

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 27 October 2023

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 AG  
BU Anchors  
Feldkircherstraße 100  
9494 SCHAAN  
FÜRSTENTUM LIECHTENSTEIN

Manufacturing plant

Hilti Werke

This European Technical Assessment  
contains

19 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

330232-01-0601, Edition 05/2021

This version replaces

ETA-11/0374 issued on 3 November 2022

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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 loading) Method A	See Annex B3 and C1
Characteristic resistance to shear load (static and quasi-static loading)	See Annex C2
Displacements	See Annex C3
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

#### 3.3 Aspects of durability linked with the Basic Works Requirements

Essential characteristic	Performance
Durability	See Annex B1

### 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

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

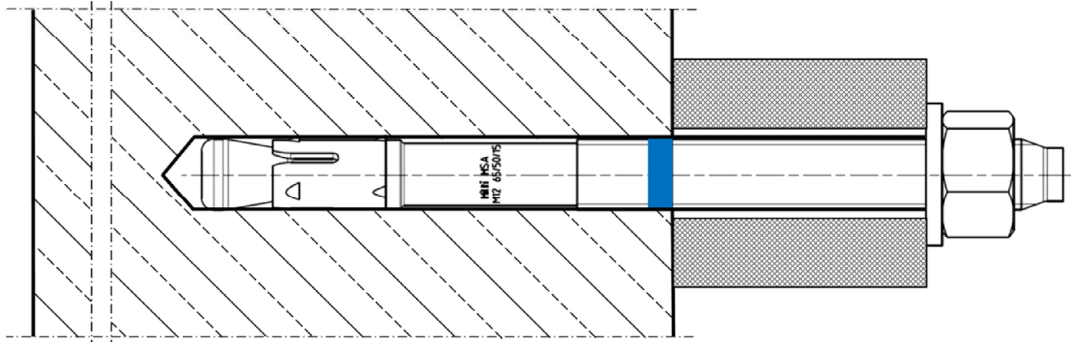
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

Issued in Berlin on 27 October 2023 by Deutsches Institut für Bautechnik

Dipl.-Ing. Beatrix Wittstock  
Head of Section

*beglaubigt:*  
Ziegler

### Installed condition

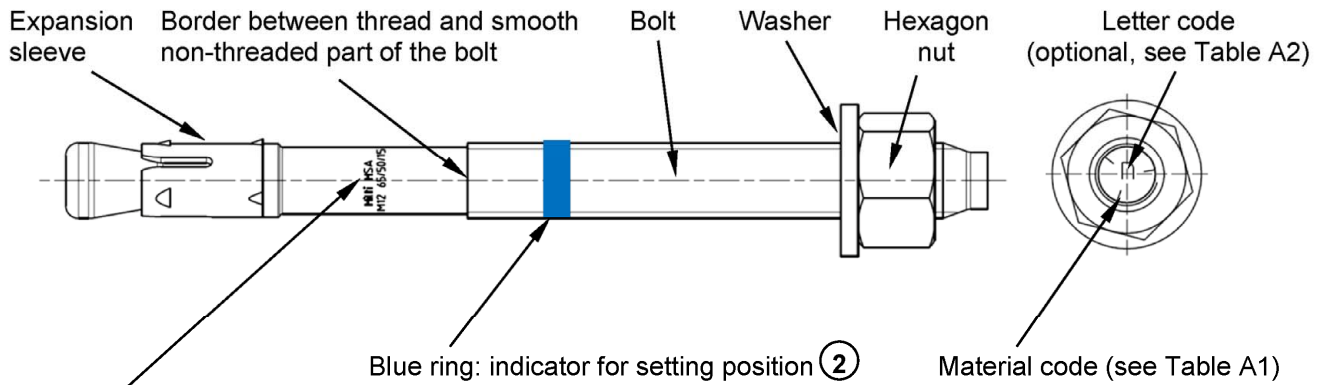


Hilti metal expansion anchor HSA

Product description  
Installed condition

Annex A1

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

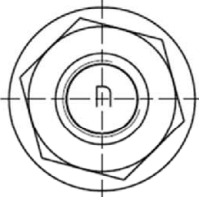

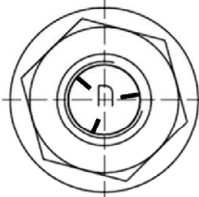


**Marking:**

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	 <p>Letter code without mark</p>	 <p>Letter code with two marks</p>	 <p>Letter code with three marks</p>

**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 thickness (optional)<sup>1)</sup>**

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>	<b>5/-/-</b>	<b>5/-/-</b>	<b>5/-/-</b>	<b>5/-/-</b>	<b>5/-/-</b>	5/-/-
<u>y</u>	10/-/-	10/-/-	10/-/-	10/-/-	10/-/-	<b>10/-/-</b>
<u>x</u>	15/5/-	15/5/-	15/5/-	15/-/-	15/-/-	15/-/-
<u>w</u>	<b>20/10/-</b>	<b>20/10/-</b>	<b>20/10/-</b>	<b>20/5/-</b>	<b>20/5/-</b>	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	<b>35/25/-</b>	<b>35/25/-</b>	<b>35/20/-</b>	35/20/-	35/10/-
<u>s</u>	<b>40/30/10</b>	40/30/-	40/30/-	40/25/-	<b>40/25/-</b>	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	<b>50/40/10</b>	50/35/-	50/35/-	50/25/10
<u>p</u>	<b>55/45/25</b>	<b>55/45/15</b>	55/45/15	55/40/5	55/40/-	<b>55/30/15</b>
<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	<b>65/50/15</b>	65/50/10	65/40/25
<u>m</u>	70/60/40	70/60/30	<b>70/60/30</b>	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	<b>80/70/40</b>	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	<b>85/70/30</b>	85/60/45
<u>j</u>	90/80/60	90/80/50	<b>90/80/50</b>	90/75/40	90/75/35	90/65/50
<u>h</u>	95/85/65	95/85/55	95/85/55	<b>95/80/45</b>	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	<b>105/95/65</b>	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	<b>125/110/75</b>	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	<b>145/130/95</b>	<b>135/120/80</b>	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	-

<sup>1)</sup> 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
<b>HSA, HSA-BW</b>	
Expansion sleeve	M6: Stainless steel A2 according 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
<b>HSA-F</b>	
Expansion sleeve	Stainless steel A2 according to EN 10088-1:2014
Bolt	Hot-dip galvanized, rupture elongation ( $l_0 = 5d$ ) > 8%
Washer	Hot-dip galvanized
Hexagon nut	Hot-dip galvanized
<b>HSA-R2 (stainless steel)</b> Corrosion resistance class II according to EN 1993-1-4:2006+A1:2015	
Expansion sleeve	Stainless steel A2 according to EN 10088-1:2014
Bolt	Stainless steel according to EN 10088-1:2014, coated, rupture elongation ( $l_0 = 5d$ ) > 8%
Washer	Stainless steel A2
Hexagon nut	Stainless steel A2, coated
<b>HSA-R (stainless steel)</b> Corrosion resistance class III according to EN 1993-1-4:2006+A1:2015	
Expansion sleeve	Stainless steel A2 according to EN 10088-1:2014
Bolt	Stainless steel according 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**



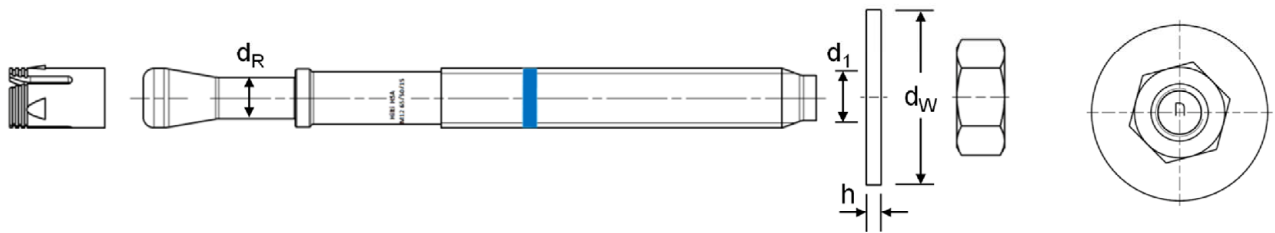
**Table A4: Dimensions of Hilti metal expansion anchor HSA, HSA-BW, HSA-F, HSA-R2 and HSA-R**

Size	M6	M8	M10	M12	M16	M20
Minimum inner diameter of washer $d_1$ [mm]	6,4	8,4	10,5	13	17	21
Minimum outer diameter of washer $d_w$ [mm]	12	16	20	24	30	37
Minimum 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.
- uncracked 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 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 055:2018.

### 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**

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

**Table B3: Setting alternatives**




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

**Hilti metal expansion anchor HSA**

**Intended use**  
Installation methods

**Annex B2**

**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 ... <sup>1)</sup>		✓					
		-	14-A / 22-A / 6AT-A22			22T-A	-
Setting speed	HSA, HSA-BW, HSA-F	-	I	I	III	.. <sup>2)</sup>	
	HSA-R2, HSA-R	-	III				-
Setting time $t_{set}$	[sec.]	-	4				-
Machine torqueing with Hilti SIW impact wrench and SI-AT adaptive torque module							
• SIW 4AT-22 with SI-AT-22 <sup>3)</sup>	HSA, HSA-BW	-	✓	✓	✓	✓	-
• SIW 6AT-22 with SI-AT-22 <sup>3)</sup>	HSA-R2, HSA-R	-	-	✓	✓	✓	✓

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

<sup>2)</sup> Impact screwdriver operates with fixed speed.

<sup>3)</sup> Equivalent combination of Hilti SIW + SI-AT tool, compatible to this anchor type, may be used

**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

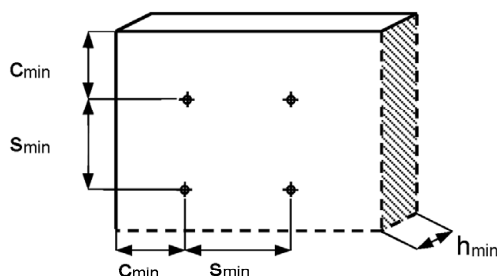
**Annex B3**

**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																							
Maximum cutting diameter of drill bit $d_{cut}$ [mm]	6,4			8,45			10,45			12,5			16,5			20,55																							
Maximum 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																					
Minimum thickness of concrete member $h_{min}$ [mm]	100			120			100			120			100			140			160			180			140			160			180			160			220		
Nominal embedment depth $h_{nom}$ [mm]	37	47	67	39	49	79	50	60	90	64	79	114	77	92	132	90	115	130																					
Effective embedment depth $h_{ef}$ [mm]	30	40	60	30	40	70	40	50	80	50	65	100	65	80	120	75	100	115																					
Drill hole depth (HD, HDB) $h_1 \geq$ [mm]	42	52	72	44	54	84	55	65	95	72	87	122	85	100	140	98	123	138																					
Drill hole depth (DD) $h_1 \geq$ [mm]	-			-			58	68	98	72	87	122	85	100	140	98	123	138																					
<b>Standard installation torque moment</b>																																							
Installation torque moment $T_{inst}$ [Nm]	5			15 <sup>1)2)</sup>			25 <sup>1)2)</sup>			50 <sup>1)2)</sup>			80 <sup>1)2)</sup>			200																							
Minimum spacing $s_{min}$ [mm]	35			35			50			70			90			195	175																						
Minimum edge distance $c_{min}$ [mm]	35			40	35	50	40	70	65	55	80	75	70	130	120																								
<b>Maximum installation torque moment</b>																																							
Maximum installation torque moment $T_{max}$ [Nm]	-			20			35			80			150			250																							
Minimum spacing $s_{min}$ [mm]	-			35			40			50			80			120																							
Minimum 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).

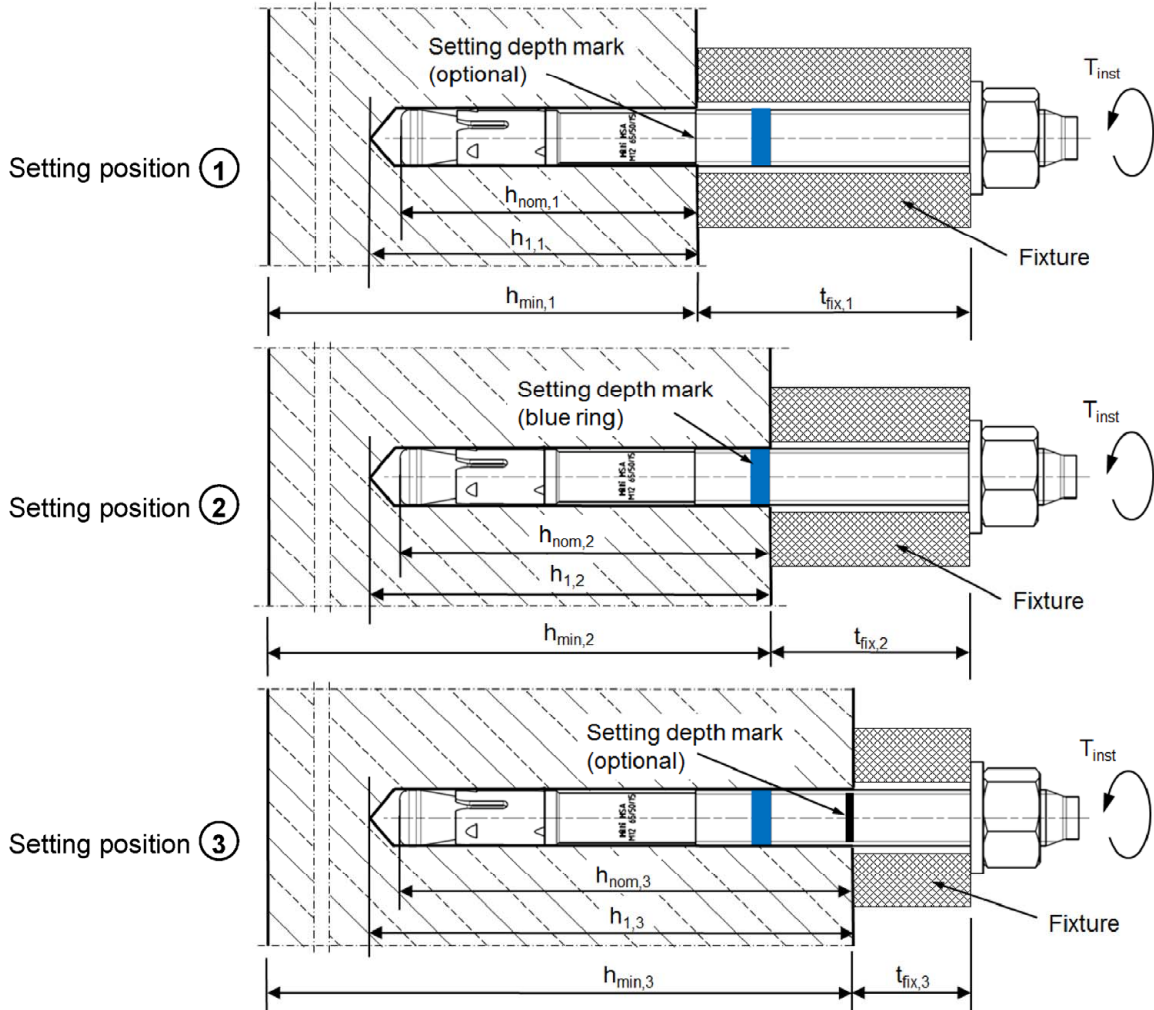


**Hilti metal expansion anchor HSA**

**Intended use**  
Installation parameters

**Annex B4**

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

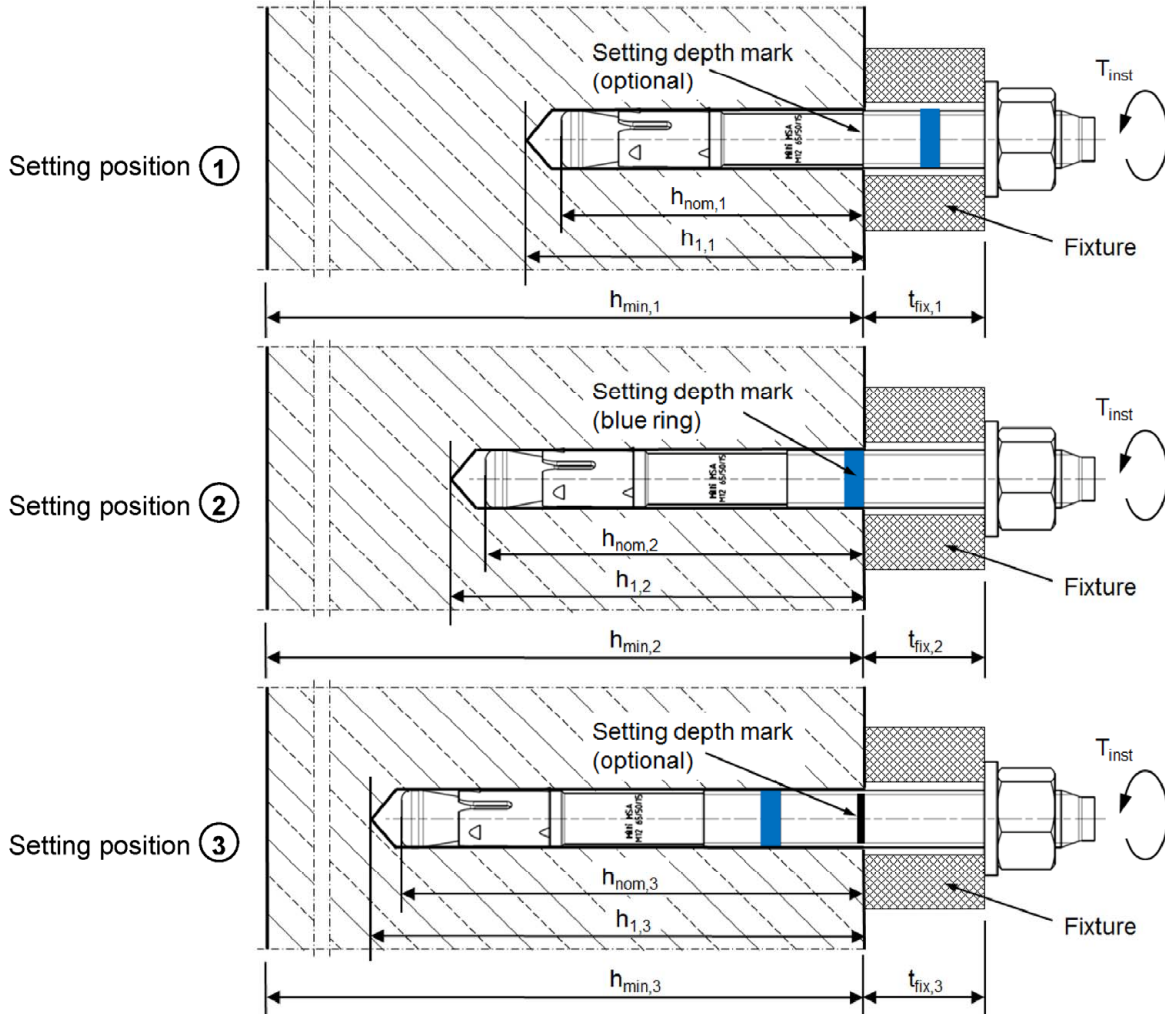


Hilti metal expansion anchor HSA

Intended use  
Installation parameters

Annex B5

**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	with letter code "a" to "z" (see Table A2): $h_{nom,1}$ is reached when the non-threaded part of the bolt is completely below the concrete surface. with letter code "aa" to "ag" (see Table A2) and without letter code: $h_{nom,1}$ 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 anchor is identical.
②	$h_{nom,2}$ is reached when the blue ring is completely below the concrete surface.	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 anchor <ul style="list-style-type: none"> <li>position of washer and hexagon nut has to be adjusted or</li> <li>drill hole depth <math>h_1</math> has to be increased.</li> </ul>
③	$h_{nom,3}$ has to be measured and marked by the installer.	

Hilti metal expansion anchor HSA

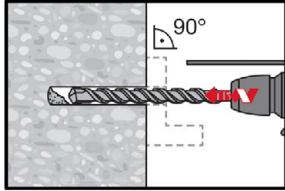
Intended use  
Installation parameters

**Annex B6**

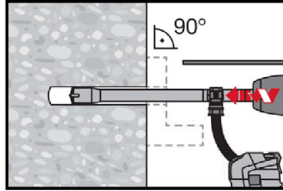
## Installation instruction

### Hole drilling and cleaning (see Table B1, Table B2 and Table B6)

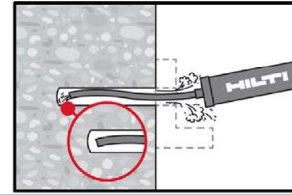
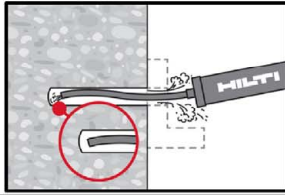
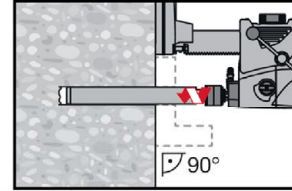
a) Hammer drilling (HD) with manual cleaning (MC)



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

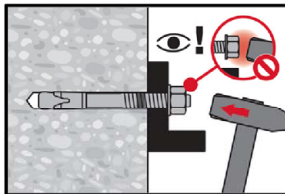


c) Diamond coring (DD) with manual cleaning (MC)

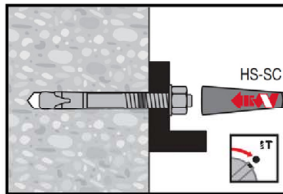


### Anchor setting (see Table B3)

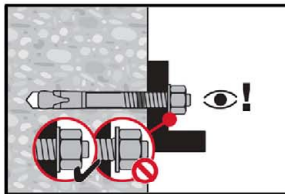
a) Hammer setting



b) Machine setting (impact screwdriver with setting tool)

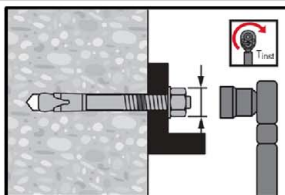


### Check setting (see Table B7)

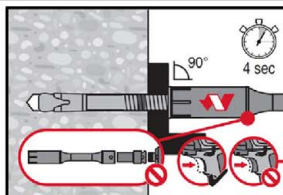


### Anchor torquing (see Table B4 and Table B5)

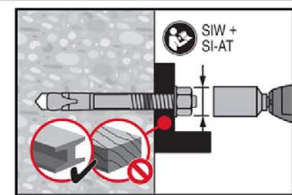
a) Torque wrench



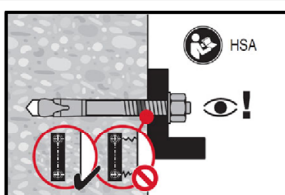
b) Impact screwdriver with setting tool



c) Impact screwdriver with module



### Check installation



Hilti metal expansion anchor HSA

Intended use  
Installation instructions

Annex B7



**Table C1: Characteristic resistance under tension load in uncracked 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 <sup>1)</sup>	40	60	30 <sup>1)</sup>	40	70	40	50	80	50	65	100	65	80	120	75	100	115
<b>Steel failure</b>																			
Partial safety factor	$\gamma_{Ms}^{2)}$ [-]	1,4																	
<b>HSA, HSA-BW</b>																			
Characteristic resistance	$N_{Rk,s}$ [kN]	9,0			16,5			28,0			41,4			82,6			124		
<b>HSA-F</b>																			
Characteristic resistance	$N_{Rk,s}$ [kN]	9,5			15,9			27,0			40,4			80,1			3)		
<b>HSA-R2, HSA-R</b>																			
Characteristic resistance	$N_{Rk,s}$ [kN]	12,2			18,3			35,6			44,6			90,5			97,6		
<b>Pullout failure</b>																			
Installation safety factor	$\gamma_{inst}$ [-]	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 $\psi_c$ for $N_{Rk,p}$	C20/25 [-]	1,00																	
	C30/37 [-]	1,22																	
	C40/50 [-]	1,41																	
	C50/60 [-]	1,55																	
<b>Concrete cone and splitting failure</b>																			
Installation safety factor	$\gamma_{inst}$ [-]	1,0																	
Factor for uncracked 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	$N_{Rk,sp}^0$ [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

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

<sup>2)</sup> In absence of other national regulations.

<sup>3)</sup> No performance assessed.

Hilti metal expansion anchor HSA

**Performance**  
Characteristic resistance under tension load in uncracked concrete

**Annex C1**

**Table C2: Characteristic resistance under shear load in uncracked 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 <sup>1)</sup>	40	60	30 <sup>1)</sup>	40	70	40	50	80	50	65	100	65	80	120	75	100	115
<b>Steel failure without lever arm</b>																		
Partial safety factor $\gamma_{Ms}^{(2)}$ [-]	1,25																	
Ductility factor $k_7$ [-]	1,0																	
<b>HSA, HSA-BW</b>																		
Characteristic resistance $V^{0}_{Rk,s}$ [kN]	6,5			10,6			18,9			29,5			51,0			85,8		
<b>HSA-F</b>																		
Characteristic resistance $V^{0}_{Rk,s}$ [kN]	6,5			10,6			18,9			29,5			51,0			3)		
<b>HSA-R2, HSA-R</b>																		
Characteristic resistance $V^{0}_{Rk,s}$ [kN]	7,2			12,3			22,6			29,3			56,5			91,9		
<b>Steel failure with lever arm</b>																		
Partial safety factor $\gamma_{Ms}^{(2)}$ [-]	1,25																	
Ductility factor $k_7$ [-]	1,0																	
<b>HSA, HSA-BW</b>																		
Characteristic resistance $M^{0}_{Rk,s}$ [Nm]	9,9			21,7			48,6			91,7			216			454		
<b>HSA-F</b>																		
Characteristic resistance $M^{0}_{Rk,s}$ [Nm]	9,9			21,7			48,6			91,7			216			3)		
<b>HSA-R2, HSA-R</b>																		
Characteristic resistance $M^{0}_{Rk,s}$ [Nm]	9,9			21,0			48,6			76,0			200			406		
<b>Concrete pry-out failure</b>																		
Installation safety factor $\gamma_{inst}$ [-]	1,0																	
Pry-out factor $k_8$ [-]	1	2	1	1,5	2	2,4	2	2,9	2	3,5								
<b>Concrete edge failure</b>																		
Installation safety factor $\gamma_{inst}$ [-]	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		

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

<sup>2)</sup> In absence of other national regulations.

<sup>3)</sup> No performance assessed.

**Hilti metal expansion anchor HSA**

**Performance**  
Characteristic resistance under shear load in uncracked concrete

**Annex C2**

**Table C3: Displacements under tension and shear loads in uncracked 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
<b>Displacements under tension loads</b>																		
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 $\delta_{N0}$ [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
<b>Displacements under shear loads</b>																		
Shear force $V$ [kN]	3,7			6,1			10,8			16,7			29,1			49,0		
Corresponding displacement $\delta_{V0}$ [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 uncracked concrete

**Annex C3**