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Eine vom Bund und den Ländern gemeinsam getragene Anstalt des öffentlichen Rechts

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Authorised and notified according to Article 10 of the Council Directive of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products (89/106/EEC)

Deutsches Institut für Bautechnik

DIBt

Mitglied der EOTA
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European Technical Approval ETA-07/0219

English translation prepared by DIBt - Original version in German language

Handelsbezeichnung *Trade name*	Hilti Rahmendübel HRD *Hilti frame anchor HRD*
Zulassungsinhaber *Holder of approval*	Hilti Aktiengesellschaft Business Unit Anchors 9494 Schaan FÜRSTENTUM LIECHTENSTEIN
Zulassungsgegenstand und Verwendungszweck *Generic type and use of construction product*	Kunststoffdübel als Mehrfachbefestigung von nichttragenden Systemen zur Verankerung im Beton und Mauerwerk *Plastic anchor for multiple use in concrete and masonry for non-structural applications*
Geltungsdauer: vom *Validity: from* bis *to* verlängert vom *extended from* bis *to*	19 October 2011 17 September 2012 18 September 2012 18 September 2017
Herstellwerk *Manufacturing plant*	Hilti Werke

Diese Zulassung umfasst *This Approval contains*	30 Seiten einschließlich 18 Anhänge *30 pages including 18 annexes*

I LEGAL BASES AND GENERAL CONDITIONS

1 This European technical approval is issued by Deutsches Institut für Bautechnik 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 Council Directive 93/68/EEC[2] and Regulation (EC) N° 1882/2003 of the European Parliament and of the Council[3];
- *Gesetz über das In-Verkehr-Bringen von und den freien Warenverkehr mit Bauprodukten zur Umsetzung der Richtlinie 89/106/EWG des Rates vom 21. Dezember 1988 zur Angleichung der Rechts- und Verwaltungsvorschriften der Mitgliedstaaten über Bauprodukte und anderer Rechtsakte der Europäischen Gemeinschaften (Bauproduktengesetz - BauPG) vom 28. April 1998[4], as amended by Article 2 of the law of 8 November 2011[5];*
- Common Procedural Rules for Requesting, Preparing and the Granting of European technical approvals set out in the Annex to Commission Decision 94/23/EC[6];
- Guideline for European technical approval of "Plastic Anchors for Multiple Use in Concrete and Masonry for Non-structural Applications - Part 1: General", ETAG 020-01.

2 Deutsches Institut für Bautechnik is authorized to check whether the provisions of this European technical approval are met. Checking may take place in the manufacturing plant. Nevertheless, the responsibility for the conformity of the products to 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 manufacturers 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 Deutsches Institut für Bautechnik, in particular pursuant to information by the Commission according to Article 5(1) of 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 Deutsches Institut für Bautechnik. 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 fully to the version circulated within EOTA. Translations into other languages have to be designated as such.

1 Official Journal of the European Communities L 40, 11 February 1989, p. 12
2 Official Journal of the European Communities L 220, 30 August 1993, p. 1
3 Official Journal of the European Union L 284, 31 October 2003, p. 25
4 *Bundesgesetzblatt Teil I 1998*, p. 812
5 *Bundesgesetzblatt Teil I 2011*, p. 2178
6 Official Journal of the European Communities L 17, 20 January 1994, p. 34

II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

1 Definition of product and intended use

1.1 Definition of the construction product

The Hilti frame anchor HRD in the sizes HRD 8 and HRD 10 is a plastic anchor consisting of a plastic sleeve made of polyamide and an accompanying specific screw of electro galvanised steel, hot-dip galvanised steel or stainless steel.

The plastic sleeve is expanded by screwing in the specific screw which presses the sleeve against the wall of the drilled hole.

The installed anchor is shown in Annex 1.

1.2 Intended use

The anchor is intended to be used for anchorages for which requirements for safety in use in the sense of the Essential Requirement 4 of Council Directive 89/106/EEC shall be fulfilled and failure of the fixture represents an immediate risk to human life.

The anchor is to be used only for multiple fixing for non-structural applications.

The base material may consist of use category a, b, c and d as given in the following Table:

Use category	Anchor size	Remarks
a	HRD 8, HRD 10	• Reinforced or unreinforced normal weight concrete • Strength class C12/15 at minimum and C50/60 at maximum according to EN 206-1:2000-12 • Cracked and non-cracked concrete • The anchor HRD 10 may also be used with requirements related to resistance to fire according 4.2.2.
	HRD 10 (h_{nom} = 50 mm)	• Thin skins (weather resistant skins of external wall panels) • 100 mm > h ≥ 40 mm • Strength class C12/15 at minimum and C50/60 at maximum according to EN 206-1:2000-12
	HRD 10 (h_{nom} = 50 mm)	• Precast prestressed hollow core slabs • $d_b \geq 25$ mm (d_b = bottom flange thickness) • Strength class C35/45 at minimum and C50/60 at maximum according to EN 206-1:2000-12
b	HRD 8, HRD 10	• Masonry walls according to Annex 13 • Mortar strength class ≥ M 2,5 according to EN 998-2:2003
c	HRD 8, HRD 10	• Masonry walls according to Annex 14 to 17 • Mortar strength class ≥ M 2,5 according to EN 998-2:2003
d	HRD 10	• Non-cracked autoclaved aerated concrete (AAC blocks) according to Annex 18

Specific screws of electro galvanised steel, hot-dip galvanised steel and stainless steel (1.4301 and 1.4567):

The specific screw made of galvanised steel, hot-dip galvanised steel or stainless steel (1.4301 and 1.4567) may only be used in structures subject to dry internal conditions.

These screws may also be used in structures subject to external atmospheric exposure, if the area of the head of the screw is protected against moisture and driving rain after mounting of the fixing unit in this way, that intrusion of moisture into the anchor shaft is prevented. Therefore there shall be an external cladding or a ventilated rainscreen mounted in front of the head of the screw and the head of the screw itself shall be coated with a soft plastic, permanently elastic bitumen-oil-combination coating (e. g. undercoating or body cavity protection for cars).

Specific screws of stainless steel (1.4362, 1.4401, 1.4404, 1.4571 and 1.4578):

The specific screw made of stainless steel may be used in structures subject to dry internal conditions and also in structures 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 anchor may be used in the following temperature range:

Temperature range:	-40 °C to +80 °C	(max long term temperature +50 °C and max short term temperature +80 °C)

The provisions made in this European technical approval are based on an assumed 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 the product and methods of verification

2.1 Characteristics of the product

The anchor corresponds to the drawings and information given in Annex 2 and 3. The characteristic material values, dimensions and tolerances of the anchor not given in these Annexes shall correspond to the respective values laid down in the technical documentation[7] of this European technical approval.

The characteristic values for the design of the anchorages are given in Annex 9 to 11 and 13 to 18.

Each anchor is to be marked with the identifying mark, the type, the diameter and the length of the anchor according to Annex 2.

The minimum embedment depth shall be marked.

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

[7] The technical documentation of this European technical approval is deposited at the Deutsches Institut für Bautechnik 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.

2.2 Methods of verification

The assessment of the fitness of the anchor for the intended use in relation to the requirements for safety in use in the sense of the Essential Requirement 4 has been made in compliance with the Guideline for European technical approval of "Plastic Anchors for Multiple Use in Concrete and Masonry for Non-structural Applications", ETAG 020,

- Part 1: "General",
- Part 2: "Plastic Anchors for Use in Normal Weight Concrete",
- Part 3: "Plastic Anchors for Use in Solid Masonry Materials",
- Part 4: "Plastic Anchors for Use in Hollow or Perforated Masonry" and
- Part 5: "Plastic Anchors for Use in Autoclaved Aerated Concrete (AAC)",

based on the use categories a, b, c (HRD 8) and a, b, c, d (HRD 10).

In addition to the specific clauses relating to dangerous substances contained in this European technical approval, there may be other requirements applicable to the products falling within its scope (e. g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the Construction Products Directive, these requirements need also to be complied with, when and where they apply.

3 Evaluation and attestation of conformity and CE marking

3.1 System of attestation of conformity

According to the decision 97/463/EG of the European Commission[8] the system 2(ii) (referred to as system 2+) of attestation of conformity applies.

This system of attestation of conformity is defined as follows.

System 2+: Declaration of conformity of the product by the manufacturer on the basis of:

(a) Tasks for the manufacturer:
  (1) initial type-testing of the product;
  (2) factory production control;
  (3) testing of samples taken at the factory in accordance with a prescribed test plan.

(b) Tasks for the approved body:
  (4) certification of factory production control on the basis of:
    – initial inspection of factory and of factory production control;
    – continuous surveillance, assessment and approval of factory production control.

3.2 Responsibilities

3.2.1 Tasks of the manufacturer

3.2.1.1 Factory production control

The manufacturer shall exercise permanent internal control of production. All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures, including records of results performed. This production control system shall insure that the product is in conformity with this European technical approval.

The manufacturer may only use raw materials stated in the technical documentation of this European technical approval.

[8] Official Journal of the European Communities L 198 of 25.07.1997.

The factory production control shall be in accordance with the control plan which is part of the technical documentation of this European technical approval. The control plan is laid down in the context of the factory production control system operated by the manufacturer and deposited at Deutsches Institut für Bautechnik.[9]

The results of factory production control shall be recorded and evaluated in accordance with the provisions of the control plan.

3.2.1.2 Other tasks of manufacturer

The manufacturer shall, on the basis of a contract, involve a body which is approved for the tasks referred to in section 3.1 in the field of anchors in order to undertake the actions laid down in section 3.2.2. For this purpose, the control plan referred to in sections 3.2.1.1 and 3.2.2 shall be handed over by the manufacturer to the approved body involved.

The manufacturer shall make a declaration of conformity, stating that the construction product is in conformity with the provisions of this European technical approval.

3.2.2 Tasks of approved bodies

The approved body shall perform the

- initial inspection of factory and of factory production control,
- continuous surveillance, assessment and approval of factory production control,

in accordance with the provisions laid down in the control plan.

The approved body shall retain the essential points of its actions referred to above and state the results obtained and conclusions drawn in a written report.

The approved certification body involved by the manufacturer shall issue an EC certificate of conformity of the factory production control stating the conformity with the factory production control of this European technical approval.

In cases where the provisions of the European technical approval and its control plan are no longer fulfilled the certification body shall withdraw the certificate of conformity and inform Deutsches Institut für Bautechnik without delay.

3.3 CE marking

The CE marking shall be affixed on each packaging of the anchor. The letters "CE" shall be followed by the identification number of the approved certification body, where relevant, and be accompanied by the following additional information:

- the name and address of the producer (legal entity responsible for the manufacturer),
- the last two digits of the year in which the CE marking was affixed,
- the number of the EC certificate for the factory production control,
- the number of the European technical approval,
- the number of the guideline for European technical approval
- use categories a, b, c (HRD 8) and a, b, c, d (HRD 10).

[9] The control plan is a confidential part of the documentation of the European technical approval, but not published together with the European technical approval and only handed over to the approved body involved in the procedure of attestation of conformity.
See section 3.2.2.

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

4.1 Manufacturing

The European technical approval is issued for the product on the basis of agreed data/information, deposited with Deutsches Institut für Bautechnik, which identifies the product that has been assessed and judged. Changes to the product or production process, which could result in this deposited data/information being incorrect, should be notified to Deutsches Institut für Bautechnik before the changes are introduced. Deutsches Institut für Bautechnik will decide whether or not such changes affect the European technical approval and consequently the validity of the CE marking on the basis of the European technical approval and if so whether further assessment or alterations to the European technical approval shall be necessary.

4.2 Design of anchorages

4.2.1 General

Fitness for the intended use of the anchor is given under the following conditions:

- The design of anchorages is carried out in compliance with ETAG 020, Guideline for European technical approval of "Plastic Anchors for Multiple Use in Concrete and Masonry for Non-structural Applications", Annex C under the responsibility of an engineer experienced in anchorages.
- Verifiable calculation notes and drawings shall be prepared taking account of the loads to be anchored, the nature and strength of the base materials and the dimensions of the anchorage members as well as of the relevant tolerances.
- The anchor is to be used only for multiple fixing for non-structural applications.

  Therefore the design of the fixture may specify the number n_1 of fixing points to fasten the fixture and the number n_2 of anchors per fixing point. Furthermore by specifying the design value of actions N_{Sd} on a fixing point to a value $\leq n_3$ (kN) up to which the strength and stiffness of the fixture are fulfilled and the load transfer in the case of excessive slip or failure of one anchor need not to be taken into account in the design of the fixture.

  The following default values for n_1, n_2 and n_3 may be taken:

  $n_1 \geq 4$; $n_2 \geq 1$ and $n_3 \leq 4{,}5$ kN or

  $n_1 \geq 3$; $n_2 \geq 1$ and $n_3 \leq 3{,}0$ kN.

Shear loads acting on an anchor may be assumed to act without lever arm if both of the following conditions are fulfilled:

- The fixture shall be made of metal and in the area of the anchorage be fixed directly to the base material either without an intermediate layer or with a levelling layer of mortar with a thickness ≤ 3 mm.
- The fixture shall be in contact with the anchor over its entire thickness. (Therefore the diameter of clearance hole in the fixture d_f has to be equal or smaller than the values given in Annex 4, Table 3.)

If these two conditions are not fulfilled the lever arm is calculated according to ETAG 020, Annex C. The characteristic bending moment is given in Annex 9, Table 9.

4.2.2 Resistance in concrete (use category "a")

The characteristic values of resistance of the anchor for use in concrete are given in Annex 9 and Annex 11, Table 12.

The design method is valid for cracked and non-cracked concrete.

According to the Technical Report TR 020 "Evaluation of anchorages in concrete concerning resistance to fire" it can be assumed that for fastening of facade systems the load bearing behaviour of the HRD 10 with $h_{nom} \geq 50$ mm has a sufficient resistance to fire at least 90 minutes (R90) if the admissible load $[F_{Rk} / (\gamma_M \cdot \gamma_F)]$ is $\leq 0{,}8$ kN (no permanent centric tension load).

4.2.3 Resistance in solid masonry (use category "b")

The characteristic values of resistance of the anchor for use in solid masonry are given in Annex 9, Table 9 and Annex 13, Table 15. These values are independent of the load direction (tension, shear or combined tension and shear) and the mode of failure.

The characteristic resistances given in Annex 13, Table 15 for use in solid masonry are valid for the base material and the bricks according this table or larger brick sizes and larger compressive strength of the masonry unit.

If smaller brick sizes are present on the construction site or if the mortar strength is smaller than the required value, the characteristic resistance of the anchor may be determined by job site tests according to 4.4.

4.2.4 Resistance in hollow or perforated masonry (use category "c")

The characteristic resistances given in Annex 9, Table 9 and Annex 14 to 17 for use in hollow or perforated masonry are only valid for the bricks and blocks according this table regarding base material, size of the units, compressive strength and configuration of the voids.

These values are independent of the load direction (tension, shear or combined tension and shear) and the mode of failure and are valid for $h_{nom} = 50$ mm (HRD 8) and $h_{nom,1} = 50$ mm or $h_{nom,2} = 70$ mm (HRD 10) only.

The influence of larger embedment depths [$h_{nom} > 50$ mm (HRD 8) and $h_{nom,1} > 50$ mm or $h_{nom,2} > 70$ mm (HRD 10)] and/or different bricks and blocks (according Annex 14 to 17 regarding base material, size of the units, compressive strength and configuration of the voids) has to be detected by job site tests according to 4.4.

4.2.5 Resistance in non-cracked autoclaved aerated concrete (AAC blocks, use category "d")

The characteristic values of resistance of the anchor type HRD 10 for use in masonry made of non-cracked autoclaved aerated concrete (AAC blocks) are given in Annex 9, Table 9 and Annex 18, Table 18. These values are independent of the load direction (tension, shear or combined tension and shear) and the mode of failure.

The anchor shall not be installed and used in water saturated aerated concrete.

4.2.6 Specific conditions for the design method in solid masonry, hollow or perforated masonry and non cracked AAC (AAC blocks)

The mortar strength class of the masonry has to be M 2,5 according to EN 998-2:2003 at minimum.

The characteristic resistance F_{Rk} for a single plastic anchor may also be taken for a group of two or four plastic anchors with a spacing equal or larger than the minimum spacing s_{min}.

The distance between single plastic anchors or a group of anchors should be $a \geq 250$ mm.

If the vertical joints of the wall are designed not to be filled with mortar then the design resistance N_{Rd} has to be limited to 2,0 kN to ensure that a pull-out of one brick out of the wall will be prevented. This limitation can be omitted if interlocking units are used for the wall or when the joints are designed to be filled with mortar.

If the joints of the masonry are not visible the characteristic resistance F_{Rk} has to be reduced with the factor α_j = 0,5.

If the joints of the masonry are visible (e.g. unplastered wall) following has to be taken into account:

- The characteristic resistance F_{Rk} may be used only, if the wall is designed such that the joints are to be filled with mortar.
- If the wall is designed such that the joints are not to be filled with mortar then the characteristic resistance F_{Rk} may be used only, if the minimum edge distance c_{min} to the vertical joints is observed. If this minimum edge distance c_{min} can not be observed then the characteristic resistance F_{Rk} has to be reduced with the factor α_j = 0,5.

4.2.7 Characteristic values, spacing and dimensions of anchorage member

The minimum spacing and dimensions of anchorage member according to Annex 7, 8, 12 and 18 shall be observed depending on the base material.

4.2.8 Displacement behaviour

The displacements under tension and shear loading in concrete, masonry and AAC are given in Annex 11, Table 13.

4.3 Installation of anchor

The fitness for use of the anchor can only be assumed if the following conditions of installation are met:

- Anchor installation carried out by appropriately qualified personnel under the supervision of the person responsible for technical matters on site.
- Use of the anchor only as supplied by the manufacturer without exchanging any component of the anchor.
- Anchor installation in accordance with the manufacturer's specifications and drawings using the tools indicated in this European technical approval.
- Checks before placing the anchor, to ensure that the characteristic values of the base material in which the anchor is to be placed, is identical with the values, which the characteristic loads apply for.
- Observation of the drill method according Annex 14 to 18 (Drill holes in some hollow or perforated masonry and in non-cracked autoclaved aerated concrete may only be drilled using the rotary drill. Other drilling methods may also be used if job-site tests according to 4.4 evaluate the influence of hammer or impact drilling.).
- Placing drill holes without damaging the reinforcement.

  For precast prestressed hollow core slabs: In the absence of national regulations, it is recommended that the distance between the side of the drill hole and the outside of prestressed reinforcement is at least 50 mm; for determining the position of the prestressed reinforcement in the structure, a suitable device (e.g. reinforcement detector according Annex 6) should be used. Annex 8 shows the admissible anchor positions.

- Observation of the different overall plastic anchor embedment depths (compare 4.2.4):

  HRD 8 h_{nom} ≥ 50 mm [for concrete, solid and hollow or perforated masonry]

  HRD 10: $h_{nom,1}$ ≥ 50 mm [for concrete, solid and hollow or perforated masonry]

  $h_{nom,2}$ ≥ 70 mm [for concrete, solid, hollow or perforated masonry and AAC]

  $h_{nom,3}$ ≥ 90 mm [for AAC only]
- The anchor shall not be installed and used in water saturated aerated concrete.
- Holes to be cleaned of drilling dust.
- 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.
- The plastic sleeve is inserted through the fixture by slight hammer blows and the special screw is screwed in until the head of the screw touches the sleeve. The anchor is correct mounted, if there is no turn-through of the plastic sleeve in the drill hole and if slightly move on turning of the screw is impossible after the complete turn-in of the screw.
- Temperature during installation of the anchor ≥ -10 °C (plastic sleeve and base material).

4.4 Job site tests according to ETAG 020, Annex B

4.4.1 General

In the absence of national requirements the characteristic resistance of the plastic anchor may be determined by job site tests, if the plastic anchor has already characteristic values given in Annex 10 and Annex 13 to 18 for the same base material as it is present on the construction works.

Furthermore job site tests for use in different concrete, solid masonry, hollow or perforated masonry and non-cracked autoclaved aerated concrete (AAC blocks) are possible only if the plastic anchor has already characteristic values given in Annex 10 and 13 to 18 for use in the equivalent base material.

Job site tests are also possible, if another drill method is been used as it is given in Annex 14 to 18.

The characteristic resistance to be applied to a plastic anchor should be determined by means of at least 15 pull-out tests carried out on the construction work with a centric tension load acting on the plastic anchor. These tests may also performed in a laboratory under equivalent conditions as used on construction work

Execution and evaluation of the tests as well as issue of the test report and determination of the characteristic resistance should be supervised by the person responsible for execution of works on site and be carried out by a competent person.

Number and position of the plastic anchors to be tested should be adapted to the relevant special conditions of the construction work in question and, for example, in the case of blind and larger areas be increased such that a reliable information about the characteristic resistance of the plastic anchor embedded in the base material in question can be derived. The tests should take account of the unfavourable conditions of practical execution.

4.4.2 Assembly

The plastic anchor to be tested shall be installed (e.g. preparation of drill hole, drilling tool to be used, drill bit, type of drilling hammer or rotation, thickness of fixture) and as far as spacing and edge distances are concerned be distributed in the same way as foreseen for the intended use.

Depending on the drilling tool hard metal hammer drill bits or hard metal percussion drill bits, respectively, according to ISO 5468 should be used. New drill bits should be used for one test series or drill bits with $d_{cut,m}$ = 8,3 mm < d_{cut} ≤ 8,45 mm = $d_{cut,max}$ (HRD 8) or $d_{cut,m}$ = 10,25 mm < d_{cut} ≤ 10,45 mm = $d_{cut,max}$ (HRD 10).

4.4.3 Execution of test

The test rig used for the pull-out tests shall provide a continuous slow increase of the load, controlled by a calibrated load cell. The load shall apply perpendicular to the surface of the base material and shall be transmitted to the anchor via a hinge. The reaction forces shall be transmitted into the base material such that possible breakout of the masonry is not restricted. This condition is considered as fulfilled, if the support reaction forces are transmitted either in adjacent masonry units or at a distance of at least 150 mm from the plastic anchors. The load shall be increased continuously in a way that the ultimate load is reached after about 1 minute. The load is measured when the ultimate load (N_1) is achieved.

If no pull-out failure occurs, other test methods are needed, e.g. proof-loading.

4.4.4 Test report

The test report shall include all information necessary to assess the resistance of the tested anchor. It shall be given to the person responsible for the design of the fastening and shall be included in the construction dossier.

The minimum data required are:

- Name of product
- Construction site, owner of building; date and location of the tests, air temperature
- Test rig
- Type of structure to be fixed
- Masonry (type of brick, strength class, all dimensions of bricks, mortar group if possible); visual assessment of masonry (flush joints, joint clearance, regularity)
- Plastic anchor and special screw
- value of the cutting diameter of hard metal hammer-drill bits, measured before and after drilling if no new drill bits are used
- Results of tests including the indication of value N_1; mode of failure
- Tests carried out or supervised by …; signature

4.4.5 Evaluation of test results

The characteristic resistance F_{Rk1} is derived from the measured values N_1 as follows

F_{Rk1} = $0,5 \cdot N_1$

The characteristic resistance F_{Rk1} has to be equal or smaller than the characteristic resistance F_{Rk} which is given in the European technical approval for similar masonry (bricks or blocks)

N_1 = the mean value of the five smallest measured values at ultimate load

In absence of national regulations the partial safety factors for the resistance of the plastic anchor may be taken as γ_{Mc} = 1,8 for use in concrete, γ_{Mm} = 2,5 for use in masonry and γ_{MAAC} = 2,0 for use in non-cracked autoclaved aerated concrete (AAC blocks).

5 Indications to the manufacturer

5.1 Responsibility of the manufacturer

It is in the responsibility of the manufacturer to ensure that the information on the specific conditions according to 1 and 2 including Annexes referred to 4 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 packaging and/or on an enclosed instruction sheet, preferably using illustrations.

The minimum data required are:

- base material for the intended use,
- ambient temperature of the base material during installation of the anchor,
- drill bit diameter (d_{cut}),
- overall anchor embedment depth in the base material (h_{nom}),
- minimum hole depth (h_0),
- information on the installation procedure,
- identification of the manufacturing batch.

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

5.2 Packaging, transport and storage

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

The anchor shall be stored under normal climatic conditions in its original light-proof packaging. Before installation, it shall not be extremely dried nor frozen.

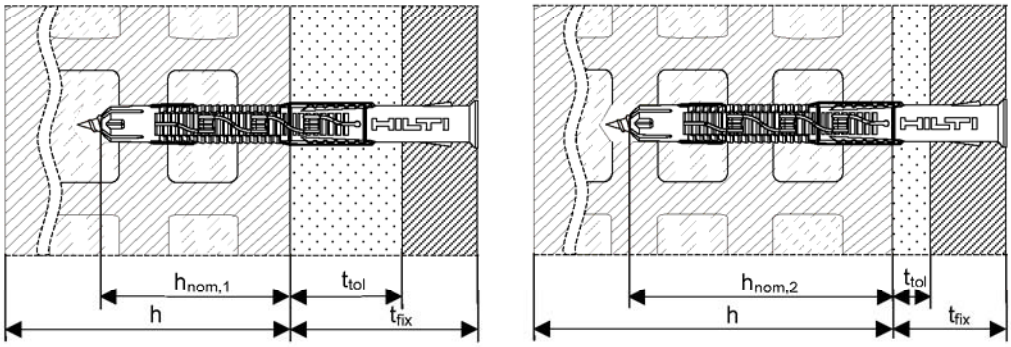
Georg Feistel
Head of Department

beglaubigt:
Baderschneider

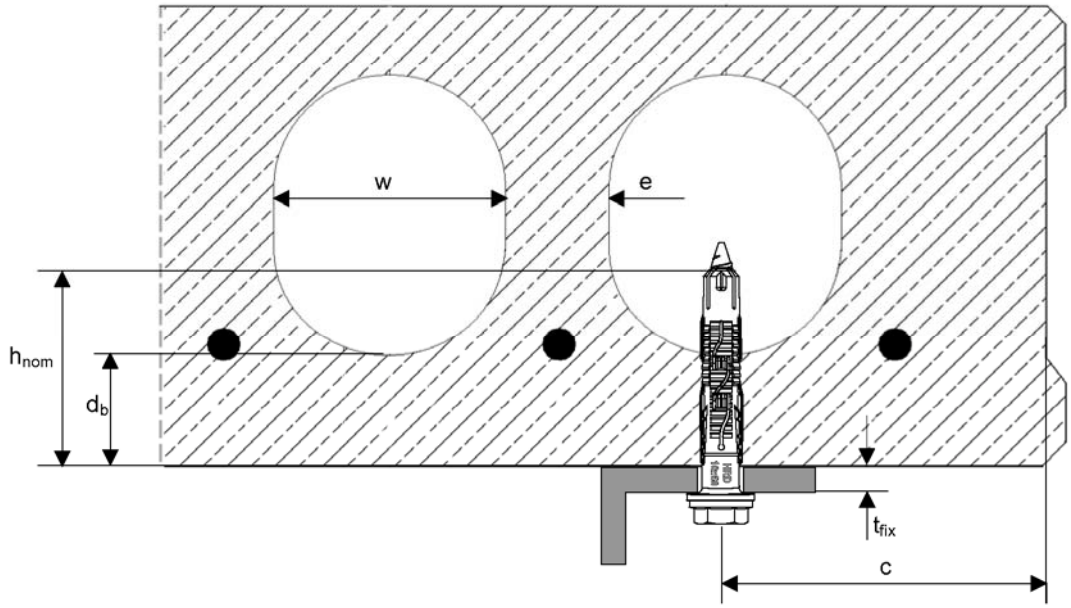
Deutsches Institut für Bautechnik

Hilti frame anchor HRD

Intended use with different embedment depth in concrete [including thin skins (weather resistant skins of external wall panels)], solid brick, hollow brick and non-cracked autoclaved aerated concrete (AAC blocks)



Intended use in precast prestressed hollow core slabs (w/e ≤ 4,2)



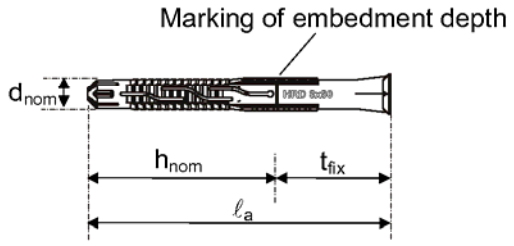
h_{nom}	=	overall plastic anchor embedment depth in the base material
h	=	thickness of member
t_{fix}	=	thickness of fixture
t_{tol}	=	thickness of non-load-bearing layer
c	=	edge distance
d_b	=	bottom flange thickness ≥ 25 mm
w	=	core width
e	=	web thickness

Hilti frame anchor HRD	**Annex 1**
Intended use	

Deutsches Institut für Bautechnik DIBt

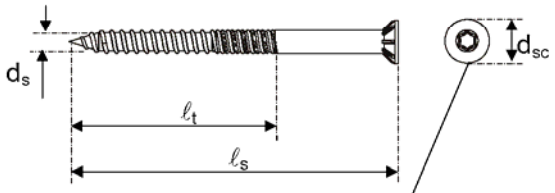
HRD 8

Anchor sleeve



Marking:
Producer, Type, size
e.g.
HILTI
HRD 8x80

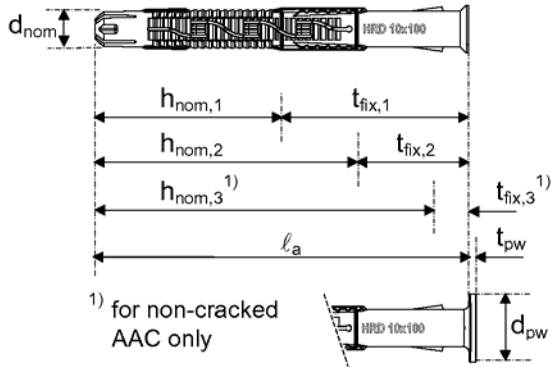
Special screw



Marking:
HDS-U

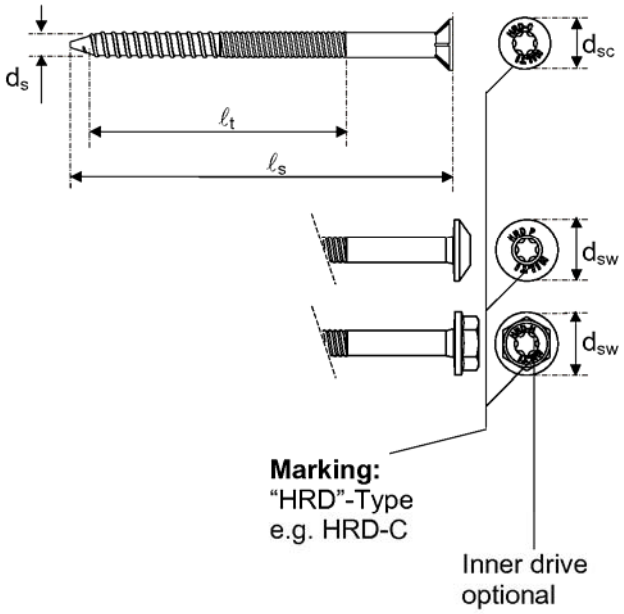
HRD 10

Anchor sleeve



Marking:
Producer, Type, Size
e.g.
HILTI
HRD 10x100

Special screw



Marking:
"HRD"-Type
e.g. HRD-C

Inner drive optional

Hilti frame anchor HRD	**Annex 2**
Product	

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Product naming

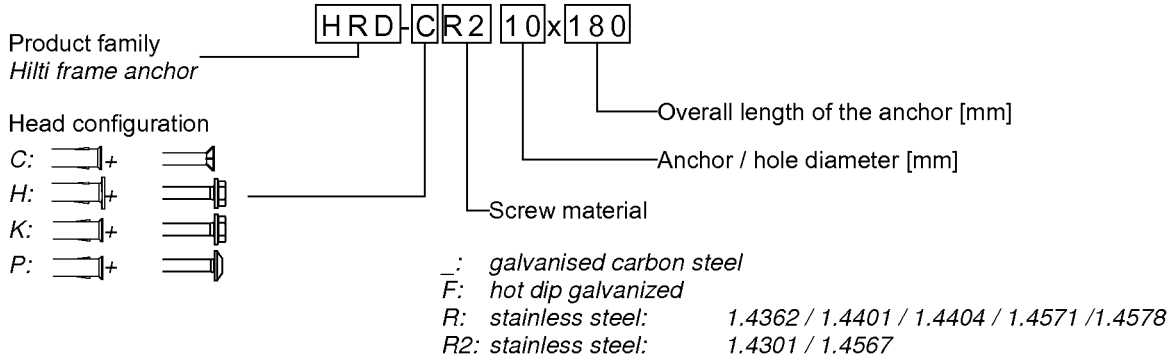

Table 1: Anchor types and dimensions [mm]

Anchor type				HRD 8	HRD 10
Plastic sleeve		Sleeve diameter	d_{nom} [mm]	8	10
		Length of sleeve min	ℓ_a [mm]	60	60
		Length of sleeve max	ℓ_a [mm]	140	310
		Diameter of plastic washer	d_{pw} [mm]	-	17,5
		Thickness of plastic washer	t_{pw} [mm]	-	2
Special screw		Screw diameter	d_s [mm]	6	7
		Length of screw	ℓ_s [mm]	ℓ_a + 5	ℓ_a + 5
		Length of thread	ℓ_t [mm]	53	70
	Head diameter	Countersunk screw	d_{sc} [mm]	11	14
		Hexhead screw	d_{sw} [mm]	-	17,5

Table 2: Materials

	HRD 8	HRD 10
Plastic sleeve	Polyamide, colour red	
Special screw	Steel, electro galvanised ≥ 5 µm, blue passivated, coated f_{yk} = 480 N/mm², f_{uk} = 600 N/mm²	
	-	Steel, hot-dip galvanized, ≥ 65 µm, coated f_{yk} = 480 N/mm², f_{uk} = 600 N/mm²
	Stainless steel: 1.4301 / 1.4567 (e.g. A2 acc. ISO 3506), coated f_{yk} = 450 N/mm², f_{uk} = 580 N/mm²	f_{yk} = 480 N/mm², f_{uk} = 630 N/mm²
	Stainless steel: 1.4362 / 1.4401 / 1.4404 / 1.4571 / 1.4578 (e.g. A4 acc. ISO 3506), coated f_{yk} = 450 N/mm², f_{uk} = 580 N/mm²	f_{yk} = 480 N/mm², f_{uk} = 630 N/mm²

Hilti frame anchor HRD	**Annex 3**
Anchor types and dimensions Materials	

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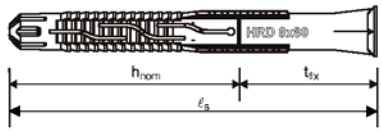
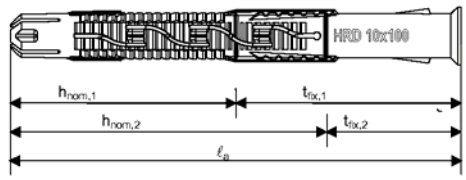
Table 3: Installation parameters

Anchor type			HRD 8	HRD 10
Drill hole diameter	d_0 =	[mm]	8	10
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	8,45	10,45
Depth of drilled hole to deepest point	$h_{1,1} \geq$	[mm]	60	60
	$h_{1,2} \geq$	[mm]	-	80
	$h_{1,3} \geq$	[mm]	-	100 [1]
Overall plastic anchor embedment depth in base material	$h_{nom,1} \geq$	[mm]	50	50
	$h_{nom,2} \geq$	[mm]	-	70
	$h_{nom,3} \geq$	[mm]	-	90 [1]
Diameter of clearance hole in the fixture	Countersunk screw $d_f \leq$	[mm]	8,5	11
	Hexhead screw $d_f \leq$	[mm]	-	12
Installation temperature		[°C]	-10 - +40	
Service temperature		[°C]	-40 - +80	
	maximum long term	[°C]	+50	
	maximum short term	[°C]	+80	

[1] for non-cracked AAC only

Table 4: Relation of h_{nom}, ℓ_a and t_{fix} for use in concrete and masonry

Anchor type		HRD 8 x ℓ_a	HRD 10 x ℓ_a	
Use category "a, b, c"		$h_{nom} \geq 50$ [1]	$h_{nom,1} \geq 50$ [1]	$h_{nom,2} \geq 70$ [2]
HRD 8  **HRD 10** 	ℓ_a	t_{fix}	$t_{fix,1}$	$t_{fix,2}$
	[mm]	[mm]	[mm]	[mm]
	60	≤ 10	≤ 10	---
	80	≤ 30	≤ 30	≤ 10
	100	≤ 50	≤ 50	≤ 30
	120	≤ 70	≤ 70	≤ 50
	140	≤ 90	≤ 90	≤ 70
	160	---	≤ 110	≤ 90
	180	---	≤ 130	≤ 110
	200	---	≤ 150	≤ 130
	230	---	≤ 180	≤ 160
	270	---	≤ 220	≤ 200
	310	---	≤ 260	≤ 240

[1] In hollow masonry (bricks and blocks) the influence of $h_{nom} > 50$ mm or $h_{nom,1} > 50$ mm has to be checked by job-site testing according chapter 4.2.4 and 4.4.

[2] In hollow masonry (bricks and blocks) the influence of $h_{nom,2} > 70$ mm has to be checked by job-site testing according chapter 4.2.4 and 4.4.

Hilti frame anchor HRD	**Annex 4**
Installation parameters **Relations of installation parameters in concrete and masonry**	

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Table 5: Relation of h_{nom}, ℓ_a and t_{fix} for use in autoclaved aerated concrete (AAC)

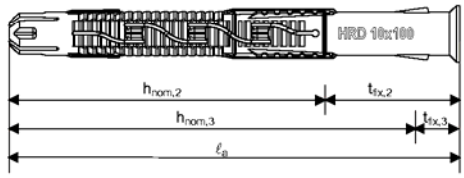
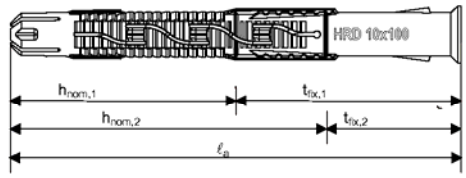
Anchor type		HRD 8 x ℓa	HRD 10 x ℓa	
Use category "d"			$h_{nom,2} \geq 70$	$h_{nom,3} \geq 90$
HRD 10	ℓ_a		$t_{fix,2}$	$t_{fix,3}$
	[mm]		[mm]	[mm]
	60	---	---	---
	80	---	≤ 10	---
	100	---	≤ 30	≤ 10
	120	---	≤ 50	≤ 30
	140	---	≤ 70	≤ 50
	160	---	≤ 90	≤ 70
	180	---	≤ 110	≤ 90
	200	---	≤ 130	≤ 110
	230	---	≤ 160	≤ 140
	270	---	≤ 200	≤ 180
	310	---	≤ 240	≤ 220

Table 6: Relation of h_{nom}, ℓ_a and t_{fix} for use in thin skins (weather resistant skins of external wall panels) and precast prestressed hollow core slabs

Anchor type		HRD 8 x ℓ_a	HRD 10 x ℓ_a	
Use category "a"			$h_{nom,1} \geq 50$	
HRD 10	ℓa		$t_{fix,min}$	$t_{fix,max}$
	[mm]		[mm]	[mm]
	60	---	2	10
	80	---	22	30
	100	---	42	50
	120	---	62	70
	140	---	82	90
	160	---	102	110
	180	---	122	130
	200	---	142	150
	230	---	172	180
	270	---	212	220
	310	---	252	260

Hilti frame anchor HRD	**Annex 5**
Relations of installation parameters in AAC, in thin skins (weather resistant skins of external wall panels) and in precast prestressed hollow core slabs	

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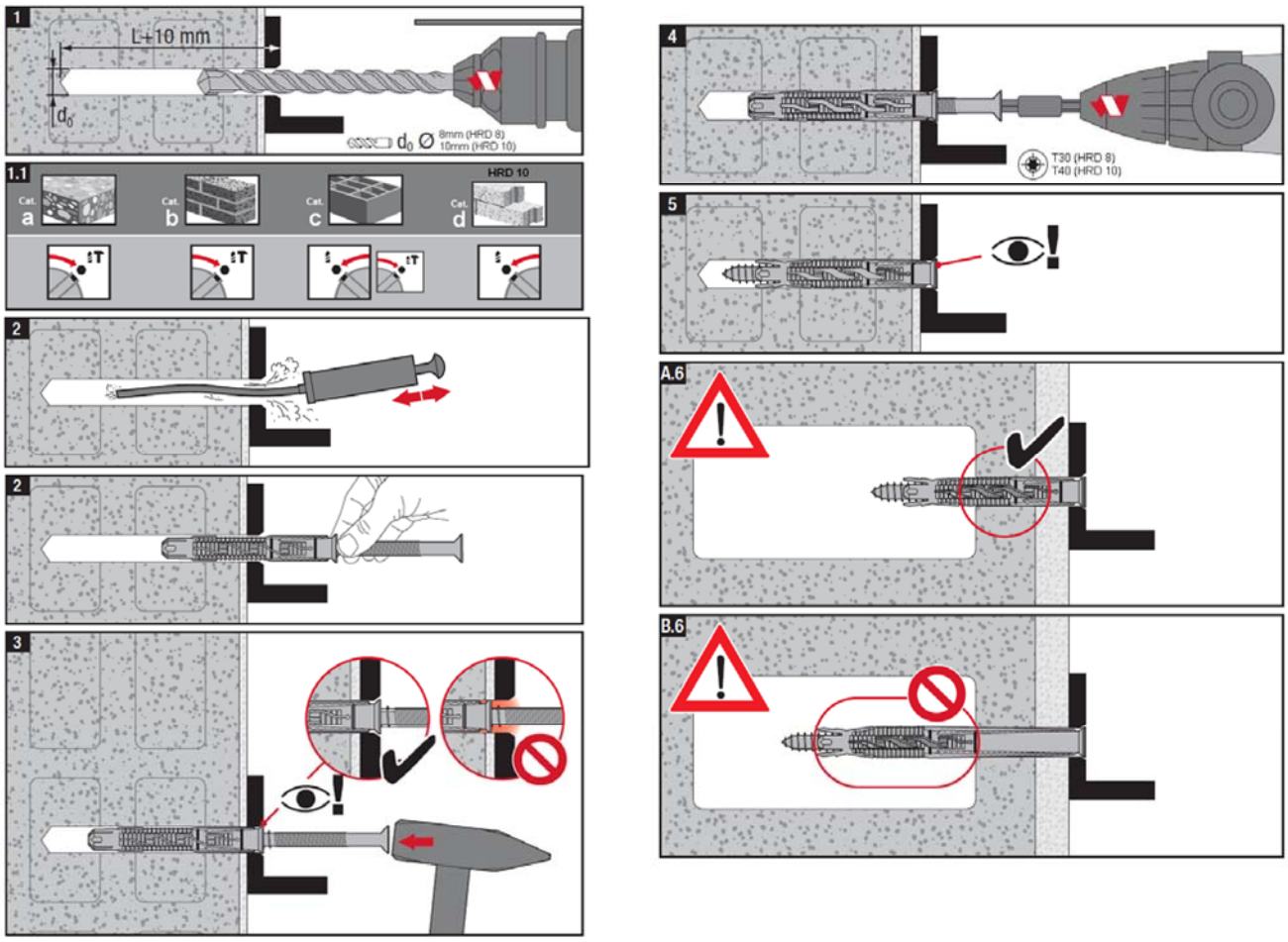
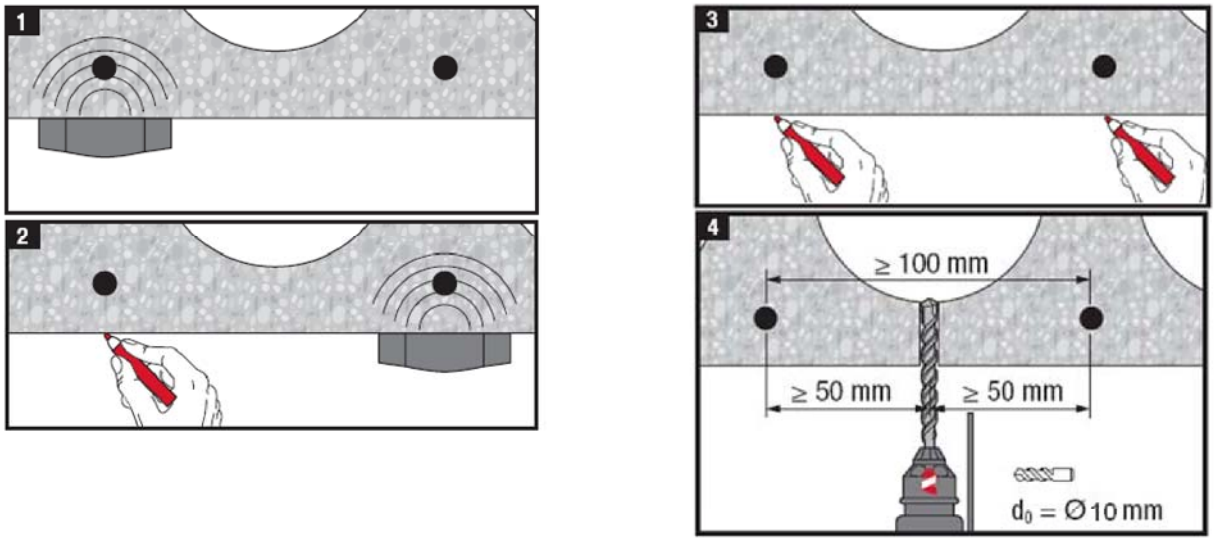
Setting instruction



Additional preparation in case of application in precast prestressed hollow core slabs
After drilling follow the main instruction above



Hilti frame anchor HRD	**Annex 6**
Setting instruction	

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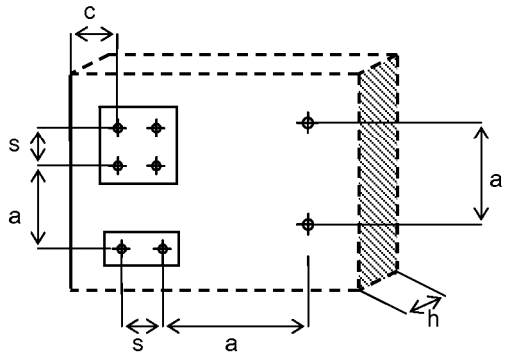
Table 7: Minimum thickness of member, edge distance and anchor spacing in concrete and thin skins (use category "a")

Anchor type				HRD 8	HRD 10	
Overall plasic anchor embedment depth in the base material		$h_{nom} \geq$	[mm]	50	50	70
Minimum thickness of member	concrete	h_{min}	[mm]	100	100	120
	thin skin	h_{min}	[mm]	-	40	-
Minimum allowable spacing	≥ C16/20	s_{min}	[mm]	100	50 if $c \geq 100$ [1]	
	C12/15	s_{min}	[mm]	140	70 if $c \geq 140$ [1]	
Minimum allowable edge distance	≥ C16/20	c_{min}	[mm]	50	50 if $s \geq 150$ [1]	
	C12/15	c_{min}	[mm]	70	70 if $s \geq 210$ [1]	
Characteristic edge distance	≥ C16/20	$c_{cr,N}$	[mm]	100	100	
	C12/15	$c_{cr,N}$	[mm]	140	140	
Characteristic spacing [2]	≥ C16/20	$s_{cr,N}$	[mm]	62	80	125
	C12/15	$s_{cr,N}$	[mm]	68	90	135

[1] Linear interpolation allowed

[2] Spacing at which a fixing point that consists of more than 1 anchor can be calculated with the characteristic resistance $N_{Rk,p}$ of each anchor ($N_{Rk,p}$ see Annex 7, Table 8).

Scheme of distances and spacing



Hilti frame anchor HRD	**Annex 7**
Concrete: minimum member thickness, edge distance and spacing	

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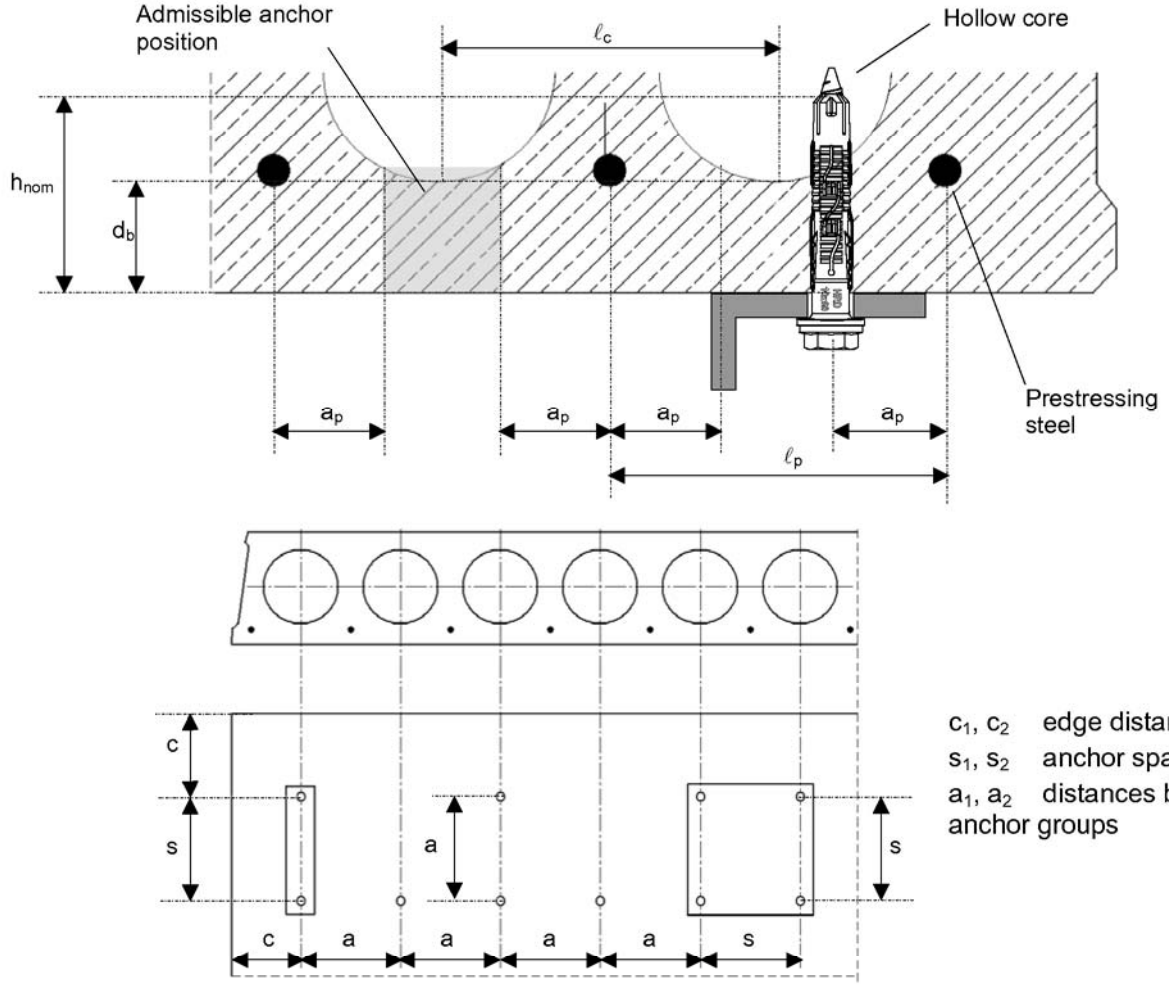
Table 8: Admissible anchor positions, minimum spacing and edge distance of anchors and distance between anchor groups in precast prestressed hollow core slabs

Anchor type			HRD 8	HRD 10
Overall plasic anchor embedment depth in the base material	$h_{nom} \geq$	[mm]	-	50
Bottom flange thickness	$d_b \geq$	[mm]	-	25
Core distance	$\ell_c \geq$	[mm]	-	100
Prestressing steel distance	$\ell_p \geq$	[mm]	-	100
Distance between anchor position and prestressing steel	$a_p \geq$	[mm]	-	50
Minimum edge distance	$c_{min} \geq$	[mm]	-	100
Minimum anchor spacing	$s_{min} \geq$	[mm]	-	100
Minimum distance between anchor groups	$a_{min} \geq$	[mm]	-	100

Schemes of distances and spacing



c_1, c_2 edge distances
s_1, s_2 anchor spacings
a_1, a_2 distances between anchor groups

Hilti frame anchor HRD	Annex 8
Admissible anchor positions in precast prestressed hollow core slabs	

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Table 9: Characteristic bending moment of screw for use in concrete, solid and hollow masonry and AAC (use category "a, b, c, d")

Anchor type			HRD 8	HRD 10
galvanised steel				
Characteristic bending resistance	$M_{Rk,s}$	[Nm]	11,1	21,3
Partial safety factor	γ_{Ms} [1)]		1,25	1,25
Hot-dip galvanized steel				
Characteristic bending resistance	$M_{Rk,s}$	[Nm]	-	19,9
Partial safety factor	γ_{Ms} [1)]		-	1,25
Stainless steel				
Characteristic bending resistance	$M_{Rk,s}$	[Nm]	10,8	22,3
Partial safety factor	γ_{Ms} [1)]		1,28	1,31

[1)] In absence of other national regulations

Table 10: Characteristic resistance for failure of expansion element (steel failure of special screw) for use in concrete (use category "a")

Anchor type			HRD 8	HRD 10
galvanised steel				
Characteristic tension resistance	$N_{Rk,s}$	[kN]	10,9	17,5
Partial safety factor	γ_{Ms} [1)]		1,50	1,50
Characteristic shear resistance	$V_{Rk,s}$	[kN]	6,9	10,6
Partial safety factor	γ_{Ms} [1)]		1,25	1,25
Hot-dip galvanized steel				
Characteristic tension resistance	$N_{Rk,s}$	[kN]	-	16,7
Partial safety factor	γ_{Ms} [1)]		-	1,50
Characteristic shear resistance	$V_{Rk,s}$	[kN]	-	10,1
Partial safety factor	γ_{Ms} [1)]		-	1,25
Stainless steel				
Characteristic tension resistance	$N_{Rk,s}$	[kN]	10,5	18,4
Partial safety factor	γ_{Ms} [1)]		1,54	1,58
Characteristic shear resistance	$V_{Rk,s}$	[kN]	6,6	11,1
Partial safety factor	γ_{Ms} [1)]		1,28	1,31

Hilti frame anchor HRD	**Annex 9**
Characteristic bending moment Concrete: characteristic resistance	

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Table 11: Characteristic resistance for pull-out failure (plastic sleeve) for use in concrete (use category "a")

Anchor type					HRD 8	HRD 10	
Pull-out failure in standard concrete slabs							
Embedment depth			$h_{nom} \geq$	[mm]	50	50	70
Characteristic resistance		≥ C16/20	$N_{Rk,p}$	[kN]	3,0	4,5	8,5
		C12/15	$N_{Rk,p}$	[kN]	2,0	3,0	6,0
Partial safety factor			γ_{Mc} [1)]			1,8	
Pull-out failure in thin skins (weather resistant skins of external wall panels)							
Embedment depth			$h_{nom} \geq$	[mm]	-	50	-
Characteristic resistance	h = 40mm to 100mm	≥ C16/20	$N_{Rk,p}$	[kN]	-	3,5	-
		C12/15	$N_{Rk,p}$	[kN]	-	2,5	-
Partial safety factor			γ_{Mc} [1)]			1,8	
Pull-out failure in precast prestressed hollow core slabs							
Embedment depth			$h_{nom} \geq$	[mm]	-	50	-
Characteristic resistance	$d_b \geq 25$mm	≥ C35/45	$N_{Rk,p}$	[kN]	-	0,6	-
	$d_b \geq 30$mm	≥ C35/45	$N_{Rk,p}$	[kN]	-	1,5	-
	$d_b \geq 35$mm	≥ C35/45	$N_{Rk,p}$	[kN]	-	2,5	-
	$d_b \geq 40$mm	≥ C35/45	$N_{Rk,p}$	[kN]	-	3,5	-
Partial safety factor			γ_{Mc} [1)]			1,8	

[1)] In absence of other national regulations

Hilti frame anchor HRD

Concrete: characteristic resistance

Annex 10

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Table 12: Characteristic resistance for concrete cone failure and concrete edge failure for use in concrete (use category "a")

Anchor type		HRD 8	HRD 10
Tension load [2]			
$N_{Rk,c} = 7{,}2 \cdot \sqrt{f_{ck,cube}} \cdot h_{ef}^{1,5} \cdot \frac{c}{c_{cr,N}} = N_{Rk,p} \cdot \frac{c}{c_{cr,N}}$ with $h_{ef}^{1,5} = \frac{N_{Rk,p}}{7{,}2 \cdot \sqrt{f_{ck,cube}}}$			
Shear load [2]			
$V_{Rk,c} = 0{,}45 \cdot \sqrt{d_{nom}} \cdot (h_{nom}/d_{nom})^{0,2} \cdot \sqrt{f_{ck,cube}} \cdot c_1^{1,5} \cdot \left(\frac{c_2}{1{,}5\, c_1}\right)^{0,5} \cdot \left(\frac{h}{1{,}5\, c_1}\right)^{0,5}$ with $\left(\frac{c_2}{1{,}5\, c_1}\right)^{0,5} \le 1$ and $\left(\frac{h}{1{,}5\, c_1}\right)^{0,5} \le 1$			
c_1 edge distance closest to the edge in loading direction c_2 edge distance perpendicular to direction 1 $f_{ck,cube}$ nominal characteristic concrete compression strength (based on cubes), values for C50/60 most			
Partial safety factor	γ_{Mc} [1]	1,8	

[1] In absence of other national regulations

[2] The design method according to ETAG 020, Annex C is to be used

Table 13: Displacements under tension and shear loading in concrete, solid and hollow masonry and non-cracked ACC (use category "a, b, c, d")

Anchor type			HRD 8	HRD 10		
Embedment depth	$h_{nom} \ge$	[mm]	50	50	70	90 [1]
Displacement under tension load	F	[kN]	1,2	1,8	3,3	1,6
	δ_{NO}	[mm]	0,3	0,5	0,9	1,0
	$\delta_{N\infty}$	[mm]	0,6	1,0	1,8	2,0
Displacement under shear load	F	[kN]	1,2	1,8	3,3	1,6
	δ_{VO}	[mm]	1,0	1,5	2,8	3,2
	$\delta_{V\infty}$	[mm]	1,5	2,3	4,2	4,8

[1] for use in non-cracked AAC

Hilti frame anchor HRD	Annex 11
Concrete: characteristic resistance All base materials: displacements	

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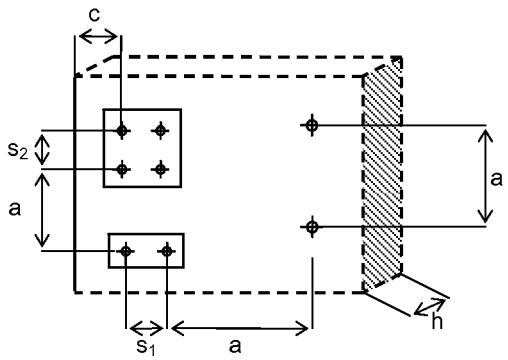
Table 14: Minimum thickness of member, edge distance and anchor spacing in solid and hollow masonry (use category "b, c")

Anchor type				HRD 8	HRD 10
Minimum thickness of member		h_{min}	[mm]	See Tables 15, 16.1	See Tables 15, 16.2–16.4
Minimum allowable edge distance		c_{min}	[mm]	100 (60 [1)])	100
Minimum allowable spacing (single anchor)		a_{min}	[mm]	250	250
Minimum allowable spacing (anchor group)	perpendicular to free edge	s_{min1}	[mm]	200 (120 [1)])	100
	parallel to free edge	s_{min2}	[mm]	400 (240 [1)])	100

[1)] only for brick "Doppio Uni" and "Mattone"

Scheme of distances and spacing



Hilti frame anchor HRD	**Annex 12**
Solid and hollow masonry minimum member thickness, edge distance and anchor spacing	

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Table 15: Characteristic resistance for use in solid masonry (use category "b") [1)]

		HRD 8	HRD 10	
		F_{Rk} [5)] [kN]	F_{Rk} [5)] [kN]	
		$h_{nom} \geq 50$	$h_{nom,1} \geq 50$	$h_{nom,2} \geq 70$
Clay brick **Mz 2,0-2DF** DIN V 105-100 / EN 771-1 Manufacturer: Augsburger Ziegel LxWxH [mm]: 240x115x113 h_{min} [mm]: 115	$f_b \geq 20$ [6)]	1,5	3,0	4)
			4,5 [3)]	
	$f_b \geq 10$ [6)]	1,2	2,0	4)
			3,0 [3)]	
Sand-lime solid brick **KS 2,0-2DF** Manufacturer: Werk Derching DIN V 106-100 / EN 771-2 LxWxH [mm]: 240x115x113 h_{min} [mm]: 115	$f_b \geq 20$ [6)]	2,5	3,0	4)
			4,5 [3)]	
	$f_b \geq 10$ [6)]	2,0	2,0	4)
			3,0 [3)]	
Lightweight concrete solid block **Vbl / V** Manufacturer: KLB DIN V 18152 / EN 771-3 LxWxH [mm]: 240x300x115 h_{min} [mm]: 240	$f_b \geq 20$ [6)]	-	3,5	4)
			6,0 [3)]	
	$f_b \geq 10$ [6)]	-	2,5	4)
			4,5 [3)]	
	$f_b \geq 2$ [6)]	0,5	-	-
Partial safety factor	γ_{Mm} [2)] [-]	2,5		

1) Drilling method: hammer drill

2) In absence of other national regulations

3) Valid for edge distance $c \geq 150$ mm, intermediate values can be interpolated

4) Data can be determined by job-site testing, data for $h_{nom} = 50$ mm can be applied

5) Characteristic resistance for tension, shear or combined tension and shear loading.
The characteristic resistance is valid for single plastic anchor or for a group of two or four plastic anchors with spacing equal or larger than the minimum spacing s_{min} according to Table 14. The specific conditions for the design method have to be considered according to chapter 4.2.6 of the ETA.

6) Mean compressive strength [N/mm²]

Hilti frame anchor HRD	**Annex 13**
Solid masonry (use category "b"): characteristic resistance	

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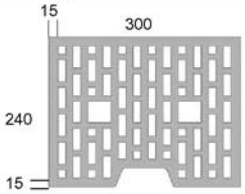
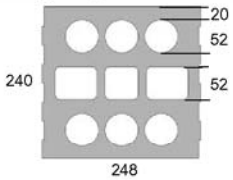
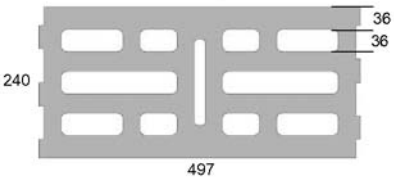
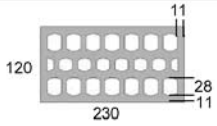
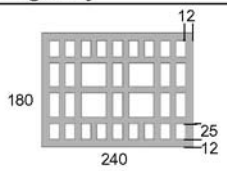
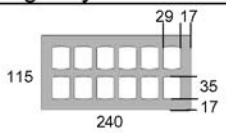
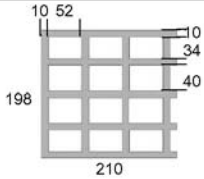
Table 16.1: Characteristic resistance for use in hollow masonry (use cat. "c") for HRD 8

Base material Specifications	Brick dimensions Drilling method	Compressive strength–class [N/mm²]	F_{Rk} [4)] [kN]
Vertically perforated clay brick **HLz B 12/1,2** DIN V 105-100 / EN 771-1 LxWxH [mm]: 300x240x248 h_{min} [mm]: 240	 rotary drilling only	≥ 12	0,5
Vertically perforated sand-lime brick **KSL 12/1,4** DIN V 106 / EN 771-2 LxWxH [mm]: 240x248x248 h_{min} [mm]: 240	 hammer drilling	≥ 12	0,75
Lightweight concrete hollow block **Hbl 2/0,8** DIN V 18151-100 / EN 771-3 LxWxH [mm]: 497x240x248 h_{min} [mm]: 240	 hammer drilling	≥ 2	0,3
Ital. Hollow brick **Doppio Uni** EN 771-1 LxWxH [mm]: 230x120x100 h_{min} [mm]: 120	 rotary drilling only	$f_b \geq 25$ [5)]	0,9
Ital. Hollow brick **Mattone** EN 771-1 LxWxH [mm]: 240x180x100 h_{min} [mm]: 180	 rotary drilling only	$f_b \geq 22$ [5)]	1,5
Span. Ladrillo cara vista **Rojo hydrofugano** EN 771-1 LxWxH [mm]: 240x115x50 h_{min} [mm]: 115	 rotary drilling only	$f_b \geq 40$ [5)]	0,6
French Hollow brick **Brique Creuse C** EN 771-1 LxWxH [mm]: 210x198x… h_{min} [mm]: 210	 rotary drilling only	$f_b \geq 6$ [5)]	0,5
Partial safety factor		γ_{Mm} [2)]	2,5

Footnotes see Annex 17

Hilti frame anchor HRD	**Annex 14**
Hollow masonry (use category "c"): characteristic resistance for HRD 8	

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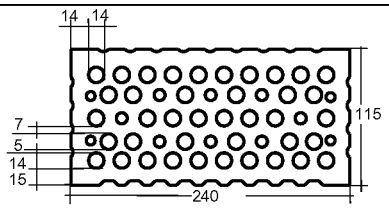
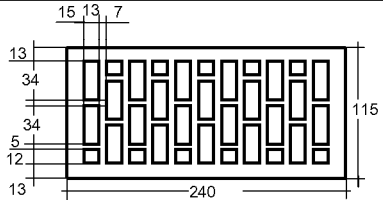
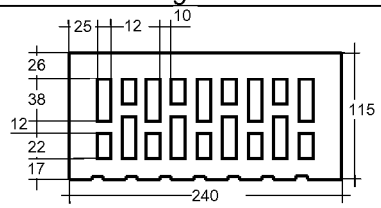
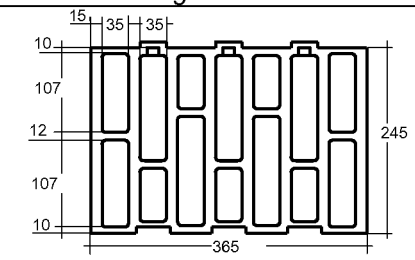
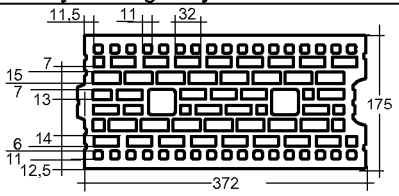
Table 16.2: Characteristic resistance for use in hollow masonry (use category "c") for HRD 10

Base material Specifications	Brick dimensions Drilling method	Compressive strength–class [N/mm²]	F_{Rk} [4)] [kN]	
			$h_{nom,1}$ = 50 [1)]	$h_{nom,2}$ = 70 [1)]
Vertically perforated clay brick **Hlz 1,2-2DF** Manufacturer: Schlagmann DIN V 105-100 / EN 771-1 LxWxH [mm]: 240x115x113 h_{min} [mm]: 115	 hammer drilling	≥ 8	1,5	-
		≥ 10	2,0	-
		≥ 12	2,0	-
Vertically perforated clay brick **Hlz 1,0-2DF** Manufacturer: Ott Ziegel DIN V 105-100 / EN 771-1 LxWxH [mm]: 240x115x113 h_{min} [mm]: 115	 hammer drilling	≥ 8	0,4	0,75
		≥ 10	0,5	0,9
		≥ 12	0,6	0,9
		≥ 20	0,9	1,5
Vertically perforated clay brick **VHlz 1,6-2DF** Manufacturer: Wienerberger DIN V 105-100 / EN 771-1 LxWxH [mm]: 240x115x113 h_{min} [mm]: 115	 hammer drilling	≥ 28	2,0	2,5
		f_b ≥ 50 [5)]	3,0	3,5
Vertically perforated clay brick **Poroton T8** Manufacturer: Wienerberger Z-17.1-982 LxWxH [mm]: 248x365x249 h_{min} [mm]: 365	 rotary drilling only	≥ 6	0,75	1,5
Vertically perforated clay brick **Hlz 1,0-9DF** Manufacturer: Bergmann DIN V 105-100 / EN 771-1 LxWxH [mm]: 372x175x238 h_{min} [mm]: 175	 rotary drilling only	≥ 8	1,2	1,5
		≥ 10	1,5	1,5
		≥ 12	1,5	2,0
		≥ 16	2,0	2,5
Partial safety factor		γ_{Mm} [2)]	2,5	

Footnotes see Annex 17

Hilti frame anchor HRD	**Annex 15**
Hollow masonry (use category "c"): characteristic resistance for HRD 10	

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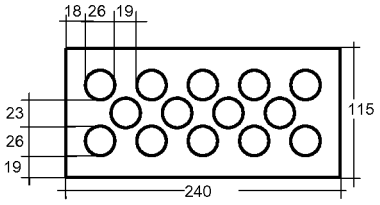
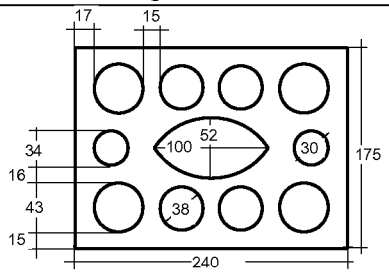
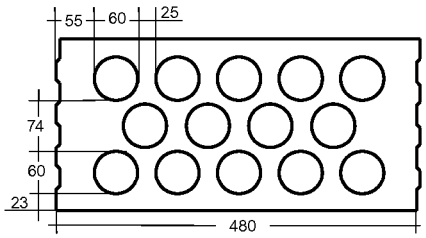
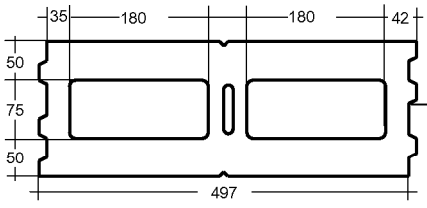
Table 16.3: Characteristic resistance for use in hollow masonry (use category "c") for HRD 10

Base material Specifications	Brick dimensions Drilling method	Compressive strength–class [N/mm²]	F_{Rk} [4)] [kN]	
			$h_{nom,1}$ = 50 [1)]	$h_{nom,2}$ = 70 [1)]
Vertically perforated sand-lime brick **KS L 1,6-2DF** Manufacturer: Werk B'güssbach DIN V 106-100 / EN 771-2 LxWxH [mm]: 240x115x113 h_{min} [mm]: 115	 hammer drilling	≥ 8	1,5	-
		≥ 10	1,5	-
		≥ 12	2,0	-
Vertically perforated sand-lime brick **KS L 1,4-3DF** Manufacturer: Werk B'güssbach DIN V 106-100 / EN 771-2 LxWxH [mm]: 240x175x113 h_{min} [mm]: 175	 hammer drilling	≥ 8	-	2,0
		≥ 10	-	2,5
		≥ 12	-	3,0
Vertically perforated sand-lime brick **KS L R 1,6-16DF** Manufacturer: Werk Derching DIN V 106-100 / EN 771-2 LxWxH [mm]: 480x240x248 h_{min} [mm]: 240	 rotary drilling only	≥ 8	0,9	1,2
		≥ 10	1,2	1,5
		≥ 12	1,5	2,0
		≥ 16	2,0	2,5
Lightweight concrete hollow block **Hbl 1,2-9DF** Manufacturer: KBL DIN V 18151 / EN 771-3 LxWxH [mm]: 497x175x238 h_{min} [mm]: 175	 rotary drilling only	≥ 2	0,5	0,75
		≥ 6	1,2	2,0
Partial safety factor		γ_{Mm} [2)]	2,5	

Footnotes see Annex 17

Hilti frame anchor HRD	**Annex 16**
Hollow masonry (use category "c"): characteristic resistance for HRD 10	

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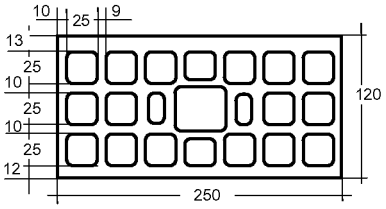
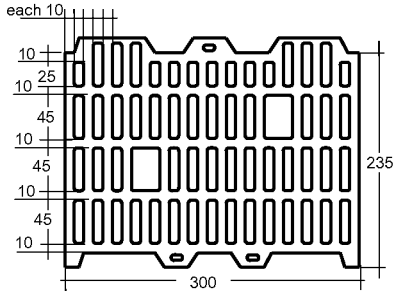
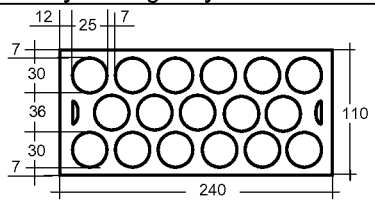
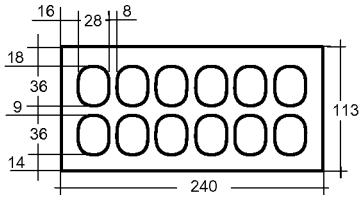
Table 16.4: Characteristic resistance for use in hollow masonry (use category "c") for HRD 10

Base material Specifications	Brick dimensions Drilling method	Compressive strength–class [N/mm²]	F_{Rk} [4)] [kN]	
			$h_{nom,1}$ = 50 [1)]	$h_{nom,2}$ = 70 [1)]
Ital. Hollow brick **Doppio Uni** Manufacturer: Danesi EN 771-1 LxWxH [mm]: 250x120x190 h_{min} [mm]: 120	 rotary drilling only	$f_b \geq 25$ [5)]	3)	1,5
Ital. Hollow brick **Poroton P700** Manufacturer: Danesi EN 771-1 LxWxH [mm]: 225x300x190 h_{min} [mm]: 300	 rotary drilling only	$f_b \geq 15$ [5)]	3)	0,6
Span. Hollow brick **Ladrillo perforado** Manufacturer: La Oliva EN 771-1 LxWxH [mm]: 240x110x100 h_{min} [mm]: 110	 rotary drilling only	$f_b \geq 26$ [5)]	1,5	2,0
Span. Hollow brick **Clinker mediterraneo** Manufacturer: - EN 771-1 LxWxH [mm]: 240x113x50 h_{min} [mm]: 113	 hammer drilling	$f_b \geq 75$ [5)]	3)	1,5
Partial safety factor		γ_{Mm} [2)]	2,5	

Footnotes for Table 16.1 to 16.4:

1) The influence of h_{nom} > 50 mm (HRD 8) or $h_{nom,1}$ > 50 mm or $h_{nom,2}$ > 70 mm (HRD 10) has to be checked by job-site testing according chapter 4.2.4 and 4.4.

2) In absence of other national regulations

3) Data can be determined by job site tests

4) Characteristic resistance for tension, shear or combined tension and shear loading.
The characteristic resistance is valid for single plastic anchor or for a group of two or four plastic anchors with a spacing equal or larger than the minimum spacing smin according to Table 14. The specific conditions for the design method have to be considered according to chapter 4.2.6 of the ETA.

5) Mean compressive strength [N/mm²]

Displacements: see Annex 11, Table 13

Hilti frame anchor HRD	**Annex 17**
Hollow masonry (use category "c"): characteristic resistance for HRD 10	

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Table 17: Minimum thickness of member, edge distance and anchor spacing in non-cracked autoclaved aerated concrete (AAC blocks, use category "d")

Anchor type					HRD 8	HRD 10
Minimum thickness of member		AAC 2	h_{min}	[mm]	-	200
		AAC 6	h_{min}	[mm]	-	240
Minimum allowable edge distance			c_{min}	[mm]	-	100
Minimum allowable spacing (single anchor)			a_{min}	[mm]	-	250
Minimum allowable spacing (anchor group)	perpendicular to free edge		s_{min1}	[mm]	-	100
	parallel to free edge		s_{min2}	[mm]	-	100

Scheme of distances and spacing

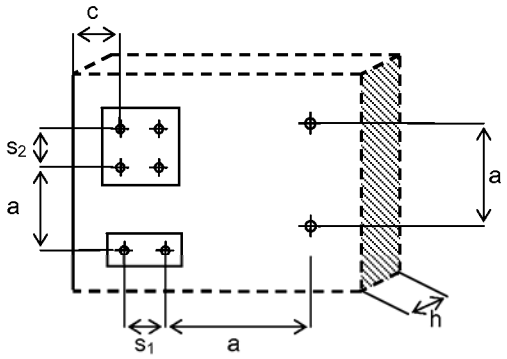

Table 18: Characteristic resistance for use in non-cracked autoclaved aerated concrete (AAC blocks, use category "d") [1)]

Anchor type				HRD 8	HRD 10	
				-	$h_{nom,2} \geq 70$	$h_{nom,3} \geq 90$
Non-cracked autoclaved aerated concrete (AAC blocks) EN 771-4	AAC 2	F_{Rk} [2)]	[kN]	-	0,9	0,9
	AAC 6	F_{Rk} [2)]	[kN]	-	2,0	2,5
					3,5 [4)]	4,5 [4)]
Partial safety factor		γ_{MAAC} [3)]		2,0		

1) Drilling method: rotary drilling only

2) Characteristic resistance for tension, shear or combined tension and shear loading.
The characteristic resistance is valid for single plastic anchor or for a group of two or four plastic anchors with spacing equal or larger than the minimum spacing s_{min} according to Table 17. The specific conditions for the design method have to be considered according to chapter 4.2.6 of the ETA.

3) In absence of other national regulations

4) Valid for edge distance $c \geq 150$mm, intermediate values can be interpolated

Displacements: see Annex 11, Table 13

Hilti frame anchor HRD	Annex 18
Non-cracked autoclaved aerated concrete (AAC blocks, use category "d"): minimum member thickness, edge distance and anchor spacing characteristic resistance	