Deutsches Institut für Bautechnik

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Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

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

European Technical Assessment ETA-15/0320 of 31 May 2021

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	CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool
Product family to which the construction product belongs	Metal Injection anchors for use in masonry
Manufacturer	CELO Befestigungssysteme GmbH Industriestraße 6 86551 Aichach DEUTSCHLAND
Manufacturing plant	Plant 2 Germany
This European Technical Assessment contains	58 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, Edition 11/2017
This version replaces	ETA-15/0320 issued on 5 May 2017

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Specific Part

1 Technical description of the product

The "CELO Injection System ResiFIX VYSF, ResiFIX VYSF Cool" is a bonded anchor (injection type) consisting of a mortar cartridge with injection mortar ResiFIX VYSF or ResiFIX VYSF Cool, a perforated sleeve and an anchor rod with hexagon nut and washer or an Internal threaded rod. The steel elements are made of zinc coated steel, stainless steel or high corrosion resistant steel.

The anchor rod is placed into a drilled hole filled with injection mortar and is anchored via the bond 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 40
Displacements	See Annex C 6 to C 40
Durability	See annex B 1

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

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.

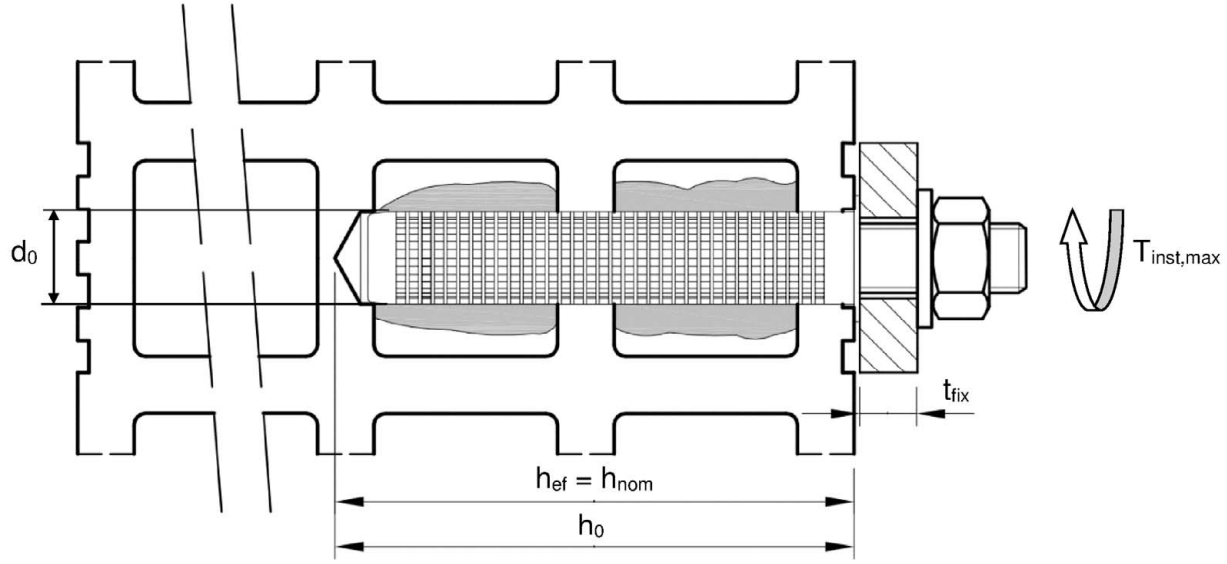
Issued in Berlin on 31 May 2021 by Deutsches Institut für Bautechnik

Dipl.-Ing. Beatrix Wittstock
Head of Section

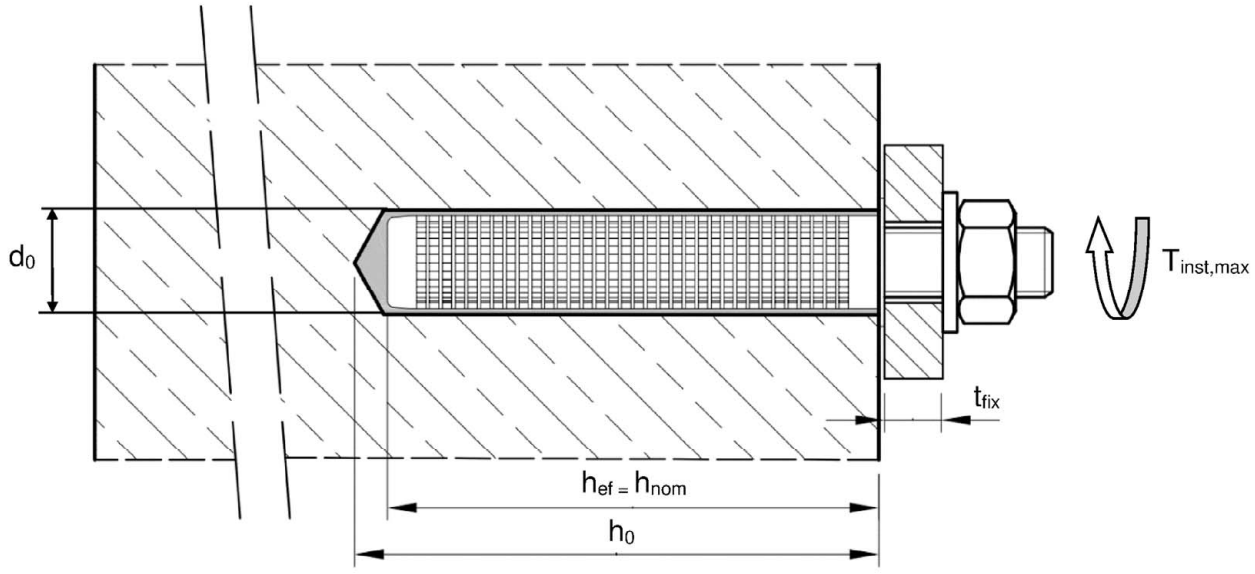
beglaubigt:
Baderschneider

Deutsches Institut für Bautechnik DIBt

Installation in hollow brick; threaded rod and Internal threaded rod with sleeve



Installation in solid brick; threaded rod and Internal threaded rod with or without sleeve



$h_{ef} = h_{nom}$	=	effective anchorage depth	d_0	=	nominal drill hole diameter
h_0	=	drill hole depth	$T_{inst,max}$	=	Max installation torque moment
t_{fix}	=	thickness of fixture			

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool	**Annex A 1**
Product description Installed condition	

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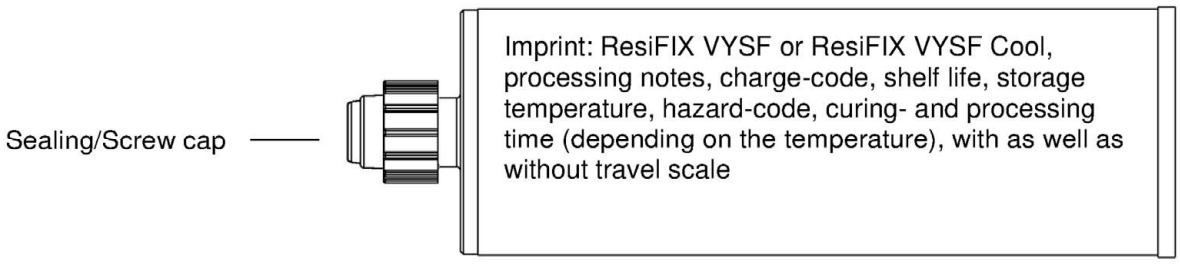
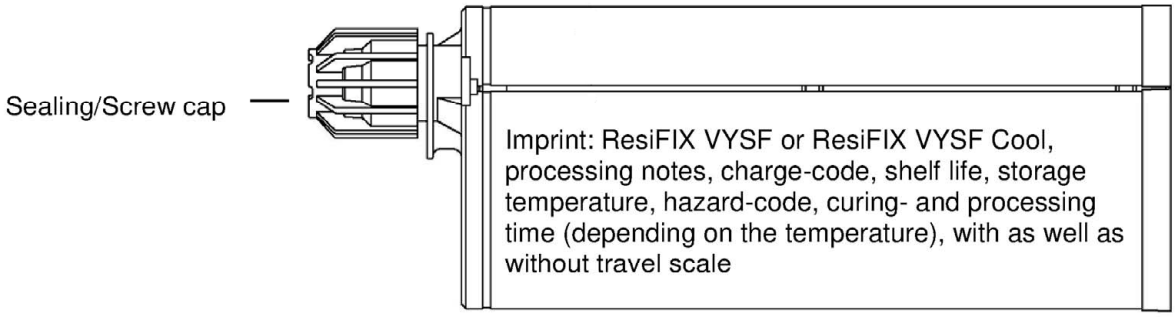
Cartridge: ResiFIX VYSF or ResiFIX VYSF Cool

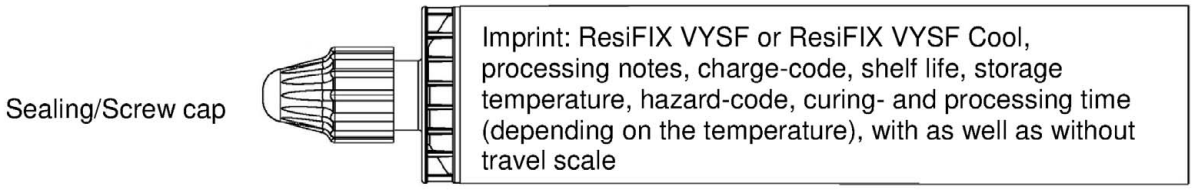
150 ml, 280 ml, 300 ml up to 333 ml and 380 ml up to 420 ml Cartridge: (Type: coaxial)



235 ml, 345 ml up to 360 ml and 825 ml Cartridge (Type: "side-by-side")

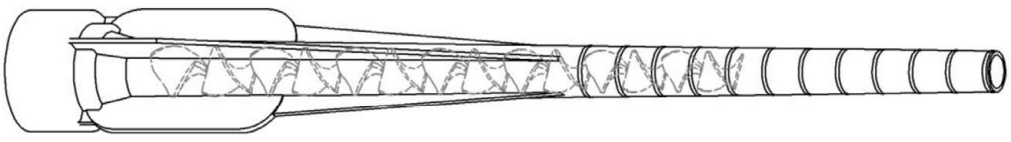


165 ml and 300 ml Cartridge (Type: "foil tube")



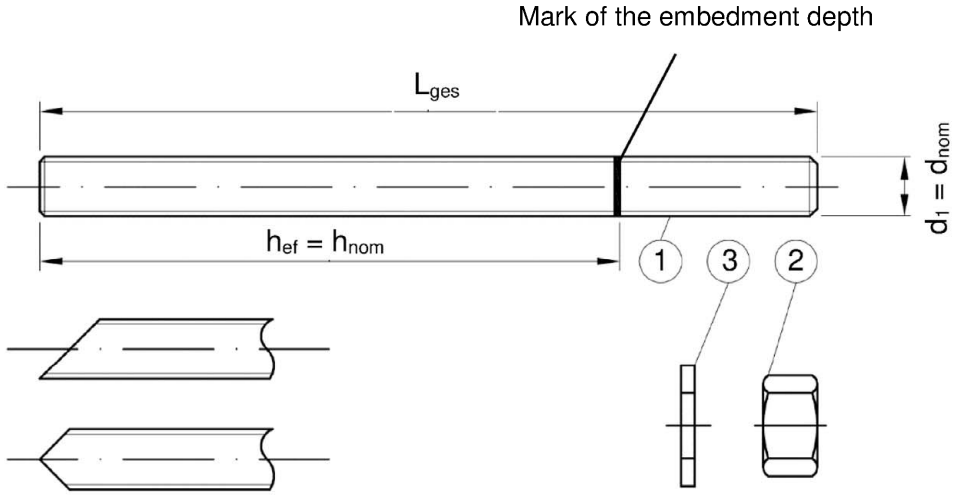
Static mixer

CRW 14W



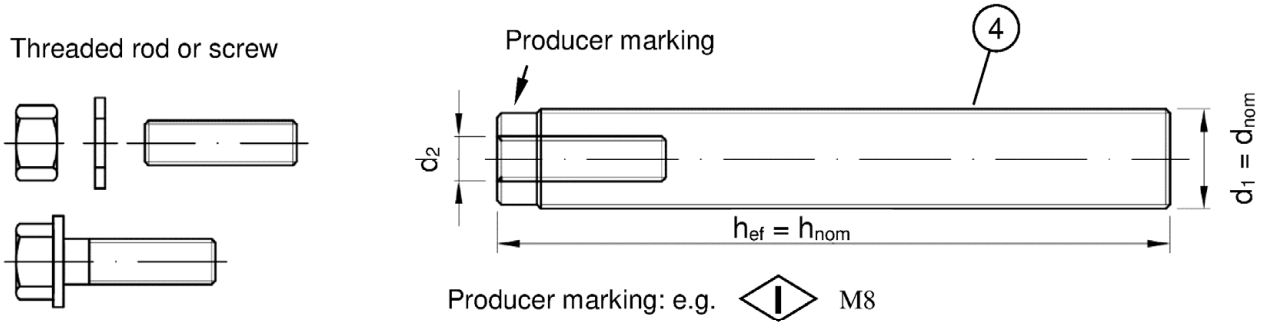
CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool	**Annex A 2**
Product description Injection system	

Threaded Rod M8, M10, M12, M16



Commercial standard rod with:
- Materials, dimensions and mechanical properties acc. to Table A1
- Inspection certificate 3.1 acc. to EN 10204:2004. The document shall be stored.
- Marking of embedment depth

Internal threaded rod IG-M6, IG-M8, IG-M10



Producer marking: e.g. M8

I	Marking Internal thread
	Mark
M8	Thread size (Internal thread)
A4	additional mark for stainless steel
HCR	additional mark for high-corrosion resistance steel

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool	**Annex A 3**
Product description Anchor rods	

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Table A1: Materials

Part	Designation	Material			
Steel, zinc plated (Steel acc. to EN ISO 683-4:2018 or EN 10263:2001) - zinc plated ≥ 5 µm acc. to EN ISO 4042:2018 or - hot-dip galvanised ≥ 40 µm acc. to EN ISO 1461:2009 and EN ISO 10684:2004+AC:2009 or - sherardized ≥ 45 µm acc. to EN ISO 17668:2016					
1	Threaded rod	Property class		Characteristic steel ultimate tensile strength	Characteristic steel yield strength
		acc. to EN ISO 898-1:2013	4.6	f_{uk} = 400 N/mm²	f_{yk} = 240 N/mm²
			4.8	f_{uk} = 400 N/mm²	f_{yk} = 320 N/mm²
			5.6	f_{uk} = 500 N/mm²	f_{yk} = 300 N/mm²
			5.8	f_{uk} = 500 N/mm²	f_{yk} = 400 N/mm²
			8.8	f_{uk} = 800 N/mm²	f_{yk} = 640 N/mm²
2	Hexagon nut	acc. to EN ISO 898-2:2012	4	for anchor rod class 4.6 or 4.8	
			5	for anchor rod class 5.6 or 5.8	
			8	for anchor rod class 8.8	
3	Washer	Steel, zinc plated, hot-dip galvanised or sherardized (e.g.: EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000 or EN ISO 7094:2000)			
4	Internal threaded anchor rod	Property class		Characteristic steel ultimate tensile strength	Characteristic steel yield strength
		acc. to EN ISO 898-1:2013	5.8	f_{uk} = 500 N/mm²	f_{yk} = 400 N/mm²
			8.8	f_{uk} = 800 N/mm²	f_{yk} = 640 N/mm²
Stainless steel A2 (Material 1.4301 / 1.4307 / 1.4311 / 1.4567 or 1.4541, acc. to EN 10088-1:2014) **Stainless steel A4** (Material 1.4401 / 1.4404 / 1.4571 / 1.4362 or 1.4578, acc. to EN 10088-1:2014) **High corrosion resistance steel** (Material 1.4529 or 1.4565, acc. to EN 10088-1: 2014)					
1	Threaded rod [1)]	Property class		Characteristic steel ultimate tensile strength	Characteristic steel yield strength
		acc. to EN ISO 3506-1:2020	50	f_{uk} = 500 N/mm²	f_{yk} = 210 N/mm²
			70	f_{uk} = 700 N/mm²	f_{yk} = 450 N/mm²
			80	f_{uk} = 800 N/mm²	f_{yk} = 600 N/mm²
2	Hexagon nut [1)]	acc. to EN ISO 3506-1:2020	50	for anchor rod class 50	
			70	for anchor rod class 70	
			80	for anchor rod class 80	
3	Washer	A2: Material 1.4301 / 1.4307 / 1.4311 / 1.4567 or 1.4541, acc. to EN 10088-1:2014 A4: Material 1.4401 / 1.4404 / 1.4571 / 1.4362 or 1.4578, acc. to EN 10088-1:2014 HCR: Material 1.4529 or 1.4565, acc. to EN 10088-1: 2014 (e.g.: EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000 or EN ISO 7094:2000)			
4	Internal threaded anchor rod [1)]	Property class		Characteristic steel ultimate tensile strength	Characteristic steel yield strength
		acc. to EN ISO 3506-1:2020	50	f_{uk} = 500 N/mm²	f_{yk} = 210 N/mm²
			70	f_{uk} = 700 N/mm²	f_{yk} = 450 N/mm²
[1)] Property class 80 only for stainless steel A4 and HCR					
Plastic sleeve					
Perforated sleeve		Polypropylene (PP)			

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Product description
Materials

Annex A 4

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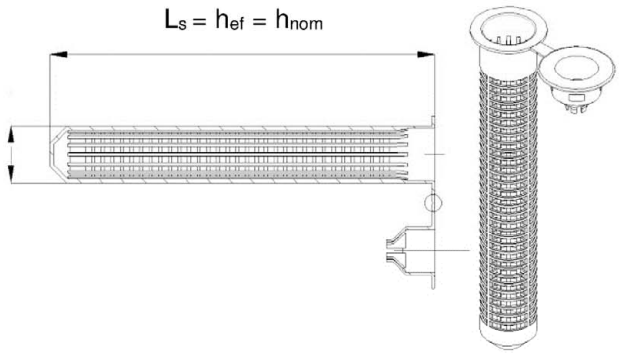
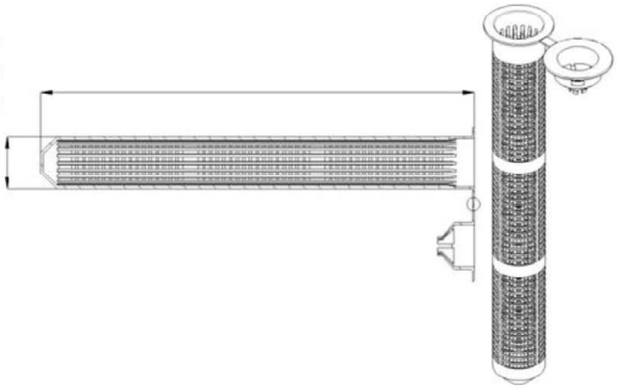
Table A2: perforated sleeve

SH 12x80
SH 16x85
SH 20x85

$L_s = h_{ef} = h_{nom}$



SH 16x130
SH 20x130
SH 20x200



SH 16x130 / 330

for installation through insulation up to a thickness of 20 cm or push through installation

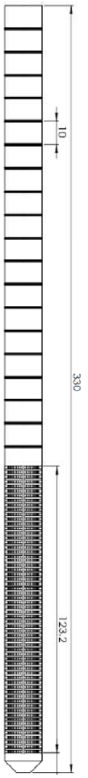


Table A3: sleeve dimensions

sleeve			
size	d_s	L_s	$h_{ef} = h_{nom}$
[mm]	[mm]	[mm]	[mm]
SH 12x80	12	80	80
SH 16x85	16	85	85
SH 16x130	16	130	130
SH 16x130 / 330 [1)]	16	330	130
SH 20x85	20	85	85
SH 20x130	20	130	130
SH 20x200	20	200	200

[1)] In annex C4 – C40 this sleeve is covered with the SH 16x130

Table A4: Steel parts

Anchor Rod			
Size	$d_1 = d_{nom}$	d_2	l_{ges}
[mm]	[mm]	[mm]	[mm]
IG-M6 [1)]	10	6	with sleeve: hef - 5mm without sleeve: hef
IG-M8 [1)]	12	8	
IG-M10 [1)]	16	10	
M8	8	-	hef + t_{fix} + 9,5
M10	10	-	hef + t_{fix} + 11,5
M12	12	-	hef + t_{fix} + 17,5
M16	16	-	hef + t_{fix} + 20,0

[1)] Internal threaded rod with metric external thread

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Product description
Sleeves

Annex A 5

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Specifications of intended use

Anchorages subject to:
- Static and quasi-static loads

Base materials:
- Autoclaved Aerated Concrete (Use condition d) according to Annex B2
- Solid brick masonry (Use condition b), according to Annex B2.
- Hollow brick masonry (Use condition c), according to Annex B2 and B3
- Mortar strength class of the masonry M2,5 at minimum according to EN 998-2:2010.
- For other bricks in solid masonry and in hollow masonry or in autoclaved aerated concrete, the characteristic resistance of the anchor may be determined by job site tests according to EOTA TR 053, Edition April 2016 under consideration of the β-factor according to Annex C1, Table C1.

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 conditions in respect of installation and use:
- Condition d/d: Installation and use in dry masonry
- Condition w/w: Installation and use in dry or wet masonry (incl. w/d installation in wet masonry and use in dry masonry)

Design:
- Verifiable calculation notes and drawings are prepared taking account the relevant masonry in the region of the anchorage, the loads to be transwithted 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 the EOTA TR 054, Edition April 2016, Design method A under the responsibility of an engineer experienced in anchorages and masonry work.
- $N_{Rk,p} = N_{Rk,b}$ see Annex C4 to C40; $N_{Rk,s}$ see Annex C2; $N_{Rk,pb}$ see EOTA TR 054, Edition April 2016
- $V_{Rk,b}$ see Annex C4 to C40; $V_{Rk,s}$ see Annex C2; $V_{Rk,c}$ see Annex C3; $V_{Rk,pb}$ see EOTA TR 054, Edition April 2016
- For application with sleeve with drill bit size ≤ 15mm installd 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 C40)
  - $V_{Rk,c,j} = 0{,}15 * V_{Rk,c}$ and $V_{Rk,b,j} = 0{,}15 * V_{Rk,b}$ ($V_{Rk,b}$ see Annex C4 to C40; and $V_{Rk,c}$ see Annex C3)
- Application without sleeve installd in joints not filled with mortar is not allowed.

Installation:
- Dry or wet structures.
- Anchor Installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- Fastening screws or threaded rods (incl. nut and washer) must comply with the appropriate material and property class of the Internal threaded rod .

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool	**Annex B 1**
Intended use Specifications	

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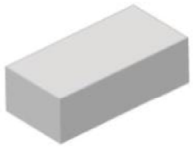
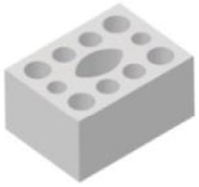
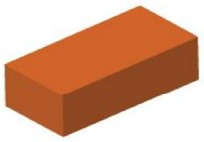
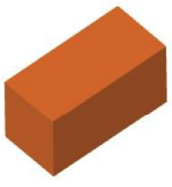
Table B1: Overview brick types and properties with corresponding fastening elements (Anchor and Sleeves)

naming density [kg/dm³] dimensions LxBxH [mm]	picture	anchor rods	perforated sleeve	Annex	naming density [kg/dm³] dimensions LxBxH [mm]	picture	anchor rods	perforated sleeve	Annex
Autoclaved aerated concrete acc. to EN 771-4					**solid light weight concrete brick acc. to EN 771-3**				
AAC ρ = 0,35-0,60 ≥ 499x240x249		M8 - M16 IG-M6 - IG-M10	12x80 16x85 16x130 20x85 20x130 20x200	C4 – C6	VBL ρ ≥ 0,6 ≥240x300x113		M8 - M16 IG-M6 - IG-M10	12x80 16x85 16x130 20x85 20x130 20x200	C39 - C40
Hollow light weight concrete brick acc. to EN 771-3									
HBL 16DF ρ ≥ 1,0 500x250x240		M8 - M16 IG-M6 - IG-M10	16x85 16x130 20x85 20x130 20x200	C35 - C36	Bloc creux B40 ρ ≥ 0,8 495x195x190		M8 - M16 IG-M6 - IG-M10	16x130 20x130	C37 - C38
Calcium silica bricks acc. to EN 771-2									
KS ρ ≥ 2,0 ≥ 240x115x71		M8 – M16 IG-M6 - IG-M10	12x80 16x85 16x130 20x85 20x130 20x200	C7 – C8	KSL-3DF ρ ≥ 1,4 240x175x113		M8 - M16 IG-M6 - IG-M10	16x85 16x130 20x85 20x130	C9 - C10
KSL-8DF ρ ≥ 1,4 248x240x238		M8-M16 IG-M6 - IG-M10	16x130 20x130 20x200	C11 - C12	KSL-12DF ρ ≥ 1,4 498x175x238		M8 - M16 IG-M6 - IG-M10	16x130 20x130	C13 - C14
Solid clay bricks acc. to EN 771-1									
Mz-1DF ρ ≥ 2,0 ≥ 240x115x55		M8 - M16 IG-M6 - IG-M10	12x80 16x85 16x130 20x85 20x130 20x200	C15 - C16	Mz – 2 DF ρ ≥ 2,0 ≥ 240x115x113		M8 - M16 IG-M6 - IG-M10	12x80 16x85 16x130 20x85 20x130 20x200	C17 - C18

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Intended Use
Brick types and properties with corresponding fastening elements

Annex B 2

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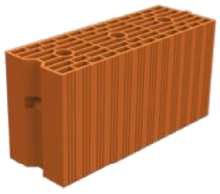
naming density [kg/dm³] dimensions LxBxH [mm]	picture	anchor rods	perforated sleeve	Annex	naming density [kg/dm³] dimensions LxBxH [mm]	picture	anchor rods	perforated sleeve	Annex
Hollow clay bricks acc. to EN 771-1									
Hlz-10DF ρ ≥ 1,25 300x240x249		M8 - M16 IG-M6 - IG-M10	12x80 16x85 16x130 20x85 20x130 20x200	C19 - C20	Porotherm Homebric ρ ≥ 0,7 500x200x299		M8 - M16 IG-M6 - IG-M10	12x80 16x85 16x130 20x85 20x130	C21 - C22
BGV Thermo ρ ≥ 0,6 500x200x314		M8 - M16 IG-M6 - IG-M10	12x80 16x85 16x130 20x85 20x130	C23 - C24	Brique creuse C40 ρ ≥ 0,7 500x200x200		M8 - M16 IG-M6 - IG-M10	12x80 16x85 16x130 20x85 20x130	C29 - C30
Calibric R+ ρ ≥ 0,6 500x200x314		M8 - M16 IG-M6 - IG-M10	12x80 16x85 16x130 20x85 20x130	C25 - C26	Blocchi Leggeri ρ ≥ 0,6 250x120x250		M8 - M16 IG-M6 - IG-M10	12x80 16x85 16x130 20x85 20x130	C31 - C32
Urbanbric ρ ≥ 0,7 560x200x274		M8 - M16 IG-M6 - IG-M10	12x80 16x85 16x130 20x85 20x130	C27 - C28	Doppio Uni ρ ≥ 0,9 250x120x120		M8 - M16 IG-M6 - IG-M10	12x80 16x85 16x130 20x85 20x130	C33 - C34

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool	**Annex B 3**
Intended Use Brick types and properties with corresponding fastening elements	

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Installation: steel brush RBS

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

Anchor size			**M8**	**M10**	**IG-M6**	**M12**	**IG-M8**	**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
Brush			RBS10	RBS12		RBS14		RBS18	
Diameter of steel brush	$d_b \geq$	[mm]	10,5	12,5		14,5		18,5	

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

Anchor size				**M8**	**M8 / M10 / IG-M6**			**M12 / M16 / IG-M8 / IG-M10**		
			Sleeve SH	**12x80**	**16x85**	**16x130**	**16x130/330**	**20x85**	**20x130**	**20x200**
nominal drill hole diameter		d_0	[mm]	12	16	16	16	20	20	20
drill hole depth		h_0	[mm]	85	90	135	330	90	135	205
effective anchorage depth		h_{ef}	[mm]	80	85	130	130	85	130	200
minimum wall thickness		h_{min}	[mm]	115	115	195	195	115	195	240
Diameter of clearance hole in the fixture	prepositioned installation	$d_f \leq$	[mm]	9	7 (IG-M6) / 9 (M8) / 12 (M10)			9 (IG-M8) / 12 (IG-M10) / 14 (M12) / 18 (M16)		
	push through installation	$d_f \leq$	[mm]	14	18			22		
Brush				RBS12	RBS16			RBS20		
Diameter of steel brush		d_b	[mm]	12,5	16,5			20,5		

Hand pump (Volume 750 ml)

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Intended Use
Installation parameters and cleaning brush

Annex B 4

Deutsches Institut für Bautechnik DIBt

Table B4: Maximum working time and minimum curing time ResiFIX VYSF

Temperature in the base material T	Temperature of cartridge	Gelling- / working time	Minimum curing time in dry base material [1)]
0°C bis + 4 °C	+5°C bis +40°C	45 min	7 h
+ 5 °C bis + 9 °C		25 min	2 h
+ 10 °C bis + 19 °C		15 min	80 min
+ 20 °C bis + 29 °C		6 min	45 min
+ 30 °C bis + 34 °C		4 min	25 min
+ 35 °C bis + 39 °C		2 min	20 min
+ 40°C		1,5 min	15 min

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

Table B5: Maximum working time and minimum curing time ResiFIX VYSF Cool

Temperature in the base material T	Temperature of cartridge	Gelling- / working time	Minimum curing time in dry base material [1)]
0 °C bis + 4 °C	-20°C bis +10°C	10 min	2,5 h
+ 5 °C bis + 9 °C		6 min	80 min
+ 10°C		6 min	60 min

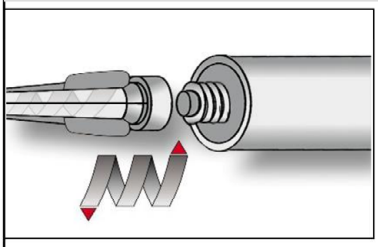
1) In wet base material the curing time **must** be doubled

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool	**Annex B 5**
Intended Use Gelling and curing times	

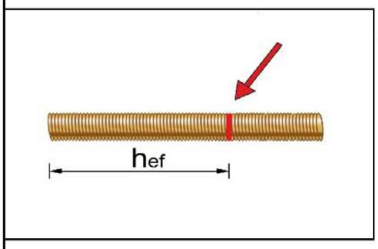
Deutsches Institut für Bautechnik DIBt

Installation Instructions

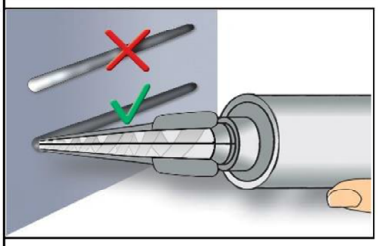
Preparation of cartridge



1. 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 and B5) as well as for new cartridges, a new static-mixer shall be used.

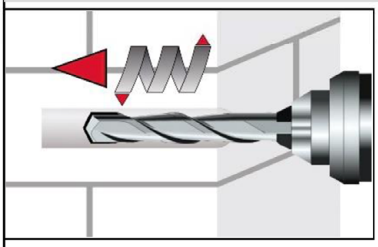


2. The position of the embedment depth shall be marked on the threaded rod.

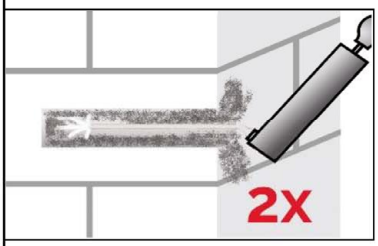


3. Initial adhesive is not suitable for fixing the anchor. Prior to dispensing into the anchor hole, squeeze out separately a minimum of three full strokes, for foil tube cartridges six full strokes and discard non-uniformly mixed adhesive components until the mortar shows a consistent grey colour.

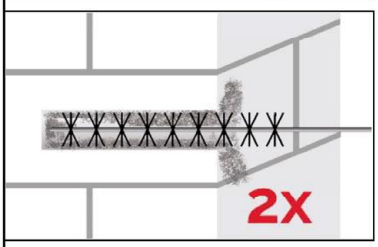
Installation in solid masonry (without sleeve)



4. Holes to be drilled perpendicular to the surface of the base material by using a hard-metal tipped hammer drill bit. Drill a hole, with drill method according to Annex C4 – C40, into the base material, with nominal drill hole diameter and bore hole depth according to the size and embedment depth required by the selected anchor.



5a. Starting from the bottom or back of the bore hole, blow the hole clean with handpump (Annex B4) a minimum of two times.



5b. Attach an appropriate sized wire brush > $d_{b,min}$ (Table B2) to a drill or a cordless screwdriver and brush the hole clean with a minimum of two times in a twisting motion. If the bore hole ground is not reached with the brush, a brush extension must be used.

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool	**Annex B 6**
Intended Use Installation instructions Solid masonry and Autoclaved Aerated Concrete	

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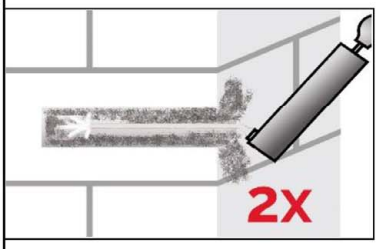
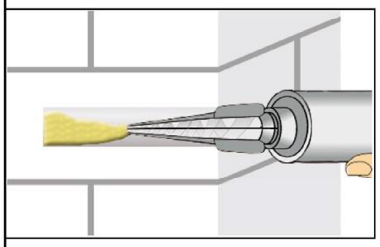
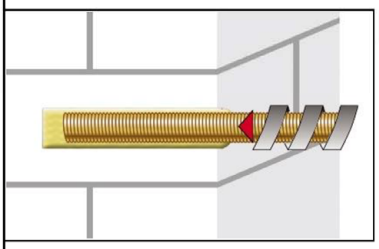
Installation instructions (continuation)



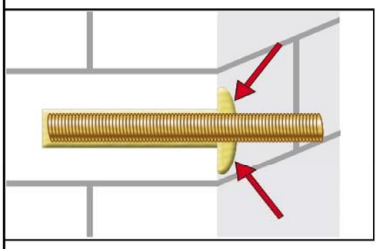
5c. Finally blow the hole clean again with handpump (Annex B4) a minimum of two times



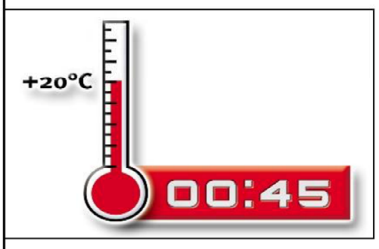
6. Starting from the bottom or back of the cleaned anchor hole, fill the hole up to approximately two-thirds with adhesive. Slowly withdraw the static mixing nozzle as the hole fills to avoid creating air pockets. If the bottom or back of the anchor hole is not reached, an appropriate extension nozzle must be used. Observe the gel-/ working times given in Table B4 + B5.



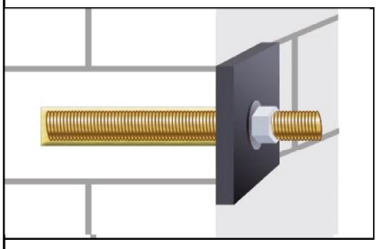
7. Push the threaded rod into the anchor hole while turning slightly to ensure positive distribution of the adhesive until the embedment depth is reached. The anchor shall be free of dirt, grease, oil or other foreign material.



8. Be sure that the anular gap is fully filled with mortar. For push through installation the hole in the fixture must also be fully filled with mortar. If no excess mortar is visible at the top of the hole, the application has to be renewed.



9. Allow the adhesive to cure to the specified curing time prior to applying any load or torque. Do not move or load the anchor until it is fully cured (attend Table B4 + B5).



10. After full curing, the fixture can be installed with up to the max. installation torque (See parameters of brick Annex C4 to Annex C40) by using a calibrated torque wrench.

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool	**Annex B 7**
Intended Use Installation instructions Solid masonry and Autoclaved Aerated Concrete	

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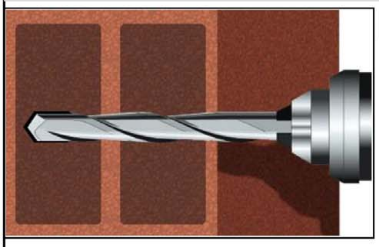
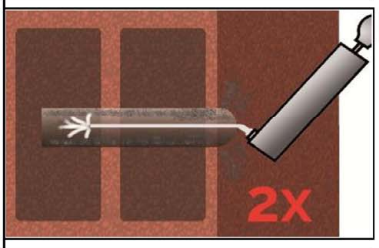
Installation instructions (continuation)

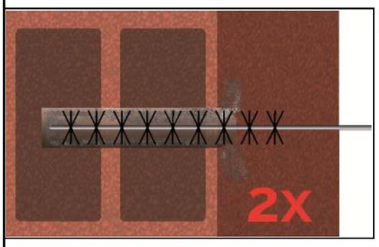
Installation in solid and hollow masonry (with sleeve)



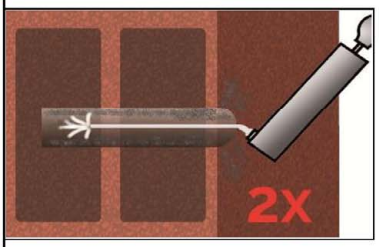
4. Holes to be drilled perpendicular to the surface of the base material by using a hard-metal tipped hammer drill bit. Drill a hole, with drill method according to Annex C4 – C40, into the base material, with nominal drill hole diameter and bore hole depth according to the size and embedment depth required by the selected anchor.



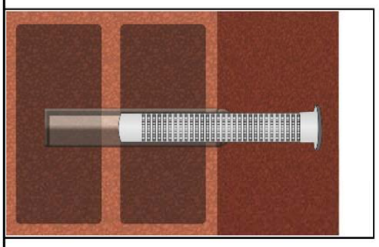
5a. Starting from the bottom or back of the bore hole, blow the hole clean with handpump (Annex B4) a minimum of two times.



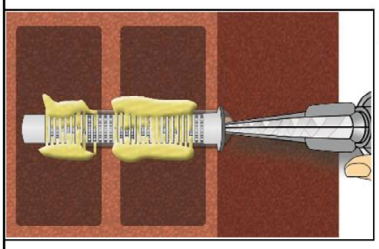
5b. Attach an appropriate sized wire brush > $d_{b,min}$ (Table B3) to a drill or a cordless screwdriver and brush the hole clean with a minimum of two times in a twisting motion. If the bore hole ground is not reached with the brush, a brush extension must be used.



5c. Finally blow the hole clean again with handpump (Annex B4) a minimum of two times



6. 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. For installation through insulation the sleeve SH 16x130/330 shall be cutted at the top end according to the insulation thickness.

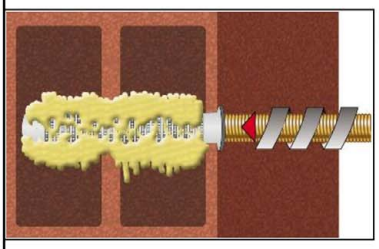


7. Starting from the bottom or back fill the sleeve with adhesive. For embedment depth equal to or larger than 130 mm an extension nozzle shall be used. For quantity of mortar attend cartridges label installation instructions. For push through installation the sleeve within the fixture must also be fully filled with mortar. Observe the gel-/ working times given in Table B4 + B5.

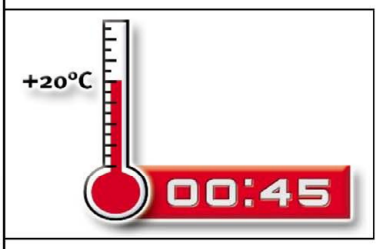
CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool	**Annex B 8**
Intended Use Installation instructions hollow brick	

Deutsches Institut für Bautechnik DIBt

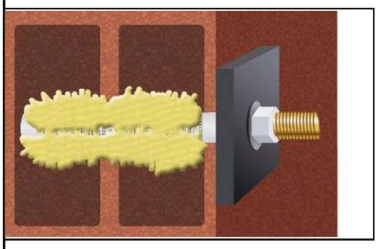
Installation instructions (continuation)



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. The anchor shall be free of dirt, grease, oil or other foreign material.



9. Allow the adhesive to cure to the specified curing time prior to applying any load or torque. Do not move or load the anchor until it is fully cured (attend Table B4 + B5).



10. After full curing, the fixture can be installed with up to the max. installation torque (See parameters of brick Annex C4 to Annex C40) by using a calibrated torque wrench.

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool	**Annex B 9**
Intended Use Installation instructions hollow brick	

Deutsches Institut für Bautechnik DIBt

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

base material	anchor size	β-Factor					
		T_a: 40°C / 24°C		T_b: 80°C / 50°C		T_c: 120°C / 72°C	
		d/d	w/d w/w	d/d	w/d w/w	d/d	w/d w/w
Autoclaved aerated concrete	all sizes	0,95	0,86	0,81	0,73	0,81	0,73
Calcium silica bricks	$d_0 \leq 14$ mm	0,93	0,80	0,87	0,74	0,65	0,56
	$d_0 \geq 16$ mm	0,93	0,93	0,87	0,87	0,65	0,65
Clay Bricks	all sizes	0,86	0,86	0,86	0,86	0,73	0,73
Concrete bricks	$d_0 \leq 12$ mm	0,93	0,80	0,87	0,74	0,65	0,56
	$d_0 \geq 16$ mm	0,93	0,93	0,87	0,87	0,65	0,65

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances
β-factors for job site testing under tension load

Annex C 1

Deutsches Institut für Bautechnik DIBt

Table C2: Characteristic steel resistance

Anchor size			**IG-M6**	**IG-M8**	**IG-M10**	**M8**	**M10**	**M12**	**M16**
Characteristic tension resistance									
steel, property class 4.6	$N_{Rk,s}$	[kN]	- [1]	- [1]	- [1]	15	23	34	63
	γ_{Ms}	[-]		- [1]			2,0		
steel, property class 4.8	$N_{Rk,s}$	[kN]	- [1]	- [1]	- [1]	15	23	34	63
	γ_{Ms}	[-]		- [1]			1,5		
steel, property class 5.6	$N_{Rk,s}$	[kN]	- [1]	- [1]	- [1]	18	29	42	79
	γ_{Ms}	[-]		- [1]			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]	- [1]	- [1]	- [1]	7	12	17	31
	γ_{Ms}	[-]		- [1]			1,67		
steel, property class 4.8	$V_{Rk,s}$	[kN]	- [1]	- [1]	- [1]	7	12	17	31
	γ_{Ms}	[-]		- [1]			1,25		
steel, property class 5.6	$V_{Rk,s}$	[kN]	- [1]	- [1]	- [1]	9	15	21	39
	γ_{Ms}	[-]		- [1]			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	$M^0_{Rk,s}$	[Nm]	- [1]	- [1]	- [1]	15	30	52	133
	γ_{Ms}	[-]		- [1]			1,67		
steel, property class 4.8	$M^0_{Rk,s}$	[Nm]	- [1]	- [1]	- [1]	15	30	52	133
	γ_{Ms}	[-]		- [1]			1,25		
steel, property class 5.6	$M^0_{Rk,s}$	[Nm]	- [1]	- [1]	- [1]	19	37	66	167
	γ_{Ms}	[-]		- [1]			1,67		
steel, property class 5.8	$M^0_{Rk,s}$	[Nm]	8	19	37	19	37	66	167
	γ_{Ms}	[-]		1,25			1,25		
steel, property class 8.8	$M^0_{Rk,s}$	[Nm]	12	30	60	30	60	105	266
	γ_{Ms}	[-]		1,25			1,25		
Stainless steel A4 / HCR, property class 70	$M^0_{Rk,s}$	[Nm]	11	26	52	26	52	92	233
	γ_{Ms}	[-]		1,56			1,56		
Stainless steel A4 / HCR, property class 80	$M^0_{Rk,s}$	[Nm]	12	30	60	30	60	105	266
	γ_{Ms}	[-]		1,33			1,33		

[1] Not part of the ETA

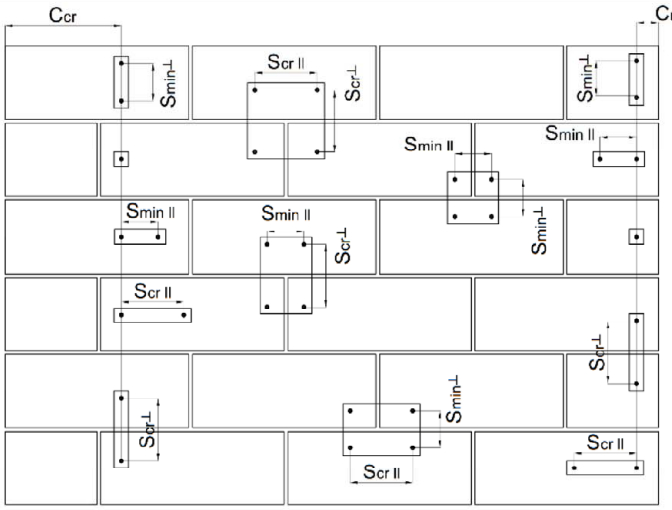
CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances
Characteristic resistance under tension and shear load – steel failure

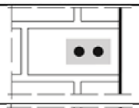
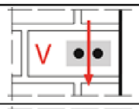
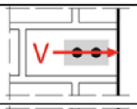
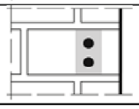
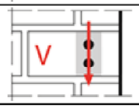
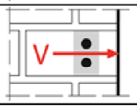
Annex C 2

Deutsches Institut für Bautechnik DIBt

Spacing and edge distances



c_{cr} = Char. Edge distance
c_{min} = Minimum Edge distance
$s_{cr,II}$; ($s_{min,II}$) = Characteristic (minimum) spacing for anchors placed parallel to horizontal joint
$s_{cr,\perp}$; ($s_{min,\perp}$) = Characteristic (minimum) spacing for anchors placed perpendicular to horizontal joint

Load direction / Anchor position	Tension load	Shear load parallel to free edge V_{II}		Shear load perpendicular to free edge $V_{\perp}$	
Anchors parallel to horizontal joint $s_{cr,II}$; ($s_{min,II}$)			$\alpha_{g\,II,V\,II}$		$\alpha_{g\,II,V\,\perp}$
Anchors vertical to horizontal joint $s_{cr,\perp}$; ($s_{min,\perp}$)			$\alpha_{g\,\perp,V\,II}$		$\alpha_{g\,\perp,V\,\perp}$

$\alpha_{edge,N}$ = Reduction factor for tension loads at the free edge (single anchor)
$\alpha_{edge,V\perp}$ = Reduction factor for shear loads perpendicular to the free edge (single anchor)
$\alpha_{edge,V\,II}$ = Reduction factor for shear loads parallel to the free edge (single anchor)
$\alpha_{g\,II,N}$ = Group factor for anchors parallel to horizontal joint under tension load
$\alpha_{g\,\perp,N}$ = Group factor for anchors perpendicular to horizontal joint under tension load
$\alpha_{g\,II,V\,II}$ = Group factor for anchors parallel to horizontal joint under shear load parallel to the free edge
$\alpha_{g\,\perp,V\,II}$ = Group factor for anchors perpendicular to horizontal joint under shear load parallel to the free edge
$\alpha_{g\,II,V\,\perp}$ = Group factor for anchors parallel to horizontal joint under shear load perpendicular to the free edge
$\alpha_{g\,\perp,V\,\perp}$ = Group factor for anchors perpendicular to hor. joint under shear load perpendicular to the free edge

Single anchor at the edge:
$N_{Rk,b} = \alpha_{edge,N} * N_{RK,b}$
$V_{Rk,c\,II} = \alpha_{edge,V\,II} * V_{Rk,b}$
$V_{Rk,c\,\perp} = \alpha_{edge,V\,\perp} * V_{Rk,b}$

Group of 2 anchors:
$N^{g}_{Rk} = \alpha_{g,N} * N_{RK,b}$
$V^{g}_{Rk} = \alpha_{g,V} * V_{Rk,b}$ (for $c \geq c_{cr}$)
$V^{g}_{Rk,c} = \alpha_{g,V} * V_{Rk,b}$ (for $c \geq c_{min}$)

Group of 4 anchors:
$N^{g}_{Rk} = \alpha_{g\,II,N} * \alpha_{g\,\perp,N} * N_{RK,b}$
$V^{g}_{Rk} = \alpha_{g\,II,V} * \alpha_{g\,\perp,V} * V_{Rk,b}$ (for $c \geq c_{cr}$)
$V^{g}_{Rk,c} = \alpha_{g\,II,V} * \alpha_{g\,\perp,V} * V_{Rk,b}$ (for $c \geq c_{min}$)

Equations depend on anchor position and load direction (see table above). Reduction factor, group factor and resistances see annex C4 - C48. Reduction for installation in joints see annex B1.

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances
Definition of the reduction- and group factors

Annex C 3

Deutsches Institut für Bautechnik DIBt

Brick type: Autoclaved aerated concrete – AAC

Table C3: Stone description

Brick type		Autoclaved aerated concrete AAC
Density	ρ [kg/dm³]	0,35 – 0,6
Compressive strength	f_b [N/mm²]	2, 4, 6
Code		EN 771-4
Producer (Country)		e.g. Porit (DE)
Brick dimensions	[mm]	≥ 499 x 240 x 249
Drilling method		Rotary drilling

Table C4: Installation parameter

Anchor size		[-]	M8	M10	M12	M16	IG-M6	IG-M8	IG-M10
Installation torque	T_{inst}	[Nm]	≤ 5	≤ 5	≤ 10	≤ 10	≤ 5	≤ 5	≤ 10
Char. Edge distance	c_{cr}	[mm]	150 (for shear loads perpendicular to the free edge: c_{cr} = 210)						
Minimum Edge Distance	c_{min}	[mm]	50						
Characteristic Spacing	$s_{cr,\,II}$	[mm]	300						
	$s_{cr,\,\perp}$	[mm]	250						
Minimum Spacing	s_{min}	[mm]	50						

Table C5: Reduction factors for single anchors at the edge

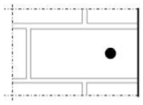
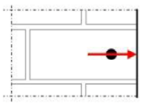
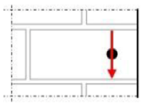
Tension load			Shear load					
			Perpendicular to the free edge			Parallel to the free edge		
	with c ≥	$\alpha_{edge,\,N}$		with c ≥	$\alpha_{edge,\,V\perp}$		with c ≥	$\alpha_{edge,\,V\,II}$
	50	0,85		50	0,12		50	0,70
				125	0,50		125	0,85
	150	1,00		210	1,00		150	1,00

Table C6: Factors for anchor groups under tension load

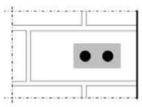
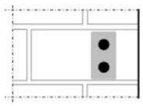
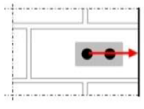
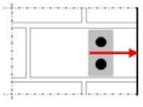
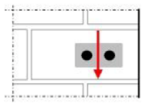
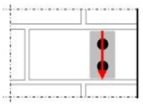
Anchor position parallel to hor. joint				Anchor position perpendicular to hor. joint			
	with c ≥	with s ≥	$\alpha_{g\,II,\,N}$		with c ≥	with s ≥	$\alpha_{g\,\perp,\,N}$
	50	50	1,10		50	50	0,75
	150	50	1,25		150	50	0,90
	150	300	2,00		150	250	2,00

Table C7: Factors for anchor groups under shear load

	Anchor position parallel to hor. joint				Anchor position perpendicular to hor. joint			
Shear load perpendicular to the free edge		with c ≥	with s ≥	$\alpha_{g\,II,V\perp}$		with c ≥	with s ≥	$\alpha_{g\,\perp,V\perp}$
		50	50	0,20		50	50	0,25
		210	50	1,60		210	50	1,80
		210	300	2,00		210	250	2,00
Shear load parallel to the free edge		with c ≥	with s ≥	$\alpha_{g\,II,V\,II}$		with c ≥	with s ≥	$\alpha_{g\,\perp,V\,II}$
		50	50	1,15		50	50	0,80
		150	50	1,60		150	50	1,10
		150	300	2,00		150	250	2,00

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances Autoclaved aerated concrete - AAC
Description of the stone, Installation parameters, Reduction- and Group factors

Annex C 4

Deutsches Institut für Bautechnik DIBt

Brick type: Autoclaved aerated concrete – AAC

Table C8: Characteristic values of tension and shear load resistances

Anchor size	Perforated sleeve	Effective Anchorage depth	Characteristic Resistances with c ≥ c_{cr} and s ≥ s_{cr}						
			Use condition						
			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}	$N_{Rk,b} = N_{Rk,p}$			$N_{Rk,b} = N_{Rk,p}$			$V_{Rk,b}$ [1]
		[mm]	[kN]						
Compressive strength f_b = 2 N/mm²; Density ρ ≥ 0,35 kg/dm³									
M8	-	≥ 80	1,2	0,9	0,9	0,9	0,9	0,9	1,5
M10 / IG-M6	-	≥ 90	1,2	0,9	0,9	0,9	0,9	0,9	2,5
M12 / IG-M8	-	≥ 100	2,0	1,5	1,5	1,5	1,5	1,5	2,5
M16 / IG-M10	-	≥ 100	2,0	1,5	1,5	1,5	1,5	1,5	2,5
M8	12x80	80	1,2	0,9	0,9	0,9	0,9	0,9	1,5
M8 / M10/ IG-M6	16x85	85	1,2	0,9	0,9	0,9	0,9	0,9	2,5
	16x130	130	1,2	0,9	0,9	0,9	0,9	0,9	2,5
M12 / M16 / IG-M8 / IG-M10	20x85	85	2,0	1,5	1,5	1,5	1,5	1,5	2,5
	20x130	130	2,0	1,5	1,5	1,5	1,5	1,5	2,5
	20x200	200	2,0	1,5	1,5	1,5	1,5	1,5	2,5

[1] $V_{Rk,c}$ according to Annex C3

Anchor size	Perforated sleeve	Effective Anchorage depth	Characteristic Resistances with c ≥ c_{cr} and s ≥ s_{cr}						
			Use condition						
			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}	$N_{Rk,b} = N_{Rk,p}$			$N_{Rk,b} = N_{Rk,p}$			$V_{Rk,b}$ [1]
		[mm]	[kN]						
Compressive strength f_b = 4 N/mm²; Density ρ ≥ 0,50 kg/dm³									
M8	-	≥ 80	3,0	2,5	2,0	2,5	2,0	2,0	4,5
M10 / IG-M6	-	≥ 90	3,0	2,5	2,0	2,5	2,0	2,0	7,5
M12 / IG-M8	-	≥ 100	5,0	4,5	4,0	4,5	4,0	4,0	7,5
M16 / IG-M10	-	≥ 100	5,0	4,5	4,0	4,5	4,0	4,0	7,5
M8	12x80	80	3,0	2,5	2,0	2,5	2,0	2,0	4,5
M8 / M10/ IG-M6	16x85	85	3,0	2,5	2,0	2,5	2,0	2,0	7,5
	16x130	130	3,0	2,5	2,0	2,5	2,0	2,0	7,5
M12 / M16 / IG-M8 / IG-M10	20x85	85	5,0	4,5	4,0	4,5	4,0	4,0	7,5
	20x130	130	5,0	4,5	4,0	4,5	4,0	4,0	7,5
	20x200	200	5,0	4,5	4,0	4,5	4,0	4,0	7,5

[1] $V_{Rk,c}$ according to Annex C3

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances Autoclaved aerated concrete - AAC
Characteristic Resistances and Displacements

Annex C 5

Deutsches Institut für Bautechnik DIBt

Brick type: Autoclaved aerated concrete – AAC

Anchor size	Perforated sleeve	Effecitve Anchorage depth	Characteristic Resistances with $c \geq c_{cr}$ and $s \geq s_{cr}$						
			Use condition						
			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}	$N_{Rk,b} = N_{Rk,p}$			$N_{Rk,b} = N_{Rk,p}$			$V_{Rk,b}$ [1]
		[mm]	[kN]						
Compressive strength f_b = 6 N/mm²; Density ρ ≥ 0,65 kg/dm³									
M8	-	≥ 80	4,0	3,5	3,0	3,5	3,0	3,0	6,0
M10 / IG-M6	-	≥ 90	4,0	3,5	3,0	3,5	3,0	3,0	10,0
M12 / IG-M8	-	≥ 100	7,0	6,0	5,5	6,5	5,5	5,5	10,0
M16 / IG-M10	-	≥ 100	7,0	6,0	5,5	6,5	5,5	5,5	10,0
M8	12x80	80	4,0	3,5	3,0	3,5	3,0	3,0	6,0
M8 / M10/ IG-M6	16x85	85	4,0	3,5	3,0	3,5	3,0	3,0	10,0
	16x130	130	4,0	3,5	3,0	3,5	3,0	3,0	10,0
M12 / M16 / IG-M8 / IG-M10	20x85	85	7,0	6,0	5,5	6,5	5,5	5,5	10,0
	20x130	130	7,0	6,0	5,5	6,5	5,5	5,5	10,0
	20x200	200	7,0	6,0	5,5	6,5	5,5	5,5	10,0

[1] $V_{Rk,c}$ according to Annex C3

Table C9: Displacements

Anchor size	h_{ef}	δ_N / N	δ_{N0}	$\delta_{N\infty}$	δ_V / V	δ_{V0}	$\delta_{V\infty}$
	[mm]	[mm/kN]	[mm]	[mm]	[mm/kN]	[mm]	[mm]
M8 – M12, IG-M6 – M10	all	0,1	$0,1*N_{Rk}$ / 2,8	$2*\delta_{N0}$	0,3	$0,3*V_{Rk}$ / 2,8	$1,5*\delta_{V0}$
M16	all				0,1	$0,1*V_{Rk}$ / 2,8	$1,5*\delta_{V0}$

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances Autoclaved aerated concrete – AAC
Characteristic Resistances and Displacements

Annex C 6

Deutsches Institut für Bautechnik DIBt

Brick type: Solid calcium silica brick KS-NF

Table C10: Stone description

Brick type		Solid calcium silica brick KS-NF
Density	ρ [kg/dm³]	≥ 2,0
Compressive strength	f_b [N/mm²]	≥ 28
Conversion factor for lower compressive strengths		$(f_b / 28)^{0,5} \leq 1,0$
Code		EN 771-2
Producer (Country)		e.g. Wemding (DE)
Brick dimensions	[mm]	≥ 240 x 115 x 71
Drilling method		Hammer drilling

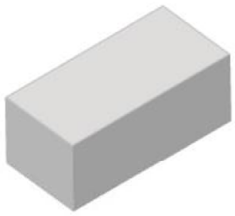


Table C11: Installation parameter

Anchor size		[-]	M8	M10	M12	M16	IG-M6	IG-M8	IG-M10
Installation torque	T_{inst}	[Nm]	≤ 10	≤ 10	≤ 15	≤ 15	≤ 10	≤ 10	≤ 10
Char. Edge distance	c_{cr}	[mm]	150 (for shear loads perpendicular to the free edge: c_{cr} = 240)						
Minimum Edge Distance	c_{min}	[mm]	60						
Characteristic Spacing	$s_{cr,\,II}$	[mm]	240						
	$s_{cr,\,\perp}$	[mm]	150						
Minimum Spacing	s_{min}	[mm]	75						

Table C12: Reduction factors for single anchors at the edge

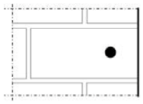
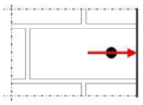
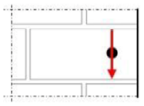
Tension load			Shear load					
			Perpendicular to the free edge			Parallel to the free edge		
	with c ≥	$\alpha_{edge,\,N}$		with c ≥	$\alpha_{edge,\,V\perp}$		with c ≥	$\alpha_{edge,\,V\,II}$
	60	0,50		60	0,30		60	0,60
	100	0,50		100	0,50		100	1,00
	150	1,00		240	1,00		150	1,00

Table C13: Factors for anchor groups under tension load

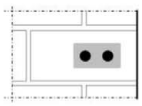
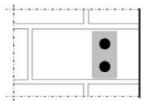
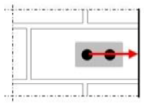
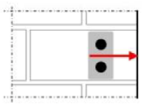
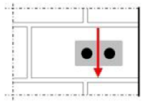
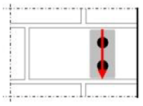
Anchor position parallel to hor. joint				Anchor position perpendicular to hor. joint			
	with c ≥	with s ≥	$\alpha_{g\,II,\,N}$		with c ≥	with s ≥	$\alpha_{g\,\perp,\,N}$
	60	75	0,70		60	75	1,15
	150	75	1,40		150	75	2,00
	150	240	2,00		150	150	2,00

Table C14: Factors for anchor groups under shear load

	Anchor position parallel to hor. joint				Anchor position perpendicular to hor. joint			
Shear load perpendicular to the free edge		with c ≥	with s ≥	$\alpha_{g\,II,V\perp}$		with c ≥	with s ≥	$\alpha_{g\,\perp,\,V\perp}$
		60	75	0,75		60	75	0,90
		150	75	2,00		150	75	2,00
		150	240	2,00		150	150	2,00
Shear load parallel to the free edge		with c ≥	with s ≥	$\alpha_{g\,II,V\,II}$		with c ≥	with s ≥	$\alpha_{g\,\perp,V\,II}$
		60	75	2,00		60	75	2,00
		150	75	2,00		150	75	2,00
		150	240	2,00		150	150	2,00

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances Solid calcium silica brick KS-NF
Description of the stone, Installation parameters, Reduction- and Group factors

Annex C 7

Deutsches Institut für Bautechnik DIBt

Brick type: Solid calcium silica brick KS-NF

Table C15: Characteristic values of tension and shear load resistances

Anchor size	Perforated sleeve	Effecitve Anchorage depth	Characteristic Resistances with c ≥ c_{cr} and s ≥ s_{cr}						
			Use condition						
			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}	$N_{Rk,b} = N_{Rk,p}$			$N_{Rk,b} = N_{Rk,p}$			$V_{Rk,b}$ [2]
		[mm]	[kN]						
Compressive strength $f_b \geq 28$ N/mm² [1]									
M8	-	≥ 80	7,0	6,5	5,0	6,0	5,5	4,0	7,0
M10 / IG-M6	-	≥ 90	7,0	6,5	5,0	6,0	5,5	4,0	
M12 / IG-M8	-	≥ 100	7,0	6,5	5,0	6,0	5,5	4,0	
M16 / IG-M10	-	≥ 100	7,0	6,5	5,0	7,0	6,5	5,0	
M8	12x80	80	7,0	6,5	5,0	6,0	5,5	4,0	
M8 / M10/ IG-M6	16x85	85	7,0	6,5	5,0	7,0	6,5	5,0	
	16x130	130	7,0	6,5	5,0	7,0	6,5	5,0	
M12 / M16 / IG-M8 / IG-M10	20x85	85	7,0	6,5	5,0	7,0	6,5	5,0	
	20x130	130	7,0	6,5	5,0	7,0	6,5	5,0	
	20x200	200	7,0	6,5	5,0	7,0	6,5	5,0	

[1] For lower compressive strengths resistances must be multiplied by the conversion factor according to Table C10. For stones with higher strengths, the shown values are valid without conversion.
[2] $V_{Rk,c}$ according to Annex C3

Table C16: Displacements

Anchor size	h_{ef}	δ_N / N	δ_{N0}	$\delta_{N\infty}$	δ_V / V	δ_{V0}	$\delta_{V\infty}$
	[mm]	[mm/kN]	[mm]	[mm]	[mm/kN]	[mm]	[mm]
M8 – M12, IG-M6 – M10	all	0,1	0,1*N_{Rk} / 3,5	2*δ_{N0}	0,3	0,3*V_{Rk} / 3,5	1,5*δ_{V0}
M16	all				0,1	0,1*V_{Rk} / 3,5	1,5*δ_{V0}

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances Solid calcium silica brick KS-NF
Characteristic Resistances and Displacements

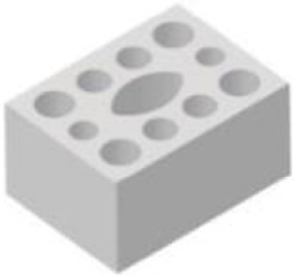
Annex C 8

Deutsches Institut für Bautechnik DIBt

Brick type: Hollow Calcium silica brick KSL-3DF

Table C17: Stone description

Brick type		Hollow calcium silica brick KSL-3DF
Density	ρ [kg/dm³]	≥ 1,4
Compressive strength	f_b [N/mm²]	≥ 14
Conversion factor for lower compressive strengths		$(f_b / 14)^{0,75} \leq 1,0$
Code		EN 771-2
Producer (Country)		e.g. KS-Wemding (DE)
Brick dimensions	[mm]	≥ 240 x 175 x 113
Drilling method		Rotary drilling



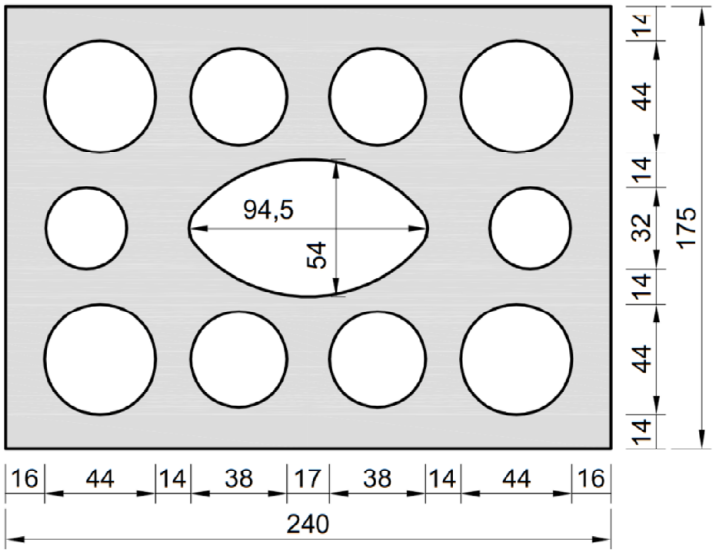


Table C18: Installation parameter

Anchor size		[-]	M8	M10	M12	M16	IG-M6	IG-M8	IG-M10
Installation torque	T_{inst}	[Nm]	≤ 5	≤ 5	≤ 8	≤ 8	≤ 5	≤ 8	≤ 8
Char. Edge distance	c_{cr}	[mm]	120 (for shear loads perpendicular to the free edge: c_{cr} = 240)						
Minimum Edge Distance	c_{min}	[mm]	60						
Characteristic Spacing	$s_{cr,\,II}$	[mm]	240						
	$s_{cr,\,\perp}$	[mm]	120						
Minimum Spacing	s_{min}	[mm]	120						

Table C19: Reduction factors for single anchors at the edge

Tension load			Shear load					
			Perpendicular to the free edge			Parallel to the free edge		
	with c ≥	$\alpha_{edge,\,N}$		with c ≥	$\alpha_{edge,\,V\perp}$		with c ≥	$\alpha_{edge,\,V\,II}$
	60	1,00		60	0,30		60	1,00
	120	1,00		240	1,00		120	1,00

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances Hollow Calcium silica brick KSL-3DF
Description of the stone, Installation parameters, Reductionfactors

Annex C 9

Deutsches Institut für Bautechnik DIBt

Brick type: Hollow Calcium silica brick KSL-3DF

Table C20: Factors for anchor groups under tension load

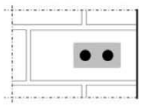
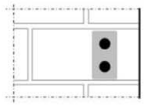
Anchor position parallel to hor. joint				Anchor position perpendicular to hor. joint			
	with c ≥	with s ≥	$\alpha_{g\ II,\ N}$		with c ≥	with s ≥	$\alpha_{g\ \perp,\ N}$
	60	120	1,50		60	120	1,00
	120	120	2,00				
	120	240	2,00		120	120	2,00

Table C21: Factors for anchor groups under shear load

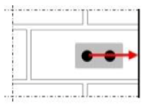
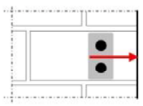
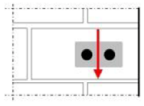
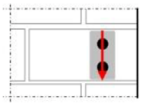
	Anchor position parallel to hor. joint				Anchor position perpendicular to hor. joint			
Shear load perpendicular to the free edge		with c ≥	with s ≥	$\alpha_{g\ II,V\ \perp}$		with c ≥	with s ≥	$\alpha_{g\ \perp,V\ \perp}$
		60	120	0,30		60	120	0,30
		120	120	1,00				
		120	240	2,00		240	120	2,00
Shear load parallel to the free edge		with c ≥	with s ≥	$\alpha_{g\ II,V\ II}$		with c ≥	with s ≥	$\alpha_{g\ \perp,V\ II}$
		60	120	1,00		60	120	1,00
		120	120	1,60				
		120	240	2,00		120	120	2,00

Table C22: Characteristic values of tension and shear load resistances

Anchor size	Perforated sleeve	Effecitve Anchorage depth	Characteristic Resistances with c ≥ c_{cr} and s ≥ s_{cr}						
			Use condition						
			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}	$N_{Rk,b} = N_{Rk,p}$			$N_{Rk,b} = N_{Rk,p}$			$V_{Rk,b}$ [2]
		[mm]	[kN]						
Compressive strength $f_b \geq 14$ N/mm² [1]									
M8 / M10/ IG-M6	16x85	85	2,5	2,5	1,5	2,5	2,5	1,5	6,0
	16x130	130	2,5	2,5	2,0	2,5	2,5	2,0	6,0
M12 / M16 / IG-M8 / IG-M10	20x85	85	6,5	6,0	4,5	6,5	6,0	4,5	6,0
	20x130	130	6,5	6,0	4,5	6,5	6,0	4,5	6,0

[1] For lower compressive strengths resistances must be multiplied by the conversion factor according to Table C17. For stones with higher strengths, the shown values are valid without conversion.

[2] $V_{Rk,c}$ according to Annex C3

Table C23: Displacements

Anchor size	h_{ef}	δ_N / N	δ_{N0}	$\delta_{N\infty}$	δ_V / V	δ_{V0}	$\delta_{V\infty}$
	[mm]	[mm/kN]	[mm]	[mm]	[mm/kN]	[mm]	[mm]
M8 – M12, IG-M6 – M10	all	0,13	0,13*N_{Rk} / 3,5	2*δ_{N0}	0,55	0,55*V_{Rk} / 3,5	1,5*δ_{V0}
M16	all				0,31	0,31*V_{Rk} / 3,5	1,5*δ_{V0}

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances Hollow Calcium silica brick KSL-3DF
Group factors, characteristic Resistances and Displacements

Annex C 10

Deutsches Institut für Bautechnik DIBt

Brick type: Hollow Calcium silica brick KSL-8DF

Table C24: Stone description

Brick type		Hollow Calcium silica brick KSL-8DF
Density	ρ [kg/dm³]	≥ 1,4
Compressive strength	f_b [N/mm²]	≥ 12
Conversion factor for lower compressive strengths		$(f_b / 12)^{0,75} \leq 1,0$
Code		EN 771-2
Producer (Country)		e.g. KS-Wemding (DE)
Brick dimensions	[mm]	≥ 248 x 240 x 238
Drilling method		Rotary drilling

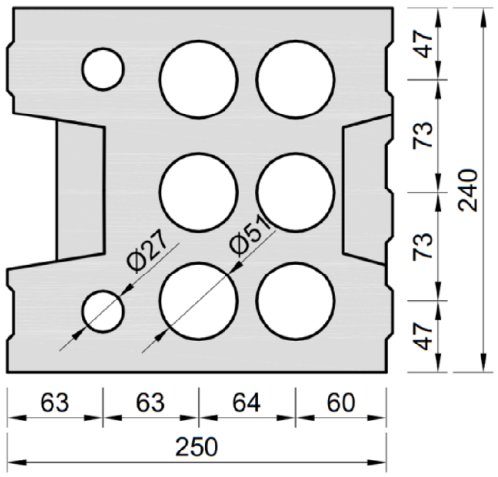


Table C25: Installation parameter

Anchor size		[-]	M8	M10	M12	M16	IG-M6	IG-M8	IG-M10
Installation torque	T_{inst}	[Nm]	≤ 5	≤ 5	≤ 8	≤ 8	≤ 5	≤ 8	≤ 8
Char. Edge distance	c_{cr}	[mm]	120 (for shear loads perpendicular to the free edge: c_{cr} = 240)						
Minimum Edge Distance	c_{min}	[mm]	50						
Characteristic Spacing	$s_{cr,\,II}$	[mm]	250						
	$s_{cr,\,\perp}$	[mm]	120						
Minimum Spacing	s_{min}	[mm]	50						

Table C26: Reduction factors for single anchors at the edge

Tension load			Shear load					
			Perpendicular to the free edge			Parallel to the free edge		
	with c ≥	$\alpha_{edge,\,N}$		with c ≥	$\alpha_{edge,\,V\perp}$		with c ≥	$\alpha_{edge,\,V\,II}$
	50	1,00		50	0,30		50	1,00
	120	1,00		250	1,00		120	1,00

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances Hollow Calcium silica brick KSL-8DF
Description of the stone, Installation parameters, Reductionfactors

Annex C 11

Deutsches Institut für Bautechnik DIBt

Brick type: Hollow Calcium silica brick KSL-8DF

Table C27: Factors for anchor groups under tension load

Anchor position parallel to hor. joint				Anchor position perpendicular to hor. joint			
	with c ≥	with s ≥	$\alpha_{g\ II,\ N}$		with c ≥	with s ≥	$\alpha_{g\ \perp,\ N}$
	50	50	1,00		50	50	1,00
	120	250	2,00		120	120	2,00

Table C28: Factors for anchor groups under shear load

	Anchor position parallel to hor. joint				Anchor position perpendicular to hor. joint			
Shear load perpendicular to the free edge		with c ≥	with s ≥	$\alpha_{g\ II,V\ \perp}$		with c ≥	with s ≥	$\alpha_{g\ \perp,V\ \perp}$
		50	50	0,45		50	50	0,45
		250	50	1,15		250	50	1,20
		250	250	2,00		250	250	2,00
Shear load parallel to the free edge		with c ≥	with s ≥	$\alpha_{g\ II,V\ II}$		with c ≥	with s ≥	$\alpha_{g\ \perp,V\ II}$
		50	50	1,30		50	50	1,00
		120	250	2,00		120	250	2,00

Table C29: Characteristic values of tension and shear load resistances

Anchor size	Perforated sleeve	Effective Anchorage depth	Characteristic Resistances with c ≥ c_{cr} and s ≥ s_{cr}						
			Use condition						
			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}	$N_{Rk,b} = N_{Rk,p}$			$N_{Rk,b} = N_{Rk,p}$			$V_{Rk,b}$ 2)
		[mm]	[kN]						
Compressive strength $f_b \geq 12$ N/mm² 1)									
M8 / M10/ IG-M6	16x130	130	5,0	4,5	3,5	5,0	4,5	3,5	3,5
M12 / M16 / IG-M8 / IG-M10	20x130	130	5,0	4,5	3,5	5,0	4,5	3,5	6,0
	20x200	200							

1) For lower compressive strengths resistances must be multiplied by the conversion factor according to Table C24. For stones with higher strengths, the shown values are valid without conversion.
2) $V_{Rk,c}$ according to Annex C3

Table C30: Displacements

Anchor size	h_{ef}	δ_N / N	δ_{N0}	$\delta_{N\infty}$	δ_V / V	δ_{V0}	$\delta_{V\infty}$
	[mm]	[mm/kN]	[mm]	[mm]	[mm/kN]	[mm]	[mm]
M8 – M12, IG-M6 – M10	all	0,13	0,13*N_{Rk} / 3,5	2*δ_{N0}	0,55	0,55*V_{Rk} / 3,5	1,5*δ_{V0}
M16	all				0,31	0,31*V_{Rk} / 3,5	1,5*δ_{V0}

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances Hollow Calcium silica brick KSL-8DF
Group factors, characteristic Resistances and Displacements

Annex C 12

Deutsches Institut für Bautechnik DIBt

Brick type: Hollow Calcium silica brick KSL-12DF

Table C31: Stone description

Brick type		Hollow Calcium silica brick KSL-12DF
Density	ρ [kg/dm³]	≥ 1,4
Compressive strength	f_b [N/mm²]	≥ 12
Conversion factor for lower compressive strengths		$(f_b / 12)^{0,75} \leq 1,0$
Code		EN 771-2
Producer (Country)		e.g. KS-Wemding (DE)
Brick dimensions	[mm]	≥ 498 x 175 x 238
Drilling method		Rotary drilling

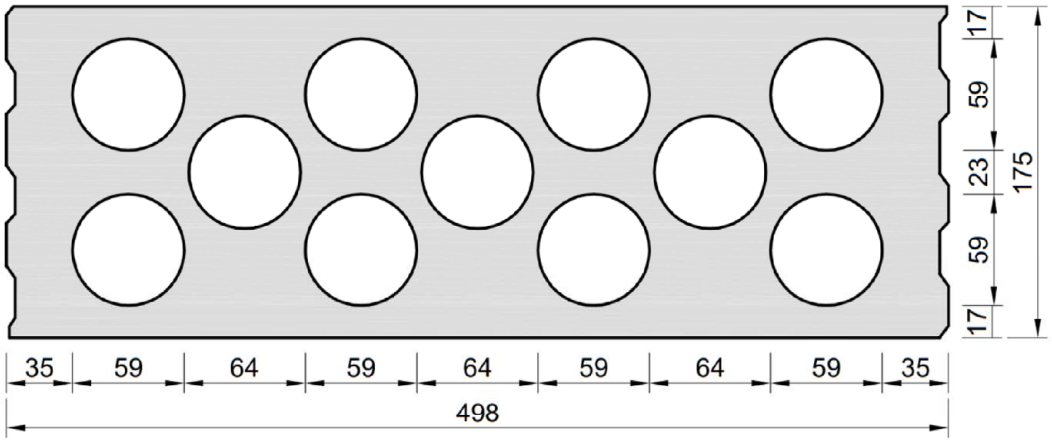


Table C32: Installation parameter

Anchor size		[-]	M8	M10	M12	M16	IG-M6	IG-M8	IG-M10
Installation torque	T_{inst}	[Nm]	≤ 4	≤ 4	≤ 5	≤ 5	≤ 4	≤ 5	≤ 5
Char. Edge distance	c_{cr}	[mm]	120 (for shear loads perpendicular to the free edge: c_{cr} = 500)						
Minimum Edge Distance	c_{min}	[mm]	50						
Characteristic Spacing	$s_{cr,\,II}$	[mm]	500						
	$s_{cr,\,\perp}$	[mm]	120						
Minimum Spacing	s_{min}	[mm]	50						

Table C33: Reduction factors for single anchors at the edge

Tension load			Shear load					
			Perpendicular to the free edge			Parallel to the free edge		
	with c ≥	$\alpha_{edge,\,N}$		with c ≥	$\alpha_{edge,\,V\perp}$		with c ≥	$\alpha_{edge,\,V\,II}$
	50	1,00		50	0,45		50	1,00
	120	1,00		500	1,00		120	1,00

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances Hollow Calcium silica brick KSL-12DF
Description of the stone, Installation parameters, Reductionfactors

Annex C 13

Deutsches Institut für Bautechnik DIBt

Brick type: Hollow Calcium silica brick KSL-12DF

Table C34: Factors for anchor groups under tension load

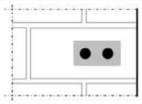
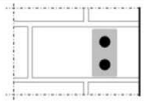
Anchor position parallel to hor. joint				Anchor position perpendicular to hor. joint			
	with c ≥	with s ≥	$\alpha_{g\,II,N}$		with c ≥	with s ≥	$\alpha_{g\,\perp,N}$
	50	50	1,50		50	50	1,00
	120	500	2,00		120	240	2,00

Table C35: Factors for anchor groups under shear load

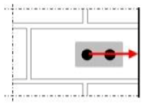
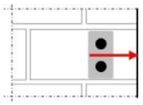
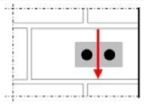
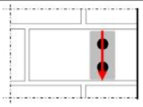
	Anchor position parallel to hor. joint				Anchor position perpendicular to hor. joint			
Shear load perpendicular to the free edge		with c ≥	with s ≥	$\alpha_{g\,II,V\perp}$		with c ≥	with s ≥	$\alpha_{g\,\perp,V\perp}$
		50	50	0,55		50	50	0,50
		500	50	1,00		500	50	1,00
		500	500	2,00		500	250	2,00
Shear load parallel to the free edge		with c ≥	with s ≥	$\alpha_{g\,II,V\,II}$		with c ≥	with s ≥	$\alpha_{g\,\perp,V\,II}$
		50	50	2,00		50	50	1,30
		120	500	2,00		120	250	2,00

Table C36: Characteristic values of tension and shear load resistances

Anchor size	Perforated sleeve	Effective Anchorage depth	Characteristic Resistances with c ≥ c_{cr} and s ≥ s_{cr}						
			Use condition						
			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}	$N_{Rk,b} = N_{Rk,p}$			$N_{Rk,b} = N_{Rk,p}$			$V_{Rk,b}$ 2)
		[mm]	[kN]						
Compressive strength $f_b \geq 12$ N/mm² 1)									
M8 / M10/ IG-M6	16x130	130	3,5	3,5	2,5	3,5	3,5	2,5	3,5
M12 / M16 / IG-M8 / IG-M10	20x130	130	3,5	3,5	2,5	3,5	3,5	2,5	7,0

1) For lower compressive strengths resistances must be multiplied by the conversion factor according to Table C31. For stones with higher strengths, the shown values are valid without conversion.

2) $V_{Rk,c}$ according to Annex C3

Table C37: Displacements

Anchor size	h_{ef}	δ_N / N	δ_{N0}	$\delta_{N\infty}$	δ_V / V	δ_{V0}	$\delta_{V\infty}$
	[mm]	[mm/kN]	[mm]	[mm]	[mm/kN]	[mm]	[mm]
M8 – M12, IG-M6 – M10	all	0,13	0,13*N_{Rk} / 3,5	2*δ_{N0}	0,55	0,55*V_{Rk} / 3,5	1,5*δ_{V0}
M16	all				0,31	0,31*V_{Rk} / 3,5	1,5*δ_{V0}

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances Hollow Calcium silica brick KSL-12DF
Group factors, characteristic Resistances and Displacements

Annex C 14

Deutsches Institut für Bautechnik DIBt

Brick type: Solid clay brick 1DF

Table C38: Stone description

Brick type		Solid clay brick Mz-1DF
Density	ρ [kg/dm³]	≥ 2,0
Compressive strength	f_b [N/mm²]	≥ 20
Conversion factor for lower compressive strengths		$(f_b / 20)^{0,5} \leq 1,0$
Code		EN 771-1
Producer (Country)		e.g. Wienerberger (DE)
Brick dimensions	[mm]	≥ 240 x 115 x 55
Drilling method		Hammer drilling

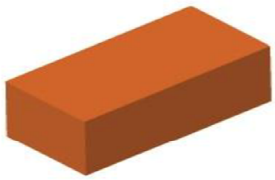


Table C39: Installation parameter

Anchor size		[-]	M8	M10	M12	M16	IG-M6	IG-M8	IG-M10
Installation torque	T_{inst}	[Nm]	≤ 10	≤ 10	≤ 10	≤ 10	≤ 10	≤ 10	≤ 10
Char. Edge distance	c_{cr}	[mm]	150 (for shear loads perpendicular to the free edge: c_{cr} = 240)						
Minimum Edge Distance	c_{min}	[mm]	60						
Characteristic Spacing	$s_{cr,\,II}$	[mm]	240						
	$s_{cr,\,\perp}$	[mm]	130						
Minimum Spacing	s_{min}	[mm]	65						

Table C40: Reduction factors for single anchors at the edge

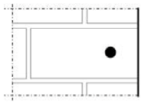
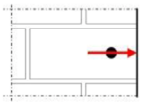
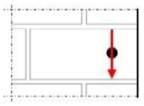
Tension load			Shear load					
			Perpendicular to the free edge			Parallel to the free edge		
	with c ≥	$\alpha_{edge,\,N}$		with c ≥	$\alpha_{edge,\,V\perp}$		with c ≥	$\alpha_{edge,\,V\,II}$
	60	0,75		60	0,10		60	0,30
				100	0,50		100	0,65
	150	1,00		240	1,00		150	1,00

Table C41: Factors for anchor groups under tension load

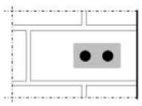
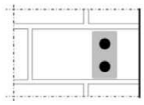
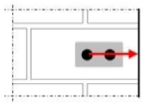
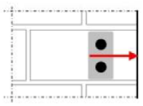
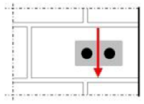
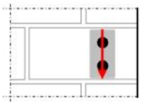
Anchor position parallel to hor. joint				Anchor position perpendicular to hor. joint			
	with c ≥	with s ≥	$\alpha_{g\,II,\,N}$		with c ≥	with s ≥	$\alpha_{g\,\perp,\,N}$
	60	65	0,85		60	65	1,00
	150	65	1,15		150	65	1,20
	150	240	2,00		150	130	2,00

Table C42: Factors for anchor groups under shear load

	Anchor position parallel to hor. joint				Anchor position perpendicular to hor. joint			
Shear load perpendicular to the free edge		with c ≥	with s ≥	$\alpha_{g\,II,V\perp}$		with c ≥	with s ≥	$\alpha_{g\,\perp,\,V\perp}$
		60	65	0,40		60	65	0,30
		240	65	2,00		240	65	2,00
		240	240	2,00		240	130	2,00
Shear load parallel to the free edge		with c ≥	with s ≥	$\alpha_{g\,II,V\,II}$		with c ≥	with s ≥	$\alpha_{g\,\perp,V\,II}$
		60	65	1,75		60	65	1,10
		150	65	2,00		150	65	2,00
		150	240	2,00		150	130	2,00

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances Solid clay brick 1DF
Description of the stone, Installation parameters, Reduction- and Group factors

Annex C 15

Deutsches Institut für Bautechnik DIBt

Brick type: Solid clay brick 1DF

Table C43: Characteristic values of tension and shear load resistances

Anchor size	Perforated sleeve	Effecitve Anchorage depth	Characteristic Resistances with c ≥ c_{cr} and s ≥ s_{cr}						
			Use condition						
			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}	$N_{Rk,b} = N_{Rk,p}$			$N_{Rk,b} = N_{Rk,p}$			$V_{Rk,b}$ 2)
		[mm]	[kN]						
Compressive strength $f_b \geq 20$ N/mm² 1)									
M8	-	≥ 80	7,0	6,0	6,0	7,0	6,0	6,0	8,0
M10 / IG-M6	-	≥ 90	7,0	6,0	6,0	7,0	6,0	6,0	8,0
M12 / IG-M8	-	≥ 100	7,0	6,0	6,0	7,0	6,0	6,0	8,0
M16 / IG-M10	-	≥ 100	8,0	6,5	6,5	8,0	6,5	6,5	12,0
M8	12x80	80	7,0	6,0	6,0	7,0	6,0	6,0	8,0
M8 / M10/ IG-M6	16x85	85	7,0	6,0	6,0	7,0	6,0	6,0	8,0
	16x130	130	7,0	6,0	6,0	7,0	6,0	6,0	8,0
M12 / IG-M8	20x85	85	7,0	6,0	6,0	7,0	6,0	6,0	8,0
	20x130	130	7,0	6,0	6,0	7,0	6,0	6,0	8,0
	20x200	200	7,0	6,0	6,0	7,0	6,0	6,0	8,0
M16 / IG-M10	20x85	85	8,0	6,5	6,5	8,0	6,5	6,5	12,0
	20x130	130	8,0	6,5	6,5	8,0	6,5	6,5	12,0
	20x200	200	8,0	6,5	6,5	8,0	6,5	6,5	12,0

1) For lower compressive strengths resistances must be multiplied by the conversion factor according to Table C38. For stones with higher strengths, the shown values are valid without conversion.

2) $V_{Rk,c}$ according to Annex C3

Table C44: Displacements

Anchor size	h_{ef}	δ_N / N	δ_{N0}	$\delta_{N\infty}$	δ_V / V	δ_{V0}	$\delta_{V\infty}$
	[mm]	[mm/kN]	[mm]	[mm]	[mm/kN]	[mm]	[mm]
M8 – M12, IG-M6 – M10	all	0,1	$0,1*N_{Rk}$ / 3,5	$2*\delta_{N0}$	0,3	$0,3*V_{Rk}$ / 3,5	$1,5*\delta_{V0}$
M16	all				0,1	$0,1*V_{Rk}$ / 3,5	$1,5*\delta_{V0}$

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances Solid clay brick 1DF
Characteristic Resistances and Displacements

Annex C 16

Deutsches Institut für Bautechnik DIBt

Brick type: Solid clay brick 2DF

Table C45: Stone description

Brick type		Solid clay brick Mz- 2DF
Density	ρ [kg/dm³]	≥ 2,0
Compressive strength	f_b [N/mm²]	≥ 28
Conversion factor for lower compressive strengths		$(f_b / 28)^{0,5} \leq 1,0$
Code		EN 771-1
Producer (Country)		e.g. Wienerberger (DE)
Brick dimensions	[mm]	≥ 240 x 115 x 113
Drilling method		Hammer drilling

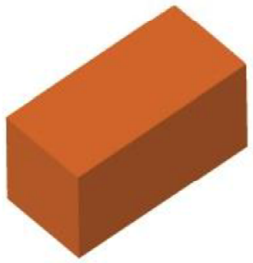


Table C46: Installation parameter

Anchor size		[-]	M8	M10	M12	M16	IG-M6	IG-M8	IG-M10
Installation torque	T_{inst}	[Nm]	≤ 10	≤ 10	≤ 10	≤ 10	≤ 10	≤ 10	≤ 10
Char. Edge distance	c_{cr}	[mm]	150 (for shear loads perpendicular to the free edge: c_{cr} = 240)						
Minimum Edge Distance	c_{min}	[mm]	50						
Characteristic Spacing	$s_{cr,\,II}$	[mm]	240						
	$s_{cr,\,\perp}$	[mm]	240						
Minimum Spacing	s_{min}	[mm]	50						

Table C47: Reduction factors for single anchors at the edge

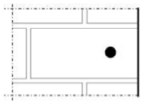
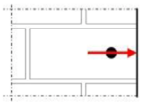
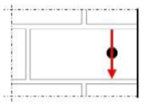
Tension load			Shear load					
			Perpendicular to the free edge			Parallel to the free edge		
	with c ≥	$\alpha_{edge,\,N}$		with c ≥	$\alpha_{edge,\,V\perp}$		with c ≥	$\alpha_{edge,\,V\,II}$
	50	1,00		50	0,20		50	1,00
				125	0,50			
	150	1,00		240	1,00		150	1,00

Table C48: Factors for anchor groups under tension load

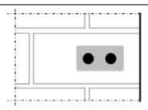
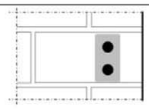
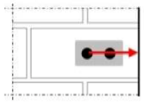
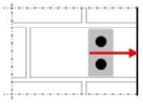
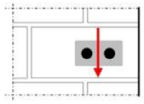
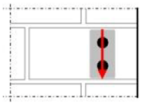
Anchor position parallel to hor. joint				Anchor position perpendicular to hor. joint			
	with c ≥	with s ≥	$\alpha_{g\,II,\,N}$		with c ≥	with s ≥	$\alpha_{g\,\perp,\,N}$
	50	50	1,50		50	50	0,80
	150	240	2,00		150	240	2,00

Table C49: Factors for anchor groups under shear load

	Anchor position parallel to hor. joint				Anchor position perpendicular to hor. joint			
		with c ≥	with s ≥	$\alpha_{g\,II,V\perp}$		with c ≥	with s ≥	$\alpha_{g\,\perp,V\perp}$
Shear load perpendicular to the free edge		50	50	0,40		50	50	0,20
		240	50	1,20		240	50	0,60
		240	240	2,00		240	125	1,00
						240	240	2,00
Shear load parallel to the free edge		with c ≥	with s ≥	$\alpha_{g\,II,V\,II}$		with c ≥	with s ≥	$\alpha_{g\,\perp,V\,II}$
		50	50	1,20		50	50	1,00
		150	240	2,00		50	125	1,00
						150	240	2,00

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances Solid clay brick 2DF
Description of the stone, Installation parameters, Reduction- and Group factors

Annex C 17

Deutsches Institut für Bautechnik DIBt

Brick type: Solid clay brick 2DF

Table C50: Characteristic values of tension and shear load resistances

Anchor size	Perforated sleeve	Effecitve Anchorage depth	Characteristic Resistances with c ≥ c_{cr} and s ≥ s_{cr}						
			Use condition						
			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}	$N_{Rk,b} = N_{Rk,p}$			$N_{Rk,b} = N_{Rk,p}$			$V_{Rk,b}$ 2)
		[mm]	[kN]						
Compressive strength $f_b \geq 28$ N/mm² 1)									
M8	-	≥ 80	9,0	9,0	7,5	9,0	9,0	7,5	9,5
M10 / IG-M6	-	≥ 90	9,0	9,0	7,5	9,0	9,0	7,5	9,5
M12 / IG-M8	-	≥ 100	9,0	9,0	7,5	9,0	9,0	7,5	12
M16 / IG-M10	-	≥ 100	9,0	9,0	7,5	9,0	9,0	7,5	12 3)
M8	12x80	80	9,0	9,0	7,5	9,0	9,0	7,5	9,5
M8 / M10/ IG-M6	16x85	85	9,0	9,0	7,5	9,0	9,0	7,5	9,5
	16x130	130	9,0	9,0	7,5	9,0	9,0	7,5	9,5
M12 / IG-M8	20x85	85	9,0	9,0	7,5	9,0	9,0	7,5	12
	20x130	130	9,0	9,0	7,5	9,0	9,0	7,5	12
	20x200	200	9,0	9,0	7,5	9,0	9,0	7,5	12
M16 / IG-M10	20x85	85	9,0	9,0	7,5	9,0	9,0	7,5	12 3)
	20x130	130	9,0	9,0	7,5	9,0	9,0	7,5	12 3)
	20x200	200	9,0	9,0	7,5	9,0	9,0	7,5	12 3)

1) For lower compressive strengths resistances must be multiplied by the conversion factor according to Table C37. For stones with higher strengths, the shown values are valid without conversion.
2) $V_{Rk,c}$ according to Annex C3
3) Valid for all stone strengths with min. 10 N/mm²

Table C51: Displacements

Anchor size	h_{ef}	δ_N / N	δ_{N0}	$\delta_{N\infty}$	δ_V / V	δ_{V0}	$\delta_{V\infty}$
	[mm]	[mm/kN]	[mm]	[mm]	[mm/kN]	[mm]	[mm]
M8 – M12, IG-M6 – M10	all	0,1	$0,1*N_{Rk}$ / 3,5	$2*\delta_{N0}$	0,3	$0,3*V_{Rk}$ / 3,5	$1,5*\delta_{V0}$
M16	all				0,1	$0,1*V_{Rk}$ / 3,5	$1,5*\delta_{V0}$

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances Solid clay brick 2DF
Characteristic Resistances and Displacements

Annex C 18

Deutsches Institut für Bautechnik DIBt

Brick type: Hollow clay brick 10 DF

Table C52: Stone description

Brick type		Hollow clay brick HLZ-10DF
Density	ρ [kg/dm³]	≥ 1,25
Compressive strength	f_b [N/mm²]	≥ 20
Conversion factor for lower compressive strengths		$(f_b / 20)^{0,5} \leq 1,0$
Code		EN 771-1
Producer (Country)		e.g. Wienerberger (DE)
Brick dimensions	[mm]	300 x 240 x 249
Drilling method		Rotary drilling

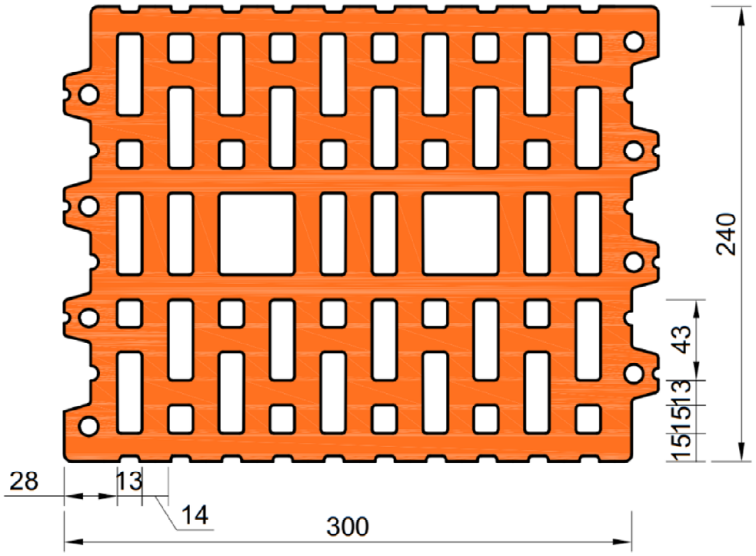


Table C53: Installation parameter

Anchor size		[-]	M8	M10	M12	M16	IG-M6	IG-M8	IG-M10
Installation torque	T_{inst}	[Nm]	≤ 5	≤ 10	≤ 10	≤ 10	≤ 5	≤ 5	≤ 10
Char. Edge distance	c_{cr}	[mm]	120 (for shear loads perpendicular to the free edge: c_{cr} = 300)						
Minimum Edge Distance	c_{min}	[mm]	50						
Characteristic Spacing	$s_{cr,\parallel}$	[mm]	300						
	$s_{cr,\perp}$	[mm]	250						
Minimum Spacing	s_{min}	[mm]	50						

Table C54: Reduction factors for single anchors at the edge

Tension load			Shear load					
			Perpendicular to the free edge			Parallel to the free edge		
	with c ≥	$\alpha_{edge,N}$		with c ≥	$\alpha_{edge,V\perp}$		with c ≥	$\alpha_{edge,V\parallel}$
	50	1,00		50	0,20		50	1,00
	120	1,00		300	1,00		120	1,00

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances Hollow clay brick HLZ 10DF
Description of the stone, Installation parameters, Reductionfactors

Annex C 19

Deutsches Institut für Bautechnik DIBt

Brick type: Hollow clay brick 10 DF

Table C55: Factors for anchor groups under tension load

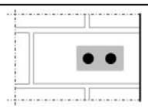
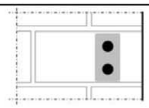
Anchor position parallel to hor. joint				Anchor position perpendicular to hor. joint			
	with c ≥	with s ≥	$\alpha_{g\,II,N}$		with c ≥	with s ≥	$\alpha_{g\,\perp,N}$
	50	50	1,55		50	50	1,00
	120	300	2,00		120	250	2,00

Table C56: Factors for anchor groups under shear load

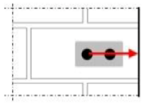
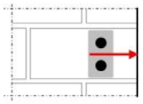
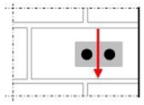
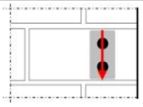
	Anchor position parallel to hor. joint				Anchor position perpendicular to hor. joint			
Shear load perpendicular to the free edge		with c ≥	with s ≥	$\alpha_{g\,II,V\perp}$		with c ≥	with s ≥	$\alpha_{g\,\perp,V\perp}$
		50	50	0,30		50	50	0,20
		300	50	1,40		300	50	1,00
		300	300	2,00		300	250	2,00
Shear load parallel to the free edge		with c ≥	with s ≥	$\alpha_{g\,II,V\,II}$		with c ≥	with s ≥	$\alpha_{g\,\perp,V\,II}$
		50	50	1,85		50	50	1,00
		120	300	2,00		120	250	2,00

Table C57: Characteristic values of tension and shear load resistances

Anchor size	Perforated sleeve	Effective Anchorage depth	Characteristic Resistances with c ≥ c_{cr} and s ≥ s_{cr}						
			Use condition						
			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}	$N_{Rk,b} = N_{Rk,p}$			$N_{Rk,b} = N_{Rk,p}$			$V_{Rk,b}$ [2]
		[mm]	[kN]						
Compressive strength $f_b \geq 20$ N/mm² [1]									
M8	12x80	80	2,5	2,5	2,0	2,5	2,5	2,0	8,0
M8 / M10/ IG-M6	16x85	85	2,5	2,5	2,0	2,5	2,5	2,0	8,0
	16x130	130	2,5	2,5	2,0	2,5	2,5	2,0	8,0
M12 / IG-M8	20x85	85	5,0	5,0	4,5	5,0	5,0	4,5	8,0
	20x130	130	5,0	5,0	4,5	5,0	5,0	4,5	8,0
	20x200	200	5,0	5,0	4,5	5,0	5,0	4,5	8,0
M16 / IG-M10	20x85	85	5,0	5,0	4,5	5,0	5,0	4,5	11,5
	20x130	130	5,0	5,0	4,5	5,0	5,0	4,5	11,5
	20x200	200	5,0	5,0	4,5	5,0	5,0	4,5	11,5

[1] For lower compressive strengths resistances must be multiplied by the conversion factor according to Table C52. For stones with higher strengths, the shown values are valid without conversion.

[2] $V_{Rk,c}$ according to Annex C3

Table C58: Displacements

Anchor size	h_{ef}	δ_N / N	δ_{N0}	$\delta_{N\infty}$	δ_V / V	δ_{V0}	$\delta_{V\infty}$
	[mm]	[mm/kN]	[mm]	[mm]	[mm/kN]	[mm]	[mm]
M8 – M12, IG-M6 – M10	all	0,13	0,13*N_{Rk} / 3,5	2*δ_{N0}	0,55	0,55*V_{Rk} / 3,5	1,5*δ_{V0}
M16	all				0,31	0,31*V_{Rk} / 3,5	1,5*δ_{V0}

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances Hollow clay brick HLZ 10DF
Group factors, characteristic Resistances and Displacements

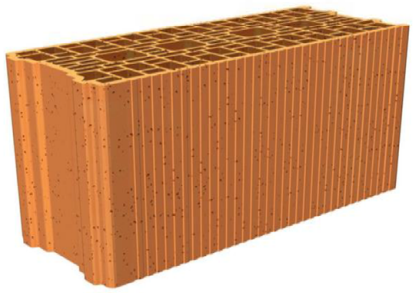
Annex C 20

Deutsches Institut für Bautechnik DIBt

Brick type: Hollow Clay brick Porotherm Homebric

Table C59: Stone description

Brick type		Hollow clay brick Porotherm Homebric
Density	ρ [kg/dm³]	≥ 0,70
Compressive strength	f_b [N/mm²]	≥ 10
Conversion factor for lower compressive strengths		$(f_b / 10)^{0,5} \leq 1,0$
Code		EN 771-1
Producer (Country)		e.g. Wienerberger (FR)
Brick dimensions	[mm]	500 x 200 x 300
Drilling method		Rotary drilling



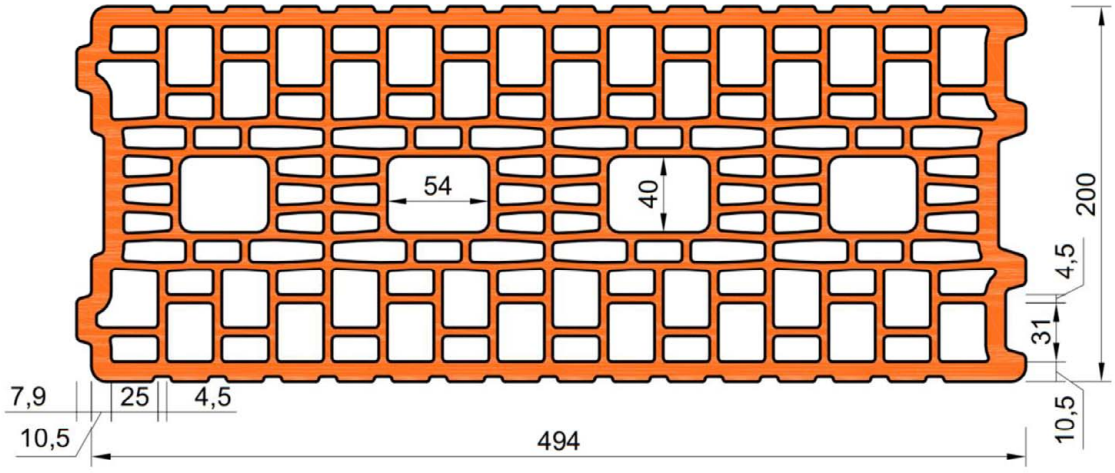
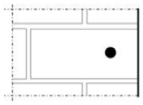
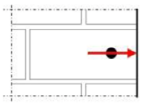
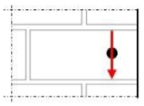


Table C60: Installation parameter

Anchor size		[-]	M8	M10	M12	M16	IG-M6	IG-M8	IG-M10
Installation torque	T_{inst}	[Nm]	≤ 2	≤ 2	≤ 2	≤ 2	≤ 2	≤ 2	≤ 2
Char. Edge distance	c_{cr}	[mm]	120 (for shear loads perpendicular to the free edge: c_{cr} = 500)						
Minimum Edge Distance	c_{min}	[mm]	120						
Characteristic Spacing	$s_{cr,\,II}$	[mm]	500						
	$s_{cr,\,\perp}$	[mm]	300						
Minimum Spacing	s_{min}	[mm]	120						

Table C61: Reduction factors for single anchors at the edge

Tension load			Shear load					
			Perpendicular to the free edge			Parallel to the free edge		
	with c ≥	$\alpha_{edge,\,N}$		with c ≥	$\alpha_{edge,\,V\perp}$		with c ≥	$\alpha_{edge,\,V\,II}$
	120	1,00		120	0,30		120	0,60
				250	0,60			
	120	1,00		500	1,00		200	1,00

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances Hollow clay brick Porotherm Homebric
Description of the stone, Installation parameters, Reductionfactors

Annex C 21

Deutsches Institut für Bautechnik DIBt

Brick type: Hollow Clay brick Porotherm Homebric

Table C62: Factors for anchor groups under tension load

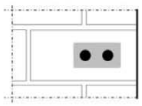
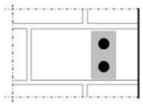
Anchor position parallel to hor. joint				Anchor position perpendicular to hor. joint			
	with c ≥	with s ≥	$\alpha_{g\,II,N}$		with c ≥	with s ≥	$\alpha_{g\,\perp,N}$
	120	100	1,00		120	100	1,00
	200	100	2,00		200	100	1,20
	120	500	2,00		120	300	2,00

Table C63: Factors for anchor groups under shear load

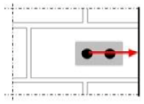
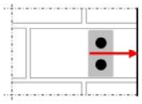
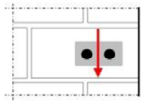
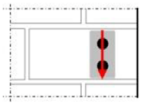
	Anchor position parallel to hor. joint				Anchor position perpendicular to hor. joint			
Shear load perpendicular to the free edge		with c ≥	with s ≥	$\alpha_{g\,II,V\perp}$		with c ≥	with s ≥	$\alpha_{g\,\perp,V\perp}$
		120	100	0,30		120	100	0,30
		250	100	0,60		250	100	0,60
		500	100	1,00		120	300	2,00
		120	500	2,00				
Shear load parallel to the free edge		with c ≥	with s ≥	$\alpha_{g\,II,V\,II}$		with c ≥	with s ≥	$\alpha_{g\,\perp,V\,II}$
		120	100	1,00		120	100	1,00
		120	500	2,00		120	300	2,00

Table C64: Characteristic values of tension and shear load resistances

Anchor size	Perforated sleeve	Effective Anchorage depth	Characteristic Resistances with c ≥ c_{cr} and s ≥ s_{cr}						
			Use condition						
			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}	$N_{Rk,b} = N_{Rk,p}$			$N_{Rk,b} = N_{Rk,p}$			$V_{Rk,b}$ 2)
		[mm]	[kN]						
Compressive strength $f_b \geq 10$ N/mm² 1)									
M8	12x80	80	1,2						3,0
M8 / M10/ IG-M6	16x85	85	1,2						3,0
	16x130	130	1,5						3,5
M12 / M16/ IG-M8 / IG-M10	20x85	85	1,2						4,0
	20x130	130	1,5						4,0
	20x200	200	1,5						4,0

1) For lower compressive strengths resistances must be multiplied by the conversion factor according to Table C59. For stones with higher strengths, the shown values are valid without conversion.
2) $V_{Rk,c}$ according to Annex C3

Table C65: Displacements

Anchor size	h_{ef}	δ_N / N	δ_{N0}	$\delta_{N\infty}$	δ_V / V	δ_{V0}	$\delta_{V\infty}$
	[mm]	[mm/kN]	[mm]	[mm]	[mm/kN]	[mm]	[mm]
M8 – M12, IG-M6 – M10	all	0,13	0,13*N_{Rk} / 3,5	2*δ_{N0}	0,55	0,55*V_{Rk} / 3,5	1,5*δ_{V0}
M16	all				0,31	0,31*V_{Rk} / 3,5	1,5*δ_{V0}

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances Hollow clay brick Porotherm Homebric
Group factors, characteristic Resistances and Displacements

Annex C 22

Deutsches Institut für Bautechnik DIBt

Brick type: Hollow Clay brick BGV Thermo

Table C66: Stone description

Brick type		Hollow clay brick BGV Thermo
Density	ρ [kg/dm³]	≥ 0,60
Compressive strength	f_b [N/mm²]	≥ 10
Conversion factor for lower compressive strengths		$(f_b / 10)^{0,5} \leq 1,0$
Code		EN 771-1
Producer (Country)		e.g. Leroux (FR)
Brick dimensions	[mm]	500 x 200 x 314
Drilling method		Rotary drilling

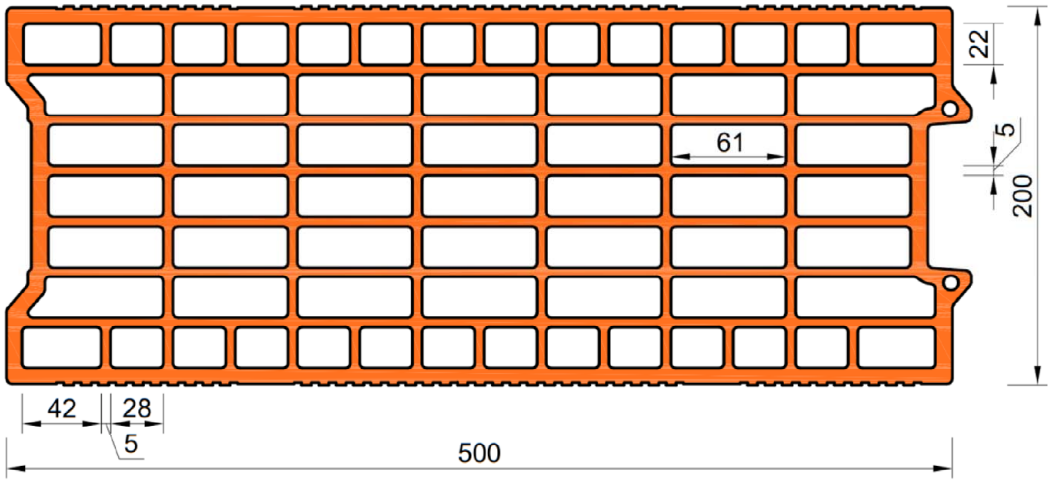
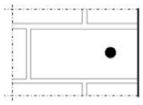
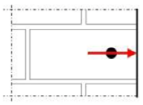
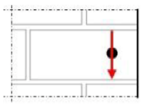


Table C67: Installation parameter

Anchor size		[-]	M8	M10	M12	M16	IG-M6	IG-M8	IG-M10
Installation torque	T_{inst}	[Nm]	≤ 2	≤ 2	≤ 2	≤ 2	≤ 2	≤ 2	≤ 2
Char. Edge distance	c_{cr}	[mm]	120 (for shear loads perpendicular to the free edge: c_{cr} = 500)						
Minimum Edge Distance	c_{min}	[mm]	120						
Characteristic Spacing	$s_{cr,\,II}$	[mm]	500						
	$s_{cr,\,\perp}$	[mm]	315						
Minimum Spacing	s_{min}	[mm]	120						

Table C68: Reduction factors for single anchors at the edge

Tension load			Shear load					
			Perpendicular to the free edge			Parallel to the free edge		
	with c ≥	$\alpha_{edge,\,N}$		with c ≥	$\alpha_{edge,\,V\perp}$		with c ≥	$\alpha_{edge,\,V\,II}$
	120	1,00		120	0,30		120	0,60
				250	0,60			
	120	1,00		500	1,00		250	1,00

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances Hollow clay brick BGV Thermo
Description of the stone, Installation parameters, Reductionfactors

Annex C 23

Deutsches Institut für Bautechnik DIBt

Brick type: Hollow Clay brick BGV Thermo

Table C69: Factors for anchor groups under tension load

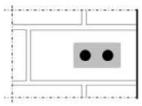
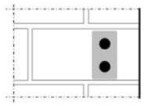
Anchor position parallel to hor. joint				Anchor position perpendicular to hor. joint			
	with c ≥	with s ≥	$\alpha_{g\ II,\ N}$		with c ≥	with s ≥	$\alpha_{g\ \perp,\ N}$
	120	100	1,00		120	100	1,00
	200	100	1,70		200	100	1,10
	120	500	2,00		120	315	2,00

Table C70: Factors for anchor groups under shear load

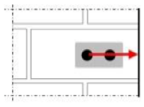
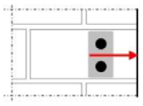
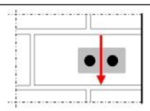
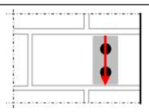
	Anchor position parallel to hor. joint				Anchor position perpendicular to hor. joint			
Shear load perpendicular to the free edge		with c ≥	with s ≥	$\alpha_{g\ II,V\ \perp}$		with c ≥	with s ≥	$\alpha_{g\ \perp,V\ \perp}$
		120	100	1,00		120	100	1,00
		120	500	2,00		120	315	2,00
Shear load parallel to the free edge		with c ≥	with s ≥	$\alpha_{g\ II,V\ II}$		with c ≥	with s ≥	$\alpha_{g\ \perp,V\ II}$
		120	100	1,00		120	100	1,00
		120	500	2,00		120	315	2,00

Table C71: Characteristic values of tension and shear load resistances

Anchor size	Perforated sleeve	Effecitve Anchorage depth	Characteristic Resistances with c ≥ c_{cr} and s ≥ s_{cr}						
			Use condition						
			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}	$N_{Rk,b} = N_{Rk,p}$			$N_{Rk,b} = N_{Rk,p}$			$V_{Rk,b}$ [2]
		[mm]	[kN]						
Compressive strength $f_b \geq 10$ N/mm² [1]									
M8	12x80	80	0,9						3,5
M8 / M10/ IG-M6	16x85	85	0,9						3,5
	16x130	130	2,0		1,5	2,0		1,5	4,0
M12 / IG-M8	20x85	85	0,9						4,0
	20x130	130	2,0		1,5	2,0		1,5	4,0
	20x200	200	2,0		1,5	2,0		1,5	4,0
M16 / IG-M10	20x85	85	0,9						4,0
	20x130	130	2,0		1,5	2,0		1,5	4,0
	20x200	200	2,0		1,5	2,0		1,5	4,0

1) For lower compressive strengths resistances must be multiplied by the conversion factor according to Table C66. For stones with higher strengths, the shown values are valid without conversion.

2) $V_{Rk,c}$ according to Annex C3

Table C72: Displacements

Anchor size	h_{ef}	δ_N / N	δ_{N0}	$\delta_{N\infty}$	δ_V / V	δ_{V0}	$\delta_{V\infty}$
	[mm]	[mm/kN]	[mm]	[mm]	[mm/kN]	[mm]	[mm]
M8 – M12, IG-M6 – M10	all	0,13	0,13*N_{Rk} / 3,5	2*δ_{N0}	0,55	0,55*V_{Rk} / 3,5	1,5*δ_{V0}
M16	all				0,31	0,31*V_{Rk} / 3,5	1,5*δ_{V0}

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances Hollow clay brick BGV Thermo
Group factors, characteristic Resistances and Displacements

Annex C 24

Deutsches Institut für Bautechnik DIBt

Brick type: Hollow Clay brick Calibric R+

Table C73: Stone description

Brick type		Hollow clay brick Calibric R+
Density	ρ [kg/dm³]	≥ 0,60
Compressive strength	f_b [N/mm²]	≥ 12
Conversion factor for lower compressive strengths		$(f_b / 12)^{0,5} \leq 1,0$
Code		EN 771-1
Producer (Country)		e.g. Leroux (FR)
Brick dimensions	[mm]	500 x 200 x 314
Drilling method		Rotary drilling

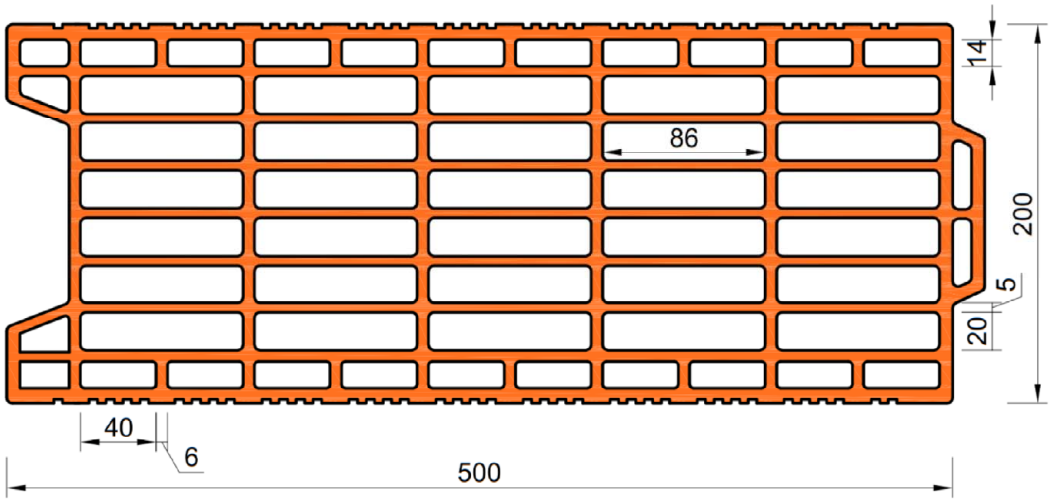
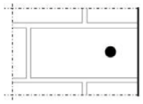
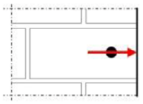
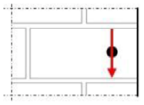


Table C74: Installation parameter

Anchor size		[-]	M8	M10	M12	M16	IG-M6	IG-M8	IG-M10
Installation torque	T_{inst}	[Nm]	≤ 2	≤ 2	≤ 2	≤ 2	≤ 2	≤ 2	≤ 2
Char. Edge distance	c_{cr}	[mm]	120 (for shear loads perpendicular to the free edge: c_{cr} = 500)						
Minimum Edge Distance	c_{min}	[mm]	120						
Characteristic Spacing	$s_{cr,\,II}$	[mm]	500						
	$s_{cr,\,\perp}$	[mm]	315						
Minimum Spacing	s_{min}	[mm]	120						

Table C75: Reduction factors for single anchors at the edge

Tension load			Shear load					
			Perpendicular to the free edge			Parallel to the free edge		
	with c ≥	$\alpha_{edge,\,N}$		with c ≥	$\alpha_{edge,\,V\perp}$		with c ≥	$\alpha_{edge,\,V\,II}$
	120	1,00		120	0,15		120	0,30
				250	0,30			
	120	1,00		500	1,00		250	1,00

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances Hollow clay brick Calibric R+
Description of the stone, Installation parameters, Reductionfactors

Annex C 25

Deutsches Institut für Bautechnik DIBt

Brick type: Hollow Clay brick Calibric R+

Table C76: Factors for anchor groups under tension load

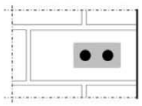
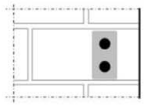
Anchor position parallel to hor. joint				Anchor position perpendicular to hor. joint			
	with c ≥	with s ≥	$\alpha_{g\,II,N}$		with c ≥	with s ≥	$\alpha_{g\,\perp,N}$
	120	100	1,00		120	100	1,00
	175	100	1,70		175	100	1,10
	120	500	2,00		120	315	2,00

Table C77: Factors for anchor groups under shear load

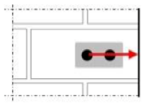
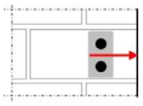
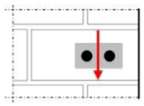
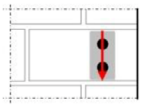
	Anchor position parallel to hor. joint				Anchor position perpendicular to hor. joint			
Shear load perpendicular to the free edge		with c ≥	with s ≥	$\alpha_{g\,II,V\perp}$		with c ≥	with s ≥	$\alpha_{g\,\perp,V\perp}$
		120	100	1,00		120	100	1,00
		120	500	2,00		120	315	2,00
Shear load parallel to the free edge		with c ≥	with s ≥	$\alpha_{g\,II,V\,II}$		with c ≥	with s ≥	$\alpha_{g\,\perp,V\,II}$
		120	100	1,00		120	100	1,00
		120	500	2,00		120	315	2,00

Table C78: Characteristic values of tension and shear load resistances

Anchor size	Perforated sleeve	Effective Anchorage depth	Characteristic Resistances with c ≥ c_{cr} and s ≥ s_{cr}						
			Use condition						
			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}	$N_{Rk,b} = N_{Rk,p}$			$N_{Rk,b} = N_{Rk,p}$			$V_{Rk,b}$ 2)
		[mm]	[kN]						
Compressive strength $f_b \geq 12$ N/mm² 1)									
M8	12x80	80	1,2	1,2	0,9	1,2	1,2	0,9	4,0
M8 / M10/ IG-M6	16x85	85	1,2	1,2	0,9	1,2	1,2	0,9	5,5
	16x130	130	1,5	1,5	1,2	1,5	1,5	1,2	5,5
M12 / IG-M8	20x85	85	1,2	1,2	0,9	1,2	1,2	0,9	8,5
	20x130	130	1,5	1,5	1,2	1,5	1,5	1,2	8,5
M16 / IG-M10	20x85	85	1,2	1,2	0,9	1,2	1,2	0,9	8,5
	20x130	130	1,5	1,5	1,2	1,5	1,5	1,2	8,5

1) For lower compressive strengths resistances must be multiplied by the conversion factor according to Table C73. For stones with higher strengths, the shown values are valid without conversion.

2) $V_{Rk,c}$ according to Annex C3

Table C79: Displacements

Anchor size	h_{ef}	δ_N / N	δ_{N0}	$\delta_{N\infty}$	δ_V / V	δ_{V0}	$\delta_{V\infty}$
	[mm]	[mm/kN]	[mm]	[mm]	[mm/kN]	[mm]	[mm]
M8 – M12, IG-M6 – M10	all	0,13	0,13*N_{Rk} / 3,5	2*δ_{N0}	0,55	0,55*V_{Rk} / 3,5	1,5*δ_{V0}
M16	all				0,31	0,31*V_{Rk} / 3,5	1,5*δ_{V0}

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances Hollow Clay brick Calibric R+
Group factors, characteristic Resistances and Displacements

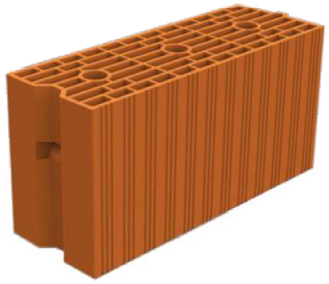
Annex C 26

Deutsches Institut für Bautechnik DIBt

Brick type: Hollow Clay brick Urbanbric

Table C80: Stone description

Brick type		Hollow clay brick Urbanbric
Density	ρ [kg/dm³]	≥ 0,70
Compressive strength	f_b [N/mm²]	≥ 12
Conversion factor for lower compressive strengths		$(f_b / 12)^{0,5} \leq 1,0$
Code		EN 771-1
Producer (Country)		e.g. Imerys (FR)
Brick dimensions	[mm]	560 x 200 x 274
Drilling method		Rotary drilling



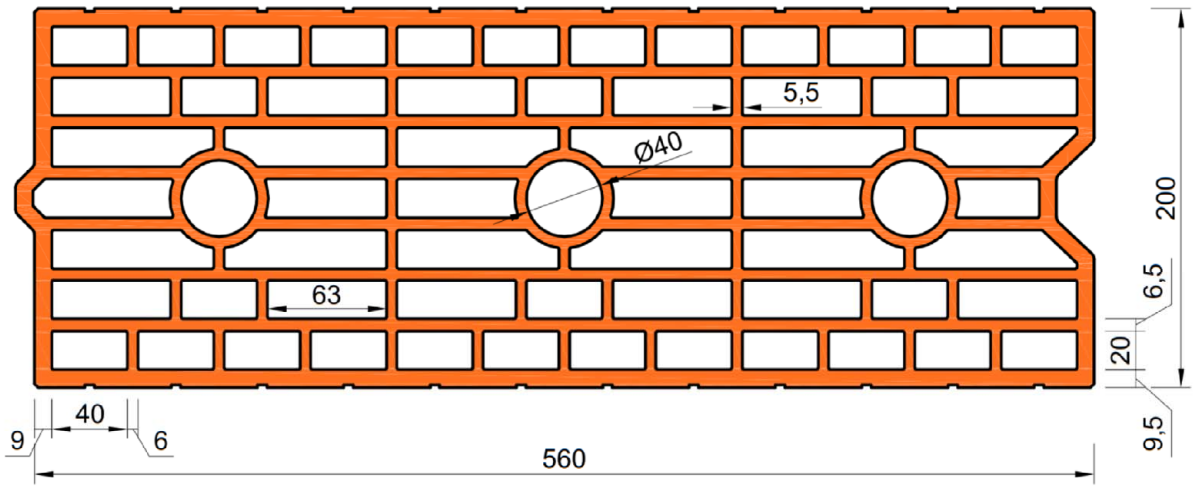
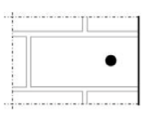
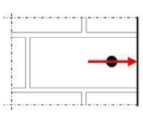
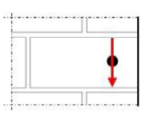


Table C81: Installation parameter

Anchor size		[-]	M8	M10	M12	M16	IG-M6	IG-M8	IG-M10
Installation torque	T_{inst}	[Nm]	≤ 2	≤ 2	≤ 2	≤ 2	≤ 2	≤ 2	≤ 2
Char. Edge distance	c_{cr}	[mm]	120 (for shear loads perpendicular to the free edge: c_{cr} = 500)						
Minimum Edge Distance	c_{min}	[mm]	120						
Characteristic Spacing	$s_{cr,\,II}$	[mm]	560						
	$s_{cr,\,\perp}$	[mm]	275						
Minimum Spacing	s_{min}	[mm]	100						

Table C82: Reduction factors for single anchors at the edge

Tension load			Shear load					
			Perpendicular to the free edge			Parallel to the free edge		
	with c ≥	$\alpha_{edge,\,N}$		with c ≥	$\alpha_{edge,\,V\perp}$		with c ≥	$\alpha_{edge,\,V\,II}$
	120	1,00		120	0,25		120	0,50
				250	0,50			
	120	1,00		500	1,00		250	1,00

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances Hollow clay brick Urbanbric
Description of the stone, Installation parameters, Reductionfactors

Annex C 27

Deutsches Institut für Bautechnik DIBt

Brick type: Hollow Clay brick Urbanbric

Table C83: Factors for anchor groups under tension load

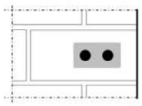
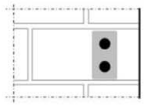
Anchor position parallel to hor. joint				Anchor position perpendicular to hor. joint			
	with c ≥	with s ≥	$\alpha_{g\,II,N}$		with c ≥	with s ≥	$\alpha_{g\,\perp,N}$
	120	100	1,00		120	100	1,00
	185	100	1,90		185	100	1,10
	120	560	2,00		120	275	2,00

Table C84: Factors for anchor groups under shear load

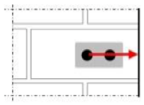
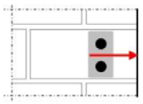
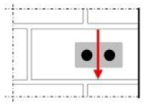
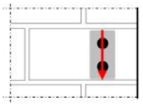
	Anchor position parallel to hor. joint				Anchor position perpendicular to hor. joint			
Shear load perpendicular to the free edge		with c ≥	with s ≥	$\alpha_{g\,II,V\perp}$		with c ≥	with s ≥	$\alpha_{g\,\perp,V\perp}$
		120	100	1,00		120	100	1,00
		120	560	2,00		120	275	2,00
Shear load parallel to the free edge		with c ≥	with s ≥	$\alpha_{g\,II,V\,II}$		with c ≥	with s ≥	$\alpha_{g\,\perp,V\,II}$
		120	100	1,00		120	100	1,00
		120	560	2,00		120	275	2,00

Table C85: Characteristic values of tension and shear load resistances

Anchor size	Perforated sleeve	Effecitve Anchorage depth	Characteristic Resistances with c ≥ c_{cr} and s ≥ s_{cr}						
			Use condition						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}	$N_{Rk,b} = N_{Rk,p}$			$N_{Rk,b} = N_{Rk,p}$			$V_{Rk,b}$ 2)
		[mm]	[kN]						
Compressive strength $f_b \geq 12$ N/mm² 1)									
M8	12x80	80	1,2	1,2	0,9	1,2	1,2	0,9	4,5
M8 / M10/ IG-M6	16x85	85	1,2	1,2	0,9	1,2	1,2	0,9	4,5
	16x130	130	3,0	3,0	2,5	3,0	3,0	2,5	4,5
M12 / IG-M8	20x85	85	1,2	1,2	0,9	1,2	1,2	0,9	5,0
	20x130	130	3,0	3,0	2,5	3,0	3,0	2,5	5,0
M16 / IG-M10	20x85	85	1,2	1,2	0,9	1,2	1,2	0,9	5,0
	20x130	130	3,0	3,0	2,5	3,0	3,0	2,5	5,0

1) For lower compressive strengths resistances must be multiplied by the conversion factor according to Table C80. For stones with higher strengths, the shown values are valid without conversion.

2) $V_{Rk,c}$ according to Annex C3

Table C86: Displacements

Anchor size	h_{ef}	δ_N / N	δ_{N0}	$\delta_{N\infty}$	δ_V / V	δ_{V0}	$\delta_{V\infty}$
	[mm]	[mm/kN]	[mm]	[mm]	[mm/kN]	[mm]	[mm]
M8 – M12, IG-M6 – M10	all	0,13	0,13*N_{Rk} / 3,5	2*δ_{N0}	0,55	0,55*V_{Rk} / 3,5	1,5*δ_{V0}
M16	all				0,31	0,31*V_{Rk} / 3,5	1,5*δ_{V0}

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances Hollow Clay brick Urbanbric
Group factors, characteristic Resistances and Displacements

Annex C 28

Deutsches Institut für Bautechnik DIBt

Brick type: Hollow Clay brick Brique creuse C40

Table C87: Stone description

Brick type		Hollow clay brick Brique creuse C40
Density	ρ [kg/dm³]	≥ 0,70
Compressive strength	f_b [N/mm²]	≥ 12
Conversion factor for lower compressive strengths		$(f_b / 12)^{0,5} \leq 1,0$
Code		EN 771-1
Producer (Country)		e.g. Terreal (FR)
Brick dimensions	[mm]	500 x 200 x 200
Drilling method		Rotary drilling

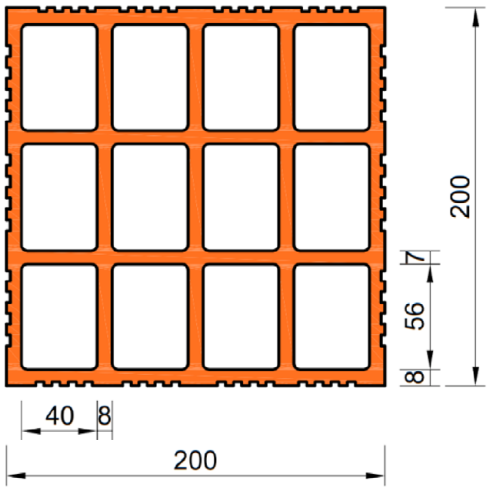


Table C88: Installation parameter

Anchor size		[-]	M8	M10	M12	M16	IG-M6	IG-M8	IG-M10
Installation torque	T_{inst}	[Nm]	≤ 2	≤ 2	≤ 2	≤ 2	≤ 2	≤ 2	≤ 2
Char. Edge distance	c_{cr}	[mm]	120 (for shear loads perpendicular to the free edge: c_{cr} = 500)						
Minimum Edge Distance	c_{min}	[mm]	120						
Characteristic Spacing	$s_{cr,\,II}$	[mm]	500						
	$s_{cr,\,\perp}$	[mm]	200						
Minimum Spacing	s_{min}	[mm]	200						

Table C89: Reduction factors for single anchors at the edge

Tension load			Shear load					
			Perpendicular to the free edge			Parallel to the free edge		
	with c ≥	$\alpha_{edge,\,N}$		with c ≥	$\alpha_{edge,\,V\perp}$		with c ≥	$\alpha_{edge,\,V\,II}$
	120	1,00		120	0,83		120	1,00
	120	1,00		500	1,00		250	1,00

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances Hollow clay brick Brique Creuse C40
Description of the stone, Installation parameters, Reductionfactors

Annex C 29

Deutsches Institut für Bautechnik DIBt

Brick type: Hollow Clay brick Brique creuse C40

Table C90: Factors for anchor groups under tension load

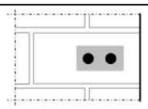
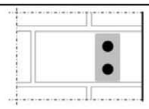
Anchor position parallel to hor. joint				Anchor position perpendicular to hor. joint			
	with c ≥	with s ≥	$\alpha_{g\,II,N}$		with c ≥	with s ≥	$\alpha_{g\,\perp,N}$
	120	500	2,00		120	200	2,00

Table C91: Factors for anchor groups under shear load

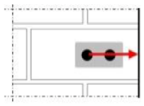
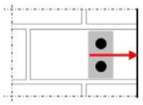
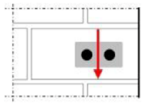
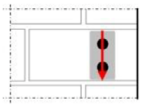
	Anchor position parallel to hor. joint				Anchor position perpendicular to hor. joint			
Shear load perpendicular to the free edge		with c ≥	with s ≥	$\alpha_{g\,II,V\perp}$		with c ≥	with s ≥	$\alpha_{g\,\perp,V\perp}$
		120	500	2,00		120	200	2,00
Shear load parallel to the free edge		with c ≥	with s ≥	$\alpha_{g\,II,V\,II}$		with c ≥	with s ≥	$\alpha_{g\,\perp,V\,II}$
		120	500	2,00		120	200	2,00

Table C92: Characteristic values of tension and shear load resistances

Anchor size	Perforated sleeve	Effective Anchorage depth	Characteristic Resistances with c ≥ c_{cr} and s ≥ s_{cr}						
			Use condition						
			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}	$N_{Rk,b} = N_{Rk,p}$			$N_{Rk,b} = N_{Rk,p}$			$V_{Rk,b}$ 2)
		[mm]	[kN]						
Compressive strength $f_b \geq 12$ N/mm² 1)									
M8	12x80	80	1,2	1,2	0,9	1,2	1,2	0,9	1,5
M8 / M10/ IG-M6	16x85	85							
	16x130	130							
M12 / IG-M8	20x85	85							
	20x130	130							
M16 / IG-M10	20x85	85							
	20x130	130							

1) For lower compressive strengths resistances must be multiplied by the conversion factor according to Table C87. For stones with higher strengths, the shown values are valid without conversion.
2) $V_{Rk,c}$ according to Annex C3

Table C93: Displacements

Anchor size	h_{ef}	δ_N / N	δ_{N0}	$\delta_{N\infty}$	δ_V / V	δ_{V0}	$\delta_{V\infty}$
	[mm]	[mm/kN]	[mm]	[mm]	[mm/kN]	[mm]	[mm]
M8 – M12, IG-M6 – M10	all	0,13	0,13*N_{Rk} / 3,5	2*δ_{N0}	0,55	0,55*V_{Rk} / 3,5	1,5*δ_{V0}
M16	all				0,31	0,31*V_{Rk} / 3,5	1,5*δ_{V0}

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances Hollow Clay brick Brique Creuse C40
Group factors, characteristic Resistances and Displacements

Annex C 30

Deutsches Institut für Bautechnik DIBt

Brick type: Hollow Clay brick Blocchi Leggeri

Table C94: Stone description

Brick type		Hollow clay brick Blocchi Leggeri
Density	ρ [kg/dm³]	≥ 0,60
Compressive strength	f_b [N/mm²]	≥ 12
Conversion factor for lower compressive strengths		$(f_b / 12)^{0,5} \leq 1,0$
Code		EN 771-1
Producer (Country)		e.g. Wienerberger (IT)
Brick dimensions	[mm]	250 x 120 x 250
Drilling method		Rotary drilling

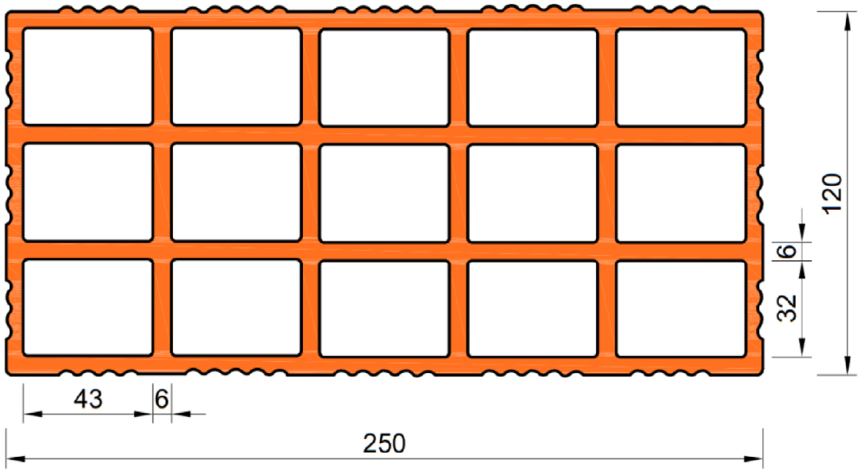


Table C95: Installation parameter

Anchor size		[-]	M8	M10	M12	M16	IG-M6	IG-M8	IG-M10
Installation torque	T_{inst}	[Nm]	≤ 2	≤ 2	≤ 2	≤ 2	≤ 2	≤ 2	≤ 2
Char. Edge distance	c_{cr}	[mm]	120 (for shear loads perpendicular to the free edge: c_{cr} = 250)						
Minimum Edge Distance	c_{min}	[mm]	60						
Characteristic Spacing	$s_{cr,\,II}$	[mm]	250						
	$s_{cr,\,\perp}$	[mm]	250						
Minimum Spacing	s_{min}	[mm]	100						

Table C96: Reduction factors for single anchors at the edge

Tension load			Shear load					
			Perpendicular to the free edge			Parallel to the free edge		
	with c ≥	$\alpha_{edge,\,N}$		with c ≥	$\alpha_{edge,\,V\perp}$		with c ≥	$\alpha_{edge,\,V\,II}$
	60	1,00		60	0,40		60	0,40
	120	1,00		250	1,00		120	1,00

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances Hollow clay brick Blocchi Leggeri
Description of the stone, Installation parameters, Reductionfactors

Annex C 31

Deutsches Institut für Bautechnik DIBt

Brick type: Hollow Clay brick Blocchi Leggeri

Table C97: Factors for anchor groups under tension load

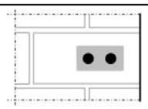
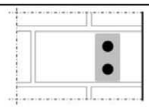
Anchor position parallel to hor. joint				Anchor position perpendicular to hor. joint			
	with c ≥	with s ≥	$\alpha_{g\,II,N}$		with c ≥	with s ≥	$\alpha_{g\,\perp,N}$
	60	100	1,00		60	100	2,00
	120	250	2,00		120	250	2,00

Table C98: Factors for anchor groups under shear load

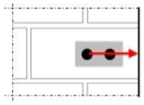
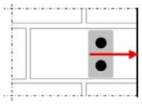
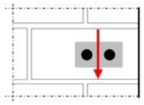
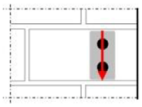
	Anchor position parallel to hor. joint				Anchor position perpendicular to hor. joint			
		with c ≥	with s ≥	$\alpha_{g\,II,V\perp}$		with c ≥	with s ≥	$\alpha_{g\,\perp,V\perp}$
Shear load perpendicular to the free edge		60	100	0,40		60	100	0,40
		250	100	1,00		250	100	1,00
		250	250	2,00		250	250	2,00
		with c ≥	with s ≥	$\alpha_{g\,II,V\,II}$		with c ≥	with s ≥	$\alpha_{g\,\perp,V\,II}$
Shear load parallel to the free edge		60	100	0,40		60	100	0,40
		120	100	1,00		120	100	1,00
		120	250	2,00		120	250	2,00

Table C99: Characteristic values of tension and shear load resistances

Anchor size	Perforated sleeve	Effecitve Anchorage depth	Characteristic Resistances with c ≥ c_{cr} and s ≥ s_{cr}						
			Use condition						
			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}	$N_{Rk,b} = N_{Rk,p}$			$N_{Rk,b} = N_{Rk,p}$			$V_{Rk,b}$ 2)
		[mm]	[kN]						
Compressive strength $f_b \geq 12$ N/mm² 1)									
M8	12x80	80	0,6	0,6	0,6	0,6	0,6	0,6	3,5
M8 / M10/ IG-M6	16x85	85							
	16x130	130							
M12 / IG-M8	20x85	85							
	20x130	130							
	20x200	200							
M16 / IG-M10	20x85	85							
	20x130	130							
	20x200	200							

1) For lower compressive strengths resistances must be multiplied by the conversion factor according to Table C94. For stones with higher strengths, the shown values are valid without conversion.
2) $V_{Rk,c}$ according to Annex C3

Table C100: Displacements

Anchor size	h_{ef}	δN / N	$\delta N0$	$\delta N\infty$	δV / V	$\delta V0$	$\delta V\infty$
	[mm]	[mm/kN]	[mm]	[mm]	[mm/kN]	[mm]	[mm]
M8 – M12, IG-M6 – M10	all	0,13	0,13*N_{Rk} / 3,5	2*$\delta N0$	0,55	0,55*V_{Rk} / 3,5	1,5*$\delta V0$
M16	all				0,31	0,31*V_{Rk} / 3,5	1,5*$\delta V0$

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances Hollow Clay brick Blocchi Leggeri
Group factors, characteristic Resistances and Displacements

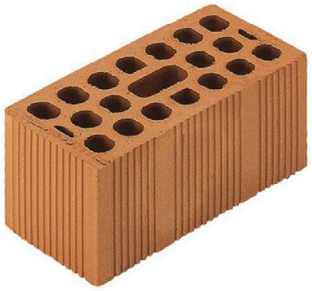
Annex C 32

Deutsches Institut für Bautechnik DIBt

Brick type: Hollow Clay brick Doppio Uni

Table C101: Stone description

Brick type		Hollow clay brick Doppio Uni
Density	ρ [kg/dm³]	≥ 0,90
Compressive strength	f_b [N/mm²]	≥ 28
Conversion factor for lower compressive strengths		$(f_b / 28)^{0,5} \leq 1,0$
Code		EN 771-1
Producer (Country)		e.g. Wienerberger (IT)
Brick dimensions	[mm]	250 x 120 x 120
Drilling method		Rotary drilling



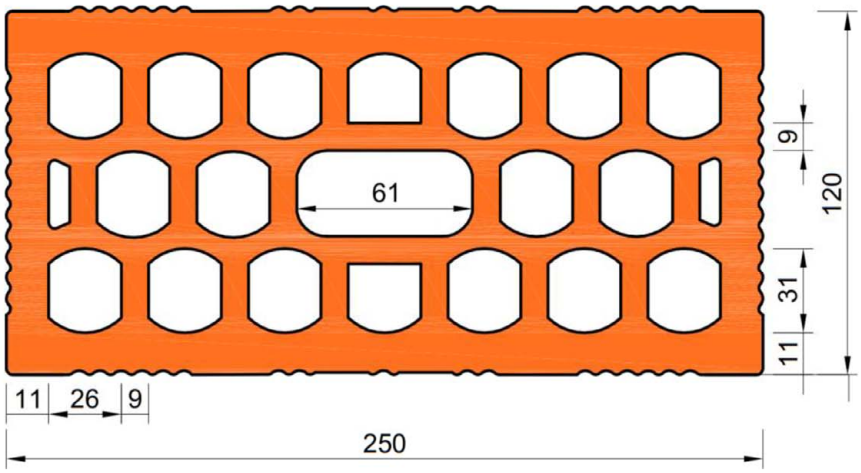


Table C102: Installation parameter

Anchor size		[-]	M8	M10	M12	M16	IG-M6	IG-M8	IG-M10
Installation torque	T_{inst}	[Nm]	≤ 2	≤ 2	≤ 2	≤ 2	≤ 2	≤ 2	≤ 2
Char. Edge distance	c_{cr}	[mm]	120 (for shear loads perpendicular to the free edge: c_{cr} = 250)						
Minimum Edge Distance	c_{min}	[mm]	100						
Characteristic Spacing	$s_{cr,\,II}$	[mm]	250						
	$s_{cr,\,\perp}$	[mm]	120						
Minimum Spacing	s_{min}	[mm]	100						

Table C103: Reduction factors for single anchors at the edge

Tension load			Shear load					
			Perpendicular to the free edge			Parallel to the free edge		
	with c ≥	$\alpha_{edge,\,N}$		with c ≥	$\alpha_{edge,\,V\perp}$		with c ≥	$\alpha_{edge,\,V\,II}$
	100	1,00		100	0,50		100	1,00
	120	1,00		250	1,00		120	1,00

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances Hollow clay brick Doppio Uni
Description of the stone, Installation parameters, Reductionfactors

Annex C 33

Deutsches Institut für Bautechnik DIBt

Brick type: Hollow Clay brick Doppio Uni

Table C104: Factors for anchor groups under tension load

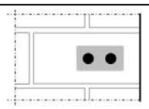
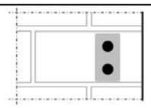
Anchor position parallel to hor. joint				Anchor position perpendicular to hor. joint			
	with c ≥	with s ≥	$\alpha_{g\ II,\ N}$		with c ≥	with s ≥	$\alpha_{g\ \perp,\ N}$
	100	100	1,00		100	120	2,00
	120	250	2,00		120	120	2,00

Table C105: Factors for anchor groups under shear load

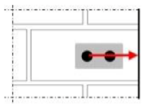
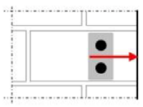
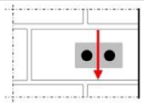
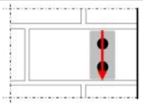
	Anchor position parallel to hor. joint				Anchor position perpendicular to hor. joint			
Shear load perpendicular to the free edge		with c ≥	with s ≥	$\alpha_{g\ II,V\ \perp}$		with c ≥	with s ≥	$\alpha_{g\ \perp,V\ \perp}$
		100	100	1,00		100	100	1,00
		250	250	2,00		250	120	2,00
Shear load parallel to the free edge		with c ≥	with s ≥	$\alpha_{g\ II,V\ II}$		with c ≥	with s ≥	$\alpha_{g\ \perp,V\ II}$
		100	100	1,00		100	100	1,00
		120	250	2,00		120	120	2,00

Table C106: Characteristic values of tension and shear load resistances

Anchor size	Perforated sleeve	Effective Anchorage depth	Characteristic Resistances with c ≥ c_{cr} and s ≥ s_{cr}						
			Use condition						
			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}	$N_{Rk,b} = N_{Rk,p}$			$N_{Rk,b} = N_{Rk,p}$			$V_{Rk,b}$ [2]
		[mm]	[kN]						
Compressive strength $f_b \geq 28$ N/mm² [1]									
M8	12x80	80	1,2	1,2	0,9	1,2	1,2	0,9	2,5
M8 / M10/ IG-M6	16x85	85							
	16x130	130							
M12 / IG-M8	20x85	85							
	20x130	130							
	20x200	200							
M16 / IG-M10	20x85	85							
	20x130	130							
	20x200	200							

[1] For lower compressive strengths resistances must be multiplied by the conversion factor according to Table C101. For stones with higher strengths, the shown values are valid without conversion.

[2] $V_{Rk,c}$ according to Annex C3

Table C107: Displacements

Anchor size	h_{ef}	δ_N / N	δ_{N0}	$\delta_{N\infty}$	δ_V / V	δ_{V0}	$\delta_{V\infty}$
	[mm]	[mm/kN]	[mm]	[mm]	[mm/kN]	[mm]	[mm]
M8 – M12, IG-M6 – M10	all	0,13	0,13*N_{Rk} / 3,5	2*δ_{N0}	0,55	0,55*V_{Rk} / 3,5	1,5*δ_{V0}
M16	all				0,31	0,31*V_{Rk} / 3,5	1,5*δ_{V0}

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances Hollow Clay brick Doppio Uni
Group factors, characteristic Resistances and Displacements

Annex C 34

Deutsches Institut für Bautechnik DIBt

Brick type: Hollow light weight concrete brick HBL 16DF

Table C108: Stone description

Brick type		Hollow light weight concrete brick HBL 16DF
Density	ρ [kg/dm³]	≥ 1,0
Compressive strength	f_b [N/mm²]	≥ 3,1
Conversion factor for lower compressive strengths		$(f_b/3{,}1)^{0,5} \leq 1{,}0$
Code		EN 771-3
Producer (Country)		e.g. KLB Klimaleichtblock (DE)
Brick dimensions	[mm]	500 x 250 x 240
Drilling method		Rotary drilling

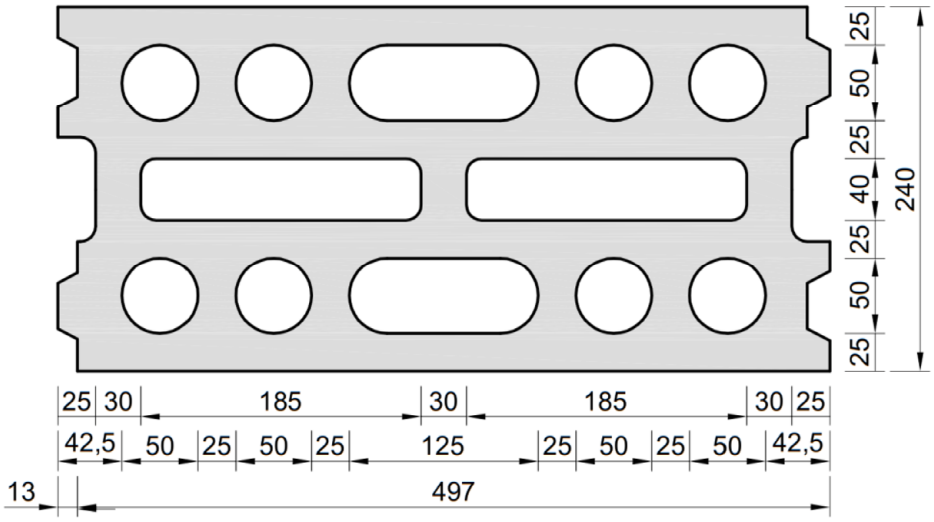


Table C109: Installation parameter

Anchor size		[-]	M8	M10	M12	M16	IG-M6	IG-M8	IG-M10
Installation torque	T_{inst}	[Nm]	≤ 2	≤ 2	≤ 5	≤ 5	≤ 2	≤ 5	≤ 5
Char. Edge distance	c_{cr}	[mm]	120 (for shear loads perpendicular to the free edge: c_{cr} = 250)						
Minimum Edge Distance	c_{min}	[mm]	50						
Characteristic Spacing	$s_{cr,\parallel}$	[mm]	500						
	$s_{cr,\perp}$	[mm]	250						
Minimum Spacing	s_{min}	[mm]	50						

Table C110: Reduction factors for single anchors at the edge

Tension load			Shear load					
			Perpendicular to the free edge			Parallel to the free edge		
	with c ≥	$\alpha_{edge,N}$		with c ≥	$\alpha_{edge,V\perp}$		with c ≥	$\alpha_{edge,V\parallel}$
	50	1,00		50	0,30		50	1,00
	120	1,00		250	1,00		120	1,00

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances Hollow light weight concrete brick HBL 16DF
Description of the stone, Installation parameters, Reductionfactors

Annex C 35

Deutsches Institut für Bautechnik DIBt

Brick type: Hollow light weight concrete brick HBL 16DF

Table C111: Factors for anchor groups under tension load

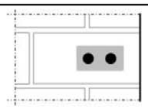
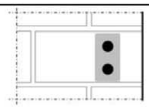
Anchor position parallel to hor. joint				Anchor position perpendicular to hor. joint			
	with c ≥	with s ≥	$\alpha_{g\,II,N}$		with c ≥	with s ≥	$\alpha_{g\,\perp,N}$
	50	50	2,00		50	50	1,55
	120	500	2,00		120	250	2,00

Table C112: Factors for anchor groups under shear load

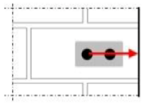
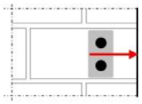
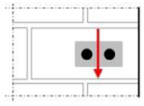
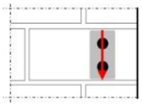
	Anchor position parallel to hor. joint				Anchor position perpendicular to hor. joint			
Shear load perpendicular to the free edge		with c ≥	with s ≥	$\alpha_{g\,II,V\perp}$		with c ≥	with s ≥	$\alpha_{g\,\perp,V\perp}$
		50	50	0,60		50	50	0,35
		120	50	2,00		120	50	1,15
		120	500	2,00		120	250	2,00
Shear load parallel to the free edge		with c ≥	with s ≥	$\alpha_{g\,II,V\,II}$		with c ≥	with s ≥	$\alpha_{g\,\perp,V\,II}$
		50	50	1,30		50	50	1,00
		120	250	2,00				
		120	500	2,00		120	250	2,00

Table C113: Characteristic values of tension and shear load resistances

Anchor size	Perforated sleeve	Effecitve Anchorage depth	Characteristic Resistances with c ≥ c_{cr} and s ≥ s_{cr}							
			Use condition							
			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}	$N_{Rk,b} = N_{Rk,p}$			$N_{Rk,b} = N_{Rk,p}$			$V_{Rk,b}$ 2)	
		[mm]	[kN]							
Compressive strength $f_b \geq 3{,}1$ N/mm² 1)										
M8 / M10/ IG-M6	16x85	85	1,2	1,2	0,9	1,2	1,2	0,9	2,0	
	16x130	130								
M12 / IG-M8	20x85	85	1,5	1,5	1,2	1,5	1,5	1,2	3,0	
	20x130	130								
	20x200	200								
M16 / IG-M10	20x85	85							5,0	
	20x130	130								
	20x200	200								

1) For lower compressive strengths resistances must be multiplied by the conversion factor according to Table C108. For stones with higher strengths, the shown values are valid without conversion.

2) $V_{Rk,c}$ according to Annex C3

Table C114: Displacements

Anchor size	h_{ef}	δ_N / N	δ_{N0}	$\delta_{N\infty}$	δ_V / V	δ_{V0}	$\delta_{V\infty}$
	[mm]	[mm/kN]	[mm]	[mm]	[mm/kN]	[mm]	[mm]
M8 – M12, IG-M6 – M10	all	0,13	0,13*N_{Rk} / 3,5	2*δ_{N0}	0,55	0,55*V_{Rk} / 3,5	1,5*δ_{V0}
M16	all				0,31	0,31*V_{Rk} / 3,5	1,5*δ_{V0}

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances Hollow light weight concrete brick HBL 16DF
Group factors, characteristic Resistances and Displacements

Annex C 36

Deutsches Institut für Bautechnik DIBt

Brick type: Hollow concrete brick Bloc Creux B40

Table C115: Stone description

Brick type		Hollow concrete brick Bloc Creux B40
Density	ρ [kg/dm³]	≥ 0,8
Compressive strength	f_b [N/mm²]	≥ 5,2
Conversion factor for lower compressive strengths		$(f_b / 5{,}2)^{0,5} \leq 1{,}0$
Code		EN 772-1
Producer (Country)		e.g. Leroux (FR)
Brick dimensions	[mm]	500 x 200 x 200
Drilling method		Rotary drilling

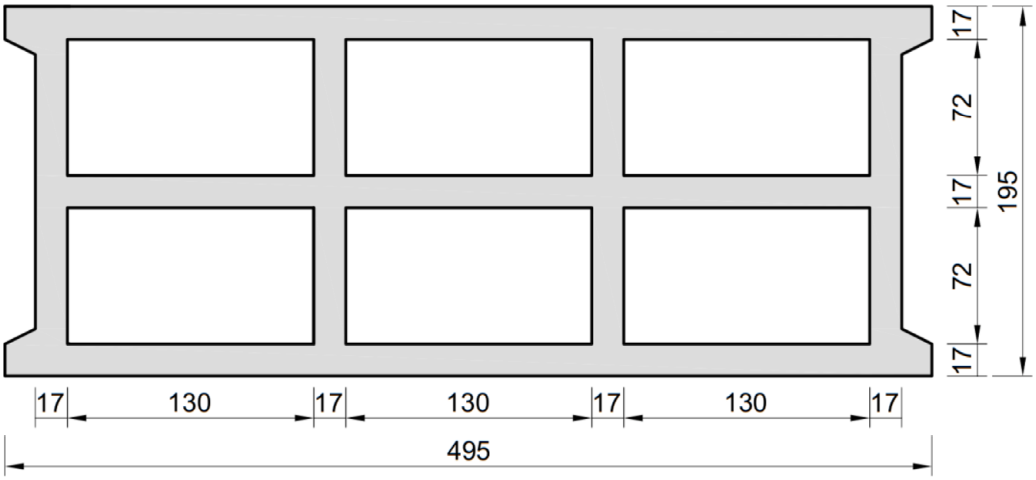


Table C116: Installation parameter

Anchor size		[-]	M8	M10	M12	M16	IG-M6	IG-M8	IG-M10
Installation torque	T_{inst}	[Nm]	≤ 4	≤ 4	≤ 4	≤ 4	≤ 4	≤ 4	≤ 4
Char. Edge distance	c_{cr}	[mm]	120 (for shear loads perpendicular to the free edge: c_{cr} = 170)						
Minimum Edge Distance	c_{min}	[mm]	50						
Characteristic Spacing	$s_{cr,\parallel}$	[mm]	170						
	$s_{cr,\perp}$	[mm]	200						
Minimum Spacing	s_{min}	[mm]	50						

Table C117: Reduction factors for single anchors at the edge

Tension load			Shear load					
			Perpendicular to the free edge			Parallel to the free edge		
	with c ≥	$\alpha_{edge,N}$		with c ≥	$\alpha_{edge,V\perp}$		with c ≥	$\alpha_{edge,V\parallel}$
	50	1,00		50	0,35		50	1,00
	120	1,00		170	1,00		120	1,00

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances Hollow concrete brick Bloc Creux B40
Description of the stone, Installation parameters, Reductionfactors

Annex C 37

Deutsches Institut für Bautechnik DIBt

Brick type: Hollow concrete brick Bloc Creux B40

Table C118: Factors for anchor groups under tension load

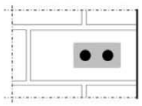
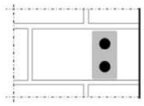
Anchor position parallel to hor. joint				Anchor position perpendicular to hor. joint			
	with c ≥	with s ≥	$\alpha_{g\,II,N}$		with c ≥	with s ≥	$\alpha_{g\,\perp,N}$
	50	50	1,50		50	50	1,40
	50	170	2,00		50	200	2,00
	120	170	2,00		120	200	2,00

Table C119: Factors for anchor groups under shear load

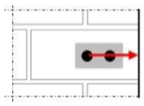
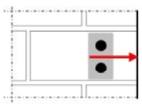
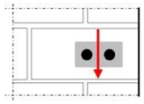
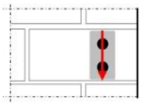
	Anchor position parallel to hor. joint				Anchor position perpendicular to hor. joint			
Shear load perpendicular to the free edge		with c ≥	with s ≥	$\alpha_{g\,II,V\perp}$		with c ≥	with s ≥	$\alpha_{g\,\perp,V\perp}$
		50	50	0,55		50	50	0,35
		120	50	1,30		120	50	0,85
		120	170	2,00		120	200	2,00
Shear load parallel to the free edge		with c ≥	with s ≥	$\alpha_{g\,II,V\,II}$		with c ≥	with s ≥	$\alpha_{g\,\perp,V\,II}$
		50	50	1,10		50	50	1,00
		120	170	2,00		50	200	2,00
						120	200	2,00

Table C120: Characteristic values of tension and shear load resistances

Anchor size	Perforated sleeve	Effective Anchorage depth	Characteristic Resistances with c ≥ c_{cr} and s ≥ s_{cr}						
			Use condition						
			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}	$N_{Rk,b} = N_{Rk,p}$			$N_{Rk,b} = N_{Rk,p}$			$V_{Rk,b}$ 2)
		[mm]	[kN]						
Compressive strength $f_b \geq 5{,}2$ N/mm² 1)									
M8 / M10/ IG-M6	16x130	130	2,0	1,5	1,2	2,0	1,5	1,2	6,0
M12 / IG-M8	20x130	130							
M16 / IG-M10	20x130	130							

1) For lower compressive strengths resistances must be multiplied by the conversion factor according to Table C115. For stones with higher strengths, the shown values are valid without conversion.
2) $V_{Rk,c}$ according to Annex C3

Table C121: Displacements

Anchor size	h_{ef}	δ_N / N	δ_{N0}	$\delta_{N\infty}$	δ_V / V	δ_{V0}	$\delta_{V\infty}$
	[mm]	[mm/kN]	[mm]	[mm]	[mm/kN]	[mm]	[mm]
M8 – M12, IG-M6 – M10	all	0,13	0,13*N_{Rk} / 3,5	2*δ_{N0}	0,55	0,55*V_{Rk} / 3,5	1,5*δ_{V0}
M16	all				0,31	0,31*V_{Rk} / 3,5	1,5*δ_{V0}

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances hollow concrete brick Bloc Creux B40
Group factors, characteristic Resistances and Displacements

Annex C 38

Deutsches Institut für Bautechnik DIBt

Brick type: Solid light weight concrete brick

Table C122: Stone description

Brick type		Solid light weight concrete brick
Density	ρ [kg/dm³]	≥ 0,6
Compressive strength	f_b [N/mm²]	≥ 2
Conversion factor for lower compressive strengths		$(f_b / 2)^{0,5} \leq 1,0$
Code		EN 771-3
Producer (Country)		e.g. Bisotherm (DE)
Brick dimensions	[mm]	≥ 240 x 300 x 113
Drilling method		Rotary drilling

Table C123: Installation parameter

Anchor size		[-]	M8	M10	M12	M16	IG-M6	IG-M8	IG-M10
Installation torque	T_{inst}	[Nm]	≤ 2	≤ 2	≤ 2	≤ 2	≤ 2	≤ 2	≤ 2
Char. Edge distance	c_{cr}	[mm]	150						
Minimum Edge Distance	c_{min}	[mm]	60						
Characteristic Spacing	$s_{cr,\,II}$	[mm]	300						
	$s_{cr,\,\perp}$	[mm]	300						
Minimum Spacing	s_{min}	[mm]	120						

Table C124: Reduction factors for single anchors at the edge

Tension load			Shear load					
			Perpendicular to the free edge			Parallel to the free edge		
	with c ≥	$\alpha_{edge,\,N}$		with c ≥	$\alpha_{edge,\,V\perp}$		with c ≥	$\alpha_{edge,\,V\,II}$
	60	1,00		60	0,25		60	0,40
	150	1,00		150	1,00		100	1,00

Table C125: Factors for anchor groups under tension load

Anchor position parallel to hor. joint				Anchor position perpendicular to hor. joint			
	with c ≥	with s ≥	$\alpha_{g\,II,\,N}$		with c ≥	with s ≥	$\alpha_{g\,\perp,\,N}$
	60	120	1,00		60	120	1,00
	150	300	2,00		150	300	2,00

Table C126: Factors for anchor groups under shear load

	Anchor position parallel to hor. joint				Anchor position perpendicular to hor. joint			
Shear load perpendicular to the free edge		with c ≥	with s ≥	$\alpha_{g\,II,V\perp}$		with c ≥	with s ≥	$\alpha_{g\,\perp,V\perp}$
		60	120	0,25		60	120	0,25
		150	120	1,00		150	120	1,00
		150	300	2,00		150	300	2,00
Shear load parallel to the free edge		with c ≥	with s ≥	$\alpha_{g\,II,V\,II}$		with c ≥	with s ≥	$\alpha_{g\,\perp,V\,II}$
		60	120	0,40		60	120	0,40
		100	120	1,00		100	120	1,00
		150	300	2,00		150	300	2,00

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances Solid light weight concrete brick
Description of the stone, Installation parameters, Reduction- and Group factors

Annex C 39

Deutsches Institut für Bautechnik DIBt

Brick type: Solid light weight concrete brick

Table C127: Characteristic values of tension and shear load resistances

Anchor size	Perforated sleeve	Effecitve Anchorage depth	Characteristic Resistances with c ≥ c_{cr} and s ≥ s_{cr}						
			Use condition						
			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}	$N_{Rk,b} = N_{Rk,p}$			$N_{Rk,b} = N_{Rk,p}$			$V_{Rk,b}$ 2)
		[mm]	[kN]						
Compressive strength $f_b \geq 2$ N/mm² 1)									
M8	-	80	3,0	2,5	2,0	2,5	2,0	1,5	3,0
M10 / IG-M6	-	90							
M12 / IG-M8	-	100							
M16 / IG-M10	-	100							
M8	12x80	80	2,5	2,5	2,0	2,5	2,0	1,5	
M8 / M10/ IG-M6	16x85	85							
	16x130	130							
M12 / IG-M8	20x85	85							
	20x130	130							
	20x200	200							
M16 / IG-M10	20x85	85							
	20x130	130							
	20x200	200							

1) For lower compressive strengths resistances must be multiplied by the conversion factor according to Table C122. For stones with higher strengths, the shown values are valid without conversion.

2) $V_{Rk,c}$ according to Annex C3

Table C128: Displacements

Anchor size	h_{ef}	δ_N / N	δ_{N0}	$\delta_{N\infty}$	δ_V / V	δ_{V0}	$\delta_{V\infty}$
	[mm]	[mm/kN]	[mm]	[mm]	[mm/kN]	[mm]	[mm]
M8 – M12, IG-M6 – M10	all	0,1	$0,1*N_{Rk}$ / 3,5	$2*\delta_{N0}$	0,3	$0,3*V_{Rk}$ / 3,5	$1,5*\delta_{V0}$
M16	all				0,1	$0,1*V_{Rk}$ / 3,5	$1,5*\delta_{V0}$

CELO Injection system ResiFIX VYSF, ResiFIX VYSF Cool

Performances Solid light weight concrete brick
Characteristic Resistances and Displacements

Annex C 40