Deutsches Institut für Bautechnik

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Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

Designated according to Article 29 of Regulation (EU) No 305/2011 and member of EOTA (European Organisation for Technical Assessment)

European Technical Assessment ETA-07/0219 of 28 June 2018

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the European Technical Assessment:	Deutsches Institut für Bautechnik
Trade name of the construction product	Hilti frame anchor HRD
Product family to which the construction product belongs	Plastic anchor for multiple use in concrete and masonry for non-structural applications
Manufacturer	Hilti Aktiengesellschaft Business Unit Anchors 9494 Schaan FÜRSTENTUM LIECHTENSTEIN
Manufacturing plant	Hilti Werke
This European Technical Assessment contains	23 pages including 3 annexes which form an integral part of this assessment
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	ETAG 020, March 2012, used as EAD according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011.
This version replaces	ETA-07/0219 issued on 19 September 2017

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Specific Part

1 Technical description of the 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 product description is given in Annex A.

2 Specification of the intended use in accordance with the applicable European Assessment Document

The performances given in Section 3 are only valid if the anchor is used in compliance with the specifications and conditions given in Annex B.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the anchors of at least 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

3 Performance of the product and references to the methods used for its assessment

3.1 Mechanical resistance and stability (BWR 1)

The essential characteristics regarding mechanical resistance and stability are included under the Basic Works Requirement Safety in use.

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Anchorages satisfy requirements for Class A 1
Resistance to fire	See Annex C 2

3.3 Safety and accessibility (BWR 4)

Essential characteristic	Performance
Characteristic resistance for tension and shear loads	See Annexes C 1 - C 8
Characteristic resistance for bending moments	See Annex C 1
Displacements under shear and tension loads	See Annex C 8
Anchor distances and dimensions of members	See Annex B 5 - B 7

3.4 General aspects

The verification of durability is part of testing the essential characteristics. Durability is only ensured if the specifications of intended use according to Annex B are taken into account.

4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

In accordance with guideline for European technical approval ETAG 020, March 2012 used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011 the applicable European legal act is: 97/463/EC.

The system to be applied is: 2+

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document

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

Issued in Berlin on 28 June 2018 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow
Head of Department

beglaubigt:
Aksünger

Deutsches Institut für Bautechnik DIBt

Installed condition

Figure A1:

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)

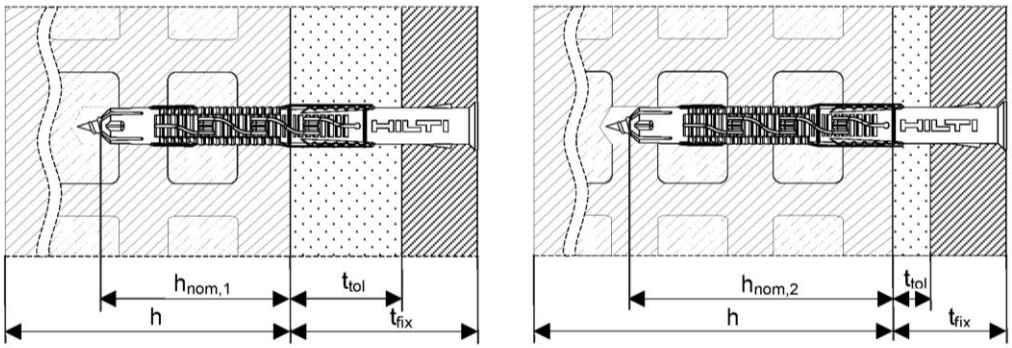
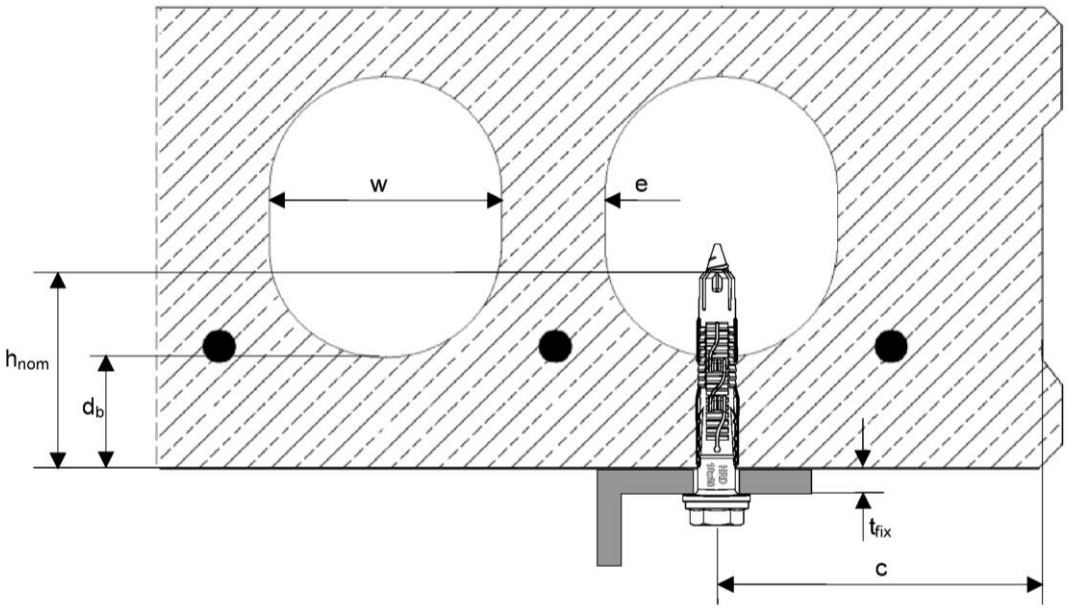


Figure A2:

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



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

Hilti frame anchor HRD	
Product description Installed condition	**Annex A1**

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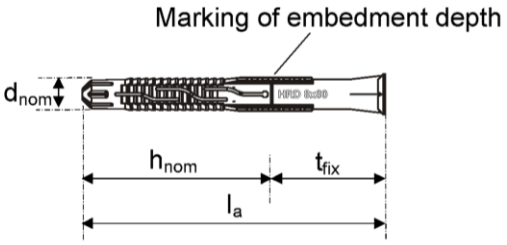
Anchor types, marking and identification after installation

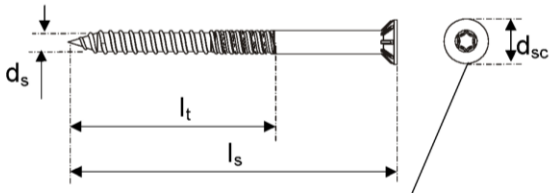
HRD 8

Anchor sleeve



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

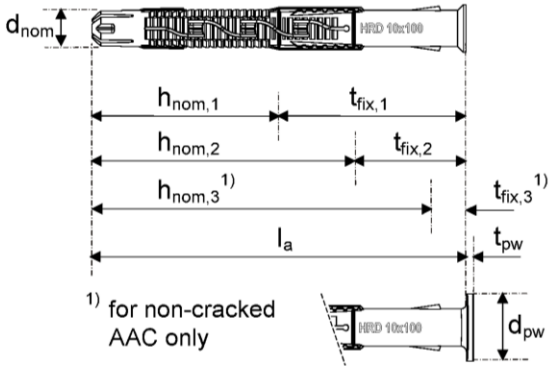
Special screw



Marking:
HDS-U

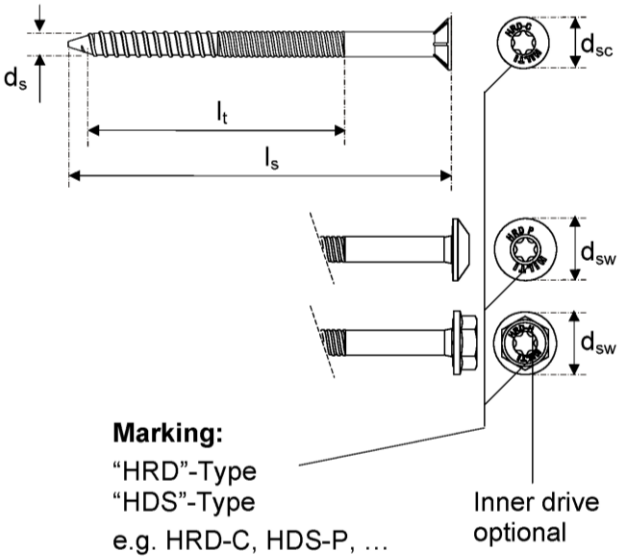
HRD 10

Anchor sleeve



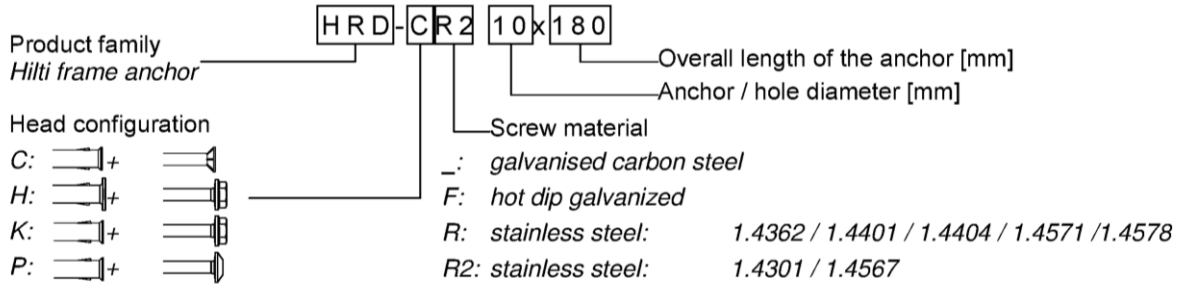
Marking:
Producer, Type, Size
e.g. HILTI HRD 10x100

Special screw



Marking:
"HRD"-Type
"HDS"-Type
e.g. HRD-C, HDS-P, …

Naming



Hilti frame anchor HRD	
Product description Anchor types, marking, naming	**Annex A2**

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Table A1: Dimensions

					HRD 8	HRD 10
Plastic sleeve	Sleeve diameter		d_{nom}	[mm]	8	10
	Length of sleeve	min	l_a	[mm]	60	60
		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 A2: Materials

	HRD 8	HRD 10
Plastic sleeve	Polyamide, PA6, 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

Product description
Dimensions, materials

Annex A3

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Specifications of intended use

Anchorages subject to:

- Static and quasi-static loads
- Multiple fixing of non-structural applications

Base materials:

- Reinforced or unreinforced normal weight concrete with strength classes ≥ C12/15 (use category a) according to EN 206-1:2000 and according Annex C2.
- Precast prestressed hollow core slabs with strength classes ≥ C35/55 (use category a) according Annex C2.
- Solid brick masonry (use category b) according to Annex C3.

  Note: The characteristic resistance is also valid for larger brick sizes and higher compressive strength of the masonry unit.
- Hollow brick masonry (use category c) according to Annex C4 to C7.
- Autoclaved aerated concrete AAC (use category d) according to Annex C8.
- Mortar strength class of the masonry ≥ M2,5 according to EN 998-2:2010.
- For other base materials of the use categories a, b, c or d the characteristic resistance of the anchor may be determined by job site tests according to ETAG 020, Annex B, Edition March 2012.

Temperature range:

- In-service
  -40 °C to +80 °C (max. long term temperature +50 °C and max. short term temperature +80 °C)

Use conditions (Environmental conditions):

- Hilti frame anchor HRD, HRD-F, HRD-R and HRD-R2:

  Structures subject to dry internal conditions

  The specific screw made of galvanized steel 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).
- Hilti frame anchor HRD, HRD-F, HRD-R and HRD-R2:

  Structures subject to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal condition, if no particular aggressive conditions exist (stainless steel).

  Note: 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).

Hilti frame anchor HRD	Annex B1
Specifications of intended use	

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Design:

- The anchorages are to be designed in accordance with the ETAG 020, Annex C under the responsibility of an engineer experienced in anchorages and masonry work.
- 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 position of the anchor is indicated on the design drawings.
- Fasteners are only to be used for multiple use for non-structural application according to ETAG 020, Edition March 2012.

Installation:

- Hole drilling by the drill modes according to Annex B 8.
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- Temperature at installation
  -10 °C to +40 °C
- Exposure to UV due to solar radiation of the anchor not protected ≤ 6 weeks

Hilti frame anchor HRD	**Annex B2**
Specifications of intended use	

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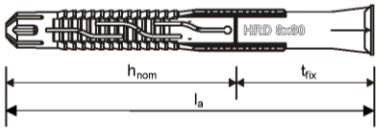
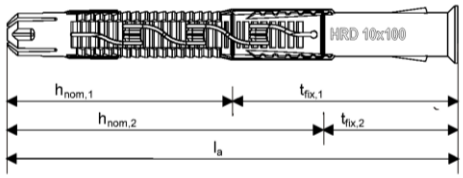
Table B1: Installation parameters

				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

1) for non-cracked AAC only

Table B2: Relation of h_{nom}, l_a and t_{fix} for use in concrete and masonry

		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)]	$h_{nom,2} \geq 70$ [1)]
	l_a	t_{fix}	$t_{fix,1}$	$t_{fix,2}$
	[mm]	[mm]	[mm]	[mm]
HRD 8	60	≤ 10	≤ 10	---
	80	≤ 30	≤ 30	≤ 10
	100	≤ 50	≤ 50	≤ 30
	120	≤ 70	≤ 70	≤ 50
HRD 10	140	≤ 90	≤ 90	≤ 70
	160	-	≤ 110	≤ 90
	180	-	≤ 130	≤ 110
	200	-	≤ 150	≤ 130
	230	-	≤ 180	≤ 160
	270	-	≤ 220	≤ 200
	310	-	≤ 260	≤ 240

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 Annex B1

Hilti frame anchor HRD	Annex B3
Intended use Installation parameters, Relations of h_{nom}, l_a and t_{fix}	

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Table B3: Relation of h_{nom}, l_a and t_{fix} for use in autoclaved aerated concrete (AAC)

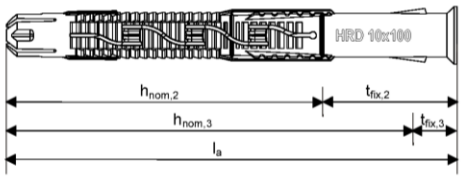
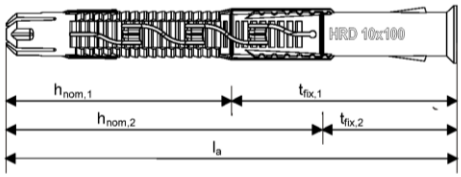
		HRD 8 x l_a	HRD 10 x l_a	
Use category "d"			$h_{nom,2} \geq 70$	$h_{nom,3} \geq 90$
	l_a		$t_{fix,2}$	$t_{fix,3}$
	[mm]		[mm]	[mm]
HRD 10	60	-	-	-
	80	-	≤ 10	-
	100	-	≤ 30	≤ 10
	120	-	≤ 50	≤ 30
	140	-	≤ 70	≤ 50
	160	-	≤ 90	≤ 70
	180	-	≤ 110	≤ 90
	200	-	≤ 130	≤ 110
	230	-	≤ 160	≤ 140
	270	-	≤ 200	≤ 180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

Table B4: 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

		HRD 8 x l_a	HRD 10 x l_a	
Use category "a"			$h_{nom,1} \geq 50$	
	l_a		$t_{fix,min}$	$t_{fix,max}$
	[mm]		[mm]	[mm]
HRD 10	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

Intended use
Relations of h_{nom}, l_a and t_{fix}

Annex B4

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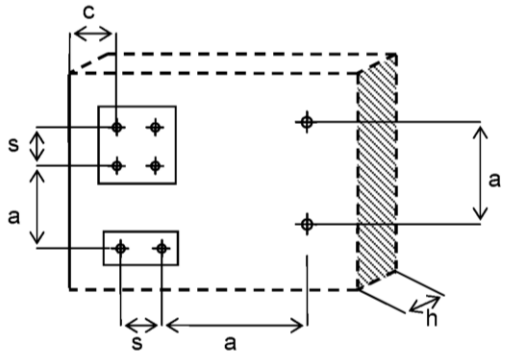
Table B5: Minimum thickness of member, edge distance and anchor spacing in concrete and thin skins (use category "a")

				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 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 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.

Scheme of distances and spacing



Hilti frame anchor HRD	Annex B5
Intended Use Minimum spacing and minimum edge distance in concrete	

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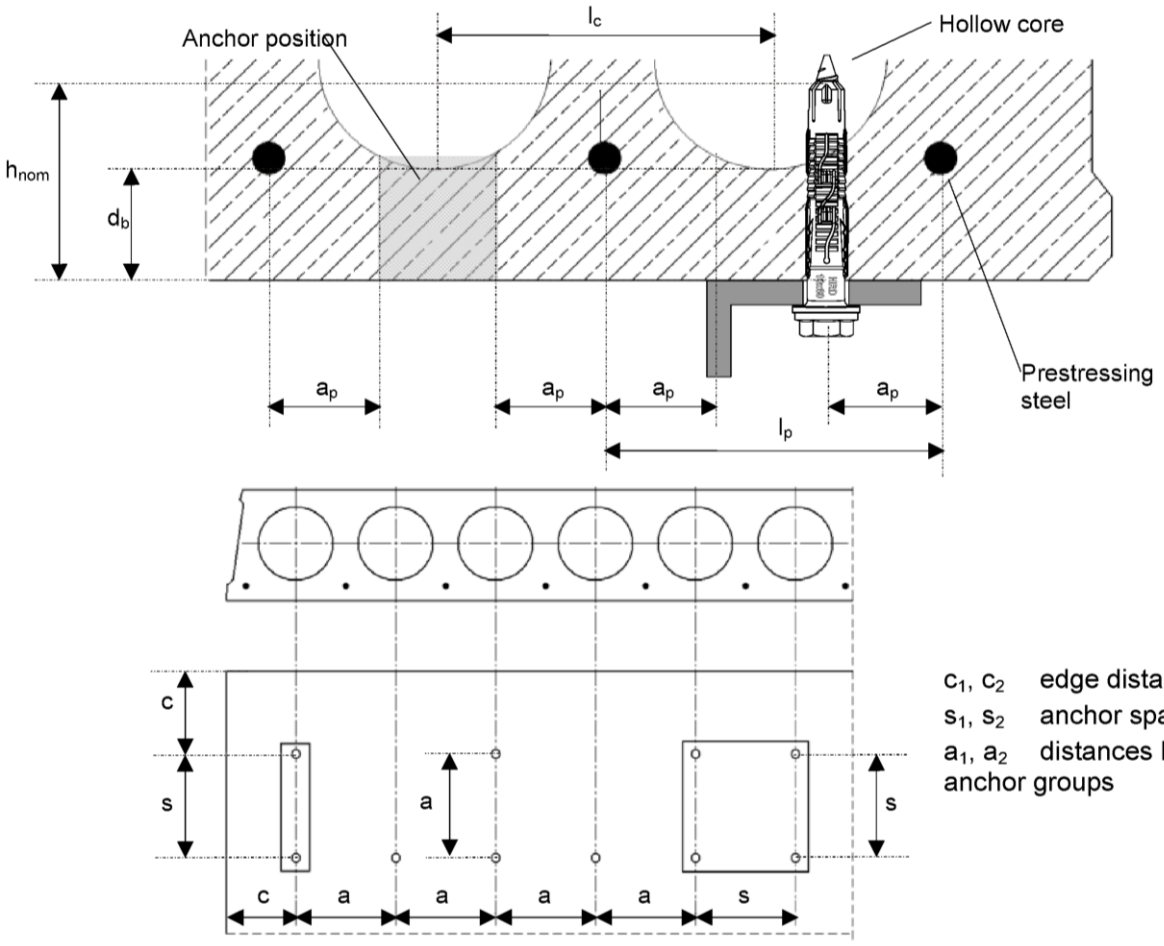
Table B6: Anchor positions, minimum spacing and edge distance of anchors and distance between anchor groups in precast prestressed hollow core slabs

			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	$l_c \geq$	[mm]	-	100
Prestressing steel distance	$l_p \geq$	[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 B6
Intended Use Minimum spacing and minimum edge distance in precast prestressed hollow core slabs	

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Table B7: Minimum thickness of member, edge distance and anchor spacing in solid and hollow masonry (use category "b, c")

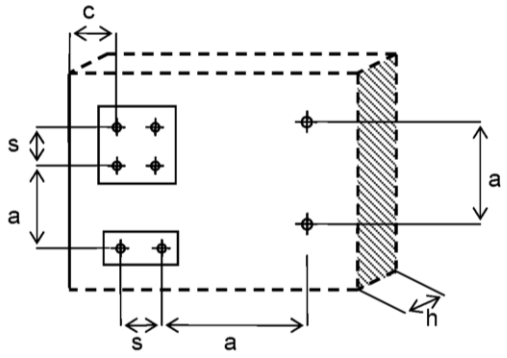
				HRD 8	HRD 10
Minimum thickness of member		h_{min}	[mm]	see Table C4, Table C5	see Table C4- Table C6
Minimum edge distance		c_{min}	[mm]	100 (60)[1]	100
Minimum spacing (single anchor)		a_{min}	[mm]	250	250
Minimum spacing (anchor group)	perpendicular to free edge	s_{min1}	[mm]	200 (120 [1)])	100
	parallel to free edge	s_{min2}	[mm]	400 (240 [1)])	100

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

Table B8: Minimum thickness of member, edge distance and anchor spacing in non-cracked autoclaved aerated concrete (AAC blocks, use category "d")

				HRD 8	HRD 10
Minimum thickness of member	AAC 2	h_{min}	[mm]	-	200
	AAC 4	h_{min}	[mm]	-	240
	AAC 6	h_{min}	[mm]	-	240
Minimum edge distance		c_{min}	[mm]	-	100
Minimum spacing (single anchor)		a_{min}	[mm]	-	250
Minimum spacing (anchor group)	perpendicular to free edge	s_{min1}	[mm]	-	100
	parallel to free edge	s_{min2}	[mm]	-	100

Scheme of distances and spacing



Hilti frame anchor HRD	Annex B7
Intended Use Minimum spacing and minimum edge distance in masonry and AAC	

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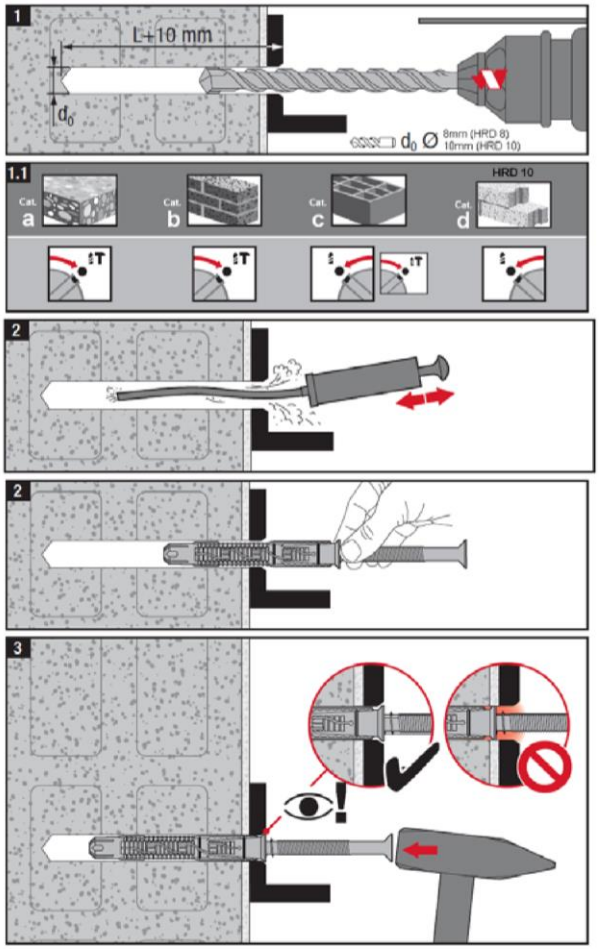
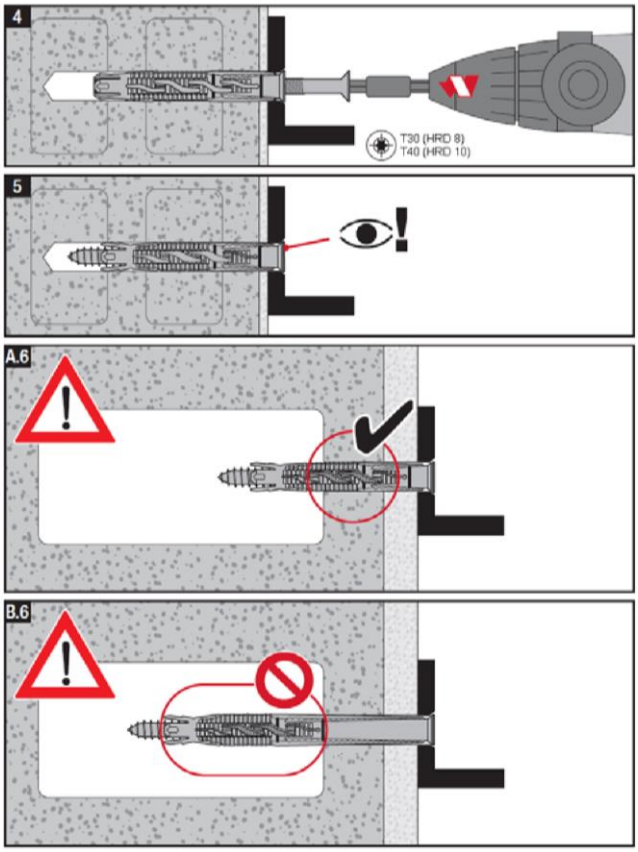
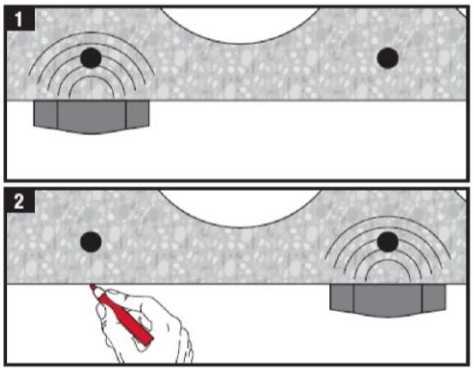
Installation instruction

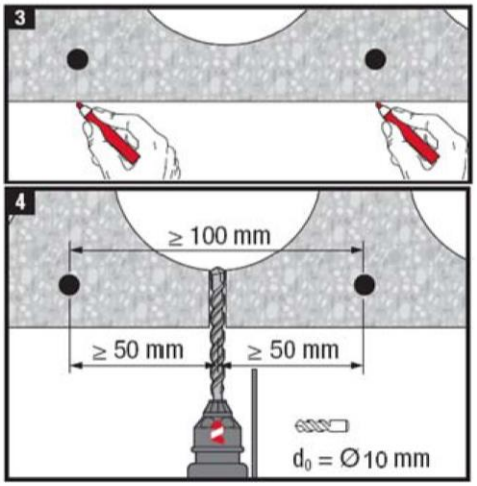




Additional preparation in case of application in precast prestressed hollow core slabs

After drilling follow the main instruction above





Hilti frame anchor HRD	Annex B8
Intended Use Installation instruction	

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Table C1: Characteristic resistance of the screw

			HRD 8	HRD 10
galvanised steel				
Characteristic tension resistance	$N_{Rk,s}$	[kN]	10,9	17,5
Partial safety factor for tension	γ_{Ms} [1)]	[-]	1,50	1,50
Characteristic shear resistance	$V_{Rk,s}$	[kN]	6,9	10,6
Characteristic bending resistance	$M_{Rk,s}$	[Nm]	11,1	21,3
Partial safety factor for shear and bending	γ_{Ms} [1)]	[-]	1,25	1,25
Hot-dip galvanized steel				
Characteristic tension resistance	$N_{Rk,s}$	[kN]	-	16,7
Partial safety factor for tension	γ_{Ms} [1)]	[-]	-	1,50
Characteristic shear resistance	$V_{Rk,s}$	[kN]	-	10,1
Characteristic bending resistance	$M_{Rk,s}$	[Nm]	-	19,9
Partial safety factor for shear and bending	γ_{Ms} [1)]	[-]	-	1,25
Stainless steel				
Characteristic tension resistance	$N_{Rk,s}$	[kN]	10,5	18,4
Partial safety factor for tension	γ_{Ms} [1)]	[-]	1,54	1,58
Characteristic shear resistance	$V_{Rk,s}$	[kN]	6,6	11,1
Characteristic bending resistance	$M_{Rk,s}$	[Nm]	10,8	22,3
Partial safety factor for shear and bending	γ_{Ms} [1)]	[-]	1,28	1,31

1) In absence of other national regulations

Hilti frame anchor HRD

Performances
Characteristic resistance of the screw

Annex C1

Deutsches Institut für Bautechnik DIBt

Table C2: Characteristic resistance for pull-out failure (plastic sleeve) for use in concrete (use category "a")

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

1) In absence of other national regulations

Table C3: Values under fire exposure in concrete C20/25 to C50/60 in any load direction, no permanent centric tension load and without lever arm

			HRD 8	HRD 10
Fire resistance class: R 90	F [1)]	[kN]	-	0,8

1) $F = F_{Rk} / (\gamma_M \cdot \gamma_F)$

Hilti frame anchor HRD

Performances
Characteristic resistance for pull-out in concrete, values under fire exposure

Annex C2

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Table C4: Characteristic resistance for use in solid masonry (use category "b") [1)]

		Characteristic resistance F_{Rk} [kN]		
		HRD 8	HRD 10	
		$h_{nom} \geq 50$	$h_{nom} \geq 50$	$h_{nom} \geq 70$
Clay brick **Mz 2,0-2DF** DIN V 105-100:2012-01 / EN 771-1:2011 Manufacturer: Augsburger Ziegel LxWxH [mm]: 240x115x113 h_{min} [mm]: 115	$f_b \geq 20$ [5)]	1,5	3,0	[4)]
			4,5 [3)]	
	$f_b \geq 10$ [5)]	1,2	2,0	[4)]
			3,0 [3)]	
Sand-lime solid brick **KS 2,0-2DF** Manufacturer: Werk Derching DIN V 106:2005-10 / EN 771-2:2011 LxWxH [mm]: 240x115x113 h_{min} [mm]: 115	$f_b \geq 20$ [5)]	2,5	3,0	[4)]
			4,5 [3)]	
	$f_b \geq 10$ [5)]	2,0	2,0	[4)]
			3,0 [3)]	
Lightweight concrete solid block **Vbl / V** Manufacturer: KLB DIN V 18152-100:2005-10 / EN 771-3:2011 LxWxH [mm]: 240x300x115 h_{min} [mm]: 240	$f_b \geq 20$ [5)]	-	3,5	[4)]
			6,0 [3)]	
	$f_b \geq 10$ [5)]	-	2,5	[4)]
			4,5 [3)]	
	$f_b \geq 2$ [5)]	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) Mean compressive strength [N/mm²]

Hilti frame anchor HRD

Performances
Characteristic resistance in solid masonry

Annex C3

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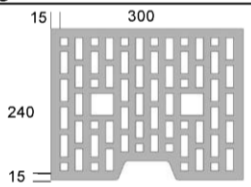
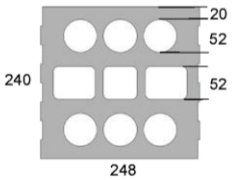
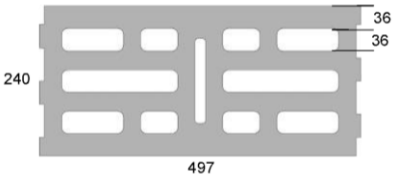
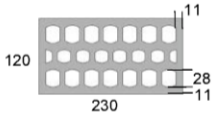
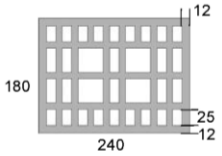
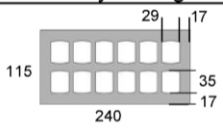
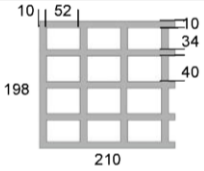
Table C5: Characteristic resistance for use in hollow masonry (use cat. "c") for HRD 8

Base material Specifications | Brick dimensions | Drilling methods	Compressive strength–class [N/mm²]	**Characteristic resistance F_{Rk} [kN]** $h_{nom} \geq 50$ [1)]
Vertically perforated clay brick **HLz B 12/1,2** DIN V 105-100:2012-01 / EN 771-1:2011 LxWxH [mm]: 300x240x248 h_{min} [mm]: 240  rotary drilling only	≥ 12	0,5
Vertically perforated sand-lime brick **KSL 12/1,4** DIN V 106:2005-10 / EN 771-2:2011 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 771-1:2011 LxWxH [mm]: 230x120x100 h_{min} [mm]: 120  rotary drilling only	$f_b \geq 25$ [4)]	0,9
Ital. Hollow brick **Mattone** EN 771-1:2011 LxWxH [mm]: 240x180x100 h_{min} [mm]: 180  rotary drilling only	$f_b \geq 22$ [4)]	1,5
Span. Ladrillo cara vista **Rojo hydrofugano** EN 771-1:2011 LxWxH [mm]: 240x115x50 h_{min} [mm]: 115  rotary drilling only	$f_b \geq 40$ [4)]	0,6
French Hollow brick **Brique Creuse C** EN 771-1:2011 LxWxH [mm]: 210x198x… h_{min} [mm]: 210  rotary drilling only	$f_b \geq 6$ [4)]	0,5
Partial safety factor γ_{Mm} [2)]	[-]	2,5

Footnotes see Table C6

Hilti frame anchor HRD

Performances
Characteristic resistance in hollow masonry for HRD 8

Annex C4

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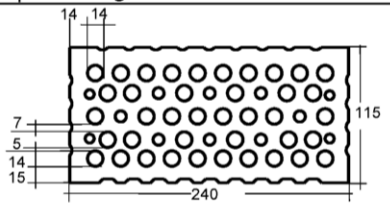
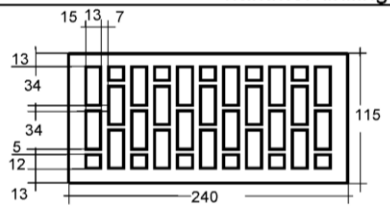
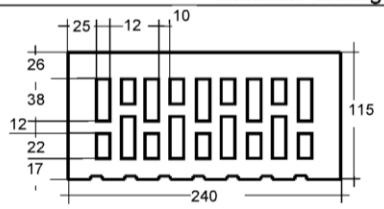
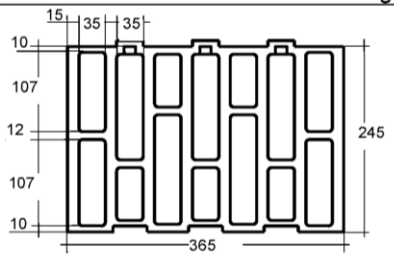
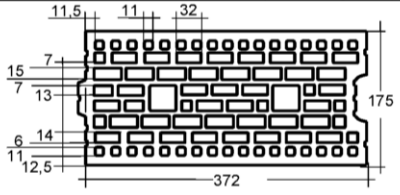
Table C6: Characteristic resistance for use in hollow masonry (use cat. "c") for HRD 10

Base material Specifications | Brick dimensions | Drilling methods		Compressive strength–class [N/mm²]	**Characteristic resistance F_{Rk} [kN]**	
			$h_{nom} \geq 50$ [1]	$h_{nom} \geq 70$ [1]
Vertically perforated clay brick **Hlz 1,2-2DF** Manufacturer: Schlagmann DIN V 105-100:2012-01 / EN 771-1:2011 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 105-100:2012-01 / EN 771-1:2011 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 105-100:2012-01 / EN 771-1:2011 LxWxH [mm]: 240x115x113 h_{min} [mm]: 115	 hammer drilling	≥ 28	2,0	2,5
		$f_b \geq 50$ [4]	3,0	3,5
Vertically perforated clay brick **Poroton T8** Manufacturer: Wienerberger Z-17.1-982 of 14.10.2016 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 105-100:2012-01 / EN 771-1:2011 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	

Hilti frame anchor HRD

Performances
Characteristic resistance in hollow masonry for HRD 10

Annex C5

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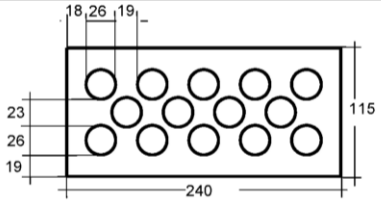
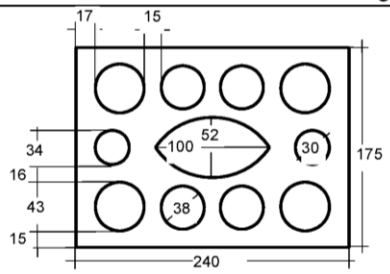
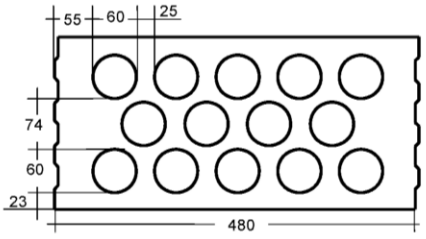
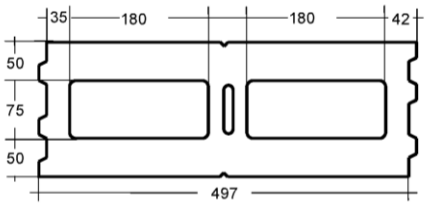
Table C6: continued

Base material Specifications | Brick dimensions | Drilling methods	Compressive strength–class [N/mm²]	**Characteristic resistance F_{Rk} [kN]**	
		$h_{nom} \geq 50$ [1)]	$h_{nom} \geq 70$ [1)]
Vertically perforated sand-lime brick **KS L 1,6-2DF** Manufacturer: Werk B'güssbach DIN V 106:2005-10 / EN 771-2:2011 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 106:2005-10 / EN 771-2:2011 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 106:2005-10 / EN 771-2:2011 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 18151-100:2005-10 / EN 771-3:2011 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	

Hilti frame anchor HRD

Performances
Characteristic resistance in hollow masonry for HRD 10

Annex C6

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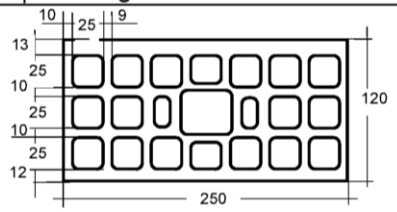
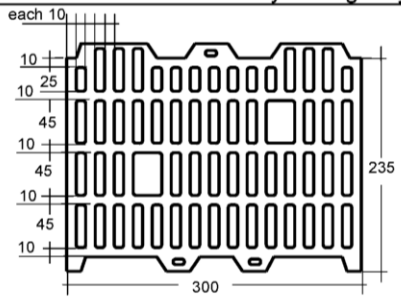
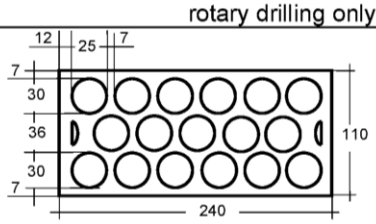
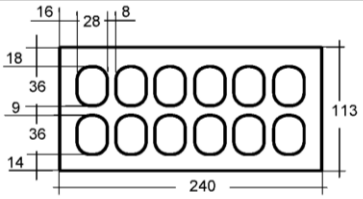
Table C6: continued

Base material Specifications | Brick dimensions | Drilling methods	Compressive strength–class [N/mm²]	**Characteristic resistance F_{Rk} [kN]** $h_{nom} \geq 50$ [1]	$h_{nom} \geq 70$ [1]
Ital. Hollow brick **Doppio Uni** Manufacturer: Danesi EN 771-1:2011 LxWxH [mm]: 250x120x190 h_{min} [mm]: 120  rotary drilling only	$f_b \geq 25$ [4]	[3]	1,5
Ital. Hollow brick **Poroton P700** Manufacturer: Danesi EN 771-1:2011 LxWxH [mm]: 225x300x190 h_{min} [mm]: 300  rotary drilling only	$f_b \geq 15$ [4]	[3]	0,6
Span. Hollow brick **Ladrillo perforado** Manufacturer: La Oliva EN 771-1:2011 LxWxH [mm]: 240x110x100 h_{min} [mm]: 110  rotary drilling only	$f_b \geq 26$ [4]	1,5	2,0
Span. Hollow brick **Clinker mediterraneo** Manufacturer: - EN 771-1:2011 LxWxH [mm]: 240x113x50 h_{min} [mm]: 113  hammer drilling	$f_b \geq 75$ [4]	[3]	1,5
Partial safety factor γ_{Mm} [2]	[-]	2,5	

[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 Annex B1

[2] In absence of other national regulations

[3] Data can be determined by job site tests

[4] Mean compressive strength [N/mm²]

Hilti frame anchor HRD

Performances
Characteristic resistance in hollow masonry for HRD 10

Annex C7

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Table C7: Characteristic resistance for use in non-cracked autoclaved aerated concrete (AAC blocks, use category "d") [1)]

				HRD 8	HRD 10	
				$h_{nom} \geq 50$	$h_{nom,2} \geq 70$	$h_{nom,3} \geq 90$
Characteristic resistance in **non-cracked autoclaved aerated concrete (AAC blocks)**, EN 771-4:2011	AAC 2	F_{Rk}	[kN]	-	0,9	0,9
	AAC 4	F_{Rk}	[kN]	-	2,0	2,0
		F_{Rk}	[kN]	-	2,0 [3)]	2,5 [3)]
	AAC 6	F_{Rk}	[kN]	-	2,0	2,5
		F_{Rk}	[kN]	-	3,5 [3)]	4,5 [3)]
Partial safety factor		γ_{MAAC} [2)]	[-]	2,0		

1) Drilling method: rotary drilling only
2) In absence of other national regulations
3) Valid for edge distance $c \geq 150$mm, intermediate values can be interpolated

Table C8: Displacements under tension and shear loading in concrete, solid and hollow masonry and non-cracked ACC (use category "a, b, c, d")

			HRD 8	HRD 10		
Embedment depth	$h_{nom} \geq$	[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

Performances
Characteristic resistance in AAC, Displacements for all base materials

Annex C8