

Approval body for construction products
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and
Laender Governments



European Technical Assessment

ETA-11/0374
of 22 October 2020

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the
European Technical Assessment:

Deutsches Institut für Bautechnik

Trade name of the construction product

Hilti metal expansion anchor HSA

Product family
to which the construction product belongs

Mechanical fastener for use in uncracked concrete

Manufacturer

Hilti Aktiengesellschaft
Business Unit Anchors
9494 Schaan
FÜRSTENTUM LIECHTENSTEIN

Manufacturing plant

Hilti Werke

This European Technical Assessment
contains

18 pages including 3 annexes which form an integral part
of this assessment

This European Technical Assessment is
issued in accordance with Regulation (EU)
No 305/2011, on the basis of

EAD 330232-01-0601 Edition 12/2019

This version replaces

ETA-11/0374 issued on 28 August 2017

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Specific Part

1 Technical description of the product

The Hilti metal expansion anchor HSA is a torque-controlled expansion fastener which is placed into a drilled hole and anchored by torque-controlled expansion.
The product description is given in Annex A.

2 Specification of the intended use in accordance with the applicable European Assessment Document

The performances given in Section 3 are only valid if the anchor is used in compliance with the specifications and conditions given in Annex B.
The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the anchor of at least 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

3 Performance of the product and references to the methods used for its assessment

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Characteristic resistance to tension load (static and quasi static action) Method A	See Annex B3 and C1
Characteristic resistance to shear load (static and quasi static action)	See Annex C2
Displacements and Durability	See Annex C3 and B1
Characteristic resistance and displacements for seismic performance categories C1 and C2	No performance assessed

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire	No performance assessed

4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

In accordance with the European Assessment Document EAD 330232-01-0601 the applicable European legal act is: [96/582/EC].
The system to be applied is: 1

English translation prepared by DIBt

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

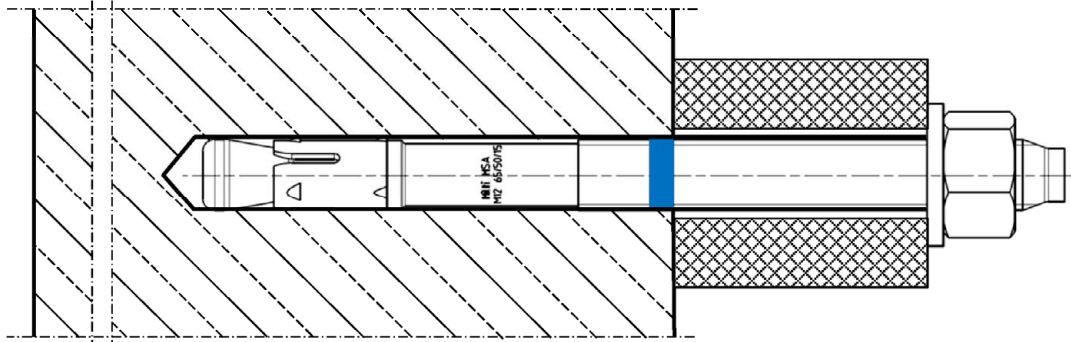
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

Issued in Berlin on 22 October 2020 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow
Head of Department

beglaubigt:
Lange

Installed condition

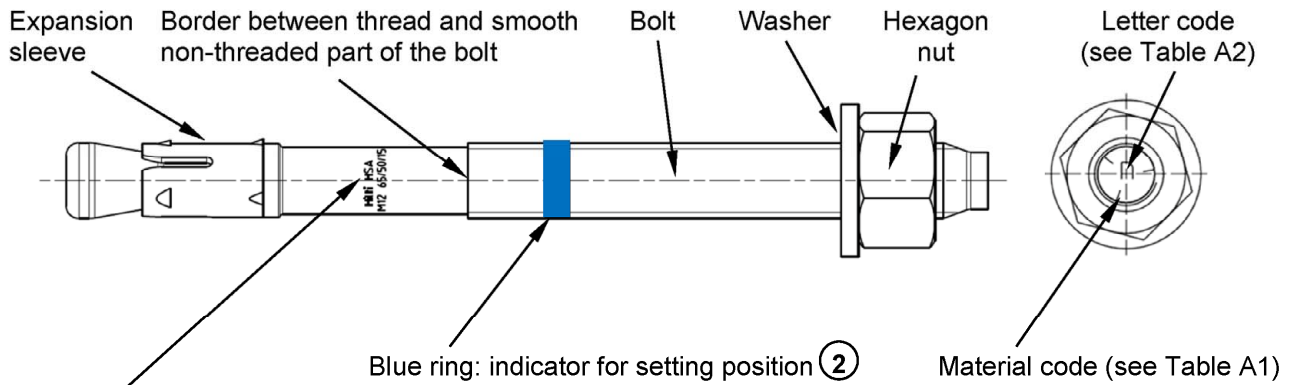


Hilti metal expansion anchor HSA

Product description
Installed condition

Annex A1

Product description: Hilti metal expansion anchor HSA, HSA-BW, HSA-F, HSA-R2 and HSA-R

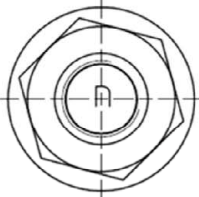

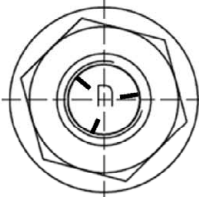


Marking:

Hilti HSA M... $t_{fix,1}/t_{fix,2}/t_{fix,3}$

Brand and metal expansion anchor type as well as metal expansion anchor size and max. fixture thicknesses $t_{fix,1}/t_{fix,2}/t_{fix,3}$

Table A1: Material code for identification of different materials

	HSA, HSA-BW, HSA-F	HSA-R2	HSA-R
Material code	 Letter code without mark	 Letter code with two marks	 Letter code with three marks

Hilti metal expansion anchor HSA

Product description

Product marking and material code for identification of metal expansion anchor

Annex A2

Table A2: Letter code for identification of maximum fixture thickness¹⁾

Size	M6	M8	M10	M12	M16	M20
	$t_{fix,1}/t_{fix,2}/t_{fix,3}$	$t_{fix,1}/t_{fix,2}/t_{fix,3}$	$t_{fix,1}/t_{fix,2}/t_{fix,3}$	$t_{fix,1}/t_{fix,2}/t_{fix,3}$	$t_{fix,1}/t_{fix,2}/t_{fix,3}$	$t_{fix,1}/t_{fix,2}/t_{fix,3}$
	[mm]/[mm]/[mm]	[mm]/[mm]/[mm]	[mm]/[mm]/[mm]	[mm]/[mm]/[mm]	[mm]/[mm]/[mm]	[mm]/[mm]/[mm]
<u>z</u>	5/-/-	5/-/-	5/-/-	5/-/-	5/-/-	5/-/-
<u>y</u>	10/-/-	10/-/-	10/-/-	10/-/-	10/-/-	10/-/-
<u>x</u>	15/5/-	15/5/-	15/5/-	15/-/-	15/-/-	15/-/-
<u>w</u>	20/10/-	20/10/-	20/10/-	20/5/-	20/5/-	20/-/-
<u>v</u>	25/15/-	25/15/-	25/15	25/10/-	25/10/-	25/-/-
<u>u</u>	30/20/-	30/20/-	30/20/-	30/15/-	30/15/-	30/5/-
<u>t</u>	35/25/5	35/25/-	35/25/-	35/20/-	35/20/-	35/10/-
<u>s</u>	40/30/10	40/30/-	40/30/-	40/25/-	40/25/-	40/15/-
<u>r</u>	45/35/15	45/35/5	45/35/5	45/30/-	45/30/-	45/20/5
<u>q</u>	50/40/20	50/40/10	50/40/10	50/35/-	50/35/-	50/25/10
<u>p</u>	55/45/25	55/45/15	55/45/15	55/40/5	55/40/-	55/30/15
<u>o</u>	60/50/30	60/50/20	60/50/20	60/45/10	60/45/5	60/35/20
<u>n</u>	65/55/35	65/55/25	65/55/25	65/50/15	65/50/10	65/40/25
<u>m</u>	70/60/40	70/60/30	70/60/30	70/55/20	70/55/15	70/45/30
<u>l</u>	75/65/45	75/65/35	75/65/35	75/60/25	75/60/20	75/50/35
<u>k</u>	80/70/50	80/70/40	80/70/40	80/65/30	80/65/25	80/55/40
<u>i</u>	85/75/55	85/75/45	85/75/45	85/70/35	85/70/30	85/60/45
<u>j</u>	90/80/60	90/80/50	90/80/50	90/75/40	90/75/35	90/65/50
<u>h</u>	95/85/65	95/85/55	95/85/55	95/80/45	95/80/40	95/70/55
<u>g</u>	100/90/70	100/90/60	100/90/60	100/85/50	100/85/45	100/75/60
<u>f</u>	105/95/75	105/95/65	105/95/65	105/90/55	105/90/50	105/80/65
<u>e</u>	110/100/80	110/100/70	110/100/70	110/95/60	110/95/55	110/85/70
<u>d</u>	115/105/85	115/105/75	115/105/75	115/100/65	115/100/60	115/90/75
<u>c</u>	120/110/90	120/110/80	120/110/80	125/110/75	120/105/65	120/95/80
<u>b</u>	125/115/95	125/115/85	125/115/85	135/120/85	125/110/70	125/100/85
<u>a</u>	130/120/100	130/120/90	130/120/90	145/130/95	135/120/80	130/105/90
aa	-	-	-	155/140/105	145/130/90	-
ab	-	-	-	165/150/115	155/140/100	-
ac	-	-	-	175/160/125	165/150/110	-
ad	-	-	-	180/165/130	190/175/135	-
ae	-	-	-	230/215/180	240/225/185	-
af	-	-	-	280/265/230	290/275/235	-
ag	-	-	-	330/315/280	340/325/285	-

¹⁾ Anchor length in bold is standard item. For selection of other anchor lengths, check availability of the items.

Hilti metal expansion anchor HSA

Product description

Letter code for identification of metal expansion anchor

Annex A3

Table A3: Materials

Designation	Material
HSA, HSA-BW	
Expansion sleeve	M6: Stainless steel A2 acc. to EN 10088-1:2014 M8 – M20: Carbon steel, galvanized
Bolt	Carbon steel, galvanized, rupture elongation ($l_0 = 5d$) > 8 %
Washer	Carbon steel, galvanized
Hexagon nut	Carbon steel, galvanized
HSA-F	
Expansion sleeve	Stainless steel A2 acc. to EN 10088-1:2014
Bolt	Hot-dip galvanized, rupture elongation ($l_0 = 5d$) > 8%
Washer	Hot-dip galvanized
Hexagon nut	Hot-dip galvanized
HSA-R2 (stainless steel) Corrosion resistance class II acc. to EN 1993-1-4:2006+A1:2015	
Expansion sleeve	Stainless steel A2 acc. to EN 10088-1:2014
Bolt	Stainless steel acc. to EN 10088-1:2014, coated, rupture elongation ($l_0 = 5d$) > 8%
Washer	Stainless steel A2
Hexagon nut	Stainless steel A2, coated
HSA-R (stainless steel) Corrosion resistance class III acc. to EN 1993-1-4:2006+A1:2015	
Expansion sleeve	Stainless steel A2 acc. to EN 10088-1:2014
Bolt	Stainless steel acc. to EN 10088-1:2014, coated, rupture elongation ($l_0 = 5d$) > 8%
Washer	Stainless steel A4
Hexagon nut	Stainless steel A4, coated

Hilti metal expansion anchor HSA

Product description
Materials

Annex A4

Table A4: Dimensions of Hilti metal expansion anchor HSA, HSA-BW, HSA-F, HSA-R2 and HSA-R

Size			M6	M8	M10	M12	M16	M20
Min. inner diameter of washer	d_1	[mm]	6,4	8,4	10,5	13	17	21
Min. outer diameter of washer	d_w	[mm]	12	16	20	24	30	37
Min. thickness of washer	h	[mm]	1,6	1,6	2	2,5	3	3

Figure A1: Hilti metal expansion anchor HSA, HSA-F, HSA-R2, HSA-R

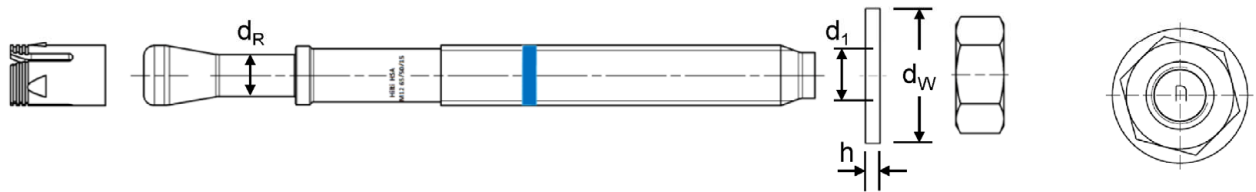
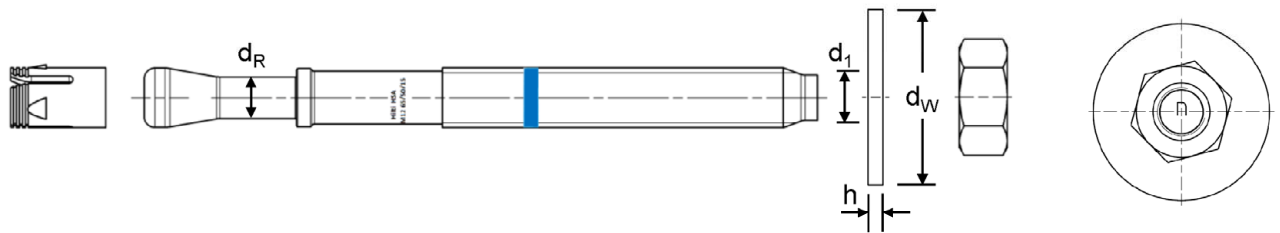


Figure A2: Hilti metal expansion anchor HSA-BW



Hilti metal expansion anchor HSA

Product description
Dimensions

Annex A5

Specifications of intended use

Anchorage subject to:

- Static and quasi static loading.

Base materials:

- Compacted reinforced or unreinforced normal weight concrete without fibres according to EN 206:2013+A1:2016.
- Strength classes C20/25 to C50/60 according to EN 206:2013+A1:2016.
- Non-cracked concrete.

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions (all materials).
- For all other conditions according EN 1993-1-4:2006+A1:2015-06 corresponding to corrosion resistance classes Annex A, Table A3 (stainless steel).

Design:

- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored. The position of the metal expansion anchor is indicated on the design drawings (e. g. position of the metal expansion anchor relative to reinforcement or to supports, etc.).
- Anchorages under static or quasi static loading are designed in accordance with: EN 1992-4:2018 and EOTA Technical Report TR 055.

Installation:

- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- The metal expansion anchor may only be set once.

Hilti metal expansion anchor HSA

Intended use
Specifications

Annex B1

Table B1: Drilling technique




Size		M6	M8	M10	M12	M16	M20	
Hammer drilling (HD)		✓						
Hammer drilling with Hilti hollow drill bit TE-CD/YD ... drilling system (HDB)		-	-	-		✓		
Diamond coring (DD) with DD 30-W coring tool and C+ ... SPX-T (abrasive) core bits		-	-		✓			

Table B2: Drill hole cleaning






Manual cleaning (MC): Hilti hand pump for blowing out drill holes.	
Automatic cleaning (AC): Cleaning is performed during drilling with Hilti TE-CD and TE-YD drilling system including vacuum cleaner.	

Table B3: Setting alternatives

Size	M6	M8	M10	M12	M16	M20
Hammer setting	✓					
Machine setting (impact screwdriver with setting tool)	-		✓			-

Table B4: Methods for application of torque moment

Size		M6	M8	M10	M12	M16	M20
Torque wrench		✓					
Setting tool S-TB HSA ... with impact screwdriver Hilti SIW ... ¹⁾		-		✓			-
Setting speed	HSA, HSA-BW, HSA-F	-	I	I	III	- ²⁾	
	HSA-R2, HSA-R	-		III			-
Setting time t_{set}	[sec.]	-		4			-
Hilti SIW 6AT-A22 impact screwdriver with SI-AT-A22 module	HSA, HSA-BW HSA-R2, HSA-R 	-		✓			-

¹⁾ see Table B5 for battery state of charge depending on the ambient temperature.

²⁾ Impact screwdriver operates with fixed speed.

Table B5: Battery state of charge of impact screwdriver

Ambient temperature		$\leq +5\text{ °C}$	$+5\text{ to }+10\text{ °C}$	$\geq +10\text{ °C}$
Battery state of charge	low	-	-	-
	middle	-	-	✓
	high	-	✓	✓

Hilti metal expansion anchor HSA

Intended use
Installation methods

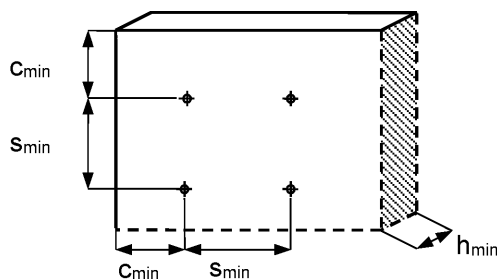
Annex B2

Table B6: Installation parameters

Size	M6			M8			M10			M12			M16			M20								
Nominal diameter of drill bit d_0 [mm]	6			8			10			12			16			20								
Max. cutting diameter of drill bit d_{cut} [mm]	6,4			8,45			10,45			12,5			16,5			20,55								
Diameter of clearance hole in the fixture d_f [mm]	7			9			12			14			18			22								
Width across flats SW [mm]	10			13			17			19			24			30								
Setting position	①	②	③	①	②	③	①	②	③	①	②	③	①	②	③	①	②	③						
Min. thickness of concrete member h_{min} [mm]	100			120			100			120			100			120			160			220		
Nominal anchorage depth h_{nom} [mm]	37	47	67	39	49	79	50	60	90	64	79	114	77	92	132	90	115	130						
Effective anchorage depth h_{ef} [mm]	30	40	60	30	40	70	40	50	80	50	65	100	65	80	120	75	100	115						
Min. drill hole depth (HD, HDB) h_1 [mm]	42	52	72	44	54	84	55	65	95	72	87	122	85	100	140	98	123	138						
Min. drill hole depth (DD) h_1 [mm]	-			-			58	68	98	72	87	122	85	100	140	98	123	138						
Standard installation torque moment																								
Installation torque moment T_{inst} [Nm]	5			15 ¹⁾²⁾			25 ¹⁾²⁾			50 ¹⁾²⁾			80 ¹⁾²⁾			200								
Min. spacing s_{min} [mm]	35			35			50			70			90			195	175							
Min. edge distance c_{min} [mm]	35			40	35	50	40	70	65	55	80	75	70	130	120									
Max. installation torque moment																								
Max. installation torque moment T_{max} [Nm]	-			20			35			80			150			250								
Min. spacing s_{min} [mm]	-			35			40			50			80			120								
Min. edge distance c_{min} [mm]	-			100			150			190			200			225								

1) Alternatively, the metal expansion anchor can be tightened with an impact screwdriver in combination with a setting tool with the required setting time (see Annex B2).

2) Alternatively, the metal expansion anchor can be tightened with an impact screwdriver in combination with module (see Annex B2).

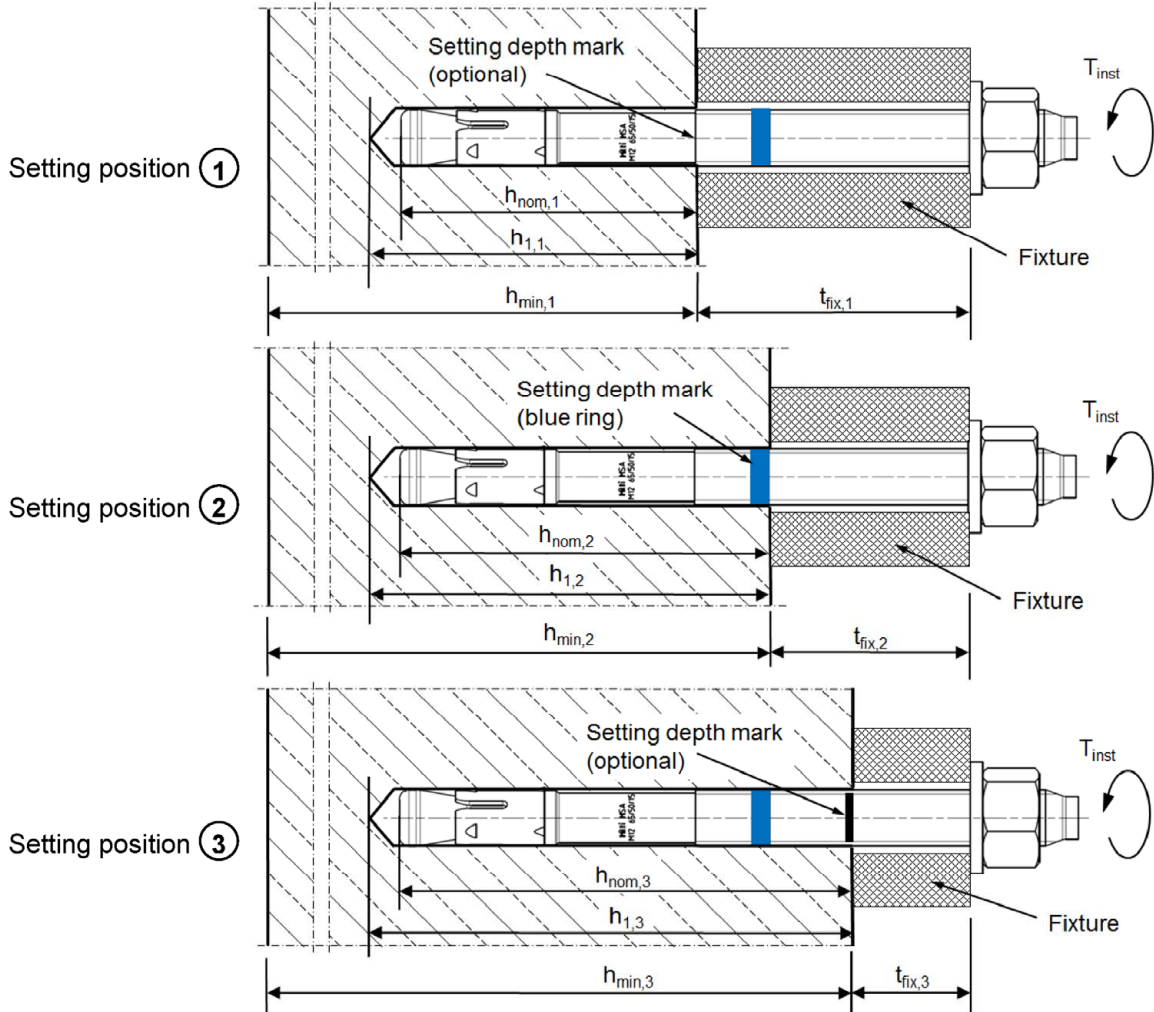


Hilti metal expansion anchor HSA

Intended use
Installation parameters

Annex B3

Figure B1: Constant anchor length with various fixture thicknesses t_{fix} and corresponding setting position



Hilti metal expansion anchor HSA

Intended use
Installation parameters

Annex B4

Figure B2: Various anchor lengths for different setting positions and corresponding fixture thickness t_{fix}

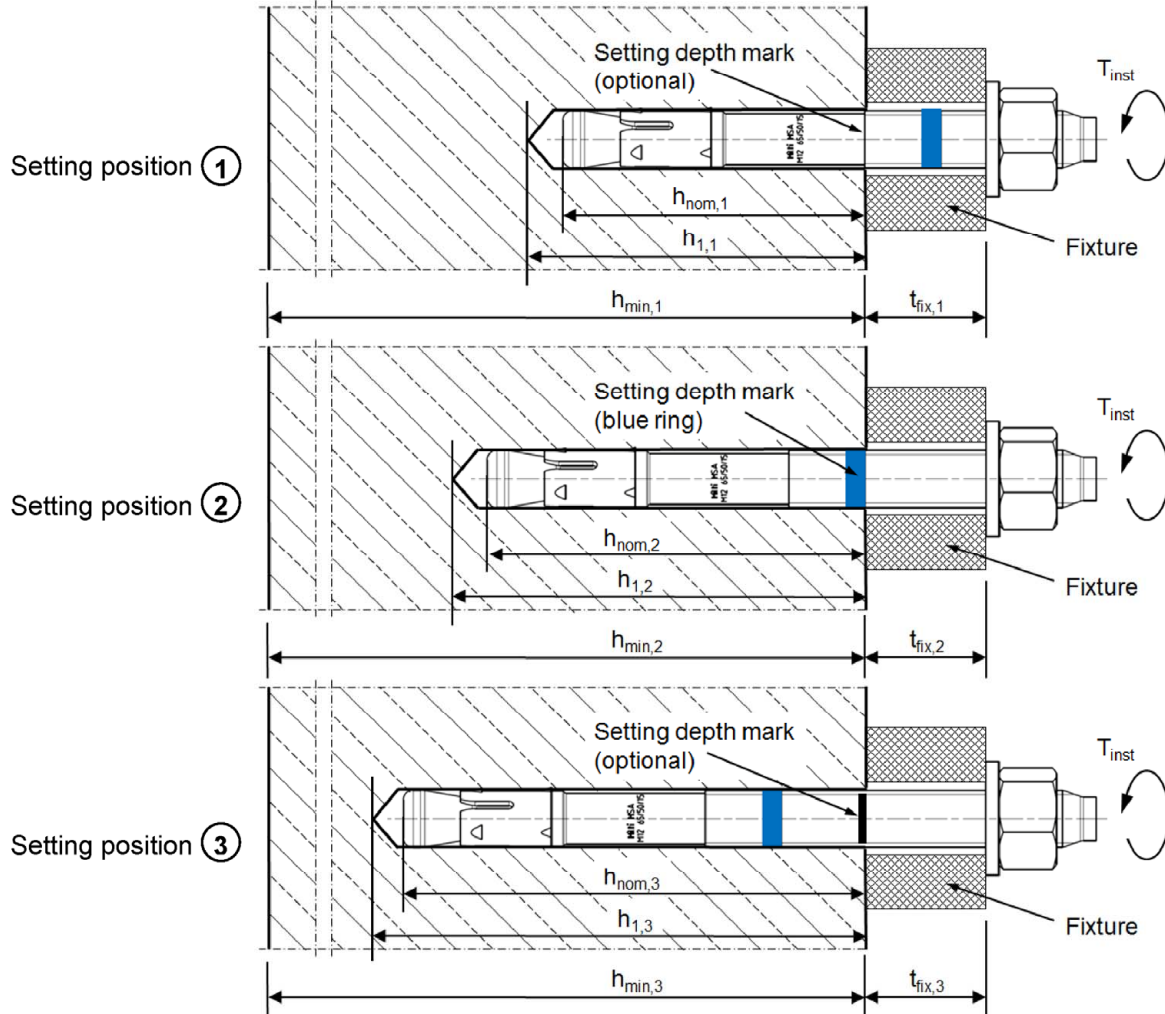


Table B7: Checking setting position

Setting position	Pre-setting	Through setting
①	$h_{nom,1}$ is reached when the non-threaded part of the bolt is completely below the concrete surface. For metal expansion anchor HSA with letter code "aa" to "ag" (see Table A2) $h_{nom,1}$ has to be measured and marked by the installer.	$h_{nom,1}$, $h_{nom,2}$ or $h_{nom,3}$ is reached when the present thickness of the fixture t_{fix} and the maximum thickness of the fixture $t_{fix,1}/t_{fix,2}/t_{fix,3}$ given by the metal expansion anchor HSA (see Table A2) is identical. If the present thickness of the fixture t_{fix} is smaller than the maximum thickness of the fixture $t_{fix,1}/t_{fix,2}/t_{fix,3}$ given by the metal expansion anchor HSA <ul style="list-style-type: none"> position of washer and hexagon nut has to be adjusted or drill hole depth h_1 has to be increased.
②	$h_{nom,2}$ is reached when the blue ring is completely below the concrete surface.	
③	$h_{nom,3}$ has to be measured and marked by the installer.	

Hilti metal expansion anchor HSA

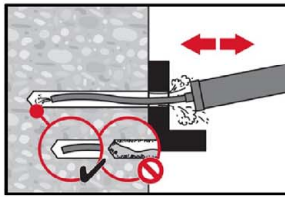
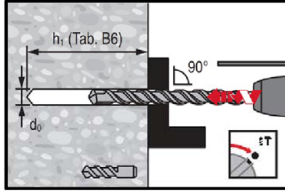
Intended use
Installation parameters

Annex B5

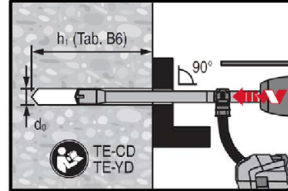
Installation instruction

Hole drilling and cleaning (see Table B1 and Table B2)

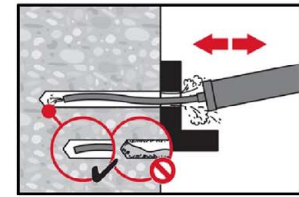
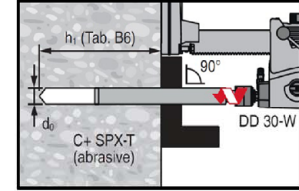
a) Hammer drilling (HD) with manual cleaning (MC)



b) Hammer drilling with Hilti hollow drill bit (HDB) with automatic cleaning (AC)

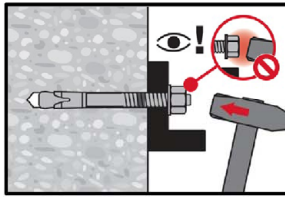


c) Diamond coring (DD) with manual cleaning (MC)

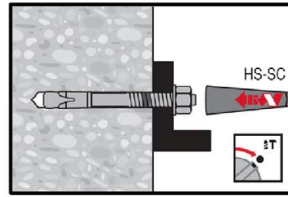


Anchor setting (see Table B3)

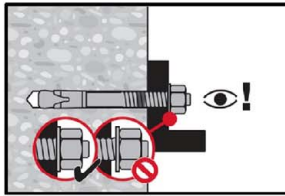
a) Hammer setting



b) Machine setting (impact screwdriver with setting tool)

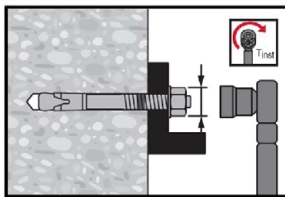


Check setting (see also Table B7)

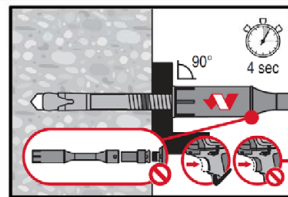


Anchor torquing (see Table B4 and Table B5)

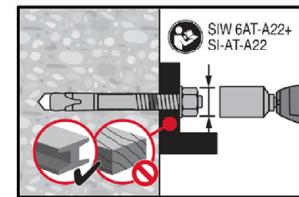
a) Torque wrench



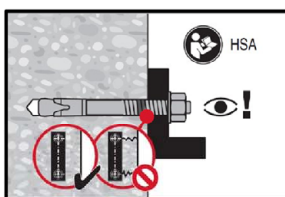
b) Impact screwdriver with setting tool



c) Impact screwdriver with module



Check installation



Hilti metal expansion anchor HSA

Intended use
Installation instructions

Annex B6

Table C1: Characteristic resistance under tension load in non-cracked concrete

Size		M6			M8			M10			M12			M16			M20		
Setting position		①	②	③	①	②	③	①	②	③	①	②	③	①	②	③	①	②	③
Effective anchorage depth	h_{ef} [mm]	30 ¹⁾	40	60	30 ¹⁾	40	70	40	50	80	50	65	100	65	80	120	75	100	115
Steel failure																			
Partial safety factor	γ_{Ms^2} [-]	1,4																	
HSA, HSA-BW																			
Characteristic resistance	$N_{Rk,s}$ [kN]	9,0			16,5			28,0			41,4			82,6			124		
HSA-F																			
Characteristic resistance	$N_{Rk,s}$ [kN]	9,5			15,9			27,0			40,4			80,1			3)		
HSA-R2, HSA-R																			
Characteristic resistance	$N_{Rk,s}$ [kN]	12,2			18,3			35,6			44,6			90,5			97,6		
Pullout failure																			
Installation safety factor	γ_{inst} [-]	1,0																	
Characteristic resistance	$N_{Rk,p}$ [kN]	6	7,5	9	8,1	12,4	16	12,4	17,4	25	17,4	25,8	35	25,8	35,2	50	32	49,2	60,7
Increasing factor	ψ_c	1,00																	
	C20/25 [-]	1,22																	
	C30/37 [-]	1,41																	
	C40/50 [-]	1,55																	
C50/60 [-]	1,55																		
Concrete cone and splitting failure																			
Installation safety factor	γ_{inst} [-]	1,0																	
Factor for non-cracked concrete	$k_{ucr,N}$ [-]	11,0																	
Factor for cracked concrete	$k_{cr,N}$ [-]	3)																	
Spacing	$s_{cr,N}$ [mm]	$3 \cdot h_{ef}$																	
	$s_{cr,sp}$ [mm]	100	120	130	130	180	200	190	210	290	200	250	310	230	280	380	260	370	400
Edge distance	$c_{cr,N}$ [mm]	$1,5 \cdot h_{ef}$																	
	$c_{cr,sp}$ [mm]	50	60	65	65	90	100	95	105	145	100	125	155	115	140	190	130	185	200
Characteristic resistance	$N^0_{Rk,sp}$ [kN]	6	7,5	9	8,1	12,4	16	12,4	17,4	25	17,4	25,8	35	25,8	35,2	50	32	49,2	60,7

1) Use is restricted to anchoring of statically indeterminate structural components and dry internal conditions.

2) In absence of other national regulations.

3) No performance assessed.

Hilti metal expansion anchor HSA

Performance
Characteristic resistance under tension load in non-cracked concrete

Annex C1

Table C2: Characteristic resistance under shear load in non-cracked concrete

Size	M6			M8			M10			M12			M16			M20		
Setting position	①	②	③	①	②	③	①	②	③	①	②	③	①	②	③	①	②	③
Effective anchorage depth h_{ef} [mm]	30 ¹⁾	40	60	30 ¹⁾	40	70	40	50	80	50	65	100	65	80	120	75	100	115
Steel failure without lever arm																		
Partial safety factor $\gamma_{Ms}^{2)}$ [-]	1,25																	
Ductility factor k_7 [-]	1,0																	
HSA, HSA-BW																		
Characteristic resistance $V^{0}_{Rk,s}$ [kN]	6,5			10,6			18,9			29,5			51,0			85,8		
HSA-F																		
Characteristic resistance $V^{0}_{Rk,s}$ [kN]	6,5			10,6			18,9			29,5			51,0			3)		
HSA-R2, HSA-R																		
Characteristic resistance $V^{0}_{Rk,s}$ [kN]	7,2			12,3			22,6			29,3			56,5			91,9		
Steel failure with lever arm																		
Partial safety factor $\gamma_{Ms}^{2)}$ [-]	1,25																	
Ductility factor k_7 [-]	1,0																	
HSA, HSA-BW																		
Characteristic resistance $M^{0}_{Rk,s}$ [Nm]	9,9			21,7			48,6			91,7			216			454		
HSA-F																		
Characteristic resistance $M^{0}_{Rk,s}$ [Nm]	9,9			21,7			48,6			91,7			216			3)		
HSA-R2, HSA-R																		
Characteristic resistance $M^{0}_{Rk,s}$ [Nm]	9,9			21,0			48,6			76,0			200			406		
Concrete pry-out failure																		
Installation safety factor γ_{inst} [-]	1,0																	
Pry-out factor k_8 [-]	1	2	1	1,5	2	2,4	2	2,9	2	3,5								
Concrete edge failure																		
Installation safety factor γ_{inst} [-]	1,0																	
Effective length of anchor l_f [mm]	30	40	60	30	40	70	40	50	80	50	65	100	65	80	120	75	100	115
Effective outside diameter of anchor d_{nom} [mm]	6			8			10			12			16			20		

1) Use is restricted to anchoring of statically indeterminate structural components and dry internal conditions.

2) In absence of other national regulations.

3) No performance assessed.

Hilti metal expansion anchor HSA

Performance
Characteristic resistance under shear load in non-cracked concrete

Annex C2

Table C3: Displacements under tension and shear loads in non-cracked concrete

Size	M6			M8			M10			M12			M16			M20		
Setting position	①	②	③	①	②	③	①	②	③	①	②	③	①	②	③	①	②	③
Effective anchorage depth h_{ef} [mm]	30	40	60	30	40	70	40	50	80	50	65	100	65	80	120	75	100	115
Displacements under tension loads																		
Tension force N [kN]	2,9	3,6	4,3	4,0	6,1	7,6	6,1	8,5	11,9	8,5	12,6	16,7	12,6	17,2	23,8	16,6	25,1	30,8
Corresponding displacement δ_{N0} [mm]	0,2	0,6	1,0	0,2	1,2	1,8	0,4	1,1	2,0	0,3	1,4	2,3	0,4	1,3	2,1	0,1	0,8	1,9
Corresponding displacement $\delta_{N\infty}$ [mm]	0,6	1,0	1,4	0,6	1,6	2,2	0,8	1,5	2,4	0,7	1,8	2,7	0,8	1,7	2,5	0,5	1,2	2,3
Displacements under shear loads																		
Shear force V [kN]	3,7			6,1			10,8			16,7			29,1			49,0		
Corresponding displacement δ_{V0} [mm]	1,6			1,9			2,0			2,1			2,2			2,3		
Corresponding displacement $\delta_{V\infty}$ [mm]	2,4			2,9			3,0			3,2			3,3			3,5		

Hilti metal expansion anchor HSA

Performance

Displacement under tension and shear loads in non-cracked concrete

Annex C3