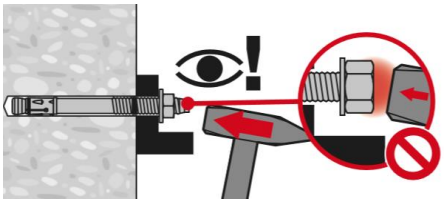


Hollow Drill Bit (M16, M20, M24), no cleaning required

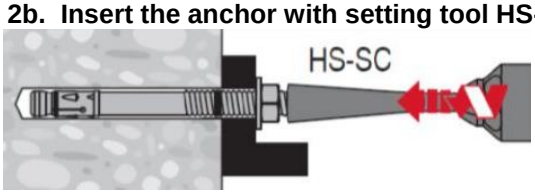
1. Drill the hole with the Hollow drill bit



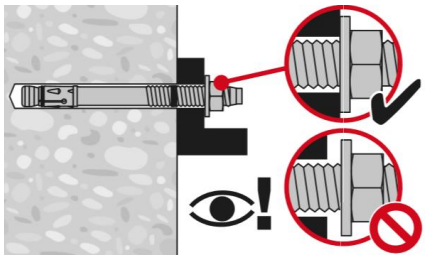
2a. Insert the anchor with hammer



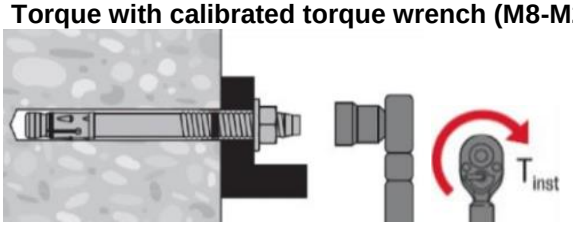
2b. Insert the anchor with setting tool HS-SC



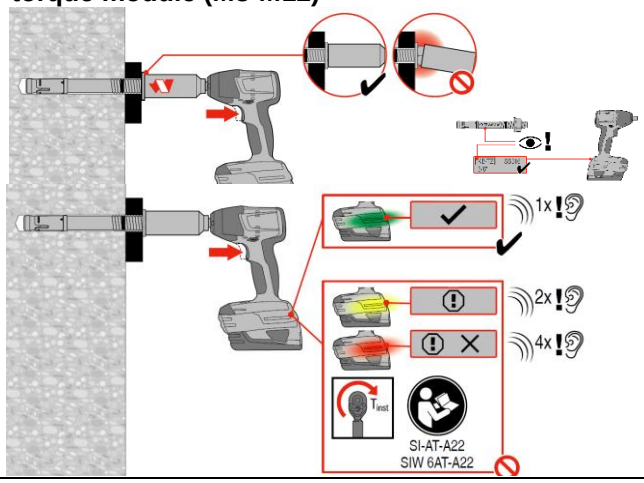
3. Check



5a. Torque with calibrated torque wrench (M8-M24)

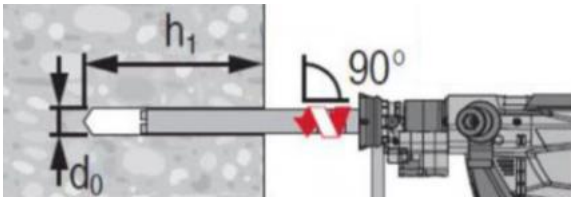


5b. Torque with impact wrench with Adaptative torque module (M8-M12)

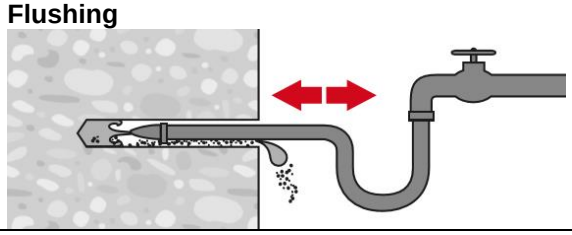


Diamond coring (M8, M10, M12, M16, M20, M24)

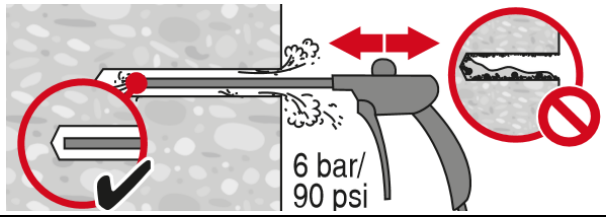
1. Core the hole



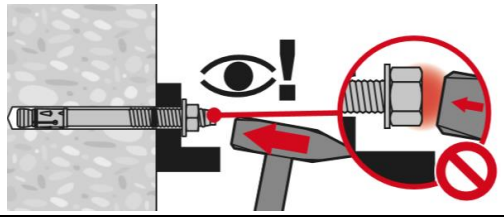
2. Flushing



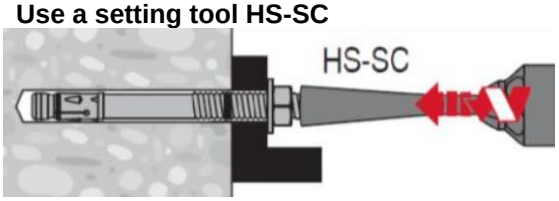
3. Clean the hole



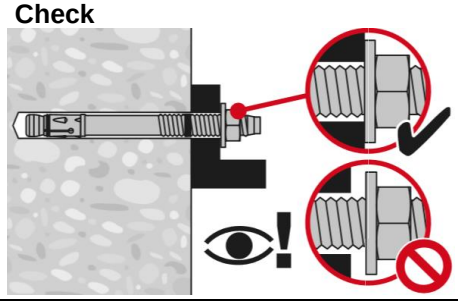
4a. Insert the anchor with hammer



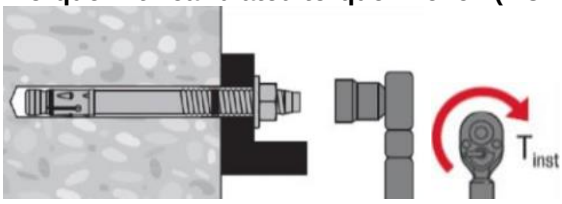
4b. Use a setting tool HS-SC



5. Check



6a. Torque with calibrated torque wrench (M8-M24)



5b. Torque with impact wrench with Adaptative torque module (M8-M12)