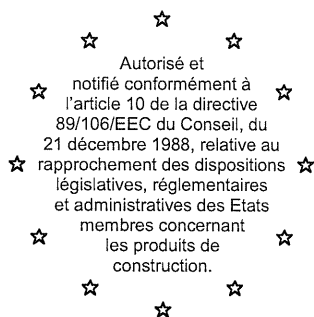


Centre Scientifique et Technique du Bâtiment

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CSTB
le futur en construction

MEMBRE DE L'EOTA

European Technical Approval

ETA-02/0042

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

Nom commercial :

Trade name:

Hilti HSL-3

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, à expansion par vissage à
couple contrôlé, de fixation dans le béton : diamètres M8, M10, M12,
M16, M20 et M24.

**Torque-controlled expansion anchor, made of galvanised
steel, for use in concrete: sizes M8, M10, M12, M16, M20 and
M24.**

Validité du :
au :

Validity from / to:

10/01/2008

10/01/2013

Usine de fabrication :

Manufacturing plant:

Plant, Austria

Le présent Agrément technique européen
contient :

**This European Technical Approval
contains:**

18 pages incluant 11 annexes faisant partie intégrante du document.

**18 pages including 11 annexes which form an integral part
of the document.**

This European Technical Approval replaces ETA-02/0042 with validity from 01/12/2003 to 09/01/2008

Cet Agrément Technique Européen remplace ETA-02/0042 valide du 01/12/2003 au 09/01/2008



Organisation pour l'Agrément Technique Européen
European Organisation for Technical Approvals

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 products¹, modified by the Council Directive 93/68/EEC of 22 July 1993²;
 - Décret n°92-647 du 8 juillet 1992³ 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/EC⁴;
 - Guideline for European Technical Approval of « Metal Anchors for use in Concrete » ETAG 001, edition 1997, Part 1 « Anchors in general » and Part 2 « Torque-controlled expansion 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.
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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.

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 heavy duty HSL-3 anchor in the range of M8 to M24 is a torque-controlled expansion anchor made of galvanised steel. The Hilti heavy duty HSL-3 anchor is available in five versions: an hexagonal bolt version (HSL-3) in the range of M8 to M24; a threaded rod version (HSL-3-G) in the range of M8 to M20; a safety cap version (HSL-3-B) in the range of M12 to M24; a socket hexagonal head version (HSL-3-SH) in the range M8 to M12; a countersunk version (HSL-3-SK) in the range of M8 to M12. It is placed into a drilled hole and anchored by torque-controlled expansion.

For the installed anchor see Figures given in Annex 1.

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 anchor may only be used in concrete subject to dry internal conditions.

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 M8 to M24 corresponds to the drawings and provisions given in Annexes 1 to 7. The characteristic material values, dimensions and tolerances of the anchor not indicated in Annexes 2 to 7 shall correspond to the respective values laid down in the technical documentation⁵ of this European Technical Approval. The characteristic anchor values for the design of anchorages are given in Annexes 8 to 11. The steel grade of all versions with bolt (HSL-3; HSL-3-B; HSL-3-SH; HSL-3-SK) or threaded rod (HSL-3-G) 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.

Each anchor is marked on the distance sleeve with the product name (HSL-3), the nominal diameter and the maximum thickness of the fixture according to Annex 4.

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.

As example : HSL-3 M16/50

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 2 « Torque-controlled expansion 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.

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 plan⁶. 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);
 - distance sleeve (lengths, internal and external diameters);
 - expansion sleeve (lengths, internal and external diameters, geometry of the expansion part);

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.

hexagonal nut (proper running, wrench size across flats);
washer (diameters, thickness).

- Material properties: bolt (ultimate tensile strength), sleeve (ultimate tensile strength for the raw material), hexagonal nut (proof load), washer (ultimate tensile strength for the raw material).
- 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.

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 torque-controlled expansion 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.).

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 if the marking on the distance sleeve does not exceed the concrete surface;
- anchor installation ensuring complete expansion of the sleeve depending on the appropriate torque moment (except in the case of safety cap version (HSL-3-B) where the correct installation is reached without torque moment but when the safety cap shear off);
- 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;
- application of the torque moment given in Annexes 4 and 5 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).

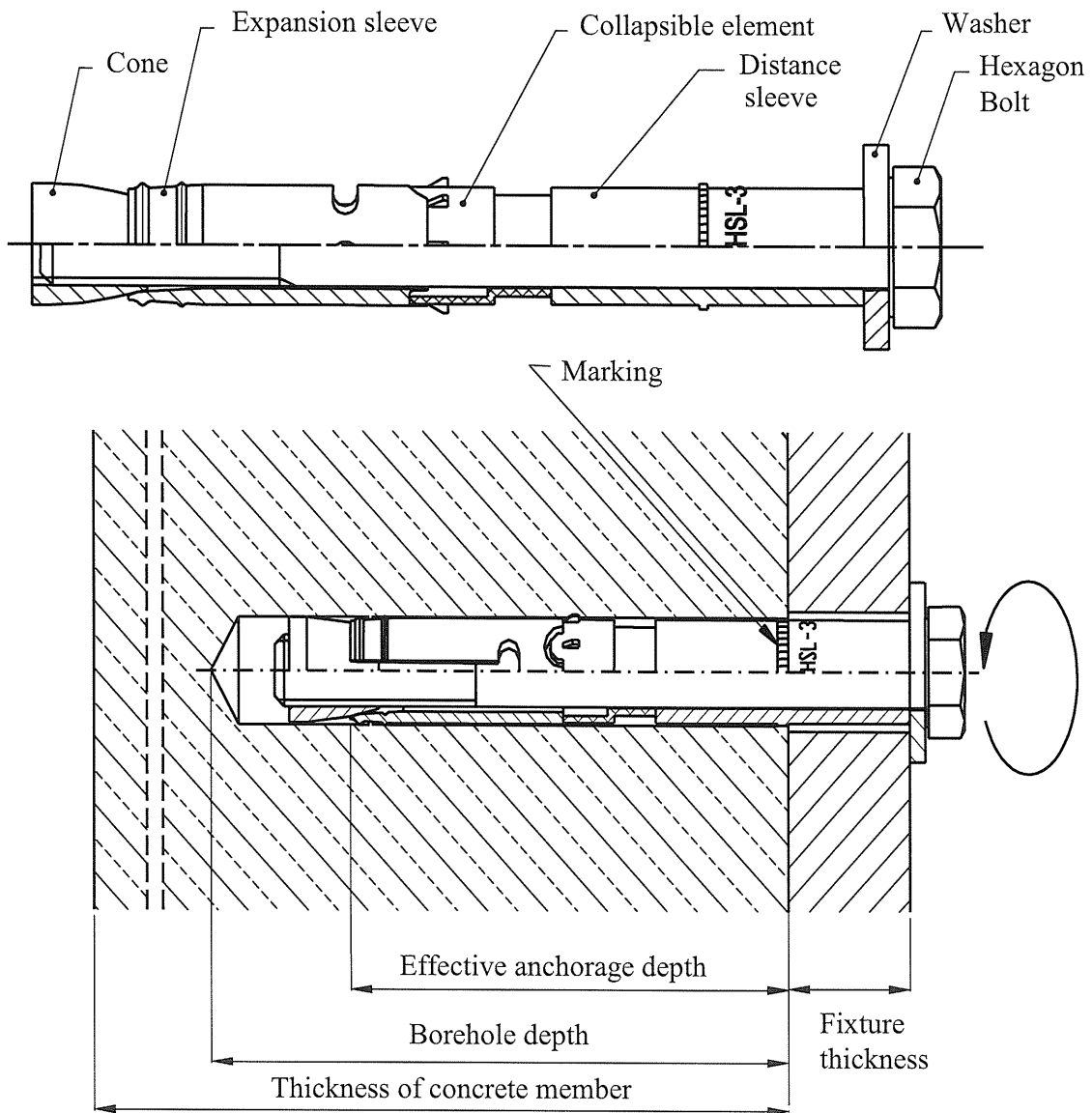
The minimum data required are:

- drill bit diameter,
- thread diameter,
- maximum thickness of the fixture,
- required installation and hole depth,
- 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.

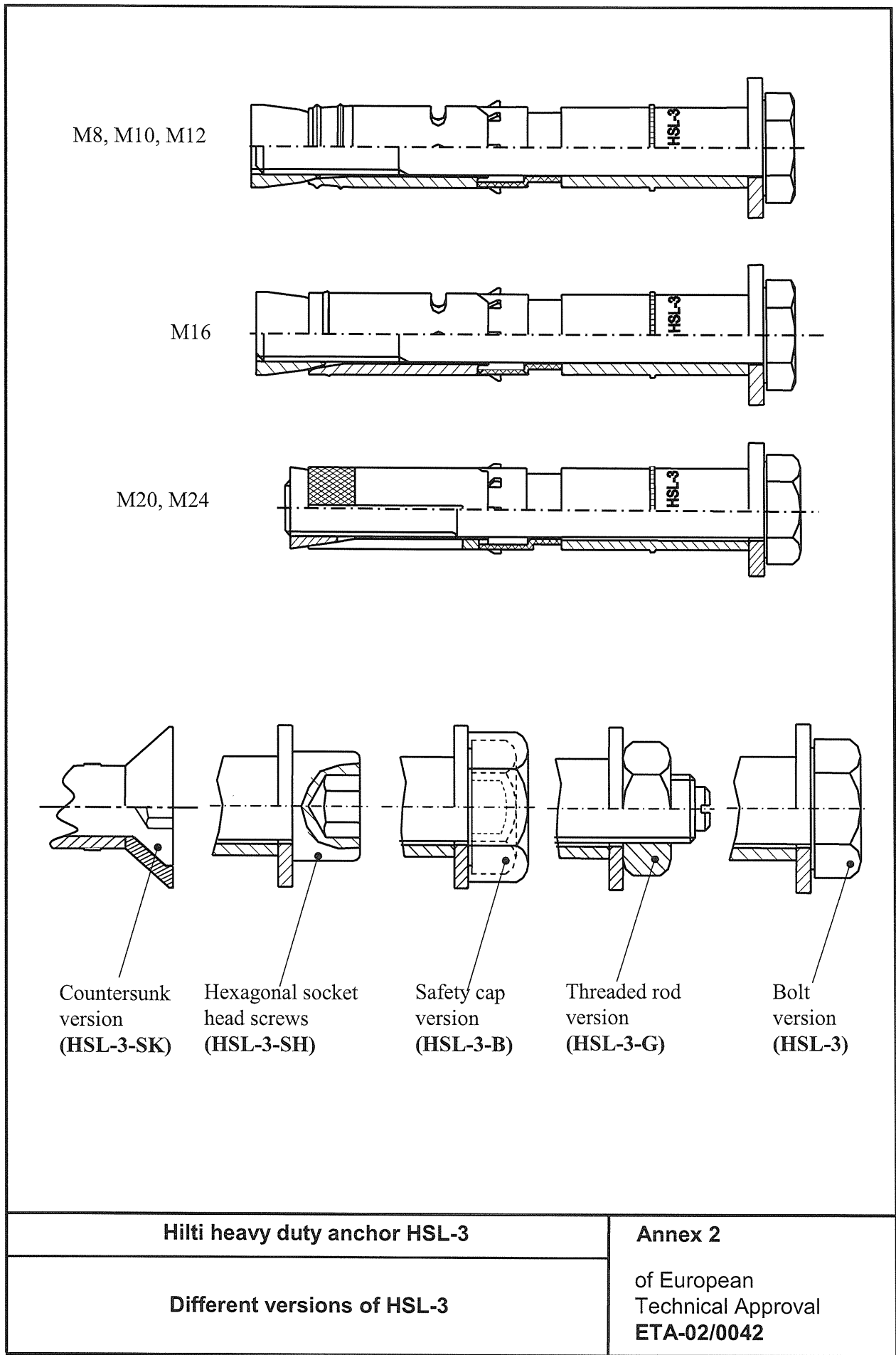
All data shall be presented in a clear and explicit form.

The original French version is signed by

**Le Directeur Technique
H. BERRIER**



<p>Hilti heavy duty anchor HSL-3</p>	<p>Annex 1</p>
<p>Product and intended use</p>	<p>of European Technical Approval ETA-02/0042</p>



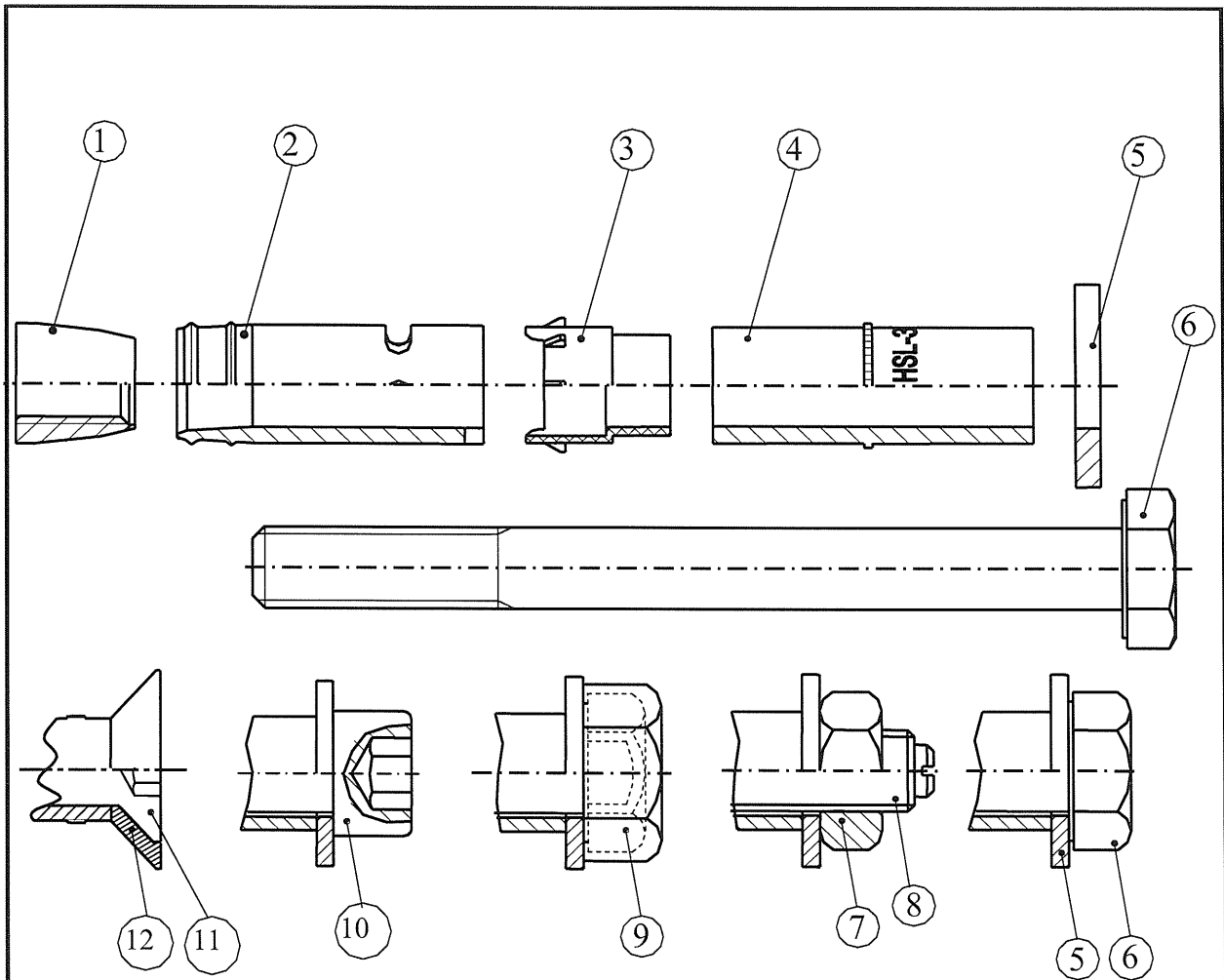


Table 1 : Materials

Part	Designation	HSL-3 (galvanized 5µm)
1	Cone	Steel, DIN 1654-4
2	Expansion sleeve	Steel, DIN 1654-4
3	Collapsible element	POM plastic element
4	Distance sleeve	Carbon steel DIN 2393 T1
5	Washer	St 37 DIN 1544
6	Hexagonal bolt	Steel 8.8 acc. DIN EN ISO 898-1
7	Hexagon nut	Grade 8 (DIN 934, in future EN 24032)
8	Threaded rod	Steel 8.8 acc. DIN EN ISO 898-1
9	Safety cap version	Steel 8.8 acc. DIN EN ISO 898-1
10	Hexagonal socket head	Steel 8.8 acc. DIN EN ISO 898-1
11	Countersunk bolt	Steel 8.8 acc. DIN ISO 4759-1 and DIN EN ISO 898-1
12	Cup washer	11SMnPb37 + C MOD HN389

Hilti heavy duty anchor HSL-3

Materials

Annex 3

of European
Technical Approval
ETA-02/0042

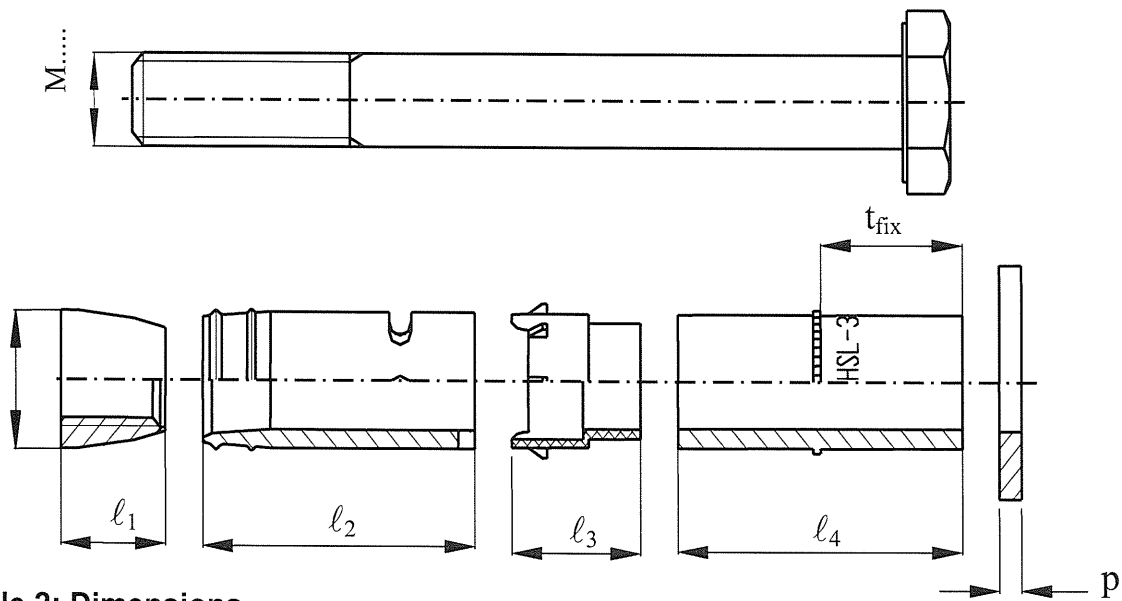


Table 2: Dimensions

Anchor version	Thread size	t_{fix} [mm]		d_s [mm]	l_1 [mm]	l_2 [mm]	l_3 [mm]	l_4 [mm]		p [mm]
		min	max					min	max	
HSL-3	M8	5	200	11,9	12	32	15,2	19	214	2
HSL-3-G	M10	5	200	14,8	14	36	17,2	23	218	3
HSL-3	M12	5	200	17,6	17	40	20,0	28	223	3
HSL-3-G	M16	10	200	23,6	20	54,4	24,4	34,5	224,5	4
HSL-3-B	M20	10	200	27,6	20	57	31,5	51	241	4
HSL-3	M24	10	200	31,6	22	65	39,0	57	247	4
HSL-3-B										
HSL-3-SH	M8	5		11,9	12	32	15,2	19		2
	M10	20		14,8	14	36	17,2	38		3
	M12	25		17,6	17	40	20,0	48		3
HSL-3-SK	M8	10	20	11,9	12	32	15,2	18,2	28,2	2
	M10	20		14,8	14	36	17,2	32,2		3
	M12	25		17,6	17	40	20,0	40		3

Hilti heavy duty anchor HSL-3

Dimensions of anchor HSL-3

Annex 4

of European
Technical Approval
ETA-02/0042

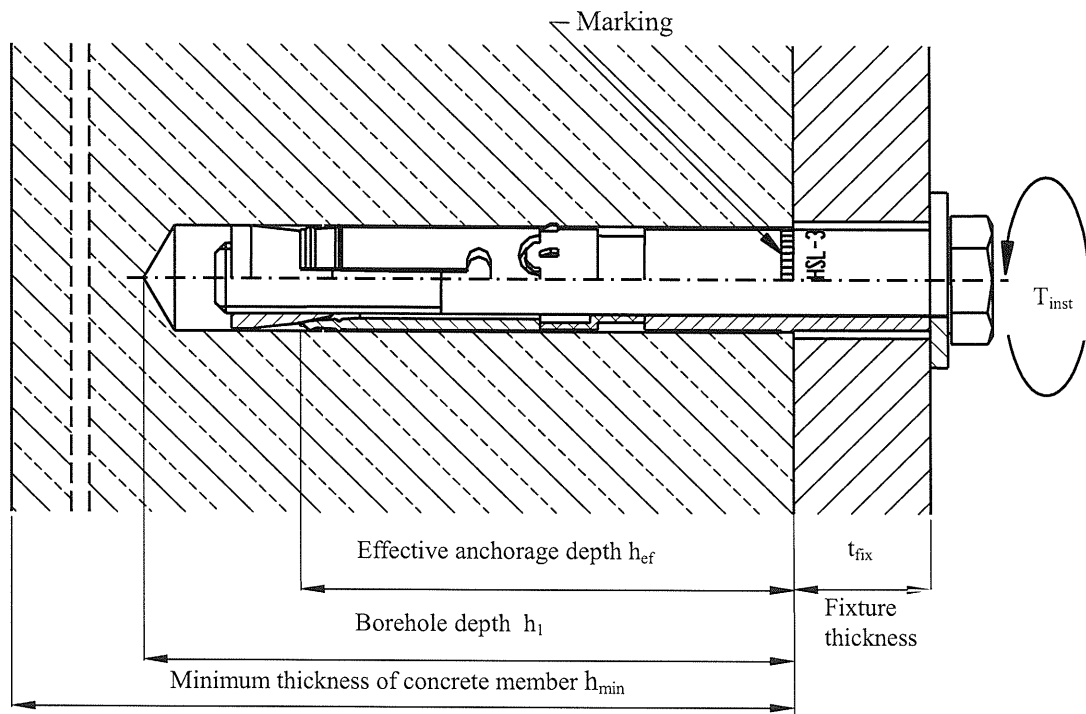
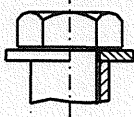


Table 3a: Characteristic values of anchors and installation for HSL-3

Anchor version			M8	M10	M12	M16	M20	M24
HSL-3								
Nominal diameter of drill bit	d_0	[mm]	12	15	18	24	28	32
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	12,5	15,5	18,5	24,55	28,55	32,7
Depth of drill hole	$h_1 \geq$	[mm]	80	90	105	125	155	180
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	14	17	20	26	31	35
Effective anchorage depth	h_{ef}	[mm]	60	70	80	100	125	150
Torque moment	T_{inst}	[Nm]	25	50	80	120	200	250
Width across	SW	[mm]	13	17	19	24	30	36

Hilti heavy duty anchor HSL-3	Annex 5 of European Technical Approval ETA-02/0042
Installation data	

Table 3b: Characteristic values of anchors and installation for HSL-3-G


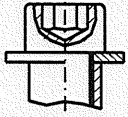
Anchor version			M8	M10	M12	M16	M20
HSL-3-G							
Nominal diameter of drill bit	d_0	[mm]	12	15	18	24	28
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	12,5	15,5	18,5	24,55	28,55
Depth of drill hole	$h_1 \geq$	[mm]	80	90	105	125	155
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	14	17	20	26	31
Effective anchorage depth	h_{ef}	[mm]	60	70	80	100	125
Torque moment	T_{inst}	[Nm]	20	35	60	80	160
Width across	SW	[mm]	13	17	19	24	30

Table 3c: Characteristic values of anchors and installation for HSL-3-SH

Anchor version			M8	M10	M12
HSL-3-SH					
Nominal diameter of drill bit	d_0	[mm]	12	15	18
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	12,5	15,5	18,5
Depth of drill hole	$h_1 \geq$	[mm]	85	95	110
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	14	17	20
Effective anchorage depth	h_{ef}	[mm]	60	70	80
Torque moment	T_{inst}	[Nm]	20	35	60
Size of hexagon socket screw key	SW	[mm]	6	8	10

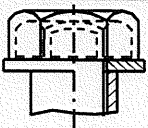
Hilti heavy duty anchor HSL-3

Installation data

Annex 6

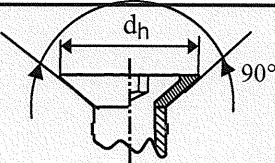
of European
Technical Approval
ETA-02/0042

Table 3d: Characteristic values of anchors and installation for HSL-3-B

Anchor version HSL-3-B			M12	M16	M20	M24
Nominal diameter of drill bit	d_0	[mm]	18	24	28	32
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	18,5	24,55	28,55	32,7
Depth of drill hole	$h_1 \geq$	[mm]	105	125	155	180
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	20	26	31	35
Effective anchorage depth	h_{ef}	[mm]	80	100	125	150
Width across	SW	[mm]	24	30	36	41

The torque moment is controlled by the safety cap.

Table 3e: Characteristic values of anchors and installation for HSL-3-SK

Anchor version HSL-3-SK			M8	M10	M12
Nominal diameter of drill bit	d_0	[mm]	12	15	18
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	12,5	15,5	18,5
Depth of drill hole	$h_1 \geq$	[mm]	80	90	105
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	14	17	20
Diameter of countersunk hole in the fixture	$d_h =$	[mm]	22,5	25,5	32,9
Effective anchorage depth	h_{ef}	[mm]	60	70	80
Torque moment	T_{inst}	[Nm]	25	50	80
Size of hexagon socket screw key	SW	[mm]	5	6	8

Hilti heavy duty anchor HSL-3

Installation data

Annex 7

of European
Technical Approval
ETA-02/0042

Table 4: Minimum thickness of concrete member, minimum spacing and minimum edge distance of anchors

			M8	M10	M12	M16	M20	M24
Minimum thickness of concrete member	h_{min}	[mm]	120	140	160	200	250	300
Non-cracked and cracked concrete								
Minimum spacing	s_{min}	[mm]	60	70	80	100	125	150
	for $c \geq$	[mm]	100	100	160	240	300	300
Minimum edge distance	c_{min}	[mm]	60	70	80	100	150	150
	for $s \geq$	[mm]	100	160	240	240	300	300

Intermediate values by linear interpolation

Table 5: Characteristic values of resistance to tension loads - design method A

				M8	M10	M12	M16	M20	M24
Steel failure									
Characteristic resistance	$N_{Rk,s}$	[kN]		29,3	46,4	67,4	125,6	196,0	282,4
Partial safety factor	γ_{Ms}	[-]		1,50					
Pullout failure									
Characteristic resistance in cracked concrete	$N_{Rk,p}$	[kN]	C20/25	12	16	--*)			
Increasing factors for $N_{Rk,p}$ for cracked concrete	ψ_c		C30/37	1,22					
			C40/50	1,41					
			C50/60	1,55					
Partial safety factor	γ_{Mp}			1,8	1,5				
Concrete cone failure and splitting failure									
Effective anchorage depth	h_{ef}	[mm]		60	70	80	100	125	150
Spacing	$s_{cr,N}$	[mm]		3 x h_{ef}					
Edge distance	$c_{cr,N}$	[mm]		1,5 x h_{ef}					
Spacing (splitting)	$s_{cr,sp}$	[mm]		230	270	300	380	480	570
Edge distance (splitting)	$c_{cr,sp}$	[mm]		115	135	150	190	240	285
Partial safety factor	$\gamma_{Mc} = \gamma_{M,sp}$			1,5 **)					

*) Pull-out is not relevant in cracked and non-cracked concrete.

) Partial safety factor γ_2 is includedHilti heavy duty anchor HSL-3**

**Design method A,
Minimum spacing and edge distances
Characteristic value of resistance to tension loads**

Annex 8

of European
Technical Approval
ETA-02/0042

Table 6: Displacements under tension loads

			M8	M10	M12	M16	M20	M24	
Tension load in C20/25 (C50/60) cracked concrete			[kN]	3,6 (5,5)	6,4 (9,8)	10,2 (15,9)	14,3 (22,1)	20,0 (30,9)	26,2 (40,7)
Displacement	δ_{N0}	[mm]	0,5 (0,6)	0,5 (0,7)	0,6 (0,7)	0,6 (0,8)	0,7 (0,9)	0,8 (1,1)	
	$\delta_{N\infty}$	[mm]	1,1 (1,1)	1,1 (1,1)	1,1 (1,1)	1,1 (1,1)	1,1 (1,1)	1,1 (1,1)	
Tension load in C20/25 (C50/60) non-cracked concrete			[kN]	9,3 (13,9)	11,7 (18,2)	14,3 (22,2)	20,0 (31,0)	27,9 (43,3)	36,7 (56,9)
Displacement	δ_{N0}	[mm]	0,1 (0,2)	0,1 (0,3)	0,2 (0,3)	0,3 (0,5)	0,4 (0,7)	0,5 (0,9)	
	$\delta_{N\infty}$	[mm]	0,2 (0,2)	0,2 (0,3)	0,2 (0,3)	0,4 (0,5)	0,4 (0,7)	0,6 (0,9)	

Hilti heavy duty anchor HSL-3

**Design method A,
Displacements under tension loads**

Annex 9

of European
Technical Approval
ETA-02/0042

Table 7: Characteristic values of resistance to shear loads - design method A




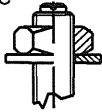
			M8	M10	M12	M16	M20	M24
Steel failure without lever arm								
Characteristic resistance bolt version HSL-3 / HSL-3-B		$V_{Rk,s}$ [kN]	31,1	49,2	71,7	101,1	141,9	177,4
Characteristic resistance hexagonal socket head version HSL-3-SH / HSL-3-SK		$V_{Rk,s}$ [kN]	31,1	49,2	71,7	-	-	-
Characteristic resistance threaded rod version HSL-3-G		$V_{Rk,s}$ [kN]	26,1	34,8	54,3	85,7	141,9	-
Characteristic resistance threaded rod only		$V_{Rk,s}$ [kN]	14,6	23,2	33,7	62,8	98,0	-
Partial safety factor	γ_{Ms} [-]		1,25	1,25	1,25	1,25	1,25	1,25
Steel failure with lever arm								
Characteristic resistance	$M_{Rk,s}$ [kN]		30	60	105	266	519	898
Partial safety factor	γ_{Ms} [-]		1,25	1,25	1,25	1,25	1,25	1,25
Concrete pryout failure								
Factor in equation (5.6) of ETAG Annex C, 5.2.3.3	k [-]		1,8	2,0				
Partial safety factor	γ_{Mcp} [-]		1,5					
Concrete edge failure								
effective length of anchor in shear loading	l_f [mm]		60	70	80	100	125	150
Diameter of anchor	d_{nom} [mm]		12	15	18	24	28	32
Partial safety factor	γ_{Mc} [-]		1,5					
Hilti heavy duty anchor HSL-3						Annex 10		
Design method A Characteristic value of resistance to shear loads						of European Technical Approval ETA-02/0042		

Table 8: Displacements under shear loads ^{*)}

HSL-3, HSL-3-B, HSL-3-SH, HSL-3-SK			M8	M10	M12	M16	M20	M24	
Shear load in C20/25 to C50/60 cracked and non-cracked concrete			[kN]	17,8	28,1	41,0	57,8	81,1	101,4
Displacement	δ_{V0}	[mm]	3,8 (+1,9)	3,0 (+1,9)	4,0 (+1,9)	6,0 (+1,9)	5,3 (+2,4)	5,1 (+2,4)	
	$\delta_{V\infty}$	[mm]	5,7 (+1,9)	4,5 (+1,9)	6,0 (+1,9)	9,0 (+1,9)	7,9 (+2,4)	7,7 (+2,4)	

HSL-3-G			M8	M10	M12	M16	M20	
Shear load in C20/25 to C50/60 cracked concrete			[kN]	8,6	19,9	31,0	49,0	81,1
Displacement	δ_{V0}	[mm]	3,7 (+1,9)	5,4 (+1,9)	5,6 (+1,9)	5,5 (+1,9)	8,9 (+2,4)	
	$\delta_{V\infty}$	[mm]	5,6 (+1,9)	8,1 (+1,9)	8,4 (+1,9)	8,2 (+1,9)	13,4 (+2,4)	

HSL-3-G			M8	M10	M12	M16	M20	
Shear load in C20/25 to C50/60 non-cracked concrete			[kN]	8,6	19,9	31,0	49,0	81,1
Displacement	δ_{V0}	[mm]	1,6 (+1,9)	2,2 (+1,9)	3,3 (+1,9)	4,0 (+1,9)	5,0 (+2,4)	
	$\delta_{V\infty}$	[mm]	2,4 (+1,9)	3,3 (+1,9)	4,9 (+1,9)	6,0 (+1,9)	7,5 (+2,4)	

*) The displacement values given in table 8 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.

Hilti heavy duty anchor HSL-3

**Design method A,
Displacement under shear loads**

Annex 11

of European
Technical Approval
ETA-02/0042