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Autorisé et notifié conformément à l'article 10 de la directive 89/106/EEC du Conseil, du 21 décembre 1988, relative au rapprochement des dispositions législatives, réglementaires et administratives des Etats membres concernant les produits de construction.

CSTB le futur en construction

MEMBRE DE L'EOTA

European Technical Approval ETA-02/0027

(English language translation, the original version is in French language)

Nom commercial : **Trade name:**	**Hilti HSC and HSC-R**
Titulaire : **Holder of approval:**	**Hilti AG, Business Unit Anchors** **FL-9494 SCHAAN** **Principality of Liechtenstein**
Type générique et utilisation prévue du produit de construction : **Generic type and use of construction product:**	Cheville métallique en acier galvanisé ou inoxydable, à verrouillage de forme par auto ancrage, de fixation dans le béton : diamètres M6, M8, M10 et M12. **Self-cutting undercut anchor, made of galvanised steel or stainless steel, for use in concrete: sizes M6, M8, M10 and M12.**
Validité du : au : **Validity from / to:**	**20/09/2007** **20/09/2012**
Usine de fabrication : **Manufacturing plant:**	**Hilti AG, plant 8**
Le présent Agrément technique européen contient : **This European Technical Approval contains:**	22 pages incluant 14 annexes faisant partie intégrante du document. **22 pages including 14 annexes which form an integral part of the document.**

Cet Agrément Technique Européen annule et remplace les ATE 02/0027 et 02/0028 valides du 20/09/2002 au 20/09/2007

This European Technical Approval cancels and replaces ETA-02/0027 and 02/0028 with validity from 20/09/2002 to 20/09/2007

I LEGAL BASES AND GENERAL CONDITIONS

1. This European Technical Approval is issued by the Centre Scientifique et Technique du Bâtiment in accordance with:

   - Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products[1], modified by the Council Directive 93/68/EEC of 22 July 1993[2];
   - Décret n° 92-647 du 8 juillet 1992[3] concernant l'aptitude à l'usage des produits de construction;
   - Common Procedural Rules for Requesting, Preparing and the Granting of European Technical Approvals set out in the Annex of Commission Decision 94/23/EC[4];
   - Guideline for European Technical Approval of « Metal Anchors for use in Concrete » ETAG 001, edition 1997, Part 1 « Anchors in general » and Part 3 « Undercut anchors ».

2. The Centre Scientifique et Technique du Bâtiment is authorised to check whether the provisions of this European Technical Approval are met. Checking may take place in the manufacturing plant (for example concerning the fulfilment of assumptions made in this European Technical Approval with regard to manufacturing). Nevertheless, the responsibility for the conformity of the products with the European Technical Approval and for their fitness for the intended use remains with the holder of the European Technical Approval.

3. This European Technical Approval is not to be transferred to manufacturers or agents of manufacturer other than those indicated on page 1; or manufacturing plants other than those indicated on page 1 of this European Technical Approval.

4. This European Technical Approval may be withdrawn by the Centre Scientifique et Technique du Bâtiment pursuant to Article 5 (1) of the Council Directive 89/106/EEC.

5. Reproduction of this European Technical Approval including transmission by electronic means shall be in full. However, partial reproduction can be made with the written consent of the Centre Scientifique et Technique du Bâtiment. In this case partial reproduction has to be designated as such. Texts and drawings of advertising brochures shall not contradict or misuse the European Technical Approval.

6. The European Technical Approval is issued by the approval body in its official language. This version corresponds to the version circulated within EOTA. Translations into other languages have to be designated as such.

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1 Official Journal of the European Communities n° L 40, 11.2.1989, p. 12
2 Official Journal of the European Communities n° L 220, 30.8.1993, p. 1
3 Journal officiel de la République française du 14 juillet 1992
4 Official Journal of the European Communities n° L 17, 20.1.1994, p. 34

II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

1 Definition of product and intended use

1.1. Definition of product

The Hilti HSC anchor in the range of M6 to M12 is a self-cutting undercut anchor made of galvanised steel or stainless steel. The Hilti HSC anchor is available in four versions : an externally threaded carbon steel version (HSC-A), an internally threaded carbon steel version (HSC-I), an externally threaded stainless steel version (HSC-AR), an internally threaded stainless steel version (HSC-IR). It is placed into a hole drilled with a special step drill bit and self-cutting undercut using a special setting tool. The nut is torque tightened to complete the fastening of the fixture. In the case of HSC-I and HSC-IR version, the fixture shall be anchored with a fastening screw or a threaded rod according to Annex 4.
For the installed anchor see Figures given in Annexes 1 and 2.

1.2. Intended use

The anchor is intended to be used for anchorages for which requirements for mechanical resistance and stability and safety in use in the sense of the Essential Requirements 1 and 4 of Council Directive 89/106/EEC shall be fulfilled and failure of anchorages made with these products would compromise the stability of the works, cause risk to human life and/or lead to considerable economic consequences. The anchor is to be used only for anchorages subject to static or quasi-static loading in reinforced or unreinforced normal weight concrete of strength classes C 20/25 minimum to C50/60 maximum according to ENV 206-1: 2000-12. It may be anchored in cracked and non-cracked concrete.

The HSC-A and HSC-I carbon steel anchors may only be used in concrete subject to dry internal conditions.

The HSC-AR and HSC-IR anchors may be used in concrete subject to dry internal conditions and also in concrete subject to external atmospheric exposure (including industrial and marine environment), or exposure in permanently damp internal conditions, if no particular aggressive conditions exist. Such particular aggressive conditions are e.g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with extreme chemical pollution (e.g. in desulphurization plants or road tunnels where de-icing materials are used).

The provisions made in this European Technical Approval are based on an assumed intended working life of the anchor of 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.

2 Characteristics of product and methods of verification

2.1. Characteristics of product

The anchor in the range of M6 to M12 corresponds to the drawings and provisions given in Annexes 1 to 4. The characteristic material values, dimensions and tolerances of the anchor not indicated in Annexes 2 to 4 shall correspond to the respective values laid down in the

technical documentation[5] of this European Technical Approval. The characteristic anchor values for the design of HSC-A and HSC-I carbon steel anchorages are given in Annexes 5 to 8. The characteristic anchor values for the design of HSC-AR and HSC-IR stainless steel anchorages are given in Annexes 9 to 12. The special tools required to use this anchor are described in Annexes 13 to 14.

In the case of the HSC-I version, the fastening screw or the threaded rod shall at least correspond to the strength class 8.8 according to EN ISO 898-1 and galvanised Fe/Zn 5 according to EN ISO 4042.

In the case of the HSC-IR version, the fastening screw or threaded rod shall be at least steel grade A4-70 according to EN ISO 3506

Each carbon steel anchor is marked on the bolt with the product name (HSC-A or HSC-I) and each stainless steel anchor is marked on the bolt with the product name (HSC-AR or HSC-IR), the nominal diameter of the thread, the embedment depth and the maximum thickness of the fixture according to Annex 3.

As example : Carbon steel: HSC-A M10*40/20
Stainless steel: HSC-AR M10*40/20

The anchor shall only be packaged and supplied as a complete unit.

2.2. Methods of verification

The assessment of fitness of the anchor for the intended use in relation to the requirements for mechanical resistance and stability and safety in use in the sense of the Essential Requirements 1 and 4 has been made in accordance with the « Guideline for European Technical Approval of Metal Anchors for use in Concrete », Part 1 « Anchors in general » and Part 3 « Undercut anchors », on the basis of Option 1.

3 Evaluation of Conformity and CE marking

3.1. Attestation of conformity system

The system of attestation of conformity 2 (i) (referred to as system 1) according to Council Directive 89/106/EEC Annex III laid down by the European Commission provides:

a) tasks for the manufacturer:

1. factory production control,
2. further testing of samples taken at the factory by the manufacturer in accordance with a prescribed test plan.

b) tasks for the approved body:

3. initial type-testing of the product,
4. initial inspection of factory and of factory production control,
5. continuous surveillance, assessment and approval of factory production control.

[5] The technical documentation of this European Technical Approval is deposited at the Centre Scientifique et Technique du Bâtiment and, as far as relevant for the tasks of the approved bodies involved in the attestation of conformity procedure, is handed over to the approved bodies.

3.2. Responsibilities

3.2.1. Tasks of the manufacturer, factory production control

The manufacturer has a factory production control system in the plant and exercises permanent internal control of production. All the elements, requirements and provisions adopted by the manufacturer are documented in a systematic manner in the form of written policies and procedures. This production control system ensures that the product is in conformity with the European Technical Approval.

The manufacturer shall only use raw materials supplied with the relevant inspection documents as laid down in the prescribed test plan[6]. The incoming raw materials shall be subject to controls and tests by the manufacturer before acceptance. Check of incoming materials such as nuts, washers, wire for bolts and sleeves shall include control of the inspection documents presented by suppliers (comparison with nominal values) by verifying dimension and determining material properties, e.g. tensile strength, hardness, surface finish.

The manufactured components of the anchor shall be subjected to the following tests:

- Dimensions of component parts:
  bolt (diameters, lengths, thread and marking, geometry of the cone);
  sleeve (lengths, internal and external diameters, geometry of the expansion part, cutting edge);
  hexagonal nut (proper running, wrench size across flats);
  washer (diameters, thickness).
- Material properties: bolt (ultimate tensile strength), sleeve (ultimate tensile strength), hexagonal nut (proof load), washer (hardness).
- Visual control of correct assembly and of completeness of the anchor.

The frequency of controls and tests conducted during production and on the assembled anchor is laid down in the prescribed test plan taking account of the automated manufacturing process of the anchor.

The results of factory production control are recorded and evaluated. The records include at least the following information:

- designation of the product, basic material and components;
- type of control or testing;
- date of manufacture of the product and date of testing of the product or basic material and components;
- result of control and testing and, if appropriate, comparison with requirements;
- signature of person responsible for factory production control.

The records shall be presented to the inspection body during the continuous surveillance. On request, they shall be presented to the Centre Scientifique et Technique du Bâtiment.

Details of the extent, nature and frequency of testing and controls to be performed within the factory production control shall correspond to the prescribed test plan which is part of the technical documentation of this European Technical Approval.

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6 The prescribed test plan has been deposited at the Centre Scientifique et Technique du Bâtiment and is only made available to the approved bodies involved in the conformity attestation procedure.

3.2.2. Tasks of approved bodies

3.2.2.1. Initial type-testing of the product

For initial type-testing the results of the tests performed as part of the assessment for the European Technical Approval shall be used unless there are changes in the production line or plant. In such cases the necessary initial type-testing has to be agreed between the Centre Scientifique et Technique du Bâtiment and the approved bodies involved.

3.2.2.2. Initial inspection of factory and of factory production control

The approved body shall ascertain that, in accordance with the prescribed test plan, the factory and the factory production control are suitable to ensure continuous and orderly manufacturing of the anchor according to the specifications mentioned in 2.1. as well as to the Annexes to the European Technical Approval.

3.2.2.3. Continuous surveillance

The approved body shall visit the factory at least once a year for regular inspection. It has to be verified that the system of factory production control and the specified automated manufacturing process are maintained taking account of the prescribed test plan.

Continuous surveillance and assessment of factory production control have to be performed according to the prescribed test plan.

The results of product certification and continuous surveillance shall be made available on demand by the certification body or inspection body, respectively, to the Centre Scientifique et Technique du Bâtiment. In cases where the provisions of the European Technical Approval and the prescribed test plan are no longer fulfilled the conformity certificate shall be withdrawn.

3.3. CE-Marking

The CE marking shall be affixed on each packaging of anchors. The symbol « CE » shall be accompanied by the following information:

- identification number of the certification body;
- name or identifying mark of the producer and manufacturing plant;
- the last two digits of the year in which the CE-marking was affixed;
- number of the EC certificate of conformity;
- number of the European Technical Approval;
- use category (ETAG 001-1 Option1);
- size.

4 Assumptions under which the fitness of the product for the intended use was favourably assessed

4.1. Manufacturing

The anchor is manufactured in accordance with the provisions of the European Technical Approval using the automated manufacturing process as identified during inspection of the

plant by the Centre Scientifique et Technique du Bâtiment and the approved body and laid down in the technical documentation.

4.2. Installation

4.2.1. Design of anchorages

The fitness of the anchors for the intended use is given under the following conditions:

The anchorages are designed in accordance with the « Guideline for European Technical Approval of Metal Anchors for Use in Concrete », Annex C, Method A, for undercut anchors 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 anchor is indicated on the design drawings (e.g. position of the anchor relative to reinforcement or to support, etc.).

The minimum strength class and the minimum screwing depth of the fastening screw or threaded rod for installation of the fixture shall meet the requirements according to Annex 4. The length of the fastening screw or threaded rod shall be defined according to the requirements given in Annex 4, taking into account the available thread length, the minimum screwing depth, the thickness of fixture and tolerances of member and fixture.

4.2.2. Installation of anchors

The fitness for use of the anchor can only be assumed if the anchor is installed as follows:

- anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters on the site;
- use of the anchor only as supplied by the manufacturer without exchanging the components of an anchor;
- anchor installation in accordance with the manufacturer's specifications and drawings prepared for that purpose and using the appropriate special tools;
- thickness of the fixture corresponding to the range of required thickness values for the type of anchor;
- checks before placing the anchor to ensure that the strength class of the concrete in which the anchor is to be placed is in the range given and is not lower than that of the concrete to which the characteristic loads apply;
- check of concrete being well compacted, e.g. without significant voids;
- clearing the hole of drilling dust;
- anchor installation ensuring the specified embedment depth using the special required stepped drill bit.
- anchor installation ensuring complete expansion of the sleeve using the special required setting tool, that is the end face of the expansion sleeve reaches the depth of the embedment mark on the stud;
- keeping of the edge distance and spacing to the specified values without minus tolerances;
- positioning of the drill holes without damaging the reinforcement;
- in case of aborted hole: new drilling at a minimum distance away of twice the depth of the aborted hole or smaller distance if the aborted drill hole is filled with high strength mortar and if under shear or oblique tension load it is not to the anchor in the direction of load application;

- the fastening screw or threaded rod shall correspond to the requirements given in Annex 4;
- application of the torque moment given in Annex 4 using a calibrated torque wrench.

4.2.3. Responsibility of the manufacturer

It is the manufacturer's responsibility to ensure that the information on the specific conditions according to 1 and 2 including Annexes referred to in 4.2.1. and 4.2.2. is given to those who are concerned. This information may be made by reproduction of the respective parts of the European Technical Approval. In addition all installation data shall be shown clearly on the package and/or on an enclosed instruction sheet, preferably using illustration(s).

The minimum data required are:

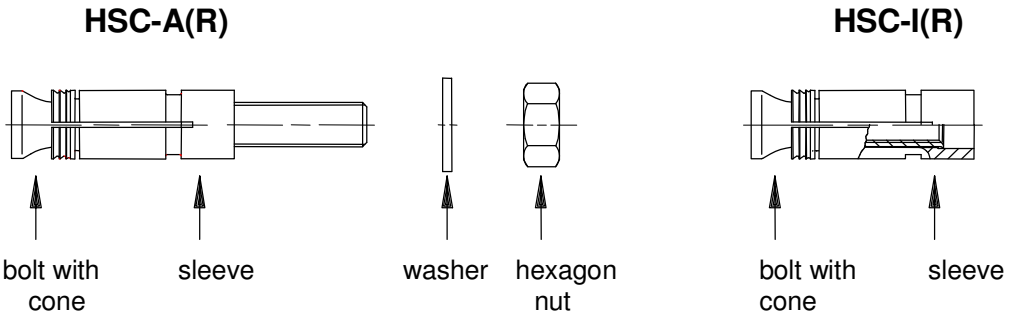
- drill bit diameter,
- thread diameter,
- maximum thickness of the fixture,
- required installation and hole depth,
- minimum screwing depth of the fastening screw or threaded rod (HSC-I and HSC-IR versions),
- minimum strength class of the fastening screw or threaded rod according to EN ISO 898-1 (HSC-I version) or EN ISO 3506 (HSC-IR version),
- required torque moment,
- information on the installation procedure, including cleaning of the hole, preferably by means of an illustration,
- reference to any special installation equipment needed,
- identification of the manufacturing batch.

All data shall be presented in a clear and explicit form.

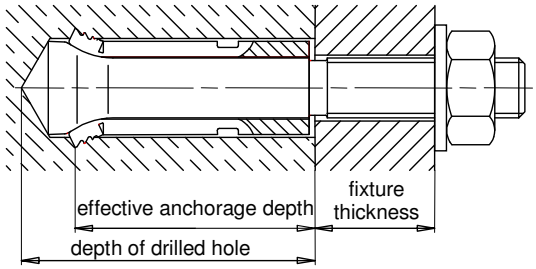
The original French version is signed by

Le Directeur Technique
H. BERRIER

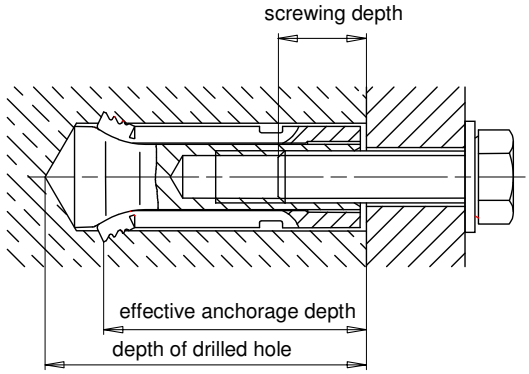
HSC(-R) safety anchor (externally and internally threaded version)



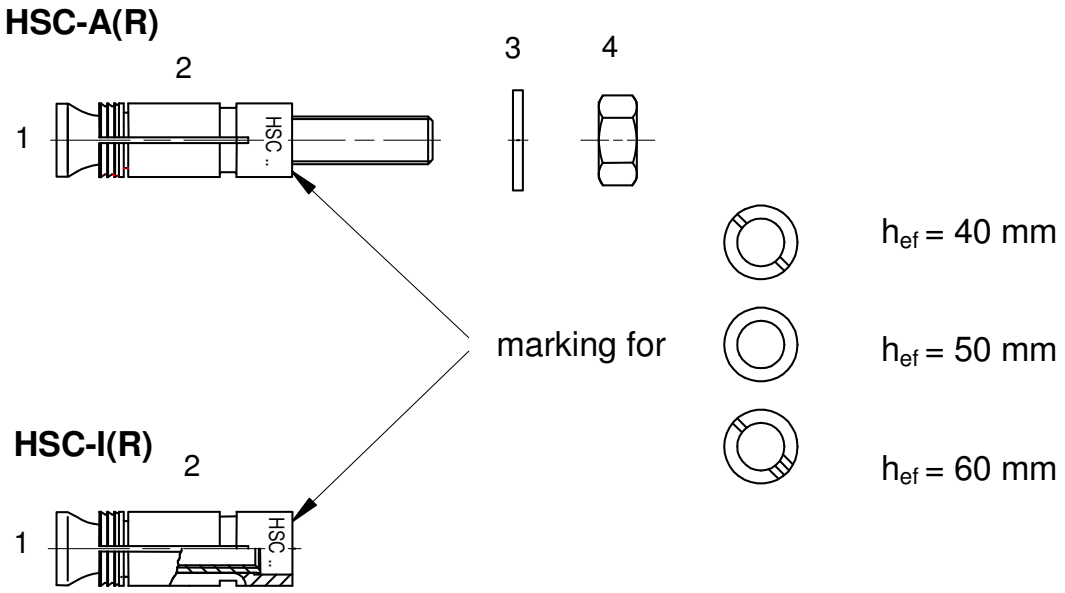
Installed condition: HSC-A(R) safety anchor (externally threaded version)



Installed condition: HSC-I(R) safety anchor (internally threaded version)



Hilti Safety Anchor HSC and HSC-R	**Annex 1**
Product and intended use	of European Technical Approval **ETA-02/0027**



part	designation	material (galvanised steel [1)])
1	cone bolt with external thread	grade 8.8 EN ISO 898-1
	cone bolt with internal thread	grade 8.8 EN ISO 898-1
2	expansion sleeve	galvanised steel
3	washer	galvanised steel
4	hexagon nut	grade 8 EN 20898-2

1) gal. Zn ≥ 5µm

part	designation	material (stainless steel)
1	cone bolt with external thread	1.4401, 1.4571 EN 10088 A4-70 EN ISO 3506
	cone bolt with internal thread	1.4401, 1.4571 EN 10088 A4-70 EN ISO 3506
2	expansion sleeve	1.4401, 1.4571 EN 10088
3	washer	1.4401, 1.4571 EN 10088
4	hexagon nut	1.4401, 1.4571 EN 10088 A4-70 EN ISO 3506

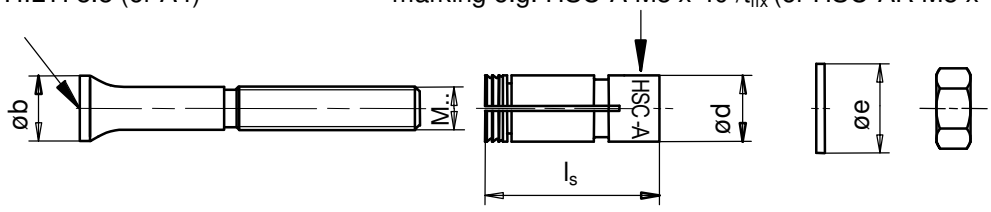
Table 1: Materials

Hilti Safety Anchor HSC and HSC-R	Annex 2
Materials	of European Technical Approval **ETA-02/0027**

External thread anchor HSC-A(R)

marking HILTI 8.8 (or A4)

marking e.g. HSC-A M8 x 40 /t_{fix} (or HSC-AR M8 x 40 /t_{fix}A4)



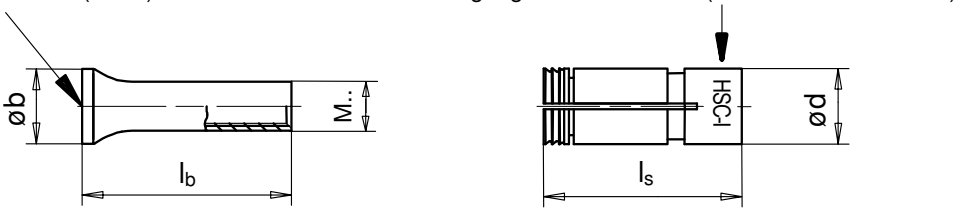
Anchor type **HSC-A(R)**	size	diameter of cone bolt **b** [mm]	length of expansion sleeve **l_s** [mm]	diameter of expansion sleeve **d** [mm]	diameter of washer **e** [mm]
M8 x 40	M8	13,5	40,8	13,5	16
M10 x 40	M10	15,5	40,8	15,5	20
M8 x 50	M8	13,5	50,8	13,5	16
M12 x 60	M12	17,5	60,8	17,5	24

Table 2: Dimensions for externally threaded version HSC-A(R)

Internal thread anchor HSC-I(R)

marking HILTI 8.8 (or A4)

marking e.g. HSC-I M6 x 40 (or HSC-IR M6 x 40 A4)

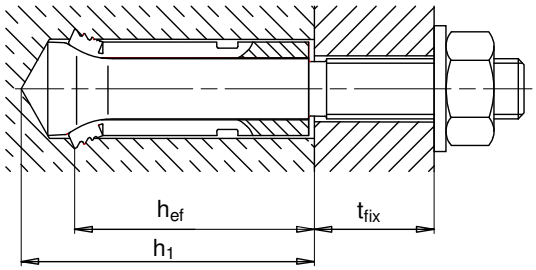


Anchor type **HSC-I(R)**	size	length of cone bolt **l_b** [mm]	diameter of cone bolt **b** [mm]	length of expansion sleeve **l_s** [mm]	diameter of expansion sleeve **d** [mm]
M6 x 40	M6	43,3	13,5	40,8	13,5
M8 x 40	M8	43,8	15,5	40,8	15,5
M10 x 50	M10	54,8	17,5	50,8	17,5
M10 x 60	M10	64,8	17,5	60,8	17,5
M12 x 60	M12	64,8	19,5	60,8	19,5

Table 3: Dimensions for internally threaded version HSC-I(R)

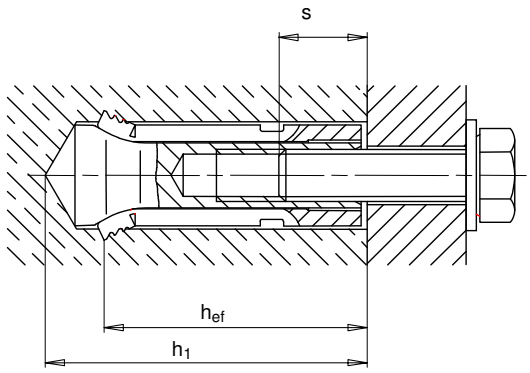
Hilti Safety Anchor HSC and HSC-R	**Annex 3**
Dimensions of anchors	of European Technical Approval **ETA-02/0027**

Table 4:
HSC-A(R) External thread anchor



Anchor type	HSC-A(R)	M8x40/t_{fix}	M10x40/t_{fix}	M8x50/t_{fix}	M12x60/t_{fix}
Nominal diameter of drill bit	d_0 [mm]	14	16	14	18
Depth of drill hole	h_1 [mm]	46	46,5	56	68
Torque moment	T_{inst} [Nm]	10	20	10	30
Diameter of clearance hole in the fixture	d_f [mm]	9	12	9	14

Table 5:
HSC-I(R) Internal thread anchor



Fastening carbon steel screw or threaded rod for the HSC-I : Minimum strength class 8.8 according to EN ISO 898-1
Fastening stainless steel screw or threaded rod for the HSC-IR: Minimum strength class A4-70 according to EN ISO 3506;
minimum screw depth min s; the length of the fastening shall be determined depending on thickness of fixture t_{fix}, admissible tolerances and available thread length.

Anchor type	HSC-I(R)	M6x40	M8x40	M10x50	M10x60	M12x60
Nominal diameter of drill bit	d_0 [mm]	14	16	18	18	20
Depth of drilled hole	h_1 [mm]	46	46,5	56	68	68,5
Torque moment	T_{inst} [Nm]	10	10	20	30	30
Diameter of clearance hole in the fixture	d_f [mm]	7	9	12	12	14
Screwing depth	min s [mm]	6	8	10	10	12
	max s [mm]	16	22	28	28	30

Table 6: Minimum thickness of concrete member, minimum spacing and minimum edge distances of anchors

HSC-A(R)			M8x40	M10x40	M8x50	M12x60
Minimum thickness of concrete member	h_{min}	[mm]	100	100	100	130
Minimum spacing	s_{min}	[mm]	40	40	50	60
Minimum edge distance	c_{min}	[mm]	40	40	50	60

HSC-I(R)			M6x40	M8x40	M10x50	M10x60	M12x60
Minimum thickness of concrete member	h_{min}	[mm]	100	100	110	130	130
Minimum spacing	s_{min}	[mm]	40	40	50	60	60
Minimum edge distance	c_{min}	[mm]	40	40	50	60	60

Carbon steel HSC-A and HSC-I anchor design

Table 7: Characteristic resistance to tension loads (design method A)

HSC-A			M8x40	M10x40	M8x50	M12x60
Steel failure						
Characteristic resistance	$N_{Rk,s}$	[kN]	29,3	46,4	29,3	67,4
Partial safety factor	γ_{Ms}		1,50			
Concrete cone and splitting failure						
Effective anchorage depth	h_{ef}	[mm]	40	40	50	60
Partial safety factor in cracked and non cracked concrete	γ_2		1,0			
	$\gamma_{Mc} = \gamma_{M,sp}$		1,50			
Spacing	$s_{cr,N}$	[mm]	120	120	150	180
Edge distance	$c_{cr,N}$	[mm]	60	60	75	90
Spacing	$s_{cr,sp}$	[mm]	130	120	170	180
Edge distance	$c_{cr,sp}$	[mm]	65	60	85	90

HSC-I			M6x40	M8x40	M10x50	M10x60	M12x60
Steel failure							
Characteristic resistance	$N_{Rk,s}$	[kN]	16,1	24,4	30,3	30,3	36,5
Partial safety factor	γ_{Ms}		1,50				
Concrete cone and splitting failure							
Effective anchorage depth	h_{ef}	[mm]	40	40	50	60	60
Partial safety factor in cracked and non cracked concrete	γ_2		1,0				
	$\gamma_{Mc} = \gamma_{M,sp}$		1,50				
Spacing	$s_{cr,N}$	[mm]	120	120	150	180	180
Edge distance	$c_{cr,N}$	[mm]	60	60	75	90	90
Spacing	$s_{cr,sp}$	[mm]	130	120	170	180	180
Edge distance	$c_{cr,sp}$	[mm]	65	60	85	90	90

Table 8: Characteristic resistance to shear loads (design method A)

HSC-A			**M8x40**	**M10x40**	**M8x50**	**M12x60**
Steel failure without lever arm						
Characteristic resistance	$V_{Rk,s}$	[kN]	14,6	23,2	14,6	33,7
Partial safety factor	γ_{Ms}		1,25			
Steel failure with lever arm						
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	30	60	30	105
Partial safety factor	γ_{Ms}		1,25			
Concrete pryout failure						
Factor in equation (5.6) of ETAG Annex C, §5.2.3.3	k		2	2	2	2
Partial safety factor	γ_2		1,0			
	γ_{Mc}		1,50			
Concrete edge failure						
Effective length of anchor in shear loading	l_f	[mm]	40	40	50	60
External diameter of anchor	d_{nom}	[mm]	14	16	14	18
Partial safety factor	γ_2		1,0			
	γ_{Mc}		1,50			

HSC-I			**M6x40**	**M8x40**	**M10x50**	**M10x60**	**M12x60**
Steel failure without lever arm							
Characteristic resistance	$V_{Rk,s}$	[kN]	8,0	12,2	15,2	15,2	18,2
Partial safety factor	γ_{Ms}		1,25				
Steel failure with lever arm							
Characteristic resistance	$M^0_{Rk,s}$	[N.m]	12	30	60	60	105
Partial safety factor	γ_{Ms}		1,25				
Concrete pryout failure							
Factor in equation (5.6) of ETAG Annex C, §5.2.3.3	k		2	2	2	2	2
Partial safety factor	γ_2		1,0				
	γ_{Mc}		1,50				
Concrete edge failure							
Effective length of anchor in shear loading	l_f	[mm]	40	40	50	60	60
External diameter of anchor	d_{nom}	[mm]	14	16	18	18	20
Partial safety factor	γ_2		1,0				
	γ_{Mc}		1,50				

Hilti Safety Anchor HSC	**Annex 6**
Characteristic resistance to shear loads (Design method A)	of European Technical Approval **ETA-02/0027**

Table 9: Displacements under tension loads

HSC-A			**M8x40**	**M10x40**	**M8x50**	**M12x60**
Tension load in C20/25 (C50/60) cracked concrete	N	[kN]	3,6 (5,6)	3,6 (5,6)	5,1 (7,8)	6,6 (10,3)
Displacement	δ_{N0}	[mm]	0,2 (0,4)	0,2 (0,4)	0,3 (0,4)	0,4 (0,4)
	$\delta_{N\infty}$	[mm]	0,7 (0,7)	0,7 (0,7)	0,6 (0,6)	0,4 (0,4)

HSC-I			**M6x40**	**M8x40**	**M10x50**	**M10x60**	**M12x60**
Tension load in C20/25 (C50/60) cracked concrete	N	[kN]	3,6 (5,6)	3,6 (5,6)	5,1 (7,8)	6,6 (10,3)	6,6 (10,3)
Displacement	δ_{N0}	[mm]	0,2 (0,4)	0,2 (0,4)	0,3 (0,4)	0,4 (0,4)	0,4 (0,4)
	$\delta_{N\infty}$	[mm]	0,7 (0,7)	0,7 (0,7)	0,6 (0,6)	0,4 (0,4)	0,4 (0,4)

HSC-A			**M8x40**	**M10x40**	**M8x50**	**M12x60**
Tension load in C20/25 (C50/60)non-cracked concrete	N	[kN]	5,1 (7,8)	5,1 (7,8)	7,1 (11,0)	9,3 (14,4)
Displacement	δ_{N0}	[mm]	0,1 (0,2)	0,1 (0,2)	0,1 (0,2)	0,1 (0,2)
	$\delta_{N\infty}$	[mm]	0,2 (0,2)	0,2 (0,2)	0,2 (0,2)	0,2 (0,2)

HSC-I			**M6x40**	**M8x40**	**M10x50**	**M10x60**	**M12x60**
Tension load in C20/25 (C50/60) non-cracked concrete	N	[kN]	5,1 (7,6)	5,1 (7,8)	7,1 (11,0)	9,3 (14,4)	9,3 (14,4)
Displacement	δ_{N0}	[mm]	0,1 (0,2)	0,1 (0,2)	0,1 (0,2)	0,1 (0,2)	0,1 (0,2)
	$\delta_{N\infty}$	[mm]	0,2 (0,2)	0,2 (0,2)	0,2 (0,2)	0,2 (0,2)	0,2 (0,2)

Table 10: Displacements under shear loads*

HSC-A			**M8x40/15**	**M10x40/20**	**M8x50/15**	**M12x60/20**
Shear load in C20/25 to C50/60 cracked and non-cracked concrete	V	[kN]	8,4	13,3	8,4	19,3
Displacement	δ_{V0}	[mm]	3,0 (+1,7)	3,0 (+1,7)	2,8 (+1,7)	3,0 (+1,7)
	$\delta_{V\infty}$	[mm]	4,5 (+1,7)	4,5 (+1,7)	4,3 (+1,7)	4,5 (+1,7)

HSC-I			**M6x40**	**M8x40**	**M10x50**	**M10x60**	**M12x60**
Shear load in C20/25 to C50/60 cracked and non-cracked concrete	V	[kN]	4,6	7,0	8,7	8,7	10,4
Displacement	δ_{V0}	[mm]	3,0 (+1,7)	3,0 (+1,7)	2,8 (+1,7)	3,0 (+1,7)	3,0 (+1,7)
	$\delta_{V\infty}$	[mm]	4,5 (+1,7)	4,5 (+1,7)	4,3 (+1,7)	4,5 (+1,7)	4,5 (+1,7)

* The displacements values given in table 10 correspond to the anchor's own deformation. This displacement is accompanied by a displacement, indicated in brackets, linked to the bringing into contact of the anchor's body and the edge of the drilled hole in the concrete substrate on the one hand and on the fixture on the other hand.

Stainless steel HSC-AR and HSC-IR anchor design

Table 11: Characteristic resistance to tension loads (design method A)

HSC-AR			M8x40	M10x40	M8x50	M12x60
Steel failure						
Characteristic resistance	$N_{Rk,s}$	[kN]	25,6	40,6	25,6	59,0
Partial safety factor	γ_{Ms}		1,87			
Concrete cone and splitting failure						
Effective anchorage depth	h_{ef}	[mm]	40	40	50	60
Partial safety factor in cracked and non cracked concrete	γ_2		1,0			
	$\gamma_{Mc} = \gamma_{M,sp}$		1,50			
Spacing	$s_{cr,N}$	[mm]	120	120	150	180
Edge distance	$c_{cr,N}$	[mm]	60	60	75	90
Spacing	$s_{cr,sp}$	[mm]	130	120	170	180
Edge distance	$c_{cr,sp}$	[mm]	65	60	85	90

HSC-IR			M6x40	M8x40	M10x50	M10x60	M12x60
Steel failure							
Characteristic resistance	$N_{Rk,s}$	[kN]	14,1	21,4	26,5	26,5	31,9
Partial safety factor	γ_{Ms}		1,87				
Concrete cone and splitting failure							
Effective anchorage depth	h_{ef}	[mm]	40	40	50	60	60
Partial safety factor in cracked and non cracked concrete	γ_2		1,0				
	$\gamma_{Mc} = \gamma_{M,sp}$		1,50				
Spacing	$s_{cr,N}$	[mm]	120	120	150	180	180
Edge distance	$c_{cr,N}$	[mm]	60	60	75	90	90
Spacing	$s_{cr,sp}$	[mm]	130	120	170	180	180
Edge distance	$c_{cr,sp}$	[mm]	65	60	85	90	90

Table 12: Characteristic resistance to shear loads (design method A)

HSC-AR			**M8x40**	**M10x40**	**M8x50**	**M12x60**
Steel failure without lever arm						
Characteristic resistance	$V_{Rk,s}$	[kN]	12,8	20,3	12,8	29,5
Partial safety factor	γ_{Ms}		1,56			
Steel failure with lever arm						
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	26	52	26	92
Partial safety factor	γ_{Ms}		1,56			
Concrete pryout failure						
Factor in equation (5.6) of ETAG Annex C, §5.2.3.3	k		2	2	2	2
Partial safety factor	γ_2		1			
	γ_{Mc}		1,50			
Concrete edge failure						
Effective length of anchor in shear loading	l_f	[mm]	40	40	50	60
External diameter of anchor	d_{nom}	[mm]	14	16	14	18
Partial safety factor	γ_2		1			
	γ_{Mc}		1,50			

HSC-IR			**M6x40**	**M8x40**	**M10x50**	**M10x60**	**M12x60**
Steel failure without lever arm							
Characteristic resistance	$V_{Rk,s}$	[kN]	7,0	10,7	13,3	13,3	16,0
Partial safety factor	γ_{Ms}		1,56				
Steel failure with lever arm							
Characteristic resistance	$M^0_{Rk,s}$	[kN]	11	26	52	52	92
Partial safety factor	γ_{Ms}		1,56				
Concrete pryout failure							
Factor in equation (5.6) of ETAG Annex C, §5.2.3.3	k		2	2	2	2	2
Partial safety factor	γ_2		1				
	γ_{Mc}		1,50				
Concrete edge failure							
Effective length of anchor in shear loading	l_f	[mm]	40	40	50	60	60
External diameter of anchor	d_{nom}	[mm]	14	16	18	18	20
Partial safety factor	γ_2		1				
	γ_{Mc}		1,50				

Table 13: Displacements under tension loads

HSC-AR			**M8x40**	**M10x40**	**M8x50**	**M12x60**
Tension load in C20/25 (C50/60) cracked concrete	N	[kN]	3,6 (5,6)	3,6 (5,6)	5,1 (7,8)	6,6 (10,3)
Displacement	δ_{N0}	[mm]	0,4 (0,5)	0,4 (0,5)	0,4 (0,5)	1,0 (0,5)
	$\delta_{N\infty}$	[mm]	0,9 (0,9)	1,0 (1,0)	0,9 (0,9)	1,0 (0,9)

HSC-IR			**M6x40**	**M8x40**	**M10x50**	**M10x60**	**M12x60**
Tension load in C20/25 (C50/60) cracked concrete	N	[kN]	3,6 (5,6)	3,6 (5,6)	5,1 (7,8)	6,6 (10,3)	6,6 (10,3)
Displacement	δ_{N0}	[mm]	0,4 (0,5)	0,4 (0,5)	0,5 (1,0)	0,5 (1,0)	1,0 (1,0)
	$\delta_{N\infty}$	[mm]	0,9 (0,9)	1,0 (1,0)	1,2 (1,2)	0,9 (1,0)	1,0 (1,0)

HSC-AR			**M8x40**	**M10x40**	**M8x50**	**M12x60**
Tension load in C20/25 (C50/60) non-cracked concrete	N	[kN]	5,1 (7,8)	5,1 (7,8)	7,1 (11,0)	9,3 (14,4)
Displacement	δ_{N0}	[mm]	0,1 (0,2)	0,1 (0,2)	0,1 (0,2)	0,2 (0,2)
	$\delta_{N\infty}$	[mm]	0,3 (0,3)	0,3 (0,3)	0,3 (0,3)	0,3 (0,3)

HSC-IR			**M6x40**	**M8x40**	**M10x50**	**M10x60**	**M12x60**
Tension load in C20/25 (C50/60) non-cracked concrete	N	[kN]	5,1 (7,6)	5,1 (7,8)	7,1 (11,0)	9,3 (14,4)	9,3 (14,4)
Displacement	δ_{N0}	[mm]	0,1 (0,2)	0,1 (0,2)	0,1 (0,2)	0,2 (0,2)	0,2 (0,2)
	$\delta_{N\infty}$	[mm]	0,3 (0,3)	0,3 (0,3)	0,3 (0,3)	0,3 (0,3)	0,3 (0,3)

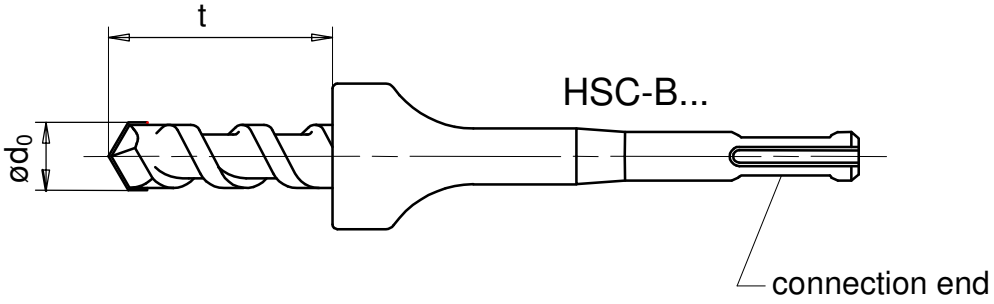
Table 14: Displacements under shear loads*

HSC-A(R)			**M8x40/15**	**M10x40/20**	**M8x50/15**	**M12x60/20**
Shear load in C20/25 to C50/60 cracked and non-cracked concrete	V	[kN]	8,4	13,3	8,4	19,3
Displacement	δ_{V0}	[mm]	3,0 (+1,7)	3,0 (+1,7)	2,8 (+1,7)	3,0 (+1,7)
	$\delta_{V\infty}$	[mm]	4,5 (+1,7)	4,5 (+1,7)	4,3 (+1,7)	4,5 (+1,7)

HSC-I(R)			**M6x40**	**M8x40**	**M10x50**	**M10x60**	**M12x60**
Shear load in C20/25 to C50/60 cracked and non-cracked concrete	V	[kN]	4,6	7,0	8,7	8,7	10,4
Displacement	δ_{V0}	[mm]	3,0 (+1,7)	3,0 (+1,7)	2,8 (+1,7)	3,0 (+1,7)	3,0 (+1,7)
	$\delta_{V\infty}$	[mm]	4,5 (+1,7)	4,5 (+1,7)	4,3 (+1,7)	4,5 (+1,7)	4,5 (+1,7)

* The displacements values given in table 10 correspond to the anchor's own deformation. This displacement is accompanied by a displacement, indicated in brackets, linked to the bringing into contact of the anchor's body and the edge of the drilled hole in the concrete substrate on the one hand and on the fixture on the other hand.

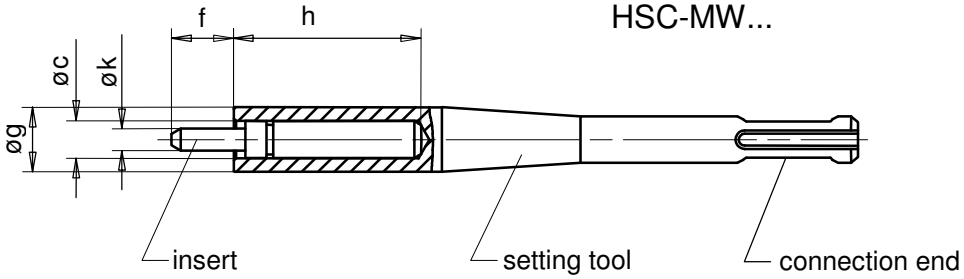
Stepped drill bit HSC-B



type	diameter of drill bit d_0 [mm]	total length t [mm]
HSC-B 14 x 40	14	46
HSC-B 16 x 40	16	46,5
HSC-B 14 x 50	14	56
HSC-B 18 x 50	18	58
HSC-B 18 x 60	18	68
HSC-B 20 x 60	20	68,5

Table 15: Dimensions of stepped drill bit

Setting tool HSC-MW



setting tool / insert tool	h [mm]	c [mm]	g [mm]	k [mm]	f [mm]
HSC-MW 14	37,5	8,1	13,5	-	-
HSC-EW 14	-	8	-	4,9	17
HSC-MW 16	40	10,1	16	-	-
HSC-EW 16	-	10	-	6,6	24,5
HSC-MW 18	47	12,1	18	-	-
HSC-EW 18	-	12	-	8,3	31
HSC-MW 20	47	14,1	20	-	-
HSC-EW 20	-	13,9	-	10,1	34

Table 16: Setting tool HSC-MW / insert tool HSC-EW

The setting tool HSC-MW.. is needed for both versions of HSC safety anchor. The insert tool HSC-EW.. is needed only for the HSC-I version.

Table 17: Required setting tools and stepped drill bits for HSC-A(R)

Anchor type	**HSC-A(R) M8 x 40/ t_{fix}**	**HSC-A(R) M10 x 40/ t_{fix}**	**HSC-A(R) M8 x 50/ t_{fix}**	**HSC-A(R) M12 x 60/ t_{fix}**
Stepped drill bit	HSC-B 14 x 40	HSC-B 16 x 40	HSC-B 14 x 50	HSC-B 18 x 60
Setting tool	HSC-MW14	HSC-MW16	HSC-MW14	HSC-MW18

Table 18: Required setting tools and stepped drill bits for HSC-I(R)

Anchor type	**HSC-I(R) M6 x 40**	**HSC-I(R) M8 x 40**	**HSC-I(R) M10 x 50**	**HSC-I(R) M10 x 60**	**HSC-I(R) M12 x 60**
Stepped drill bit	HSC-B 14 x 40	HSC-B 16 x 40	HSC-B 18 x 50	HSC-B 18 x 60	HSC-B 20 x 60
Setting tool	HSC-MW14	HSC-MW16	HSC-MW18	HSC-MW18	HSC-MW20
Insert tool	HSC-EW14	HSC-EW16	HSC-EW18	HSC-EW18	HSC-EW20