

Approval body for construction products
and types of construction

Bautechnisches Prüfamt

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Article 29 of Regula-
tion (EU) No 305/2011
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(European Organi-
sation for Technical
Assessment)
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European Technical Assessment

ETA-18/1113
of 22 February 2019

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

292 Alfa Injection mortar for masonry

Product family
to which the construction product belongs

Metal Injection anchors for use in masonry

Manufacturer

Alfa GmbH
Ferdinand-Porsche-Straße 10
73479 Ellwangen
DEUTSCHLAND

Manufacturing plant

Werk 1,D und Werk 2, D

This European Technical Assessment
contains

61 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

EAD 330076-00-0604

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Specific Part

1 Technical description of the product

The 292 Alfa Injection mortar for masonry is a bonded anchor (injection type) consisting of a mortar cartridge with injection mortar 292 Alfa, a perforated sleeve and an anchor rod with hexagon nut and washer. The steel elements are made of zinc coated steel or stainless steel.

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

The product description is given in Annex A.

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

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

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the anchor 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 values for resistance	See Annexes C 1 to C 45
Displacements	See Annex C 5 to C 45

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1

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 330076-00-0604 the applicable European legal act is: [97/177/EC].

The system to be applied is: 1

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

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

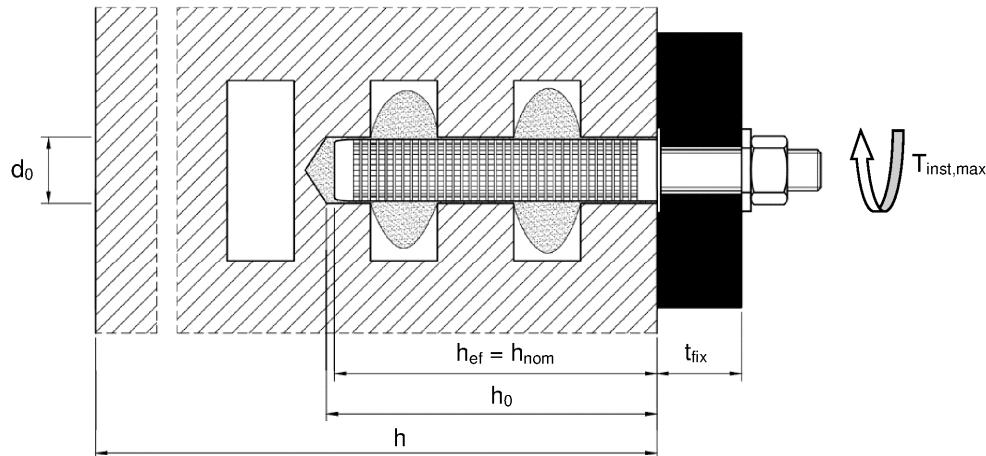
Issued in Berlin on 22 February 2019 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow
Head of Department

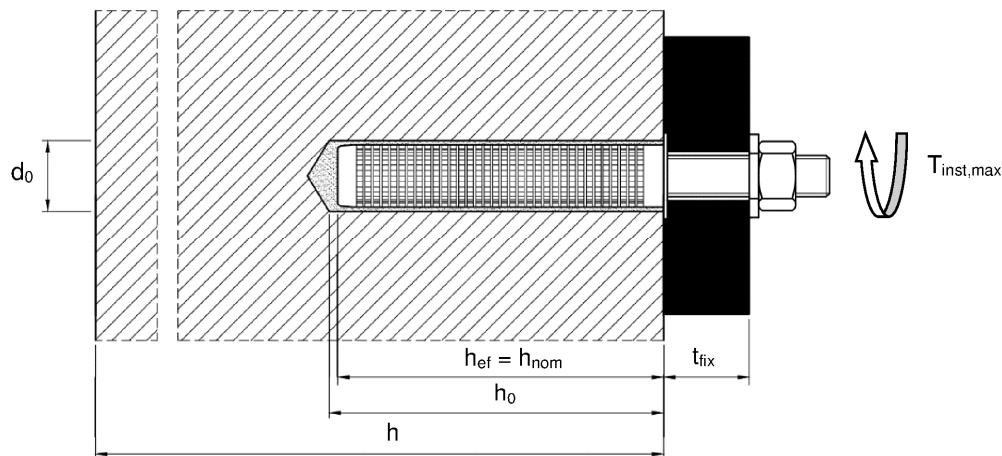
beglaubigt:
Baderschneider

English translation prepared by DIBt

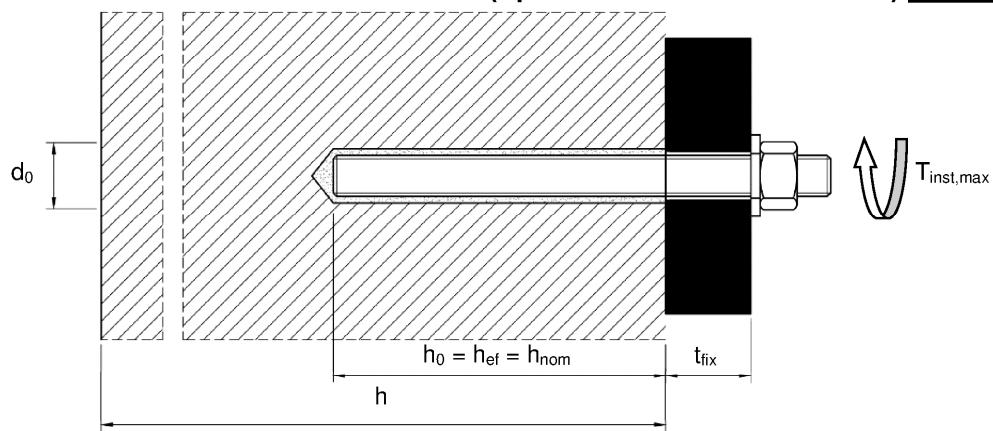
Installation in hollow brick: Threaded rod (optional with internal thread) with perforated sleeve



Installation in solid brick: Threaded rod (optional with internal thread) with perforated sleeve



Installation in solid brick: Threaded rod (optional with internal thread) without perforated sleeve



h_{ef} = effective anchorage depth
 h_{nom} = nominal embedment depth
 h_0 = bore hole depth
 d_0 = bore hole diameter

t_{fix} = thickness of fixture
 $T_{\text{inst,max}}$ = max. installation torque
 h = thickness of member

292 Alfa Injection mortar for masonry

Product description

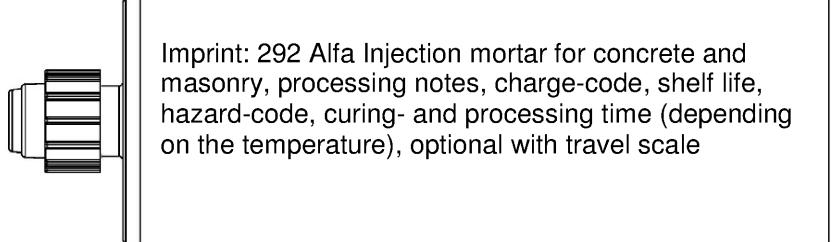
Installed condition

Annex A1

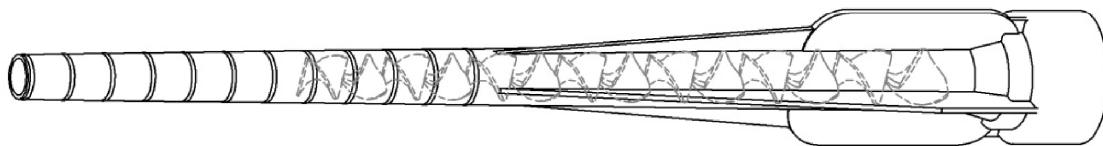
Cartridge 292 Alfa Injection mortar

280 ml cartridge (Type: coaxial)

Sealing cap



Static Mixer

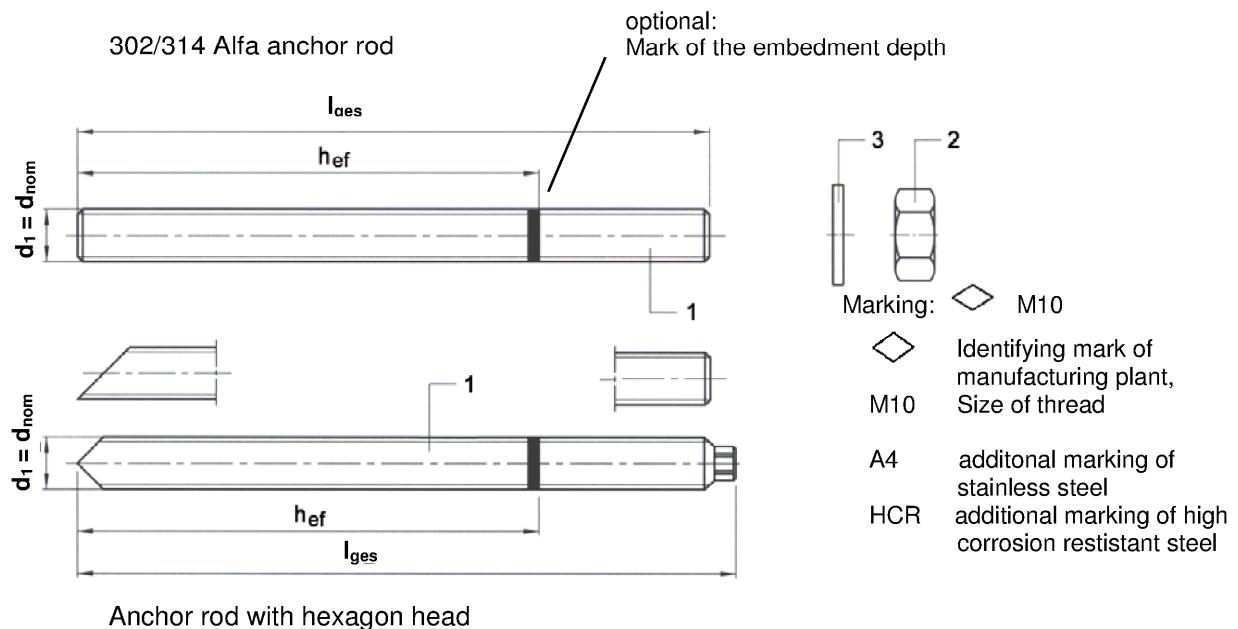


292 Alfa Injection mortar for masonry

Product description
Injection System

Annex A2

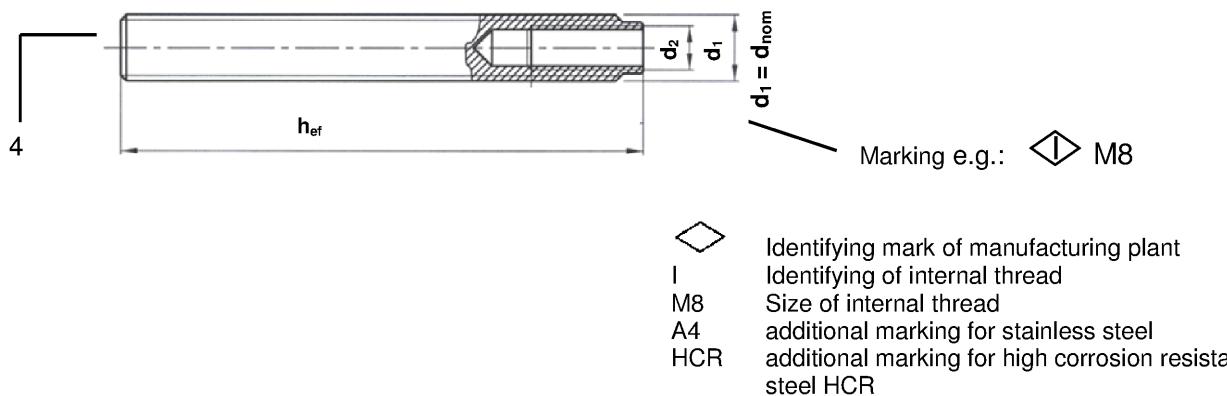
302/314 Alfa anchor rods or anchor rods with hexagon head M8, M10, M12, M16



Commercial standard threaded rod with:

- Materials, dimensions and mechanical properties see Table A1 and Table A2
- Inspection certificate 3.1 acc. to EN 10204:2004
- Marking of embedment depth

Threaded rod with internal thread IG M6, IG M8 and IG M10



292 Alfa Injection mortar for masonry

Product description

Threaded rods

Annex A3

Table A1: Materials

Part	Designation	Material
Steel, zinc plated ≥ 5 µm acc. to EN ISO 4042:1999 or Steel, hot-dip galvanized ≥ 40 µm acc. to EN ISO 1461:2009 and EN ISO 10684:2004+AC:2009		
1	Anchor rod	Steel, EN 10087:1998 or EN 10263:2001 Property class 4.6, 4.8, 5.6, 5.8, and 8.8 acc. EN 1993-1-8:2005+AC:2009
2	Hexagon nut	Steel acc. EN 10087:1998 or EN 10263:2001 Property class 4 (for class 4.6, 4.8 rod) Property class 5 (for class 5.6, 5.8 rod) Property class 8 (for class 8.8 rod) acc. to EN ISO 898-2:2012
3	Washer, EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000, or EN ISO 7094:2000	Steel, zinc plated or hot-dip galvanized
4	Threaded rod with internal thread	Steel, zinc plated Property class 5.6, 5.8 and 8.8 acc. to EN ISO 898-1:2013
Stainless steel		
1	Anchor rod	Material 1.4401 / 1.4404 / 1.4571 / 1.4362, EN 10088-1:2014, Property class 70, EN ISO 3506-1:2009 Property class 80, EN ISO 3506-1:2009
2	Hexagon nut	Material 1.4401 / 1.4404 / 1.4571 / 1.4362, EN 10088-1:2014, Property class 70 (for class 70 rod), EN ISO 3506-2:2009 Property class 80 (for class 80 rod), EN ISO 3506-2:2009
3	Washer, EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000, or EN ISO 7094:2000	Material 1.4401 / 1.4404 / 1.4571 / 1.4362 acc. to EN 10088-1:2014
4	Threaded rod with internal thread	Material 1.4401 / 1.4404 / 1.4571 / 1.4362 EN 10088-1:2014, Property class 70 acc. to EN ISO 3506-1:2009
High corrosion resistant steel (HCR)		
1	Anchor rod	Material 1.4529 / 1.4565, EN 10088-1:2014, Property class 70, acc. to EN ISO 3506-1:2009 Property class 80, acc. to EN ISO 3506-1:2009
2	Hexagon nut	Material 1.4529 / 1.4565, EN 10088-1:2014, Property class 70 (for class 70 rod) Property class 80 (for class 80 rod) acc. to EN ISO 3506-2:2009
3	Washer, EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000, or EN ISO 7094:2000	Material 1.4529 / 1.4565 acc. to EN 10088-1:2014
4	Threaded rod with internal thread	Material 1.4529 / 1.4565 EN 10088-1:2014, Property class 70 acc. to. EN ISO 3506-1:2009
Perforated sleeve		Material: Polypropylene

292 Alfa Injection mortar for masonry

Product description

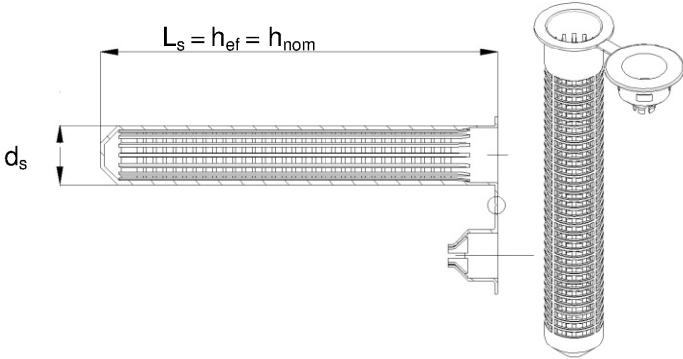
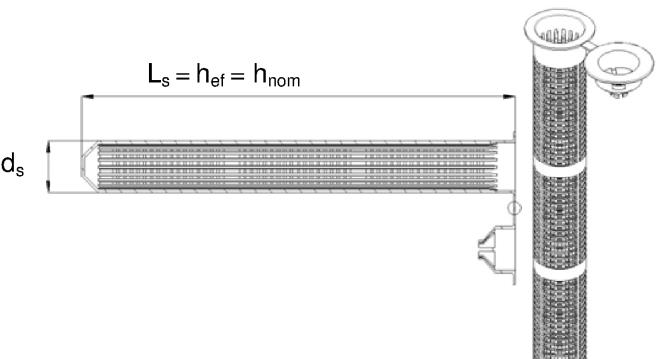
Materials

Annex A4

Table A2: Sizes of threaded rods

Type	Size	Diameter		Min. screw-in depth	Thread length (Internal thread)	Total length
		$d_1 = d_{\text{nom}}$	d_2			
		[mm]	[mm]	$L_{IG,\min}$	L_{IG}	[mm]
Threaded rods						
302/314 Alfa anchor rod and anchor rod with hexagon head	M8	8	-	-	-	$h_{\text{ef}} + t_{\text{fix}} + 9,5$
	M10	10	-	-	-	$h_{\text{ef}} + t_{\text{fix}} + 11,5$
	M12	12	-	-	-	$h_{\text{ef}} + t_{\text{fix}} + 17,5$
	M16	16	-	-	-	$h_{\text{ef}} + t_{\text{fix}} + 20,0$
Threaded rods with internal thread and metric external thread						
IG	M6	10	6	8	20	with sleeve: $h_{\text{ef}} - 5 \text{ mm}$
	M8	12	8	8	20	
	M10	16	10	10	25	without sleeve: h_{ef}

Table A3: Sizes of sleeves

Type	Size	$d_s = d_{\text{nom}}$	$L_s = h_{\text{ef}} = h_{\text{nom}}$
		[mm]	[mm]
	349 Alfa sleeves 12x80	12	80
	349 Alfa sleeves 16x85	16	85
	349 Alfa sleeves 20x85	20	
	349 Alfa sleeves 16x130	16	130
	349 Alfa sleeves 20x130	20	
	349 Alfa sleeves 20x200	20	200

292 Alfa Injection mortar for masonry

Product description

Sizes of threaded rods and sleeves

Annex A5

Specifications of intended use

Anchors subject to:

- Static and quasi-static loads

Base material:

- Autoclaved Aerated Concrete (use category d) according to Annex B2
- Solid brick masonry (use category b), according to Annex B2.
- Hollow brick masonry (use category c), according to Annex B2 and B3.
- Mortar strength class of the masonry M 2,5 at minimum according to EN 998-2:2010.
- For other bricks in solid masonry and in hollow or perforated masonry, the characteristic resistance of the anchor may be determined by job site tests according TR 053 (Recommendations for job site tests of metal injection anchors for use in masonry) under consideration of the β factor according to Annex C1, Table C1

Note: The characteristic resistance for solid bricks and autoclaved aerated concrete are also valid for larger brick sizes and larger compressive strength of the masonry unit.

Temperature range:

- T_a : - 40°C to +40°C (max. short term temperature +40°C and max. long term temperature +24°C)
- T_b : - 40°C to +80°C (max. short term temperature +80°C and max. long term temperature +50°C)
- T_c : - 40°C to +120°C (max. short term temperature +120°C and max. long term temperature +72°C)

Use conditions (Environmental conditions):

- Dry and wet structure (regarding injection mortar).
- Structures subject to dry internal conditions (zinc coated steel, stainless steel or high corrosion resistant steel).
- Structures subject to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal condition, if no particular aggressive conditions exist (stainless steel or high corrosion resistant steel).
- Structures subject to external atmospheric exposure and to permanently damp internal condition, if other particular aggressive conditions exist (high corrosion resistant steel).

Note: Particular aggressive conditions are e.g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with extreme chemical pollution (e.g. in desulphurization plants or road tunnels where de-icing materials are used).

Use categories in respect of installation and use:

- Category d/d: Installation and use in dry masonry
- Category w/d: Installation in wet masonry and use in dry masonry
- Category w/w: Installation and use in dry or wet masonry

Design:

- Verifiable calculation notes and drawings are prepared taking account the relevant masonry in the region of the anchorage, the loads to be transmitted and their transmission to the supports of the structure. The position of the anchor is indicated on the design drawings.
- The anchorages are designed in accordance with Technical Report TR 054, Design Method A under the responsibility of an engineer experienced in anchorages and masonry work.

Characteristic values	$N_{Rk,s}$ $V_{Rk,s}$	$N_{Rk,p} = N_{Rk,b}$ $V_{Rk,b}$ and $V_{Rk,c}$	$N_{Rk,pb}$ $V_{Rk,pb}$
Determination acc. to	Annex C2	Annex C4 to C45	TR 054

- For application with sleeve with drill bit size \leq 15mm installed in joints not filled with mortar:
 $N_{Rk,p,j} = 0,18 * N_{Rk,p}$ and $N_{Rk,b,j} = 0,18 * N_{Rk,b}$ ($N_{Rk,p} = N_{Rk,b}$ see Annex C4 to C45)
 $V_{Rk,c,j} = 0,15 * V_{Rk,c}$ and $V_{Rk,b,j} = 0,15 * V_{Rk,b}$ ($V_{Rk,b}$ and $V_{Rk,c}$ see Annex C4 to C45)

- Application without sleeve installed in joints not filled with mortar is not allowed.

Installation:

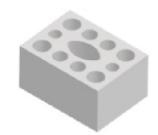
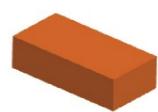
- Dry or wet structures
- Drill method acc. to Annex C4 to C45.
- Anchor Installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- When using anchor rods with internal thread (IG) fastening screws or threaded rods (incl. nut and washer) must comply with the appropriate material and property class of the Internal threaded rod.

292 Alfa Injection mortar for masonry

Intended Use
Specifications

Annex B1

Table B1: Overview brick types and properties with corresponding fastening elements (Anchor and 349 Alfa Sleeve)

Brick-No.	Brick type	Picture	Brick size length width height	Compressive strength	Bulk density	349 Alfa Sleeve - Anchor type	Annex
			[mm]	[N/mm ²]	[kg/dm ³]		
Autoclaved aerated concrete units according EN 771-4							
1	Autoclaved aerated concrete AAC6		499 240 249	6	0,6	M8/M10/M12/M16 IG-M6/IG-M8/IG-M10	C4 — C5
Calcium silicate masonry units according EN 771-2							
2	Calcium silicate solid brick KS-NF		240 115 71	10 20 27	2,0	M8/M10/M12/M16/IG-M6/IG-M8/IG-M10 349 12x80 – M8 349 16x85 – M8/M10/IG-M6 349 16x130 – M8/M10/IG-M6 349 20x85 – M12/M16/IG-M8/IG-M10 349 20x130 – M12/M16/IG-M8/IG-M10 349 20x200 – M12/M16/IG-M8/IG-M10	C6 — C8
3	Calcium silicate hollow brick KSL-3DF		240 175 113	8 12 14	1,4	349 12x80 – M8 349 16x85 – M8/M10/IG-M6 349 16x130 – M8/M10/IG-M6 349 20x85 – M12/M16/IG-M8/IG-M10 349 20x130 – M12/M16/IG-M8/IG-M10 349 20x200 – M12/M16/IG-M8/IG-M10	C9 — C11
4	Calcium silicate hollow brick KSL-12DF		498 175 238	10 12 16	1,4	349 12x80 – M8 349 16x85 – M8/M10/IG-M6 349 16x130 – M8/M10/IG-M6 349 20x85 – M12/M16/IG-M8/IG-M10 349 20x130 – M12/M16/IG-M8/IG-M10	C12 — C14
Clay masonry units according EN 771-1							
5	Clay solid brick Mz – DF		240 115 55	10 20 28	1,6	M8/M10/M12/M16/IG-M6/IG-M8/IG-M10 349 12x80 – M8 349 16x85 – M8/M10/IG-M6 349 16x130 – M8/M10/IG-M6 349 20x85 – M12/M16/IG-M8/IG-M10 349 20x130 – M12/M16/IG-M8/IG-M10 349 20x200 – M12/M16/IG-M8/IG-M10	C15 — C17
6	Clay hollow brick HLz-16DF		497 240 238	6 8 12 14	0,8	349 12x80 – M8 349 16x85 – M8/M10/IG-M6 349 16x130 – M8/M10/IG-M6 349 20x85 – M12/M16/IG-M8/IG-M10 349 20x130 – M12/M16/IG-M8/IG-M10 349 20x200 – M12/M16/IG-M8/IG-M10	C18 — C20
7	Clay hollow brick Porotherm Homebric		500 200 299	4 6 10	0,7	349 12x80 – M8 349 16x85 – M8/M10/IG-M6 349 16x130 – M8/M10/IG-M6 349 20x85 – M12/M16/IG-M8/IG-M10 349 20x130 – M12/M16/IG-M8/IG-M10	C21 — C23

292 Alfa Injection mortar for masonry

Intended use

Brick types and properties with corresponding fastening elements

Annex B2

Table B1: Overview brick types and properties with corresponding fastening elements (Anchor and 349 Alfa Sleeve) – continue

Brick-No.	Brick type	Picture	Brick size length width height	Compressive strength	Bulk density	349 Alfa Sleeve - Anchor type	Annex
			[mm]	[N/mm ²]	[kg/dm ³]		
Clay masonry units according EN 771-1							
8	Clay hollow brick BGV Thermo		500 200 314	4 6 10	0,6	349 12x80 – M8 349 16x85 – M8/M10/IG-M6 349 16x130 – M8/M10/IG-M6 349 20x85 – M12/M16/IG-M8/IG-M10 349 20x130 – M12/M16/IG-M8/IG-M10	C24 - C26
9	Clay hollow brick Calibric R+		500 200 314	6 9 12	0,6	349 12x80 – M8 349 16x85 – M8/M10/IG-M6 349 16x130 – M8/M10/IG-M6 349 20x85 – M12/M16/IG-M8/IG-M10 349 20x130 – M12/M16/IG-M8/IG-M10	C27 - C29
10	Clay hollow brick Urbanbrick		560 200 274	6 9 12	0,7	349 12x80 – M8 349 16x85 – M8/M10/IG-M6 349 16x130 – M8/M10/IG-M6 349 20x85 – M12/M16/IG-M8/IG-M10 349 20x130 – M12/M16/IG-M8/IG-M10	C30 - C32
11	Clay hollow brick Brique creuse C40		500 200 200	4 8 12	0,7	349 12x80 – M8 349 16x85 – M8/M10/IG-M6 349 16x130 – M8/M10/IG-M6 349 20x85 – M12/M16/IG-M8/IG-M10 349 20x130 – M12/M16/IG-M8/IG-M10	C33 - C35
12	Clay hollow brick Blocchi Leggeri		250 120 250	4 6 8 12	0,6	349 12x80 – M8 349 16x85 – M8/M10/IG-M6 349 16x130 – M8/M10/IG-M6 349 20x85 – M12/M16/IG-M8/IG-M10 349 20x130 – M12/M16/IG-M8/IG-M10 349 20x200 – M12/M16/IG-M8/IG-M10	C36 - C38
13	Clay hollow brick Doppio Uni		250 120 120	10 16 20 28	0,9	349 12x80 – M8 349 16x85 – M8/M10/IG-M6 349 16x130 – M8/M10/IG-M6 349 20x85 – M12/M16/IG-M8/IG-M10 349 20x130 – M12/M16/IG-M8/IG-M10 349 20x200 – M12/M16/IG-M8/IG-M10	C39 - C41
Lightweight concrete according EN 771-3							
14	Hollow lightweight concrete Bloc creux B40		494 200 190	4	0,8	349 12x80 – M8 349 16x85 – M8/M10/IG-M6 349 16x130 – M8/M10/IG-M6 349 20x85 – M12/M16/IG-M8/IG-M10 349 20x130 – M12/M16/IG-M8/IG-M10	C42 - C43
15	Solid lightweight concrete		300 123 248	2	0,6	M8/M10/M12/M16/IG-M6/IG-M8/IG-M10 349 12x80 – M8 349 16x85 – M8/M10/IG-M6 349 16x130 – M8/M10/IG-M6 349 20x85 – M12/M16/IG-M8/IG-M10 349 20x130 – M12/M16/IG-M8/IG-M10 349 20x200 – M12/M16/IG-M8/IG-M10	C44 - C45

292 Alfa Injection mortar for masonry

Intended use

Brick types and properties with corresponding fastening elements

Annex B3

Installation: Steel brush



Table B2: Installation parameters in autoclaved aerated concrete AAC and solid masonry (without sleeve)

Anchor type and size		302/314 Alfa anchor rod M8 and anchor rod with hexagon head M8	302/314 Alfa anchor rod M10 and anchor rod with hexagon head M10	IG M6	302/314 Alfa anchor rod M12 and anchor rod with hexagon head M12	IG M8	302/314 Alfa anchor rod M16 and anchor rod with hexagon head M16	IG M10
Nominal drill hole diameter	d_0 [mm]	10	12		14		18	
Drill hole depth	h_0 [mm]	80	90		100		100	
Effective anchorage depth	h_{ef} [mm]	80	90		100		100	
Minimum wall thickness	h_{min} [mm]			$h_{ef} + 30$				
Diameter of clearance hole in the fixture	$d_f \leq$ [mm]	9	12	7	14	9	18	12
Diameter of steel brush	d_b [mm]	12	14		16		20	
Min. diameter of steel brush	$d_{b,min}$ [mm]	10,5	12,5		14,5		18,5	
Max. installation torque moment	$T_{inst,max}$ [Nm]			2 (14 for Mz DF)				

Table B3: Installation parameters in solid and hollow masonry (with sleeve)

Anchor size		M8	M8 / M10 / IG-M6		M12 / M16 IG-M8 IG-M10		
349 Alfa Sleeve		12x80	16x85	16x130	20x85	20x130	20x200
Nominal drill hole diameter	d_0 [mm]	12	16		20		
Drill hole depth	h_0 [mm]	85	90	135	90	135	205
Effective anchorage depth	h_{ef} [mm]	80	85	130	85	130	200
Minimum wall thickness	h_{min} [mm]	115	115	175	115	175	240
Diameter of clearance hole in the fixture	$d_f \leq$ [mm]	9	7 (IG-M6) 9 (M8) 12 (M10)		9 (IG-M8) 12 (IG-M10) 14 (M12) 18 (M16)		
Diameter of steel brush	d_b [mm]	14	18		22		
Min. diameter of steel brush	$d_{b,min}$ [mm]	12,5	16,5		20,5		
Max. installation torque moment	$T_{inst,max}$ [Nm]		2				

292 Alfa Injection mortar for masonry

Intended use

Cleaning brush and installation parameters

Annex B4

**Table B4: Maximum working time and minimum curing time
292 Alfa Injectionmortar**

Temperature in the base material	Temperature of cartridge	Working time	Minimum curing time in dry base material ¹⁾
0 °C to + 4 °C	+ 5°C to + 40°C	45 min	7 h
+ 5 °C to + 9 °C		25 min	2 h
+ 10 °C to + 19 °C		15 min	80 min
+ 20 °C to + 29 °C		6 min	45 min
+ 30°C to + 34 °C		4 min	25 min
+ 35°C to + 39 °C		2 min	20 min
+ 40 °C		1,5 min	15 min

¹⁾ In wet base material the curing time **must** be doubled.

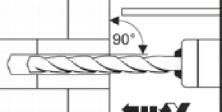
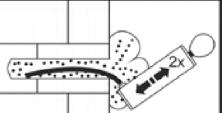
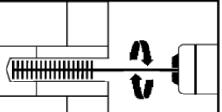
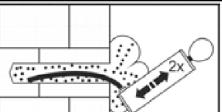
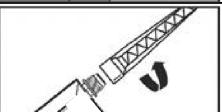
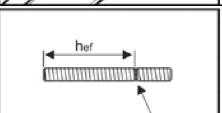
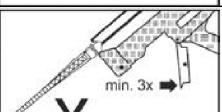
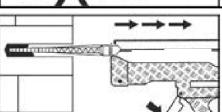
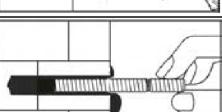
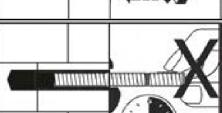
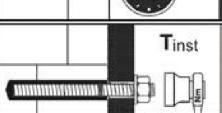
292 Alfa Injection mortar for masonry

Intended Use

Working and curing time

Annex B5

Installation Instruction - Solid masonry without sleeve

1.		Drill hole perpendicular to the surface of base material with drill method according to Annex C4-C45, with nominal drill hole diameter and bore hole depth according to the size and embedment depth required by the selected anchor. In case of aborted drill hole the hole shall be filled with mortar.
2a.		Drill hole must be cleaned prior to installation of the anchor. Blow out from the bottom of the bore hole two times.
2b.		Attach the appropriate sized brush (acc.to Annex B4) to a drilling machine or a battery screwdriver, brush the hole clean two times.
2c.		Finally blow out the hole again two times.
3.		Remove the cap and attach the supplied static-mixing nozzle to the cartridge and load the cartridge into the correct dispensing tool. In case of a foil tube cartridge, cut off the clip before use. For every working interruption longer than the recommended working time (Table B4) as well as for new cartridges, a new static-mixer shall be used.
4.		The position of the embedment depth shall be marked on the threaded rod. The anchor rod shall be free of dirt, grease, oil or other foreign material.
5.		Initial adhesive is not suitable for fixing the anchor. Prior to dispensing into the anchor hole, squeeze out separately a minimum of three full strokes, for foil tube cartridges six full strokes and discard non-uniformly mixed adhesive components until the mortar shows a consistent grey color.
6.		Starting from the bottom or back of the cleaned anchor hole, fill up the hole to min two-thirds with adhesive. Slowly withdraw the static mixing nozzle will avoid creating air pockets. Observe the working times given in Table B4.
7.		Push the threaded rod into the anchor hole while turning slightly to ensure positive distribution of the adhesive until the embedment depth is reached. Be sure that the annular gap is fully filled with mortar. If no excess mortar is visible at the top of the hole, the application has to be renewed.
8.		Allow the adhesive to cure to the specified curing time given in Table B4. Do not move or load the anchor until it is fully cured. After curing time remove access mortar.
9.		After full curing, the fixture can be installed with up to the max. installation torque acc. to Table B2 or B3 with calibrated torque wrench.

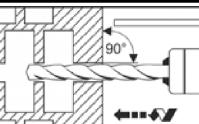
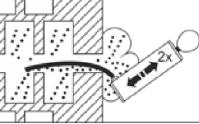
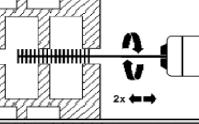
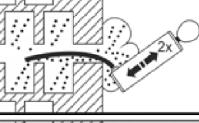
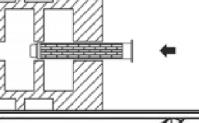
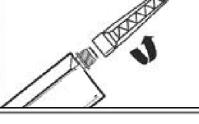
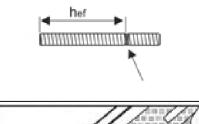
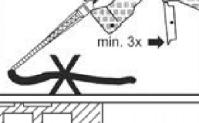
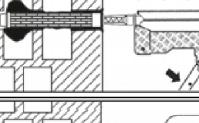
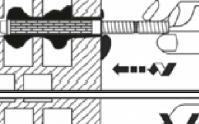
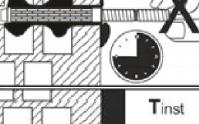
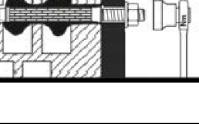
292 Alfa Injection mortar for masonry

Intended Use

Installation instructions (Solid masonry without sleeve)

Annex B6

Installation Instructions - Solid or hollow masonry - with sleeve

1.		Drill hole perpendicular to the surface of base material with drill method according to Annex C4-C45, with nominal drill hole diameter and bore hole depth according to the size and embedment depth required by the selected anchor. In case of aborted drill hole the drill hole shall be filled with mortar.
2a.		Drill hole must be cleaned prior to installation of the anchor. Blow out from the bottom of the bore hole two times.
2b.		Attach the appropriate sized brush (acc.to Annex B4) to a drilling machine or a battery screwdriver, brush the hole clean two times.
2c.		Finally blow out the hole again two times.
3.		Insert the perforated sleeve flush with the surface of the masonry or plaster. Only use sleeves that have the right length. Never cut the sleeve.
4.		Remove the cap and attach the supplied static-mixing nozzle to the cartridge and load the cartridge into the correct dispensing tool. In case of a foil tube cartridge, cut off the clip before use. For every working interruption longer than the recommended working time (Table B4) as well as for new cartridges, a new static-mixer shall be used.
5.		The position of the embedment depth shall be marked on the threaded rod. The anchor rod shall be free of dirt, grease, oil or other foreign material.
6.		Initial adhesive is not suitable for fixing the anchor. Prior to dispensing into the anchor hole, squeeze out separately a minimum of three full strokes, for foil tube cartridges six full strokes and discard non-uniformly mixed adhesive components until the mortar shows a consistent grey colour.
7.		Starting from the bottom or back fill the sleeve with adhesive. For embedment depth equal to or larger than 130 mm an extension nozzle shall be used. For quantity of mortar attend cartridges label installation instructions. Observe the working times given in Table B4.
8.		Push the threaded rod into the anchor hole while turning slightly to ensure positive distribution of the adhesive until the embedment depth is reached.
9.		Allow the adhesive to cure to the specified curing time given in Table B4. Do not move or load the anchor until it is fully cured. After curing time remove access mortar.
10.		After full curing, the fixture can be installed with up to the max. installation torque acc. to Table B2 and B3 with calibrated torque wrench.

292 Alfa Injection mortar for masonry

Intended Use

Installation Instruction (Solid or hollow masonry - with sleeve)

Annex B7

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

Brick-No. and abbreviation	Installation & Use category	β-Factor					
		Ta: 40°C / 24°C		Tb: 80°C / 50°C		Tc: 120°C / 72°C	
		d/d	w/d w/w	d/d	w/d w/w	d/d	w/d w/w
1 AAC6	All sizes	0,95	0,86	0,81	0,73	0,81	0,73
2 KS-NF	d ₀ ≤ 14 mm	0,93	0,80	0,87	0,74	0,65	0,56
	d ₀ ≥ 16 mm	0,93	0,93	0,87	0,87	0,65	0,65
3 KSL-3DF	d ₀ ≤ 12 mm	0,93	0,80	0,87	0,74	0,65	0,56
	d ₀ ≥ 16 mm	0,93	0,93	0,87	0,87	0,65	0,65
4 KSL-12DF	d ₀ ≤ 12 mm	0,93	0,80	0,87	0,74	0,65	0,56
	d ₀ ≥ 16 mm	0,93	0,93	0,87	0,87	0,65	0,65
5 MZ-DF	all sizes						
6 Hz-16DF							
7 Porotherm Homebric							
8 BGV-Thermo							
9 Calibric R+		0,86	0,86	0,86	0,86	0,73	0,73
10 Urbanbric							
11 Brique creuse C40							
12 Blocchi Leggeri							
13 Doppio Uni							
14 Bloc creux B40	d ₀ ≤ 12 mm	0,93	0,80	0,87	0,74	0,65	0,56
	d ₀ ≥ 16 mm	0,93	0,93	0,87	0,87	0,65	0,65
15 Solid lightweight concrete	d ₀ ≤ 12 mm	0,93	0,80	0,87	0,74	0,65	0,56
	d ₀ ≥ 16 mm	0,93	0,93	0,87	0,87	0,65	0,65

292 Alfa Injection mortar for masonry

Performances

β - factors for job site testing under tension load

Annex C1

English translation prepared by DIbt

Table C2: Characteristic steel resistance under tension and shear load

Anchor type	N _{Rk,s} [kN]	Internally threaded anchor rod IG			302/314 Alfa anchor rod and anchor rod with hexagon head			
		M6	M8	M10	M8	M10	M12	M16
Characteristic tension resistance								
Steel, property class 4.6	N _{Rk,s} [kN]	-	-	-	15	23	34	63
	γ _{Ms} [-]		-			2,0		
Steel, property class 4.8	N _{Rk,s} [kN]	-	-	-	15	23	34	63
	γ _{Ms} [-]		-			1,5		
Steel, property class 5.6	N _{Rk,s} [kN]	10	18	29	18	29	42	79
	γ _{Ms} [-]		2,0			2,0		
Steel, property class 5.8	N _{Rk,s} [kN]	10	17	29	18	29	42	79
	γ _{Ms} [-]		1,5			1,5		
Steel, property class 8.8	N _{Rk,s} [kN]	16	27	46	29	46	67	126
	γ _{Ms} [-]		1,5			1,5		
Stainless steel A4 / HCR, property class 70	N _{Rk,s} [kN]	14	26	41	26	41	59	110
	γ _{Ms} [-]		1,87			1,87		
Stainless steel A4 / HCR, property class 80	N _{Rk,s} [kN]	16	29	46	29	46	67	126
	γ _{Ms} [-]		1,6			1,6		
Characteristic shear resistance								
Steel, property class 4.6	V _{Rk,s} [kN]	-	-	-	7	12	17	31
	γ _{Ms} [-]		-			1,67		
Steel, property class 4.8	V _{Rk,s} [kN]	-	-	-	7	12	17	31
	γ _{Ms} [-]		-			1,25		
Steel, property class 5.6	V _{Rk,s} [kN]	5	9	15	9	15	21	39
	γ _{Ms} [-]		1,67			1,67		
Steel, property class 5.8	V _{Rk,s} [kN]	5	9	15	9	15	21	39
	γ _{Ms} [-]		1,25			1,25		
Steel, property class 8.8	V _{Rk,s} [kN]	8	14	23	15	23	34	63
	γ _{Ms} [-]		1,25			1,25		
Stainless steel A4 / HCR, property class 70	V _{Rk,s} [kN]	7	13	20	13	20	30	55
	γ _{Ms} [-]		1,56			1,56		
Stainless steel A4 / HCR, property class 80	V _{Rk,s} [kN]	8	15	23	15	23	34	63
	γ _{Ms} [-]		1,33			1,33		
Characteristic bending moment								
Steel, property class 4.6	M _{Rk,s} [Nm]	-	-	-	15	30	52	133
	γ _{Ms} [-]		-			1,67		
Steel, property class 4.8	M _{Rk,s} [Nm]	-	-	-	15	30	52	133
	γ _{Ms} [-]		-			1,25		
Steel, property class 5.6	M _{Rk,s} [Nm]	8	19	37	19	37	66	167
	γ _{Ms} [-]		1,67			1,67		
Steel, property class 5.8	M _{Rk,s} [Nm]	8	19	37	19	37	66	167
	γ _{Ms} [-]		1,25			1,25		
Steel, property class 8.8	M _{Rk,s} [Nm]	12	30	60	30	60	105	266
	γ _{Ms} [-]		1,25			1,25		
Stainless steel A4 / HCR, property class 70	M _{Rk,s} [Nm]	11	26	52	26	52	92	233
	γ _{Ms} [-]		1,56			1,56		
Stainless steel A4 / HCR, property class 80	M _{Rk,s} [Nm]	12	30	60	30	60	105	266
	γ _{Ms} [-]		1,33			1,33		

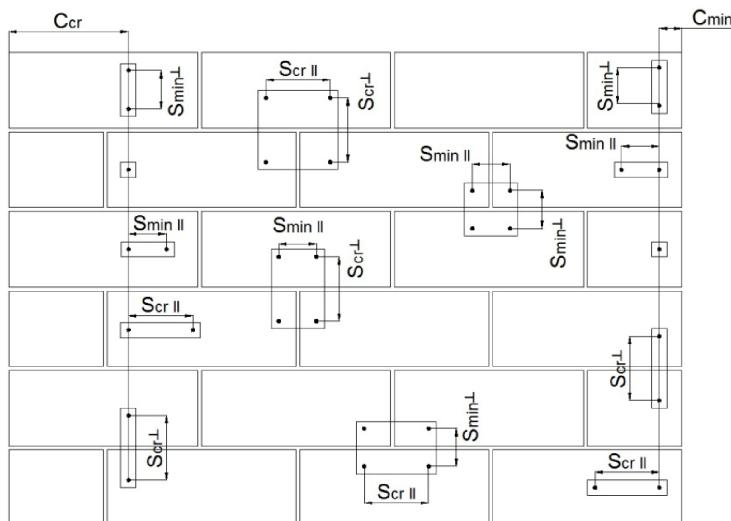
292 Alfa Injection mortar for masonry

Performances

Characteristic steel resistance under tension and shear load

Annex C2

Spacing and edge distance



C_{cr} = Characteristic edge distance

C_{min} = Minimum edge distance

S_{cr} = Characteristic spacing

S_{min} = Minimum spacing

$S_{cr,II}; (S_{min,II})$ = Characteristic (minimum) spacing for anchors placed parallel to bed joint

$S_{cr,\perp}; (S_{min,\perp})$ = Characteristic (minimum) spacing for anchors placed perpendicular to bed joint

Load direction Anchor position	Tension load	Shear load parallel to free edge	Shear load perpendicular to free edge
Anchors places parallel to bed joint $s_{cr,II}; (s_{min,II})$			
Anchors places perpendicular to bed joint $s_{cr,\perp}; (s_{min,\perp})$			

$\alpha_{g,N,II}$ = Group factor in case of tension load for anchors placed parallel to the bed joint

$\alpha_{g,V,II}$ = Group factor in case of shear load for anchors placed parallel to the bed joint

$\alpha_{g,N,\perp}$ = Group factor in case of tension load for anchors placed perpendicular to the bed joint

$\alpha_{g,V,\perp}$ = Group factor in case of shear load for anchors placed perpendicular to the bed joint

Group of 2 anchors:

$$N_{Rk}^g = \alpha_{g,N} * N_{Rk}$$

and

$$V_{Rk}^g = \alpha_{g,V} * V_{Rk}$$

Group of 4 anchors:

$$N_{Rk}^g = \alpha_{g,N,II} * \alpha_{g,N,\perp} * N_{Rk}$$

and

$$V_{Rk}^g = \alpha_{g,V,II} * \alpha_{g,V,\perp} * V_{Rk}$$

(N_{Rk} : $N_{Rk,b}$ or $N_{Rk,b,j}$ for c_{cr})

(V_{Rk} : $V_{Rk,c}$; $V_{Rk,c,j}$; $V_{Rk,b}$ or $V_{Rk,b,j}$ for c_{cr})

(with the relevant α_g)

292 Alfa Injection mortar for masonry

Performances

Edge distance and Spacing

Annex C3

Brick type: Autoclaved Aerated Concrete – AAC6

Table C3: Description of the brick

Brick type	Autoclaved Aerated Concrete AAC6	
Bulk density ρ [kg/dm ³]	0,6	
Compressive strength $f_b \geq$ [N/mm ²]	6	
Code	EN 771-4	
Producer (country code)	e.g. Porit (DE)	
Brick dimensions [mm]	499 x 240 x 249	
Drilling method	Rotary	



Table C4: Spacing and edge distance

Anchor size	All sizes		
Edge distance c_{cr} [mm]		1,5*h _{ef}	
Minimum edge distance $c_{min,N}$ [mm]		75	
$c_{min,V,II}$ ($c_{min,V,\perp}$) ¹⁾ [mm]		75 (1,5*h _{ef})	
Spacing s_{cr} [mm]		3*h _{ef}	
Minimum spacing s_{min} [mm]		100	

¹⁾ $c_{min,V,II}$ for shear loading parallel to the free edge; $c_{min,V,\perp}$ for shear loading perpendicular free edge

Table C5: Group factor for anchor group in case of tension loading

Configuration	with c [mm] \geq	with s [mm] \geq			
II: anchors placed parallel to horizontal joint		125 (120 for M8)	100	$\alpha_{g,N,II}$	1,8
		1,5*h _{ef}	3*h _{ef}		2,0
\perp : anchors placed perpendicular to horizontal joint		75	100	$\alpha_{g,N,\perp}$	1,4
		1,5*h _{ef}	3*h _{ef}		2,0

Table C6: Group factor for anchor group in case of shear loading parallel to free edge

Configuration	with c [mm] \geq	with s [mm] \geq			
II: anchors placed parallel to horizontal joint		75	100	$\alpha_{g,V,II}$	1,2
		1,5*h _{ef}	3*h _{ef}		2,0
\perp : anchors placed perpendicular to horizontal joint		1,5*h _{ef}	3*h _{ef}	$\alpha_{g,V,\perp}$	2,0

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Performances - Autoclaved Aerated Concrete - AAC6

Description of the brick, Spacing and edge distance, Group factors

Annex C4

Brick type: Autoclaved Aerated Concrete – AAC6

Table C7: Group factor for anchor group in case of shear loading perpendicular to free edge

Configuration	with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		1,5*hef	3,0*hef	$\alpha_{g,V,II}$	2,0
⊥: anchors placed perpendicular to horizontal joint		1,5*hef	3,0*hef	$\alpha_{g,V,\perp}$	2,0

Table C8: Characteristic values of resistance under tension and shear loads

Anchor size	Effective anchorage depth	Characteristic resistance						All temperature ranges			
		d/d			w/w w/d						
		40°C/24°C	80°C/50°C	120°C/72°C	40°C/24°C	80°C/50°C	120°C/72°C				
	h _{ef}	$N_{Rk,b} = N_{Rk,p}$ ¹⁾			$N_{Rk,b} = N_{Rk,p}$ ¹⁾			$V_{Rk,b}$ ²⁾³⁾			
	[mm]	[kN]									
Compressive strength $f_b \geq 6 \text{ N/mm}^2$											
M8	80	2,5 (2,0)	2,5 (1,5)	2,0 (1,2)	2,5 (1,5)	2,0 (1,5)	1,5 (1,2)	6,0			
M10/IG-M6	90	4,0 (2,5)	3,0 (2,0)	2,5 (1,5)	3,5 (2,5)	3,0 (2,0)	2,5 (1,5)	10,0			
M12/IG-M8	100	5,0 (3,5)	4,0 (3,0)	3,0 (2,5)	4,5 (3,0)	3,5 (2,5)	3,0 (2,5)	10,0			
M16/IG-M10	100	6,5 (4,5)	5,5 (3,5)	4,0 (3,0)	5,5 (4,0)	5,0 (3,5)	4,0 (3,0)	10,0			

¹⁾ Values are valid for c_{cr} , values in brackets are valid for single anchors with c_{min}

²⁾ For calculation of $V_{Rk,c}$ see Technical Report TR 054;

³⁾ The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply $V_{Rk,b}$ by 0,8

Table C9: Displacements

Anchor size	h _{ef}	N	δ_N / N	δ_{N0}	$\delta_{N\infty}$	V	δ_{v0}	$\delta_{v\infty}$
	[mm]	[kN]	[mm/kN]	[mm]	[mm]	[kN]	[mm]	[mm]
M8	80	0,9	0,18	0,16	0,32	1,3	0,8	1,20
M10/IG-M6	90	1,4		0,26	0,51	1,8	1,2	1,80
M12/IG-M8	100	1,8	0,08	0,14	0,29	2,1	1,4	2,10
M16/IG-M10	100	2,3		0,19	0,37	2,3	1,5	2,25

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Performances - Autoclaved Aerated Concrete – AAC6

Group factor, Characteristic values of resistance, Displacements

Annex C5

Brick type: Calcium silicate solid brick KS-NF

Table C10: Description of the brick

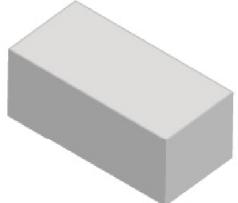
Brick type	Calcium silicate solid brick KS-NF			
Bulk density ρ [kg/dm ³]	2,0			
Compressive strength $f_b \geq$ [N/mm ²]	10, 20 or 27			
Code	EN 771-2			
Producer (country code)	e.g. Wemding (DE)			
Brick dimensions [mm]	240 x 115 x 71			
Drilling method	Hammer			

Table C11: Spacing and edge distance

Anchor size	All sizes		
Edge distance c_{cr} [mm]		1,5*h _{ef}	
Minimum edge distance c_{min} [mm]		60	
Spacing s_{cr} [mm]		3*h _{ef}	
Minimum spacing s_{min} [mm]		120	

Table C12: Group factor for anchor group in case of tension loading

Configuration	with c [mm] \geq	with s [mm] \geq			
II: anchors placed parallel to horizontal joint	60	120	$\alpha_{g,N,II}$	[-]	1,0
	140	120			1,5
	1,5*h _{ef}	3*h _{ef}			2,0
\perp : anchors placed perpendicular to horizontal joint	60	120	$\alpha_{g,N,\perp}$	[-]	0,5
	1,5*h _{ef}	120			1,0
	1,5*h _{ef}	3*h _{ef}			2,0

Table C13: Group factor for anchor group in case of shear loading parallel to free edge

Configuration	with c [mm] \geq	with s [mm] \geq			
II: anchors placed parallel to horizontal joint	60	120	$\alpha_{g,V,II}$	[-]	1,0
	115	120			1,7
	1,5*h _{ef}	3*h _{ef}			2,0
\perp : anchors placed perpendicular to horizontal joint	60	120	$\alpha_{g,V,\perp}$	[-]	1,0
	1,5*h _{ef}	120			1,0
	1,5*h _{ef}	3*h _{ef}			2,0

Table C14: Group factor for anchor group in case of shear loading perpendicular to free edge

Configuration	with c [mm] \geq	with s [mm] \geq			
II: anchors placed parallel to horizontal joint	60	120	$\alpha_{g,V,II}$	[-]	1,0
	1,5*h _{ef}	3*h _{ef}			2,0
\perp : anchors placed perpendicular to horizontal joint	60	120	$\alpha_{g,V,\perp}$	[-]	1,0
	1,5*h _{ef}	3*h _{ef}			2,0

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Performances - Calcium solid brick KS-NF
Description, Spacing and edge distance, Group factor

Annex C6

Brick type: Calcium silicate solid brick KS-NF

Table C15: Characteristic values of resistance under tension and shear loads

Anchor size	349 Alfa Sleeve	Effective anchorage depth	Characteristic resistance											
			Use category											
			d/d			w/d w/w			d/d w/d w/w					
			40°C/24°C	80°C/50°C	120°C/72°C	40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges					
$N_{Rk,b} = N_{Rk,p}$ ¹⁾			$N_{Rk,b} = N_{Rk,p}$ ¹⁾					$V_{Rk,b}$ ²⁾⁽³⁾						
[mm]			[kN]											
Compressive strength $f_b \geq 10 \text{ N/mm}^2$														
M8	-	80	4,5 (2,0)	4,5 (2,0)	3,0 (1,5)	3,5 (1,5)	3,5 (1,5)	2,5 (1,2)	2,5 (1,5)					
M10 / IG-M6	-	90							3,0 (2,0)					
M12 / IG-M8	-	100							2,5 (1,5)					
M16 / IG-M10	-	100	3,5 (1,5)	3,5 (1,5)	2,5 (1,2)	3,0 (1,5)	3,5 (1,5)	2,0 (0,9)	2,5 (1,5)					
M8	12x80	80	3,5 (1,5)	3,5 (1,5)	2,5 (1,2)	3,5 (1,5)	3,0 (1,5)	2,5 (1,2)	2,5 (1,5)					
M8 / M10/ IG-M6	16x85	85	3,5 (1,5)	3,0 (1,5)	2,0 (0,9)	3,5 (1,5)	3,0 (1,5)	2,5 (1,2)	2,5 (1,5)					
	16x130	130	3,5 (1,5)	3,0 (1,5)	2,0 (0,9)	3,5 (1,5)	3,0 (1,5)	2,5 (1,2)	2,5 (1,5)					
M12 / M16 / IG-M8 / IG-M10	20x85	85	3,0 (1,5)	2,5 (1,2)	2,0 (0,9)	3,0 (1,5)	2,5 (1,2)	2,0 (0,9)	2,5 (1,5)					
	20x130	130												
	20x200	200												
Compressive strength $f_b \geq 20 \text{ N/mm}^2$														
M8	-	80	6,0 (3,0)	5,5 (2,5)	4,0 (2,0)	5,0 (2,5)	5,0 (2,5)	3,5 (1,5)	4,0 (2,5)					
M10 / IG-M6	-	90							4,5 (2,5)					
M12/ IG-M8	-	100							4,0 (2,5)					
M16/ IG-M10	-	100	5,0 (2,5)	5,0 (2,5)	3,5 (1,5)	5,0 (2,5)	5,0 (2,5)	3,5 (1,5)	4,0 (2,5)					
M8	12x80	80	5,5 (2,5)	5,0 (2,5)	3,5 (1,5)	4,5 (2,0)	4,5 (2,0)	3,0 (1,5)	4,0 (2,5)					
M8 / M10/ IG-M6	16x85	85	5,0 (2,5)	4,5 (2,0)	3,5 (1,5)	5,0 (2,5)	4,5 (2,0)	3,5 (1,5)	4,0 (2,5)					
	16x130	130	5,0 (2,5)	4,5 (2,0)	3,5 (1,5)	5,0 (2,5)	4,5 (2,0)	3,5 (1,5)	4,0 (2,5)					
M12 / M16 / IG-M8 / IG-M10	20x85	85	4,0 (2,0)	4,0 (2,0)	3,0 (1,5)	4,0 (2,0)	4,0 (2,0)	3,0 (1,5)	4,0 (2,5)					
	20x130	130												
	20x200	200												

¹⁾ Values are valid for c_{cr} , values in brackets are valid for single anchors with c_{min}

²⁾ For c_{cr} calculation of $V_{Rk,c}$ see Technical Report TR 054; values in brackets $V_{Rk,c} = V_{Rk,b}$ for single anchors with c_{min}

³⁾ The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply $V_{Rk,b}$ by 0.8.

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Performances - Calcium solid brick KS-NF

Characteristic values of resistance

Annex C7

Brick type: Calcium silicate solid brick KS-NF

Table C16: Characteristic values of resistance under tension and shear loads (continue)

Anchor size	349 Alfa Sleeve	Effective anchorage depth	Characteristic resistance										
			Use category										
			d/d			w/d w/w			d/d w/d w/w				
			40°C/24°C	80°C/50°C	120°C/72°C	40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges				
			$N_{Rk,b} = N_{Rk,p}$ ¹⁾			$N_{Rk,b} = N_{Rk,p}$ ¹⁾			$V_{Rk,b}$ ²⁾⁽³⁾				
		[mm]	[kN]										
Compressive strength $f_b \geq 27 \text{ N/mm}^2$													
M8	-	80	7,0 (3,5)	6,5 (3,0)	5,0 (2,5)	6,0 (3,0)	5,5 (2,5)	4,0 (2,0)	4,5 (2,5)				
M10 / IG-M6	-	90											
M12 / IG-M8	-	100											
M16 / IG-M10	-	100	6,0 (3,0)	5,5 (2,5)	4,5 (2,0)	6,0 (3,0)	5,5 (2,5)	4,0 (2,0)	4,5 (2,5)				
M8	12x80	80	6,5 (3,0)	6,0 (3,0)	4,5 (2,0)	5,5 (2,5)	5,0 (2,5)	3,5 (1,5)	4,5 (2,5)				
M8 / M10/ IG-M6	16x85	85	5,5 (2,5)	5,0 (2,5)	4,0 (2,0)	5,5 (2,5)	5,0 (2,5)	4,0 (2,0)	4,5 (2,5)				
	16x130	130	5,5 (2,5)	5,0 (2,5)	4,0 (2,0)	5,5 (2,5)	5,0 (2,5)	4,0 (2,0)	4,5 (2,5)				
M12 / M16 / IG-M8 / IG-M10	20x85	85	5,0 (2,5)	4,5 (2,0)	3,5 (1,5)	5,0 (2,5)	4,5 (2,0)	3,5 (1,5)	4,5 (2,5)				
	20x130	130											
	20x200	200											

¹⁾ Values are valid for c_{cr} , values in brackets are valid for single anchors with c_{min}

²⁾ For c_{cr} calculation of $V_{Rk,c}$ see Technical Report TR 054; values in brackets $V_{Rk,c} = V_{Rk,b}$ for single anchors with c_{min}

³⁾ The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply $V_{Rk,b}$ by 0,8

Table C17: Displacements

Anchor size	349 Alfa Sleeve	h_{ef} [mm]	N [kN]	δ_N / N [mm/kN]	δ_{N0} [mm]	$\delta_{N\infty}$ [mm]	V [kN]	δ_{V0} [mm]	$\delta_{V\infty}$ [mm]
M8	-	80	2,0	0,15	0,30	0,60	1,7	0,90	1,35
M10 / IG-M6	-	90					2,0		
M12 / IG-M8	-	100							
M16 / IG-M10	-	100	1,4	0,21	0,51	0,43	1,7	0,90	1,35
M8	12x80	80							
M8 / M10/ IG-M6	16x85	85							
	16x130	130							
M12 / M16 / IG-M8 / IG-M10	20x85	85	1,3	0,19	0,39				
	20x130	130							
	20x200	200							

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Performances - Calcium solid brick KS-NF

Characteristic values of resistance (continue), Displacements

Annex C8

Brick type: Calcium silicate hollow brick KSL-3DF

Table C18: Description of the brick

Brick type	Calcium silicate hollow brick KSL-3DF	
Bulk density ρ [kg/dm ³]	1,4	
Compressive strength $f_b \geq$ [N/mm ²]	8, 12 or 14	
Code	EN 771-2	
Producer (country code)	e.g. Wemding (DE)	
Brick dimensions [mm]	240 x 175 x 113	
Drilling method	Rotary	

Table C19: Spacing and edge distance

Anchor size	All sizes		
Edge distance c_{cr} [mm]		100	(120) ¹⁾
Minimum edge distance c_{min} [mm]		60	
Spacing $s_{cr,II}$ [mm]		240	
Spacing $s_{cr,I}$ [mm]		120	
Minimum spacing s_{min} [mm]		120	

¹⁾ Value in brackets for 349 Alfa Siebhülse 20x85; 349 Alfa Siebhülse 20x130 and 349 Alfa Siebhülse 20x200

Table C20: Group factor for anchor group in case of tension loading

Configuration	with c [mm] \geq	with s [mm] \geq	$\alpha_{g,N,II}$	$[-]$	1,5 2,0 2,0 1,0 2,0
II: anchors placed parallel to horizontal joint	60 c_{cr} 160	120 240 120			
⊥: anchors placed perpendicular to horizontal joint	60 c_{cr}	120 120	$\alpha_{g,N,I}$	$[-]$	1,0 2,0

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Performances - Calcium silicate hollow brick KSL-3DF
Description of the brick, Spacing and edge distance, Group factor

Annex C9

Brick type: Calcium silicate hollow brick KSL-3DF

Table C21: Group factor for anchor group in case of shear loading parallel to free edge

Configuration		with c [mm] ≥	with s [mm] ≥	$\alpha_{g,V,II}$	[-]	1,0
II: anchors placed parallel to horizontal joint		60 160 c_{cr}				1,6 2,0 1,0 2,0
I: anchors placed perpendicular to horizontal joint		60 c_{cr}		$\alpha_{g,V,I}$	[-]	1,0 2,0

Table C22: Group factor for anchor group in case of shear loading perpendicular to free edge

Configuration		with c [mm] ≥	with s [mm] ≥	$\alpha_{g,V,II}$	[-]	1,0
II: anchors placed parallel to horizontal joint		60 c_{cr}				2,0
I: anchors placed perpendicular to horizontal joint		60 c_{cr}		$\alpha_{g,V,I}$	[-]	1,0 2,0

Table C23: Characteristic values of resistance under tension and shear loads

Anchor size	349 Alfa Sleeve	Effective anchorage depth	Characteristic resistance											
			Use category						All temperature ranges					
			d/d			w/d; w/w								
			40°C/24°C	80°C/50°C	120°C/72°C	40°C/24°C	80°C/50°C	120°C/72°C						
			h_{ef}	$N_{Rk,b} = N_{Rk,p}$ ¹⁾			$N_{Rk,b} = N_{Rk,p}$ ¹⁾	$V_{Rk,b}$ ⁴⁾						
			[mm]	[kN]										
Compressive strength $f_b \geq 8 \text{ N/mm}^2$														
M8	12x80	80	1,5	1,5	1,2	1,5	1,2	0,9	2,5 ²⁾ (0,9) ³⁾					
M8 / M10 / IG-M6	16x85	85					1,5	1,2	4,0 ²⁾ (1,5) ³⁾					
	16x130	130					1,5	1,2	4,0 ²⁾ (1,5) ³⁾					
M12 / M16 / IG-M8 / IG-M10	20x85	85	4,5	4,0	3,0	4,5	4,0	3,0	4,0 ²⁾ (1,5) ³⁾					
	20x130	130												
	20x200	200												
Compressive strength $f_b \geq 12 \text{ N/mm}^2$														
M8	12x80	80	2,0	2,0	1,5	2,0	1,5	1,2	3,0 ²⁾ (1,2) ³⁾					
M8 / M10 / IG-M6	16x85	85	2,0	2,0	1,5	2,0	2,0	1,5	4,5 ²⁾ (1,5) ³⁾					
	16x130	130	2,5	2,5	1,5	2,5	2,5	1,5	4,5 ²⁾ (1,5) ³⁾					
M12 / M16 / IG-M8 / IG-M10	20x85	85	6,0	5,5	4,0	6,0	5,5	4,0	4,5 ²⁾ (1,5) ³⁾					
	20x130	130												
	20x200	200												

¹⁾ Values are valid for c_{cr} and c_{min}

²⁾ $V_{Rk,c,II} = V_{Rk,b}$ valid for shear load parallel to free edge

³⁾ $V_{Rk,c,I} = V_{Rk,b}$ (values in brackets) valid for shear load in direction to free edge

⁴⁾ The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply $V_{Rk,b}$ by 0,8

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Performances - Calcium silicate hollow brick KSL-3DF

Group factor, Characteristic values of resistance

Annex C10

Brick type: Calcium silicate hollow brick KSL-3DF

Table C24: Characteristic values of resistance under tension and shear loads (continue)

Anchor size	349 Alfa Sleeve	Effective anchorage depth h_{ef} [mm]	Characteristic resistance						d/d; w/d; w/w $V_{Rk,b}^{(4)}$					
			Use category											
			d/d			w/d; w/w								
			40°C/24°C	80°C/50°C	120°C/72°C	40°C/24°C	80°C/50°C	120°C/72°C						
$N_{Rk,b} = N_{Rk,p}^{(1)}$						$N_{Rk,b} = N_{Rk,p}^{(1)}$								
						[kN]								
Compressive strength $f_b \geq 14 \text{ N/mm}^2$														
M8	12x80	80	2,5	2,5	1,5	2,0	2,0	1,5	3,5 ⁽²⁾ (1,5) ⁽³⁾					
M8 / M10 / IG-M6	16x85	85	2,5	2,5	1,5	2,5	2,5	1,5	6,0 ⁽²⁾ (2,0) ⁽³⁾					
	16x130	130	2,5	2,5	2,0	2,5	2,5	2,0	6,0 ⁽²⁾ (2,0) ⁽³⁾					
M12 / M16 / IG-M8 / IG-M10	20x85	85	6,5	6,0	4,5	6,5	6,0	4,5	6,0 ⁽²⁾ (2,0) ⁽³⁾					
	20x130	130												
	20x200	200												

¹⁾ Values are valid for c_{cr} and c_{min}

²⁾ $V_{Rk,c,II} = V_{Rk,b}$ valid for shear load parallel to free edge

³⁾ $V_{Rk,c,\perp} = V_{Rk,b}$ (values in brackets) valid for shear load in direction to free edge

⁴⁾ The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply $V_{Rk,b}$ by 0,8

Table C25: Displacements

Anchor size	349 Alfa Sleeve	h_{ef}	N [kN]	δ_N / N [mm/kN]	δ_{N0} [mm]	$\delta_{N\infty}$ [mm]	V [kN]	δ_{V0} [mm]	$\delta_{V\infty}$ [mm]
		[mm]							
M8	12x80	80	0,71	0,90	0,64	1,29	1,0	1,0	1,50
M8 / M10 / IG-M6	16x85	85					1,7	1,9	2,85
	16x130	130			1,67	3,34			
M12 / M16 / IG-M8 / IG-M10	20x85	85	1,86						
	20x130	130							
	20x200	200							

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Performance - Calcium silicate hollow brick KSL-3DF
Characteristic values of resistance, Displacements

Annex C11

Brick type: Calcium silicate hollow brick KSL-12DF

Table C26: Description of the brick

Brick type	Calcium silicate hollow brick KSL-12DF	
Bulk density ρ [kg/dm ³]	1,4	
Compressive strength $f_b \geq$ [N/mm ²]	10, 12 or 16	
Code	EN 771-2	
Producer (country code)	e.g. Wemding (DE)	
Brick dimensions [mm]	498 x 175 x 238	
Drilling method	Rotary	

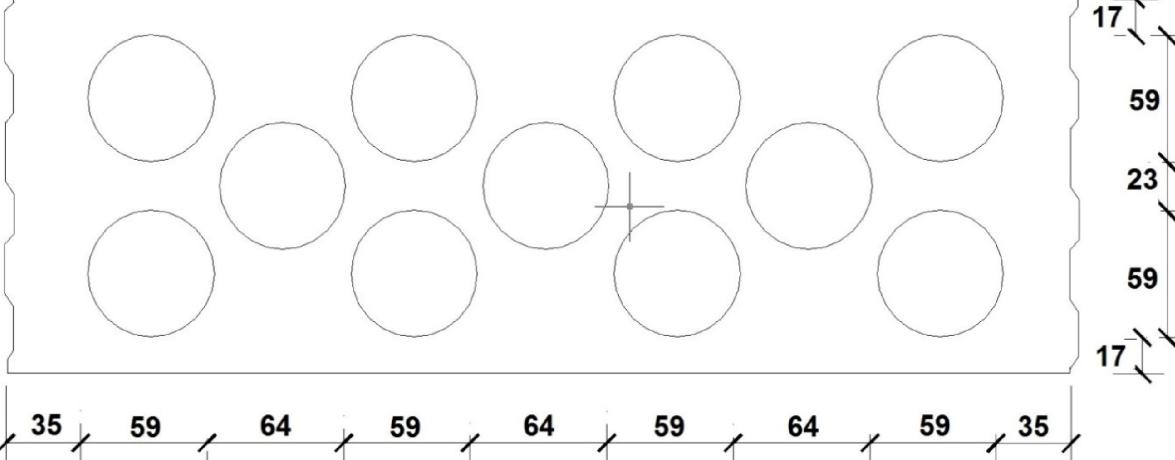


Table C27: Spacing and edge distances

Anchor size	All sizes	
Edge distance c_{cr} [mm]		100 (120) ¹⁾
Minimum edge distance c_{min} ²⁾ [mm]		100 (120) ¹⁾
Spacing $s_{cr,II}$ [mm]		498
	$s_{cr,\perp}$ [mm]	238
Minimum spacing s_{min} [mm]		120

¹⁾ Value in brackets for 349 Alfa Siebhülse 20x85 and 349 Alfa Siebhülse 20x130

²⁾ For $V_{Rk,c}$: c_{min} according to Technical Report TR 054

Table C28: Group factor for anchor group in case of tension loading

Configuration	with c [mm] \geq	with s [mm] \geq		
II: anchors placed parallel to horizontal joint	100	120	$\alpha_{g,N,II}$	1,0 2,0
	c_{cr}	498		
\perp : anchors placed perpendicular to horizontal joint	100	120	$\alpha_{g,N,\perp}$	1,0 2,0
	c_{cr}	238		

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Performance - Calcium silicate hollow brick KSL-12DF

Description of the brick, Spacing and edge distances, Group factor

Annex C12

Brick type: Calcium silicate hollow brick KSL-12DF

Table C29: Group factor for anchor group in case of shear loading parallel to free edge

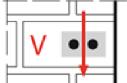
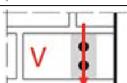
Configuration		with c [mm] ≥	with s [mm] ≥		
II: anchors placed parallel to horizontal joint		c _{cr}	498	α _{g,V,II}	[-] 2,0
⊥: anchors placed perpendicular to horizontal joint		c _{cr}	238	α _{g,V,⊥}	

Table C30: Group factor for anchor group in case of shear load perpendicular to free edge

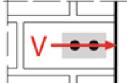
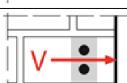
Configuration		with c [mm] ≥	with s [mm] ≥		
II: anchors placed parallel to horizontal joint		c _{cr}	498	α _{g,V,II}	[-] 2,0
⊥: anchors placed perpendicular to horizontal joint		c _{cr}	238	α _{g,V,⊥}	

Table C31: Characteristic values of resistance under tension and shear loads

Anchor size	349 Alfa Sleeve	Effective anchorage depth	Characteristic resistance														
			Use category														
			d/d			w/d; w/w											
			40°C/24°C	80°C/50°C	120°C/72°C	40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges								
		h _{ef}	N _{Rk,b} = N _{Rk,p} ¹⁾			N _{Rk,b} = N _{Rk,p} ¹⁾			V _{Rk,b} ²⁾⁽³⁾								
		[mm]	[kN]														
Compressive strength f_b ≥ 10 N/mm²																	
M8	12x80	80	0,6	0,6	0,4	0,5	0,5	0,4	2,5								
M8 / M10 / IG-M6	16x85	85	0,6	0,6	0,4	0,6	0,6	0,4	5,5								
M12 / M16 / IG-M8 / IG-M10	16x130	130	2,5	2,5	2,0	2,5	2,5	2,0	5,5								
M8	20x85	85	1,5	1,5	0,9	1,5	1,5	0,9	5,5								
M12 / M16 / IG-M8 / IG-M10	20x130	130	2,5	2,5	2,0	2,5	2,5	2,0	5,5								
Compressive strength f_b ≥ 12 N/mm²																	
M8	12x80	80	0,75	0,6	0,5	0,6	0,6	0,4	3,0								
M8 / M10 / IG-M6	16x85	85	0,75	0,6	0,5	0,75	0,6	0,5	6,5								
M12 / M16 / IG-M8 / IG-M10	16x130	130	3,0	3,0	2,0	3,0	3,0	2,0	6,5								
M8	20x85	85	1,5	1,5	1,2	1,5	1,5	1,2	6,5								
M12 / M16 / IG-M8 / IG-M10	20x130	130	3,0	3,0	2,0	3,0	3,0	2,0	6,5								

¹⁾ Values are valid for c_{cr} and c_{min}

²⁾ Calculation of V_{Rk,c} see Technical Report TR 054, except for shear load parallel to free edge with c ≥ 120 mm: V_{Rk,c,II} = V_{Rk,b}

³⁾ The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply V_{Rk,b} by 0,8

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Performance - Calcium silicate hollow brick KSL-12DF

Group factor, Characteristic values of resistance

Annex C13

Brick type: Calcium silicate hollow brick KSL-12DF

Table C32: Characteristic values of resistance under tension and shear loads (continue)

Anchor size	349 Alfa Sleeve	Effective anchorage depth	Characteristic resistance														
			Use category														
			d/d			w/d; w/w			d/d w/d w/w	All temperature ranges							
			40°C/24°C	80°C/50°C	120°C/72°C	40°C/24°C	80°C/50°C	120°C/72°C	V _{Rk,b} ²⁽³⁾								
h_{ef}			$N_{Rk,b} = N_{Rk,p}$ ¹⁾			$N_{Rk,b} = N_{Rk,p}$ ¹⁾			$V_{Rk,b}$ ²⁽³⁾								
[mm]			[kN]														
Compressive strength $f_b \geq 16 \text{ N/mm}^2$																	
M8	12x80	80	0,9	0,9	0,6	0,75	0,75	0,5	3,5								
M8 / M10 / IG-M6	16x85	85	0,9	0,9	0,6	0,9	0,9	0,6	8,0								
	16x130	130	4,0	3,5	2,5	4,0	3,5	2,5	8,0								
M12 / M16 / IG-M8 / IG-M10	20x85	85	2,0	2,0	1,5	2,0	2,0	1,5	8,0								
	20x130	130	4,0	3,5	2,5	4,0	3,5	2,5	8,0								

¹⁾ Values are valid for c_{cr} and c_{min}

²⁾ Calculation of $V_{Rk,c}$ see Technical Report TR 054, except for shear load parallel to free edge with $c \geq 120 \text{ mm}$: $V_{Rk,c,II} = V_{Rk,b}$

³⁾ The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply $V_{Rk,b}$ by 0,8

Table C33: Displacements

Anchor size	349 Alfa Sleeve	h_{ef}	N	δ_N / N	δ_{N0}	$\delta_{N\infty}$	V	δ_{v0}	$\delta_{v\infty}$
		[mm]	[kN]	[mm/kN]	[mm]	[mm]			
M8	12x80	80	0,26	0,90	0,23	0,46	1,0	1,3	1,95
M8 / M10 / IG-M6	16x85	85			1,03	2,06	2,3	2,5	3,75
	16x130	130			0,51	1,03			
M12 / M16 / IG-M8 / IG-M10	20x85	85			1,03	2,06			
	20x130	130							

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Performance - Calcium silicate hollow brick KSL-12DF

Characteristic values of resistance (continue), Displacements

Annex C14

Brick type: Clay solid brick Mz-DF

Table C34: Description of the brick

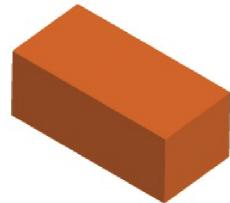
Brick type	Clay solid brick Mz-DF			
Bulk density ρ [kg/dm ³]	1,6			
Compressive strength $f_b \geq$ [N/mm ²]	10, 20 or 28			
Code	EN 771-1			
Producer (country code)	e.g. Unipor (DE)			
Brick dimensions [mm]	240 x 115 x 55			
Drilling method	Hammer			

Table C35: Spacing and edge distances

Anchor size	Alle Größen		
Edge distance c_{cr} [mm]		1,5*h _{ef}	
Minimum edge distance c_{min} [mm]		60	
Spacing s_{cr} [mm]		3*h _{ef}	
Minimum spacing s_{min} [mm]		120	

Table C36: Group factor for anchor group in case of tension loading

Configuration	with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint	60	120	$\alpha_{g,N,II}$	[-]	0,7
	1,5*h _{ef}	3*h _{ef}			2,0
⊥: anchors placed perpendicular to horizontal joint	60	120	$\alpha_{g,N,\perp}$	[-]	0,5
	1,5*h _{ef}	120			1,0
	1,5*h _{ef}	3*h _{ef}			2,0

Table C37: Group factor for anchor group in case of shear loading parallel to free edge

Configuration	with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint	60	120	$\alpha_{g,V,II}$	[-]	0,5
	90	120			1,1
	1,5*h _{ef}	3*h _{ef}			2,0
⊥: anchors placed perpendicular to horizontal joint	60	120	$\alpha_{g,V,\perp}$	[-]	0,5
	1,5*h _{ef}	120			1,0
	1,5*h _{ef}	3*h _{ef}			2,0

Table C38: Group factor for anchor group in case of shear load perpendicular to free edge

Configuration	with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint	60	120	$\alpha_{g,V,II}$	[-]	0,5
	1,5*h _{ef}	120			1,0
	1,5*h _{ef}	3*h _{ef}			2,0
⊥: anchors placed perpendicular to horizontal joint	60	120	$\alpha_{g,V,\perp}$	[-]	0,5
	1,5*h _{ef}	120			1,0
	1,5*h _{ef}	3*h _{ef}			2,0

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Performance - Clay solid brick Mz-DF

Description of the brick , Spacing and edge distances, Group factor

Annex C15

Brick type: Clay solid brick Mz-DF

Table C39: Characteristic values of resistance under tension and shear loads

Anchor size	349 Alfa Sleeve	Effective Anchorage depth	Characteristic resistance				
			Use category			d/d w/d w/w	
			d/d w/d w/w		40°C/24°C 80°C/50°C 120°C/72°C		
h_{ef}		[mm]	$N_{Rk,b} = N_{Rk,p}$ ¹⁾			$V_{Rk,b}$ ²⁾⁽³⁾	
						[kN]	
Compressive strength $f_b \geq 10 \text{ N/mm}^2$							
M8	-	80	3,5 (1,5)	3,5 (1,5)	2,5 (1,2)	3,5 (1,2)	
M10 / IG-M6	-	90	3,5 (1,5)	3,5 (1,5)	3,0 (1,5)	3,5 (1,2)	
M12 / IG-M8	-	100	4,0 (2,0)	4,0 (2,0)	3,5 (1,5)	3,5 (1,2)	
M16 / IG-M10	-	100	4,0 (2,0)	4,0 (2,0)	3,5 (1,5)	5,5 (1,5)	
M8	12x80	80	3,5 (1,5)	3,5 (1,5)	3,0 (1,2)	3,5 (1,2)	
M8 / M10 / IG-M6	16x85	85					
	16x130	130					
M12 / M16 / IG-M8 / IG-M10	20x85	85	3,5 (1,5)	3,5 (1,5)	3,0 (1,5)	3,5 (1,2)	
	20x130	130					
	20x200	200					
Compressive strength $f_b \geq 20 \text{ N/mm}^2$							
M8	-	80	4,5 (2,5)	4,5 (2,5)	4,0 (2,0)	5,0 (1,5)	
M10 / IG-M6	-	90	5,5 (2,5)	5,5 (2,5)	4,5 (2,0)	5,0 (1,5)	
M12 / IG-M8	-	100	6,0 (3,0)	6,0 (3,0)	5,0 (2,5)	5,0 (1,5)	
M16 / IG-M10	-	100	6,0 (3,0)	6,0 (3,0)	5,0 (2,5)	8,0 (2,5)	
M8	12x80	80	4,5 (2,5)	4,5 (2,5)	4,0 (2,0)	5,0 (1,5)	
M8 / M10 / IG-M6	16x85	85					
	16x130	130					
M12 / M16 / IG-M8 / IG-M10	20x85	85	5,0 (2,5)	5,0 (2,5)	4,0 (2,0)	5,0 (1,5)	
	20x130	130					
	20x200	200					
Compressive strength $f_b \geq 28 \text{ N/mm}^2$							
M8	-	80	5,5 (2,5)	5,5 (2,5)	4,5 (2,5)	5,5 (2,0)	
M10 / IG-M6	-	90	6,0 (3,0)	6,0 (3,0)	5,0 (2,5)	5,5 (2,0)	
M12 / IG-M8	-	100	7,0 (3,5)	7,0 (3,5)	6,0 (3,0)	5,5 (2,0)	
M16 / IG-M10	-	100	7,0 (3,5)	7,0 (3,5)	6,0 (3,0)	9,0 (3,0)	
M8	12x80	80	5,5 (2,5)	5,5 (2,5)	4,5 (2,5)	5,5 (2,0)	
M8 / M10 / IG-M6	16x85	85					
	16x130	130					
M12 / M16 / IG-M8 / IG-M10	20x85	85	6,0 (3,0)	6,0 (3,0)	5,0 (2,5)	5,5 (2,0)	
	20x130	130					
	20x200	200					

¹⁾ Values are valid for c_{cr} , values in brackets are valid for single anchors with c_{min}

²⁾ For c_{cr} calculation of $V_{Rk,c}$ see Technical Report TR 054; for c_{min} values in brackets $V_{Rk,c} = V_{Rk,b}$

³⁾ The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply $V_{Rk,b}$ by 0.8.

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Performance - Clay solid brick Mz-DF

Characteristic values of resistance

Annex C16

Brick type: Clay solid brick Mz-DF

Table C40: Displacements

Anchor size	349 Alfa Sleeve	h_{ef}	N	δ_N / N	δ_{N0}	$\delta_{N\infty}$	V	δ_{V0}	$\delta_{V\infty}$
		[mm]	[kN]	[mm/kN]	[mm]	[mm]	[kN]	[mm]	[mm]
M8	-	80	1,3	0,15	0,19	0,39	1,9	1,00	1,50
M10 / IG-M6	-	90	1,6		0,24	0,47			
M12 / IG-M8	-	100	1,7		0,26	0,51			
M16 / IG-M10	-	100					2,9		
M8	12x80	80	1,3	0,15	0,19	0,39	1,9	1,00	1,50
M8 / M10 / IG-M6	16x85	85							
	16x130	130							
M12 / M16 / IG-M8 / IG-M10	20x85	85							
	20x130	130							
	20x200	200							

Brick type: Clay hollow brick HLz-16-DF

Table C41: Description of the brick

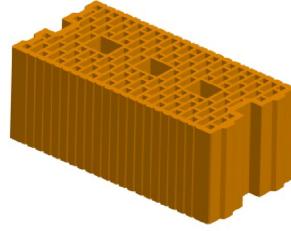
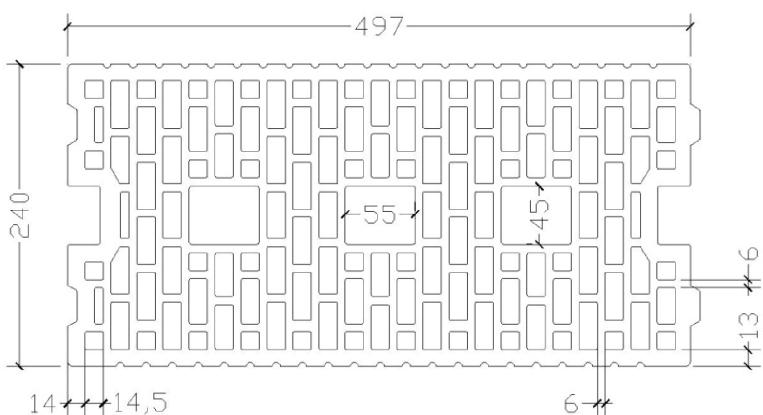
Brick type	Clay hollow brick HLz-16-DF			
Bulk density	ρ [kg/dm ³]	0,8		
Compressive strength	$f_b \geq$ [N/mm ²]	6, 8, 12 or 14		
Code	EN 771-1			
Producer (country code)	e.g. Unipor (DE)			
Brick dimensions	[mm]	497 x 240 x 238		
Drilling method	Rotary			
				
				

Table C42: Spacing and edge distances

Anchor size	All sizes		
Edge distance	c_{cr}	[mm]	100 (120) ¹⁾
Minimum edge distance	c_{min} ²⁾	[mm]	100 (120) ¹⁾
Spacing	$s_{cr,II}$	[mm]	497
	$s_{cr,\perp}$	[mm]	238
Minimum spacing	s_{min}	[mm]	100

¹⁾ Value in bracket for 349 Alfa Siebhülse 20x85; 349 Alfa Siebhülse 20x130 and 349 Alfa Siebhülse 20x200

²⁾ For $V_{RK,c}$: c_{min} according to Technical Report TR 054

Table C43: Group factor for anchor group in case of tension loading

Configuration	with c [mm] \geq	with s [mm] \geq			
II: anchors placed parallel to horizontal joint	c_{cr}	100	$\alpha_{g,N,II}$	[-]	1,3
	c_{cr}	497			2,0
\perp : anchors placed perpendicular to horizontal joint	c_{cr}	100	$\alpha_{g,N,\perp}$	[-]	1,1
	c_{cr}	238			2,0

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Performance - Clay hollow brick HLz-16DF

Description of the brick, Spacing and edge distances, Group factor

Annex C18

Brick type: Clay hollow brick HLz-16-DF

Table C44: Group factor for anchor group in case of shear loading parallel to free edge

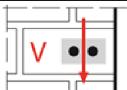
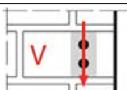
Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		c _{cr}	497	α _{g,V,II}	[-]	2,0
⊥: anchors placed perpendicular to horizontal joint		c _{cr}	238	α _{g,V,⊥}		2,0

Table C45: Group factor for anchor group in case of shear load perpendicular to free edge

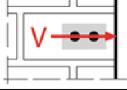
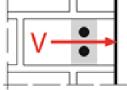
Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		c _{cr}	497	α _{g,V,II}	[-]	2,0
⊥: anchors placed perpendicular to horizontal joint		c _{cr}	238	α _{g,V,⊥}		2,0

Table C46: Characteristic values of resistance under tension and shear loads

Anchor size	349 Alfa Sleeve	Effective Anchorage depth	Characteristic resistance				All temperature ranges		
			Use category			d/d			
			w/d	w/w	d/d	w/d			
			40°C/24°C	80°C/50°C	120°C/72°C	w/w			
			h_{ef}	$N_{Rk,b} = N_{Rk,p}$ ¹⁾			$V_{Rk,b}$ ²⁾⁽³⁾		
[mm]			[kN]			[kN]			
Compressive strength $f_b \geq 6 \text{ N/mm}^2$									
M8	12x80	80	2,5	2,5	2,0	2,5			
M8 / M10 / IG-M6	16x85	85	2,5	2,5	2,0	4,5			
	16x130	130	3,5	3,5	3,0	4,5			
M12 / M16 / IG-M8 / IG-M10	20x85	85	2,5	2,5	2,0	5,0			
	20x130	130	3,5	3,5	3,0	6,0			
	20x200	200	3,5	3,5	3,0	6,0			
Compressive strength $f_b \geq 8 \text{ N/mm}^2$									
M8	12x80	80	3,0	3,0	2,5	3,0			
M8 / M10 / IG-M6	16x85	85	3,0	3,0	2,5	5,5			
	16x130	130	4,5	4,5	3,5	5,5			
M12 / M16 / IG-M8 / IG-M10	20x85	85	3,0	3,0	2,5	6,0			
	20x130	130	4,5	4,5	3,5	7,0			
	20x200	200	4,5	4,5	3,5	7,0			

¹⁾ Values are valid for c_{cr} and c_{min}

²⁾ Calculation of $V_{Rk,c}$ see Technical Report TR 054, except for shear load parallel to free edge with $c \geq 125 \text{ mm}$: $V_{Rk,c,II} = V_{Rk,b}$

³⁾ The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply $V_{Rk,b}$ by 0,8

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Performance - Clay hollow brick HLz-16DF

Group factor, Characteristic values of resistance

Annex C19

Brick type: Clay hollow brick HLz-16DF

Table C47: Characteristic values of resistance under tension and shear loads (continue)

Anchor size	349 Alfa Sleeve	Effective Anchorage depth	Characteristic resistance				All temperature ranges		
			Use category						
			d/d w/d w/w			V _{Rk,b} ²⁾⁽³⁾ [kN]			
			40°C/24°C	80°C/50°C	120°C/72°C				
			h_{ef} [mm]	$N_{Rk,b} = N_{Rk,p}$ ¹⁾ [kN]					
Compressive strength $f_b \geq 12 \text{ N/mm}^2$									
M8	12x80	80	3,5	3,5	3,0	4,0			
M8 / M10 / IG-M6	16x85	85	3,5	3,5	3,0	6,5			
	16x130	130	5,0	5,0	4,5	6,5			
M12 / M16 / IG-M8 / IG-M10	20x85	85	3,5	3,5	3,0	7,0			
	20x130	130	5,0	5,0	4,5	9,0			
	20x200	200	5,0	5,0	4,5	9,0			
Compressive strength $f_b \geq 14 \text{ N/mm}^2$									
M8	12x80	80	4,0	4,0	3,0	4,0			
M8 / M10 / IG-M6	16x85	85	4,0	4,0	3,0	6,5			
	16x130	130	5,5	5,5	4,5	6,5			
M12 / M16 / IG-M8 / IG-M10	20x85	85	4,0	4,0	3,0	7,0			
	20x130	130	5,5	5,5	4,5	9,0			
	20x200	200	5,5	5,5	4,5	9,0			

1) Values are valid for c_{cr} and c_{min}

2) Calculation of $V_{Rk,c}$ see Technical Report TR 054, except for shear load parallel to free edge with $c \geq 125 \text{ mm}$: $V_{Rk,c,II} = V_{Rk,c}$

3) The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply $V_{Rk,b}$ by 0,8

Table C48: Displacements

Anchor size	349 Alfa Sleeve	h_{ef} [mm]	N [kN]	δ_N / N [mm/kN]	δ_{N0} [mm]	$\delta_{N\infty}$ [mm]	V [kN]	δ_{v0} [mm]	$\delta_{v\infty}$ [mm]
M8	12x80	80	1,14	0,10	0,11	0,23	1,10	1,20	1,80
M8 / M10 / IG-M6	16x85	85			0,16	0,31	1,86	1,50	2,25
	16x130	130			0,11	0,23	1,86	1,50	2,25
M12 / M16 / IG-M8 / IG-M10	20x85	85			0,16	0,31	2,57	2,10	3,15
	20x130	130							
	20x200	200							

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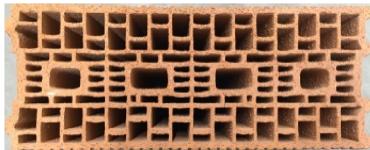
Performance - Clay hollow brick HLz-16DF

Characteristic values of resistance (continue), Displacements

Annex C20

Brick type: Clay hollow brick Porotherm Homebric

Table C49: Description of the brick

Brick type	Clay hollow brick Porotherm Homebric	
Bulk density ρ [kg/dm ³]	0,7	
Compressive strength $f_b \geq$ [N/mm ²]	4, 6 or 10	
Code	EN 771-1	
Producer (country code)	e.g. Wienerberger (FR)	
Brick dimensions [mm]	500 x 200 x 299	
Drilling method	Rotary	

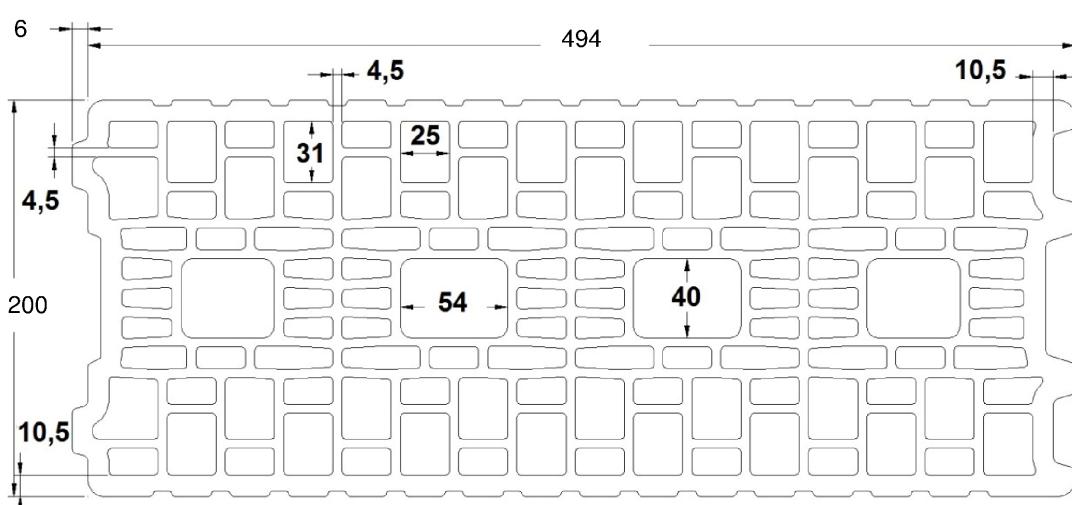


Table C50: Spacing and edge distances

Anchor size	All sizes		
Edge distance c_{cr} [mm]		100 (120) ¹⁾	
Minimum edge distance c_{min} ²⁾ [mm]		100 (120) ¹⁾	
Spacing $s_{cr,II}$ [mm]		500	
$s_{cr,L}$ [mm]		299	
Minimum spacing s_{min} [mm]		100	

¹⁾ Value in brackets for 349 Alfa Siebhülse 20x85 and 349 Alfa Siebhülse 20x130

²⁾ For $V_{Rk,c}$: c_{min} according to Technical Report TR 054

Table C51: Group factor for anchor group in case of tension loading

Configuration	with c [mm] \geq	with s [mm] \geq			
II: anchors placed parallel to horizontal joint	200	100	$\alpha_{g,N,II}$	[-]	2,0
	c_{cr}	500			2,0
\perp : anchors placed perpendicular to horizontal joint	200	100	$\alpha_{g,N,\perp}$	[-]	1,2
	c_{cr}	299			2,0

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Performance - Clay hollow brick Porotherm Homebric
Description of the brick, Spacing and edge distances, Group factor

Annex C21

Brick type: Clay hollow brick Porotherm Homebric

Table C52: Group factor for anchor group in case of shear loading parallel to free edge

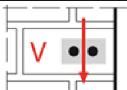
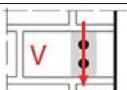
Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		c _{cr}	500	α _{g,V,II}	[-]	2,0
⊥: anchors placed perpendicular to horizontal joint		c _{cr}	299	α _{g,V,⊥}		2,0

Table C53: Group factor for anchor group in case of shear load perpendicular to free edge

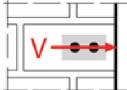
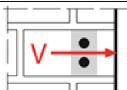
Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		c _{cr}	500	α _{g,V,II}	[-]	2,0
⊥: anchors placed perpendicular to horizontal joint		c _{cr}	299	α _{g,V,⊥}		2,0

Table C54: Characteristic values of resistance under tension and shear loads

Anchor size	349 Alfa Sleeve	Effective Anchorage depth	Characteristic resistance				All temperature ranges		
			Use category			d/d			
			w/d	w/w	d/d	w/d			
			40°C/24°C	80°C/50°C	120°C/72°C	V _{Rk,b} ²⁽³⁾			
		h _{ef}	N _{Rk,b} = N _{Rk,p} ¹⁾			V _{Rk,c} ²⁽³⁾			
[mm]			[kN]			[kN]			
Compressive strength f_b ≥ 4 N/mm²									
M8	12x80	80	0,9	0,9	0,75	2,0			
M8 / M10 / IG-M6	16x85	85	0,9	0,9	0,75	2,0			
	16x130	130	1,2	1,2	0,9	2,0			
M12 / M16 / IG-M8 / IG-M10	20x85	85	0,9	0,9	0,75	2,5			
	20x130	130	1,2	1,2	0,9	2,5			
Compressive strength f_b ≥ 6 N/mm²									
M8	12x80	80	0,9	0,9	0,9	2,5			
M8 / M10 / IG-M6	16x85	85	0,9	0,9	0,9	2,5			
	16x130	130	1,2	1,2	1,2	2,5			
M12 / M16 / IG-M8 / IG-M10	20x85	85	0,9	0,9	0,9	3,0			
	20x130	130	1,2	1,2	1,2	3,0			

¹⁾ Values are valid for c_{cr} and c_{min}

²⁾ Calculation of V_{Rk,c} see Technical Report TR 054, except for shear load parallel to free edge with c ≥ 200 mm: V_{Rk,c,II} = V_{Rk,b}

³⁾ The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply V_{Rk,b} by 0,8

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Performance - Clay hollow brick Porotherm Homebric
Group factor, Characteristic values of resistance

Annex C22

Brick type: Clay hollow brick Porotherm Homebric

Table C55: Characteristic values of resistance under tension and shear loads (continue)

Anchor size	349 Alfa Sleeve	Effective Anchorage depth	Characteristic resistance				All temperature ranges	
			Use category			d/d w/d w/w		
			40°C/24°C		80°C/50°C			
			h_{ef}	$N_{Rk,b} = N_{Rk,p}$ ¹⁾			$V_{Rk,b}$ ^{2/3)}	
			[mm]	[kN]			[kN]	
Compressive strength $f_b \geq 10 \text{ N/mm}^2$								
M8	12x80	80	1,2	1,2	1,2	1,2	3,0	
M8 / M10/ IG-M6	16x85	85	1,2	1,2	1,2	1,2	3,0	
	16x130	130	1,5	1,5	1,5	1,5	3,5	
M12 / M16 / IG-M8 / IG-M10	20x85	85	1,2	1,2	1,2	1,2	4,0	
	20x130	130	1,5	1,5	1,5	1,5	4,0	

1) Values are valid for c_{cr} and c_{min}

2) Calculation of $V_{Rk,c}$ see Technical Report TR 054, except for shear load parallel to free edge with $c \geq 200 \text{ mm}$: $V_{Rk,c,II} = V_{Rk,b}$

3) The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply $V_{Rk,b}$ by 0,8

Table C56: Displacements

Anchor size	349 Alfa Sleeve	h_{ef}	N	δ_N / N	δ_{N0}	$\delta_{N\infty}$	V	δ_{v0}	$\delta_{v\infty}$		
		[mm]	[kN]	[mm/kN]	[mm]	[mm]	[kN]	[mm]	[mm]		
M8	12x80	80	0,34	0,80	0,27	0,55	0,9	1,20	1,80		
M8 / M10/ IG-M6	16x85	85			0,34	0,69	1,0				
	16x130	130			0,27	0,55	1,14				
M12 / M16 / IG-M8 / IG-M10	20x85	85			0,34	0,69					
	20x130	130									

292 Alfa Injection mortar for masonry

Performance - Clay hollow brick Porotherm Homebric
Characteristic values of resistance (continue), Displacements

Annex C23

Brick type: Clay hollow brick BGV Thermo

Table C57: Description of the brick

Brick type	Clay hollow brick BGV Thermo			
Bulk density	ρ [kg/dm ³]			
Compressive strength	$f_b \geq$ [N/mm ²]			
Code	EN 771-1			
Producer (country code)	e.g. Leroux (FR)			
Brick dimensions	[mm] 500 x 200 x 314			
Drilling method	Rotary			

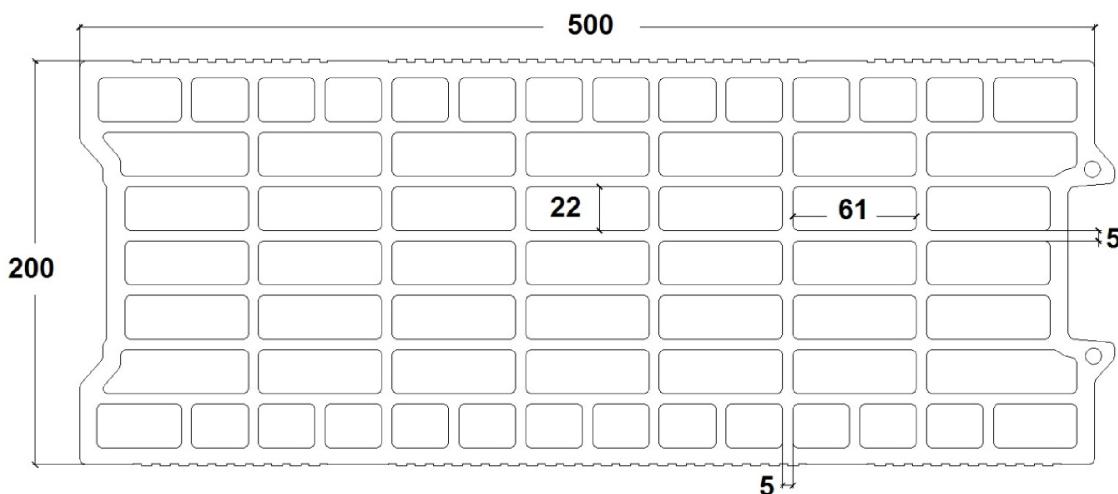


Table C58: Spacing and edge distances

Anchor size	All sizes		
Edge distance	c_{cr}	[mm]	100 (120) ¹⁾
Minimum edge distance	c_{min} ²⁾	[mm]	100 (120) ¹⁾
Spacing	$s_{cr,II}$	[mm]	500
	$s_{cr,\perp}$	[mm]	314
Minimum spacing	s_{min}	[mm]	100

¹⁾ Values in brackets for 349 Alfa Siebhülse 20x85 and 349 Alfa Siebhülse 20x130

²⁾ For $V_{Rk,c}$: c_{min} according to Technical Report TR 054

Table C59: Group factor for anchor group in case of tension loading

Configuration	with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint	200	100	$\alpha_{g,N,II}$	[-]	1,7
	c_{cr}	500			2,0
⊥: anchors placed perpendicular to horizontal joint	200	100	$\alpha_{g,N,\perp}$	[-]	1,1
	c_{cr}	314			2,0

292 Alfa Injection mortar for masonry

Performance - Clay hollow brick BGV Thermo

Description of the brick, Spacing and edge distances, Group factor

Annex C24

Brick type: Clay hollow brick BGV Thermo

Table C60: Group factor for anchor group in case of shear loading parallel to free edge

Configuration	with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		c_{cr}	500	$\alpha_{g,V,II}$	[-]
⊥: anchors placed perpendicular to horizontal joint		c_{cr}	314	$\alpha_{g,V,\perp}$	

Table C61: Group factor for anchor group in case of shear load perpendicular to free edge

Configuration	with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		c_{cr}	500	$\alpha_{g,V,II}$	[-]
⊥: anchors placed perpendicular to horizontal joint		c_{cr}	314	$\alpha_{g,V,\perp}$	

Brick type: Clay hollow brick BGV Thermo

Table C62: Characteristic values of resistance under tension and shear loads

Anchor size	349 Alfa Sleeve	Effective Anchorage depth	Characteristic resistance				All temperature ranges		
			Use category						
			d/d	w/d	w/w				
			40°C/24°C		80°C/50°C				
			$N_{Rk,b} = N_{Rk,p}$ ¹⁾		$V_{Rk,b}$ ²⁾⁽³⁾				
		h_{ef}	[mm]		[kN]		[kN]		
Compressive strength $f_b \geq 4 \text{ N/mm}^2$									
M8	12x80	80	0,6	0,6	0,6	0,6	2,0		
M8 / M10/ IG-M6	16x85	85	0,6	0,6	0,6	0,6	2,0		
	16x130	130	1,2	1,2	0,9	0,9	2,5		
M12 / M16 / IG-M8 / IG-M10	20x85	85	0,6	0,6	0,6	0,6	2,5		
	20x130	130	1,2	1,2	0,9	0,9	2,5		
Compressive strength $f_b \geq 6 \text{ N/mm}^2$									
M8	12x80	80	0,9	0,9	0,75	0,75	2,5		
M8 / M10/ IG-M6	16x85	85	0,9	0,9	0,75	0,75	2,5		
	16x130	130	1,5	1,5	1,2	1,2	3,0		
M12 / M16 / IG-M8 / IG-M10	20x85	85	0,9	0,9	0,75	0,75	3,0		
	20x130	130	1,5	1,5	1,2	1,2	3,0		
Compressive strength $f_b \geq 10 \text{ N/mm}^2$									
M8	12x80	80	0,9	0,9	0,9	0,9	3,5		
M8 / M10/ IG-M6	16x85	85	0,9	0,9	0,9	0,9	3,5		
	16x130	130	2,0	2,0	1,5	1,5	4,0		
M12 / M16 / IG-M8 / IG-M10	20x85	85	0,9	0,9	0,9	0,9	4,0		
	20x130	130	2,0	2,0	1,5	1,5	4,0		

¹⁾ Values are valid for c_{cr} and c_{min}

²⁾ Calculation of $V_{Rk,c}$ see Technical Report TR 054, except for shear load parallel to free edge with $c \geq 250 \text{ mm}$: $V_{Rk,c,II} = V_{Rk,b}$

³⁾ The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply $V_{Rk,b}$ by 0,8

Table C63: Displacements

Anchor size	349 Alfa Sleeve	h_{ef}	N	δ_N / N	δ_{N0}	$\delta_{N\infty}$	V	δ_{v0}	$\delta_{v\infty}$
		[mm]			[mm/kN]				
M8	12x80	80	0,26	0,80	0,21	0,41	0,7	1,00	1,50
	16x85	85			0,34	0,69			
	16x130	130			0,21	0,41			
	20x85	85			0,34	0,69			
	20x130	130			0,21	0,41			

292 Alfa Injection mortar for masonry

Performance - Clay hollow brick BGV Thermo

Characteristic values of resistance, Displacements

Annex C26

Brick type: Clay hollow brick Calibric R+

Table C64: Description of the brick

Brick type	Clay hollow brick Calibric R+		
Bulk density	ρ [kg/dm ³]	0,6	
Compressive strength	$f_b \geq$ [N/mm ²]	6, 9 or 12	
Code	EN 771-1		
Producer (country code)	e.g. Terreal (FR)		
Brick dimensions	[mm]	500 x 200 x 314	
Drilling method	Rotary		

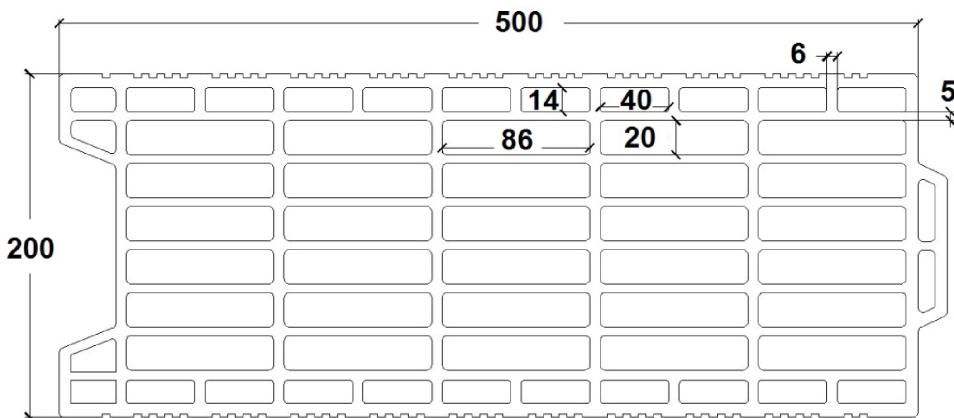


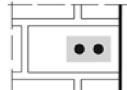
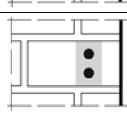
Table C65: Spacing and edge distances

Anchor size			All sizes
Edge distance	c_{cr}	[mm]	100 (120) ¹⁾
Minimum edge distance	c_{min} ²⁾	[mm]	100 (120) ¹⁾
Spacing	$s_{cr,II}$	[mm]	500
	$s_{cr,\perp}$	[mm]	314
Minimum spacing	s_{min}	[mm]	100

¹⁾ Value in brackets for 349 Alfa Siebhüle 20x85 and 349 Alfa Siebhüle 20x130

²⁾ For $V_{Rk,c}$: c_{min} according to Technical Report TR 054

Table C66: Group factor for anchor group in case of tension loading

Configuration		with c [mm] \geq		$\alpha_{g,N,II}$	$\alpha_{g,N,\perp}$	[-]
		175	100			
II: anchors placed parallel to horizontal joint		c_{cr}	500			
\perp : anchors placed perpendicular to horizontal joint		175	100	$\alpha_{g,N,\perp}$	[-]	1,0
		c_{cr}	314			

292 Alfa Injection mortar for masonry

Performance - Clay hollow brick Calibric R+

Description of the brick, Spacing and edge distances, Group factor

Annex C27

Brick type: Clay hollow brick Calibric R+

Table C67: Group factor for anchor group in case of shear loading parallel to free edge

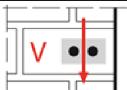
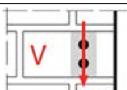
Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		c _{cr}	500	α _{g,V,II}	[-]	2,0
⊥: anchors placed perpendicular to horizontal joint		c _{cr}	314	α _{g,V,⊥}		2,0

Table C68: Group factor for anchor group in case of shear load perpendicular to free edge

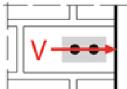
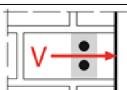
Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		c _{cr}	500	α _{g,V,II}	[-]	2,0
⊥: anchors placed perpendicular to horizontal joint		c _{cr}	314	α _{g,V,⊥}		2,0

Table C69: Characteristic values of resistance under tension and shear loads

Anchor size	349 Alfa Sleeve	Effective Anchorage depth	Characteristic resistance			
			Use category			d/d w/d w/w
			40°C/24°C	80°C/50°C	120°C/72°C	
			h _{ef}	N _{Rk,b} = N _{Rk,p} ¹⁾		V _{Rk,b} ²⁾⁽³⁾
			[mm]	[kN]		[kN]
Compressive strength f_b ≥ 6 N/mm²						
M8	12x80	80	0,9	0,9	0,75	3,0
M8 / M10 / IG-M6	16x85	85	0,9	0,9	0,75	4,0
	16x130	130	1,2	1,2	0,9	4,0
M12 / M16 / IG-M8 / IG-M10	20x85	85	0,9	0,9	0,75	6,0
	20x130	130	1,2	1,2	0,9	6,0
Compressive strength f_b ≥ 9 N/mm²						
M8	12x80	80	1,2	1,2	0,9	3,5
M8 / M10 / IG-M6	16x85	85	1,2	1,2	0,9	5,0
	16x130	130	1,5	1,5	1,2	5,0
M12 / M16 / IG-M8 / IG-M10	20x85	85	1,2	1,2	0,9	7,5
	20x130	130	1,5	1,5	1,2	7,5

¹⁾ Values are valid for c_{cr} and c_{min}

²⁾ Calculation of V_{Rk,c} see Technical Report TR 054, except for shear load parallel to free edge with c ≥ 250 mm: V_{Rk,c,II} = V_{Rk,b}

³⁾ The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply V_{Rk,b} by 0,8

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Performance - Clay hollow brick Calibric R+

Group factor, Characteristic values of resistance

Annex C28

Brick type: Clay hollow brick Calibric R+

Table C70: Characteristic values of resistance under tension and shear load (continue)

Anchor size	349 Alfa Sleeve	Effective Anchorage depth	Characteristic resistance				All temperature ranges		
			Use category						
			d/d	w/d	w/w				
			40°C/24°C		80°C/50°C				
			$N_{Rk,b} = N_{Rk,p}$ ¹⁾		$V_{Rk,b}$ ^{2/3)}				
		h_{ef}	[mm]		[kN]		[kN]		
Compressive strength $f_b \geq 12 \text{ N/mm}^2$									
M8	12x80	80	1,2	1,2	0,9	4,0			
M8 / M10 / IG-M6	16x85	85	1,2	1,2	0,9	5,5			
	16x130	130	1,5	1,5	1,2	5,5			
M12 / M16 / IG-M8 / IG-M10	20x85	85	1,2	1,2	0,9	8,5			
	20x130	130	1,5	1,5	1,2	8,5			

1) Values are valid for c_{cr} and c_{min}

2) Calculation of $V_{Rk,c}$ see Technical Report TR 054, except for shear load parallel to free edge with $c \geq 250 \text{ mm}$: $V_{Rk,c,II} = V_{Rk,b}$

3) The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply $V_{Rk,b}$ by 0,8

Table C71: Displacements

Anchor size	349 Alfa Sleeve	h_{ef}	N	δ_N / N	δ_{N0}	$\delta_{N\infty}$	V	δ_{v0}	$\delta_{v\infty}$
		[mm]	[kN]	[mm/kN]	[mm]	[mm]	[kN]	[mm]	[mm]
M8	12x80	80	0,34	0,80	0,27	0,55	1,0	1,10	1,65
M8 / M10 / IG-M6	16x85	85			0,34	0,69	1,43	2,0	3,0
	16x130	130			0,27	0,55			
M12 / M16 / IG-M8 / IG-M10	20x85	85			0,34	0,69	2,14		
	20x130	130							

292 Alfa Injection mortar for masonry

Performance - Clay hollow brick Calibric R+

Characteristic values of resistance, Displacements

Annex C29

Brick type: Clay hollow brick Urbanbrick

Table C72: Description of the brick

Brick type	Clay hollow brick Urbanbrick	
Bulk density	ρ [kg/dm ³]	0,7
Compressive strength	$f_b \geq$ [N/mm ²]	6, 9 or 12
Code	EN 771-1	
Producer (country code)	e.g. Imerys (FR)	
Brick dimensions	[mm]	560 x 200 x 274
Drilling method	Rotary	

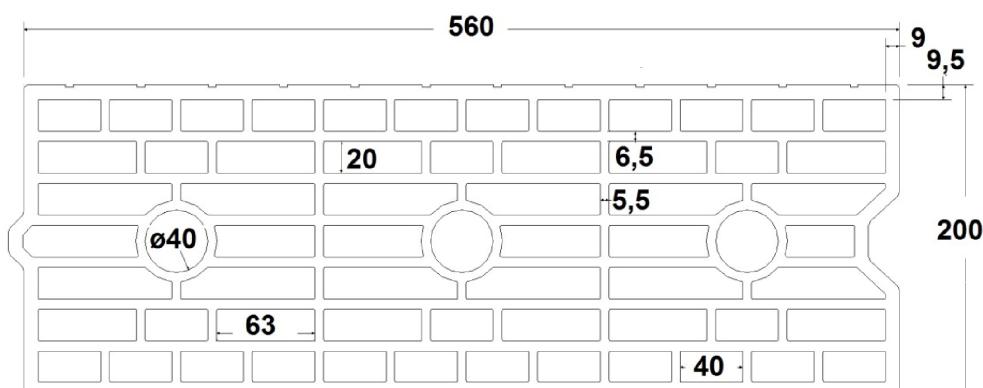


Table C73: Spacing and edge distances

Anchor size	All sizes		
Edge distance	c_{cr}	[mm]	100 (120) ¹⁾
Minimum edge distance	c_{min} ²⁾	[mm]	100 (120) ¹⁾
Spacing	$s_{cr,II}$	[mm]	560
	$s_{cr,\perp}$	[mm]	274
Minimum spacing	s_{min}	[mm]	100

¹⁾ Value in brackets for 349 Alfa Siebhüse 20x85 and 349 Alfa Siebhüse 20x130

²⁾ For $V_{Rk,c}$: c_{min} according to Technical Report TR 054

Table C74: Group factor for anchor group in case of tension loading

Configuration		with c [mm] \geq	with s [mm] \geq			
II: anchors placed parallel to horizontal joint		185	100	$\alpha_{g,N,II}$		1,9
		c_{cr}	560			2,0
\perp : anchors placed perpendicular to horizontal joint		185	100	$\alpha_{g,N,\perp}$		1,1
		c_{cr}	274			2,0

292 Alfa Injection mortar for masonry

Performance - Clay hollow brick Urbanbrick

Description of the brick, Spacing and edge distances, Group factor

Annex C30

Brick type: Clay hollow brick Urbanbrick

Table C75: Group factor for anchor group in case of shear loading parallel to free edge

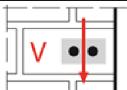
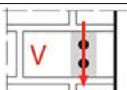
Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		c_{cr}	560	$\alpha_{g,V,II}$	[-]	2,0
⊥: anchors placed perpendicular to horizontal joint		c_{cr}	274	$\alpha_{g,V,\perp}$		2,0

Table C76: Group factor for anchor groups in case of shear load perpendicular to free edge

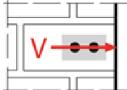
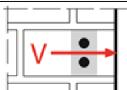
Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		c_{cr}	560	$\alpha_{g,V,II}$	[-]	2,0
⊥: anchors placed perpendicular to horizontal joint		c_{cr}	274	$\alpha_{g,V,\perp}$		2,0

Table C77: Characteristic values of resistance under tension and shear load

Anchor size	349 Alfa Sleeve	Effective Anchorage depth	Characteristic resistance				All temperature ranges		
			Use category						
			d/d	w/d	w/w				
			40°C/24°C	80°C/50°C	120°C/72°C				
			h_{ef}	$N_{Rk,b} = N_{Rk,p}$ ¹⁾			$V_{Rk,b}$ ²⁾⁽³⁾		
[mm]			[mm]	[kN]			[kN]		
Compressive strength $f_b \geq 6 \text{ N/mm}^2$									
M8	12x80	80	0,9	0,9	0,75		3,0		
M8 / M10 / IG-M6	16x85	85	0,9	0,9	0,75		3,0		
	16x130	130	2,0	2,0	1,5		3,0		
M12 / M16 / IG-M8 / IG-M10	20x85	85	0,9	0,9	0,75		3,5		
	20x130	130	2,0	2,0	1,5		3,5		
Compressive strength $f_b \geq 9 \text{ N/mm}^2$									
M8	12x80	80	0,9	0,9	0,9		4,0		
M8 / M10 / IG-M6	16x85	85	0,9	0,9	0,9		4,0		
	16x130	130	2,5	2,5	2,0		4,0		
M12 / M16 / IG-M8 / IG-M10	20x85	85	0,9	0,9	0,9		4,5		
	20x130	130	2,5	2,5	2,0		4,5		

¹⁾ Values are valid for c_{cr} and c_{min}

²⁾ Calculation of $V_{Rk,c}$ see Technical Report TR 054, except for shear load parallel to free edge with $c \geq 190 \text{ mm}$: $V_{Rk,c,II} = V_{Rk,b}$

³⁾ The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply $V_{Rk,b}$ by 0,8

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Performance - Clay hollow brick Urbanbrick

Group factor, Characteristic values of resistance

Annex C31

Brick type: Clay hollow brick Urbanbrick

Table C78: Characteristic values of resistance under tension and shear load (continue)

Anchor size	349 Alfa Sleeve	Effective Anchorage depth	Characteristic resistance				All temperature ranges	
			Use category			d/d		
			w/d	w/w	d/d	w/d		
			40°C/24°C	80°C/50°C	120°C/72°C	w/w		
			h_{ef}	$N_{Rk,b} = N_{Rk,p}$ ¹⁾		$V_{Rk,b}$ ^{2/3)}		
		[mm]		[kN]			[kN]	

Compressive strength $f_b \geq 12 \text{ N/mm}^2$						
M8	12x80	80	1,2	1,2	0,9	4,5
M8 / M10/ IG-M6	16x85	85	1,2	1,2	0,9	4,5
	16x130	130	3,0	3,0	2,5	4,5
M12 / M16 / IG-M8 / IG-M10	20x85	85	1,2	1,2	0,9	5,0
	20x130	130	3,0	3,0	2,5	5,0

1) Values are valid for c_{cr} and c_{min}

2) Calculation of $V_{Rk,c}$ see Technical Report TR 054, except for shear load parallel to free edge with $c \geq 190 \text{ mm}$: $V_{Rk,c,II} = V_{Rk,b}$

3) The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply $V_{Rk,b}$ by 0,8

Table C79: Displacements

Anchor size	349 Alfa Sleeve	h_{ef}	N	δ_N / N	δ_{N0}	$\delta_{N\infty}$	V	δ_{V0}	$\delta_{V\infty}$		
		[mm]	[kN]	[mm/kN]	[mm]	[mm]	[kN]	[mm]	[mm]		
M8	12x80	80									
M8 / M10/ IG- M6	16x85	85	0,34	0,80	0,27	0,55	1,30	1,00	1,50		
	16x130	130	0,86		0,69	1,37					
M12 / M16 / IG-M8 / IG-M10	20x85	85	0,34		0,27	0,55	1,43				
	20x130	130	0,86		0,69	1,37					

292 Alfa Injection mortar for masonry

Performance - Clay hollow brick Urbanbrick
Characteristic values of resistance, Displacements

Annex C32

Brick type: Clay hollow brick Brique creuse C40

Table C80: Description of the brick

Brick type	Clay hollow brick Brique creuse C40		
Bulk density	ρ [kg/dm ³]	0,7	
Compressive strength	$f_b \geq$ [N/mm ²]	4, 8 or 12	
Code	EN 771-1		
Producer (country code)	e.g. Terreal (FR)		
Brick dimensions	[mm]	500 x 200 x 200	
Drilling method	Rotary		

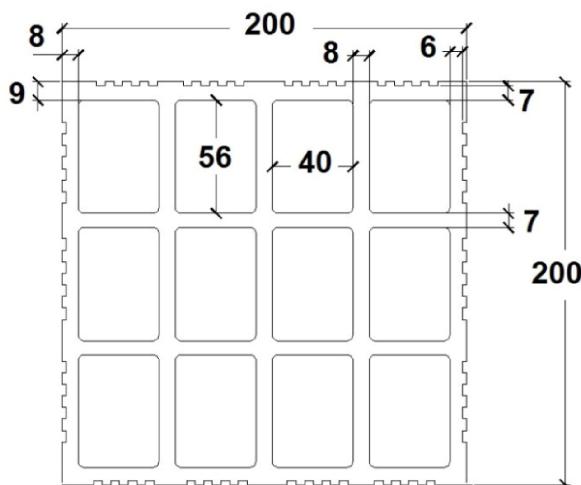


Table C81: Spacing and edge distances

Anchor size	All sizes		
Edge distance	c_{cr}	[mm]	100 (120) ¹⁾
Minimum edge distance	$c_{min}^{2)}$	[mm]	100 (120) ¹⁾
Spacing	$s_{cr,II}$	[mm]	500
	$s_{cr,L}$	[mm]	200
Minimum spacing	s_{min}	[mm]	200

¹⁾ Values in brackets for 349 Alfa Siebhülse 20x85 and 349 Alfa Siebhülse 20x130

²⁾ For $V_{Rk,c}$: c_{min} according to Technical Report TR 054

Table C82: Group factor for anchor group in case of tension loading

Configuration	with c [mm] \geq	with s [mm] \geq	$\alpha_{g,N,II}$	$\alpha_{g,N,L}$	
II: anchors placed parallel to horizontal joint	c_{cr}	200	$\alpha_{g,N,II}$	$\alpha_{g,N,L}$	2,0
⊥: anchors placed perpendicular to horizontal joint	c_{cr}	200			2,0

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Performance - Clay hollow brick Brique creuse C40

Description of the brick, Spacing and edge distances, Group factor

Annex C33

Brick type: Clay hollow brick Brique creuse C40

Table C83: Group factor for anchor group in case of shear loading parallel to free edge

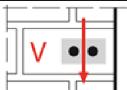
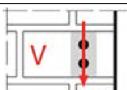
Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		c_{cr}	500	$\alpha_{g,V,II}$	[-]	2,0
⊥: anchors placed perpendicular to horizontal joint		c_{cr}	200	$\alpha_{g,V,\perp}$		2,0

Table C84: Group factor for anchor group in case of shear load perpendicular to free edge

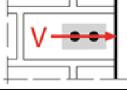
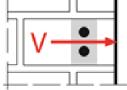
Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		c_{cr}	500	$\alpha_{g,V,II}$	[-]	2,0
⊥: anchors placed perpendicular to horizontal joint		c_{cr}	200	$\alpha_{g,V,\perp}$		2,0

Table C85: Characteristic values of resistance under tension and shear load

Anchor size	349 Alfa Sleeve	Effective Anchorage depth	Characteristic resistance					
			Use category					
			d/d	w/d	w/w	d/d		
			40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges		
			h_{ef}	$N_{Rk,b} = N_{Rk,p}$ ¹⁾		$V_{Rk,b}$ ²⁾⁽³⁾		
$[mm]$			$[kN]$			$[kN]$		
Compressive strength $f_b \geq 4 \text{ N/mm}^2$								
M8	12x80	80	0,6	0,6	0,6	0,9		
M8 / M10 / IG-M6	16x85	85						
	16x130	130						
M12 / M16 / IG-M8 / IG-M10	20x85	85						
	20x130	130						
Compressive strength $f_b \geq 8 \text{ N/mm}^2$								
M8	12x80	80	0,9	0,9	0,75	1,2		
M8 / M10 / IG-M6	16x85	85						
	16x130	130						
M12 / M16 / IG-M8 / IG-M10	20x85	85						
	20x130	130						

¹⁾ Values are valid for c_{cr} and c_{min}

²⁾ Calculation of $V_{Rk,c}$ see Technical Report TR 054

³⁾ The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply $V_{Rk,b}$ by 0,8

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Performance - Clay hollow brick Brique creuse C40

Group factor, Characteristic values of resistance

Annex C34

Brick type: Clay hollow brick Brique creuse C40

Table C86: Characteristic values of resistance under tension and shear load (continue)

Anchor size	349 Alfa Sleeve	Effective Anchorage depth	Characteristic resistance				All temperature ranges	
			Use category			d/d w/d w/w		
			40°C/24°C	80°C/50°C	120°C/72°C			
			h_{ef}	$N_{Rk,b} = N_{Rk,p}$ ¹⁾			$V_{Rk,b}$ ²⁾⁽³⁾	
			[mm]	[kN]			[kN]	
Compressive strength $f_b \geq 12 \text{ N/mm}^2$								
M8	12x80	80	1,2	1,2	0,9	1,5		
M8 / M10 / IG-M6	16x85	85						
	16x130	130						
M12 / M16 / IG-M8 / IG-M10	20x85	85						
	20x130	130						

1) Values are valid for c_{cr} and c_{min}

2) Calculation of $V_{Rk,c}$ see Technical Report TR 054

3) The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply $V_{Rk,b}$ by 0,8

Table C87: Displacements

Anchor size	349 Alfa Sleeve	h_{ef}	N	δ_N / N	δ_{N0}	$\delta_{N\infty}$	V	δ_{v0}	$\delta_{v\infty}$
		[mm]	[kN]	[mm/kN]	[mm]	[mm]	[kN]	[mm]	[mm]
M8	12x80	80	0,17	0,80	0,14	0,27	0,3	0,9	1,35
	16x85	85			0,11	0,23			
	16x130	130			0,14	0,27			
	20x85	85			0,11	0,23			
M12 / M16 / IG-M8 / IG-M10	20x130	130	0,14						

292 Alfa Injection mortar for masonry

Performance - Clay hollow brick Brique creuse C40

Characteristic values of resistance, Displacements

Annex C35

Brick type: Clay hollow brick Blocchi Leggeri

Table C88: Description of the brick

Brick type	Clay hollow brick Blocchi Leggeri	
Bulk density	ρ [kg/dm ³]	0,6
Compressive strength	$f_b \geq$ [N/mm ²]	4, 6, 8 or 12
Code	EN 771-1	
Producer (country code)	e.g. Wienerberger (IT)	
Brick dimensions	[mm]	250 x 120 x 250
Drilling method	Rotary	

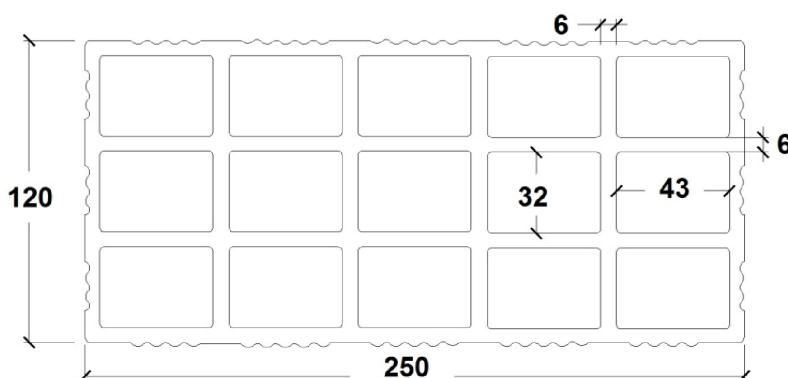


Table C89: Spacing and edge distances

Anchor size	All sizes		
Edge distance	c_{cr}	[mm]	100 (120) ¹⁾
Minimum edge distance	c_{min}	[mm]	60
Spacing	$s_{cr,II}$	[mm]	250
	$s_{cr,\perp}$	[mm]	120
Minimum spacing	s_{min}	[mm]	100

¹⁾ Value in brackets for 349 Alfa Siebhülse 20x85; 349 Alfa Siebhülse 20x130 and 349 Alfa Siebhülse 20x200

Table C90: Group factor for anchor group in case of tension loading

Configuration		with c [mm] \geq	with s [mm] \geq			
II: anchors placed parallel to horizontal joint		60	100	$\alpha_{g,N,II}$	[-]	1,0
		c_{cr}	250			2,0
\perp : anchors placed perpendicular to horizontal joint		60	100	$\alpha_{g,N,\perp}$	[-]	2,0

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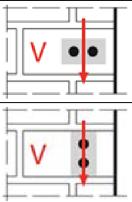
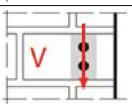
Performance - Clay hollow brick Blocchi Leggeri

Description of the brick, Spacing and edge distances, Group factor

Annex C36

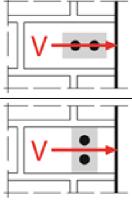
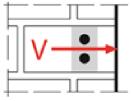
Brick type: Clay hollow brick Blocchi Leggeri

Table C91: Group factor for anchor group in case of shear loading parallel to free edge

Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		60 ¹⁾	100 ¹⁾	$\alpha_{g,V,II}$	[-]	1,0
		c_{cr}	250			2,0
⊥: anchors placed perpendicular to horizontal joint		60 ¹⁾	100 ¹⁾	$\alpha_{g,V,\perp}$	[-]	1,6
		c_{cr}	250			2,0

¹⁾ Only valid for $V_{Rk,b}$ according to Table C93 and C94 values in brackets

Table C92: Group factor for anchor group in case of shear load perpendicular to free edge

Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		60 ¹⁾	100 ¹⁾	$\alpha_{g,V,II}$	[-]	1,0
		c_{cr}	250			2,0
⊥: anchors placed perpendicular to horizontal joint		60 ¹⁾	100 ¹⁾	$\alpha_{g,V,\perp}$	[-]	1,6
		c_{cr}	250			2,0

¹⁾ Only valid for $V_{Rk,b}$ according to Table C93 and C94 values in brackets

Table C93: Characteristic values of resistance under tension and shear load

Anchor size	349 Alfa Sleeve	Effective Anchorage depth	Characteristic resistance			
			Use category			d/d w/d w/w
			d/d	w/d	w/w	
			40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges
			$N_{Rk,b} = N_{Rk,p}$ ¹⁾			$V_{Rk,b}$ ⁴⁾
			[kN]			[kN]
Compressive strength $f_b \geq 4 \text{ N/mm}^2$						
M8	12x80	80	0,4	0,4	0,3	2,0 ²⁾ (0,9 ³⁾
M8 / M10 / IG-M6	16x85	85				
	16x130	130				
M12 / M16 / IG-M8 / IG-M10	20x85	85				
	20x130	130				
	20x200	200				

¹⁾ Values are valid for c_{cr} and c_{min}

²⁾ Calculation of $V_{Rk,c}$ see Technical Report TR 054, except for shear load parallel to free edge with $c \geq 125 \text{ mm}$: $V_{Rk,c,II} = V_{Rk,b}$

³⁾ Values in brackets $V_{Rk,c} = V_{Rk,b}$ for anchors with c_{min}

⁴⁾ The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply $V_{Rk,b}$ by 0,8

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Performance - Clay hollow brick Blocchi Leggeri

Group factor, Characteristic values of resistance

Annex C37

Brick type: Clay hollow brick Blocchi Leggeri

Table C94: Characteristic values of resistance under tension and shear load (continue)

Anchor size	349 Alfa Sleeve	Effective Anchorage depth	Characteristic resistance				All temperature ranges	
			Use category					
			d/d	w/d	w/w			
			40°C/24°C	80°C/50°C	120°C/72°C			
			$N_{Rk,b} = N_{Rk,p}$ ¹⁾			$V_{Rk,b}$ ⁴⁾		
		h_{ef}		[kN]			[kN]	
		[mm]						
Compressive strength $f_b \geq 6 \text{ N/mm}^2$								
M8	12x80	80	0,5	0,5	0,4	$2,5^{2)} (1,2)^3)$		
M8 / M10/ IG-M6	16x85	85						
	16x130	130						
M12 / M16 / IG-M8 / IG-M10	20x85	85						
	20x130	130						
	20x200	200						
Compressive strength $f_b \geq 8 \text{ N/mm}^2$								
M8	12x80	80	0,6	0,6	0,5	$3,0^{2)} (1,2)^3)$		
M8 / M10/ IG-M6	16x85	85						
	16x130	130						
M12 / M16 / IG-M8 / IG-M10	20x85	85						
	20x130	130						
	20x200	200						
Compressive strength $f_b \geq 12 \text{ N/mm}^2$								
M8	12x80	80	0,6	0,6	0,6	$3,5^{2)} (1,5)^3)$		
M8 / M10/ IG-M6	16x85	85						
	16x130	130						
M12 / M16 / IG-M8 / IG-M10	20x85	85						
	20x130	130						
	20x200	200						

¹⁾ Values are valid for c_{cr} and c_{min}

²⁾ Calculation of $V_{Rk,c}$ see Technical Report TR 054, except for shear load parallel to free edge with $c \geq 125 \text{ mm}$: $V_{Rk,c,II} = V_{Rk,b}$

³⁾ Values in brackets $V_{Rk,c} = V_{Rk,b}$ for anchors with c_{min}

⁴⁾ The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply $V_{Rk,b}$ by 0,8

Table C95: Displacements

Anchor size	349 Alfa Sleeve	h_{ef}	N	δ_N / N	δ_{N0}	$\delta_{N\infty}$	V	δ_{v0}	$\delta_{v\infty}$
		[mm]	[kN]	[mm/kN]	[mm]	[mm]	[kN]	[mm]	[mm]
All sizes	All sizes	All sizes	0,17	1,20	0,21	0,41	0,9	1,20	1,80

292 Alfa Injection mortar for masonry

Performance - Clay hollow brick Blocchi Leggeri

Characteristic values of resistance, Displacements

Annex C38

Brick type: Clay hollow brick Doppio Uni

Table C96: Description of the brick

Brick type	Clay hollow brick Doppio Uni	
Bulk density	ρ [kg/dm ³]	0,9
Compressive strength	$f_b \geq$ [N/mm ²]	10, 16, 20 or 28
Code	EN 771-1	
Producer (country code)	e.g. Wienerberger (IT)	
Brick dimensions	[mm]	250 x 120 x 120
Drilling method	Rotary	

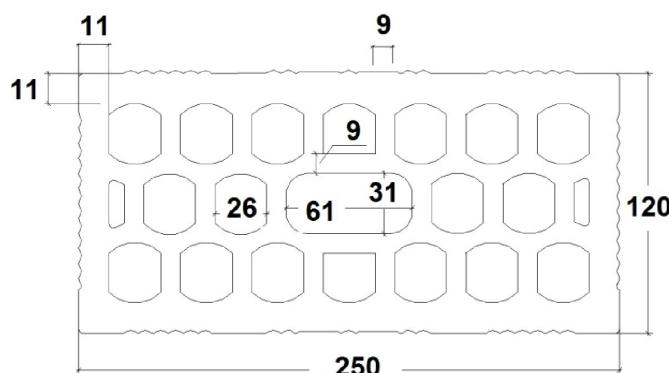
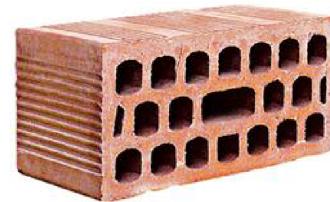


Table C97: Spacing and edge distances

Anchor size	All sizes	
Edge distance	c_{cr}	[mm] 100 (120) ¹⁾
Minimum edge distance	c_{min} ²⁾	[mm] 60
Spacing	$s_{cr,II}$	[mm] 250
	$s_{cr,\perp}$	[mm] 120
Minimum spacing	$s_{min,II}$	[mm] 100
	$s_{min,\perp}$	[mm] 120

¹⁾ Value in brackets for 349 Alfa Siebhüle; 349 Alfa Siebhüle 20x130 and 349 Alfa Siebhüle 20x200

²⁾ For $V_{Rk,c}$: c_{min} according to Technical Report TR 054

Table C98: Group factor for anchor group in case of tension loading

Configuration	with c [mm] \geq	with s [mm] \geq			
II: anchors placed parallel to horizontal joint	60	100	$\alpha_{g,N,II}$	[-]	1,0
	c_{cr}	250			2,0
\perp : anchors placed perpendicular to horizontal joint	60	120	$\alpha_{g,N,\perp}$	[-]	2,0

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Performance - Clay hollow brick Doppio Uni

Description of the brick, Spacing and edge distances, Group factor

Annex C39

Brick type: Clay hollow brick Doppio Uni

Table C99: Group factor for anchor group in case of shear loading parallel to free edge

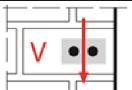
Configuration	with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		c _{cr}	250	α _{g,V,II}	[-]
⊥: anchors placed perpendicular to horizontal joint		c _{cr}	120	α _{g,V,⊥}	

Table C100: Group factor for anchor group in case of shear load perpendicular to free edge

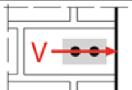
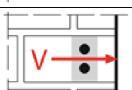
Configuration	with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		c _{cr}	250	α _{g,V,II}	[-]
⊥: anchors placed perpendicular to horizontal joint		c _{cr}	120	α _{g,V,⊥}	

Table C101: Characteristic values of resistance under tension and shear load

Anchor size	349 Alfa Sleeve	Effective Anchorage depth	Characteristic resistance					
			Use category			d/d w/d w/w		
			40°C/24°C	80°C/50°C	120°C/72°C			
			h_{ef}	$N_{Rk,b} = N_{Rk,p}$ ¹⁾		$V_{Rk,b}$ ²⁾⁽³⁾		
[mm]			[kN]			[kN]		
Compressive strength $f_b \geq 10 \text{ N/mm}^2$								
M8	12x80	80	0,6	0,6	0,5	1,5		
M8 / M10 / IG-M6	16x85	85						
	16x130	130						
M12 / M16 / IG-M8 / IG-M10	20x85	85						
	20x130	130						
	20x200	200						

1) Values are valid for c_{cr} and c_{min}

2) Calculation of $V_{Rk,c}$ see Technical Report TR 054

3) The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply $V_{Rk,b}$ by 0,8

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Performance - Clay hollow brick Doppio Uni

Group factor, Characteristic values of resistance

Annex C40

Brick type: Clay hollow brick Doppio Uni

Table C102: Characteristic values of resistance under tension and shear load (continue)

Anchor size	349 Alfa Sleeve	Effective Anchorage depth	Characteristic resistance				All temperature ranges	
			Use category			d/d w/d w/w		
			40°C/24°C	80°C/50°C	120°C/72°C			
			h_{ef}	$N_{Rk,b} = N_{Rk,p}$ ¹⁾		$V_{Rk,b}$ ^{2/3)}		
			[mm]	[kN]		[kN]		
Compressive strength $f_b \geq 16 \text{ N/mm}^2$								
M8	12x80	80	0,75	0,75	0,6	2,0		
M8 / M10/ IG-M6	16x85	85						
	16x130	130						
M12 / M16 / IG-M8 / IG-M10	20x85	85						
	20x130	130						
	20x200	200						
Compressive strength $f_b \geq 20 \text{ N/mm}^2$								
M8	12x80	80	0,9	0,9	0,75	2,0		
M8 / M10/ IG-M6	16x85	85						
	16x130	130						
M12 / M16 / IG-M8 / IG-M10	20x85	85						
	20x130	130						
	20x200	200						
Compressive strength $f_b \geq 28 \text{ N/mm}^2$								
M8	12x80	80	1,2	1,2	0,9	2,5		
M8 / M10/ IG-M6	16x85	85						
	16x130	130						
M12 / M16 / IG-M8 / IG-M10	20x85	85						
	20x130	130						
	20x200	200						

1) Values are valid for c_{cr} and c_{min}

2) Calculation of $V_{Rk,c}$ see Technical Report TR 054

3) The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply $V_{Rk,b}$ by 0,8

Table C103: Displacements

Anchor size	349 Alfa Sleeve	h_{ef}	N	δ_N / N	δ_{N0}	$\delta_{N\infty}$	V	δ_{v0}	$\delta_{v\infty}$
		[mm]	[kN]	[mm/kN]	[mm]	[mm]	[kN]	[mm]	[mm]
All sizes	All sizes	All sizes	0,26	1,20	0,31	0,62	0,6	0,3	0,45

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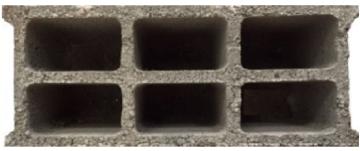
Performance - Clay hollow brick Doppio Uni

Characteristic values of resistance, Displacements

Annex C41

Brick type: Hollow lightweight concrete Bloc creux B40

Table C104: Description of the brick

Brick type	Hollow Lightweight concrete Bloc creux B40	
Bulk density ρ [kg/dm ³]	0,8	
Compressive strength $f_b \geq$ [N/mm ²]	4	
Code	EN 771-3	
Producer (country code)	e.g. Sepa (FR)	
Brick dimensions [mm]	494 x 200 x 190	
Drilling method	Rotary	

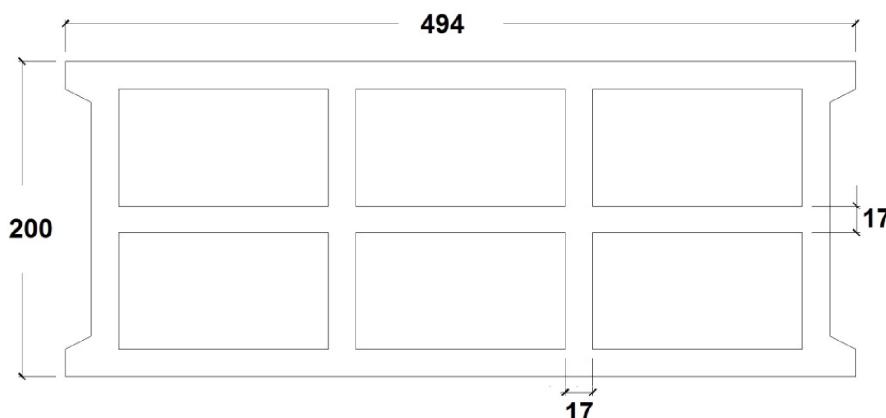


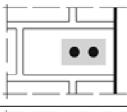
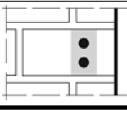
Table C105: Spacing and edge distances

Anchor size			All sizes
Edge distance c_{cr}	c_{cr}	[mm]	100 (120) ¹⁾
Minimum edge distance c_{min}	c_{min}	[mm]	100 (120) ¹⁾
Spacing $s_{cr,II}$	$s_{cr,II}$	[mm]	494
	$s_{cr,\perp}$	[mm]	190
Minimum spacing s_{min}	s_{min}	[mm]	100

¹⁾ Value in brackets for 349 Alfa Siebhülse 20x85 and 349 Alfa Siebhülse 20x130

²⁾ For $V_{Rk,c}$: c_{min} according to Technical Report TR 054

Table C106: Group factor for anchor group in case of tension loading

Configuration		with c [mm] \geq	with s [mm] \geq		
II: anchors placed parallel to horizontal joint		100	100	$\alpha_{g,N,II}$	1,5
		c_{cr}	494		
\perp : anchors placed perpendicular to horizontal joint		100	100	$\alpha_{g,N,\perp}$	2,0
		c_{cr}	190		

292 Alfa Injection mortar for masonry

Performance - Hollow Lightweight concrete Bloc creux B40

Description of the brick, Spacing and edge distances, Group factor

Annex C42

Brick type: Hollow lightweight concrete Bloc creux B40

Table C107: Group factor for anchor group in case of shear loading parallel to free edge

Configuration		with c [mm] ≥	with s [mm] ≥		
II: anchors placed parallel to horizontal joint		50	100	$\alpha_{g,V,II}$	1,1 2,0
		c_{cr}	494		
⊥: anchors placed perpendicular to horizontal joint		100	100	$\alpha_{g,V,\perp}$	1,1 2,0
		c_{cr}	190		

Table C108: Group factor for anchor group in case of shear load perpendicular to free edge

Configuration		with c [mm] ≥	with s [mm] ≥		
II: anchors placed parallel to horizontal joint		c_{cr}	494	$\alpha_{g,V,II}$	2,0
		c_{cr}	190		
⊥: anchors placed perpendicular to horizontal joint		c_{cr}	190	$\alpha_{g,V,\perp}$	2,0
		c_{cr}	190		

Table C109: Characteristic values of resistance under tension and shear load

Anchor size	349 Alfa Sleeve	Effective anchorage depth	Characteristic resistance						d/d w/d w/w All temperature ranges $V_{Rk,b}^{2/3)}$					
			d/d			w/d w/w								
			40°C/24°C	80°C/50°C	120°C/72°C	40°C/24°C	80°C/50°C	120°C/72°C						
			h_{ef}	$N_{Rk,b} = N_{Rk,p}^{1)}$			$N_{Rk,b} = N_{Rk,p}^{1)}$	$[kN]$						
			[mm]											
Compressive strength $f_b \geq 4 \text{ N/mm}^2$														
M8	12x80	80	1,2	0,9	0,75	0,9	0,9	0,75	3,0					
M8 / M10 / IG-M6	16x85	85				1,2								
	16x130	130				1,2								
M12 / M16 / IG-M8 / IG-M10	20x85	85				1,2								
	20x130	130				1,2								

¹⁾ Values are valid for c_{cr} and c_{min}

²⁾ Calculation of $V_{Rk,c}$ see Technical Report TR 054, except for shear load parallel to free edge with $c \geq 250 \text{ mm}$: $V_{Rk,c,II} = V_{Rk,b}$

³⁾ The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply $V_{Rk,b}$ by 0.8

Table C110: Displacements

Anchor size	349 Alfa Sleeve	h_{ef}	N	δ_N / N	δ_{N0}	$\delta_{N\infty}$	V	δ_{V0}	$\delta_{V\infty}$
Anchor size	All sizes	All sizes	N	[mm/kN]	[mm]	[mm]	V	[mm]	[mm]
All sizes	All sizes	All sizes	0,34	0,90	0,31	0,62	0,86	0,9	1,35

292 Alfa Injection mortar for masonry

Performance - Hollow lightweight concrete Bloc creux B40

Group factor, Characteristic values of resistance, Displacements

Annex C43

Brick type: Solid lightweight concrete - LAC

Table C111: Description of the brick

Brick type	Solid lightweight concrete LAC			
Bulk density ρ [kg/dm ³]	0,6			
Compressive strength $f_b \geq$ [N/mm ²]	2			
Code	EN 771-3			
Producer (country code)	e.g. Bisotherm (DE)			
Brick dimensions [mm]	300 x 123 x 248			
Drilling method	Rotary			

Table C112: Spacing and edge distances

Anchor size	All sizes		
Edge distance c_{cr} [mm]		1,5*h _{ef}	
Minimum edge distance c_{min} [mm]		60	
Spacing s_{cr} [mm]		3*h _{ef}	
Minimum spacing s_{min} [mm]		120	

Table C113: Group factor for anchor group in case of tension loading

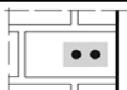
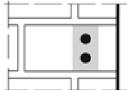
Configuration	with c [mm] \geq	with s [mm] \geq			
II: anchors placed parallel to horizontal joint		90	120	$\alpha_{g,N,II}$	1,1
		1,5*h _{ef}			2,0
I: anchors placed perpendicular to horizontal joint		124	120	$\alpha_{g,N,\perp}$	1,1
		1,5*h _{ef}			2,0

Table C114: Group factor for anchor group in case of shear loading parallel to free edge

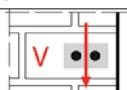
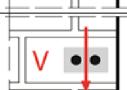
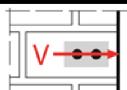
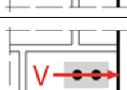
Configuration	with c [mm] \geq	with s [mm] \geq			
II: anchors placed parallel to horizontal joint		60	120	$\alpha_{g,V,II}$	0,6
		90			2,0
I: anchors placed perpendicular to horizontal joint		60	120	$\alpha_{g,V,\perp}$	0,6
		124			2,0

Table C115: Group factor for anchor group in case of shear load perpendicular to free edge

Configuration	with c [mm] \geq	with s [mm] \geq			
II: anchors placed parallel to horizontal joint		60	120	$\alpha_{g,V,II}$	0,6
		90			2,0
I: anchors placed perpendicular to horizontal joint		60	120	$\alpha_{g,V,\perp}$	0,6
		1,5*h _{ef}			1,0
		1,5*h _{ef}	120		2,0
			3*h _{ef}		

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Performance - Solid lightweight concrete - LAC

Description of the brick, Spacing and edge distances, Group factor

Annex C44

Brick type: Solid lightweight concrete - LAC

Table C116: Characteristic values of resistance under tension and shear load

Anchor size	349 Alfa Sleeve	Effective anchorage depth	Characteristic resistance									
			Use category									
			d/d			w/d w/w			d/d w/d w/w			
			40°C/24°C	80°C/50°C	120°C/72°C	40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges			
h_{ef}			$N_{Rk,b} = N_{Rk,p}$ ¹⁾						$V_{Rk,b}$ ²⁽³⁾			
[mm]			[kN]									
Compressive strength $f_b \geq 2 \text{ N/mm}^2$												
M8	-	80	3,0	2,5	2,0	2,5	2,0	1,5	3,0			
M8 / M10 / IG-M6	-	90	3,0	3,0	2,0	2,5	2,5	2,0	3,0			
M10 / IG-M8	-	100	3,5	3,0	2,5	3,0	2,5	2,0	3,0			
M16 / IG-M10	-	100	3,0	3,0	2,0	3,0	3,0	2,0	3,0			
M8	12x80	80	2,5	2,5	2,0	2,5	2,0	1,5	3,0			
M8 / M10 / IG-M6	16x85	85	3,0	2,5	2,0	3,0	2,5	2,0	3,0			
	16x130	130	3,0	2,5	2,0	3,0	2,5	2,0	3,0			
M12 / M16 / IG-M8 / IG-M10	20x85	85	2,5	2,5	2,0	2,5	2,5	2,0				
	20x130	130							3,0			
	20x200	200										

¹⁾ Values are valid for c_{cr} , values in brackets are valid for single anchors with c_{min}

²⁾ For calculation of $V_{Rk,c}$ see Technical Report TR 054

³⁾ The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply $V_{Rk,b}$ by 0,8

Table C117: Displacements

Anchor size	349 Alfa Sleeve	h_{ef}	N	δ_N / N		δ_{N0}	$\delta_{N\infty}$	V	δ_{v0}	$\delta_{v\infty}$
				[mm]	[kN]	[mm/kN]	[mm]			
M8	-	80	0,86	0,50	0,43	0,86	0,9	0,25	0,38	
M8 / M10 / IG-M6	-	90								
M10 / IG-M8	-	100	1,00	0,35	0,35	0,70	0,9	0,25	0,38	
M16 / IG-M10	-	100								
M8	12x80	80	0,71	0,50	0,36	0,71	0,9	0,25	0,38	
M8 / M10 / IG-M6	16x85	85								
	16x130	130								
M12 / M16 / IG-M8 / IG-M10	20x85	85	0,35	0,25	0,50	0,50	0,9	0,25	0,38	
	20x130	130								
	20x200	200								

292 Alfa Injection mortar for masonry

Performance - Solid lightweight concrete - LAC

Characteristic values of resistance, Displacements

Annex C45