Deutsches Institut für Bautechnik DIBt

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Bautechnisches Prüfamt

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European Technical Assessment ETA-19/0160 of 30 October 2023

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 HIT-HY 270 with HAS and HAS-U
Product family to which the construction product belongs	Metal Injection anchors for use in masonry
Manufacturer	Hilti Aktiengesellschaft 9494 SCHAAN FÜRSTENTUM LIECHTENSTEIN
Manufacturing plant	Hilti Werke
This European Technical Assessment contains	52 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	330076-01-0604, Edition 10/2022
This version replaces	ETA-19/0160 issued on 30 August 2019

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Specific Part

1 Technical description of the product

The Injection system Hilti HIT-HY 270 with HAS and HAS-U for masonry is a bonded anchor (injection type) consisting of a mortar foil pack with injection mortar Hilti HIT-HY 270, a perforated sieve sleeve and an anchor rod with hexagon nut and washer in the range of M6 to M16. The steel elements are made of zinc coated steel, stainless steel or high corrosion resistant steel.

The anchor rod is placed into a drilled hole filled with injection mortar and is anchored via the bond and/or mechanical interlock between steel element, injection mortar and masonry.

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 fastener 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 fastener of at least 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

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

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Characteristic resistance for static and quasi-static loading	See Annexes B7 to B9 and C1 to C30
Characteristic resistance and displacements for seismic loading	No performance assessed

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire under tension and shear loading with and without lever arm. Minimum edge distances and spacing	No performance assessed

3.3 Hygiene, health and the environment (BWR 3)

Essential characteristic	Performance
Content, emission and/or release of dangerous substances	No performance assessed

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

In accordance with the European Assessment Document EAD 330076-01-0604 the applicable European legal act is: [97/177/EC].

The system to be applied is: 1

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

The following standards are referred to in this European Technical Assessment:

- EN 1993-1-4:2006 + A1:2015	Eurocode 3: Design of steel structures - Part 1-4: General rules - Supplementary rules for stainless steels
- EN 10088-1:2014	Stainless steels - Part 1: List of stainless steels
- EN 10204:2004	Metallic products - Types of inspection documents
- EN 998-2:2016	Specification for mortar for masonry - Part 2: Masonry mortar
- EN 771-1:2011 + A1:2015	Specification for masonry units - Part 1: Clay masonry units
- EN 771-2:2011 + A1:2015	Specification for masonry units - Part 2: Calcium silicate masonry units
- EN 771-3:2011 + A1:2015	Specification for masonry units - Part 3: Aggregate concrete masonry units (Dense and lightweight aggregates)
- EN 15037-3: 2009 + A1:2011	Precast concrete products - Beam-and-block floor systems – Part 3: Clay blocks

Issued in Berlin on 30 October 2023 by Deutsches Institut für Bautechnik

Dipl.-Ing. Beatrix Wittstock
Head of Section

beglaubigt:
Baderschneider

Installed condition

Figure A1: Hollow and solid brick with HAS… and HAS-U… and one sieve sleeve HIT-SC (see Table 5)

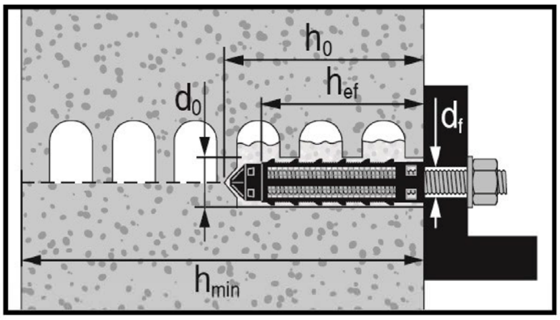


Figure A2: Hollow and solid brick with HAS… and HAS-U… and two sieve sleeves HIT-SC for deeper embedment depth (see Table B6)

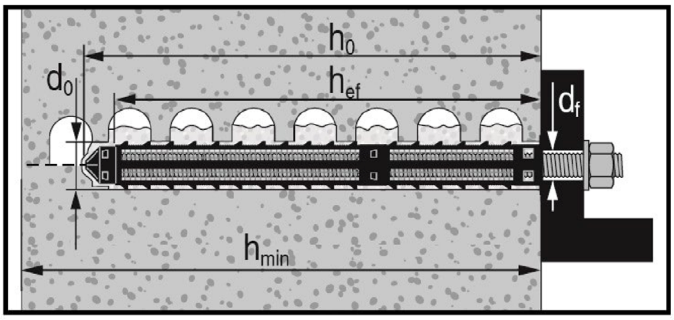
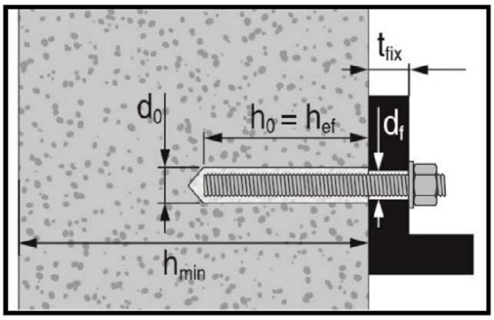
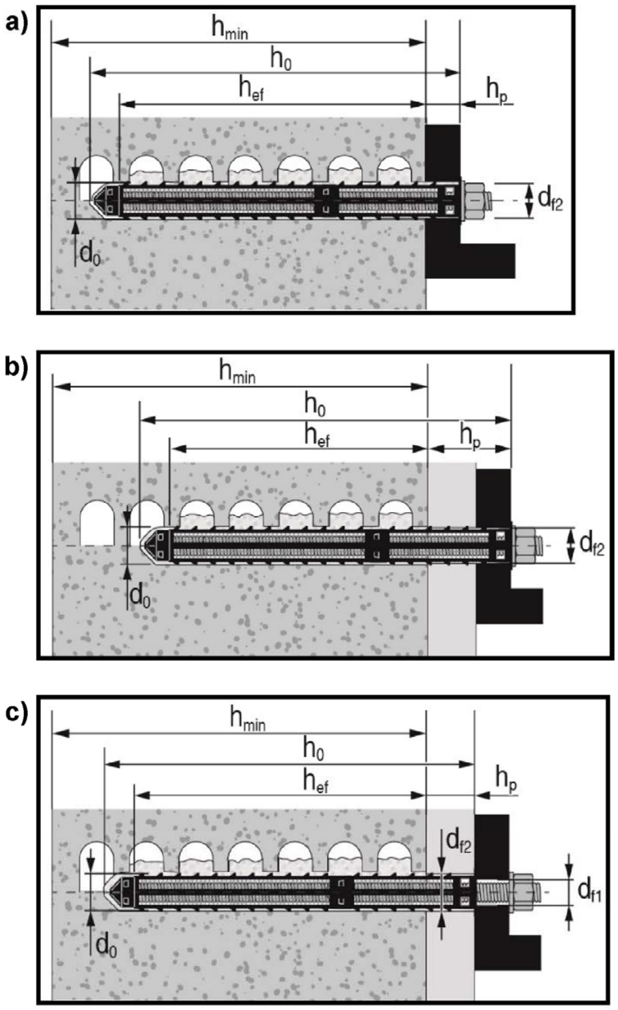


Figure A3: Solid brick with HAS… and HAS-U… (see Table B7)



Hilti HIT-HY 270 with HAS and HAS-U	
Product description Installed condition	**Annex A1**

Figure A4: Hollow and solid brick with HAS and HAS-U… with two sieve sleeves HIT-SC for setting through the fixture and/or through the non-loadbearing layer (see Table B8)



Hilti HIT-HY 270 with HAS and HAS-U	
Product description Installed condition	**Annex A2**

Product description: Injection mortar and steel elements

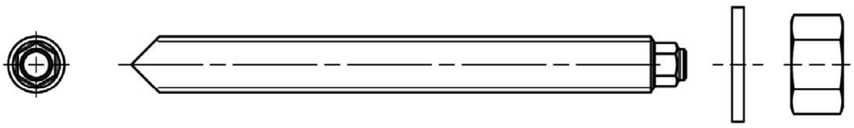
Injection mortar Hilti HIT-HY 270: hybrid system with aggregate
330 ml and 500 ml

Marking
HILTI HY-270
Production number and
production line
Expiry date mm/yyyy

Product name: "Hilti HIT-HY 270"

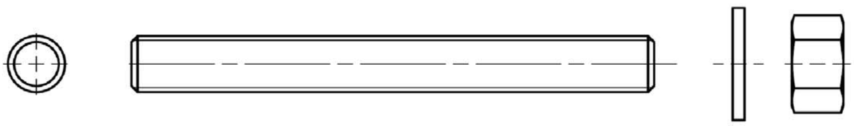
Static mixer Hilti HIT-RE-M

HAS-U…



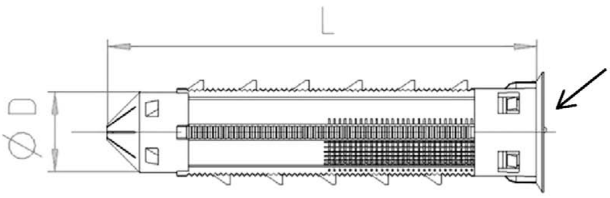
M6 to M16 **washer** **nut**

HAS…



M8 to M16 **washer** **nut**

Sieve sleeve HIT- SC 12 to 22



Head marking:
e.g. HIT-SC 18x85

Hilti HIT-HY 270 with HAS and HAS-U	
Product description Injection mortar / Static mixer / Steel element / Sieve sleeve	**Annex A3**

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Table A1: Materials

Designation	**Material**
Steel elements made of zinc coated steel	
HAS 5.8 (HDG), HAS-U 5.8 (HDG)	Strength class 5.8, f_{uk} = 500 N/mm², f_{yk} = 400 N/mm², Elongation at fracture (l_0=5d) > 8% ductile Electroplated zinc coated ≥ 5 µm, (HDG) hot dip galvanized ≥ 50 µm
HAS 8.8 (HDG), HAS-U 8.8 (HDG)	Strength class 8.8, f_{uk} = 800 N/mm², f_{yk} = 640 N/mm², Elongation at fracture (l_0=5d) > 12% ductile Electroplated zinc coated ≥ 5 µm, (HDG) hot dip galvanized ≥ 50 µm
Washer	Electroplated zinc coated ≥ 5 µm Hot dip galvanized ≥ 50 µm
Nut	Strength class of nut adapted to strength class of threaded rod Electroplated zinc coated ≥ 5 µm, Hot dip galvanized ≥ 50 µm
Steel elements made of stainless steel **Corrosion resistance class (CRC) III according EN 1993-1-4**	
HAS A4 HAS-U A4	Strength class 70 f_{uk} = 700 N/mm², f_{yk} = 450 N/mm², Rupture elongation (l_0 = 5d) > 12% ductile.
Washer	Stainless steel EN 10088-1
Nut	Strength class of nut adapted to strength class of threaded rod Stainless steel EN 10088-1
Steel elements made of high corrosion resistant steel **Corrosion resistance class (CRC) V according EN 1993-1-4**	
HAS-U HCR	Strength class 80, f_{uk} = 800 N/mm², f_{yk} = 640 N/mm², Rupture elongation (l_0 = 5d) > 12% ductile
Washer	High corrosion resistant steel EN 10088-1
Nut	Strength class of nut adapted to strength class of threaded rod High corrosion resistant steel EN 10088-1
Plastic parts	
Sieve sleeve HIT-SC	Frame: FPP 20T Sieve: PA6.6 N500/200

Hilti HIT-HY 270 with HAS and HAS-U

Product description
Materials

Annex A4

Specifications of intended use

Base materials:

- Solid brick masonry (use category b), according to Annex B3.
  Note: The characteristic resistances are also valid for larger brick sizes and larger compressive strengths of the masonry unit.
- Hollow brick masonry (use category c), according to Annex B3, B5 and B6.
- Mortar strength class of the masonry: M2,5 at minimum according to EN 998-2.
- For masonry made of other solid, hollow or perforated bricks, the characteristic resistance of the anchor may be determined by job site tests according to TR 053:2022-07, under consideration of the β-factor according to Annex C1, Table C1.

Table B1: Overview use categories

Anchorages subject to:	**HIT-HY 270 with HAS and HAS-U**	
	In solid bricks	**In hollow bricks**
Hole drilling	Hammer mode, rotary mode	Rotary mode
Static and quasi static loading	Annex : C1 (steel), C3 to C20	Annex : C1 (steel), C21 to C30
Use condition: dry or wet structure	Condition **d/d** - **Installation and use** in structures subject to **dry** internal conditions. Condition **w/d** - **Installation in dry or wet** substrate **and use** in structures subject to **dry** internal conditions (except calcium silicate bricks). Condition **w/w** - **Installation and use** in structures subject to **dry or wet** environmental conditions (except calcium silicate bricks).	
Installation direction Masonry	Horizontal	
Installation direction Ceiling brick	Overhead	
Use category	b (solid masonry)	c (hollow or perforated masonry)
Temperature in the base material at installation	+5° C to +40° C (Table B9)	0° C to +40° C (Table B10)
In-service temperature – Temperature range Ta:	-40 °C to +40 °C	(max. long term temperature +24 °C and max. short term temperature +40 °C)
In-service temperature – Temperature range Tb:	-40 °C to +80 °C	(max. long term temperature +50 °C and max. short term temperature +80 °C)

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions
  (zinc coated steel, stainless steel or high corrosion resistant steel).
- For all other conditions according to EN 1993-1-4 accordingly to corrosion resistance class according to annex A4, table A1.

Design:

- Anchorages are designed under the responsibility of an engineer experienced in anchorages and masonry work.
- Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored. The position of the anchor is indicated on the design drawings (e. g. position of the anchor relative to supports, etc.).
- Anchorages under static or quasi-static loading are designed in accordance with:
  TR 054:2022-07, Design method A.
  Applies to all bricks, if no other values are specified:
  $N_{Rk} = N_{Rk,b} = N_{Rk,p} = N_{Rk,b,c} = N_{Rk,p,c}$
  $V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$
  For the calculation of pulling out a brick under tension loading $\mathbf{N_{Rk,pb}}$ or
  pushing out a brick under shear loading $\mathbf{V_{Rk,pb}}$ see EOTA Technical Report TR 054:2022-07.
  $\mathbf{N_{Rk,s}}$, $\mathbf{V_{Rk,s}}$ and $\mathbf{M^0_{Rk,s}}$ see annexes C1
  Factors for job site tests and displacements see annex C1 – C30

- In case of a brick compressive strength f_b is smaller than the highest strength stated in the load table the load can be calculated according to the following Equation:

  $F_{Rk,act.} = F_{Rk,ETA,(fb)} * (f_{b,act.}/f_{b,ETA})^{\alpha}$

  $F_{Rk,act.}$ = Resistance of the fastener in the actual masonry unit

  $F_{Rk,ETA,(fb)}$ = Resistance of the fastener in the masonry unit stated in annex C3 to C30

  $f_{b,act.}$ = Actual normalized mean compressive strength of the masonry unit according to EN 772-1

  $f_{b,ETA.}$ = Normalized mean compressive strength stated in annexes C3 to C30

  α = 0,5 for masonry units of clay or concrete and solid unit of calcium silicate

  α = 0,75 for masonry units of perforated calcium silicate
- For hollow brick masonry. The shear load vertical to the free edge must be transferred via the vertical joint. (Completely filled joint or direct contact.)
- For hollow brick masonry shear load only without lever arm permitted.

Installation:

- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.

Hilti HIT-HY 270 with HAS and HAS-U	**Annex B2**
Intended Use Specifications	

Table B2: Overview brick types and properties

Brick type	Picture	Brick size [mm]	Compressive strength $f_{b,ETA}$ [N/mm²]	Bulk density [kg/dm³]	Annex
Solid clay brick EN 771-1		≥ 240x115x52	12 / 20 / 40	2,0	C3/C4
Solid clay brick EN 771-1		≥ 240x115x72	10 / 20	2,0	C5/C7
Solid clay brick EN 771-1		≥ 240x115x113	12 / 20	2,0	C8/C10
Solid calcium silicate brick EN 771-2		≥ 240x115x113	12 / 28	2,0	C11/C12
Solid calcium silicate brick EN 771-2		≥ 248x240x248	12 / 20 / 28	2,0	C13/C16
Solid light weight concrete brick EN 771-3		≥ 240x115x113	4 / 6	0,9	C17/C18
Solid normal weight concrete brick EN 771-3		≥ 240x115x113	6 / 16	2,0	C19/C20
Hollow clay brick EN 771-1		300x240x238	12 / 20	1,4	C21/C22
Hollow calcium silicate brick EN 771-2		248x240x248	12 / 20	1,4	C23/C24
Hollow lightweight concrete brick EN 771-3		495x240X238	2 / 6	0,7	C25/C27
Hollow normal weight concrete brick EN 771-3		500x200x200	4 / 10	0,9	C28/C29
Hollow clay brick EN 771-1 Ceiling brick		250x510x180	EN 15037-3 class R2	1,0	C30

Hilti HIT-HY 270 with HAS and HAS-U

Intended Use
Brick types and properties

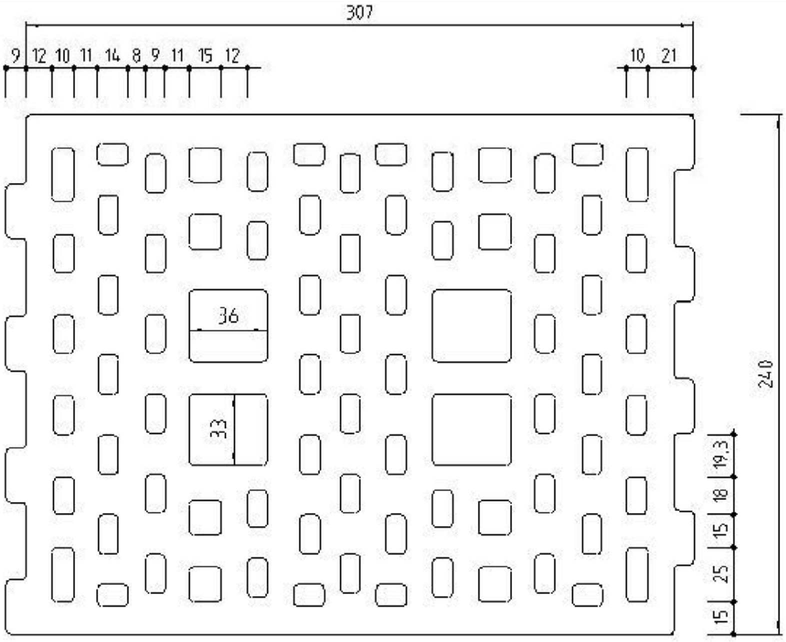
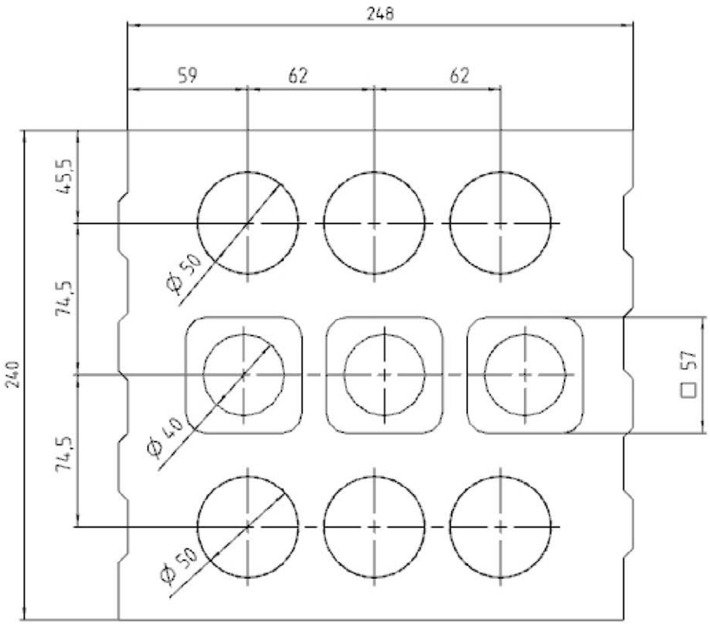
Annex B3

Table B3: Overview fastening elements (including sizes and embedment depths) and corresponding brick types

Brick type	Picture	HAS/HAS-U 	HAS/HAS-U + HIT-SC 	Annex
Solid clay brick EN 771-1		M8 to M16 h_{ef} = 50 mm to 300 mm	M8 to M16 h_{ef} = 80 mm to 160 mm	C3/C4
Solid clay brick EN 771-1		M8 to M16 h_{ef} = 50 mm to 300 mm	M8 to M16 h_{ef} = 80 mm to 160 mm	C5/C7
Solid clay brick EN 771-1		M8 to M16 h_{ef} = 50 mm to 300 mm	M8 to M16 h_{ef} = 80 mm to 160 mm	C8/C10
Solid calcium silicate brick EN 771-2		M8 to M16 h_{ef} = 50 mm to 300 mm	M8 to M16 h_{ef} = 80 mm to 160 mm	C11/C12
Solid calcium silicate brick EN 771-2		M8 to M16 h_{ef} = 50 mm to 300 mm	M8 to M16 h_{ef} = 80 mm to 160 mm	C13/C16
Solid light weight concrete brick EN 771-3		M8 to M16 h_{ef} = 50 mm to 300 mm	M8 to M16 h_{ef} = 80 mm to 160 mm	C17/C18
Solid normal weight concrete brick EN 771-3		M8 to M16 h_{ef} = 50 mm to 300 mm	M8 to M16 h_{ef} = 80 mm to 160 mm	C19/C20
Hollow clay brick EN 771-1		-	M8 to M16 h_{ef} = 80 mm to 160 mm	C21/C22
Hollow calcium silicate brick EN 771-2		-	M8 to M16 h_{ef} = 80 mm to 160 mm	C23/C24
Hollow lightweight concrete brick EN 771-3		-	M8 to M16 h_{ef} = 80 mm to 160 mm	C25/C27
Hollow normal weight concrete brick EN 771-3		-	M8 to M16 h_{ef} = 50 mm to 160 mm	C28/C29
Hollow clay brick EN 771-1 Ceiling brick		-	M6 h_{ef} = 80 mm	C30

Hilti HIT-HY 270 with HAS and HAS-U	Annex B4
Intended Use Fastening elements and corresponding brick types	

Table B4: Details of hollow bricks

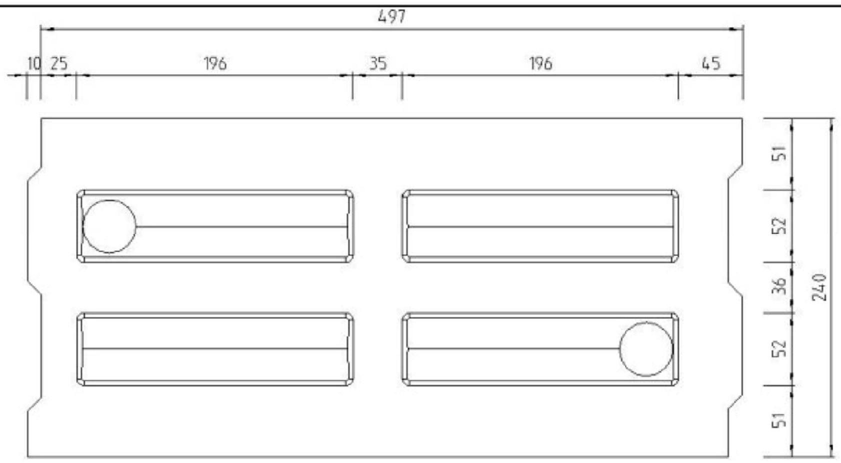
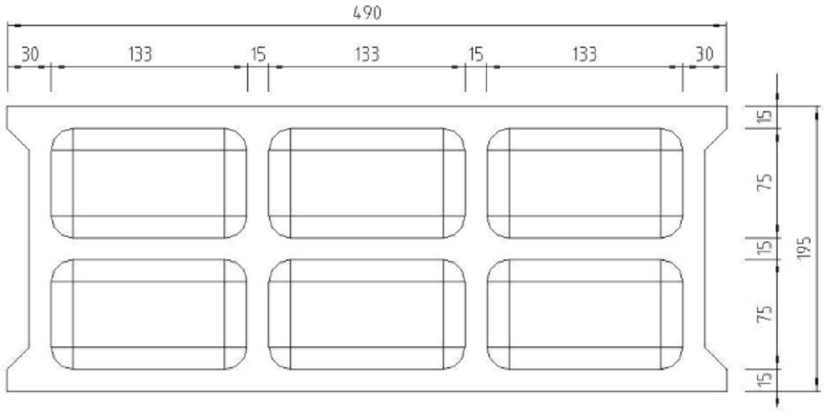
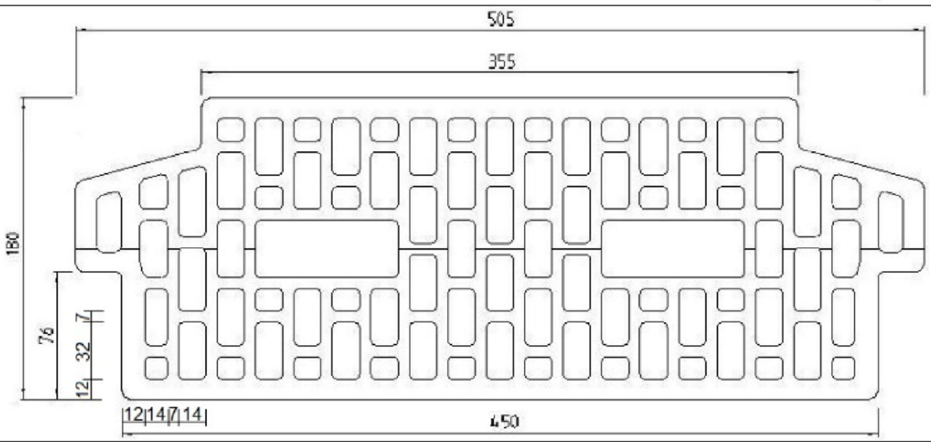
Hollow clay brick EN 771-1 Rapis Ziegel Hlz 12-1,4-10DF 	
Hollow calcium silicate brick EN 771-2 KS Südbayern KSL-R(P) 12-1,4-8DF 	

Hilti HIT-HY 270 with HAS and HAS-U

Intended Use
Details of hollow bricks

Annex B5

Table B4 continued

Hollow lightweight concrete brick EN 771-3 Knobel Betonwerk Hbl 6-0,8-500x240x238 	
Hollow normal weight concrete brick EN 771-3 Parpaing creux B40 	
Hollow clay brick EN 771-1 Ceiling brick Fiedler Brick Ceiling Type 18+0 or 18+3 	

Hilti HIT-HY 270 with HAS and HAS-U

Intended Use
Details of hollow bricks

Annex B6

Table B5: Installation parameters of HAS… and HAS-U… with one sieve sleeve HIT-SC in hollow brick and solid brick (Figure A1)

HAS… and HAS-U…			**M6**	**M8**		**M10**		**M12**		**M16**	
with HIT-SC			**12x85**	**16x50**	**16x85**	**16x50**	**16x85**	**18x50**	**18x85**	**22x50**	**22x85**
Nominal diameter of drill bit	d_0	[mm]	12	16	16	16	16	18	18	22	22
Drill hole depth	h_0	[mm]	95	60	95	60	95	60	95	60	95
Effective embedment depth	h_{ef}	[mm]	80	50	80	50	80	50	80	50	80
Maximum diameter of clearance hole in the fixture	d_f	[mm]	7	9	9	12	12	14	14	18	18
Minimum wall thickness	h_{min}	[mm]	115	80	115	80	115	80	115	80	115
Brush HIT-RB	-	[-]	12	16	16	16	16	18	18	22	22
Number of strokes HDM	-	[-]	5	4	6	4	6	4	8	6	10
Number of strokes HDE 500-A	-	[-]	4	3	5	3	5	3	6	5	8
Maximum torque moment for all brick types except “parpaing creux”	T_{max}	[Nm]	0	3	3	4	4	6	6	8	8
Maximum torque moment for “parpaing creux”	T_{max}	[Nm]	-	2	2	2	2	3	3	6	6

Table B6: Installation parameters of HAS… and HAS-U… with two HIT-SC in hollow brick and solid brick for deeper embedment depth (Figure A2)

HAS… and HAS-U…			**M8**		**M10**	
with HIT-SC			**16x50+16x85**	**16x85+16x85**	**16x50+16x85**	**16x85+16x85**
Nominal diameter of drill bit	d_0	[mm]	16	16	16	16
Drill hole depth	h_0	[mm]	145	180	145	180
Effective embedment depth	h_{ef}	[mm]	130	160	130	160
Maximum diameter of clearance hole in the fixture	d_f	[mm]	9	9	12	12
Minimum wall thickness	h_{min}	[mm]	195	230	195	230
Brush HIT-RB	-	[-]	16	16	16	16
Number of strokes HDM	-	[-]	4+6	6+6	4+6	6+6
Number of strokes HDE-500	-	[-]	3+5	5+5	3+5	5+5
Maximum torque moment	T_{max}	[Nm]	3	3	4	4

Table B6 continued

HAS… and HAS-U…			**M12**		**M16**	
with HIT-SC			**18x50+18x85**	**18x85+18x85**	**22x50+22x85**	**22x85+22x85**
Nominal diameter of drill bit	d_0	[mm]	18	18	22	22
Drill hole depth	h_0	[mm]	145	180	145	180
Effective embedment depth	h_{ef}	[mm]	130	160	130	160
Maximum diameter of clearance hole in the fixture	d_f	[mm]	14	14	18	18
Minimum wall thickness	h_{min}	[mm]	195	230	195	230
Brush HIT-RB	-	[-]	18	18	22	22
Number of strokes HDM	-	[-]	4+8	8+8	6+10	10+10
Number of strokes HDE-500	-	[-]	3+6	6+6	5+8	8+8
Maximum torque moment	T_{max}	[Nm]	6	6	8	8

Hilti HIT-HY 270 with HAS and HAS-U

Intended Use
Installation parameters

Annex B7

Table B7: Installation parameters of HAS… and HAS-U… in solid brick (Figure A3)

HAS… and HAS-U…			M8	M10	M12	M16
Nominal diameter of drill bit	d_0	[mm]	10	12	14	18
Drill hole depth = Effective embedment depth	h_0= h_{ef}	[mm]	50…300	50…300	50…300	50…300
Maximum diameter of clearance hole in the fixture	d_f	[mm]	9	12	14	18
Minimum wall thickness	h_{min}	[mm]	h_0+30	h_0+30	h_0+30	h_0+36
Brush HIT-RB	-	[-]	10	12	14	18
Maximum torque moment	T_{max}	[Nm]	5	8	10	10

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Table B8: Installation parameters of HAS… and HAS-U… with two sieve sleeves HIT-SC for setting through the fixture and/or through the non- loadbearing layer in hollow brick and solid brick (Figure A4)

HAS… and HAS-U…			M8		M10	
with HIT-SC			**16x50+16x85**	**16x85+16x85**	**16x50+16x85**	**16x85+16x85**
Nominal diameter of drill bit	d_0	[mm]	16	16	16	16
Drill hole depth	h_0	[mm]	145	180	145	180
Min. effective embedment depth	$h_{ef,min}$	[mm]	80	80	80	80
Max. thickness of non-loadbearing layer and fixture (through setting)	$h_{p,max}$	[mm]	50	80	50	80
Max. diameter of clearance hole in the fixture (pre-setting)	d_{f1}	[mm]	9	9	12	12
Max. diameter of clearance hole in the fixture (through setting)	d_{f2}	[mm	17	17	17	17
Min. wall thickness	h_{min}	[mm]	h_{ef}+65	h_{ef}+70	h_{ef}+65	h_{ef}+70
Brush HIT-RB	-	[-]	16	16	16	16
Number of strokes HDM	-	[-]	4+6	6+6	4+6	6+6
Number of strokes HDE-500	-	[-]	3+5	5+5	3+5	5+5
Maximum torque moment for all brick types except “parpaing creux”	T_{max}	[Nm]	3	3	4	4
Maximum torque moment for “parpaing creux”	T_{max}	[Nm]	2	2	2	2

Table B8 continued

HAS… and HAS-U…			M12		M16	
with HIT-SC			**18x50+18x85**	**18x85+18x85**	**22x50+22x85**	**22x85+22x85**
Nominal diameter of drill bit	d_0	[mm]	18	18	22	22
Drill hole depth	h_0	[mm]	145	180	145	180
Min. effective embedment depth	$h_{ef,min}$	[mm]	80	80	80	80
Max. thickness of non-loadbearing layer and fixture (for through setting)	$h_{p,max}$	[mm]	50	80	50	80
Max. diameter of clearance hole in the fixture (pre-setting)	d_{f1}	[mm]	14	14	18	18
Max. diameter of clearance hole in the fixture (through setting)	d_{f2}	[mm	19	19	23	23
Min. wall thickness	h_{min}	[mm]	h_{ef}+65	h_{ef}+70	h_{ef}+65	h_{ef}+70
Brush HIT-RB	-	[-]	18	18	22	22
Number of strokes HDM	-	[-]	4+8	8+8	6+10	10+10
Number of strokes HDE-500	-	[-]	5+8	8+8	5+8	8+8
Maximum torque moment for all brick types except “parpaing creux”	T_{max}	[Nm]	6	6	8	8
Maximum torque moment for “parpaing creux”	T_{max}	[Nm]	3	3	6	6

Hilti HIT-HY 270 with HAS and HAS-U

Intended Use
Installation parameters

Annex B9

Table B9: Maximum working time and minimum curing time for solid bricks [1)]

Temperature in the base material T	Maximum working time t_{work}	minimum curing time t_{cure}
5 °C to 10 °C	10 min	2,5 h
> 10 °C to 20 °C	7 min	1,5 h
> 20 °C to 30 °C	4 min	30 min
> 30 °C to 40 °C	1 min	20 min

1) The curing time data are valid for dry base material only.
In wet base material the curing times must be doubled.

Table B10: Maximum working time and minimum curing time for hollow bricks [1)]

Temperature in the base material T	Maximum working time t_{work}	minimum curing time t_{cure}
0 °C to 5 °C	10 min	4 h
> 5 °C to 10 °C	10 min	2,5 h
> 10 °C to 20 °C	7 min	1,5 h
> 20 °C to 30 °C	4 min	30 min
> 30 °C to 40 °C	1 min	20 min

1) The curing time data are valid for dry base material only.
In wet base material the curing times must be doubled.

Table B11: Cleaning alternatives

Manual Cleaning (MC): Hilti hand pump for blowing out drill hole diameter $d_0 \leq 18$ mm and drill hole depth up to $h_0 = 100$ mm.	
Compressed air cleaning (CAC): Air nozzle with an orifice opening of minimum 3,5 mm in diameter for blowing out drill hole depth up to $h_0 = 300$ mm.	
Steelbrush HIT-RB: See table B5 to B8 depending on drill hole diameter for MC and CAC	

Hilti HIT-HY 270 with HAS and HAS-U

Intended Use
Installation parameters
Cleaning tools

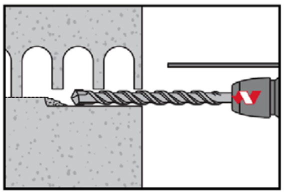
Annex B10

Installation

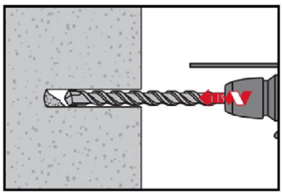
Hole drilling

If no significant resistance is felt over the entire depth of the hole when drilling (e.g. in unfilled butt joints), the anchor should not be set at this position.

Drilling mode



In hollow and solid bricks (use category c): rotary mode
Drill hole to the required embedment depth with a hammer drill set in rotation mode using an appropriately sized carbide drill bit.

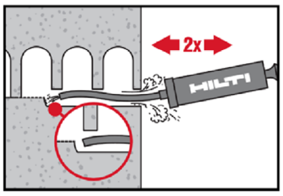


In solid bricks (use category b): hammer mode
Drill hole to the required embedment depth with a hammer drill set in hammer mode using an appropriately sized carbide drill bit.

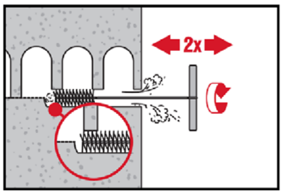
Drill hole cleaning

Just before setting the anchor, the drill hole must be free of dust and debris.
Inadequate hole cleaning = poor load values.

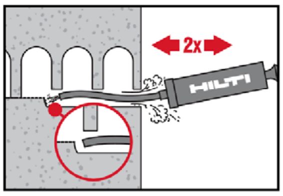
Manual Cleaning (MC): For hollow and solid bricks



The Hilti hand pump may be used for blowing out drill holes up to diameters $d_0 \leq 18$ mm and drill hole depths up to $h_0 = 100$ mm.
Blow out at least 2 times from the back of the drill hole until return air stream is free of noticeable dust

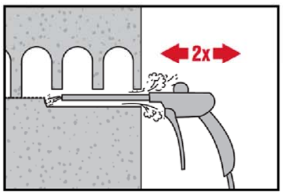


Brush 2 times with the specified steel brush (tables B5 to B8) by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it.
The brush must produce natural resistance as it enters the drill hole (brush Ø ≥ drill hole Ø) - if not the brush is too small and must be replaced with the proper brush diameter.

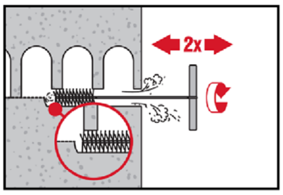


Blow out again with the Hilti hand pump at least 2 times until return air stream is free of noticeable dust.

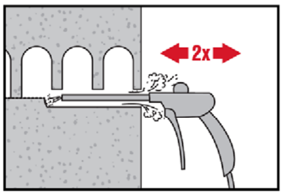
Compressed Air Cleaning (CAC): For hollow and solid bricks



Blow 2 times from the back of the hole (if needed with nozzle extension) over the hole length with oil-free compressed air (min. 6 bar at 6 m³/h; drill hole depth up to h_0 = 300 mm) until return air stream is free of noticeable dust.

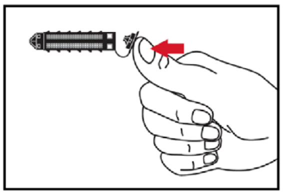


Brush 2 times with the specified steel brush (tables B5 to B8) by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it.
The brush must produce natural resistance as it enters the drill hole (brush Ø ≥ drill hole Ø) - if not the brush is too small and must be replaced with the proper brush diameter.

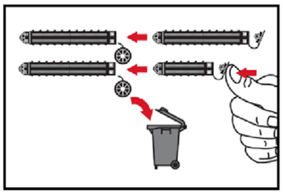


Blow again with Hilti hand pump or compressed air 2 times until return air stream is free of noticeable dust.

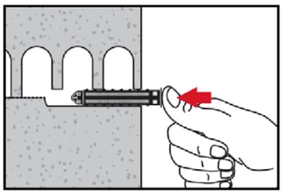
Injection preparation in masonry with holes or voids: installation with sieve sleeve HIT-SC



Single sieve sleeve HIT-SC
Close lid

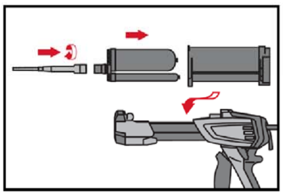
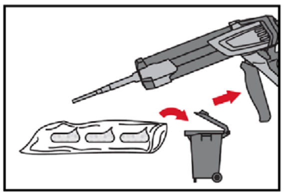


Two sieve sleeves HIT-SC
Plug sieve sleeves together. Discard superfluous lid.
Observe sieve sleeve order in case of different sieve sleeve lengths: shorter sleeve has to be plugged into longer sleeve.



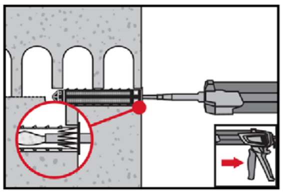
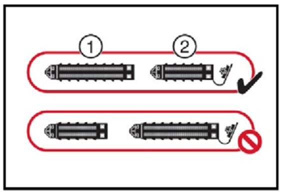
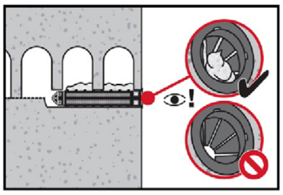
Insert sieve sleeve manually.
When using two sieve sleeves, longer sieve sleeve has to be be inserted first.

For all applications

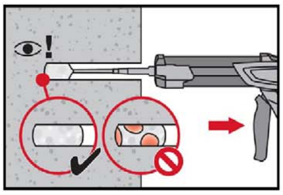
	Tightly attach new Hilti mixing nozzle HIT-RE-M to foil pack manifold (snug fit). Do not modify the mixing nozzle. Observe the instruction for use of the dispenser and foil pack. Check foil pack holder for proper function. Do not use damaged foil packs / holders. Insert foil pack into foil pack holder and put holder into HIT-dispenser.
	Discard initial adhesive. The foil pack opens automatically as dispensing is initiated. Depending on the size of the foil pack an initial amount of adhesive has to be discarded. Discarded quantities are 2 strokes for 330 ml foil pack, 3 strokes for 500 ml foil pack.

Inject adhesive without forming air voids

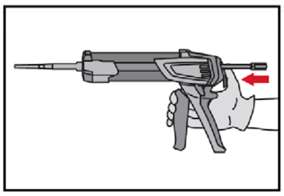
Installation with sieve sleeve HIT-SC

	**Single sieve sleeve HIT-SC** Insert mixer approximately 1 cm through the lid. Inject required amount of adhesive (see tables B5 to B8). Adhesive must emerge through the lid.
	**Two sieve sleeves HIT-SC** Use extension for installation with two sieve sleeves. Insert mixer approximately 1 cm through the tip of sieve sleeve “2” and inject required amount of adhesive into sieve sleeve “1” (see tables B5 to B8). Withdraw mixer to the point where it extends about 1 cm through the lid into the sleeve “2”. Continue injecting in sieve sleeve “2” as described above.
	Control amount of injected mortar. Adhesive has to protrude into the lid. After injection is completed, depressurize the dispenser by pressing the release trigger. This will prevent further adhesive discharge from the mixer.

Solid bricks: installation without sieve sleeve

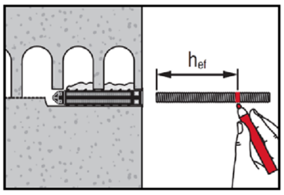


Inject the adhesive starting at the back of the hole, slowly withdrawing the mixer with each trigger pull.
Fill holes approximately 2/3 full to ensure that the annular gap between the anchor and the base material is completely filled with adhesive along the embedment length.

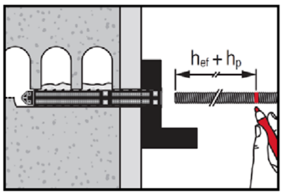


After injection is completed, depressurize the dispenser by pressing the release trigger. This will prevent further adhesive discharge from the mixer.

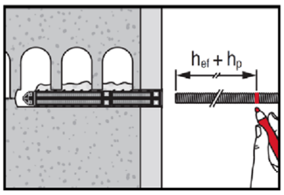
Setting the element: Before use, verify that the element is dry and free of oil and other contaminants.



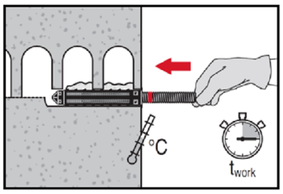
HAS and HAS-U… in hollow and solid bricks:
Pre-setting (Figure A1 to FigureA4)
Mark the element to the required embedment depth h_{ef} acc. to Table B5 to B7.



HAS and HAS-U… in hollow and solid bricks:
setting through the fixture (Figure A4a)
or through the non-loadbearing layer and the fixture (Figure A4b)
Mark the element to the required embedment depth h_{ef} + h_p acc. to Table B8.

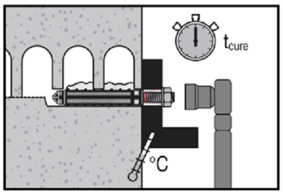


HAS and HAS-U… in hollow and solid bricks:
setting through the non-loadbearing (Figure A4c)
Mark the element to the required embedment depth h_{ef} + h_p acc. to Table B8.



Set element to the required embedment depth until working time t_{work} has elapsed. The working time t_{work} is given in Table B9 and Table B10.

Loading the anchor



After required curing time t_{cure} (see Table B9 and Table B10) the anchor can be loaded.
The applied installation torque shall not exceed the values T_{max} given in tables B5 to B8.

Table C1: β-factor for job-site testing under tension loading

Use categories		w/w and w/d		d/d	
Temperature range		**Ta***	**Tb***	**Ta***	**Tb***
Base material	**Cleaning**				
Solid clay brick EN 771-1	CAC	0,96	0,96	0,96	0,96
	MC	0,84	0,84	0,84	0,84
Solid calcium silicate brick EN 771-2	CAC/MC	-[1)]	-[1)]	0,96	0,80
Solid light weight concrete brick EN 771-3	CAC	0,82	0,68	0,96	0,80
	MC	0,81	0,67	0,90	0,75
Solid normal weight concrete brick EN 771-3	CAC/MC	0,96	0,80	0,96	0,80
Hollow clay brick EN 771-1	CAC	0,96	0,96	0,96	0,96
	MC	0,84	0,84	0,84	0,84
Hollow calcium silicate brick EN 771-2	CAC/MC	-[1)]	-[1)]	0,96	0,80
Hollow light weight concrete brick EN 771-3	CAC	0,69	0,57	0,81	0,67
	MC	0,68	0,56	0,76	0,63
Hollow normal weight concrete brick EN 771-3	CAC/MC	0,96	0,80	0,96	0,80

*Temperature range Ta / Tb see Annex B1

[1)] No performance assessed

Table C2: Characteristic resistance to steel failure for HAS… and HAS-U… under tension and shear loading in masonry

Steel failure tension loads			**M6**	**M8**	**M10**	**M12**	**M16**
Characteristic steel resistance	$N_{Rk,s}$	[kN]	$A_s \cdot f_{uk}$				
Steel failure shear loads without lever arm							
Characteristic steel resistance strength class 5.8	$V_{Rk,s}$	[kN]	$0{,}6 \cdot A_s \cdot f_{uk}$				
Characteristic steel resistance strength class 8.8, 70 and 80	$V_{Rk,s}$	[kN]	$0{,}5 \cdot A_s \cdot f_{uk}$				
Steel failure shear loads with lever arm							
Characteristic bending moment	$M^0_{Rk,s}$	[kN]	$1{,}2 \cdot W_{el} \cdot f_{uk}$				

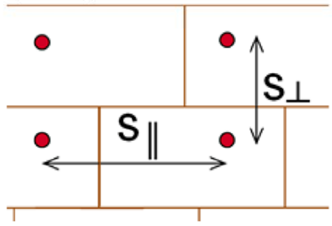
Hilti HIT-HY 270 with HAS and HAS-U

Performances
β-factors for job-site testing under tension load
Characteristic resistances under tension and shear load – steel failure

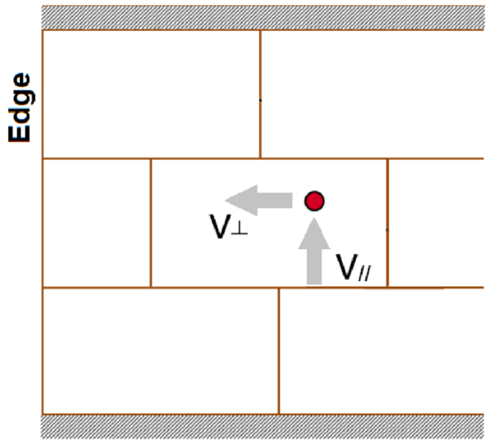
Annex C1

Spacing dependent on edge distances for all anchor combinations:

Spacing

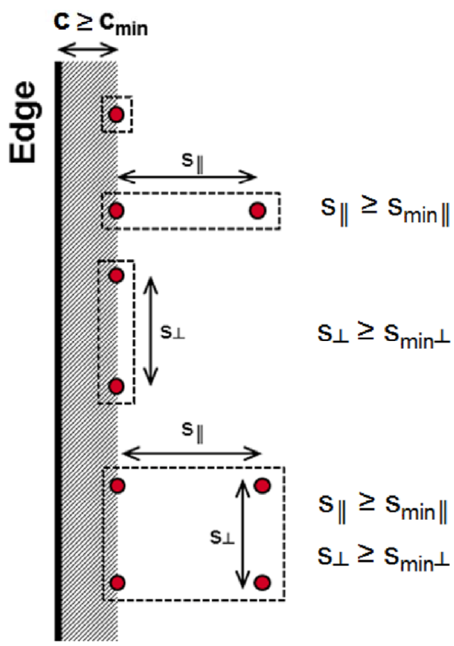


Shear load direction



Shear// (parallel to the free edge)
Shear⊥ (perpendicular to the free edge)

Edge distance [a)] and spacing



[a)] A vertical joint not filled with mortar is considered an edge and $c \geq c_{min}$ should be observed.

The characteristic values of resistance of an anchor group are calculated by using the group-factors α_g according to Annexes C3 to C30:

Group of two anchors: $N^g_{Rk} = \alpha_{g,N} \cdot N_{Rk}$ and $V^g_{RK,b} = V^g_{RK,c,II} = V^g_{RK,c\perp} = \alpha_{g,V} \cdot V_{Rk}$ (with the relevant α_g)

Group of four anchors: $N^g_{Rk} = \alpha_{g,N\,II} \cdot \alpha_{g,N\perp} \cdot N_{Rk}$ and $V^g_{RK,b} = V^g_{RK,c,II} = V^g_{RK,c\perp} = \alpha_{g,V\,II} \cdot \alpha_{g,V\perp} \cdot V_{Rk}$

In following tables are resistances for single anchors given based on $c \geq c_{min}$ or $c \geq c_{cr}$.

The group factors $\alpha_g < 2{,}0$ in following tables are based on $c \geq c_{min}$ and $s \geq s_{min}$. The group factor $\alpha_g = 2{,}0$ is valid for $c \geq c_{min}$ and $s \geq s_{cr}$.

Brick type: Solid clay brick Mz, 1DF

Table C3: Description of brick

Brick type		Solid Mz, 1DF	
Bulk density	ρ [kg/dm³]	2,0	
Compressive strength	f_b [N/mm²]	≥ 12, ≥ 20 or ≥ 40	
Code		EN 771 - 1	
Producer			
Brick dimensions	[mm]	≥ 240 x 115 x 52	
Minimum wall thickness	h_{min} [mm]	≥ 115	

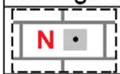
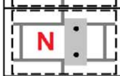
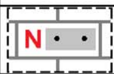
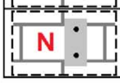
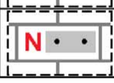
Characteristic resistances for all anchor combinations (see Table B3)

Table C4: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading at edge distance c ≥115 mm

Use category			**w/w = w/d**		**d/d**	
Service temperature range			**Ta**	**Tb**	**Ta**	**Tb**
Anchor type and size	h_{ef} [mm]	f_b [N/mm²]	$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]			
All anchor	≥ 50	12	1,5 (2,0*)			
		20	2,0 (2,5*)			
		40	3,5 (4,0*)			
	≥ 80	12	2,5 (3,0*)			
		20	3,5 (4,0*)			
		40	5,5 (6,5*)			
	≥ 100	12	3,5 (4,0*)			
		20	4,5 (5,0*)			
		40	7,0 (8,0*)			

* CAC cleaning only

Related edge and spacing distance and group factor α_g

Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g,N}$ [-]	Configuration	c ≥ [mm]	s_{II} ≥ [mm]	$\alpha_{g,N}$ [-]
	115	-	-	-	-	-	-
	115	55	1,0		115	75	1,35
	115	115	2,0		115	3 h_{ef}	2,0

Hilti HIT-HY 270 with HAS and HAS-U	**Annex C3**
Performances solid clay brick Mz, 1DF Characteristic values of resistance under tension load and group factor	

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Table C5: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading at edge distance c ≥ 115 mm (for V_{II}) and c ≥ 1,5 h_{ef} (for $V_{\perp}$)

Anchor type and size	h_{ef} [mm]	f_b [N/mm²]	$V_{Rk} = V_{Rk,b} = V_{Rk,c,II}$ [kN]	$V_{Rk,c\perp}$
HAS and HAS-U M8; M10	≥ 50	12	2,5	Calculate according to TR 054 equation 4.7
		20	3,0	
		40	4,0	
HAS and HAS-U M12; M16	≥ 50	12	3,5	
		20	4,5	
		40	5,5	
HAS and HAS-U M8; M10	≥ 80	12	5,0	
		20	6,0	
		40	7,5	
HAS and HAS-U M12; M16	≥ 80	12	6,5	
		20	8,5	
		40	10,5	

Related edge and spacing distance and group factor α_g

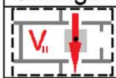
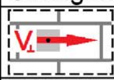
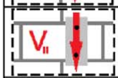
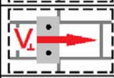
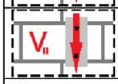
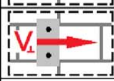
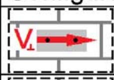
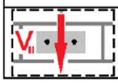
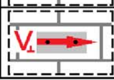
Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g\perp,V II}$ [-]	Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g\perp,V\perp}$ [-]
	115	-	-		1,5 h_{ef}	-	-
	115	55	1,0		1,5 h_{ef}	55	1,0
	115	115	2,0		1,5 h_{ef}	3 h_{ef}	2,0
Configuration	c ≥ [mm]	s_{II} [mm]	$\alpha_{gII,VII}$ [-]	Configuration	c ≥ [mm]	s_{II} [mm]	$\alpha_{gII,V\perp}$ [-]
-	-	-	-		1,5 h_{ef}	115	1,0
	115	75	2,0		1,5 h_{ef}	3 h_{ef}	2,0

Table C6: Displacements

h_{ef}	N	δ_{N0}	$\delta_{N\infty}$	V	δ_{V0}	$\delta_{V\infty}$
[mm]	[kN]	[mm]	[mm]	[kN]	[mm]	[mm]
50	1,2	0,1	0,2	1,4	0,5	0,75
80	2,1	0,1	0,2	2,1	1,1	1,65
100	3,9	0,2	0,4	3,0	1,3	1,95

Brick type: Solid clay brick Mz, NF

Table C7: Description of brick

Brick type		Solid Mz, NF
Bulk density	ρ [kg/dm³]	2,0
Compressive strength	f_b [N/mm²]	≥ 10 / 20
Code		EN 771 - 1
Producer		
Brick dimensions	[mm]	≥ 240 x 115 x 71
Minimum wall thickness	h_{min} [mm]	≥ 115

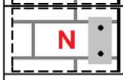
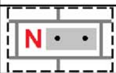
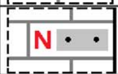
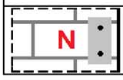
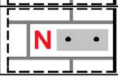
Characteristic resistances for all anchor combinations (see Table B3)

Table C8: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading at edge distance c ≥ 50 mm

Use category			**w/w = w/d**		**d/d**	
Service temperature range			**Ta**	**Tb**	**Ta**	**Tb**
Anchor type and size	h_{ef} [mm]	f_b [N/mm²]	$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]			
All anchor	≥ 50	10	1,5 (1,5*)			
		20	2,0 (2,0*)			
	≥ 80	10	2,5 (3,0*)			
		20	3,5 (4,0*)			

* CAC cleaning only

Related edge and spacing distance and group factor α_g

Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g,N}$ [-]	Configuration	c ≥ [mm]	s_{II} ≥ [mm]	$\alpha_{g,N}$ [-]
	50	-	-	-	-	-	-
	50	75	1,0		115	50	1,0
-	-	-	-		50	115	1,15
	50	150	2,0		50	3 h_{ef}	2,0

Hilti HIT-HY 270 with HAS and HAS-U

Performances solid clay brick Mz, NF
Characteristic values of resistance under tension load and group factor

Annex C5

Table C9: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading at edge distance for h_{ef} ≥ 100 mm at c ≥ 150 mm

Use category			**w/w = w/d**		**d/d**	
Service temperature range			**Ta**	**Tb**	**Ta**	**Tb**
Anchor type and size	h_{ef} [mm]	f_b [N/mm²]	$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]			
All anchor	≥ 100	10	4,0 (4,5*)			
		20	5,5 (6,0*)			

* CAC cleaning only

Related edge and spacing distance and group factor α_g

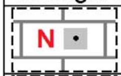
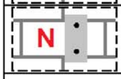
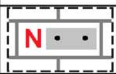
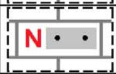
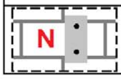
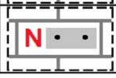
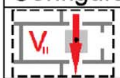
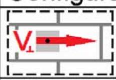
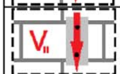
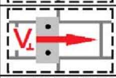
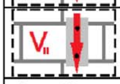
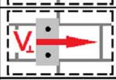
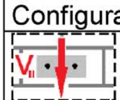
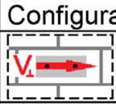
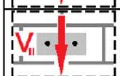
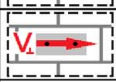
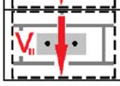
Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g,N}$ [-]	Configuration	c ≥ [mm]	s_{II} ≥ [mm]	$\alpha_{g,N}$ [-]
	150	-	-	-	-	-	-
	150	75	1,40		150	50	0,75
-	-	-	-		150	115	1,35
	150	150	2,0		150	3 h_{ef}	2,0

Table C10: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading at edge distance c ≥ 1,5 h_{ef}

Anchor type and size	h_{ef} [mm]	f_b [N/mm²]	$V_{Rk} = V_{Rk,b} = V_{Rk,c,II}$ [kN]	$V_{Rk,c\perp}$
All anchor	≥ 50	10	3,0	Calculate according to TR 054 equation 4.7
		20	4,5	
HAS and HAS-U M8; M10	≥ 80	10	5,0	
		20	7,0	
HAS and HAS-U M8; M10	≥ 100	10	8,0	
		20	11,0	
HAS and HAS-U M12; M16	≥ 80	10	9,0	
		20	12,0	

Related edge and spacing distance and group factor α_g

Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g\perp,V II}$ [-]	Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g\perp,V\perp}$ [-]
	1,5 h_{ef}	-	-		1,5 h_{ef}	-	-
	1,5 h_{ef}	75	1,55		1,5 h_{ef}	75	1,0
	1,5 h_{ef}	150	2,0		1,5 h_{ef}	3 h_{ef}	2,0
Configuration	c ≥ [mm]	s_{II} [mm]	$\alpha_{gII,VII}$ [-]	Configuration	c ≥ [mm]	s_{II} [mm]	$\alpha_{gII,V\perp}$ [-]
	1,5 h_{ef}	50	1,2		1,5 h_{ef}	50	1,60
	1,5 h_{ef}	75	1,5		1,5 h_{ef}	3 h_{ef}	2,0
	1,5 h_{ef}	115	2,0	-	-	-	-

Hilti HIT-HY 270 with HAS and HAS-U

Performances solid clay brick Mz, NF
Characteristic values of resistance under tension load and group factor

Annex C6

Table C11: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading at edge distance c ≥ 50 mm

Anchor type and size	h_{ef} [mm]	f_b [N/mm²]	$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]
All anchor	≥ 50	10	3,0
		20	4,5
	≥ 80	10	4,0
		20	5,5

Related edge and spacing distance and group factor α_g

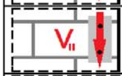
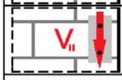
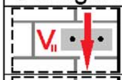
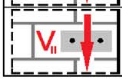
Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g\perp,V II}$ [-]
	50	-	-
	50	75	1,55
	50	150	2,0
Configuration	c ≥ [mm]	s_{II} [mm]	$\alpha_{gII,VII}$ [-]
	50	50	1,2
	50	115	2,0

Table C12: Displacements

h_{ef}	N	δ_{N0}	$\delta_{N\infty}$	V	δ_{V0}	$\delta_{V\infty}$
[mm]	[kN]	[mm]	[mm]	[kN]	[mm]	[mm]
50	0,8	0,1	0,2	1,6	0,8	1,2
80	1,5	0,1	0,2	2,1	0,8	1,2
100	2,3	0,1	0,2	2,1	0,8	1,2

Brick type: Solid clay brick Mz, 2DF

Table C13: Description of brick

Brick type			Solid Mz, 2DF
Bulk density	ρ	[kg/dm³]	≥ 2,0
Compressive strength	f_b	[N/mm²]	≥ 12 / 20
Code			EN 771 - 1
Producer			
Brick dimensions		[mm]	≥ 240 x 115 x 113
Minimum wall thickness	h_{min}	[mm]	≥ 115

Characteristic resistances for all anchor combinations (see Table B3)

Table C14: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading at edge distance c ≥ 115 mm

Use category			**w/w = w/d**		**d/d**	
Service temperature range			**Ta**	**Tb**	**Ta**	**Tb**
Anchor type and size	h_{ef} [mm]	f_b [N/mm²]	$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]			
All anchor	≥ 50	12	2,5 (3,0*)			
		20	2,5 (3,0*)			
	≥ 80	12	3,5 (4,0*)			
		20	4,5 (5,5*)			
	≥ 100	12	6,0 (7,0*)			
		20	7,0 (8,0*)			

* CAC cleaning only

Related edge and spacing distance and group factor α_g

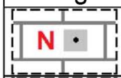
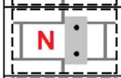
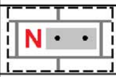
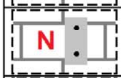
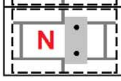
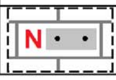
Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g,N}$ [-]	Configuration	c ≥ [mm]	s_{II} ≥ [mm]	$\alpha_{g,N}$ [-]
	115	-	-	-	-	-	-
	115	75	1,0		115	75	1,50
	115	115	1,60	-	-	-	-
	115	3 h_{ef}	2,0		115	3 h_{ef}	2,0

Table C15: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading at edge distance c ≥ 50 mm

Use category			w/w = w/d		d/d	
Service temperature range			Ta	Tb	Ta	Tb
Anchor type and size	h_{ef} [mm]	f_b [N/mm²]	$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]			
All anchor	≥ 50	12	1,5 (1,5*)			
		20	2,0 (2,0*)			
	≥ 80	12	3,0 (3,5*)			
		20	3,5 (4,0*)			

* CAC cleaning only

Related edge and spacing distance and group factor α_g

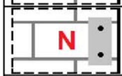
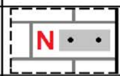
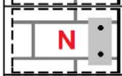
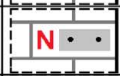
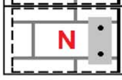
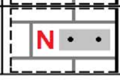
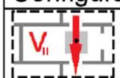
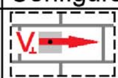
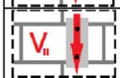
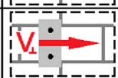
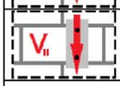
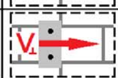
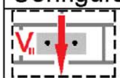
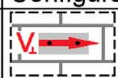
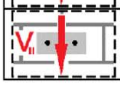
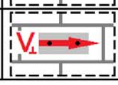
Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g,N}$ [-]	Configuration	c ≥ [mm]	s_{II} ≥ [mm]	$\alpha_{g,N}$ [-]
	50	-	-	-	-	-	-
	50	75	1,10		115	50	1,0
	50	115	1,45		50	115	1,15
	50	3 h_{ef}	2,0		50	3 h_{ef}	2,0

Table C16: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading at edge distance c ≥ 1,5 h_{ef}

Anchor type and size	h_{ef} [mm]	f_b [N/mm²]	$V_{Rk} = V_{Rk,b} = V_{Rk,c,II}$ [kN]	$V_{Rk,c\perp}$
All anchor	≥ 50	12	5,5	Calculate according to TR 054 equation 4.7 (for h_{ef} >80 mm calculate with h_{ef} = 80 mm)
		20	7,0	
HAS and HAS-U M8; M10	≥ 80	12	8,0	
		20	10,0	
HAS and HAS-U M12	≥ 80	12	10,5	
		20	12,0	
HAS and HAS-U M16	≥ 80	12	12,0	
		20	12,0	

Related edge and spacing distance and group factor α_g

Configuration	c ≥ [mm]	$s_\perp$ c [mm]	$\alpha_{g\perp,V II}$ [-]	Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g\perp,V\perp}$ [-]
	1,5 h_{ef}	-	-		1,5 h_{ef}	-	-
	1,5 h_{ef}	75	0,85		1,5 h_{ef}	115	0,75
	1,5 h_{ef}	3 h_{ef}	2,0		1,5 h_{ef}	3 h_{ef}	2,0
Configuration	c ≥ [mm]	s_{II} [mm]	$\alpha_{gII,VII}$ [-]	Configuration	c ≥ [mm]	s_{II} [mm]	$\alpha_{gII,V\perp}$ [-]
	1,5 h_{ef}	115	1,60		1,5 h_{ef}	115	0,8
	1,5 h_{ef}	3 h_{ef}	2,0		1,5 h_{ef}	3 h_{ef}	2,0

Hilti HIT-HY 270 with HAS and HAS-U

Performances solid clay brick Mz, 2DF
Characteristic values of resistance under tension and shear load and group factor

Annex C9

Table C17: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading at edge distance c ≥ 50 mm

Anchor type and size	h_{ef} [mm]	f_b [N/mm²]	$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]
All anchor	≥ 50	12	3,0
		20	4,0
All anchor	≥ 80	12	4,5
		20	5,5

Related edge and spacing distance and group factor α_g

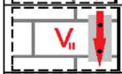
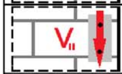
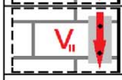
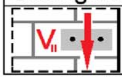
Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g\perp,V II}$ [-]
	50	-	-
	50	75	0,70
	50	115	1,5
	50	3 h_{ef}	2,0
Configuration	**c ≥ [mm]**	**s_{II} [mm]**	**$\alpha_{gII,VII}$ [-]**
	50	115	2,0

Table C18: Displacements

h_{ef}	N	δ_{N0}	$\delta_{N\infty}$	V	δ_{V0}	$\delta_{V\infty}$
[mm]	[kN]	[mm]	[mm]	[kN]	[mm]	[mm]
50	0,9	0,1	0,2	1,9	0,6	0,9
80	1,3	0,2	0,4	2,8	1,0	1,5
100	1,7	0,3	0,6	2,8	1,0	1,5

Brick type: Solid calcium silicate brick KS, 2DF

Table C19: Description of brick

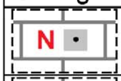
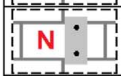
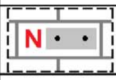
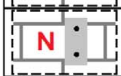
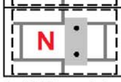
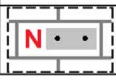
Brick type			Solid KS, 2DF	
Bulk density	ρ	[kg/dm³]	≥ 2,0	
Compressive strength	f_b	[N/mm²]	≥ 12 / 28	
Code			EN 771 - 2	
Producer			-	
Brick dimensions		[mm]	≥ 240 x 115 x 113	
Minimum wall thickness	h_{min}	[mm]	≥ 115	

Characteristic resistances for all anchor combinations (see Table B3)

Table C20: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading at edge distance c ≥ 115 mm

Use category			**w/w = w/d**		**d/d**	
Service temperature range			**Ta**	**Tb**	**Ta**	**Tb**
Anchor type and size	h_{ef} [mm]	f_b [N/mm²]	$\mathbf{N_{Rk}} = \mathbf{N_{Rk,p}} = \mathbf{N_{Rk,b}} = \mathbf{N_{Rk,p,c}} = \mathbf{N_{Rk,b,c}}$ [kN]			
All anchor	≥ 50	12	-[1)]	-[1)]	6,0	5,0
		28	-[1)]	-[1)]	9,0	7,5

Related edge and spacing distance and group factor α_g

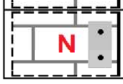
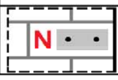
Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g,N}$ [-]	Configuration	c ≥ [mm]	s_{II} ≥ [mm]	$\alpha_{g,N}$ [-]
	115	-	-	-	-	-	-
	115	50	1,0		115	50	1,0
	115	115	1,45	-	-	-	-
	115	150	2,0		115	115 (H)* 240 (S)*	2,0

* (H) = Header, (S) = Stretcher
1) No performance assessed

Table C21: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading at edge distance c ≥ 50 mm

Use category			**w/w = w/d**		**d/d**	
Service temperature range			**Ta**	**Tb**	**Ta**	**Tb**
Anchor type and size	h_{ef} [mm]	f_b [N/mm²]	$\mathbf{N_{Rk}} = \mathbf{N_{Rk,p}} = \mathbf{N_{Rk,b}} = \mathbf{N_{Rk,p,c}} = \mathbf{N_{Rk,b,c}}$ [kN]			
All anchor	≥ 50	12	-[1)]		4,0	3,5
		28	-[1)]		6,5	5,5

Related edge and spacing distance and group factor α_g

Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g,N}$ [-]	Configuration	c ≥ [mm]	s_{II} ≥ [mm]	$\alpha_{g,N}$ [-]
	50	-	-	-	-	-	-
	50	115	2,0		50	115 (H)* 240 (S)*	2,0

* (H) = Header, (S) = Stretcher
1) No performance assessed

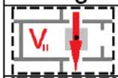
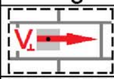
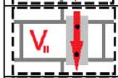
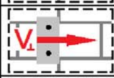
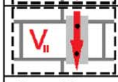
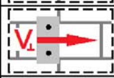
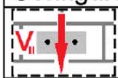
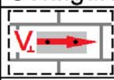
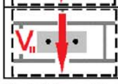
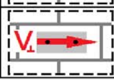
Hilti HIT-HY 270 with HAS and HAS-U	**Annex C11**
Performances solid silica brick KS, 2DF Characteristic values of resistance under tension load and group factor	

Deutsches Institut für Bautechnik DIBt

Table C22: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading at edge distance c ≥ 115 mm

Anchor type and size	h_{ef} [mm]	f_b [N/mm²]	$V_{Rk} = V_{Rk,b} = V_{Rk,c,II}$ [kN]	$V_{Rk,c\perp}$
All anchor	≥ 50	12	6,0	Calculate according to TR 054 equation 4.7
		28	9,0	

Related edge and spacing distance and group factor α_g

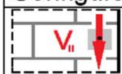
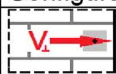
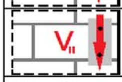
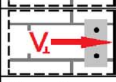
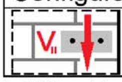
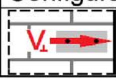
Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g\perp,V II}$ [-]	Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g\perp,V\perp}$ [-]
	115	-	-		115	-	-
	115	50	0,45		115	50	0,45
	115	115	2,0		115	115	2,0
Configuration	c ≥ [mm]	s_{II} [mm]	$\alpha_{gII,VII}$ [-]	Configuration	c ≥ [mm]	s_{II} [mm]	$\alpha_{gII,V\perp}$ [-]
	115	50	0,45		115	50	0,45
	115	115 (H)* 240 (S)*	2,0		115	115 (H)* 240 (S)*	2,0

* (H) = Header, (S) = Stretcher

Table C23: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading at edge distance c ≥ 50 mm

Anchor type and size	h_{ef} [mm]	f_b [N/mm²]	$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]
All anchor	≥ 50	12	3,0
		28	4,5

Related edge and spacing distance and group factor α_g

Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g\perp,V II}$ [-]	Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g\perp,V\perp}$ [-]
	50	-	-		50	-	-
	50	115	2,0		50	115	2,0
Configuration	c ≥ [mm]	s_{II} [mm]	$\alpha_{gII,VII}$ [-]	Configuration	c ≥ [mm]	s_{II} [mm]	$\alpha_{gII,V\perp}$ [-]
	50	115 (H)* 240 (S)*	2,0		50	115 (H)* 240 (S)*	2,0

* (H) = Header, (S) = Stretcher

Table C24: Displacements

h_{ef}	N	δ_{N0}	$\delta_{N\infty}$	V	δ_{V0}	$\delta_{V\infty}$
[mm]	[kN]	[mm]	[mm]	[kN]	[mm]	[mm]
≥ 50	2,5	0,3	0,6	2,5	1,0	1,5

Hilti HIT-HY 270 with HAS and HAS-U

Performances solid silica brick KS, 2DF
Characteristic values of resistance under tension and shear load and group factor
Displacements

Annex C12

Brick type: Solid calcium silicate brick KS, 8DF

Table C25: Description of brick

Brick type		Solid KS, 8DF	
Bulk density	ρ [kg/dm³]	≥ 2,0	
Compressive strength	f_b [N/mm²]	≥ 12 / 20 / 28	
Code		EN 771 - 2	
Producer			
Brick dimensions	[mm]	≥ 248 x 240 x 248	
Minimum wall thickness	h_{min} [mm]	≥ 240	

Characteristic resistances for all anchor combinations (see Table B3)

Table C26: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading at edge distance c ≥ 120 mm

Use category			**w/w = w/d**		**d/d**	
Service temperature range			**Ta**	**Tb**	**Ta**	**Tb**
Anchor type and size	h_{ef} [mm]	f_b [N/mm²]	$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]			
All anchor	≥ 50	12	-[1)]	-[1)]	7,0	5,5
		20	-[1)]	-[1)]	9,0	7,5
		28	-[1)]	-[1)]	10,5	8,5
HAS and HAS-U M8, M10 	≥ 80	12	-[1)]	-[1)]	8,5	7,0
		20	-[1)]	-[1)]	11,0	9,0
		28	-[1)]	-[1)]	12,0	10,5
HAS and HAS-U M12  HAS and HAS-U M8, M10 + HIT-SC 		12	-[1)]	-[1)]	11,5	9,5
		20	-[1)]	-[1)]	12,0	12,0
		28	-[1)]	-[1)]	12,0	12,0
HAS and HAS-U M16  HAS and HAS-U M12, M16 + HIT-SC 		12	-[1)]	-[1)]	12,0	12,0
		20	-[1)]	-[1)]	12,0	12,0
		28	-[1)]	-[1)]	12,0	12,0
HAS and HAS-U M8, M10 	≥ 100	12	-[1)]	-[1)]	12,0	11,0
		20	-[1)]	-[1)]	12,0	12,0
		28	-[1)]	-[1)]	12,0	12,0

Hilti HIT-HY 270 with HAS and HAS-U	Annex C13
Performances solid silica brick KS, 8DF Characteristic values of resistance under tension load	

Table C26 continued

HAS and HAS-U	M12, M16	≥ 100	12	-[1)]	-[1)]	12,0	12,0
HAS and HAS-U + HIT-SC	M8 to M16		20	-[1)]	-[1)]	12,0	12,0
			28	-[1)]	-[1)]	12,0	12,0

[1)] No performance assessed

Related edge and spacing distance and group factor α_g

Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g,N}$ [-]	Configuration	c ≥ [mm]	s_{II} ≥ [mm]	$\alpha_{g,N}$ [-]
N	120	-	-	-	-	-	-
N	120	3 h_{ef}	2,0	N	120	3 h_{ef}	2,0

Table C27: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading at edge distance c ≥ 50 mm

Use category				**w/w = w/d**		**d/d**	
Service temperature range				**Ta**	**Tb**	**Ta**	**Tb**
Anchor type and size		h_{ef} [mm]	f_b [N/mm²]	$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]			
All anchor		≥ 50	12	-[1)]	-[1)]	4,0	3,5
			20	-[1)]	-[1)]	5,5	4,5
			28	-[1)]	-[1)]	6,5	5,0
HAS and HAS-U	M8, M10	≥ 80	12	-[1)]	-[1)]	5,0	4,0
			20	-[1)]	-[1)]	6,5	5,5
			28	-[1)]	-[1)]	7,5	6,5
HAS and HAS-U M12; HAS and HAS-U + HIT-SC M8, M10			12	-[1)]	-[1)]	7,0	5,5
			20	-[1)]	-[1)]	9,0	7,5
			28	-[1)]	-[1)]	10,5	8,5
HAS and HAS-U M16; HAS and HAS-U + HIT-SC M12, M16			12	-[1)]	-[1)]	10,0	8,0
			20	-[1)]	-[1)]	12,0	10,5
			28	-[1)]	-[1)]	12,0	12,0
HAS and HAS-U	M8, M10	≥ 100	12	-[1)]	-[1)]	8,0	6,5
			20	-[1)]	-[1)]	10,5	8,5
			28	-[1)]	-[1)]	12,0	10,0

Table C27 continued

HAS and HAS-U	M12	≥ 100	12	-[1)]	-[1)]	9,5	8,0
HAS and HAS-U + HIT-SC	M8, M10		20	-[1)]	-[1)]	12,0	10,0
			28	-[1)]	-[1)]	12,0	12,0
HAS and HAS-U	M16		12	-[1)]	-[1)]	12,0	10,5
HAS and HAS-U + HIT-SC	M12, M16		20	-[1)]	-[1)]	12,0	12,0
			28	-[1)]	-[1)]	12,0	12,0

[1)] No performance assessed

Related edge and spacing distance and group factor α_g

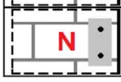
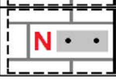
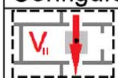
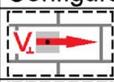
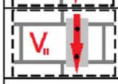
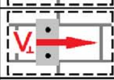
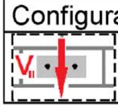
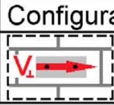
Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g,N}$ [-]	Configuration	c ≥ [mm]	s_{II} ≥ [mm]	$\alpha_{g,N}$ [-]
	50	-	-	-	-	-	-
	50	50	1,0		50	50	1,0
	50	3 h_{ef}	2,0		50	3 h_{ef}	2,0

Table C28: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading at edge distance c ≥ 120 mm (for V_{II}) and c ≥ 1,5 h_{ef} (for $V_\perp$)

Anchor type and size		h_{ef} [mm]	f_b [N/mm²]	$V_{Rk} = V_{Rk,b} = V_{Rk,c,II}$ [kN]	$V_{Rk,c\perp}$
HAS and HAS-U	M8, M10	≥ 50	12	9,0	Calculate according to TR 054 equation 4.7
			20	12,0	
			28	12,0	
HAS and HAS-U	M12, M16		12	12,0	
HAS and HAS-U + HIT-SC	M12, M16		20	12,0	
			28	12,0	

Related edge and spacing distance and group factor α_g

Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g\perp,V II}$ [-]	Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g\perp,V\perp}$ [-]
	120	-	-		1,5 h_{ef}	-	-
	120	3 h_{ef}	2,0		1,5 h_{ef}	3 h_{ef}	2,0
Configuration	**c ≥ [mm]**	**s_{II} [mm]**	**$\alpha_{gII,VII}$ [-]**	**Configuration**	**c ≥ [mm]**	**s_{II} [mm]**	**$\alpha_{gII,V\perp}$ [-]**
	120	3 h_{ef}	2,0		1,5 h_{ef}	3 h_{ef}	2,0

Hilti HIT-HY 270 with HAS and HAS-U

Performances solid silica brick KS, 8DF
Characteristic values of resistance under tension and shear load and group factor

Annex C15

Table C29: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading at edge distance c ≥ 50 mm

Anchor type and size	h_{ef} [mm]	f_b [N/mm²]	$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]
All anchor	≥ 50	12	3,0
		20	4,0
		28	4,5

Related edge and spacing distance and group factor α_g

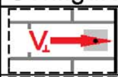
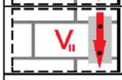
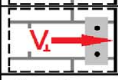
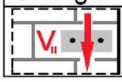
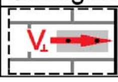
Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g\perp,V II}$ [-]	Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g\perp,V\perp}$ [-]
	50	-	-		50	-	-
	50	250	2,0		50	250	2,0
Configuration	c ≥ [mm]	s_{II} [mm]	$\alpha_{gII,VII}$ [-]	Configuration	c ≥ [mm]	s_{II} [mm]	$\alpha_{gII,V\perp}$ [-]
	50	250	2,0		50	250	2,0

Table C30: Displacements

h_{ef}	N	δ_{N0}	$\delta_{N\infty}$	V	δ_{V0}	$\delta_{V\infty}$
[mm]	[kN]	[mm]	[mm]	[kN]	[mm]	[mm]
50	2,3	0,10	0,20	3,4	2,8	4,2
80	3,4	0,15	0,30	3,4	2,8	4,2
100	3,4	0,15	0,30	3,4	2,8	4,2

Brick type: Solid lightweight concrete brick Vbl, 2DF

Table C31: Description of brick

Brick type			Solid Vbl, 2DF	
Bulk density	ρ	[kg/dm³]	≥ 0,9	
Compressive strength	f_b	[N/mm²]	≥ 4 / 6	
Code			EN 771-3	
Producer				
Brick dimensions		[mm]	≥ 240 x 115 x 113	
Minimum wall thickness	h_{min}	[mm]	≥ 115	

Characteristic resistances for all anchor combinations (see Table B3)

Table C32: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading at edge distance c ≥ 115 mm

Use category			**w/w = w/d**		**d/d**	
Service temperature range			**Ta**	**Tb**	**Ta**	**Tb**
Anchor type and size	h_{ef} [mm]	f_b [N/mm²]	$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]			
All anchor	≥ 50	4	3,0	2,0	3,0 (3,5*)	2,5
		6	3,5	3,0	4,0	3,0 (3,5*)
	≥ 80	4	4,5	3,5	5,0	4,0 (4,5*)
		6	5,5	4,5	6,0 (6,5*)	5,0 (5,5*)
	≥ 100	4	6,0	5,0	6,5 (7,0*)	5,5 (6,0*)
		6	7,5	6,0	8,0 (8,5*)	6,5 (7,0*)

* Compressed air cleaning only

Related edge and spacing distance and group factor α_g

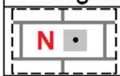
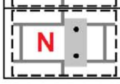
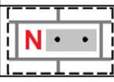
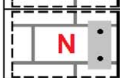
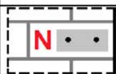
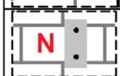
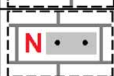
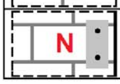
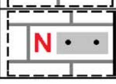
Configuration	c ≥ [mm]	$s_{\perp}$ ≥ [mm]	$\alpha_{g,N}$ [-]	Configuration	c ≥ [mm]	s_{II} ≥ [mm]	$\alpha_{g,N}$ [-]
	115	-	-	-	-	-	-
	115	3 h_{ef}	2,0		115	3 h_{ef}	2,0

Table C33: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading at edge distance c ≥ 50 mm

Use category			**w/w = w/d**		**d/d**	
Service temperature range			**Ta**	**Tb**	**Ta**	**Tb**
Anchor type and size	h_{ef} [mm]	f_b [N/mm²]	$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]			
All anchor	≥ 50	4	1,5	1,2	1,5	1,5
		6	2,0	1,5	2,0	1,5

Related edge and spacing distance and group factor α_g

Configuration	c ≥ [mm]	$s_{\perp}$ ≥ [mm]	$\alpha_{g,N}$ [-]	Configuration	c ≥ [mm]	s_{II} ≥ [mm]	$\alpha_{g,N}$ [-]
	50	-	-	-	-	-	-
	50	115	1,0		50	115	1,0
	115	50	1,0		115	50	1,0
	50	3 h_{ef}	2,0		50	3 h_{ef}	2,0

Hilti HIT-HY 270 with HAS and HAS-U

Performances solid lightweight concrete brick Vbl, 2DF
Characteristic values of resistance under tension load and group factor

Annex C17

Table C34: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading at edge distance c ≥ 115 mm (for V_{II}) and c ≥ 1,5 h_{ef} (for $V_{\perp}$)

Anchor type and size	h_{ef} [mm]	f_b [N/mm²]	$V_{Rk} = V_{Rk,b} = V_{Rk,c,II}$ [kN]	$V_{Rk,c\perp}$
HAS and HAS-U M8	≥ 50	4	2,0	Calculate according to TR 054 equation 4.7
		6	2,5	
HAS and HAS-U M10 to M16		4	2,5	
		6	3,0	

Related edge and spacing distance and group factor α_g

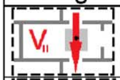
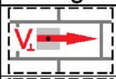
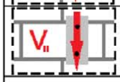
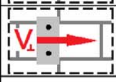
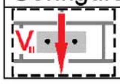
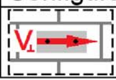
Configuration	c ≥ [mm]	$s_{\perp}$ ≥ [mm]	$\alpha_{g\perp,V II}$ [-]	Configuration	c ≥ [mm]	$s_{\perp}$ ≥ [mm]	$\alpha_{g\perp,V\perp}$ [-]
	115	-	-		1,5 h_{ef}	-	-
	115	3 h_{ef}	2,0		1,5 h_{ef}	3 h_{ef}	2,0
Configuration	c ≥ [mm]	s_{II} [mm]	$\alpha_{gII,VII}$ [-]	Configuration	c ≥ [mm]	s_{II} [mm]	$\alpha_{gII,V\perp}$ [-]
	115	3 h_{ef}	2,0		1,5 h_{ef}	3 h_{ef}	2,0

Table C35: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading at edge distance c ≥ 50 mm

Anchor type and size	h_{ef} [mm]	f_b [N/mm²]	$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]
All anchor	≥ 50	4	1,20
		6	1,50

Related edge and spacing distance and group factor α_g

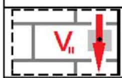
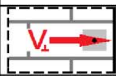
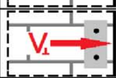
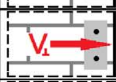
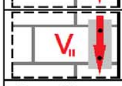
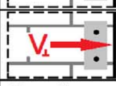
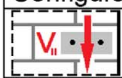
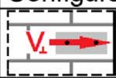
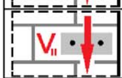
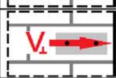
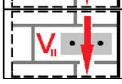
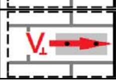
Configuration	c ≥ [mm]	$s_{\perp}$ ≥ [mm]	$\alpha_{g\perp,V II}$ [-]	Configuration	c ≥ [mm]	$s_{\perp}$ ≥ [mm]	$\alpha_{g\perp,V\perp}$ [-]
	50	-	-		50	-	-
	115	50	1,0		115	50	1,0
	50	115	1,0		50	115	1,0
	50	3 h_{ef}	2,0		50	3 h_{ef}	2,0
Configuration	c ≥ [mm]	s_{II} [mm]	$\alpha_{gII,VII}$ [-]	Configuration	c ≥ [mm]	s_{II} [mm]	$\alpha_{gII,V\perp}$ [-]
	115	50	1,0		115	50	1,0
	50	115	1,0		50	115	1,0
	50	3 h_{ef}	2,0		50	3 h_{ef}	2,0

Table C36: Displacements

h_{ef}	N	δ_{N0}	$\delta_{N\infty}$	V	δ_{V0}	$\delta_{V\infty}$
[mm]	[kN]	[mm]	[mm]	[kN]	[mm]	[mm]
≥ 50	2,5	0,3	0,6	1,8	2,0	3,0

Brick type: Solid normal weight concrete brick Vbn, 2DF

Table C37: Description of brick

Brick type			Solid Vbn, 2DF	
Bulk density	ρ	[kg/dm³]	≥ 2,0	
Compressive strength	f_b	[N/mm²]	≥ 6 / 16	
Code			EN 771-3	
Producer				
Brick dimensions		[mm]	≥ 240 x 115 x 113	
Minimum wall thickness	h_{min}	[mm]	≥ 115	

Characteristic resistances for all anchor combinations (see Table B3)

Table C38: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading at edge distance c ≥ 115 mm

Use category			**w/w = w/d**		**d/d**	
Service temperature range			**Ta**	**Tb**	**Ta**	**Tb**
Anchor type and size	h_{ef} [mm]	f_b [N/mm²]	$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]			
All anchor	≥ 50	6	3,0	2,5	3,0	2,5
		16	5,5	4,5	5,5	4,5

Related edge and spacing distance and group factor α_g

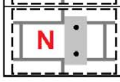
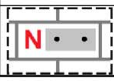
Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g,N}$ [-]	Configuration	c ≥ [mm]	s_{II} ≥ [mm]	$\alpha_{g,N}$ [-]
	115	-	-	-	-	-	-
	115	3 h_{ef}	2,0		115	3 h_{ef}	2,0

Table C39: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading at edge distance c ≥ 50 mm

Use category			**w/w = w/d**		**d/d**	
Service temperature range			**Ta**	**Tb**	**Ta**	**Tb**
Anchor type and size	h_{ef} [mm]	f_b [N/mm²]	$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]			
All anchor	≥ 50	6	1,5	1,2	1,5	1,2
		16	2,5	2,0	2,5	2,0

Related edge and spacing distance and group factor α_g

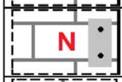
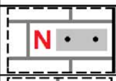
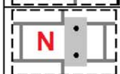
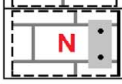
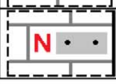
Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g,N}$ [-]	Configuration	c ≥ [mm]	s_{II} ≥ [mm]	$\alpha_{g,N}$ [-]
	50	-	-	-	-	-	-
	50	115	1,0		50	115	1,0
	115	50	1,0		115	50	1,0
	50	3 h_{ef}	2,0		50	3 h_{ef}	2,0

Table C40: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading at edge distance c ≥ 115 mm (for V_{II}) and c ≥ 1,5 hef (for $V_{\perp}$)

Anchor type and size	h_{ef} [mm]	f_b [N/mm²]	$V_{Rk} = V_{Rk,b} = V_{Rk,c,II}$ [kN]	$V_{Rk,c\perp}$
All anchor	≥ 50	6	4,0	Calculate according to TR 054 equation 4.7
		16	6,5	

Related edge and spacing distance and group factor α_g

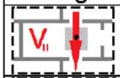
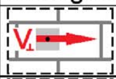
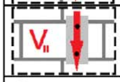
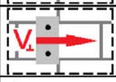
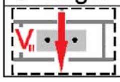
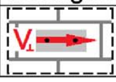
Configuration	c ≥ [mm]	$s_{\perp}$ ≥ [mm]	$\alpha_{g\perp,V II}$ [-]	Configuration	c ≥ [mm]	$s_{\perp}$ ≥ [mm]	$\alpha_{g\perp,V\perp}$ [-]
	115	-	-		1,5 h_{ef}	-	-
	115	3 h_{ef}	2,0		1,5 h_{ef}	3 h_{ef}	2,0
Configuration	c ≥ [mm]	s_{II} [mm]	$\alpha_{gII,VII}$ [-]	Configuration	c ≥ [mm]	s_{II} [mm]	$\alpha_{gII,V\perp}$ [-]
	115	3 h_{ef}	2,0		1,5 h_{ef}	3 h_{ef}	2,0

Table C41: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading at edge distance c ≥ 50 mm

Anchor type and size	h_{ef} [mm]	f_b [N/mm²]	$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]
All anchor	≥ 50	4	1,5
		6	3,0

Related edge and spacing distance and group factor α_g

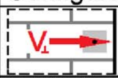
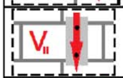
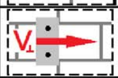
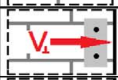
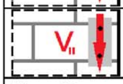
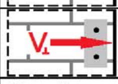
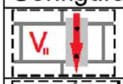
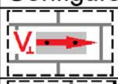
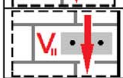
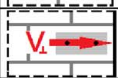
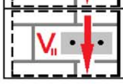
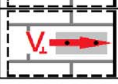
Configuration	c ≥ [mm]	$s_{\perp}$ ≥ [mm]	$\alpha_{g\perp,V II}$ [-]	Configuration	c ≥ [mm]	$s_{\perp}$ ≥ [mm]	$\alpha_{g\perp,V\perp}$ [-]
	50	-	-		50	-	-
	115	50	1,0		115	50	1,0
	50	115	1,0		50	115	1,0
	50	3 h_{ef}	2,0		50	3 h_{ef}	2,0
Configuration	c ≥ [mm]	s_{II} [mm]	$\alpha_{gII,VII}$ [-]	Configuration	c ≥ [mm]	s_{II} [mm]	$\alpha_{gII,V\perp}$ [-]
	115	50	1,0		115	50	1,0
	50	115	1,0		50	115	1,0
	50	3 h_{ef}	2,0		50	3 h_{ef}	2,0

Table C42: Displacements

h_{ef}	N	δ_{N0}	$\delta_{N\infty}$	V	δ_{V0}	$\delta_{V\infty}$
[mm]	[kN]	[mm]	[mm]	[kN]	[mm]	[mm]
≥ 50	1,5	0,3	0,6	1,8	2,0	3,0

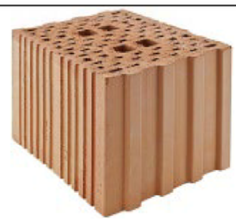
Hilti HIT-HY 270 with HAS and HAS-U

Performances solid normal weight concrete brick Vbn, 2DF
Characteristic values of resistance under shear load and group factor
Displacements

Annex C20

Brick type: Hollow clay brick Hlz, 10DF

Table C43: Description of brick

Brick type		Hlz12-1,4-10 DF	 Drawing of the brick see **Table B4**
Bulk density	ρ [kg/dm³]	≥ 1,4	
Compressive strength	f_b [N/mm²]	≥ 12 / 20	
Code		EN 771 - 1	
Producer		Rapis (D)	
Brick dimensions	[mm]	300 x 240 x 238	
Minimum wall thickness	h_{min} [mm]	≥ 240	

Characteristic resistances for all anchor combinations (see Table B3)

Table C44: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading at edge distance c ≥ 150 mm

Use category			**w/w = w/d**		**d/d**	
Service temperature range			**Ta**	**Tb**	**Ta**	**Tb**
Anchor type and size	h_{ef} [mm]	f_b [N/mm²]	$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]			
All anchor	≥ 80	12	5,5 (6,0*)			
		20	7,0 (8,0*)			

* Compressed air cleaning only

Related edge and spacing distance and group factor α_g

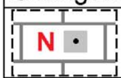
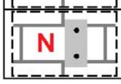
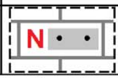
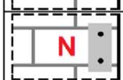
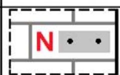
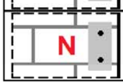
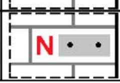
Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g,N}$ [-]	Configuration	c ≥ [mm]	s_{II} ≥ [mm]	$\alpha_{g,N}$ [-]
	150	-	-	-	-	-	-
	150	240	2,0		150	300	2,0

Table C45: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading at edge distance c ≥ 50 mm

Use category			**w/w = w/d**		**d/d**	
Service temperature range			**Ta**	**Tb**	**Ta**	**Tb**
Anchor type and size	h_{ef} [mm]	f_b [N/mm²]	$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]			
All anchor	≥ 80	12	1,5 (2,0*)			
		20	2,0 (2,5*)			

* Compressed air cleaning only

Related edge and spacing distance and group factor α_g

Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g,N}$ [-]	Configuration	c ≥ [mm]	s_{II} ≥ [mm]	$\alpha_{g,N}$ [-]
	50	-	-	-	-	-	-
	50	5 d_0	1,0		50	5 d_0	1,0
	50	240	2,0		50	300	2,0

Hilti HIT-HY 270 with HAS and HAS-U

Performances hollow clay brick Hlz, 10DF
Characteristic values of resistance under tension load and group factor

Annex C21

Table C46: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading at edge distance c ≥ 300 mm

Anchor type and size	h_{ef} [mm]	f_b [N/mm²]	$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [1] [kN]
HAS and HAS-U M8, M10	≥ 80	12	4,5
		20	5,5
HAS and HAS-U M12, M16		12	9,5
		20	10

1) $V_{Rk,b}$ may be used as $V_{Rk,c\perp}$ if
- Horizontal joints are completely filled with mortar and
- Vertical joints are completely filled with mortar or the bricks have completely direct contact to each other.

Related edge and spacing distance and group factor α_g

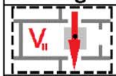
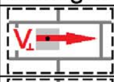
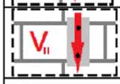
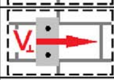
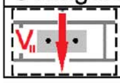
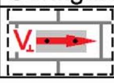
Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g\perp,V II}$ [-]	Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g\perp,V\perp}$ [-]
	300	-	-		300	-	-
	300	240	2,0		300	240	1,0
Configuration	c ≥ [mm]	s_{II} [mm]	$\alpha_{gII,VII}$ [-]	Configuration	c ≥ [mm]	s_{II} [mm]	$\alpha_{gII,V\perp}$ [-]
	300	300	2,0		300	300	2,0

Table C47: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading at edge distance c ≥ 50 mm

Anchor type and size	h_{ef} [mm]	c [mm]	$V_{Rk,c,\perp}$ [kN]
All anchor	≥ 80	≥ 50	1,25
		≥ 250	2,5
		c [mm]	$V_{Rk} = V_{Rk,b} = V_{Rk,c,II}$ [kN]
		≥ 50	1,25
		≥ 100 and ≥ 6*d_0	2,5

Related edge and spacing distance and group factor α_g

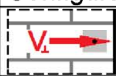
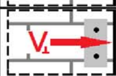
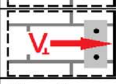
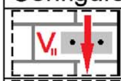
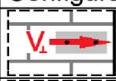
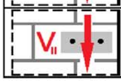
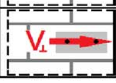
Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g\perp,V II}$ [-]	Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g\perp,V\perp}$ [-]
	see table C47	-	-		see table C47	-	-
	see table C47	5 d_0	1,0		see table C47	5 d_0	1,0
	see table C47	240	2,0		see table C47	240	2,0
Configuration	c ≥ [mm]	s_{II} [mm]	$\alpha_{gII,VII}$ [-]	Configuration	c ≥ [mm]	s_{II} [mm]	$\alpha_{gII,V\perp}$ [-]
	see table C47	5 d_0	1,0		see table C47	5 d_0	1,0
	see table C47	300	2,0		see table C47	300	2,0

Table C48: Displacements

h_{ef}	N	δ_{N0}	$\delta_{N\infty}$	V	δ_{V0}	$\delta_{V\infty}$
[mm]	[kN]	[mm]	[mm]	[kN]	[mm]	[mm]
≥ 80	2,5	0,4	0,8	1,7	1,0	1,5

Hilti HIT-HY 270 with HAS and HAS-U

Performances hollow clay brick Hlz, 10DF
Characteristic values of resistance under shear load and group factor
Displacements

Annex C22

Brick type: Hollow calcium silicate brick KSL, 8DF

Table C49: Description of brick

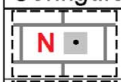
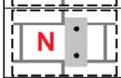
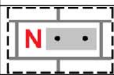
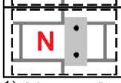
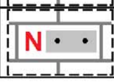
Brick type			KSL-12-1,4-8 DF	
Bulk density	ρ	[kg/dm³]	≥ 1,4	
Compressive strength	f_b	[N/mm²]	≥ 12 / 20	
Code			EN 771 – 2	
Producer			KS Wemding (D)	
Brick dimensions		[mm]	248 x 240 x 238	Drawing of the brick
Minimum wall thickness	h_{min}	[mm]	≥ 240	see **Table B4**

Characteristic resistances for all anchor combinations (see Table B3)

Table C50: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading at edge distance c ≥ 50 mm

Use category			**w/w = w/d**		**d/d**	
Service temperature range			**Ta**	**Tb**	**Ta**	**Tb**
Anchor type and size	h_{ef} [mm]	f_b [N/mm²]	$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]			
HAS and HAS-U M8 to M16	≥ 80	12	-[1)]	-[1)]	4,0	3,0
		20	-[1)]	-[1)]	5,5	4,5
	≥ 130	12	-[1)]	-[1)]	5,0	4,0
		20	-[1)]	-[1)]	7,5	6,0

Related edge and spacing distance and group factor α_g

Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g,N}$ [-]	Configuration	c ≥ [mm]	s_{II} ≥ [mm]	$\alpha_{g,N}$ [-]
	50	-	-	-	-	-	-
	50	50	1,0		50	50	1,0
	50	240	2,0		50	250	2,0

[1)] No performance assessed

Table C51: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading at edge distance c ≥ 125 mm (for V_{II}) and c ≥ 250 mm (for $V_\perp$)

Anchor type and size	h_{ef} [mm]	f_b [N/mm²]	$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [1)] [kN]
HAS and HAS-U M8	≥ 80	12	6,0
		20	9,0
HAS and HAS-U M10		12	9,0
		20	12,0
HAS and HAS-U M12 to M16		12	12,0
		20	12,0

[1)] $V_{Rk,b}$ may be used as $V_{Rk,c\perp}$ if
- Horizontal joints are completely filled with mortar and
- Vertical joints are completely filled with mortar or the bricks have completely direct contact to each other and
- max $V_{Rk,c\perp}$ = 9 kN

Related edge and spacing distance and group factor α_g

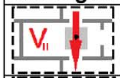
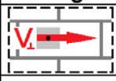
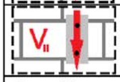
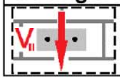
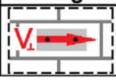
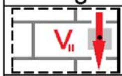
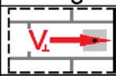
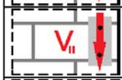
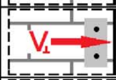
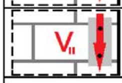
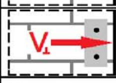
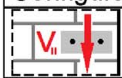
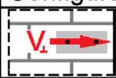
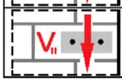
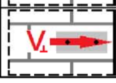
Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g\perp,V\parallel}$ [-]	Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g\perp,V\perp}$ [-]
	125	-	-		250	-	-
	125	240	2,0	-	-	-	-
Configuration	c ≥ [mm]	$s_\parallel$ [mm]	$\alpha_{g\parallel,V\parallel}$ [-]	Configuration	c ≥ [mm]	$s_\parallel$ [mm]	$\alpha_{g\parallel,V\perp}$ [-]
	125	250	2,0		250	250	2,0

Table C52: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading at edge distance c ≥ 50 mm

Anchor type and size	h_{ef} [mm]	c [mm]	f_b [N/mm²]	$V_{Rk,c,\perp}$ 1) [kN]
All anchor	≥ 80	≥ 50	12	4,0
			20	6,0
		c [mm]	f_b [N/mm²]	$V_{Rk} = V_{Rk,b} = V_{Rk,c,\parallel}$ [kN]
		≥ 50	12	4,0
			20	6,0

Related edge and spacing distance and group factor α_g

Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g\perp,V\parallel}$ [-]	Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g\perp,V\perp}$ [-]
	50	-	-		50	-	-
	50	50	1,0		50	50	1,0
	50	240	2,0		50	240	2,0
Configuration	c ≥ [mm]	$s_\parallel$ [mm]	$\alpha_{g\parallel,V\parallel}$ [-]	Configuration	c ≥ [mm]	$s_\parallel$ [mm]	$\alpha_{g\parallel,V\perp}$ [-]
	50	50	1,0		50	50	1,0
	50	250	2,0		50	250	2,0

1) max $V_{Rk,c\perp}$ = 9 kN

Table C53: Displacements

h_{ef}	N	δ_{N0}	$\delta_{N\infty}$	V	δ_{V0}	$\delta_{V\infty}$
[mm]	[kN]	[mm]	[mm]	[kN]	[mm]	[mm]
80	1,0	0,3	0,6	4,3	2,0	3,0
130	2,1	0,3	0,6	4,3	2,0	3,0

Hilti HIT-HY 270 with HAS and HAS-U

Performances hollow silica brick KSL, 8DF
Characteristic values of resistance under shear load and group factor
Displacements

Annex C24

Brick type: Hollow lightweight concrete brick Hbl, 16DF

Table C54: Description of brick

Brick type		Hbl-4-0,7	
Bulk density	ρ [kg/dm³]	≥ 0,7	
Compressive strength	f_b [N/mm²]	≥ 2 / 6	
Code		EN 771-3	
Producer		Knobel (D)	
Brick dimensions	[mm]	495 x 240 x 238	Drawing of the brick
Minimum wall thickness	h_{min} [mm]	≥ 240	see **Table B4**

Characteristic resistances for all anchor combinations (see Table B3)

Table C55: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading at edge distance c ≥ 125 mm

Use category			**w/w = w/d**		**d/d**	
Service temperature range			**Ta**	**Tb**	**Ta**	**Tb**
Anchor type and size	h_{ef} [mm]	f_b [N/mm²]	$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]			
HAS and HAS-U M8 and M10,	≥ 80	2	3,5	3,0	4,0	3,0 (3,5*)
		6	6,0	5,0	6,5 (7,0*)	5,5 (6,0*)
HAS and HAS-U M12 and M16	≥ 80	2	4,0	3,5	4,5	3,5 (4,0*)
		6	7,0	6,0	8,0	6,5 (7,0*)

* Compressed air cleaning only

Related edge and spacing distance and group factor α_g

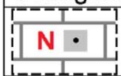
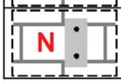
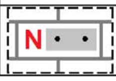
Configuration	c ≥ [mm]	$s_{\perp}$ ≥ [mm]	$\alpha_{g,N}$ [-]	Configuration	c ≥ [mm]	s_{II} ≥ [mm]	$\alpha_{g,N}$ [-]
	125	-	-	-	-	-	-
	125	240	2,0		125	240	2,0

Table C56: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading at edge distance c ≥ 50 mm

Use category			**w/w = w/d**		**d/d**	
Service temperature range			**Ta**	**Tb**	**Ta**	**Tb**
Anchor type and size	h_{ef} [mm]	f_b [N/mm²]	$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]			
HAS and HAS-U M8 to M16	≥ 80	2	1,5	1,2	1,5	1,5
		6	2,5	2,0	3,0	2,5
	160	2	2,0	1,5	2,0	1,5 (2,0*)
		6	3,5	2,5	3,5 (4,0*)	3,0

* Compressed air cleaning only

Related edge and spacing distance and group factor α_g

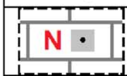
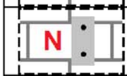
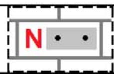
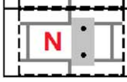
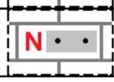
Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g,N}$ [-]	Configuration	c ≥ [mm]	s_{II} ≥ [mm]	$\alpha_{g,N}$ [-]
	50	-	-	-	-	-	-
	50	50	1,0		50	50	1,0
	50	240	2,0		50	240	2,0

Table C57: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading at edge distance c ≥ 250 mm (for V_{II}) and c ≥ 500 mm (for $V_\perp$)

Anchor type and size	h_{ef} [mm]	f_b [N/mm²]	$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ 1) [kN]
HAS and HAS-U M8, M10	≥ 80	2	4,0
		6	6,5
HAS and HAS-U M12	≥ 80	2	5,5
		6	9,5
HAS and HAS-U M16	≥ 80	2	6,0
		6	10,0

1) $V_{Rk,b}$ may be used as $V_{Rk,c\perp}$ if
- Horizontal joints are completely filled with mortar and
- Vertical joints are completely filled with mortar or the bricks have completely direct contact to each other.

Related edge and spacing distance and group factor α_g

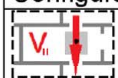
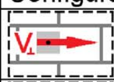
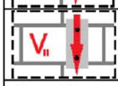
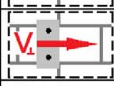
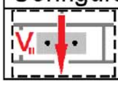
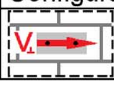
Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g\perp,V II}$ [-]	Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g\perp,V\perp}$ [-]
	250	-	-		500	-	-
	250	240	2,0		500	240	1,0
Configuration	c ≥ [mm]	s_{II} [mm]	$\alpha_{gII,VII}$ [-]	Configuration	c ≥ [mm]	s_{II} [mm]	$\alpha_{gII,V\perp}$ [-]
	250	250	2,0		500	500	2,0

Table C58: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading at edge distance c ≥ 50 mm

Anchor type and size	h_{ef} [mm]	c [mm]	f_b [N/mm²]	$V_{Rk,c,\perp}$ [kN]
All anchor	≥ 80	≥ 50	2	1,5
			6	3,0
		≥ 250	2	2,5
		c [mm]	f_b [N/mm²]	$V_{Rk} = V_{Rk,b} = V_{Rk,c,II}$ [kN]
		≥ 50	2	1,5
			6	3,0
		≥ 100 ≥ 6 d_0	2	2,5

Related edge and spacing distance and group factor α_g

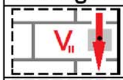
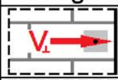
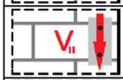
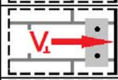
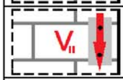
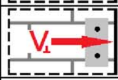
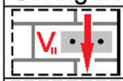
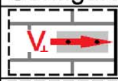
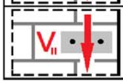
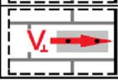
Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g\perp,V II}$ [-]	Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g\perp,V\perp}$ [-]
	see table C58	-	-		see table C58	-	-
	see table C58	50	1,0		see table C58	50	1,0
	see table C58	240	2,0		see table C58	240	2,0
Configuration	c ≥ [mm]	s_{II} [mm]	$\alpha_{gII,VII}$ [-]	Configuration	c ≥ [mm]	s_{II} [mm]	$\alpha_{gII,V\perp}$ [-]
	see table C58	50	1,0		see table C58	50	1,0
	see table C58	250	2,0		see table C58	250	2,0

Table C59: Displacements

h_{ef}	N	δ_{N0}	$\delta_{N\infty}$	V	δ_{V0}	$\delta_{V\infty}$
[mm]	[kN]	[mm]	[mm]	[kN]	[mm]	[mm]
80	0,8	0,20	0,4	2,3	1,0	1,5
160	1,1	0,25	0,5	2,3	1,0	1,5

Hilti HIT-HY 270 with HAS and HAS-U

Performances hollow lightweight concrete brick Hbl, 16DF
Characteristic values of resistance under shear load and group factor
Displacements

Annex C27

Brick type: Hollow normal weight concrete brick - parpaing creux

Table C60: Description of brick

Brick type		B40
Bulk density	ρ [kg/dm³]	≥ 0,9
Compressive strength	f_b [N/mm²]	≥ 4 / 10
Code		EN 771-3
Producer		Fabemi (F)
Brick dimensions	[mm]	500 x 200 x 200
Minimum wall thickness	h_{min} [mm]	≥ 200

Drawing of the brick see **Table B4**

Characteristic resistances for all anchor combinations (see Table B3)

Table C61: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading at edge distance c ≥ 50 mm

Use category			**w/w = w/d**		**d/d**	
Service temperature range			**Ta**	**Tb**	**Ta**	**Tb**
Anchor type and size	h_{ef} [mm]	f_b [N/mm²]	$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]			
All anchors	≥ 50	4	0,9	0,9	0,9	0,9
		10	2,0	1,5	2,0	1,5
All anchors	≥ 130	4	1,5	1,2	1,5	1,2
		10	2,5	2,0	2,5	2,0

Related edge and spacing distance and group factor α_g

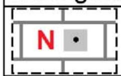
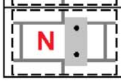
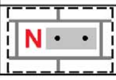
Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g,N}$ [-]	Configuration	c ≥ [mm]	s_{II} ≥ [mm]	$\alpha_{g,N}$ [-]
	50	-	-	-	-	-	-
	50	200	2,0		50	200	2,0

Table C62: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading at edge distance c ≥ 200 mm (for V_{II}) and c ≥ 500 mm (for $V_\perp$)

Anchor type and size	h_{ef} [mm]	f_b [N/mm²]	$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [1)] [kN]
All anchors	≥50	4	4
		10	6,5
	≥80	4	5
		10	7,5

[1)] $V_{Rk,b}$ may be used as $V_{Rk,c\perp}$ if

- Horizontal joints are completely filled with mortar and
- Vertical joints are completely filled with mortar or the bricks have completely direct contact to each other.

Related edge and spacing distance and group factor α_g

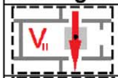
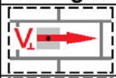
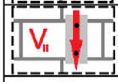
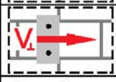
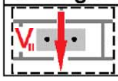
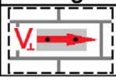
Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g\perp,V\parallel}$ [-]	Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g\perp,V\perp}$ [-]
	200	-	-		500	-	-
	200	200	2,0		500	200	1,0
Configuration	c ≥ [mm]	$s_\parallel$ [mm]	$\alpha_{g\parallel,V\parallel}$ [-]	Configuration	c ≥ [mm]	$s_\parallel$ [mm]	$\alpha_{g\parallel,V\perp}$ [-]
	200	200	2,0		500	500	2,0

Table C63: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading at edge distance c ≥ 50 mm

Anchor type and size	h_{ef} [mm]	c [mm]	f_b [N/mm²]	$V_{Rk,c,\perp}$ [kN]
All anchor	≥ 50	≥ 50	4	1,2
			10	1,5
		≥ 250	4/10	2,5
		c [mm]	f_b [N/mm²]	$V_{Rk} = V_{Rk,b} = V_{Rk,c,\parallel}$ [kN]
		≥ 50	4	2,0
			10	3,0

Related edge and spacing distance and group factor α_g

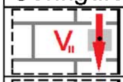
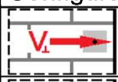
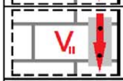
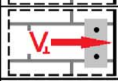
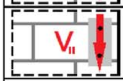
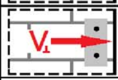
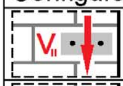
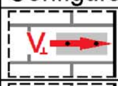
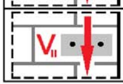
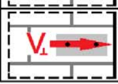
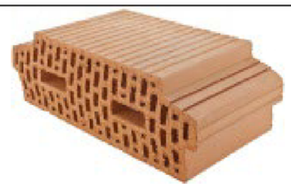
Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g\perp,V\parallel}$ [-]	Configuration	c ≥ [mm]	$s_\perp$ ≥ [mm]	$\alpha_{g\perp,V\perp}$ [-]
	50	-	-		see table C63	-	-
	50	50	1,0		see table C63	50	1,0
	50	200	2,0		see table C63	200	2,0
Configuration	c ≥ [mm]	$s_\parallel$ [mm]	$\alpha_{g\parallel,V\parallel}$ [-]	Configuration	c ≥ [mm]	$s_\parallel$ [mm]	$\alpha_{g\parallel,V\perp}$ [-]
	50	50	1,0		see table C63	50	1,0
	50	200	2,0		see table C63	200	2,0

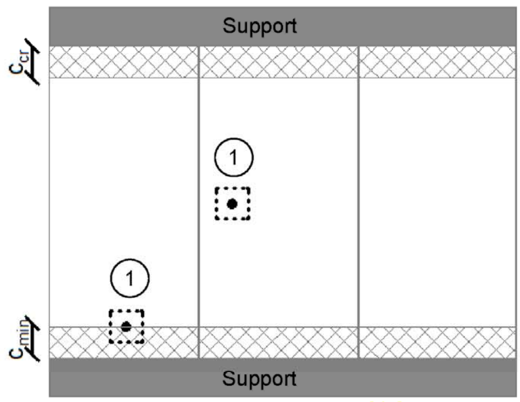
Table C64: Displacements

h_{ef}	N	δ_{N0}	$\delta_{N\infty}$	V	δ_{V0}	$\delta_{V\infty}$
[mm]	[kN]	[mm]	[mm]	[kN]	[mm]	[mm]
≥ 50	0,7	0,5	1,0	1,7	1,0	1,5

Brick type: Hollow clay brick for ceiling

Table C65: Description of brick

Brick type		Ds-1,0	
Bulk density	$\rho \geq$ [kg/dm³]	1,0	
Strenght		class R2	
Code		EN 15037-3	
Producer		Fiedler Marktredwitz (D)	
Brick dimensions	[mm]	510 x 250 x 180	Drawing of the brick
Min. ceiling thickness	$h_{min} \geq$ [mm]	≥ 180	see **Table B4**



1 Single fastening

Maximum one anchor per ceiling brick

Table C66: Installation parameter for all anchor combinations (see Table B3)

Anchor type	HAS-U M6 with HIT-SC 12x85
Edge distance $c_{min} = c_{cr}$ [mm]	100 from support
Spacing Ac $s_{min\,II}$ [mm]	510
$s_{min\,\perp} = s_{cr}$ [mm]	250

Table C67: Group factor

Group factor $\alpha_{g,N}$ [-]	1

Table C68: Characteristic tension resistance for all anchor combinations (see Table B3)

Use category			**w/w**		**d/d**	
Service temperature range			**Ta**	**Tb**	**Ta**	**Tb**
Anchor type and size	h_{ef} [mm]	Console load capacity [kN]	$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]			
All anchor	≥ 80	3	1,5	1,5	1,5	1,5

Table C69: Displacements

h_{ef}	N	δ_{N0}	$\delta_{N\infty}$
[mm]	[kN]	[mm]	[mm]
≥ 80	0,4	0,15	0,30