

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 3 November 2022

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the
European Technical Assessment:

Trade name of the construction product

Product family
to which the construction product belongs

Manufacturer

Manufacturing plant

This European Technical Assessment
contains

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

This version replaces

Deutsches Institut für Bautechnik

Hilti metal expansion anchor HSA

Mechanical fastener for use in uncracked concrete

Hilti AG
BU Anchors
Feldkircherstraße 100
9494 SCHAAN
FÜRSTENTUM LIECHTENSTEIN

Hilti Werke

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

EAD 330232-01-0601, Edition 05/2021

ETA-11/0374 issued on 23 May 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 action) Method A	See Annex B3 and C1
Characteristic resistance to shear load (static and quasi static action)	See Annex C2
Displacements	See Annex C3
Characteristic resistance and displacements for seismic performance categories C1 and C2	No performance assessed
Durability	See Annex B1

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

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

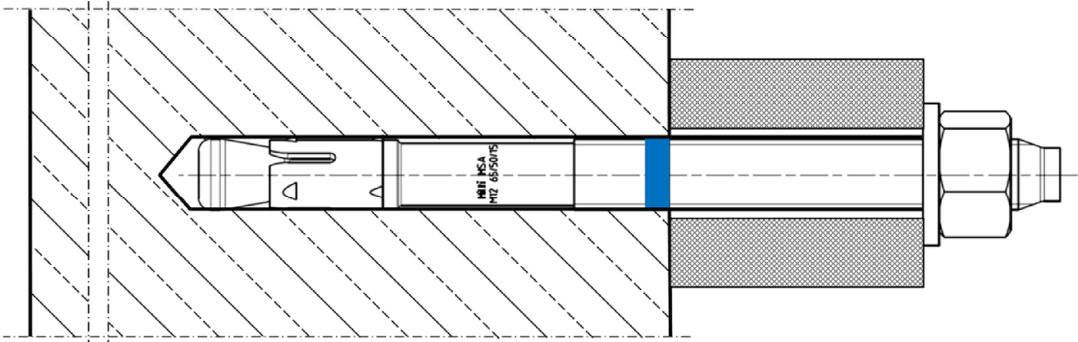
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

Issued in Berlin on 3 November 2022 by Deutsches Institut für Bautechnik

Dipl.-Ing. Beatrix Wittstock
Head of Section

beglaubigt:
Ziegler

Installed condition

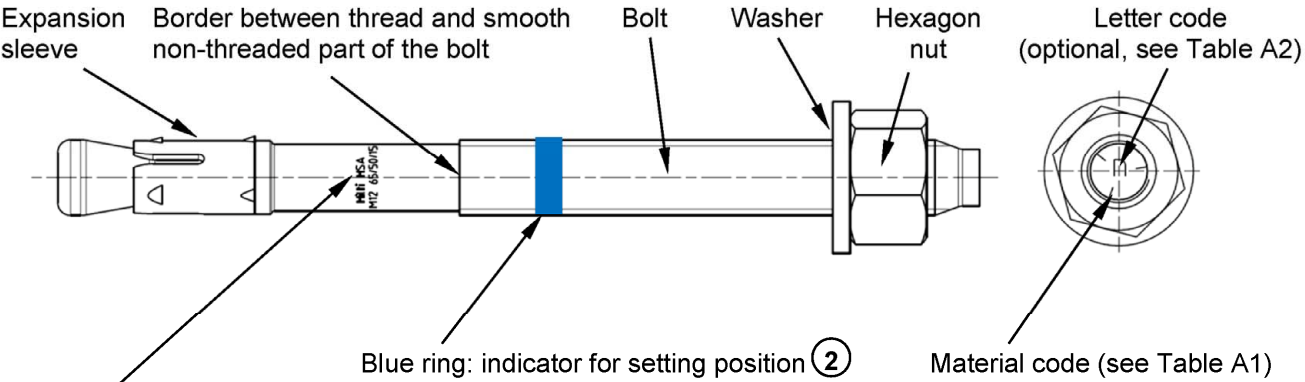


Hilti metal expansion anchor HSA

Product description
Installed condition



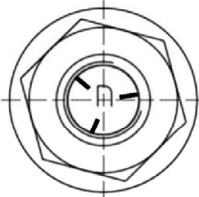
Annex A1

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	 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 thickness (optional)¹⁾

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
<u>aa</u>	-	-	-	155/140/105	145/130/90	-
<u>ab</u>	-	-	-	165/150/115	155/140/100	-
<u>ac</u>	-	-	-	175/160/125	165/150/110	-
<u>ad</u>	-	-	-	180/165/130	190/175/135	-
<u>ae</u>	-	-	-	230/215/180	240/225/185	-
<u>af</u>	-	-	-	280/265/230	290/275/235	-
<u>ag</u>	-	-	-	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 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
HSA-F	
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
HSA-R2 (stainless steel) 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
HSA-R (stainless steel) 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

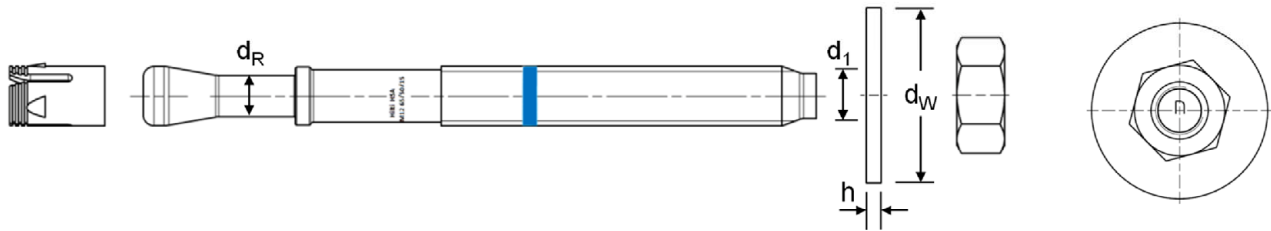
Table A4: Dimensions of Hilti metal expansion anchor HSA, HSA-BW, HSA-F, HSA-R2 and HSA-R

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



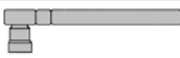


Manual cleaning (MC): Hilti hand pump for blowing out drill holes.	
Automatic cleaning (AC): Cleaning is performed during drilling with Hilti TE-CD and TE-YD drilling system including vacuum cleaner.	

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⁾		-		✓			-
		-	14-A / 22-A / 6AT-A22			22T-A	-
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 and SI-AT-A22 ³⁾ 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.

³⁾ 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		≤ +5 °C	+5 to +10 °C	≥ +10 °C
Battery state of charge	low	-	-	-
	middle	-	-	✓
	high	-	✓	✓

Hilti metal expansion anchor HSA

Intended use
Installation methods

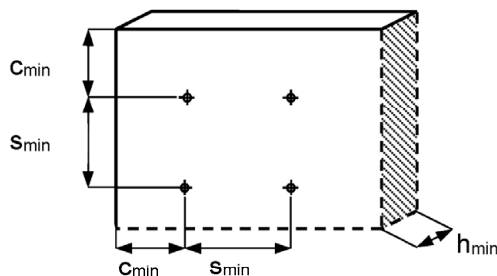
Annex B2

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		
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	120	160	100	140	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 ≥ [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 ≥ [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		
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	
Maximum installation torque moment																		
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).

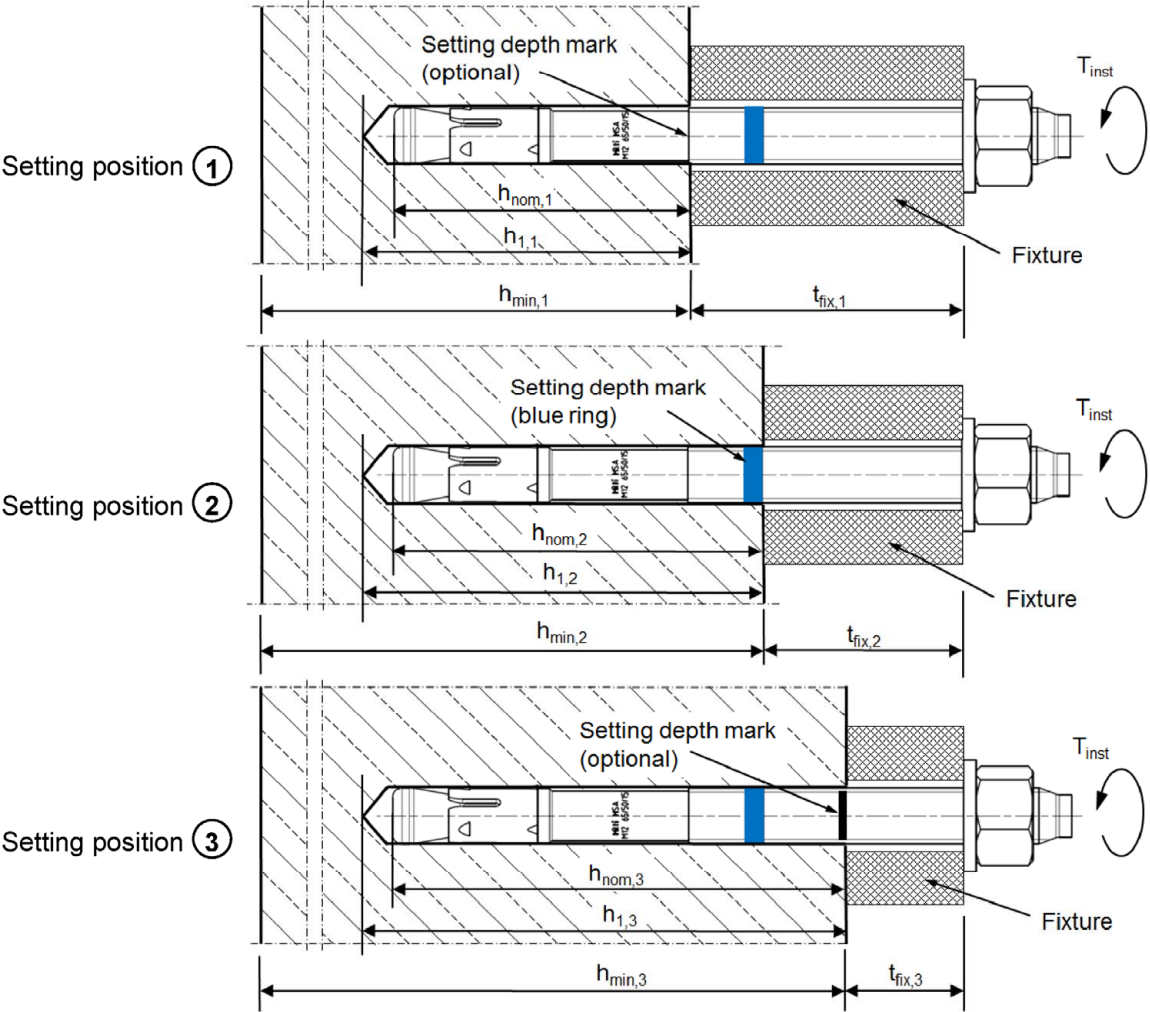


Hilti metal expansion anchor HSA

Intended use
Installation parameters

Annex 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}

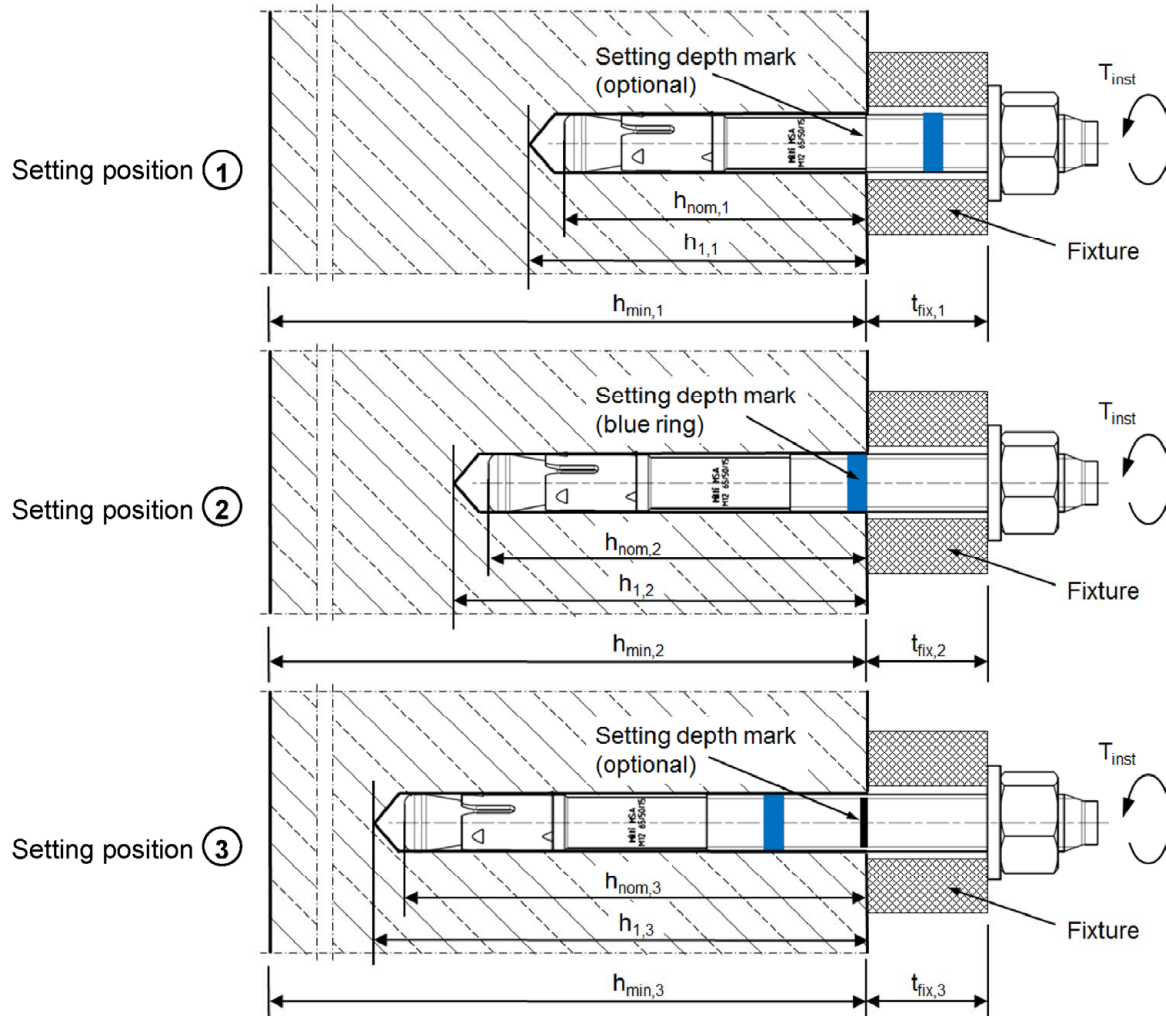


Table B7: Checking setting position

Setting position	Pre-setting	Through setting
①	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
③	$h_{nom,3}$ has to be measured and marked by the installer.	<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.

Hilti metal expansion anchor HSA

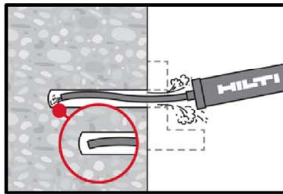
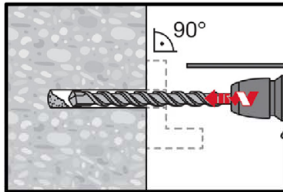
Intended use
Installation parameters

Annex B5

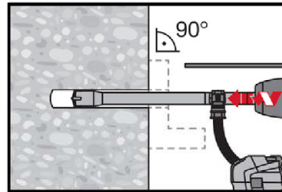
Installation instruction

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

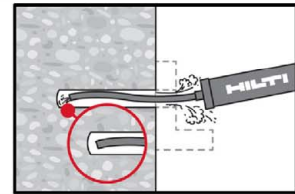
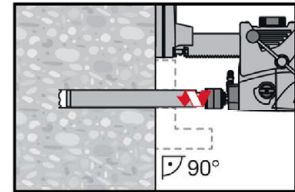
a) Hammer drilling (HD) with manual cleaning (MC)



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

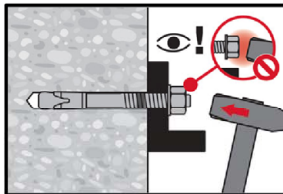


c) Diamond coring (DD) with manual cleaning (MC)

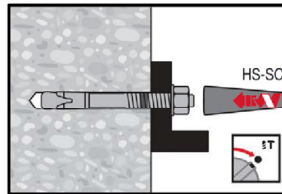


Anchor setting (see Table B3)

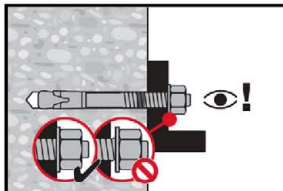
a) Hammer setting



b) Machine setting (impact screwdriver with setting tool)

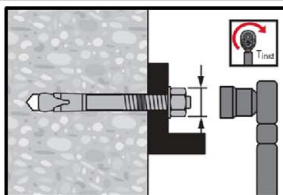


Check setting (see Table B7)

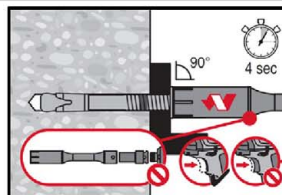


Anchor torquing (see Table B4 and Table B5)

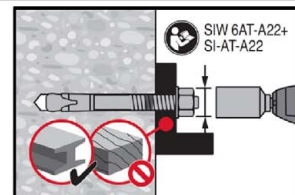
a) Torque wrench



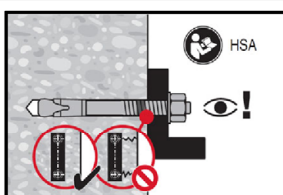
b) Impact screwdriver with setting tool



c) Impact screwdriver with module



Check installation



Hilti metal expansion anchor HSA

Intended use
Installation instructions

Annex B6

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 ¹⁾	40	60	30 ¹⁾	40	70	40	50	80	50	65	100	65	80	120	75	100	115
Steel failure																				
Partial safety factor	$\gamma_{Ms}^{2)}$	[-]	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 for $N_{Rk,p}$	C20/25	[-]	1,00																	
	C30/37	[-]	1,22																	
	C40/50	[-]	1,41																	
	C50/60	[-]	1,55																	
Concrete cone and splitting failure																				
Installation safety factor	γ_{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	$N^0_{Rk,sp}$	[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 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 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 $V_{Rk,s}^0$ [kN]	6,5			10,6			18,9			29,5			51,0			85,8		
HSA-F																		
Characteristic resistance $V_{Rk,s}^0$ [kN]	6,5			10,6			18,9			29,5			51,0			3)		
HSA-R2, HSA-R																		
Characteristic resistance $V_{Rk,s}^0$ [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 $M_{Rk,s}^0$ [Nm]	9,9			21,7			48,6			91,7			216			454		
HSA-F																		
Characteristic resistance $M_{Rk,s}^0$ [Nm]	9,9			21,7			48,6			91,7			216			3)		
HSA-R2, HSA-R																		
Characteristic resistance $M_{Rk,s}^0$ [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	2	3,5	2	3,5	2	3,5	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 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
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
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		
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