



# HST-3 EXPANSION ANCHOR



**Technical Datasheet**



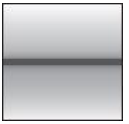




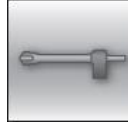





**Update: Apr-20**



# HST3 Expansion anchor

Ultimate-performance expansion anchor for cracked concrete and seismic

Anchor version	Benefits
 <p>HST3 HST3-R (M8-M24)</p>	<ul style="list-style-type: none"> <li>- Highest resistance for reduced member thickness, short spacing and edge distances</li> <li>- Increased undercut percentage in combination with optimized coating</li> <li>- Suitable for non-cracked and cracked concrete C 12/15 to C 80/95</li> <li>- Highly reliable and safe anchor for structural seismic design with ETA C1/C2 approval</li> <li>- Flexibility with two embedment depths included in the ETA</li> </ul>
 <p>HST3-BW HST3-R-BW (M8-M24)</p>	<ul style="list-style-type: none"> <li>- Minimum edge and spacing distances reduced by up to 25% compared to HST</li> <li>- Design tension resistance increased by up to 66% compared to HST</li> <li>- Product and length identification mark facilitates quality control and inspection</li> </ul>

Base material	Load conditions
 <p>Concrete (non-cracked)</p>  <p>Concrete (cracked)</p>	 <p>Static/ quasi-static</p>  <p>Seismic ETA-C1/C2</p>  <p>Fire resistance</p>
Installation conditions	Other information
 <p>Hammer drilled holes</p>  <p>Diamond drilled holes</p>  <p>Hollow drill-bit drilling</p>  <p>Impact wrench with adaptative torque module</p>	 <p>European Technical Assessment</p>  <p>CE conformity</p>  <p>PROFIS Anchor design Software</p>  <p>FM approved</p>

### Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European technical assessment <sup>a)</sup>	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,  $f_{ck,cube} = 25 \text{ N/mm}^2$

### 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	
<b>Non-cracked concrete</b>											
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
<b>Cracked concrete</b>											
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	
<b>Non-cracked concrete</b>											
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
<b>Cracked concrete</b>											
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<sup>a)</sup>

Anchor size		M8	M10	M12	M16	M20	M24				
<b>Non-cracked concrete</b>											
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
<b>Cracked concrete</b>											
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  $\gamma = 1,4$ , 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,  $f_{ck,cube} = 25 \text{ N/mm}^2$
- $\alpha_{gap} = 1,0$  (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 [kN]	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 [kN]	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,  $f_{ck,cube} = 25 \text{ N/mm}^2$
- Hilti technical data for concrete strength class C55/67 to C80/95: for a structural element that fulfills 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
<b>Fire Exposure R30</b>										
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 [kN]	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 [kN]	4,9	4,7	11,8	8,9	17,1	16,9	31,9	37,0	62,8
<b>Fire Exposure R120</b>										
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 [kN]	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 [kN]	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
<b>Fire Exposure R30</b>										
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 [kN]	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 [kN]	4,9	4,7	11,8	8,9	17,1	16,9	31,9	37,0	62,8
<b>Fire Exposure R120</b>										
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 [kN]	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 [kN]	1,7	2,0	3,3	3,3	4,8	6,2	9,0	14,1	20,3

## Materials

### Mechanical properties

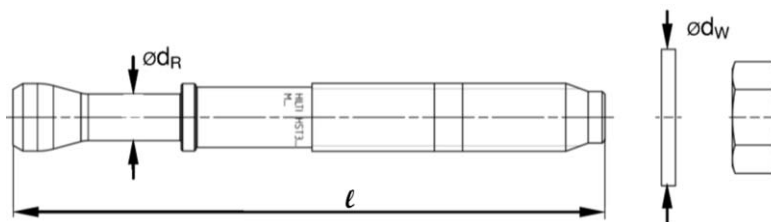
Anchor size		M8	M10	M12	M16	M20	M24
Nominal tensile strength $f_{uk,thread}$	HST3/HST3-BW	800	800	800	720	700	530
	HST3-R/HST3-R-BW	720	710	710	650	650	650
Yield strength $f_{yk,thread}$	HST3/HST3-BW	640	640	640	576	560	450
	HST3-R/HST3-R-BW	576	568	568	520	520	500
Stressed cross-section $A_s$		36,6	58,0	84,3	157	245	353
Moment of resistance $W$		31,2	62,3	109	277	541	935
Char, bending resistance $M^{0}_{Rk,s}$	HST3/HST3-BW	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
	HST3-R/HST3-R-BW	M8, M12, M20, M24: Stainless steel
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	$l_{max} \leq$ [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

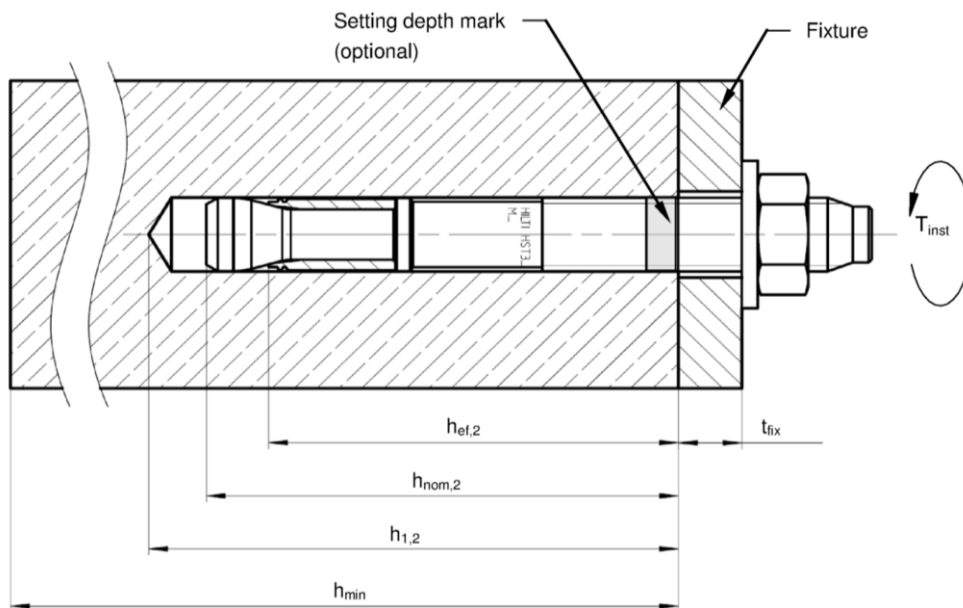


## Setting information

### 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 <sup>1)</sup>	$h_{1,1} \geq$ [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 <sup>a)</sup> C55/67 to C80/95 <sup>b)</sup>	C12/15 <sup>b)</sup> C16/20 <sup>b)</sup>	C12/15 to C16/20 <sup>a)</sup>	C20/25 to C50/60 <sup>a)</sup> C55/67 to C80/95 <sup>b)</sup>	C12/15 <sup>b)</sup> C16/20 <sup>b)</sup>		
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 <i>non-cracked</i> concrete	$s_{min}$	[mm]	35	35	35	50	40	40	70
	for $c \geq$	[mm]	55	50	65	95	100	60	90
Minimum spacing in <i>cracked</i> concrete	$s_{min}$	[mm]	35	35	35	40	40	40	45
	for $c \geq$	[mm]	50	50	55	90	100	55	85
Minimum edge distance in <i>non-cracked</i> concrete	$c_{min}$	[mm]	40	40	50	50	60	50	80
	for $s \geq$	[mm]	50	50	80	190	90	90	120
Minimum edge distance in <i>cracked</i> concrete	$c_{min}$	[mm]	40	40	40	45	60	45	70
	for $s \geq$	[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 <sup>a)</sup>	C20/25 to C50/60 <sup>a)</sup> C55/67 to C80/95 <sup>b)</sup>	C12/15 <sup>b)</sup> C16/20 <sup>b)</sup>	C20/25 to C50/20 <sup>a)</sup>	C20/25 to C50/60 <sup>a)</sup> C55/67 to C80/95 <sup>b)</sup>	C12/15 <sup>b)</sup> C16/20 <sup>b)</sup>		
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 <i>non-cracked</i> 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 <i>cracked</i> concrete	$s_{min}$	[mm]	50	50	50	80	65	80	65	70
	for $c \geq$	[mm]	105	90	70	120	130	130	95	125
Minimum edge distance in <i>non-cracked</i> concrete	$c_{min}$	[mm]	60	60	55	90	65	65	65	110
	for $s \geq$	[mm]	210	120	110	190	240	180	150	170
Minimum edge distance in <i>cracked</i> concrete	$c_{min}$	[mm]	55	60	55	80	65	65	65	90
	for $s \geq$	[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



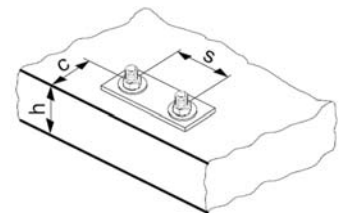
**Setting parameters of HST3(-BW) / HST3-R(-BW) for M20 and M24**

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

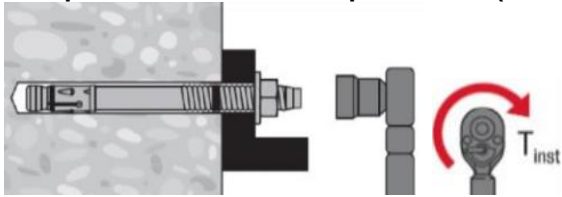


Setting instructions

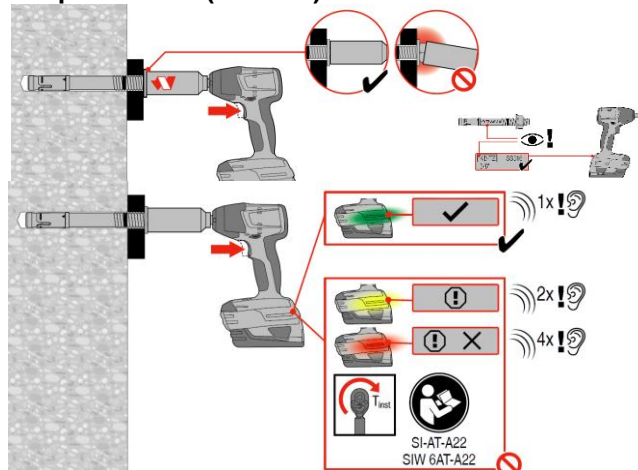
\*For detailed information on installation see instruction for use given with the package of the product

Setting instruction for HST3, HST3-BW, HST3-R, HST3-R-BW	
Hammer drilling (M8, M10, M12, M16, M20, M24)	
<p>1. Drill the hole</p>	<p>2. Clean the hole</p>
<p>3a. Insert the anchor with hammer</p>	<p>3a. Insert the anchor with setting tool HS-SC</p>
<p>4. Check</p>	<p>5a. Torque with calibrated torque wrench (M8-M24)</p>
<p>5b. Torque with impact wrench with Adaptive torque module (M8-M12)</p>	
Hollow Drill Bit (M16, M20, M24), no cleaning required	
<p>1. Drill the hole with the Hollow drill bit</p>	<p>2a. Insert the anchor with hammer</p>
<p>2b. Insert the anchor with setting tool HS-SC</p>	<p>3. Check</p>

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

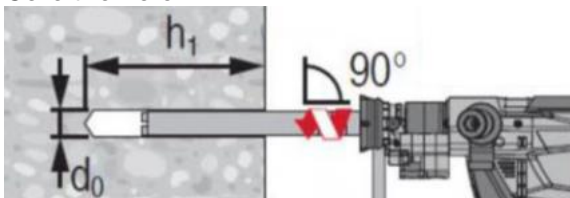


**5b. Torque with impact wrench with Adaptive torque module (M8-M12)**

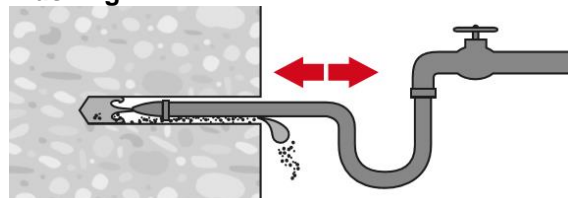


**Diamond coring (M8, M10, M12, M16, M20, M24)**

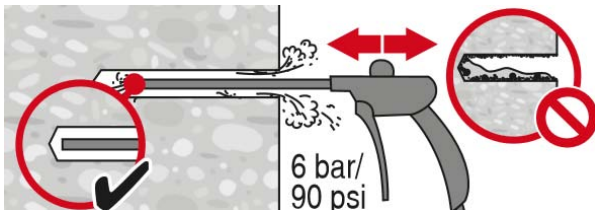
**1. Core the hole**



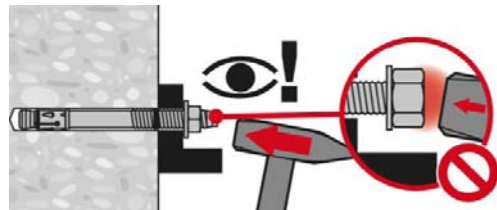
**2. Flushing**



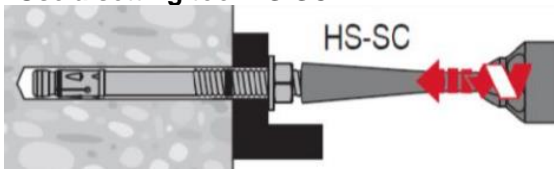
**3. Clean the hole**



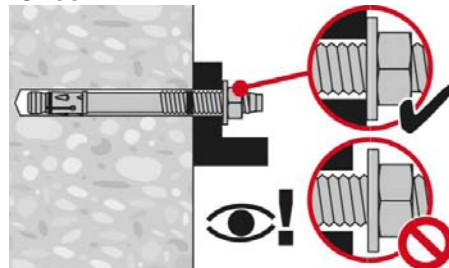
**4a. Insert the anchor with hammer**



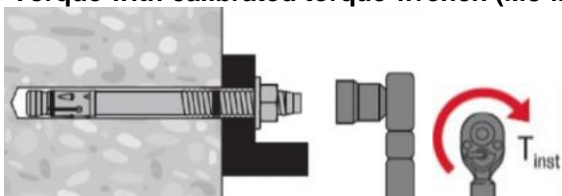
**4b. Use a setting tool HS-SC**



**5. Check**



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



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

