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European Technical Assessment

ETA-13/0909 of 8 December 2016

Deutsches Institut für Bautechnik

Injection system VMU plus for masonry

Injection system for use in masonry

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the European Technical Assessment:

Trade name of the construction product

Product family to which the construction product belongs

Manufacturer

MKT Metall-Kunststoff-Technik GmbH & Co. KG Auf dem Immel 2 67685 Weilerbach DEUTSCHLAND

Manufacturing plant

This European Technical Assessment contains

This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of Werk 2, D

61 pages including 3 annexes which form an integral part of this assessment

Guideline for European technical approval of "Metal Injection Anchors for Use in Masonry", ETAG 029, April 2013,

used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011.



European Technical Assessment ETA-13/0909 English translation prepared by DIBt

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Specific Part

1 Technical description of the product

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

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

The Illustration and the description of the product are 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 resistance for steel elements	See Annex C2
Characteristic resistance for anchors in masonry units	See Annex C3 – C45
Displacements under shear and tension loads	See Annex C4 – C45
Reduction Factor for job site tests (β-Factor)	See Annex C1
Edge distances and spacing	See Annex C3 – C45
Group factor for group fastenings	See Annex C3 – C45

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire	No performance assessed

3.3 Hygiene, health and the environment (BWR 3)

Regarding dangerous substances there may be requirements (e.g. transposed European legislation and national laws, regulations and administrative provisions) applicable to the products falling within the scope of this European Technical Assessment. In order to meet the provisions of Regulation (EU) No 305/2011, these requirements need also to be complied with, when and where they apply.



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3.4 Safety in use (BWR 4)

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

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

In accordance with guideline for European technical approval ETAG 029, April 2013 used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011 the applicable European legal act is: [97/177/EC]. The system to be applied is: 1

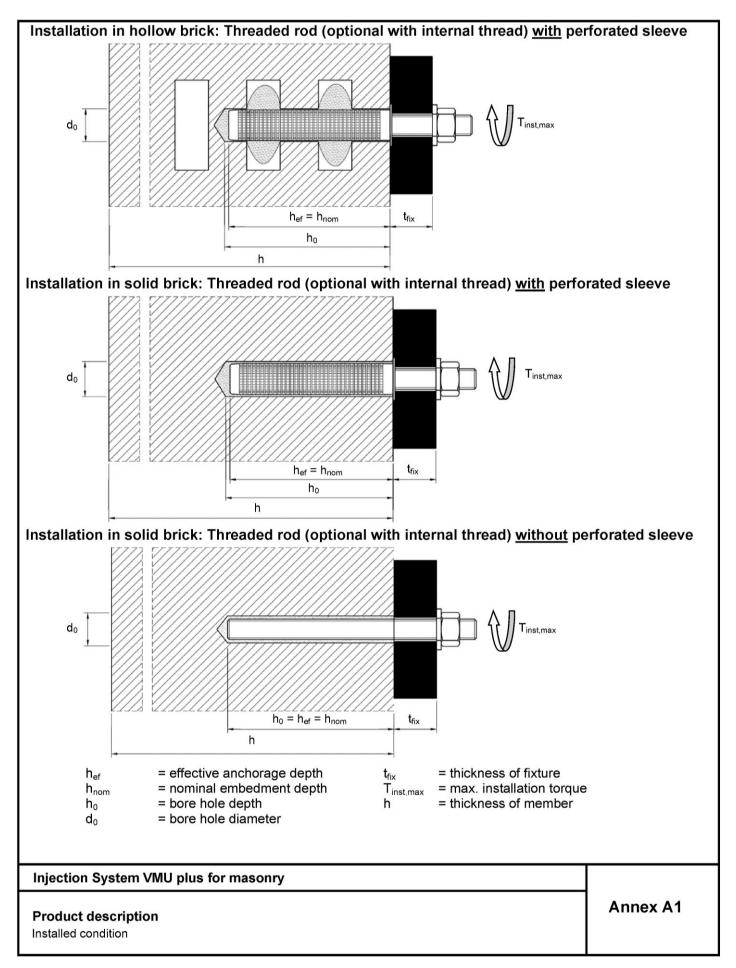
5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document

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

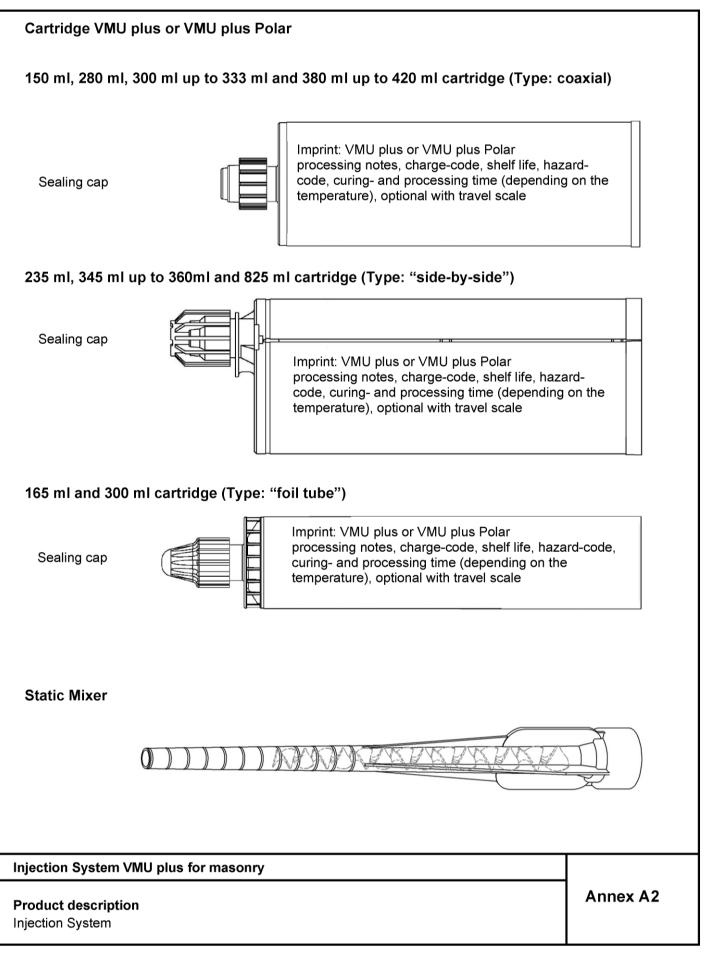
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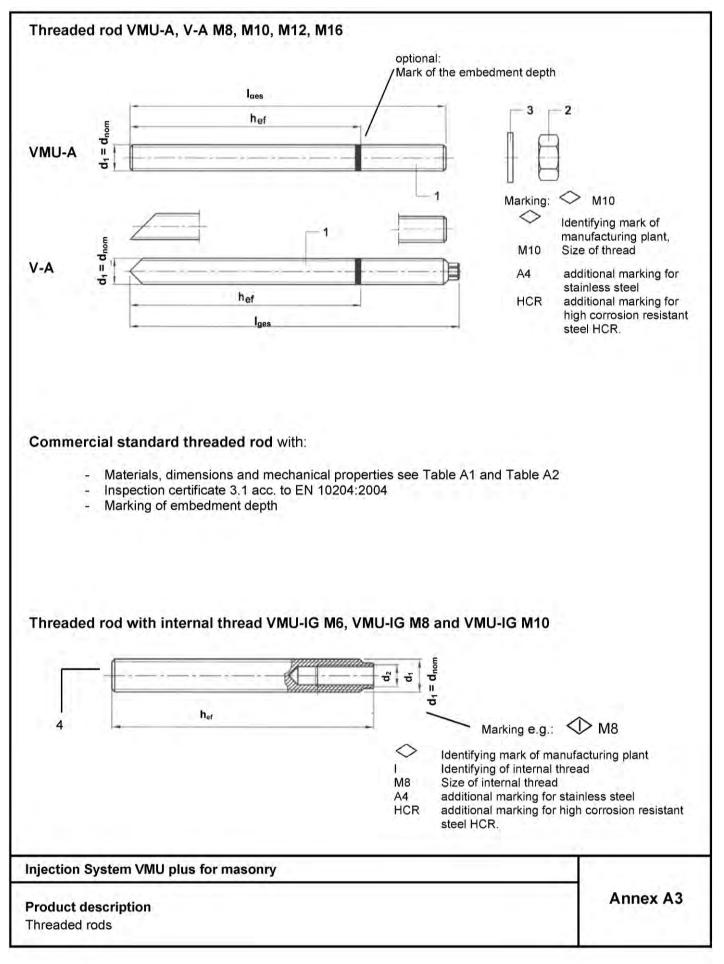














Part	Designation	Material
	, zinc plated ≥ 5 μm acc. to EN ISO 4 ip galvanized ≥ 40 μm acc. to EN ISO	042:1999 or Steel, O 1461:2009 and EN ISO 10684:2004+AC:2009
1	Anchor rod	Steel, EN 10087:1998 or EN 10263:2001 Property class 4.6, 4.8, 5.6, 5.8, and 8.8 acc. EN 1993-1-8:2005+AC:2009
2	Hexagon nut	Steel acc. EN 10087:1998 or EN 10263:2001 Property class 4 (for class 4.6, 4.8 rod) Property class 5 (for class 5.6, 5.8 rod) Property class 8 (for class 8.8 rod) acc. to EN ISO 898-2:2012
3	Washer, EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000, or EN ISO 7094:2000	Steel, zinc plated or hot-dip galvanized
4	Threaded rod with internal thread	Steel, zinc plated Property class 5.6, 5.8 and 8.8 acc. to. EN ISO 898-1:2013
Stain	less steel	
1	Anchor rod	Material 1.4401 / 1.4404 / 1.4571 / 1.4362, EN 10088-1:2014, Property class 70, EN ISO 3506-1:2009 Property class 80, EN ISO 3506-1:2009
2	Hexagon nut	Material 1.4401 / 1.4404 / 1.4571 / 1.4362, EN 10088-1:2014, Property class 70 (for class 70 rod), EN ISO 3506-2:2009 Property class 80 (for class 80 rod), EN ISO 3506-2:2009
3	Washer, EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000, or EN ISO 7094:2000	Material 1.4401 / 1.4404 / 1.4571 / 1.4362 acc. to EN 10088-1:2014
4	Threaded rod with internal thread	Material 1.4401 / 1.4404 / 1.4571 / 1.4362 EN 10088-1:2014, Property class 70 acc. to EN ISO 3506-1:2009
ligh	corrosion resistant steel (HCR)	
1	Anchor rod	Material 1.4529 / 1.4565, EN 10088-1:2014, Property class 70, acc. to EN ISO 3506-1:2009 Property class 80, acc. to EN ISO 3506-1:2009
2	Hexagon nut	Material 1.4529 / 1.4565, EN 10088-1:2014, Property class 70 (for class 70 rod) Property class 80 (for class 80 rod) acc. to EN ISO 3506-2:2009
3	Washer, EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000, or EN ISO 7094:2000	Material 1.4529 / 1.4565 acc. to EN 10088-1:2014
4	Threaded rod with internal thread	Material 1.4529 / 1.4565 EN 10088-1:2014, Property class 70 acc. to. EN ISO 3506-1:2009
Perfo	rated sleeve	Material: Polypropylene

Product description

Materials

Annex A4

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-	0.	Dian	neter	Min. screw-in depth	Thread length (Internal thread)	To	tal length
Туре	Size	$d_1 = d_{nom}$	d ₂	L _{IG,min}	L _{IG}		l _{ges}
		[mm]	[mm]	[mm]	[mm]		[mm]
Threaded	rods						
	M8	8	-	-	-	h _{ef} +	+ t _{fix} + 9,5
VMU-A	M10	10	-	-	-		+ t _{fix} + 11,5
V-A	M12	12	-	-	-		⊦ t _{fix} + 17,5
	M16	16	-	-	-	h _{ef} +	⊦ t _{fix} + 20,0
hreaded		ith internal th	nread and m	etric external threa			
	M6	10	6	8	20	with slee	ve: h _{ef} -5mm
VMU-IG	M8	12	8	8	20	without s	
	M10	16	10	10	25		
			Гуре		Size	$d_s = d_{no}$	
						[mm]	[mm]
	L,	$_{\rm s}$ = $h_{\rm ef}$ = $h_{\rm nom}$			VM-SH 12x80	12	80
d _s	d _s			VM-SH 16x85	16		
			Ľ				
					VM-SH 20x85		
	L	. _s = h _{ef} = h _{nom}			VM-SH	20	
ds		. _s = h _{ef} = h _{nom}			VM-SH 20x85 VM-SH	20	85
ds		$h_s = h_{ef} = h_{nom}$			VM-SH 20x85 VM-SH 16x130 VM-SH	20	



Specifications of intended use

Anchorages subject to:

Static and quasi-static loads

Base material:

- Autoclaved Aerated Concrete (use category d) according to Annex B2
- Solid brick masonry (use category b), according to Annex B2.
- Hollow brick masonry (use category c), according to Annex B2 and B3.
- Mortar strength class of the masonry M 2,5 at minimum according to EN 998-2:2010.
- For other bricks in solid masonry and in hollow or perforated masonry, the characteristic resistance of the anchor may be determined by job site tests according to ETAG 029, Annex B under consideration of the β factor according to Annex C1, Table C1

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

Temperature range:

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

Use conditions (Environmental conditions):

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

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

Use categories in respect of installation and use:

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

Design:

- Verifiable calculation notes and drawings are prepared taking account the relevant masonry in the region of the anchorage, the loads to be transmitted and their transmission to the supports of the structure. The position of the anchor is indicated on the design drawings.
- The anchorages are designed in accordance with the ETAG 029, Annex C, Design method A under the responsibility of an engineer experienced in anchorages and masonry work.

Characteristic values	N _{Rk,s}	$N_{Rk,p} = N_{Rk,b}$	N _{Rk,pb}	
	V _{Rk,s}	$V_{Rk,b}$ and $V_{Rk,c}$	V _{Rk,pb}	
Determination acc. to	Annex C3	Annex C4 to C45	ETAG 029, Annex C	

For application with sleeve with drill bit size ≤ 15mm installed in joints not filled with mortar: C45) $N_{Rk,p,j} =$

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 C

$$V_{Rk,c,j} = 0,15 * V_{Rk,c}$$
 and $V_{Rk,b,j} = 0,15 * V_{Rk,b}$ ($V_{Rk,b}$ and $V_{Rk,c}$ see Annex C4 to C45)

Installation:

Drv or wet structures

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

Injection System VMU plus for masonry

Intended Use

Specifications

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Brick-No.	Brick type	Picture	Brick size length width height	Compressive strength	Bulk density	Sleeve - Anchor type	Annex
			[mm]	[N/mm ²]	[kg/dm ³]		
Auto	oclaved aerated	concrete units	according EN	771-4			
1	Autoclaved aerated concrete AAC6	T	499 240 249	6	0,6	M8/M10/M12/M16 IG-M6/IG-M8/IG-M10	C4 - C5
Calc	ium silicate mas	onry units acc	ording EN 771	-2			
2	Calcium silicate solid brick KS-NF	-	240 115 71	10 20 27	2,0	M8/M10/M12/M16/IG-M6/IG-M8/IG-M10 VM-SH 12x80 – M8 VM-SH 16x85 – M8/M10/IG-M6 VM-SH 16x130 – M8/M10/IG-M6 VM-SH 20x85 – M12/M16/IG-M8/IG-M10 VM-SH 20x130 – M12/M16/IG-M8/IG-M10 VM-SH 20x200 – M12/M16/IG-M8/IG-M10	C6 - C8
3	Calcium silicate hollow brick KSL-3DF		240 175 113	8 12 14	1,4	VM-SH 12x80 – M8 VM-SH 16x85 – M8/M10/IG-M6 VM-SH 16x130 – M8/M10/IG-M6 VM-SH 20x85 – M12/M16/IG-M8/IG-M10 VM-SH 20x130 – M12/M16/IG-M8/IG-M10 VM-SH 20x200 – M12/M16/IG-M8/IG-M10	C9
4	Calcium silicate hollow brick KSL-12DF	and	498 175 238	10 12 16	1,4	VM-SH 12x80 – M8 VM-SH 16x85 – M8/M10/IG-M6 VM-SH 16x130 – M8/M10/IG-M6 VM-SH 20x85 – M12/M16/IG-M8/IG-M10 VM-SH 20x130 – M12/M16/IG-M8/IG-M10	C12 C14
Clay	masonry units a	according EN 7	71-1	_			
5	Clay solid brick Mz – DF		240 115 55	10 20 28	1,6	M8/M10/M12/M16/IG-M6/IG-M8/IG-M10 VM-SH 12x80 – M8 VM-SH 16x85 – M8/M10/IG-M6 VM-SH 16x130 – M8/M10/IG-M6 VM-SH 20x85 – M12/M16/IG-M8/IG-M10 VM-SH 20x130 – M12/M16/IG-M8/IG-M10 VM-SH 20x200 – M12/M16/IG-M8/IG-M10	C15 C17
6	Clay hollow brick HLz-16DF		497 240 238	6 8 12 14	0,8	VM-SH 12x80 – M8 VM-SH 16x85 – M8/M10/IG-M6 VM-SH 16x130 – M8/M10/IG-M6 VM-SH 20x85 – M12/M16/IG-M8/IG-M10 VM-SH 20x130 – M12/M16/IG-M8/IG-M10 VM-SH 20x200 – M12/M16/IG-M8/IG-M10	C18 C20
7	Clay hollow brick Porotherm Homebric		500 200 299	4 6 10	0,7	VM-SH 12x80 – M8 VM-SH 16x85 – M8/M10/IG-M6 VM-SH 16x130 – M8/M10/IG-M6 VM-SH 20x85 – M12/M16/IG-M8/IG-M10 VM-SH 20x130 – M12/M16/IG-M8/IG-M10	C21 C23
Inje	ction System V	MU plus for r	nasonry				



Brick-No.	Brick type	Picture	Brick size length width height	Compressive strength	Bulk density	Sleeve - Anchor type	Annex
	1		[mm]	[N/mm ²]	[kg/dm ³]		
Clay	masonry units	according EN 7	71-1		1		4
8	Clay hollow brick BGV Thermo		500 200 314	4 6 10	0,6	VM-SH 12x80 – M8 VM-SH 16x85 – M8/M10/IG-M6 VM-SH 16x130 – M8/M10/IG-M6 VM-SH 20x85 – M12/M16/IG-M8/IG-M10 VM-SH 20x130 – M12/M16/IG-M8/IG-M10	C24
9	Clay hollow brick Calibric R+		500 200 314	6 9 12	0,6	VM-SH 12x80 – M8 VM-SH 16x85 – M8/M10/IG-M6 VM-SH 16x130 – M8/M10/IG-M6 VM-SH 20x85 – M12/M16/IG-M8/IG-M10 VM-SH 20x130 – M12/M16/IG-M8/IG-M10	C2 C2
10	Clay hollow brick Urbanbric	Fair	560 200 274	6 9 12	0,7	VM-SH 12x80 – M8 VM-SH 16x85 – M8/M10/IG-M6 VM-SH 16x130 – M8/M10/IG-M6 VM-SH 20x85 – M12/M16/IG-M8/IG-M10 VM-SH 20x130 – M12/M16/IG-M8/IG-M10	C3
11	Clay hollow brick Brique creuse C40		500 200 200	4 8 12	0,7	VM-SH 12x80 – M8 VM-SH 16x85 – M8/M10/IG-M6 VM-SH 16x130 – M8/M10/IG-M6 VM-SH 20x85 – M12/M16/IG-M8/IG-M10 VM-SH 20x130 – M12/M16/IG-M8/IG-M10	C3 C3
12	Clay hollow brick Blocchi Leggeri		250 120 250	4 6 8 12	0,6	VM-SH 12x80 – M8 VM-SH 16x85 – M8/M10/IG-M6 VM-SH 16x130 – M8/M10/IG-M6 VM-SH 20x85 – M12/M16/IG-M8/IG-M10 VM-SH 20x130 – M12/M16/IG-M8/IG-M10 VM-SH 20x200 – M12/M16/IG-M8/IG-M10	C3 C3
13	Clay hollow brick Doppio Uni		250 120 120	10 16 20 28	0,9	VM-SH 12x80 – M8 VM-SH 16x85 – M8/M10/IG-M6 VM-SH 16x130 – M8/M10/IG-M6 VM-SH 20x85 – M12/M16/IG-M8/IG-M10 VM-SH 20x130 – M12/M16/IG-M8/IG-M10 VM-SH 20x200 – M12/M16/IG-M8/IG-M10	C3 C4
Ligh	tweight concret	e according EN	771-3		· · ·		
14	Hollow lightweight concrete Bloc creux		494 200 190	4	0,8	VM-SH 12x80 – M8 VM-SH 16x85 – M8/M10/IG-M6 VM-SH 16x130 – M8/M10/IG-M6 VM-SH 20x85 – M12/M16/IG-M8/IG-M10 VM-SH 20x420 – M12/M16/IG-M8/IG-M10	C4 - C4
15	B40 Solid lightweight concrete		300 123 248	2	0,6	VM-SH 20x130 - M12/M16/IG-M8/IG-M10 M8/M10/M12/M16/IG-M6/IG-M8/IG-M10 VM-SH 12x80 - M8 VM-SH 16x85 - M8/M10/IG-M6 VM-SH 16x130 - M8/M10/IG-M6 VM-SH 20x85 - M12/M16/IG-M8/IG-M10 VM-SH 20x130 - M12/M16/IG-M8/IG-M10 VM-SH 20x200 - M12/M16/IG-M8/IG-M10	C4 C4
Inje	ction System \	/MU plus for n	nasonry				_

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Installation: Steel brush Table B2: Installation para (<u>without</u> sleeve)		n autoc	laved aera	ated cone	crete A	AC and s	olid mase	d _b	
Anchor type and size			VMU-A M8 V-A M8	VMU-A M10 V-A M10	VMU- IG M6	VMU-A M12 V-A M12	VMU-IG M8	VMU-A M16 V-A M16	VMU-IG M10
Nominal drill hole diameter	d ₀	[mm]	10	1	2		14		18
Drill hole depth	ho	[mm]	80	9	0		100		100
Effective anchorage depth	h _{ef}	[mm]	80	9	0		100		100
Minimum wall thickness	h _{min}	[mm]				h _{ef} + 3	30		
Diameter of clearance hole in the fixture	d _f ≤	[mm]	9	12	7	14	9	18	12
Diameter of steel brush	db	[mm]	12	1	4		16		20
Min. diameter of steel brush	$d_{b,min}$	[mm]	10,5	12	,5		14,5		18,5
Max. installation torque moment	T _{inst,max}	[Nm]				2 (14 for M	Mz DF)		
Table B3: Installation pa (<u>with</u> sleeve)	aramete	rs in so	lid and ho	llow mas	sonry				
Anchor size			M8	I	N8 / M1 IG-M6	-	M12 / M16 IG-M8 IG-M10		
Sleeve			x80	x85		(130	x85	(130	500

Anchor size			M8	M8 / N IG-I	-		M12 / M16 IG-M8 IG-M10	
Sleeve			12x80	16x85	16x130	20x85	20×130	20x200
Nominal drill hole diameter	d_0	[mm]	12	16	3		20	
Drill hole depth	ho	[mm]	85	90	135	90	135	205
Effective anchorage depth	h _{ef}	[mm]	80	85	130	85	130	200
Minimum wall thickness	h _{min}	[mm]	115	115	175	115	175	240
Diameter of clearance hole in the fixture	d _f ≤	[mm]	9	7 (IG- 9 (N 12 (N	18)	9 (IG-M8) 12 (IG-M10) 14 (M12) 18 (M16)		
Diameter of steel brush	d_{b}	[mm]	14	18	3	22		
Min. diameter of steel brush	d _{b,min}	[mm]	12,5	16,	5		20,5	
Max. installation torque moment	T _{inst,max}	[Nm]			2			

Injection System VMU plus for masonry

Intended use

Cleaning brush and installation parameters

Annex B4



Tempera in the base		Temperature of cartridge	Working time	Minimum curing time ir dry base material ¹⁾
-10°C to	- 6 °C	+ 15°C to + 40°C	90 min	24 h
-5°C to	- 1 °C		90 min	14 h
0 °C to	+ 4 °C		45 min	7 h
+5°C to	+ 9 °C		25 min	2 h
+ 10 °C to	+ 19 °C	+ 5°C to + 40°C	15 min	80 min
+ 20 °C to	+ 29 °C		6 min	45 min
+ 30°C to	+ 34 °C		4 min	25 min
+ 35°C to	+ 39 °C		2 min	20 min
+ 40	°C		1,5 min	15 min

working times and minimum availant time

In wet base material the curing time **<u>must</u>** be doubled.

Table B5: Maximum working time and minimum curing time VMU plus Polar

Temperature in the base material	Temperature of cartridge	Working time	Minimum curing time in dry base material ¹⁾
-20 °C to - 16 °C		75 min	24 h
- 15 °C to - 11 °C		55 min	16 h
- 10 °C to - 6 °C	1	35 min	10 h
- 5 °C to - 1 °C	-20°C to +10°C	20 min	5 h
0 °C to + 4 °C		10 min	2,5 h
+ 5 °C to + 9 °C		6 min	80 min
+ 10 °C		6 min	60 min

1) In wet base material the curing time <u>must</u> be doubled.

Injection System VMU plus for masonry

Intended Use Working and curing time Annex B5



1,	90°+	Drill hole perpendicular to the surface of base material with drill method according C45, with nominal drill hole diameter and bore hole depth according to the size an depth required by the selected anchor. In case of aborted drill hole the hole shall I mortar.	nd embedment
		Drill hole must be cleaned prior to installation of the anchor.	
2a.	Contraction of the second	Blow out from the bottom of the bore hole two times.	
2b.		Attach the appropriate sized brush (acc.to Annex B4) to a drilling machine or a ba screwdriver, brush the hole clean two times.	ttery
2c.	- Canal	Finally blow out the hole again two times.	
з.	MILITER DE	Remove the cap and attach the supplied static-mixing nozzle to the cartridge and cartridge into the correct dispensing tool. In case of a foil tube cartridge, cut off the For every working interruption longer than the recommended working time (Table well as for new cartridges, a new static-mixer shall be used.	e clip before use.
4.		The position of the embedment depth shall be marked on the threaded rod. The anchor rod shall be free of dirt, grease, oil or other foreign material.	
5.		Initial adhesive is not suitable for fixing the anchor. Prior to dispensing into the an squeeze out separately a minimum of three full strokes, for foil tube cartridges six discard non-uniformly mixed adhesive components until the mortar shows a consi	full strokes and
6.		Starting from the bottom or back of the cleaned anchor hole, fill up the hole to m adhesive. Slowly withdraw the static mixing nozzle will avoid creating air pock working times given in Table B4 and B5.	
7.		Push the threaded rod into the anchor hole while turning slightly to ensure positi the adhesive until the embedment depth is reached. Be sure that the annular gap mortar. If no excess mortar is visible at the top of the hole, the application has to b	is fully filled with
8.		Allow the adhesive to cure to the specified curing time given in Table B4 or B5. Do not move or load the anchor until it is fully cured. After curing time remove access mortar.	
9.		After full curing, the fixture can be installed with up to the max. installation torque or B3 with calibrated torque wrench.	acc. to Table B2
Inje	ection System VML	plus for masonry	

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1.		Drill hole perpendicular to the surface of base material with drill method accordent C45, with nominal drill hole diameter and bore hole depth according to the sidepth required by the selected anchor. In case of aborted drill hole the drill honortar.	ize and embedment						
ШŤ,		Drill hole must be cleaned prior to installation of the anchor.							
2a.	ALL CONSCIENCE	Blow out from the bottom of the bore hole two times.							
2b.		Attach the appropriate sized brush (acc.to Annex B4) to a drilling machine o brush the hole clean two times.	r a battery screwdriver,						
2c.	11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Finally blow out the hole again two times.							
3,	-	Insert the perforated sleeve flush with the surface of the masonry or plaster. have the right length. Never cut the sleeve.	Only use sleeves that						
4.	A TROOM	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 or B5) as well as for new cartridges, a new static-mixer shall be used.							
5.		The position of the embedment depth shall be marked on the threaded rod. The anchor rod shall be free of dirt, grease, oil or other foreign material.							
6.	The state	Initial adhesive is not suitable for fixing the anchor. Prior to dispensing into the squeeze out separately a minimum of three full strokes, for foil tube cartridge discard non-uniformly mixed adhesive components until the mortar shows a	es six full strokes and						
7.		Starting from the bottom or back fill the sleeve with adhesive. For embed larger than 130 mm an extension nozzle shall be used. For quantity of morta installation instructions. Observe the working times given in Table B4 or B5.							
8.		Push the threaded rod into the anchor hole while turning slightly to ensure p adhesive until the embedment depth is reached.	ositive distribution of the						
9.	×	Allow the adhesive to cure to the specified curing time given in Table B4 or f Do not move or load the anchor until it is fully cured. After curing time remove access mortar.	35.						
10.	Tinst	After full curing, the fixture can be installed with up to the max. installation to and B3 with calibrated torque wrench.	rque acc. to Table B2						
Inje	ction System VM	J plus for masonry							
Inte	nded Use		Annex B7						



				β-Fa	ictor			
Brick-No. and	Installation & Use category	T _a : 40°0	C / 24°C	Т _ь : 80°(C / 50°C	T _c : 120°	C / 72°C	
abbreviation	Use category	d/d	w/d w/w	d/d	w/d w/w	d/d	w/d w/w	
1 AAC6	All sizes	0,95	0,86	0,81	0,73	0,81	0,73	
2	d₀ ≤ 14 mm	0,93	0,80	0,87	0,74	0,65	0,56	
KS-NF	d₀ ≥ 16 mm	0,93	0,93	0,87	0,87	0,65	0,65	
3	d₀ ≤ 12 mm	0,93	0,80	0,87	0,74	0,65	0,56	
KSL-3DF	d₀ ≥ 16 mm	0,93	0,93	0,87	0,87	0,65	0,65	
4	d₀ ≤ 12 mm	0,93	0,80	0,87	0,74	0,65	0,56	
KSL-12DF	d₀ ≥ 16 mm	0,93	0,93	0,87	0,87	0,65	0,65	
6 Hlz-16DF 7 Porotherm Homebric 8 BGV-Thermo 9 Calibric R+ 10 Urbanbric	all sizes	0,86	0,86	0,86	0,86	0,73	0,73	
11 Brique creuse C40								
12 Blocchi Leggeri								
13 Doppio Uni								
14	d₀ ≤ 12 mm	0,93	0,80	0,87	0,74	0,65	0,56	
Bloc creux B40	d₀≥ 16 mm	0,93	0,93	0,87	0,87	0,65	0,65	
15	d₀ ≤ 12 mm	0,93	0,80	0,87	0,74	0,65	0,56	
Solid lightweight concrete	d₀ ≥ 16 mm	0,93	0,93	0,87	0,87	0,65	0,65	

Injection System VMU plus for masonry

Performances

 $\boldsymbol{\beta}$ - factors for job site testing under tension load

Deutsches Institut für Bautechnik

Anchor type		1.1		VMU-IG	1		VMU-	A, V-A	
Anchor size			M6	M8	M10	M8	M10	M12	M16
Characteristic tension resistance				-	-				
Steel property close 1.6	N _{Rk,s}	[kN]	4-	- 40 L	-	15	23	34	63
Steel, property class 4.6	γMs	[-]					2	,0	
Steel, property class 4.8	N _{Rk,s}	[kN]		~		15	23	34	63
Steel, property class 4.8	γMs	[-]			-		1	,5	
Steel, property class 5.6	N _{Rk,s}	[kN]	10	18	29	18	29	42	79
Steer, property class 5.0	γMs	[-]		2,0	-	-	2	,0	-
Steel, property class 5.8	N _{Rk,s}	[kN]	10	17	29	18	29	42	79
Steer, property class 5.0	γMs	[-]		1,5	-	-	1	,5	
Steel, property class 8.8	N _{Rk,s}	[kN]	16	27	46	29	46	67	126
Steer, property class 0.0	γMs	[-]	-	1,5	110.00		1	,5	-
Stainless steel A4 / HCR,	N _{Rk,s}	[kN]	14	26	41	26	41	59	110
property class 70	γMs	[-]		1,87	/		1,	87	
Stainless steel A4 / HCR,	N _{Rk,s}	[kN]	16	29	46	29	46	67	126
property class 80	γMs	[-]		1,6			1	,6	
Characteristic shear resistance						-			
Steel amongstu globar 4 G	V _{Rk,s}	[kN]				7	12	17	31
Steel, property class 4.6	γMs	[-]		3			1,	67	
Charl amount along 4.9	V _{Rk,s}	[kN]		- ÷ 1		7	12	17	31
Steel, property class 4.8	γ̈́Ms	[-]		4			1,	25	
Otest success and a large C.C.	V _{Rk,s}	[kN]	5	9	15	9	15	21	39
Steel, property class 5,6	YMs	[-]		1,67			1,	67	-
Otral amount along 5.0	V _{Rk,s}	[kN]	5	9	15	9	15	21	39
Steel, property class 5.8	Ϋ́Ms	[-]		1,25			1,	25	
	V _{Rk,s}	[kN]	8	14	23	15	23	34	63
Steel, property class 8.8	Ϋ́Ms	[-]		1,25	1.0.0		1,	25	_
Stainless steel A4 / HCR,	V _{Rk,s}	[kN]	7	13	20	13	20	30	55
property class 70	Ϋ́Ms	[-]		1,56	1		1,	56	
Stainless steel A4 / HCR,	V _{Rk,s}	[kN]	8	15	23	15	23	34	63
property class 80	γMs	[-]		1,33			1,	33	
Characteristic bending moment									
	M _{Rk,s}	[Nm]	-	-	-	15	30	52	133
Steel, property class 4.6	γMs	[-]		-				67	
23 - 24 - 24 - 24 - 24 - 24 - 24 - 24 -	M _{Rk,s}	[Nm]	14	- 21 H	12211	15	30	52	133
Steel, property class 4.8	γMs	[-]		4	-		1.	25	
	M _{Rk,s}	[Nm]	8	19	37	19	37	66	167
Steel, property class 5.6	γMs.	E		1,67				67	
	MRk,s	[Nm]	8	19	37	19	37	66	167
Steel, property class 5.8	γMs	[-]		1,25				25	v=1
	M _{Rk,s}	[Nm]	12	30	60	30	60	105	266
Steel, property class 8.8	ΎMs.	[-]		1,25				25	
Stainless steel A4 / HCR,	M _{Rk,s}	[Nm]	11	26	52	26	52	92	233
property class 70	γMs	[-]		1,56				56	200
Stainless steel A4 / HCR,	M _{Rk,s}	[Nm]	12	30	60	30	60	105	266
property class 80	YMs.	[-]		1,33				33	200

Injection System VMU plus for masonry

Performances

Characteristic steel resistance under tension and shear load

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Spacing and edge distance		Cmin	
		Source State	
		Ð	
		Scr 11 .	
c _{min} = Minimur s _{cr} = Charact s _{min} = Minimur s _{cr.ll} ; (s _{min.ll}) = Charact	eristic edge distance n edge distance eristic spacing n spacing eristic (minimum) spacing for	anchors placed parallel to bed jo	int
$s_{cr,\perp}; (s_{min,\perp}) = Charact$	eristic (minimum) spacing for	anchors placed perpendicular to	bed joint
Anchor position	Tension load	Shear load parallel to free edge	Shear load perpendicular to free edge
Anchors places parallel to bed joint s _{cr.ll ;} (s _{min,ll})			
Anchors places perpendicular to bed joint $s_{cr, ^{\bot}} (s_{min, ^{\bot}})$			
•		anchors placed parallel to the be	
		anchors placed perpendicular to	Second and the second sec
	tor in case of shear load for a	anchors placed perpendicular to the	ne bed joint
Group of 2 anchors:	$N_{Rk}^{g} = \alpha_{g,N} * N_{RK}$	and $V_{Rk}^{g} = \alpha_{g,V} * V_{Rk}$	
	$\mathbf{J}_{Rk}^{g} = \alpha_{g,N,\parallel} * \alpha_{g,N,\perp} * \mathbf{N}_{RK}$	and $V_{Rk}^{g} = \alpha_{g,V,II} * \alpha_{g,II}$	
(N_{Rk} : $N_{Rk,b}$ or $N_{Rk,b,j}$ for $C_{V_{Rk}}$: $V_{Rk,c}$; $V_{Rk,c,j}$; $V_{Rk,b}$ of with the relevant α_{g})	er)	
Injection System VMU plus fo	r masonry		
Performances Edge distance and Spacing			Annex C3



Brick type: Autoclaved Aerated Concrete – AAC6

Table C3: Description of the brick

Brick type		Autoclaved Aerated Concrete AAC6	1
Bulk density	ρ [kg/dm ³]	0,6	and the second sec
Compressive strength	$f_b \ge [N/mm^2]$	6	
Code		EN 771-4	
Producer (country code)		e.g. Porit (DE)	
Brick dimensions	[mm]	499 x 240 x 249	
Drilling method		Rotary	

Table C4: Spacing and edge distance

Anchor size			All sizes		
Edge distance	Ccr	[mm]	1,5*h _{ef}		
Minimum odro distance	C _{min,N}	[mm]	75		
Minimum edge distance	$C_{\min,V,II} (C_{\min,v,\perp})^{1}$	[mm]	75 (1,5*h _{ef})		
Spacing	Scr	[mm]	3*h _{ef}	1000	
Minimum spacing	Smin	[mm]	100		

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

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

Configuration	with c [mm] ≥	with s [mm] ≥			
II: anchors placed	125 (120 for M8)	100			1,8
parallel to horizontal joint	1,5*hef	3*hef	α _{g,N,II}	11	2,0
1: anchors placed	75	100		[-]	1,4
perpendicular to horizontal joint	1,5*hef	3*hef	-α _{g,N,L}		2,0

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

Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal	NV N	75	100			1,2
joint	V	1,5*hef	3*hef	α _{g,V,II}	11	2,0
⊥: anchors placed perpendicular to horizontal joint	V	1,5*hef	3*hef	$\alpha_{g,V,\perp}$	[]	2,0

Injection System VMU plus for masonry

Performances - Autoclaved Aerated Concrete - AAC6 Description of the brick, Spacing and edge distance, Group factors



iced		with	c [mm] ≥	with s	[mm] ≥		
ontal		1,	5*hef	3,0	'hef	α _{g,V,II} . [-]	2,0
r to int	V	1,	5*hef	3,0	hef	α _{g,V,⊥}	2,0
Characte	eristic value:	s of resistar	ice under ter	nsion and sl	near loads		
			Cha	acteristic resi	stance		
				Use category	1		
e Effective anchorage depth		d/d				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}		$N_{Rkb} = N_{Rkp}^{1}$)		$N_{Rk,p} = N_{Rk,p}^{(1)}$		V _{Rk,b} ²⁾³⁾
[mm]				[kN]	- Andre - Crustle		
		Compress	ive strength f	≥ 6 N/mm ²		1.	
80	2,5 (2,0)	2,5 (1,5)	2,0 (1,2)	2,5 (1,5)	2,0 (1,5)	1,5 (1,2)	6,0
90			2,5 (1,5)			The second second	10,0
							10,0
			1 1		5,0 (3,5)	4,0 (3,0)	10,0
are valid fo	or steel 5.6 or h	, Annex C; igher. For ste δ <mark>N</mark> / N	el 4.6 and 4.8 r δ N 0	multiply V _{Rk,b} t δ N ∞	v 0,8	δνο	δγ∞
[mm]	[kN]	[mm/kN]	[mm]	[mm]	[kN]	[mm]	[mm]
and the second se	0,9		0,16	0,32	1,3	0,8	1,20
80	0,0	0,18		1.0.	1,8	1,2	1,80
	1,4	0,10	0,26	0,51	1,0		
80		0,08	0,26 0,14	0,51	2,1	1,4	2,10
	Character extraction auchorade geoty hef [mm] 80 90 100 100 100 100 100 100 100	Bit of the set of the	Characteristic values of resistara) $\frac{1}{100}$ d/d a) $\frac{1}{100}$ d/d a) $\frac{1}{100}$ $d/o^{\circ}C/24^{\circ}C$ b) $\frac{1}{100}$ $d0^{\circ}C/24^{\circ}C$ b) $\frac{1}{100}$ $d0^{\circ}C/24^{\circ}C$ b) $\frac{1}{100}$ $80^{\circ}C/50^{\circ}C$ b) $\frac{1}{100}$ $5,0(3,5)$ compress80 $2,5(2,0)$ $2,5(1,5)$ 90 $4,0(2,5)$ $3,0(2,0)$ 100 $5,0(3,5)$ $4,0(2,5)$ $3,0(2,0)$ 100 $5,5(3,5)$ valid for c_{cr} , values in brackets are validtion of $V_{Rk,c}$ see ETAG029, Annex C;are valid for steel 5.6 or higher. For steel	Characteristic values of resistance under ter and the problem of the	Characteristic values of resistance under tension and sh Characteristic resist Use category d/d Use category d/d Mage call of degrees on the stand with the stand state on the	$\begin{tabular}{ c c c c c } \hline Characteristic values of resistance under tension and shear loads \\ \hline Characteristic resistance \\ \hline Use category \\ \hline WW \\ W/d \\ \hline W/d \\ \hline$	$\begin{tabular}{ c c c c c } \hline Characteristic values of resistance under tension and shear loads \\ \hline Characteristic resistance \\ \hline Use category \\ \hline Use categ$



NS-NP Builk density $p [kg/dm^3]$ 2.0 Compressive strength $f_b \ge [N/mm^2]$ 10, 20 or 27 Code EN 771-2 Image: Compressive strength $f_b \ge [N/mm^2]$ $f_b \ge $	Table C10: D	escription of	the brid	:k						
Bulk density ρ [kg/dm ²] 2.0 Compressive strength f _b ≥ [N/mm ²] 10. 20 or 27 Code EN 771-2 Producer (country code) e.g. Wemding (DE) Brick dimensions [mm] 240 x 115 x 71 Drilling method Hammer Table C11: Spacing and edge distance Anchor size Carlier [mm] 60 Spacing 8 _m [mm] 3 ³ h _{df} Winimum edge distance Carlier [mm] 60 Spacing 8 _m [mm] 120 Table C12: Group factor for anchor group in case of tension loading Configuration with c [mm] ≥ with s [mm] ≥ 1: anchors placed parallel to horizontal joint 1.5 ⁵ hef 3 ³ h _{eff} 1: anchors placed parallel to horizontal joint 1.5 ⁵ hef 3 ⁴ h _{eff} 1: anchors placed parallel to horizontal joint 1.5 ⁵ hef 3 ⁴ h _{eff} 1: anchors placed parallel to horizontal joint 1.5 ⁵ hef 3 ⁴ h _{eff} 1: anchors placed parallel to for anchor group in case of shear loading parallel to free edge Configuration with c [mm] ≥ with s [mm] ≥ 1: anchors placed parallel to free dige 1.5 ⁵ hef 3 ⁴ h _{eff} 1: anchors placed parallel to free edge Configuration with c [mm] ≥ with s [mm] ≥ 1: anchors placed parallel to free edge Configuration with c [mm] ≥ with s [mm] ≥ 1: anchors placed parallel to free edge Configuration with c [mm] ≥ with s [mm] ≥ 1: anchors placed parallel to free edge Configuration with c [mm] ≥ with s [mm] ≥ 1: anchors placed parallel to free edge Configuration with c [mm] ≥ with s [mm] ≥ 1: anchors placed parallel to free edge Configuration with c [mm] ≥ with s [mm] ≥ 1: anchors placed fo0 120 1.5 ⁵ hef 3 ⁵ h _{eff} 3 ⁵ h _{eff} 2.0 1.0 1.5 ⁵ hef 3 ⁵ h _{eff} 3 ⁶ h _{eff} 1.0 1.5 ⁵ hef 3 ⁵ h _{eff} 3 ⁶ h _{eff} 3 ⁶ h _{eff} 1.0 1.5 ⁶ hef 3 ⁶ h _{eff} 3 ⁶ h _{eff} 1.0 1.0 1.5 ⁶ hef 3 ⁶ h _{eff} 3 ⁶ h _{eff} 1.0 1.0 1.5 ⁶ hef 3 ⁶ h _{eff} 3 ⁶ h _{eff} 1.0 1.0 1.5 ⁶ hef 3 ⁶ h _{eff} 3 ⁶ h _{eff} 1.0 1.0 1.0 1.5 ⁶ hef 3 ⁶ h _{eff} 3 ⁶ h	Brick type			m silicate solid b	rick					
Compressive strength $f_b \ge [N/mm^2]$ 10, 20 or 27 Code EN 771-2 Producer (country code) e.g. Wending (DE) Brick dimensions [mm] 240 x 115 x 71 Dnilling method Hammer Hammer Table C11: Spacing and edge distance Anchor size All sizes Edge distance Core mm Minimum edge distance Core mm Minimum spacing Ser. mm] Spacing Ser. mm] 120 Table C12: Group factor for anchor group in case of tension loading Configuration with c (mm] ≥ with s (mm] ≥ 1: anchors placed perpendicular to horizontal joint 60 120 1: anchors placed perpendicular to horizontal joint 60 120 a_{gVA} 1: anchors placed perpendicular to horizontal joint 60 120 a_{gVA} 1: anchors placed perpendicular to horizontal joint 1,5*hef 3*hef 1.0 1: anchors placed perpendicular to horizontal joint 60 120 a_{gVA} [-1 1: anchors placed perpendicular to horizontal joint 1.5*hef 3*hef 2.0	Bulk density	0 [kg/dm ³]				100				
Producer (country code) e.g. Wending (DE) Brick dimensions [mm] 240 x 115 x 71 Drilling method Hammer Table C11: Spacing and edge distance Anchor size All sizes Edge distance C_{min} (mm] 60 Spacing S_{er} (mm] 60 Spacing S_{er} (mm] 120 Table C12: Group factor for anchor group in case of tension loading Configuration with c [mm] \geq with s [mm] \geq I: anchors placed perpendicular to horizontal joint 1.5 th ef 3 th ef 1.0 1: anchors placed perpendicular to horizontal joint $I = 60$ 120 $a_{g,N,L}$ [-] 1.0 1: anchors placed perpendicular to horizontal joint $I = 60$ 120 $a_{g,N,L}$ [-] 1.0 1: anchors placed perpendicular to horizontal joint $I = 60$ 120 $a_{g,N,L}$ [-] 1.0 1: anchors placed perpendicular to horizontal joint $I = 60$ 120 $a_{g,N,L}$ [-] 1.0 1: anchors placed perpendicular to free 60 120 $a_{g,N,L}$ 1.0<	Compressive strength		10, 20	or 27		in the second	-	1.1		
Brick dimensions [mm] $240 \times 115 \times 71$ Drilling method Hammer Table C11: Spacing and edge distance Anchor size All sizes Edge distance Car [mm] 60 Spacing sa [mm] 3*har Minimum edge distance Car [mm] 60 Spacing sa [mm] 120 Table C12: Group factor for anchor group in case of tension loading Configuration with c [mm] ≥ with s [mm] ≥ II: anchors placed perpendicular to horizontal joint If the f 3*har 1.0 1: anchors placed perpendicular to horizontal joint If the f 3*har 7.0 2.0 Table C13: Group factor for anchor group in case of shear loading parallel to free edge Configuration with c [mm] ≥ with s [mm] ≥ II: anchors placed perpendicular to horizontal joint If the f 3*har 7.0 2.0 Table C13: Group factor for anchor group in case of shear loading parallel to free edge Configuration with c [mm] ≥ if the f 3*har 1.0 <th colsparalel="" hor<="" td="" to=""><td>Code</td><td></td><td>EN 771</td><td>-2</td><td></td><td></td><td>100</td><td>6</td></th>	<td>Code</td> <td></td> <td>EN 771</td> <td>-2</td> <td></td> <td></td> <td>100</td> <td>6</td>	Code		EN 771	-2			100	6	
Drilling method Hammer Table C11: Spacing and edge distance Anchor size All sizes Edge distance C_{ex} [mm] 1,5*h _{eff} Minimum edge distance C_{mm} [mm] 60 Spacing S_{ex} [mm] 3*h_{ex} Minimum edge distance C_{mm} [mm] 60 Spacing S_{ex} [mm] 120 Table C12: Group factor for anchor group in case of tension loading Configuration with c [mm] ≥ with s [mm] ≥ II: anchors placed parallel to horizontal joint 1.5° hef 3° hef 1.0 Dividual to horizontal joint $I = 0^{\circ}$ $I = 0^{\circ}$ $I = 0^{\circ}$ $I = 0^{\circ}$ II: anchors placed parallel to horizontal joint $I = 0^{\circ}$ $I = 0^{\circ}$ $I = 0^{\circ}$ $I = 0^{\circ}$ II: anchors placed parallel to horizontal joint $I = 0^{\circ}$ II: anchors placed parallel to horizontal joint $I = 0^{\circ}$ $I = 0^{\circ$	Producer (country code)		e.g. We	emding (DE)			200	10.00		
Table C11: Spacing and edge distance All sizes Configuration Minimum spacing Ser (mm) Group factor for anchor group in case of tension loading Configuration with c (mm) ≥ with s [mm] ≥ It anchors placed 60 120 It anchors placed Group factor for anchor group in case of tension loading Configuration with c (mm) ≥ with s [mm] ≥ It anchors placed 60 120 Joint 1.5*hef 3*her It anchors placed 60 120 Table C13: Group factor for anchor group in case of shear loading parallel to free edge Configuration with c (mm] ≥ 1.0 Minimum spacing 1.0 Joint 1.0 Joint 1.0 Joint 1.0 Joint <th <="" colspan="2" td=""><td>Brick dimensions</td><td>[mm]</td><td>240 x 1</td><td>15 x 71</td><td></td><td></td><td>-</td><td></td></th>	<td>Brick dimensions</td> <td>[mm]</td> <td>240 x 1</td> <td>15 x 71</td> <td></td> <td></td> <td>-</td> <td></td>		Brick dimensions	[mm]	240 x 1	15 x 71			-	
Anchor size All sizes Edge distance C_{ac} [mm] 1,5*her Edge distance C_{min} [mm] 60 Spacing Sw. [mm] 3*her Minimum edge distance Group factor for anchor group in case of tension loading Imm 120 Table C12: Group factor for anchor group in case of tension loading 1,0 1,5 Configuration with c [mm] ≥ with s [mm] ≥ 1,0 It: anchors placed perpendicular to horizontal joint 1,5*hef 3*her 1,0 1.: anchors placed perpendicular to horizontal joint 60 120 $a_{0,N,I}$ 1,0 1: anchors placed parallel to horizontal joint 60 120 $a_{0,N,I}$ 1,0 1: anchors placed parallel to horizontal joint 60 120 $a_{0,V,I}$ 1,0 1: anchors placed parallel to horizontal joint 60 120 $a_{0,V,I}$ 1,0 1: anchors placed parallel to horizontal joint 1,5*hef 3*her 1,0 1,0 1: anchors placed parallel to horizontal joint 1,5*hef 120 $a_{0,V,I}$ 1,0 1: anchors placed paralle	Drilling method		Hamme	er						
Edge distance C_{err} [mm] $1.5^{\circ}h_{err}$ Minimum edge distance C_{min} [mm] 60 Spacing S_{orr} [mm] $3^{\circ}h_{err}$ Minimum spacing S_{min} [mm] $3^{\circ}h_{err}$ Minimum spacing Smin [mm] 120 Table C12: Group factor for anchor group in case of tension loading Configuration with c [mm] \geq with s [mm] \geq II: anchors placed parallel to horizontal joint 60 120 $\alpha_{g,N,l}$ J: anchors placed perpendicular to horizontal joint 60 120 $\alpha_{g,N,l}$ II: anchors placed parallel to horizontal joint 60 120 $\alpha_{g,N,l}$ II: anchors placed parallel to horizontal joint 0 $1.5^{\circ}hef$ $3^{\circ}h_{err}$ II: anchors placed parallel to horizontal joint 0 $1.5^{\circ}hef$ $3^{\circ}h_{err}$ 1.0 II: anchors placed perpendicular to horizontal joint 0 $1.5^{\circ}hef$ $3^{\circ}h_{err}$ 1.0 II: anchors placed perpendicular to into intorizontal joint 0 0 1.0 0 1.0 II: a	Table C11: S	pacing and e	dge dis	tance						
$\begin{array}{ $					All sizes	C				
Spacing see [mm] $3^{+}h_{df}$ Minimum spacing smin [mm] 120 Table C12: Group factor for anchor group in case of tension loading 120 It: anchors placed parallel to horizontal joint with c [mm] \geq with s [mm] \geq 10 1:: anchors placed perpendicular to horizontal joint Image: second s						-				
Minimum spacing s_{min} $[mm]$ 120Table C12:Group factor for anchor group in case of tension loadingConfigurationwith c $[mm] \ge$ with s $[mm] \ge$ II: anchors placed parallel to horizontal joint 60 120 $\alpha_{g,N,il}$ 1,0II: anchors placed perpendicular to horizontal joint 60 120 $\alpha_{g,N,il}$ $\alpha_{g,N,il}$ $1,0$ II: anchors placed perpendicular to horizontal joint $1.5^{\circ}hef$ $3^{\circ}h_{ef}$ 1.0 II: anchors placed perpendicular to horizontal joint $1.5^{\circ}hef$ $3^{\circ}h_{ef}$ $\alpha_{g,V,il}$ 1.0 II: anchors placed perpendicular to horizontal joint $1.5^{\circ}hef$ $3^{\circ}h_{ef}$ $\alpha_{g,V,il}$ 1.0 II: anchors placed perpendicular to horizontal joint V 0 120 $1.5^{\circ}hef$ $\alpha_{g,V,il}$ 1.0 II: anchors placed perpendicular to horizontal joint V 0 10 $1.5^{\circ}hef$ 120 $\alpha_{g,V,il}$ $\alpha_{g,V,il}$ 1.0 1.0 II: anchors placed parallel to horizontal joint V 0 10 $1.5^{\circ}hef$ $3^{\circ}h_{ef}$ $\alpha_{g,V,il}$ 1.0 1.0 II: anchors placed parallel to horizontal joint V 0 10 $1.5^{\circ}hef$ $3^{\circ}h_{ef}$ $\alpha_{g,V,il}$ 1.0 1.0 II: anchors placed parallel to horizontal joint V 0 10 $1.5^{\circ}hef$ $3^{\circ}h_{ef}$ $\alpha_{g,V,il}$ 1.0 1.0 II: anchors placed perpendicular to perpendicular to <th< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></th<>										
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1. alcroits placed perpendicular to horizontal joint1.5*hef120 $\alpha_{g,N,\perp}$ $\alpha_{g,N,\perp}$ 1.0 2.0Table C13:Group factor for anchor group in case of shear loading parallel to free edgeConfigurationwith c [mm] \geq with s [mm] \geq 1.0 2.0II: anchors placed parallel to horizontal joint 0 120 115 $\alpha_{g,V,\parallel}$ 1.0 2.0II: anchors placed perpendicular to horizontal joint 0 120 1.5*hef $\alpha_{g,V,\parallel}$ 1.0 1.7 2.01.0 1.7 2.0II: anchors placed perpendicular to horizontal joint 0 120 1.5*hef $\alpha_{g,V,\parallel}$ 1.0 1.0 1.0II: anchors placed perpendicular to horizontal joint 0 120 1.5*hef $\alpha_{g,V,\parallel}$ 1.0 1.0II: anchors placed perpendicular to horizontal joint 0 0 120 $\alpha_{g,V,\parallel}$ 0 0 II: anchors placed parallel to horizontal joint 0 0 120 $\alpha_{g,V,\parallel}$ 0 0 II: anchors placed parallel to horizontal joint 0 0 120 $\alpha_{g,V,\parallel}$ 0 0 II: anchors placed perpendicular to perpendicular to 0 0 120 $\alpha_{g,V,\parallel}$ 0 0 II: anchors placed perpendicular to 0 0 120 $\alpha_{g,V,\parallel}$ 0 0 II: anchors placed perpendicular to 0 0 120 $\alpha_{g,V,\parallel}$ 0 0 II: anchors placed perpendicular to 0 0 120 $\alpha_{g,V,$	in a second s						[-]			
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Table C13:Group factor for anchor group in case of shear loading parallel to free edgeConfigurationwith c [mm] \geq with s [mm] \geq II: anchors placed parallel to horizontal jointIII 5120 $\alpha_{g,V,II}$ 1,0II: anchors placed perpendicular to horizontal jointIII 5120 $\alpha_{g,V,II}$ 1,0II: anchors placed perpendicular to horizontal jointIII 5120 $\alpha_{g,V,II}$ 1,0II: anchors placed perpendicular to horizontal jointIIII 5120 $\alpha_{g,V,II}$ 1,0II: anchors placed perpendicular to horizontal jointIIIII 5120 $\alpha_{g,V,II}$ 1,0II: anchors placed parallel to horizontal jointIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII				17.17 (D.3.)						
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Table C13: G	roup factor f	or anch	or group in case	of shear loading p	vallel to f	roo odgo	302		
It alteriols placed parallel to horizontal jointImage: constraint of the placed perpendicular to horizontal jointImage: constraint of the placed markedImage: constraint of the placed marked <td>and the second second</td> <td>Toup factor in</td> <td>0.2.00.0</td> <td></td> <td></td> <td></td> <td>ree euge</td> <td></td>	and the second	Toup factor in	0.2.00.0				ree euge			
In alteriors placed parallel to horizontal jointImage: mathematical strain of the placed perpendicular to horizontal jointImage: mathematical strain of the placed mathematical strain of the perpendicular to horizontal jointImage: mathematical strain of the placed mathematical strain of the perpendicular to horizontal jointImage: mathematical strain of the placed mathematical strain of the perpendicular to mathematical strain of the perpendicular to horizontal jointImage: mathematical strain of the perpendicular to mathematical strain of the perpendicular toImage: mathematical strain of the perpendicular to mathematical strain of the perpendicular to mathematical strain of the perpendicular toImage: mathematical strain of the perpendicular to mathematical strain of the perpendicular toImage: mathematical strain of the perpendicular to mathematical strain of the perpendicular toImage: mathematical strain of the perpendicular to mathematical strain of the perpendicular toImage: mathematical strain of the perpendicular to mathematical strain of the perpendicular toImage: mathematical strain of the perpendicular to mathematical strain of the perpendicular toImage: mathematical strain of the perpendicular to mathematical strain of the perpendicular toImage: mathematical strain of the perpendicular to mathematical strain of the perpendicular toImage: mathematical strain of the perpendicular strain of the perpendicular		J. J.						1.0		
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$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Table C14: G	roup factor fo	ranche		of choor loading po	mondioul	ar to from	odao		
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parallel to horizontal jointV1,5*hef $3*h_{ef}$ $\alpha_{g,V,II}$ 2,0L: anchors placed perpendicular to V 60120 $\alpha_{g,V,II}$ 1,0								1.0		
L: anchors placed perpendicular to $V \rightarrow 0$ 60 120 $\alpha_{g,V,\perp}$ $1,0$	parallel to horizontal	V			1.07	αg,V,II				
perpendicular to	L: anchors placed				120		E	1,0		
		V			3*h _{ef}	$\alpha_{g,V,\perp}$		2,0		



Brick type:	Brick type: Calcium silicate solid brick KS-NF											
Table C	Table C15: Characteristic values of resistance under tension and shear loads											
			Characteristic resistance									
	Sleeve	e e	Use category									
Anchor size		Effective anchorage depth	d/d					d/d w/d w/w				
		(0	40°C/24°C	80°C/50°C	120°C/72°C	40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges			
		h _{ef}		$N_{Rk,b} = N_{Rk,p}$	1)		$N_{Rk,b} = N_{Rk,p}$	1)	V _{Rk,b} ²⁾³⁾			
		[mm]				[kN]						
Compressive strength f _b ≥ 10 N/mm ²												
M8	-	80							2,5 (1,5)			
M10 / IG-M6	-	90	4,5 (2,0)	4,5 (2,0)	3,0 (1,5)	3,5 (1,5)	3,5 (1,5)	2,5 (1,2)	3,0 (2,0)			
M12 / IG-M8	-	100							2,5 (1,5)			
M16 / IG-M10	-	100	3,5 (1,5)	3,5 (1,5)	2,5 (1,2)	3,0 (1,5)	3,5 (1,5)	2,0 (0,9)	2,5 (1,5)			
M8	12x80	80	3,5 (1,5)	3,5 (1,5)	2,5 (1,2)	3,5 (1,5)	3,0 (1,5)	2,5 (1,2)	2,5 (1,5)			
M8 / M10/	16x85	85	3,5 (1,5)	3,0 (1,5)	2,0 (0,9)	3,5 (1,5)	3,0 (1,5)	2,5 (1,2)	2,5 (1,5)			
IG-M6	16x130	130	3,5 (1,5)	3,0 (1,5)	2,0 (0,9)	3,5 (1,5)	3,0 (1,5)	2,5 (1,2)	2,5 (1,5)			
M12 / M16 /	20x85	85										
IG-M8 /	20x130	130	3,0 (1,5)	2,5 (1,2)	2,0 (0,9)	3,0 (1,5)	2,5 (1,2)	2,0 (0,9)	2,5 (1,5)			
IG-M10	20x200	200										
ļ,			Co	mpressive	strength f _b ≥	20 N/mm ²	1	1				
M8	-	80							4,0 (2,5)			
M10 / IG-M6	-	90	6,0 (3,0)	5,5 (2,5)	4,0 (2,0)	5,0 (2,5)	5,0 (2,5)	3,5 (1,5)	4,5 (2,5)			
M12/ IG-M8	-	100							4,0 (2,5)			
M16/ IG-M10	-	100	5,0 (2,5)	5,0 (2,5)	3,5 (1,5)	5,0 (2,5)	5,0 (2,5)	3,5 (1,5)	4,0 (2,5)			
M8	12x80	80	5,5 (2,5)	5,0 (2,5)	3,5 (1,5)	4,5 (2,0)	4,5 (2,0)	3,0 (1,5)	4,0 (2,5)			
M8 / M10/	16x85	85	5,0 (2,5)	4,5 (2,0)	3,5 (1,5)	5,0 (2,5)	4,5 (2,0)	3,5 (1,5)	4,0 (2,5)			
IG-M6	16x130	130	5,0 (2,5)	4,5 (2,0)	3,5 (1,5)	5,0 (2,5)	4,5 (2,0)	3,5 (1,5)	4,0 (2,5)			
M12 / M16 /	20x85	85										
IG-M8 /	20x130	130	4,0 (2,0)	4,0 (2,0)	3,0 (1,5)	4,0 (2,0)	4,0 (2,0)	3,0 (1,5)	4,0 (2,5)			
IG-M10	20x200	200										

1)

Values are valid for c_{cr} , values in brackets are valid for single anchors with c_{min} For c_{cr} calculation of $V_{Rk,c}$ see ETAG 029, Annex C; values in brackets $V_{Rk,c} = V_{Rk,b}$ for single anchors with c_{min} The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply $V_{Rk,b}$ by 0,8. 2)

3)

Injection System VMU plus for masonry

Performances - Calcium solid brick KS-NF Characteristic values of resistance



Brick type:	Brick type: Calcium silicate solid brick KS-NF											
Table C	Table C16: Characteristic values of resistance under tension and shear loads (continue)											
				Characteristic resistance								
		n 9				Use categ	jory					
Anchor size	Sleeve	Effective anchorage depth		d/d			w/d w/w		d/d w/d w/w			
		ຫ	40°C/24°C	80°C/50°C	120°C/72°C	40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges			
		h _{ef}		$N_{Rk,b} = N_{Rk,p}$	1)		$N_{Rk,b} = N_{Rk,p}$	1)	V _{Rk,b} ²⁾³⁾			
		[mm]				[kN]						
	Compressive strength f _b ≥ 27 N/mm ²											
M8	-	80							4,5 (2,5)			
M10 / IG-M6	-	90	7,0 (3,5)	6,5 (3,0)	5,0 (2,5)	6,0 (3,0)	5,5 (2,5)	4,0 (2,0)	5,5 (3,0)			
M12 / IG-M8	-	100							4,5 (2,5)			
M16 / IG-M10	-	100	6,0 (3,0)	5,5 (2,5)	4,5 (2,0)	6,0 (3,0)	5,5 (2,5)	4,0 (2,0)	4,5 (2,5)			
M8	12x80	80	6,5 (3,0)	6,0 (3,0)	4,5 (2,0)	5,5 (2,5)	5,0 (2,5)	3,5 (1,5)	4,5 (2,5)			
M8 / M10/	16x85	85	5,5 (2,5)	5,0 (2,5)	4,0 (2,0)	5,5 (2,5)	5,0 (2,5)	4,0 (2,0)	4,5 (2,5)			
IG-M6	16x130	130	5,5 (2,5)	5,0 (2,5)	4,0 (2,0)	5,5 (2,5)	5,0 (2,5)	4,0 (2,0)	4,5 (2,5)			
M12 / M16 /	20x85	85										
IG-M8 /	20x130	130	5,0 (2,5)	4,5 (2,0)	3,5 (1,5)	5,0 (2,5)	4,5 (2,0)	3,5 (1,5)	4,5 (2,5)			
IG-M10	20x200	200										

1) 2)

Values are valid for c_{cr} , values in brackets are valid for single anchors with c_{min} For c_{cr} calculation of $V_{Rk,c}$ see ETAG 029, Annex C; values in brackets $V_{Rk,c} = V_{Rk,b}$ for single anchors with c_{min} The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply $V_{Rk,b}$ by 0,8

3)

Anchor	Sleeve	h _{ef}	Ν	δ _N / N	δ_{N0}	δ _{N∞}	V	δ _{V0}	δ _{V∞}
size	Sleeve	[mm]	[kN]	[mm/kN]	[mm]	[mm]	[kN]	[mm]	[mm]
M8	-	80					1,7	0,90	1,35
M10 / IG-M6	-	90	2,0		0,30	0,60	2,0	1,10	1,65
M12 / IG-M8	-	100							
M16 / IG-M10	-	100	1,7	0.15	0,26	0,51			
M8	12x80	80	,	0,15					
M8 / M10/	16x85	85	1,4		0,21	0,43	1,7	0,90	1,35
IG-M6	16x130	130	1,4		0,21	0,43			
M12 / M16	20x85	85							
IG-M8 /	20x130	130	1,3		0,19	0,39			
IG-M10	20x200	200							

Table C17: Displacements

Injection System VMU plus for masonry

Performances - Calcium solid brick KS-NF

Characteristic values of resistance (continue), Displacements



1.5 Mar. 199	cription of	Calcium silicate hollo	w brick			
Brick type		KSL-3DF	W BHCK	1.14		
Bulk density	ρ [kg/dm³]	1,4		- 260	24	
Compressive strength	$f_b \ge [N/mm^2]$	8, 12 or 14		123	100	58
Code		EN 771-2			S. 1	
Producer (country code)		e.g. Wemding (DE)				
Brick dimensions	[mm]	240 x 175 x 113			- W	
Drilling method		Rotary				
	175 (14 44 14 32 14 14 44 44			
Table C19: Spa		44 14 38 17 3 dge distance	14 8 14 44 16			_
Anchor size			8 14 44 16 All size:			
Anchor size Edge distance	cing and e	dge distance	8 14 44 16 All size 100 (120			
Anchor size Edge distance Minimum edge distance	cing and e	dge distance [mm] [mm]	8 14 44 16 All size: 100 (120 60			
Anchor size Edge distance Minimum edge distance Spacing	cing and e	dge distance [mm] [mm] [mm] [mm]	8 14 44 16 All size: 100 (120 60 240 120			
Anchor size Edge distance Minimum edge distance Spacing Minimum spacing	Ccr Cmin Scr,II Scr,I Scr,I Scr,I	dge distance [mm] [mm] [mm] [mm] [mm] [mm] [mm]	8 14 44 16 All sizes 100 (120 60 240 120 120			
Anchor size Edge distance Minimum edge distance Spacing Minimum spacing ¹⁾ Value in brackets for VM-S Table C20: Grou	Ccr Cmin Scr,II Scr,I Smin H	dge distance [mm] [mm] [mm] [mm] [mm] SH 20x130 and VM-SH 20 or anchor group in cas	8 14 44 16 All sizes 100 (120 60 240 120 120 x200 se of tension loading			
Anchor size Edge distance Minimum edge distance Spacing Minimum spacing ¹⁾ Value in brackets for VM-S Table C20: Grou Configuration	Ccr Cmin Scr,II Scr,I Smin H	dge distance [mm] [mm] [mm] [mm] [mm] [mm] SH 20x130 and VM-SH 20	8 14 44 16 All sizes 100 (120 60 240 120 120 x200			1.5
Anchor size Edge distance Minimum edge distance Spacing Minimum spacing ¹⁾ Value in brackets for VM-S Table C20: Grou	Ccr Cmin Scr,II Scr,I Smin H	dge distance [mm] [mm] [mm] [mm] [mm] SH 20x130 and VM-SH 20 or anchor group in cas with c [mm] ≥	8 14 44 16 All sizes 100 (120 60 240 120 120 x200 se of tension loading with s [mm] ≥ 12) ¹⁾		1,5
Anchor size Edge distance Minimum edge distance Spacing Minimum spacing ¹⁰ Value in brackets for VM-S Table C20: Grou Configuration II: anchors placed	Ccr Cmin Scr,II Scr,I Smin H	dge distance [mm] [mm] [mm] [mm] [mm] SH 20x130 and VM-SH 20 or anchor group in cas with c [mm] ≥ 60	8 14 16 All size: 100 (120) 60 240 120 120 x200 se of tension loading with s [mm] ≥ 120			1,5 2,0 2,0
Anchor size Edge distance Minimum edge distance Spacing Minimum spacing Value in brackets for VM-S Table C20: Grou Configuration II: anchors placed parallel to horizontal joint L: anchors placed	Ccr Cmin Scr,II Scr,I Smin H 20x85; VM-	dge distance [mm] [mm] [mm] [mm] SH 20x130 and VM-SH 20 or anchor group in cas with c [mm] ≥ 60 C _{cr}	8 14 16 All sizes 100 (120 60 240 120 x200 se of tension loading with s [mm] ≥ 120 240	α _{g,N,I}	[-]	2,0
Anchor size Edge distance Minimum edge distance Spacing Minimum spacing '' Value in brackets for VM-S Table C20: Grou Configuration II: anchors placed parallel to horizontal joint	Ccr Cmin Scr,II Scr,I Smin H 20x85; VM-	dge distance [mm] [mm] [mm] [mm] [mm] SH 20x130 and VM-SH 20 or anchor group in cas with c [mm] ≥ 60 C _{cr} 160	8 14 16 All sizes 100 (120 60 240 120 120 x200 120 se of tension loading with s [mm] ≥ 120 240 120) ¹⁾	[-]	2,0 2,0



21:		tor for and					I to free edg	je
Configurati	on		with c [mm]	2	with s [mr	n]≥		
olaced	1	T	60		120		110	1,0
rizontal) V ••		160		120	αg	,V,II	1,6
		1	Ccr		240		[-]	2,0
olaced			60		120	-111		1.0
ilar to joint	V		C _{cr}		120	αg	,V,⊥	2,0
22:	Group fac	tor for and	hor group	in case of	shear load	ing perpen	dicular to f	ree edge
Configurati	on		with c [mm]	2	with s [mi	n]≥		
olaced			60		120	1.116		1,0
rizontal	V		Ccr		240	α		2,0
placed	E I		60		120		[-]	1,0
lar to	V				100	α,ς	I,V,L	2,0
	free and the second		Sec. 2	11.1.2		1. A		
23:	Characte	ristic value	s of resista	and a second second			ads	
		-		Cna				
	rage		d/d		Use callege			d/d; w/d; w/
	ffect		uru		1	w.a, w.w		All
Sleeve	a c	40°C/24°C	80°C/50°C	120°C/72°C	40°C/24°C	80°C/50°C	120°C/72°C	temperature ranges
	h _{ef}		$N_{Rk,b} = N_{Rk,p}$	1)	1	$N_{Rk,b} = N_{Rk,p}$	1)	V _{Rk,b} ⁴⁾
	[mm]				[kN]			
	1.1			Compress	ive strength	f _b ≥ 8 N/mn	n ²	Contrast V
12x80	80					1,2	0,9	$2,5^{2}(0,9)^{3}$
16x85	85	1,5	1,5	1,2	1,5	1,5	1,2	4,0 ²⁾ (1,5) ³
16x130	130					1,5	1,2	$4,0^{2}(1,5)^{3}$
20x85	85	1.7						
20x130	130	4,5	4,0	3,0	4,5	4,0	3,0	$4,0^{2}(1,5)^{3}$
20x200	200							
		1	1000	Compressi	ive strength	f _b ≥ 12 N/mr	n ²	
		2,0	2,0	1,5	2,0	1,5	1,2	$3,0^{2}$ $(1,2)^{3}$
12x80	80		2,0	1,5	2,0	2,0	1,5	$4,5^{2}(1,5)^{3}$
12x80 16x85	80 85	2,0		1 7 12	2,5	2,5	1,5	4,5 ²⁾ (1,5) ³
		2,0 2,5	2,5	1,5	2,5	2,0	,,-	
16x85	85		17/1	1,5	2,5	2,5	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	S
16x85 16x130	85 130		17/1	1,5 4,0	6,0	5,5	4,0	4,5 ²⁾ (1,5) ³
	placed lar to joint 22: Configuration placed rizontal placed lar to joint 23: Sleeve 12x80 16x85 16x130	placed ilar to joint 22: Group face Configuration placed placed rizontal placed placed rizontal placed placed placed placed placed ilar to joint Z3: Character Sleeve strong her [mm] 12x80 80 16x85 85 16x130 130	placed lar to joint Image: Configuration 22: Group factor for and Configuration placed rizontal Image: Configuration Sieeve Image: Configuration Image: Configuration Image: Configuration Sieeve Image: Configuration Image: Configuration Image: Configuration Image: Configuration Image: Configuration Sieeve Image: Configuration Image: Configuration Image: Configuration Image: Configuration Image: Configuration Image: Configuration <	corrcorrplaced ular to jointV6022:Configurationwith c [mm]olaced nizontalplaced ular to jointVplaced nizontalVplaced ular to joint60Corr60Corr60Corr60Corr60Corr60corr60corr60Corr60SileeveSileSile60Mark8012x808016x85851,51,516x130130	corrcorrplaced ilar to joint \mathbf{C}_{cr} 60corr22: Group factor for anchor group in case of ConfigurationConfigurationwith c [mm] \geq olaced rizontalolaced niar to jointCharacteristic values of resistance underCharacteristic values of resistance underCharacteristic values of resistance underOr Cha ad/dOr Characteristic values of resistance underOr Cha ad/dI 2x8080 10x8512x8080 1012x8080 1012x8080 1012x8080 1012x8080 10I 2x8080 10I 2x8080 10I 2x8080 10 <th< td=""><td>ccr240placed ilar to joint\mathcal{C}_{cr}24060120Car120Cer120Configurationwith c [mm] \geqwith s [mrolaced olaced drizontal\mathcal{O}120Configurationwith c [mm] \geqwith s [mrolaced urizontal\mathcal{O}60120corr24060120corr24060120corr24060120Corr240Olaced ular to joint\mathcal{O}60120Characteristic values of resistance under tension ar Use categoCharacteristic values of resistance under tension ar Use categoCharacteristic values of resistance under tension ar Use categoCharacteristic values of resistance under tension ar Use categoSleeve$\mathcal{N}_{er}$$\mathcal{N}_{Rk,b} = N_{Rk,p}^{1/3}$ImmImmImmImm12x8080 16x851,51,51,216x1301301,51,51,21,5</td><td>ccr240placed llar to joint\mathcal{C}_{cr}240Configuration\mathcal{C}_{cr}120Configurationwith c [mm] \geqwith s [mm] \geqConfigurationwith c [mm] \geqwith s [mm] \geqccr240\mathcal{C}_{cr}configuration\mathcal{C}_{cr}240configuration$\mathcal{C}_{cr}$$\mathcal{C}_{cr}$configuration$\mathcal{C}_{cr}$$\mathcal{C}_{d0}$configuration$\mathcal{C}_{cr}$$\mathcal{C}_{d0}$configuration$\mathcal{C}_{cr}$$\mathcal{C}_{d0}$configuration$\mathcal{C}_{cr}$$\mathcal{C}_{d0}$configuration$\mathcal{C}_{cr}$$\mathcal{C}_{d0}$configuration$\mathcal{C}_{cr}$$\mathcal{C}_{d0}$configuration$\mathcal{C}_{cr}$$\mathcal{C}_{d0}$configuration$\mathcal{C}_{cr}$$\mathcal{C}_{d0}$configuration$\mathcal{C}_{cr}$$\mathcal{C}_{d0}$configuration$\mathcal{C}_{cr}$$\mathcal{C}_{d0}$configuration$\mathcal{C}_{cr}$$\mathcal{C}_{d0}$configuration$\mathcal{C}_{cr}$$\mathcal{C}_{d0}$configuration$\mathcal{C}_{cr}$$\mathcal{C}_{cr}$configuration$\mathcal{C}_{cr}$$\mathcal{C}_{cr}$configuration$\mathcal{C}_{cr}$$\mathcal{C}_{d0}$configuration$\mathcal{C}_{cr}$$\mathcal{C}_{cr}$configuration$\mathcal{C}_{cr}$$\mathcal{C}_{cr}$configuration$\mathcal{C}_{cr}$$\mathcal{C}_{cr}$configuration$\mathcal{C}_{cr}$$\mathcal{C}_{cr}$configuration$\mathcal{C}_{cr}$$\mathcal{C}_{cr}$configuration$\mathcal{C}_{cr}$$\mathcal{C}_{cr}$configuration<</td><td>$\begin{array}{c c c c c c c c c c c c c c c c c c c$</td></th<>	ccr240placed ilar to joint \mathcal{C}_{cr} 24060120Car120Cer120Configurationwith c [mm] \geq with s [mrolaced olaced drizontal \mathcal{O} 120Configurationwith c [mm] \geq with s [mrolaced urizontal \mathcal{O} 60120corr24060120corr24060120corr24060120Corr240Olaced ular to joint \mathcal{O} 60120Characteristic values of resistance under tension ar Use categoCharacteristic values of resistance under tension ar Use categoCharacteristic values of resistance under tension ar Use categoCharacteristic values of resistance under tension ar Use categoSleeve \mathcal{N}_{er} $\mathcal{N}_{Rk,b} = N_{Rk,p}^{1/3}$ ImmImmImmImm12x8080 16x851,51,51,216x1301301,51,51,21,5	ccr240placed llar to joint \mathcal{C}_{cr} 240Configuration \mathcal{C}_{cr} 120Configurationwith c [mm] \geq with s [mm] \geq Configurationwith c [mm] \geq with s [mm] \geq ccr240 \mathcal{C}_{cr} configuration \mathcal{C}_{cr} 240configuration \mathcal{C}_{cr} \mathcal{C}_{cr} configuration \mathcal{C}_{cr} \mathcal{C}_{d0} configuration \mathcal{C}_{cr} \mathcal{C}_{cr} configuration \mathcal{C}_{cr} \mathcal{C}_{cr} configuration \mathcal{C}_{cr} \mathcal{C}_{d0} configuration \mathcal{C}_{cr} \mathcal{C}_{cr} configuration<	$\begin{array}{c c c c c c c c c c c c c c c c c c c $

Injection System VMU plus for masonry

Performances - Calcium silicate hollow brick KSL-3DF Group factor, Characteristic values of resistance



Brick typ	e: Calciun	n silicate h	ollow brid	k KSL-3DF							
Table C	24:	Character	istic value	s of resista	ance under	tension ar	nd shear lo	ads (contin	ue)		
					Char	acteristic res	sistance				
		ge (e				Use catego					
		ffectiv Ichora depth		d/d		w/d; w/w			d/d; w/d; w/w		
Anchor size	Sleeve L c	Sleeve	r size Sleeve ມີມູດ ສີ່ມີເອ	Effe anch de	40°C/24°C	80°C/50°C	120°C/72°C	40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges
		h _{ef}		$N_{Rk,b} = N_{Rk,p}$	1)		$N_{Rk,b} = N_{Rk,p}$	1)	V _{Rk,b} ⁴⁾		
		[mm]				[kN]					
					Compressi	ve strength	f _b ≥ 14 N/mı	n²			
M8	12x80	80	2,5	2,5	1,5	2,0	2,0	1,5	3,5 ²⁾ (1,5) ³⁾		
M8 / M10 /	16x85	85	2,5	2,5	1,5	2,5	2,5	1,5	6,0 ²⁾ (2,0) ³⁾		
IG-M6	16x130	130	2,5	2,5	2,0	2,5	2,5	2,0	6,0 ²⁾ (2,0) ³⁾		
M12 / M16 /	20x85 85										
IG-M8 /	20x130	130	6,5	6,0	4,5	6,5	6,0	4,5	6,0 ²⁾ (2,0) ³⁾		
IG-M10	20x200	200									

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

2)

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

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

Table C25: Displacements

Anchor size	Sleeve	h _{ef} [mm]	N [kN]	δ _N / N [mm/kN]	δ _{N0} [mm]	δ _{N∞} [mm]	V [kN]	δ _{∨0} [mm]	δ _{∨∞} [mm]
M8	12x80	80					1,0	1,0	1,50
M8 / M10 /	16x85	85	0,71		0,64	1,29			
IG-M6	16x130	130		0.00					
M12 / M16 /	20x85	85		0,90			1,7	1,9	2,85
IG-M8 /	20x130	130	1,86		1,67	3,34			
IG-M10	20x200	200							

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



Table C26: Description of	and a distributed the second sec				
Brick type	Calcium silicate hollow KSL-12DF	brick			
Bulk density $ ho$ [kg/dm ³]	1,4	-	121		
Compressive strength $f_b \ge [N/mm^2]$	10, 12 or 16			44	
Code	EN 771-2				- 2
Producer (country code)	e.g. Wemding (DE)			-	N
Brick dimensions [mm]	498 x 175 x 238			P	pc
Drilling method	Rotary	-		1	
$\left\{ \begin{array}{c} \bigcirc \\ \end{array} \right\} $) - (17	9
35, 59, 64,	1 1	59 / 64 /	59 ₇ 3	5	
Table C27: Spacing and e	1 1	1 1	1	5	
Table C27: Spacing and e	dge distances	All sizes	1	5	
Table C27: Spacing and e Anchor size Ccr Edge distance Ccr	1 1	All sizes 100 (120) 100 (120)	s 1)	5	
Table C27: Spacing and e Anchor size Edge distance Edge distance Ccr Minimum edge distance Cmin ² Spacing Scr.II	dge distances [mm] [mm] [mm]	All sizes 100 (120) 100 (120) 498	s 1)	5	
Table C27: Spacing and e Anchor size Edge distance Edge distance C _{cr} Minimum edge distance C _{min} ²⁾ Spacing S _{cr,ll} Minimum spacing S _{min}	dge distances [mm] [mm] [mm] [mm] [mm]	All sizes 100 (120) 100 (120)	s 1)	5	
Table C27: Spacing and e Anchor size Edge distance C_{cr} Edge distance $C_{min}^{2/}$ Minimum edge distance $S_{cr,ll}$ Spacing $S_{cr,l}$ Minimum spacing S_{min} 1) Value in brackets for VM-SH 20x85 a 2) For $V_{Rk,c}$: C_{min} according to ETAG 025	dge distances [mm] [mm] [mm] [mm] [mm] and VM-SH 20x130	All sizes 100 (120) 100 (120) 498 238 120	8 1) 1)	5	
Table C27: Spacing and e Anchor size Edge distance Ccr Edge distance Cmin ² Spacing Scr.ll Scr.ll Minimum spacing Smin Smin ¹⁾ Value in brackets for VM-SH 20x85 a Scr.VRk,c: Cmin according to ETAG 025 Table C28: Group factor for	dge distances [mm] [mm] [mm] [mm] [mm] and VM-SH 20x130 9, Annex C or anchor group in case	All sizes 100 (120) 100 (120) 498 238 120 e of tension loading	8 1) 1)	5	1.0
Table C27: Spacing and e Anchor size Edge distance Ccr Edge distance Cmin ² Spacing Scr.ll Scr.ll Minimum spacing Smin Smin ¹⁾ Value in brackets for VM-SH 20x85 at 2° For V _{Rk,c} : cmin according to ETAG 029 Table C28: Group factor for Configuration II: anchors placed parallel to horizontal Image: Configuration	dge distances [mm] [mm] [mm] [mm] [mm] [mm] and VM-SH 20x130 ∂, Annex C or anchor group in case with c [mm] ≥ 100	All sizes 100 (120) 100 (120) 498 238 120 e of tension loading with s [mm] ≥	8 1) 1)	5	1,0
Table C27: Spacing and e Anchor size Edge distance Ccr Edge distance Cmin ² Minimum edge distance Cmin ² Spacing Scr.II Minimum spacing Smin ¹⁾ Value in brackets for VM-SH 20x85 at 2 ³ For V _{Rk,c} : Cmin according to ETAG 029 Table C28: Group factor for Configuration II: anchors placed parallel to horizontal joint	dge distances [mm] [mm] [mm] [mm] [mm] and VM-SH 20x130 ∂, Annex C or anchor group in case with c [mm] ≥	All sizes 100 (120) 100 (120) 498 238 120 e of tension loading with s [mm] ≥ 120	s 1) 1)	5	2,0
Table C27: Spacing and e Anchor size Edge distance Ccr Edge distance Cmin ² Spacing Scr.ll Scr.ll Minimum spacing Smin Smin ¹⁾ Value in brackets for VM-SH 20x85 at For V _{Rk,c} : Cmin according to ETAG 029 Table C28: Group factor for Configuration II: anchors placed parallel to horizontal Image: Configuration	dge distances [mm] [mm] [mm] [mm] [mm] and VM-SH 20x130 ∂, Annex C or anchor group in case with c [mm] ≥ 100 C _{cr}	All sizes 100 (120) 100 (120) 498 238 120 e of tension loading with s [mm] ≥ 120 498	s 1) 1)		



Table C	29:	Group fac	tor for and	hor group	in case of	shear load	ing paralle	I to free ed	ge
1.10.11	Configurati	on		with c [mm]	≥	with s [mr	n]≥		4.55.4
II: anchors parallel to he joint	orizontal			C _{cr}		498	α	a,V,II	2,0
⊥: anchors perpendic horizonta	ular to			C _{cr}		238	α	a,v,±	2,0
Table C	30:	Group fac	tor for and	hor group	in case of	shear load	perpendic	ular to free	edge
	Configurati	on		with c [mm]≥	with s [mr	n]≥		
II: anchors parallel to he joint	orizontal			C _{cr}		498	α	g,∨,II	2,0
⊥: anchors perpendic horizonta	ular to			C _{cr}		238	α	p.V.⊥	2,0
Table C	31:	Character	istic value	s of resist	ance under			ads	
10.000					Char	racteristic res			_
American	Classic	Effective anchorage depth		d/d		Use catego	w/d; w/w		d/d w/d w/w
Anchor size	Sleeve	аш	40°C/24°C	80°C/50°C			80°C/50°C	120°C/72°C	All temperature ranges
		h _{ef}		$N_{Rk,b} = N_{Rk,p}$	1)		$N_{Rk,b} = N_{Rk,p}$	1)	V _{Rk,b} ²⁾³⁾
		[mm]			1	[kN]			
						ve strength			
	26.22		0,6	0,6	0,4	0,5	0,5	0,4	2,5
M8	12x80	80		0.0				0,4	5,5 5,5
M8/M10/	16x85	85	0,6	0,6	0,4	0,6	0,6	20	
M8 / M10 / IG-M6	16x85 16x130	85 130	0,6 2,5	2,5	2,0	2,5	2,5	2,0	
M8 / M10 / IG-M6 M12 / M16 / IG-M8 /	16x85 16x130 20x85	85 130 85	0,6 2,5 1,5	2,5 1,5	2,0 0,9	2,5 1,5	2,5 1,5	0,9	5,5
M8 / M10 / IG-M6 M12 / M16 /	16x85 16x130	85 130	0,6 2,5	2,5	2,0 0,9 2,0	2,5 1,5 2,5	2,5 1,5 2,5	0,9 2,0	
M8 / M10 / IG-M6 M12 / M16 / IG-M8 / IG-M10	16x85 16x130 20x85 20x130	85 130 85 130	0,6 2,5 1,5 2,5	2,5 1,5 2,5	2,0 0,9 2,0 Compressi	2,5 1,5 2,5 ve strength	2,5 1,5 2,5 f _b ≥ 12 N/m	0,9 2,0 m ²	5,5 5,5
M8 / M10 / IG-M6 M12 / M16 / IG-M8 / IG-M10 M8	16x85 16x130 20x85 20x130 12x80	85 130 85 130 80	0,6 2,5 1,5 2,5 0,75	2,5 1,5 2,5 0,6	2,0 0,9 2,0 Compressi 0,5	2,5 1,5 2,5 ve strength 0,6	2,5 1,5 2,5 f _b ≥ 12 N/m 0,6	0,9 2,0 m ² 0,4	5,5 5,5 3,0
M8 / M10 / IG-M6 M12 / M16 / IG-M8 / IG-M10 M8 M8 / M10 /	16x85 16x130 20x85 20x130 12x80 16x85	85 130 85 130 80 80 85	0,6 2,5 1,5 2,5 0,75 0,75	2,5 1,5 2,5 0,6 0,6	2,0 0,9 2,0 Compressi 0,5 0,5	2,5 1,5 2,5 ve strength 0,6 0,75	2,5 1,5 2,5 f _b ≥ 12 N/m 0,6 0,6	0,9 2,0 m ² 0,4 0,5	5,5 5,5 3,0 6,5
M8 / M10 / IG-M6 M12 / M16 / IG-M8 / IG-M10 M8 M8 / M10 / IG-M6	16x85 16x130 20x85 20x130 12x80 16x85 16x130	85 130 85 130 80 80 85 130	0,6 2,5 1,5 2,5 0,75 0,75 3,0	2,5 1,5 2,5 0,6 0,6 3,0	2,0 0,9 2,0 Compressi 0,5 0,5 2,0	2,5 1,5 2,5 ve strength 0,6 0,75 3,0	2,5 1,5 2,5 f_b ≥ 12 N/m 0,6 0,6 3,0	0,9 2,0 m ² 0,4 0,5 2,0	5,5 5,5 3,0 6,5 6,5
M8 / M10 / IG-M6 M12 / M16 / IG-M8 / IG-M10 M8 M8 / M10 /	16x85 16x130 20x85 20x130 12x80 16x85	85 130 85 130 80 80 85	0,6 2,5 1,5 2,5 0,75 0,75	2,5 1,5 2,5 0,6 0,6	2,0 0,9 2,0 Compressi 0,5 0,5	2,5 1,5 2,5 ve strength 0,6 0,75	2,5 1,5 2,5 f _b ≥ 12 N/m 0,6 0,6	0,9 2,0 m ² 0,4 0,5	5,5 5,5 3,0 6,5

Calculation of $V_{Rk,c}$ see ETAG 029, Annex C, except for shear load parallel to free edge with $c \ge 120$ mm: $V_{Rk,c,II} = V_{Rk,b}$ The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply $V_{Rk,b}$ by 0,8 3)

Injection System VMU plus for masonry

Performance - Calcium silicate hollow brick KSL-12DF Group factor, Characteristic values of resistance

Deutsches Institut DIBt für Bautechnik

Brick type:	Calcium	silicate ho	llow brick	KSL-12DF					
Table C	32:	Character	istic value	s of resista	ance under	tension ar	nd shear lo	ads (contin	ue)
					Char	racteristic res	sistance		
Anchor size	Sleeve	Effective anchorage depth		d/d		w/d; w/w		d/d w/d w/w	
Anchor size	Sleeve	au E	40°C/24°C	80°C/50°C	120°C/72°C	40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges
		h _{ef}		$N_{Rk,b} = N_{Rk,p}$	1)		$N_{Rk,b} = N_{Rk,p}$	1)	V _{Rk,b} ²⁾³⁾
		[mm]				[kN]			
					Compressi	ve strength	f _b ≥ 16 N/mı	m²	
M8	12x80	80	0,9	0,9	0,6	0,75	0,75	0,5	3,5
M8 / M10 /	16x85	85	0,9	0,9	0,6	0,9	0,9	0,6	8,0
IG-M6	16x130	130	4,0	3,5	2,5	4,0	3,5	2,5	8,0
M12 / M16 /	20x85	85	2,0	2,0	1,5	2,0	2,0	1,5	8,0
IG-M8 / IG-M10	20x130	130	4,0	3,5	2,5	4,0	3,5	2,5	8,0

1)

Values are valid for c_{cr} and c_{min} Calculation of $V_{Rk,c}$ see ETAG 029, Annex C, except for shear load parallel to free edge with $c \ge 120$ mm: $V_{Rk,c,II} = V_{Rk,b}$ 2)

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

Table C33: Displacements

Anchor	Sleeve	h _{ef}	Ν	δ _N / N	δ _{N0}	δ _{N∞}	V	δ _{V0}	δ∨∞
size		[mm]	[kN]	[mm/kN]	[mm]	[mm]	[kN]	[mm]	[mm]
M8	12x80	80	0,26		0.23	0.46	1,0	1,3	1,95
M8 / M10 /	16x85	85	0,20		0,23	0,46			
IG-M6	16x130	130	1,14	0,90	1,03	2,06		0.5	0.75
M12 / M16 /	20x85	85	0,57		0,51	1,03	2,3	2,5	3,75
IG-M8 / IG-M10	20x130	130	1,14		1,03	2,06			

Injection System VMU plus for masonry

Performance - Calcium silicate hollow brick KSL-12DF Characteristic values of resistance (continue), Displacements



Table C34: De	scription of						
Brick type		Clay s Mz-DF	olid brick				
Bulk density	ρ [kg/dm ³]	1,6			-		
Compressive strength	$f_b \ge [N/mm^2]$	10, 20	or 28		and the second		
Code		EN 77	1-1		-		
Producer (country code)		e.g. U	nipor (DE)			2. 1 1	
Brick dimensions	[mm]		115 x 55			~	
Drilling method		Hamm	ner				
Table C35: Sp	acing and e	dge dis	stances				
Anchor size				Alle Größe	en		
Edge distance	Ccr	[mm]		1,5*h _{ef}			
Minimum edge distance Spacing	Cmin	[mm]		60 3*h _{ef}	_		
Spacing Minimum spacing	S _{cr} S _{min}	[mm] [mm]		<u>3"n_{ef}</u> 120			
	Sector 14		n de la la capital de la	State School	5		
	oup factor fo			of tension loading	1		
Configuration		1	vith c [mm] ≥	with s [mm] ≥		-	
II; anchors placed parallel to horizontal joint			60 1,5*hef	120 3*h _{ef}	α _{g,N,II}		0,7 2,0
	T T		60	120		[-]	0,5
⊥: anchors placed perpendicular to	•		1,5*hef	120	-		1,0
horizontal joint			1,5*hef	3*h _{ef}	α _{g,N,⊥}	1 - 14	2,0
	- 2.7 - 1.16	1.1.4		C Mer	0.0.0		-1-
	oup factor fo			of shear loading pa	rallel to f	ree edge	-
Configuration		1	vith c [mm] ≥	with s [mm] ≥			
II: anchors placed			60	120	-		0,5
parallel to horizontal	V		90	120	αg,V,II		1,1
Joint	man line and		1,5*hef	3*h _{ef}	-	[-]	2,0
⊥: anchors placed	v 1		60	120			0,5
perpendicular to horizontal joint	Y (1,5*hef 1,5*hef	120 3*h _{ef}	α _{g,V,⊥}		1,0 2,0
Sector Sector	toria dem palla.		1,0 1101) S Hef			2,0
and the second	oup factor fo	r anch	or group in case	of shear load perpe	endicular	to free ec	lge
Configuration		N	vith c [mm] ≥	with s [mm] ≥			
II: anchors placed			60	120	1		0,5
parallel to horizontal	/+		1,5*hef	120	-α _{g,V,II}		1,0
joint			1,5*hef	3*h _{ef}		[-]	2,0
⊥: anchors placed	1 martine		60	120	-		0,5
perpendicular to			1,5*hef	120	αg,V,⊥		1,0
			1,5*hef	3*h _{ef}			2,0
	_						



Brick type: C	lay solid br	ick Mz-DF				
Table C3	9: C	haracteristic v	alues of resistan	ce under tension	and shear loads	
				Characteris	tic resistance	
		υ		Use c	ategory	
		Effective Inchorage depth		d/d		d/d
		tect		w/d		w/d
Anchor size	Sleeve	Effective Anchorage depth		w/w		w/w
			40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges
		h _{ef}		$N_{Rk,b} = N_{Rk,p}^{1)}$		V _{Rk,b} ²⁾³⁾
		[mm]			<n]< td=""><td></td></n]<>	
				Compressive stre	ength f _b ≥ 10 N/mm ²	
M8	-	80	3,5 (1,5)	3,5 (1,5)	2,5 (1,2)	3,5 (1,2)
M10 / IG-M6	-	90	3,5 (1,5)	3,5 (1,5)	3,0 (1,5)	3,5 (1,2)
M12 / IG-M8	-	100	4,0 (2,0)	4,0 (2,0)	3,5 (1,5)	3,5 (1,2)
M16 / IG-M10	-	100	4,0 (2,0)	4,0 (2,0)	3,5 (1,5)	5,5 (1,5)
M8	12x80	80	3,5 (1,5)	3,5 (1,5)	3,0 (1,2)	3,5 (1,2)
M8 / M10 /	16x85	85				
IG-M6	16x130	130				
M12 / M16 /	20x85	85	3,5 (1,5)	3,5 (1,5)	3,0 (1,5)	3,5 (1,2)
IG-M8 /	20x130	130				
IG-M10	20x200	200				
				Compressive stre	ngth f _b ≥ 20 N/mm ²	_
M8	-	80	4,5 (2,5)	4,5 (2,5)	4,0 (2,0)	5,0 (1,5)
M10 / IG-M6	-	90	5,5 (2,5)	5,5 (2,5)	4,5 (2,0)	5,0 (1,5)
M12 / IG-M8	-	100	6,0 (3,0)	6,0 (3,0)	5,0 (2,5)	5,0 (1,5)
M16 / IG-M10	-	100	6,0 (3,0)	6,0 (3,0)	5,0 (2,5)	8,0 (2,5)
M8	12x80	80	4,5 (2,5)	4,5 (2,5)	4,0 (2,0)	5,0 (1,5)
M8 / M10 /	16x85	85				
IG-M6	16x130	130				
M12 / M16 /	20x85	85	5,0 (2,5)	5,0 (2,5)	4,0 (2,0)	5,0 (1,5)
IG-M8 /	20x130	130				
IG-M10	20x200	200				
					ngth f _b ≥ 28 N/mm ²	
M8	-	80	5,5 (2,5)	5,5 (2,5)	4,5 (2,5)	5,5 (2,0)
M10 / IG-M6	-	90	6,0 (3,0)	6,0 (3,0)	5,0 (2,5)	5,5 (2,0)
M12 / IG-M8	-	100	7,0 (3,5)	7,0 (3,5)	6,0 (3,0)	5,5 (2,0)
M16 / IG-M10	-	100	7,0 (3,5)	7,0 (3,5)	6,0 (3,0)	9,0 (3,0)
M8	12x80	80	5,5 (2,5)	5,5 (2,5)	4,5 (2,5)	5,5 (2,0)
M8 / M10 /	16x85	85				
IG-M6	16x130	130				
M12 / M16 /	20x85	85	6,0 (3,0)	6,0 (3,0)	5,0 (2,5)	5,5 (2,0)
IG-M8 /	20x130	130				
1) Value	20x200	200				

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

For c_{cr} calculation of $V_{Rk,c}$ see ETAG 029, Annex C; for c_{min} values in brackets $V_{Rk,c} = V_{Rk,b}$

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

Injection System VMU plus for masonry

Performance - Clay solid brick Mz-DF

Characteristic values of resistance



Brick type: Clay solid brick Mz-DF

Table C40: Displacements

Anchor size	Sleeve	h _{ef} [mm]	N [kN]	δ _N / N [mm/kN]	δ _{N0} [mm]	δ _{N∞} [mm]	V [kN]	δ _{V0} [mm]	δ _{∨∞} [mm]
M8	-	80	1,3		0,19	0,39			
M10 / IG-M6	-	90	1,6		0,24	0,47	1,9		
M12 / IG-M8	-	100	4 7		0.00	0.51			
M16 / IG-M10	-	100	1,7		0,26	0,51	2,9		
M8	12x80	80		0.45				1 00	1.50
M8 / M10 /	16x85	85		0,15				1,00	1,50
IG-M6	16x130	130	1 2		0.10	0.20	1.0		
M12 / M16 /	20x85	85	1,3		0,19	0,39	1,9		
IG-M8 /	20x130	130							
IG-M10	20x200	200							

Injection System VMU plus for masonry

Performance - Clay solid brick Mz-DF Displacements



Brick type		Clay hollow brick HLz-16-DF		-		
Bulk density	[kg/dm ³]	0,8		100	and the second	
	≥ [N/mm ²]	6, 8, 12 or 14		100	1	No.
Code		EN 771-1				
Producer (country code)		e.g. Unipor (DE)		1 A A A A A A A A A A A A A A A A A A A		
Brick dimensions	[mm]	497 x 240 x 238			-	-
Drilling method		Rotary			-	
Table C42: Spaci Anchor size	C _{cr} 2) C _{min} S _{cr,⊥} S _{min} 20x85; VM-S	dge distances	All sizes 100 (120) 100 (120) 497 238 100 00) ¹⁾		
Table C42: Spaci Anchor size Spaci Edge distance Minimum edge distance Spacing Minimum spacing ¹⁰ Value in bracket for VM-SH 2 For V _{Rk.c} : cmin according to ET	Ccr Cmin Cmin Scr,II Scr,⊥ Smin 0x85; VM-SAG 029, An	[mm] [mm] [mm] [mm] [mm] SH 20x130 and VM-SH 20x2	All sizes 100 (120) 100 (120) 497 238 100 00) ¹⁾		
Table C42: Spaci Anchor size Spaci Edge distance Minimum edge distance Spacing Minimum spacing Unimum spacing Value in bracket for VM-SH 2 D Value in bracket for VM-SH 2 P For V _{Rk.c} : cmin according to ET	Ccr Cmin Cmin Scr,II Scr,⊥ Smin 0x85; VM-SAG 029, An	[mm] [mm] [mm] [mm] [mm] SH 20x130 and VM-SH 20x2 inex C	All sizes 100 (120) 100 (120) 497 238 100 00) ¹⁾		
Table C42: Spaci Anchor size Spaci Edge distance Minimum edge distance Spacing Minimum spacing ¹⁰ Value in bracket for VM-SH 2 ¹⁰ Value in bracket for VM-SH 2 ¹⁰ For V _{Rk,c} : cmin according to ET Table C43: Group Configuration II: anchors placed	C _{cr} C _{min} S _{cr,1} S _{min} 0x85; VM-S AG 029, An factor fo	[mm] [mm] [mm] [mm] [mm] SH 20x130 and VM-SH 20x2 inex C r anchor group in case	All sizes 100 (120) 100 (120) 497 238 100 00 • of tension loading) ¹⁾		1,3
Table C42: Spaci Anchor size Spaci Edge distance Minimum edge distance Spacing Minimum spacing ⁽¹⁾ Value in bracket for VM-SH 2 For V _{Rk,c} : cmin according to ET Table C43: Group Configuration II: anchors placed parallel to horizontal	Ccr Cmin Cmin Scr,II Scr,⊥ Smin 0x85; VM-SAG 029, An	[mm] [mm] [mm] [mm] [mm] SH 20x130 and VM-SH 20x2 inex C r anchor group in case with c [mm] ≥ C _{cr}	All sizes 100 (120) 100 (120) 497 238 100 00 00 with s [mm] ≥ 100) ¹⁾		
Table C42: Spaci Anchor size Spaci Edge distance Minimum edge distance Minimum edge distance Spacing Minimum spacing Image: Spacing Value in bracket for VM-SH 2 For V _{Rk.c} : cmin according to ET Table C43: Group Configuration II: anchors placed parallel to horizontal joint	C _{cr} C _{min} S _{cr,1} S _{min} 0x85; VM-S AG 029, An factor fo	[mm] [mm] [mm] [mm] [mm] SH 20x130 and VM-SH 20x2 inex C r anchor group in case with c [mm] ≥ C _{cr} C _{cr}	All sizes 100 (120) 100 (120) 497 238 100 00 of tension loading with s [mm] ≥ 100 497	1) 1)	[-]	2,0
Table C42: Spaci Anchor size Spaci Edge distance Minimum edge distance Spacing Minimum spacing ¹ Value in bracket for VM-SH 2 For V _{Rk,c} : cmin according to ET Table C43: Group Configuration II: anchors placed II: anchors placed Inizion	C _{cr} C _{min} S _{cr,1} S _{min} 0x85; VM-S AG 029, An factor fo	[mm] [mm] [mm] [mm] [mm] SH 20x130 and VM-SH 20x2 inex C r anchor group in case with c [mm] ≥ C _{cr}	All sizes 100 (120) 100 (120) 497 238 100 00 00 with s [mm] ≥ 100	1) 1)	[-]	1,3 2,0 1,1

Performance - Clay hollow brick HLz-16DF

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



Table C44:		oup factor to	or anchor group in case of shear			to free edge	·	
Configuration			with c [mm] ≥	with s [m	im]≥		_	
II: anchors placed parallel to horizontal joint L: anchors placed perpendicular to horizontal joint			Ccr	497	-ag,v	C	2,0	
			C _{cr}	238	α _{g,V}	(.μ.	2,0	
Table C45:	Gro	oup factor fo	r anchor group in	case of shear load	d perpendicu	lar to free e	dge	
Co	nfiguration		with c [mm] ≥	with s [n	im]≥	1.1.1		
II: anchors placed parallel to horizontal joint			C _{cr}	497	$\alpha_{g,V}$	(,II [-]	2,0	
L: anchors placed perpendicular to horizontal joint		V	C _{cr}	238	α _{9.V}		2,0	
Table C46:	Cha	aracteristic	values of resistanc	e under tension a	nd shear loa	ds		
			Characteristic resistance					
		0.0		Use cat	egory			
Anchor size	Sleeve	Effective Anchorage depth		d/d w/d w/w		. 1.	d/d w/d w/w	
1010000		-4 -	40°C/24°C 80°C/50°C		120°C/72°	C	All temperatur ranges	
		h _{ef}	$N_{Rk,b} = N_{Rk,p}^{(1)}$				V _{Rk,b} ²⁾³⁾	
		[mm]	[kN]				[kN]	
			Compressive streng					
M8	12x80	80	2,5	2,5	2,0		2,5	
M8 / M10/ IG-M6	16x85	85	2,5	2,5	2,0		4,5	
	16x130	130	3,5	3,5	3,0		4,5	
M12/M16/	20x85	85	2,5	2,5	2,0		5,0	
IG-M8 / IG-M10	20x130	130 200	3,5 3,5	3,5 3,5	3,0 3,0		6,0	
20x200		200			6,0			
M8	12x80	80	Compressive streng		0.5	1	2.0	
IVIO	12x80 16x85	80	3,0 3,0	3,0	2,5		3,0 5,5	
M8 / M10/ IG-M6	16x05	130	4,5	4,5	3,5		5,5	
	20x85	85	3,0	3,0	2,5		5,5 6,0	
M12/M16/	20x03	130		4,5 4,5 3,5			7,0	
	20x200	200	4,5	4,5	3,5		7,0	
M12 / M16 / IG-M8 / IG-M10		r and c _{min}						

Group factor, Characteristic values of resistance



Brick type: Clay hollow brick HLz-16DF									
Table C47:	Cha	aracteristic	values of resistan	ce under tension a	nd shear loads (c	ontinue)			
Anchor size Slee		Effective Anchorage depth	Characteristic resistance						
			Use category						
	Sleeve			d/d w/d w/w					
		<	40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges			
		h _{ef}	$N_{Rk,b} = N_{Rk,p}^{(1)}$			V _{Rk,b} ²⁾³⁾			
		[mm]		[kN]					
Compressive strength f _b ≥ 12 N/mm ²									
M8	12x80	80	3,5	3,5	3,0	4,0			
M8 / M10/ IG-M6	16x85	85	3,5	3,5	3,0	6,5			
	16x130	130	5,0	5,0	4,5	6,5			
M12 / M16 / IG-M8 / IG-M10 -	20x85	85	3,5	3,5	3,0	7,0			
	20x130	130	5,0	5,0	4,5	9,0			
	20x200	200	5,0	9,0					
			Compressive strer	ոgth f _b ≥ 14N/mm²					
M8	12x80	80	4,0	4,0	3,0	4,0			
M8 / M10/ IG-M6	16x85	85	4,0	4,0	3,0	6,5			
	16x130	130	5,5	5,5	4,5	6,5			
	20x85	85	4,0	4,0	3,0	7,0			
M12 / M16 / IG-M8 / IG-M10	20x130	130	5,5	5,5	4,5	9,0			
IG-108 / IG-10110	20x200	200	5,5	5,5	4,5	9,0			

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

²⁾ Calculation of V_{Rk,c} see ETAG 029, Annex C, except for shear load parallel to free edge with $c \ge 125$ mm: V_{Rk,c,II} = V_{Rk,b}

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

Table C48: Displacements

Anchor size	Sleeve	h _{ef} [mm]	N [kN]	δ _N / N [mm/kN]	δ _{N0} [mm]	δ _{N∞} [mm]	V [kN]	δ _{V0} [mm]	δ _{∨∞} [mm]
M8	12x80	80	1 1 4		0.11	0.22	1,10	1,20	1,80
M8 / M10/ IG- M6	16x85	85	1,14	0,10	0,11	0,23	· 1,86	1,50	2.25
	16x130	130	1,57		0,16	0,31			2,25
M12 / M16 / IG-M8 / IG- M10	20x85	85	1,14		0,11	0,23	1,86	1,50	2,25
	20x130	130	1 57		0,16	0,31	2,57	2,10	3,15
	20x200	200	1,57		0,10	0,31	2,57	2,10	5,15

Injection System VMU plus for masonry

Performance - Clay hollow brick HLz-16DF

Characteristic values of resistance (continue), Displacements



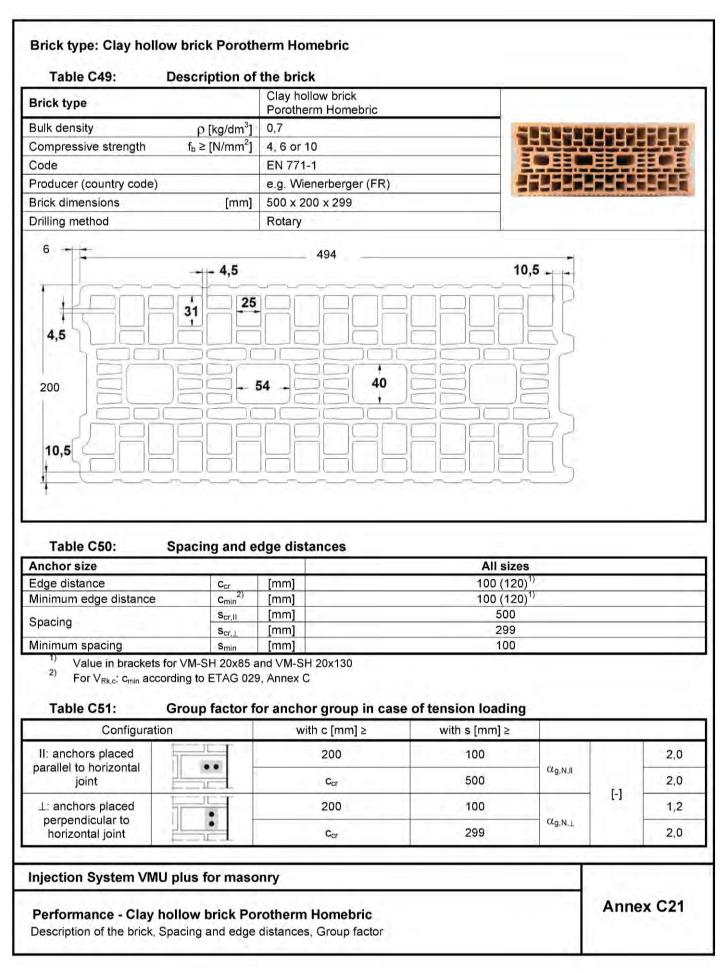




Table C52:		oup factor to		n case of shear load		ee eage	
Co	nfiguration	-	with c [mm] ≥	with s [m	m]≥		
II: anchors plac parallel to horizo joint		V •	Ccr	500	−α, _{g,V,li}		2,0
⊥: anchors plac perpendicular horizontal joir	to	V	C _{cr}	299	$\alpha_{g,V,\perp}$	FI	2,0
Table C53:	Gro	oup factor fo	er anchor group in	n case of shear load	d perpendicular t	o free ec	lge
Co	nfiguration	1.1.1.1.1	with c [mm] ≥	with s [m	im]≥		
II: anchors plac parallel to horizc joint		уг. V	Ccr	500	α _{g.V,II}	[-]	2,0
⊥: anchors plac perpendicular horizontal joir	to	V	Ccr	299	$\alpha_{g,V,\perp}$	E	2,0
Table C54:	Cha	aracteristic	values of resistan	ce under tension a	nd shear loads		
				Characteristic	resistance		
		0 9		Use cat	egory		
Anchor size	Sleeve	Effective Anchorage depth		d/d w/d w/w			d/d w/d w/w
		- 4	40°C/24°C	80°C/50°C	120°C/72°C	r	mperature anges
		h _{ef}		$N_{Rk,b} = N_{Rk,p}^{(1)}$		V	2)3) Rk,b
		[mm]		[kN]		1.	[kN]
			Compressive stre	ngth $f_b \ge 4 N/mm^2$			1
M8	12x80	80	0,9	0,9	0,75		2,0
M8 / M10 / IG-M6	16x85	85	0,9	0,9	0,75		2,0
	16x130	130	1,2	1,2	0,9		2,0
M12 / M16 /	20x85	85	0,9	0,9	0,75		2,5
IG-M8 / IG-M10	20x130	130	1,2	1,2	0,9		2,5
			Compressive stre			i i	2.2
M8	12x80	80	0,9	0,9	0,9	-	2,5
M8 / M10 / IG-M6	16x85	85	0,9	0,9	0,9		2,5
	16x130	130	1,2	1,2	1,2	-	2,5
	20x85 20x130	85 130	0,9 1,2	0,9 1,2	0,9	-	3,0 3,0
M12 / M16 / IG-M8 / IG-M10				1.7			

Injection System VMU plus for masonry

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



Brick type: Clay	/ hollow bi	rick Poroth	erm Homebric			
Table C55:	Cha	aracteristic	values of resistan	ce under tension a	nd shear loads (co	ontinue)
				Characteristic	resistance	
		n e		Use cate	egory	
Anchor size	Sleeve	Effective Anchorage depth		d/d w/d w/w		d/d w/d w/w
		4	40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges
		h _{ef}		$N_{Rk,b} = N_{Rk,p}^{1}$		V _{Rk,b} ²⁾³⁾
		[mm]		[kN]		[kN]
			Compressive stren	gth f _b ≥10 N/mm²		
M8	12x80	80	1,2	1,2	1,2	3,0
M8 / M10/	16x85	85	1,2	1,2	1,2	3,0
IG-M6	16x130	130	1,5	1,5	1,5	3,5
M12 / M16 /	20x85	85	1,2	1,2	1,2	4,0
IG-M8 / IG-M10	20x130	130	1,5	1,5	1,5	4,0

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

2) Calculation of $V_{Rk,c}$ see ETAG 029, Annex C, except for shear load parallel to free edge with c \ge 200 mm: $V_{Rk,c,II} = V_{Rk,b}$

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

Table C56: Displacements

Anchor size	Sleeve	h _{ef}	Ν	δ _N / N	δ _{Ν0}	δ _{N∞}	V	δ_{V0}	δv∞
Anchor size	Sleeve	[mm]	[kN]	[mm/kN]	[mm]	[mm]	[kN]	[mm]	[mm]
M8	12x80	80	0.24		0.07	0.55	0,9		
M8 / M10/	16x85	85	0,34		0,27	0,55	0,9		
IG-M6	16x130	130	0,43	0,80	0,34	0,69	1,0	1,20	1,80
M12 / M16 /	20x85	85	0,34		0,27	0,55			
IG-M8 / IG-M10	20x130	130	0,43		0,34	0,69	1,14		

Injection System VMU plus for masonry

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



Brick type Bulk density Compressive strength Code Producer (country code Brick dimensions Drilling method		4, 6 or 10 EN 771-1 e.g. Leroux (F	FR)			THE		
Compressive strength Code Producer (country code Brick dimensions	f _b ≥ [N/mm ²] e)	0,6 4, 6 or 10 EN 771-1 e.g. Leroux (F 500 x 200 x 3 ⁻				TT	The local division in	
Compressive strength Code Producer (country code Brick dimensions	f _b ≥ [N/mm ²] e)	4, 6 or 10 EN 771-1 e.g. Leroux (F 500 x 200 x 3						
Code Producer (country code Brick dimensions	e)	EN 771-1 e.g. Leroux (F 500 x 200 x 31						
Producer (country code Brick dimensions		e.g. Leroux (F 500 x 200 x 3						
Brick dimensions		500 x 200 x 3						
		1 1 1 1 1 T 1 1 T 1 1						
			500				-	
							-1	
			22		61			
200							35	
						1	-	
15	- II					1	70	
				1		ime	-	
				5				
				5				
Table C58:	Spacing and e	dge distances	s	5				
nchor size			s		All sizes			
nchor size dge distance	Ccr	[mm]	s		All sizes	1)		
inchor size Edge distance Ainimum edge distance	e C _{cr} 2)	[mm] [mm]	s		All sizes 100 (120) 100 (120)	1)		
nchor size dge distance linimum edge distance	e C _{cr} ²⁾ S _{cr,II}	[mm]	S		All sizes	1)		
Anchor size Edge distance Ainimum edge distance Spacing Ainimum spacing	C _{cr} C _{min}) S _{cr,I} S _{cr,⊥} S _{min}	[mm] [mm] [mm] [mm] [mm]			All sizes 100 (120) 100 (120) 500	1)		
Anchor size Edge distance Ainimum edge distance Epacing Ainimum spacing ¹⁾ Values in bracke ²⁾ For V _{Rk,c} : c _{min} ac Table C59:	e C _{cr} e C _{min} S _{cr,II} S _{cr,I} S _{min} sets for VM-SH 20x85 ccording to ETAG 029 Group factor for	[mm] [mm] [mm] [mm] [mm] and VM-SH 20x ² 9, Annex C	130 Dup in case	e of tension	All sizes 100 (120) 100 (120) 500 314 100	1)		
Anchor size Edge distance Minimum edge distance Spacing Minimum spacing ¹⁾ Values in bracke ²⁾ For V _{Rk,c} : c _{min} ac	e C _{cr} e C _{min} S _{cr,II} S _{cr,I} S _{min} sets for VM-SH 20x85 ccording to ETAG 029 Group factor for	[mm] [mm] [mm] [mm] [mm] and VM-SH 20x* 9, Annex C	130 Dup in case		All sizes 100 (120) 100 (120) 500 314 100	1)		
Anchor size Edge distance Ainimum edge distance Spacing Ainimum spacing ¹⁾ Values in bracke ²⁾ For V _{Rk,c} : c _{min} ac Table C59: Configura II: anchors placed	e C _{cr} e C _{min} S _{cr,II} S _{cr,I} S _{min} sets for VM-SH 20x85 ccording to ETAG 029 Group factor for	[mm] [mm] [mm] [mm] [mm] and VM-SH 20x ² 9, Annex C	nm] ≥	e of tension	All sizes 100 (120) 100 (120) 500 314 100 loading mm] ≥			1,7
Anchor size Edge distance Minimum edge distance Spacing Minimum spacing ¹⁾ Values in bracke ²⁾ For V _{Rk,c} : c _{min} ac Table C59: Configura II: anchors placed parallel to horizontal	e C _{cr} e C _{min} S _{cr,II} S _{cr,I} S _{min} sets for VM-SH 20x85 ccording to ETAG 029 Group factor for	[mm] [mm] [mm] [mm] i and VM-SH 20x ⁻⁹ 9, Annex C for anchor gro with c [m 200	130 Dup in case nm] ≥	e of tension with s [i 10	All sizes 100 (120) 100 (120) 500 314 100 loading mm] ≥ 0	1)		
Anchor size Edge distance Minimum edge distance Spacing Minimum spacing ¹⁾ Values in bracke ²⁾ For V _{Rk,c} : c _{min} ac Table C59: Configura II: anchors placed parallel to horizontal joint	e C _{cr} e C _{min} S _{cr,II} S _{cr,I} S _{min} sets for VM-SH 20x85 ccording to ETAG 029 Group factor for	[mm] [mm] [mm] [mm] [mm] [mm] and VM-SH 20x ⁴ 9, Annex C For anchor gro with c [m 200 c _{cr}	130 Dup in case nm] ≥)	e of tension with s [i 10 50	All sizes 100 (120) 100 (120) 500 314 100 100 100 100 100 100 100 1		[-]	2,0
Anchor size Edge distance Minimum edge distance Spacing Minimum spacing ¹⁾ Values in bracke ²⁾ For V _{Rk,c} : c _{min} ac Table C59: Configura II: anchors placed parallel to horizontal joint ⊥: anchors placed	e C _{cr} e C _{min} S _{cr,II} S _{cr,I} S _{min} sets for VM-SH 20x85 ccording to ETAG 029 Group factor for	[mm] [mm] [mm] [mm] i and VM-SH 20x ⁻⁹ 9, Annex C for anchor gro with c [m 200	130 Dup in case nm] ≥)	e of tension with s [i 10	All sizes 100 (120) 100 (120) 500 314 100 100 100 100 100 100 100 1	1) 1) αg,N,II	[-]	
Anchor size Edge distance	Ccr	[mm]	S			All sizes 100 (120)	All sizes 100 (120) ¹⁾	All sizes 100 (120) ¹⁾
acke	e C _{cr} <u>S_{cr,II}</u> <u>S_{cr,⊥}</u> <u>S_{min}</u> xets for VM-SH 20x85	[mm] [mm] [mm] [mm] [mm] and VM-SH 20x ²				All sizes 100 (120) 100 (120) 500 314	All sizes 100 (120) ¹⁾ 100 (120) ¹⁾ 500 314	All sizes 100 (120) ¹⁾ 100 (120) ¹⁾ 500 314
e C _{cr} S _{cr,II} S _{cr,I} S _{min} ets for VM-SH 20x cording to ETAG	85 029	[mm] [mm] [mm] [mm] [mm] and VM-SH 20x* 9, Annex C	130		All si 100 (1 100 (1 50 31 10	120) 120) 00 4 00	120) ¹⁾ 120) ¹⁾ 00 4 00	120) ¹⁾ 120) ¹⁾ 00 4 00
e c _{mín} ²⁾ [mm] s _{cr,ll} [mm] s _{cr,⊥} [mm]	[mm] [mm] [mm] [mm] and VM-SH				All sizes 100 (120) 100 (120) 500 314	1)		
racke _{min} ac	e C _{cr} e C _{min} S _{cr,II} S _{cr,I} S _{min} sets for VM-SH 20x85 ccording to ETAG 029 Group factor for	[mm] [mm] [mm] [mm] [mm] and VM-SH 20x ² 9, Annex C	130 Dup in case	e of tension	All sizes 100 (120) 100 (120) 500 314 100	1)		
nchor size dge distance inimum edge distance pacing ¹⁾ Values in bracke ²⁾ For V _{Rk,c} : c _{min} ac Table C59: Configura	e C _{cr} e C _{min} S _{cr,II} S _{cr,I} S _{min} sets for VM-SH 20x85 ccording to ETAG 029 Group factor for	[mm] [mm] [mm] [mm] and VM-SH 20x ² 9, Annex C For anchor gro with c [m	nm] ≥	e of tension with s [All sizes 100 (120) 100 (120) 500 314 100 loading mm] ≥	1)		1.7
Inchor size dge distance linimum edge distance pacing linimum spacing ¹⁾ Values in bracke ²⁾ For V _{Rk,c} : c _{min} ac Table C59: Configura II: anchors placed parallel to horizontal	e C _{cr} e C _{min} S _{cr,II} S _{cr,I} S _{min} sets for VM-SH 20x85 ccording to ETAG 029 Group factor for	[mm] [mm] [mm] [mm] i and VM-SH 20x ⁻⁹ 9, Annex C for anchor gro with c [m 200	130 Dup in case nm] ≥	e of tension with s [i 10	All sizes 100 (120) 100 (120) 500 314 100 loading mm] ≥ 0			
Inchor size dge distance linimum edge distance pacing linimum spacing ¹⁾ Values in bracke ²⁾ For V _{Rk,c} : c _{min} ac Table C59: Configura II: anchors placed parallel to horizontal joint	e C _{cr} e C _{min} S _{cr,II} S _{cr,I} S _{min} sets for VM-SH 20x85 ccording to ETAG 029 Group factor for	[mm] [mm] [mm] [mm] [mm] [mm] and VM-SH 20x ⁴ 9, Annex C For anchor gro with c [m 200 c _{cr}	130 Dup in case nm] ≥)	e of tension with s [i 10	All sizes 100 (120) 100 (120) 500 314 100 loading mm] ≥ 0			
Anchor size Edge distance Minimum edge distance Spacing Minimum spacing ¹⁾ Values in bracke ²⁾ For V _{Rk,c} : c _{min} ac Table C59: Configura II: anchors placed parallel to horizontal joint	e C _{cr} e C _{min} S _{cr,II} S _{cr,I} S _{min} sets for VM-SH 20x85 ccording to ETAG 029 Group factor for	[mm] [mm] [mm] [mm] [mm] [mm] and VM-SH 20x ⁴ 9, Annex C For anchor gro with c [m 200 c _{cr}	130 Dup in case nm] ≥)	e of tension with s [i 10 50	All sizes 100 (120) 100 (120) 500 314 100 100 100 100 100 100 100 1		[-]	2,0



Table C60:	Group factor for	or anchor group in case	e of shear loading pa	rallel to fr	ee edge	
Configura	ation	with c [mm] ≥	with s [mm] ≥		1.100	
II: anchors placed parallel to horizontal joint		C _{cr}	500	-α _{g,V,II}		2,0
⊥: anchors placed perpendicular to horizontal joint	V	C _{cr}	314	α _{g,V,⊥}	[-]	2,0
Table C61:	Group factor f	or anchor group in case	of shear load perpe	endicular t	o free ec	lge
Configura	ation	with c [mm] ≥	with s [mm] ≥	1.000		
II: anchors placed arallel to horizontal joint	V	C _{cr}	500	α _{g,V,II}		2,0
L: anchors placed perpendicular to horizontal joint	V	C _{cr}	314	α _{g,V,⊥}	[-]	2,0



Brick type: Clay	/ hollow br	ick BGV T	hermo			
Table C62:	Cha	aracteristic	values of resistan	ce under tension a	nd shear loads	
				Characteristic	resistance	
		n On		Use cate	egory	
Anchor size	Sleeve	Effective Anchorage depth		d/d w/d w/w		d/d w/d w/w
		đ	40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges
		h _{ef}		$N_{Rk,b} = N_{Rk,p}^{1)}$		V _{Rk,b} ²⁾³⁾
		[mm]		[kN]		[kN]
			Compressive stren	igth f _b ≥4 N/mm ²		
M8	12x80	80	0,6	0,6	0,6	2,0
M8 / M10/	16x85	85	0,6	0,6	0,6	2,0
IG-M6	16x130	130	1,2	1,2	0,9	2,5
M12 / M16 /	20x85	85	0,6	0,6	0,6	2,5
IG-M8 / IG-M10	20x130	130	1,2	1,2	0,9	2,5
			Compressive stren	gth $f_b \ge 6 N/mm^2$		
M8	12x80	80	0,9	0,9	0,75	2,5
M8 / M10/	16x85	85	0,9	0,9	0,75	2,5
IG-M6	16x130	130	1,5	1,5	1,2	3,0
M12 / M16 /	20x85	85	0,9	0,9	0,75	3,0
IG-M8 / IG-M10	20x130	130	1,5	1,5	1,2	3,0
			Compressive stren	gth f _b ≥10 N/mm²		
M8	12x80	80	0,9	0,9	0,9	3,5
M8 / M10/	16x85	85	0,9	0,9	0,9	3,5
IG-M6	16x130	130	2,0	2,0	1,5	4,0
M12 / M16 /	20x85	85	0,9	0,9	0,9	4,0
IG-M8 / IG-M10	20x130	130	2,0	2,0	1,5	4,0

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

2) Calculation of $V_{Rk,c}$ see ETAG 029, Annex C, except for shear load parallel to free edge with c \ge 250 mm: $V_{Rk,c,II} = V_{Rk,b}$

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

Table C63: Displacements

Anchor size	Sleeve	h _{ef} [mm]	N [kN]	δ _N / N [mm/kN]	δ _{N0} [mm]	δ _{N∞} [mm]	V [kN]	δ _{vo} [mm]	δ _{∨∞} [mm]
M8	12x80	80	0.00		0.01	0.44	0.7		
M8 / M10/	16x85	85	0,26		0,21	0,41	0,7		
IG-M6	16x130	130	0,43	0,80	0,34	0,69		1,00	1,50
M12 / M16 /	20x85	85	0,26		0,21	0,41	0,86		
IG-M8 / IG-M10	20x130	130	0,43		0,34	0,69			

Injection System VMU plus for masonry

Performance - Clay hollow brick BGV Thermo Characteristic values of resistance, Displacements



Brick type	ption of	Clay hollow	brick		-		
2272323	3.	Calibric R+			State of the second	The second	
	[kg/dm ³] [N/mm ²]	0,6 6, 9 or 12					
	fishing 1	EN 771-1			1		-
Producer (country code)		e.g. Terreal	(FR)		-		
Brick dimensions	[mm]	500 x 200 x				1	1
Drilling method		Rotary				~	2
			500 —		6 -11		
				40		5	
			86	20		*	
					1	6	
200			i		i		
<u> </u>			1				
						×	
Anchor size Edge distance	ng and eq C _{cr} C _{min} ²⁾	dge distance	es	All siz	20) ¹⁾		
Anchor size Edge distance Minimum edge distance	C _{cr} C _{min} ²⁾ S _{cr,II}	[mm] [mm] [mm]	es	100 (12 100 (12 500	20) ¹⁾ 20) ¹⁾		
Anchor size Edge distance Minimum edge distance Spacing Minimum spacing	Ccr Cmin Scr,II Scr,L Smin	[mm] [mm] [mm] [mm] [mm]		100 (12 100 (12	20) ¹⁾ 20) ¹⁾		
Anchor size Edge distance Minimum edge distance Spacing Minimum spacing ¹⁾ Value in brackets for VM-SI ²⁾ For V _{Rk,c} : c _{min} according to B	C _{cr} 2) S _{cr,II} S _{cr,L} S _{min} H 20x85 a ETAG 029	[mm] [mm] [mm] [mm] [mm] nd VM-SH 20x , Annex C	<130	100 (12 100 (12 500 314	20) ¹⁾ 20) ¹⁾		
Anchor size Edge distance Minimum edge distance Spacing Minimum spacing ¹⁾ Value in brackets for VM-SI ²⁾ For V _{Rk,c} : c _{min} according to B	C _{cr} 2) S _{cr,II} S _{cr,⊥} S _{min} H 20x85 a ETAG 029	[mm] [mm] [mm] [mm] [mm] nd VM-SH 20x , Annex C	d130 oup in case of	100 (12 100 (12 500 314 100	20) ¹⁾ 20) ¹⁾		
Anchor size Edge distance Minimum edge distance Spacing Minimum spacing ¹⁾ Value in brackets for VM-SI ²⁾ For V _{Rk,c} : c _{min} according to I Table C66: Group f Configuration II: anchors placed	C _{cr} 2) S _{cr,II} S _{cr,⊥} S _{min} H 20x85 a ETAG 029	[mm] [mm] [mm] [mm] [mm] nd VM-SH 20x Annex C r anchor gro	<130 oup in case of [mm] ≥	100 (12 100 (12 500 314 100	20) ¹⁾ 20) ¹⁾ 9 9 9 9		1,7
Anchor size Edge distance Minimum edge distance Spacing Minimum spacing ¹⁾ Value in brackets for VM-SI ²⁾ For V _{Rk,c} : c _{min} according to I Table C66: Group f Configuration II: anchors placed	C _{cr} 2) S _{cr,II} S _{cr,⊥} S _{min} H 20x85 a ETAG 029	[mm] [mm] [mm] [mm] [mm] nd VM-SH 20x Annex C r anchor gro with c [<130 oup in case of [mm] ≥ 75	100 (12 100 (12 500 314 100 f tension loadin with s [mm] ≥	20) ¹⁾ 20) ¹⁾		1,7
Anchor size Edge distance Minimum edge distance Spacing Minimum spacing ¹⁾ Value in brackets for VM-SI ²⁾ For V _{Rk,c} : c _{min} according to I Table C66: Group f Configuration II: anchors placed parallel to horizontal joint L: anchors placed	C _{cr} 2) S _{cr,II} S _{cr,I} S _{min} H 20x85 a ETAG 029 factor fo	[mm] [mm] [mm] [mm] [mm] nd VM-SH 20x Annex C r anchor gro with c [<130 oup in case of [mm] ≥ 75 ∝	100 (12 100 (12 500 314 100 f tension loadin with s [mm] ≥ 100	20) ¹⁾ 20) ¹⁾ 9 9 9 - α _{g,N,II}	. [-]	1
Anchor size Edge distance Minimum edge distance Spacing Minimum spacing ¹⁾ Value in brackets for VM-SI ²⁾ For V _{Rk,c} : c _{min} according to I Table C66: Group f Configuration II: anchors placed parallel to horizontal joint L: anchors placed parangedigular to	C _{cr} C _{min} S _{cr,II} S _{cr,L} S _{min} H 20x85 a ETAG 029 factor fo	[mm] [mm] [mm] [mm] [mm] nd VM-SH 20x , Annex C r anchor gro with c [17 c,	<130 oup in case o [mm] ≥ 75 cr 75	100 (12 100 (12 500 314 100 f tension loadin with s [mm] ≥ 100 500	20) ¹⁾ 20) ¹⁾ 9 9 9 9	[-]	2,0
Anchor size Edge distance Minimum edge distance Spacing Minimum spacing ¹⁾ Value in brackets for VM-SI ²⁾ For V _{Rk,c} : c _{min} according to I Table C66: Group f Configuration II: anchors placed parallel to horizontal joint L: anchors placed perpendicular to	C _{cr} 2) S _{cr,II} S _{cr,I} S _{min} H 20x85 a ETAG 029 factor fo	[mm] [mm] [mm] [mm] [mm] nd VM-SH 20x , Annex C r anchor gro with c [17 c, 17	<130 oup in case o [mm] ≥ 75 cr 75	100 (12 100 (12 500 314 100 f tension loadin with s [mm] ≥ 100 500 100	20) ¹⁾ 20) ¹⁾ 9 9 9 - α _{g,N,II}	[-]	2,0 1,0
Anchor size Edge distance Minimum edge distance Spacing Minimum spacing ¹⁾ Value in brackets for VM-SI ²⁾ For V _{Rk,c} : c _{min} according to I Table C66: Group f Configuration II: anchors placed parallel to horizontal joint L: anchors placed perpendicular to	C _{cr} 2) S _{cr,II} S _{cr,I} S _{min} H 20x85 a ETAG 029 factor fo	[mm] [mm] [mm] [mm] [mm] nd VM-SH 20x Annex C r anchor gro with c [17 c, 17 c,	<130 oup in case o [mm] ≥ 75 cr 75	100 (12 100 (12 500 314 100 f tension loadin with s [mm] ≥ 100 500 100	20) ¹⁾ 20) ¹⁾ 9 9 9 - α _{g,N,II}	[-]	2,0 1,0



	with c [mm] ≥ c _{or}	: with s [m 500	m] ≥ α _{g,V,II}		2,0
V •	C _{cr}	500	- ag, v, li		2,0
V				1.1	
1	C _{cr}	314	$\alpha_{g,V,\perp}$	[-]	2,0
oup factor fo	r anchor group ir	1 case of shear load	l perpendicular t	o free ed	lge
	with c [mm] ≥	with s [m	m]≥	1.00	
	C _{cr}	500	α _{g.V,II}		2,0
V-••	C _{cr}	314	$\alpha_{g,V,\perp}$	ы	2,0
	values of resistan	Characteristic	resistance		
Effective unchorage depth		d/d w/d w/w	gory		d/d w/d w/w
đ	40°C/24°C	80°C/50°C	120°C/72°C	ra	mperature anges
h _{ef}		$N_{Rk,b} = N_{Rk,p}^{(1)}$		V	2)3) Rk,b
[mm]		[kN]		the second se	[kN]
	Compressive stren	ngth f _b ≥6N/mm ²			
80	0,9	0,9	0,75	- February - 1	3,0
85	0,9	0,9		1	4,0
130					4,0
				1	6,0
130			0,9		6,0
1	the second se			i -	0.5
0.0	1,2	1,2	0,9	-	3,5
80		10	0.0		
85	1,2	1,2	0,9	-	5,0
		1,2 1,5 1,2	0,9 1,2 0,9	-	5,0 5,0 7,5
	haracteristic v debth her [mm]	with c [mm] \geq v c _{cr} c _{cr} c _{cr} c _{cr} c _{cr} aracteristic values of resistant browstant aracteristic values of resistant aracteristic values of resistant aracteristic values of resistant browstant aracteristic values browstant browstant cr browstant browstant compressive strent 80 0,9 85 0,9	with c [mm] ≥ with s [m c_{cr} 500 c_{cr} 314 haracteristic values of resistance under tension at a specific set of the s	$\begin{tabular}{ c c c c c } \hline with c [mm] \ge & with s [mm] \ge & & & & & & & & & & & & & & & & & & $	$\begin{tabular}{ c c c c c c } \hline c_{cr} & 500 & $\alpha_{g,V,II}$ & $[-]$ & $\alpha_{g,V,II}$ & c_{cr} & $314 & $\alpha_{g,V,II}$ & $[-]$ & $\alpha_{g,V,II}$ & $a_{g,V,II}$ & $a_{g,V,II}$$

Injection System VMU plus for masonry

Performance - Clay hollow brick Calibric R+



Brick type: Clay	hollow br	ick Calibri	c R+			
Table C70:	Cha	aracteristic	values of resistan	ce under tension a	nd shear load (cor	ntinue)
				Characteristic	resistance	
		a e		Use cat	egory	_
Anchor size	Sleeve	Effective Anchorage depth		d/d w/d w/w		d/d w/d w/w
	Sieeve	Ar	40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges
		h _{ef}		$N_{Rk,b} = N_{Rk,p}^{1}$		V _{Rk,b} ²⁾³⁾
		[mm]		[kN]		[kN]
			Compressive stren	gth f _b ≥12 N/mm ²		
M8	12x80	80	1,2	1,2	0,9	4,0
M8 / M10/	16x85	85	1,2	1,2	0,9	5,5
IG-M6	16x130	130	1,5	1,5	1,2	5,5
M12 / M16 /	20x85	85	1,2	1,2	0,9	8,5
IG-M8 / IG-M10	20x130	130	1,5	1,5	1,2	8,5

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

²⁾ Calculation of $V_{Rk,c}$ see ETAG 029, Annex C, except for shear load parallel to free edge with c ≥ 250 mm: $V_{Rk,c,II} = V_{Rk,b}$

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

Table C71: Displacements

Anchor size	Sleeve	h _{ef} [mm]	N [kN]	δ _N / N [mm/kN]	δ _{N0} [mm]	δ _{N∞} [mm]	V [kN]	δ _{∨0} [mm]	δ _{V∞} [mm]
M8	12x80	80	0.24		0.07	0.55	1,0	1,10	1,65
M8 / M10/ IG-	16x85	85	0,34		0,27	0,55	4 49		
M6	16x130	130	0,43	0,80	0,34	0,69	1,43	2.0	2.0
M12 / M16 /	20x85	85	0,34		0,27	0,55	2.14	2,0	3,0
IG-M8 / IG-M10	20x130	130	0,43		0,34	0,69	2,14		

Performance - Clay hollow brick Calibric R+ Characteristic values of resistance, Displacements



Brick type		Clay hollow brick			1	6
		Jrbanbric),7		-		
	-	5, 9 or 12		-35		
Code		EN 771-1		ES	P	
Producer (country code)		e.g. Imerys (FR)		P	1	
Brick dimensions		560 x 200 x 274				
Drilling method		Rotary				
		560		99,	5	
		20	6.5			
			-5,5			
(@40))(2	200	
					1	
	63					
			40			
Anchor size	C _{cr} [je distances	All sizes 100 (120)	1)		
Anchor size Edge distance d Minimum edge distance d Spacing	C _{cr} [C _{min} ²⁾ [S _{cr,II}][[mm] [mm] [mm]	All sizes 100 (120) 100 (120) 560	1)		
Anchor size Edge distance Minimum edge distance Spacing Minimum spacing Value in brackets for VM-SH 20x	C _{cr} [C _{min} [S _{cr,⊥} [S _{cr,⊥} [S _{min} [[mm] [mm] [mm] [mm] [mm]	All sizes 100 (120) 100 (120)	1)		
Anchor size Edge distance o Minimum edge distance o Spacing s Minimum spacing s Value in brackets for VM-SH 20x: s For V _{Rk,c} : cmin according to ETAG Table C74: Group fa	C _{cr} [C _{min} [S _{cr,II} [S _{cr,I} [S _{min} [S _{min} [S ₀ 5 and VM [S029, Anne [mm] mm] mm] mm] mm] I-SH 20x130 ex C anchor group in cas	All sizes 100 (120) 100 (120) 560 274 100 e of tension loading	1) 1)		
Anchor size Edge distance o Minimum edge distance o Spacing s Minimum spacing s Value in brackets for VM-SH 20xis s For V _{Rk,c} : cmin according to ETAG Table C74: Group fa Configuration configuration	C _{cr} [C _{min} [S _{cr,II} [S _{cr,I} [S _{min} [S _{min} [S ₀ 5 and VM [S029, Anne [[mm] [mm] [mm] [mm] [mm] [4-SH 20x130 ex C anchor group in cas with c [mm] ≥	All sizes 100 (120) 100 (120) 560 274 100 e of tension loading with s [mm] ≥	1) 1)		
Anchor size Edge distance o Minimum edge distance o Spacing s Minimum spacing s Value in brackets for VM-SH 20xis s For V _{Rk,c} : cmin according to ETAG Table C74: Group fa Configuration II: anchors placed f	C _{cr} [C _{min} [S _{cr,II} [S _{cr,I} [S _{min} [S _{min} [S ₀ 5 and VM [S029, Anne [mm] mm] mm] mm] mm] I-SH 20x130 ex C anchor group in cas	All sizes 100 (120) 100 (120) 560 274 100 e of tension loading			1,9
Anchor size Edge distance o Minimum edge distance o Spacing s Minimum spacing s Minimum spacing s Value in brackets for VM-SH 20xis s For V _{Rk,c} : cmin according to ETAG Table C74: Group fa Configuration II: anchors placed f	C _{cr} [C _{min} [S _{cr,II} [S _{cr,I} [S _{min} [S _{min} [S ₀ 5 and VM [S029, Anne [[mm] [mm] [mm] [mm] [mm] [4-SH 20x130 ex C anchor group in cas with c [mm] ≥	All sizes 100 (120) 100 (120) 560 274 100 e of tension loading with s [mm] ≥	1) 1)		1,9
Anchor size Edge distance O Minimum edge distance O Spacing S Minimum spacing S Minimum spacing S Minimum spacing S Value in brackets for VM-SH 20xil S For V _{Rk,c} : cmin according to ETAG For V _{Rk,c} : Cmin according to ETAG Table C74: Group fa Configuration II: anchors placed parallel to horizontal joint Image: Configuration L: anchors placed Image: Configuration	C _{cr} [C _{min} [S _{cr,II} [S _{cr,I} [S _{min} [S _{min} [S ₀ 5 and VM [S029, Anne [[mm] [mm] [mm] [mm] [mm] [-SH 20x130 ex C anchor group in cas with c [mm] ≥ 185	All sizes 100 (120) 100 (120) 560 274 100 e of tension loading with s [mm] ≥ 100	1) 1) α_g,N,II	[-]	
Anchor size Edge distance Minimum edge distance Spacing Minimum spacing State For V _{Rk,c} : cmin according to ETAG Table C74: Group fa Configuration II: anchors placed parallel to horizontal joint	C _{cr} [C _{min} [S _{cr,II} [S _{cr,I} [S _{min} [S _{min} [S ₀ 5 and VM [S029, Anne [[mm] [mm] [mm] [mm] [4-SH 20x130 ex C anchor group in cas with c [mm] ≥ 185 C _{cr}	All sizes 100 (120) 100 (120) 560 274 100 e of tension loading with s [mm] ≥ 100 560		[-]	2,0



Table C75:	Gro	oup factor fo	r anchor group in	case of shear load	ling parallel to fr	ee edge	
Co	nfiguration		with c [mm] ≥	with s [m	m]≥		
II: anchors plac parallel to horizo joint		V •	C _{cr}	560	α _{g,V,II}		2,0
⊥: anchors plac perpendicular horizontal joir	to	V	C _{cr}	274	α _{g,∨,⊥}	[-]	2,0
Table C76:	Gro	oup factor fo	r anchor groups i	in case of shear loa	ad perpendicular	to free e	edge
Co	nfiguration	1.1.1.1.1.1	with c [mm] ≥	with s [m	m]≥		
II: anchors plac parallel to horizo joint		V	C _{cr}	560	α _{g,V,I}		2,0
L: anchors placed perpendicular to horizontal joint		V-••	C _{cr} 274		$\alpha_{g,V,\perp}$	[-]	2,0
Table C77:	Ch	aracteristic v	values of resistan	ce under tension a Characteristic			
1		-					
		Effective Anchorage depth	Use category d/d w/d w/w		sgory	d/c w/v w/v	
Anchor size Si	Sleeve				E	C/72°C All tempera	
Anchor size	Sleeve	4	40°C/24°C	1. 2. 2. · · · 0. 2.	120°C/72°C	r	anges
Anchor size	Sleeve	⊲ h _{ef}	40°C/24°C	80°C/50°C $N_{Rk,b} = N_{Rk,p}^{1}$	120°C/72°C	r	
Anchor size	Sleeve			$N_{Rk,b} = N_{Rk,p}^{(1)}$ [KN]	120°C/72°C	r	anges
		h _{ef} [mm]	40°C/24°C Compressive stren	$N_{Rk,b} = N_{Rk,p}^{(1)}$ [KN]	120°C/72°C	r	anges (Rk,b ²⁾³⁾
M8	12x80	h _{ef} [mm] 80	Compressive stren 0,9	$N_{Rk,b} = N_{Rk,p}^{(1)}$ [kN] $f_{b} \ge 6 \text{ N/mm}^{2}$ 0,9	0,75	r	anges (_{Rk,b} ²⁾³⁾ [kN] 3,0
M8 M8 / M10/	12x80 16x85	h _{ef} [mm] 80 85	Compressive stren 0,9 0,9	$N_{Rk,b} = N_{Rk,p}^{(1)}$ [kN] igth $f_b \ge 6 N/mm^2$ 0,9 0,9 0,9	0,75 0,75	r	anges (_{Rk,b} ²⁾³⁾ [kN] 3,0 3,0
M8 M8 / M10/ IG-M6	12x80 16x85 16x130	h _{ef} [mm] 80 85 130	Compressive stren 0,9 0,9 2,0	$N_{Rk,b} = N_{Rk,p}^{(1)}$ [kN] igth f_b ≥ 6 N/mm² 0,9 0,9 2,0	0,75 0,75 1,5	r	anges (_{Rk,b} ²⁾³⁾ [kN] 3,0 3,0 3,0
M8 M8 / M10/ IG-M6 M12 / M16 /	12x80 16x85 16x130 20x85	h _{ef} [mm] 80 85 130 85	Compressive stren 0,9 0,9 2,0 0,9	$N_{Rk,b} = N_{Rk,p}^{(1)}$ [kN] egth f _b ≥ 6 N/mm ² 0,9 0,9 2,0 0,9 0,9 2,0 0,9 0,9 0,9 2,0 0,9	0,75 0,75 1,5 0,75	r	anges (_{Rk,b} ²⁾³⁾ [kN] 3,0 3,0 3,0 3,0 3,5
M8 M8 / M10/ IG-M6 M12 / M16 /	12x80 16x85 16x130	h _{ef} [mm] 80 85 130	Compressive stren 0,9 0,9 2,0 0,9 2,0 2,0	$N_{Rk,b} = N_{Rk,p}^{(1)}$ [kN] ngth f_b ≥ 6 N/mm² 0,9 0,9 2,0 0,9 2,0 0,9 2,0	0,75 0,75 1,5	r	anges (_{Rk,b} ²⁾³⁾ [kN] 3,0 3,0 3,0 3,0
M8 M8 / M10/ IG-M6 M12 / M16 / G-M8 / IG-M10	12x80 16x85 16x130 20x85 20x130	h _{ef} [mm] 80 85 130 85 130	Compressive stren 0,9 0,9 2,0 0,9 2,0 2,0 Compressive stren	$N_{Rk,b} = N_{Rk,p}^{(1)}$ [kN] [gth f _b ≥ 6 N/mm ² 0,9 0,9 2,0 0,9 2,0 0,9 2,0 0,9 2,0 0,9 2,0 0,9 2,0 0,9 2,0 0,9 0,9 0,9 0,9 0,9 0,9 0,9 0,9 0,9 0	0,75 0,75 1,5 0,75 1,5 1,5	r	anges / _{Rk,b} ²⁾³⁾ [kN] 3,0 3,0 3,0 3,5 3,5 3,5
M8 M8 / M10/ IG-M6 M12 / M16 /	12x80 16x85 16x130 20x85 20x130 12x80	h _{ef} [mm] 80 85 130 85 130 85 130	Compressive stren 0,9 0,9 2,0 0,9 2,0 Compressive stren 0,9	$N_{Rk,b} = N_{Rk,p}^{(1)}$ [kN] egth f _b ≥ 6 N/mm ² 0,9 0,9 2,0 0,9 0,9 2,0 0,9 0,9 2,0 0,9 0,9 0,9 0,9 2,0 0,9	0,75 0,75 1,5 0,75 1,5 1,5	r	anges / _{Rk,b} ²⁾³⁾ [kN] 3,0 3,0 3,0 3,5 3,5 3,5 4,0
M8 M8 / M10/ IG-M6 M12 / M16 / G-M8 / IG-M10 M8	12x80 16x85 16x130 20x85 20x130 12x80 16x85	h _{ef} [mm] 80 85 130 85 130 85 130 80 85	Compressive stren 0,9 0,9 2,0 0,9 2,0 Compressive stren 0,9 0,9	$N_{Rk,b} = N_{Rk,p}^{(1)}$ [kN] ngth f _b ≥ 6 N/mm ² 0,9 0,9 2,0 0,9 2,0 0,9 2,0 ngth f _b ≥ 9 N/mm ² 0,9	0,75 0,75 1,5 0,75 1,5 0,9 0,9	r	anges (_{Rk,b} ²⁾³⁾ [kN] 3,0 3,0 3,0 3,5 3,5 3,5 4,0 4,0
M8 M8 / M10/ IG-M6 M12 / M16 / IG-M8 / IG-M10	12x80 16x85 16x130 20x85 20x130 12x80	h _{ef} [mm] 80 85 130 85 130 85 130	Compressive stren 0,9 0,9 2,0 0,9 2,0 Compressive stren 0,9	$N_{Rk,b} = N_{Rk,p}^{(1)}$ [kN] egth f _b ≥ 6 N/mm ² 0,9 0,9 2,0 0,9 0,9 2,0 0,9 0,9 2,0 0,9 0,9 0,9 0,9 2,0 0,9	0,75 0,75 1,5 0,75 1,5 1,5	r	anges / _{Rk,b} ²⁾³⁾ [kN] 3,0 3,0 3,0 3,5 3,5 3,5 4,0

Injection System VMU plus for masonry

Performance - Clay hollow brick Urbanbric



Brick type: Clay hollow brick Urbanbric									
Table C78:	Cha	aracteristic	values of resistan	ce under tension a	nd shear load (cor	ntinue)			
				Characteristic	resistance				
		0 8	Use category						
Anchor size Sleeve	Effective Anchorage depth			d/d w/d w/w					
	ize Sleeve	4	40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges V _{Rk,b} ²⁾³⁾			
		h _{ef}		$N_{Rk,p} = N_{Rk,p}^{(1)}$					
		[mm]		[kN]		[kN]			
			Compressive stren	gth f _b ≥12 N/mm²					
M8	12x80	80	1,2	1,2	0,9	4,5			
M8 / M10/	16x85	85	1,2	1,2	0,9	4,5			
IG-M6	16x130	130	3,0	3,0	2,5	4,5			
M12 / M16 /	20x85	85	1,2	1,2	0,9	5,0			
IG-M8 / IG-M10	20x130	130	3,0	3,0	2,5	5,0			

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

²⁾ Calculation of $V_{Rk,c}$ see ETAG 029, Annex C, except for shear load parallel to free edge with c ≥ 190 mm: $V_{Rk,c,II} = V_{Rk,b}$ ³⁾ The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply $V_{Rk,b}$ by 0,8

Table C79: Displacements

Anchor size	Sleeve	h _{ef} [mm]	N [kN]	δ _N / N [mm/kN]	δ _{N0} [mm]	δ _{N∞} [mm]	V [kN]	δ _{∨0} [mm]	δ _{∨∞} [mm]
M8	12x80	80	0.24		0.07	0.55			
M8 / M10/ IG-	16x85	85	0,34		0,27	0,55	1,30		
M6	16x130	130	0,86	0,80	0,69	1,37		1,00	1,50
M12 / M16 /	20x85	85	0,34		0,27	0,55	4 42		
IG-M8 / IG-M10	20x130	130	0,86		0,69	1,37	1,43		

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



Table C80: Description						
Brick type		Clay hollow brick Brique creuse C40				
Bulk density ρ [kg/		0,7				
Compressive strength $f_b \ge [N/r]$		4, 8 or 12				
Code		EN 771-1				
Producer (country code)		e.g. Terreal (FR)				
		500 × 200 × 200				
Drilling method		Rotary				
	ل المراجعة الم		₹ 7 200			
Anchor size	nd ed	ge distances	All sizes			
Edge distance c _c	r 2)	[mm]	100 (120) ¹⁾			
Vinimum edge distance c _r	nin ²⁾	[mm]	100 (120) ¹⁾			
Spacing s _c		[mm] [mm]	500 200			

¹⁾ Values in brackets for VM-SH 20x85 and VM-SH 20x130

²⁾ For V_{Rk.c}: c_{min} according to ETAG 029, Annex C

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

Configurat	tion	with c [mm] ≥	with s [mm] ≥	1		
II: anchors placed parallel to horizontal joint		C _{cr}	200	α _{g,N,II}		2,0
⊥: anchors placed perpendicular to horizontal joint		C _{cr}	200	α _{g,N,⊥}	[-]	2,0

Injection System VMU plus for masonry

Performance - Clay hollow brick Brique creuse C40 Description of the brick, Spacing and edge distances, Group factor



Table C83:	Gro	oup factor fo	or anchor group in	n case of shear load	ding parallel to f	free edge	2
Co	nfiguration	_	with c [mm] ≥	with s [m	im] ≥		
II: anchors plac parallel to horizo joint		V •	C _{cr}	500	C⊄g,∨,II	[-]	2,0
⊥: anchors plac perpendicular horizontal joir	to	V	C _{cr}	200	$\alpha_{g,V,L}$	FI	2,0
Table C84:	Gro	oup factor fo	or anchor group ir	n case of shear load	d perpendicular	to free e	dge
Co	nfiguration	1.0.00	with c [mm] ≥	with s [m	with s [mm] ≥		
II: anchors placed parallel to horizontal joint L: anchors placed perpendicular to horizontal joint		C _{cr}	500	α, _{g,V,l} ι	- [-]	2,0	
		V	C _{cr}	200	$\alpha_{g,V,\perp}$		2,0
Table C85:	Cha	aracteristic	values of resistan	ice under tension a	nd shear load		
				Characteristic	resistance		
		υ		egory	1		
Anchor size Sle	Effective Anchorage depth		d/d w/d w/w			d/d w/d w/w	
		- × -	40°C/24°C	80°C/50°C	120°C/72°C	the second se	mperature
		h _{ef}		$N_{Rk,b} = N_{Rk,p}^{1)}$		N	2)3) Rk,b
		[mm]		[kN]		1.1.2	[kN]
2021			Compressive stren	ngth $f_b \ge 4 \text{ N/mm}^2$		-	
M8	12x80	80		1.1.1.1.1.1			
M8 / M10/	16x85	85					
IG-M6	16x130	130	0,6	0,6	0,6		0,9
M12 / M16 / G-M8 / IG-M10	20x85	85					
G-1016 / 1G-10110	20x130	130				1	
Me	10,00	00	Compressive stren	igth T _b 2 8 N/mm ⁻		Ì	
M8	12x80 16x85	80 85					
M8 / M10/ IG-M6	16x85	130	0,9	0,9	0,75		1,2
M12 / M16 /	20x85	85	0,8	0,9	0,75		1,4
G-M8 / IG-M10	20x83	130					
2) Calculation	es are valid fo	e ETAG 029, A or steel 5.6 or h	nigher. For steel 4.6 ar	nd 4.8 multiply V _{Rk,b} by 0	9,8		



Brick type: Cla	ay hollow	brick Briqu	ie creuse C40					
Table C86:	Ch	aracteristic	values of resistan	ce under tension a	nd shear load (cor	ntinue)		
				Characteristic	resistance			
		a e		Use category				
Anchor size	Anchor size Sleeve	Effective Anchorage depth		d/d w/d w/w				
					- 4	40°C/24°C	80°C/50°C	120°C/72°C
		h _{ef}		$N_{Rk,b} = N_{Rk,p}^{1}$		V _{Rk,b} ²⁾³⁾		
		[mm]		[kN]		[kN]		
		_	Compressive stren	gth f _b ≥12 N/mm²				
M8	12x80	80						
M8 / M10/	16x85	85						
IG-M6	16x130	130	1,2	1,2	0,9	1,5		
M12 / M16 /	20x85	85						
IG-M8 / IG-M10	20x130	130						
1)								

1) Values are valid for c_{cr} and c_{min} 2)

Calculation of $V_{Rk,c}$ see ETAG 029, Annex C The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply $V_{Rk,b}$ by 0,8 3)

Table C87: Displacements

Anchor size	Sleeve	h _{ef} [mm]	N [kN]	δ _N / N [mm/kN]	δ _{N0} [mm]	δ _{N∞} [mm]	V [kN]	δ _{V0} [mm]	δ _{∨∞} [mm]
M8	12x80	80	0.47		0.14	0.07			
M8 / M10/ IG-	16x85	85	0,17		0,14	0,27			
M6	16x130	130	0,14	0,80	0,11	0,23	0,3	0,9	1,35
M12 / M16 /	20x85	85	0,17		0,14	0,27			
IG-M8 / IG-M10	20x130	130	0,14		0,11	0,23			

Injection System VMU plus for masonry

Performance - Clay hollow brick Brique creuse C40 Characteristic values of resistance, Displacements



Bulk density Compressive strength Code Producer (country code) Brick dimensions Drilling method	ρ [kg/dm³] f _b ≥ [N/mm²]	Blocchi Legge 0,6				-	
Compressive strength Code Producer (country code) Brick dimensions		0,0			-		
Code Producer (country code) Brick dimensions					Day.		
Brick dimensions		EN 771-1			254		
Brick dimensions		e.g. Wienerbe	rger (IT)				
Drilling method	[mm]	7	200 070 100			-	
		Rotary			-		
	20	edge distances	250	All size 100 (120 60			
Minimum spacing	S _{cr,II} S _{cr,⊥} S _{min} Λ-SH 20x85; VM	[mm] [mm]	/M-SH 20x200	250 120 100			
Minimum spacing ¹⁾ Value in brackets for VM Table C90: G	S _{cr,⊥} S _{min} M-SH 20x85; VM	[mm] [mm] -SH 20x130 and V or anchor grou	ıp in case of ten	120 100 sion loading			
Minimum spacing ¹⁾ Value in brackets for VM Table C90: G Configuration	S _{cr,⊥} S _{min} M-SH 20x85; VM	[mm] [mm] -SH 20x130 and V or anchor grou with c [m	ıp in case of ten	120 100 sion loading with s [mm] ≥			10
Table C90: G	S _{cr,⊥} S _{min} M-SH 20x85; VM roup factor f	[mm] [mm] -SH 20x130 and V or anchor grou	ıp in case of ten	120 100 sion loading	α _{g,N,II}		1,0



		Sup factor to		n case of shear load		free edge	2
	onfiguration		with c [mm] ≥				
II: anchors plat parallel to horize		V	60 ¹⁾	100 ¹	and the second s		1,0
joint		1	Ccr	250	- Ctg,V,II	1	2,0
⊥: anchors pla			60 ¹⁾	100 ¹)	[-]	1,6
perpendicular horizontal joi		V	Ccr	250	α _{g,V,⊥}		2,0
		ding to Table C	093 and C94 values	in brackets			
Table C92:	Gro	oup factor fo	r anchor group i	n case of shear load	d perpendicula	r to free e	dge
Co	onfiguration		with c [mm] a				
II: anchors pla	ced L		60 ¹⁾	1001)		1,0
parallel to horiz joint	ontal	V	Ccr	250	α _{g,V,I}		2,0
⊥: anchors pla	ced		60 ¹⁾	100 ¹)		1,6
perpendicular horizontal joi	to	V	Ccr	250	$\alpha_{g,V,\perp}$		2,0
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			able C93 and C94 values in brackets				,-
		Use category				d/d	
		n 0		Use cat	egory		
Anchorsize	Sleeve	Effective nchorage depth		d/d w/d	egory		d/d w/d
Anchor size	Sleeve	Effective Anchorage depth	40°C/24°C	d/d	egory 120°C/72°C		w/d w/w mperature
Anchor size	Sleeve		40°C/24°C	d/d w/d w/w 80°C/50°C		r	w/d w/w mperature anges
Anchor size	Sleeve	[mu] depth	40°C/24°C	d/d w/d w/w		r	w/d w/w mperature
Anchor size	Sleeve	h _{ef}	40°C/24°C Compressive stree	d/d w/d w/w 80°C/50°C N _{Rk,b} = N _{Rk,p} ¹⁾ [kN]		r	w/d w/w mperature anges V _{Rk,b} ⁴⁾
Anchor size M8	12x80	h _{ef} [mm] 80		d/d w/d w/w 80°C/50°C N _{Rk,b} = N _{Rk,p} ¹⁾ [kN]		r	w/d w/w mperature anges V _{Rk,b} ⁴⁾
M8 M8 / M10/	12x80 16x85	h _{ef} [mm] 80 85		d/d w/d w/w 80°C/50°C N _{Rk,b} = N _{Rk,p} ¹⁾ [kN]		r	w/d w/w mperature anges V _{Rk,b} ⁴⁾
M8 M8 / M10/ IG-M6	12x80 16x85 16x130	h _{ef} [mm] 80 85 130		d/d w/d w/w 80°C/50°C N _{Rk,b} = N _{Rk,p} ¹⁾ [kN]			w/d w/w mperature anges V _{Rk,b} ⁴⁾
M8 M8 / M10/ IG-M6 M12 / M16 /	12x80 16x85 16x130 20x85	h _{ef} [mm] 80 85 130 85	Compressive stre	$d/d w/d w/w$ $80^{\circ}C/50^{\circ}C$ $N_{Rk,b} = N_{Rk,p}^{1)}$ [kN] ngth $f_b \ge 4 \text{ N/mm}^2$	120°C/72°C		w/d w/w mperature anges V _{Rk,b} ⁴⁾ [kN]
M8 M8 / M10/	12x80 16x85 16x130	h _{ef} [mm] 80 85 130	Compressive stre	$d/d w/d w/w$ $80^{\circ}C/50^{\circ}C$ $N_{Rk,b} = N_{Rk,p}^{1)}$ [kN] ngth $f_b \ge 4 \text{ N/mm}^2$	120°C/72°C		w/d w/w mperatur anges V _{Rk,b} ⁴⁾ [kN]
M8 M8 / M10/ IG-M6 M12 / M16 / IG-M8 / IG-M10 1) Values a 2) Calculati	12x80 16x85 16x130 20x85 20x130 20x200 are valid for c _c ion of V _{Rk.c} se	h _{ef} [mm] 80 85 130 85 130 85 130 200 ar and c _{min} e ETAG 029, A	Compressive stree 0,4 nnex C, except for sh	$d/d w/d w/w$ $80^{\circ}C/50^{\circ}C$ $N_{Rk,b} = N_{Rk,p}^{1)}$ [kN] ngth $f_b \ge 4 \text{ N/mm}^2$	120°C/72°C	2,0	w/d w/w mperature anges V _{Rk,b} ⁴⁾ [kN]
M8 M8 / M10/ IG-M6 M12 / M16 / IG-M8 / IG-M10 1) Values a 2) Calculati 3) Values in	12x80 16x85 16x130 20x85 20x130 20x200 are valid for c _c ion of V _{Rk.c} se h brackets V _R	h _{ef} [mm] 80 85 130 85 130 200 ar and c _{min} e ETAG 029, A k _i c = V _{Rk,b} for an	Compressive stree 0,4 nnex C, except for sh	d/d w/d w/w $80^{\circ}C/50^{\circ}C$ $N_{Rk,b} = N_{Rk,p}^{1)}$ $[kN]$ $ngth f_{b} \ge 4 N/mm^{2}$ $0,4$	120°C/72°C 0,3 edge with c ≥ 125	2,0	w/d w/w mperature anges V _{Rk,b} ⁴⁾ [kN]



Brick type: C	lay hollow l	brick Bloco	chi Leggeri			
Table C94	: Cha	aracteristic	values of resistan	ce under tension a	nd shear load (co	ntinue)
				Characteristic	resistance	
		U. U		egory		
Anchor size	Sleeve	Effective Anchorage depth		d/d w/d w/w		d/d w/d w/w
		4	40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges
		h _{ef}		$N_{Rk,b} = N_{Rk,p}^{1}$		V _{Rk,b} ⁴⁾
	[mm]			[kN]		
			Compressive stren	ngth f _b ≥6 N/mm ²		
M8	12x80	80				
M8 / M10/	16x85	85				
IG-M6	16x130	130	0,5	0,5	0,4	$2,5^{2}(1,2)^{3}$
M12 / M16 /	20x85	85	0,5	0,5		2,5 (1,2)
IG-M8 /	20x130	130				
IG-M10	20x200	200				
		_	Compressive strer	igth f _b ≥8N/mm ²	_	_
M8	12x80	80				
M8 / M10/	16x85	85				
IG-M6	16x130	130	0,6	0,6	0,5	3,0 ²⁾ (1,2) ³⁾
M12 / M16 /	20x85	85	0,8	0,8	0,5	3,0 * (1,2) *
IG-M8 /	20x130	130				
IG-M10	20x200	200				
			Compressive stren	gth_f _b ≥12 N/mm ²		
M8	12x80	80				
M8 / M10/	16x85	85				
IG-M6	16x130	130	0,6	0,6	0,6	3,5 ²⁾ (1,5) ³⁾
M12 / M16 /	20x85	85	0,0	0,0	0,0	5,5 (1,5)
IG-M8 /	20x130	130				
IG-M10	20x200	200				
¹⁾ Values	are valid for o	c _{cr} and c _{min}				

2)

Calculation of V_{Rk,c} see ETAG 029, Annex C, except for shear load parallel to free edge with c ≥ 125 mm: V_{Rk,c,II} = V_{Rk,b}

3) 4)

Values in brackets $V_{Rk,c} = V_{Rk,b}$ for anchors with c_{min} The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply $V_{Rk,b}$ by 0,8

Table C95:

Displacements	

Anchor size	Sleeve	h _{ef}	N	δ _N / N	δ _{ΝΟ}	δ _{N∞}	V	δ_{V0}	δγ∞
Anchor size	Sieeve	[mm]	[kN]	[mm/kN]	[mm]	[mm]	[kN]	[mm]	[mm]
All sizes	All sizes	All sizes	0,17	1,20	0,21	0,41	0,9	1,20	1,80

Injection System VMU plus for masonry

Performance - Clay hollow brick Blocchi Leggeri Characteristic values of resistance, Displacements



Bulk density Compressive strength		Clay hollow brick Doppio Uni				
Compressive strength	ρ [kg/dm³]	0,9		-	-	-
and the second sec	$f_b \ge [N/mm^2]$	10, 16, 20 or 28				
Code	10 - [1011111]	EN 771-1				
Producer (country code)	e.g. Wienerberger (IT)				
Brick dimensions	/[mm]	250 x 120 x 120				
Drilling method	[Rotary				
		26 61 31 250)		
Table C97:	Spacing and e	dge distances				
Anchor size	1.5		All sizes			
Edge distance Minimum edge distance	C _{cr} C _{min} ²⁾	[mm] [mm]	100 (120) 60)"		
	S _{cr,II}	[mm]	250			
Spacing	S _{cr,⊥}	[mm]	120			
Minimum spacing	S _{min,II}	[mm]	100 120			
¹⁾ Value in brackets for	VM-SH 20x85; VM-	SH 20x130 and VM-SH 20x	200			
	ling to ETAG 029, Ar	SH 20x130 and VM-SH 20x inex C r anchor group in cas	e of tension loading			
 Value in brackets for For V_{Rk,c}: c_{min} accord 	ling to ETAG 029, Ar Group factor fo	inex C				
 ¹⁾ Value in brackets for ²⁾ For V_{Rk,c}: c_{min} accord Table C98: Configurat II: anchors placed 	ling to ETAG 029, Ar Group factor fo	nex C r anchor group in cas	e of tension loading			1,0
 Value in brackets for For V_{Rk,c}: c_{min} accord Table C98: Configurat 	ling to ETAG 029, Ar Group factor fo	nnex C r anchor group in case with c [mm] ≥	e of tension loading with s [mm] ≥	α _{g,N,II}	[-]	1,0



Table C99	Gro	oup factor fo	or anchor group in	case of shear loa	ding parallel to	free edge		
Co	onfiguration	_	with c [mm] ≥	with s [n	nm] ≥			
II: anchors pla parallel to horiz joint		V •	C _{cr}	250	α _{g,V,II}		2,0	
⊥: anchors pla perpendicular horizontal joi	r to	V	Ccr	120	α _{g,v,⊥}	[-]	2,0	
Table C10	0: Gro	oup factor fo	or anchor group ir	case of shear loa	d perpendicula	r to free e	dge	
Co	onfiguration	1.1.1	with c [mm] ≥	with s [n	nm]≥			
II: anchors pla parallel to horiz joint		V	C _{cr}	250) α _{g,V,II}	[-]	2,0	
L: anchors placed perpendicular to horizontal joint		V	Cer	120) α _{g,V,⊥}		2,0	
Table C10	1: Ch	aracteristic	values of resistan	ce under tension a	and shear load			
				Characteristic	c resistance			
		. e		Use cat	egory	- 2-		
Anchor size	Sleeve	Effective Anchorage depth		d/d w/d w/w			d/d w/d w/w	
		A	40°C/24°C	80°C/50°C	120°C/72°C		mperature anges	
		h _{ef}		$N_{Rk,b} = N_{Rk,p}^{1)}$		- N	2)3) Rk,b	
		[mm]		[kN]			[kN]	
140	40.00		Compressive stren	gth $f_b \ge 10 \text{ N/mm}^2$	1	-		
M8	12x80 16x85	80 85						
M8 / M10/ IG-M6								
	16x130 20x85	130 85	0,6	0,6	0,5		1,5	
M12 / M16 / IG-M8 /	20x130	130						
IG-M10	20x130	200						
2) Calculat		e ETAG 029, A		nd 4.8 multiply V _{Rk.b} by (D,8			



Table C102		racteristic	values of I	resistance			shear load (continue)				
		_				cteristic resi						
		e e				Jse category	/					
		ctiv pth			d/d				d/d			
Anchor size	Sleeve	Effective Anchorage depth			w/d w/w				w/d w/w			
	0,00000	٦Ā	40°C/24	4°C	80°C/50°	C.	120°C/72°C	All te	mperatur			
		la la	40 0/2				120 0/12 0	r	anges			
		h _{ef}			$N_{Rk,b} = N_{Rk}$	۲,p ິ		V	2)3) Rk,b			
		[mm]			[kN]	2			[kN]			
			Compressi	ive strength	f _b ≥ 16 N/r	nm ²						
M8	12x80	80										
M8 / M10/	16x85	85										
IG-M6	16x130	130	0,75 0,75 0,6					2,0				
M12 / M16 /	20x85	85	-,		2,0							
IG-M8 /	20x130	130										
IG-M10	20x200	200										
			Compressi	ive strength	f _b ≥ 20 N/r	nm²						
M8	12x80	80										
M8 / M10/	16x85	85	_									
IG-M6	16x130	130	0,9		0,9		0,75		2,0			
M12 / M16 /	20x85	85	,		,		,					
IG-M8 / IG-M10	20x130	130 200										
	20x200	200	Compross	ive strength	5 > 20 N/m	2						
M8	12x80	80	Compressi	ive strengti		<u> </u>						
M8 / M10/	16x85	85										
IG-M6	16x130	130										
M12 / M16 /	20x85	85	1,2		1,2		0,9		2,5			
IG-M8 /	20x130	130										
IG-M10	20x200	200										
²⁾ Calculatio	es are valid for	and c _{min} ETAG 029, Ani steel 5.6 or hig placements	her. For steel	l 4.6 and 4.8 n	nultiply V _{Rk,b} b	vy 0,8						
		h _{ef}	N	δ _N / N	δ _{N0}	δ _{N∞}	V	δ _{V0}	δγ∞			
Anchor size	Sleeve	[mm]	[kN]	[mm/kN]	[mm]	[mm]	[kN]	[mm]	[mm]			
All sizes	All sizes	All sizes	0,26	1,20	0,31	0,62	0,6	0,3	0,45			

Injection System VMU plus for masonry

Performance - Clay hollow brick Doppio Uni Characteristic values of resistance, Displacements



Table C104: Descr	iption of	the brick				
Brick type		Hollow Lightweight Bloc creux B40	t concrete			
Bulk density p	[kg/dm ³]	0,8				
	[N/mm ²]	4				-
Code	Learne 1	EN 771-3				
Producer (country code)		e.g. Sepa (FR)				
Brick dimensions	[mm]	494 x 200 x 190		3, 10 3		
Drilling method		Rotary				
		494	4	1		
200				17		
Anchor size	ng and e	dge distances	17 All size:			
Edge distance c _{cr}		[mm]	100 (120)	1)		
	21					
	C _{min} ²⁾	[mm]	100 (120)			_
Minimum edge distance	C _{min} ²⁾ S _{cr,II}	[mm]	100 (120 494			_
Minimum edge distance Spacing Minimum spacing ¹⁾ Value in brackets for VM-SH 2	2) C _{min} S _{cr,⊥} S _{min} 20x85 and V	[mm] [mm] [mm] /M-SH 20x130	100 (120)			
Minimum edge distance Spacing Minimum spacing ¹⁾ Value in brackets for VM-SH 2 ²⁾ For V _{Rk.c} : c _{min} according to ET.	2) C _{min} S _{cr,II} S _{or,I} S _{min} 20x85 and V AG 029, Ar	[mm] [mm] [mm] /M-SH 20x130 nnex C	100 (120) 494 190 100			
Minimum edge distance Spacing Minimum spacing Value in brackets for VM-SH 2 For V _{Rk,c} : c _{min} according to ET, Table C106: Group Configuration II: anchors placed	2) C _{min} S _{cr,II} S _{or,I} S _{min} 20x85 and V AG 029, Ar	[mm] [mm] /M-SH 20x130 inex C	100 (120) 494 190 100			1,5
Minimum edge distance Spacing Minimum spacing ¹⁾ Value in brackets for VM-SH 2 ²⁾ For V _{Rk,c} : c _{min} according to ET. Table C106: Group Configuration II: anchors placed parallel to horizontal	2) C _{min} S _{cr,II} S _{or,I} S _{min} 20x85 and V AG 029, Ar	[mm] [mm] /M-SH 20x130 inex C r anchor group ir with c [mm] ≥ 100	100 (120) 494 190 100 n case of tension loading with s [mm] ≥			
Minimum edge distance Spacing Minimum spacing ¹⁾ Value in brackets for VM-SH 2 ¹⁾ For V _{Rk,c} : c _{min} according to ET. Table C106: Group Configuration II: anchors placed parallel to horizontal joint ⊥: anchors placed	2) C _{min} S _{cr,II} S _{or,I} S _{min} 20x85 and V AG 029, Ar	[mm] [mm] [M-SH 20x130 inex C r anchor group ir with c [mm] ≥	100 (120) 494 190 100 n case of tension loading with s [mm] ≥ 100	1)	[-]	1,5 2,0 1,0
Minimum edge distance Spacing Minimum spacing ¹⁾ Value in brackets for VM-SH 2 ²⁾ For V _{Rk,c} : c _{min} according to ET. Table C106: Group Configuration II: anchors placed parallel to horizontal joint	2) C _{min} S _{cr,II} S _{or,I} S _{min} 20x85 and V AG 029, Ar	[mm] [mm] [M-SH 20x130 inex C r anchor group ir with c [mm] ≥ 100 C _{cr}	100 (120) 494 190 100 n case of tension loading with s [mm] ≥ 100 494	1)	[-]	2,0
Minimum edge distance Spacing Minimum spacing 1) Value in brackets for VM-SH 2 2) For V _{Rk,c} : c _{min} according to ET. Table C106: Group Configuration II: anchors placed parallel to horizontal joint ⊥: anchors placed perpendicular to	Cmin ² Scr,II Scr,II Smin 20x85 and V AG 029, Ar	[mm] [mm] [mm] /M-SH 20x130 mex C r anchor group in with c [mm] ≥ 100 C _{cr} 100 C _{cr}	100 (120) 494 190 100 100 with s [mm] ≥ 100 494 100	α_g,N,II	[-]	2,0 1,0



Configuration	her (mm]	tic values of 40°C/24°C	vith c [mm] ≥ 50 C _{cr} 100 c _{cr} or group in vith c [mm] ≥ C _{cr} of resistanc d/d 80°C/50°C N _{Rk,b} = N _{Rk,p} ¹⁾	ce under to Char 120°C/72°C	with s [mm] 494 190 ension and acteristic res Use categor	α _g , erpendicu ≥ α _g , α _g ,	v,1 Jilar to 1 v,1 v,1 v,1	(-)	1,1 2,0 1,1 2,0 dge 2,0 2,0 2,0 d/d w/d w/w All temperature ranges
parallel to horizontal joint Image: second perpendicular to horizontal joint G Table C108: G Configuration II: anchors placed parallel to horizontal joint Image: second perpendicular to horizontal joint Image: second perpendicular to horizontal joint L: anchors placed perpendicular to horizontal joint Image: second perpendicular to horizontal joint Image: second perpendicular to horizontal joint Anchor size Sleeve M8 12×80 M8 / M10/ IG-M6 16×85 16×130 16×130	her (mm]	tic values of 40°C/24°C	Cer 100 cer or group in vith c [mm] ≥ Cer cer of resistance d/d 80°C/50°C	ce under to Char 120°C/72°C	494 100 190 hear load p with s [mm] 494 190 ension and acteristic res Use categor	erpendicu ≥ α _g , α _g , α _g , α _g , α _g , α _g , w/α istance y w/d w/w	v,1 Jilar to 1 v,1 v,1 v,1	free er	2,0 1,1 2,0 dge 2,0 2,0 2,0 d/d w/d w/w All temperature
joint L: anchors placed perpendicular to horizontal joint Table C108: G Configuration II: anchors placed parallel to horizontal joint L: anchors placed perpendicular to horizontal joint Table C109: C Anchor size M8 12×80 M8 12×80 M8 12×80 M8 16×130 20 21	her (mm]	tic values of 40°C/24°C	100 c _{cr} or group in vith c [mm] ≥ C _{cr} of resistanc d/d 80°C/50°C	ce under to Char 120°C/72°C	100 190 hear load p with s [mm] 494 190 ension and acteristic res Use categor	erpendicu ≥ α _g , α _g , α _g , α _g , α _g , α _g , w/α istance y w/d w/w	v,1 Jilar to 1 v,1 v,1 v,1	free er	1,1 2,0 dge 2,0 2,0 2,0 d/d w/d w/w All temperature
perpendicular to horizontal joint Table C108: G Configuration II: anchors placed parallel to horizontal joint II: anchors placed perpendicular to horizontal joint L: anchors placed perpendicular to horizontal joint C Table C109: C Anchor size Sleeve M8 12×80 M8 / M10/ IG-M6 16×85 I0x / M2 / M10/ IG-M6 16×130	her (mm]	tic values of 40°C/24°C	C _{cr} or group in vith c [mm] ≥ C _{cr} of resistand d/d 80°C/50°C	ce under to Char 120°C/72°C	190 hear load p with s [mm] 494 190 ension and acteristic res Use categor	erpendicu ≥ α _g α _g α _g α _g α _g w _g w _g w _g	v,ii v,ii	free er	2,0 dge 2,0 2,0 d/d w/d w/w All temperature
horizontal joint G Table C108: G Configuration II: anchors placed parallel to horizontal joint II: anchors placed perpendicular to horizontal joint L: anchors placed perpendicular to horizontal joint C Table C109: C Anchor size Sleeve M8 12×80 M8 / M10/ IG-M6 16×85 I6×130 20×25	her (mm]	tic values of 40°C/24°C	or group in vith c [mm] ≥ c _{cr} c _{cr} of resistand d/d	ce under to Char 120°C/72°C	hear load p with s [mm] 494 190 ension and acteristic res Use categor	erpendicu ≥ α _g α _g α _g α _g α _g w _g w _g w _g	v,ii v,ii	(-)	dge 2,0 2,0 d/d w/d w/w All temperature
Configuration II: anchors placed parallel to horizontal joint ⊥: anchors placed perpendicular to horizontal joint Table C109: C Anchor size Sleeve M8 12×80 M8 / M10/ IG-M6 16×85 16×130 20-25	her (mm]	tic values of 40°C/24°C	vith c [mm] ≥ c _{cr} c _{cr} of resistand d/d 80°C/50°C	ce under to Char 120°C/72°C	with s [mm] 494 190 ension and acteristic res Use categor	≥ α _g ; α _g ; shear loa istance y w/d w/w	V,II V.1	(-)	2,0 2,0 d/d w/d w/w All temperature
Configuration II: anchors placed parallel to horizontal joint ⊥: anchors placed perpendicular to horizontal joint Table C109: C Anchor size Sleeve M8 12×80 M8 / M10/ IG-M6 16×85 16×130 19×95	her (mm]	tic values of 40°C/24°C	vith c [mm] ≥ c _{cr} c _{cr} of resistand d/d 80°C/50°C	ce under to Char 120°C/72°C	with s [mm] 494 190 ension and acteristic res Use categor	≥ α _g ; α _g ; shear loa istance y w/d w/w	V,II V.1	(-)	2,0 2,0 d/d w/d w/w All temperature
II: anchors placed parallel to horizontal joint Image: scalar scala	her (mm]	tic values 40°C/24°C	c _{cr} c _{cr} of resistanc d/d 80°C/50°C	Char 120°C/72°C	494 190 ension and acteristic res Use categor	α _g α _g shear loa istance y w/d w/w	v,_		2,0 d/d w/d w/w All temperature
parallel to horizontal joint Image: constraint of the second perpendicular to horizontal joint Table C109: C Anchor size Sleeve M8 12x80 M8 / M10/ IG-M6 16x85 16x130 20.25	her (mm]	40°C/24°C	c _{cr} of resistand d/d 80°C/50°C	Char 120°C/72°C	190 ension and acteristic res Use categor	shear loa istance y w/d w/w	v,_		2,0 d/d w/d w/w All temperature
perpendicular to horizontal joint C Table C109: C Anchor size Sleeve M8 12x80 M8 / M10/ IG-M6 16x85 16x130 20.05	Effective anchorage depth	40°C/24°C	of resistand d/d 80°C/50°C	Char 120°C/72°C	ension and acteristic res Use categor	shear loa istance y w/d w/w	d		d/d w/d w/w All temperature
Table C109: C Anchor size Sleeve M8 12x80 M8 / M10/ IG-M6 16x85 16x130 20.05	Effective anchorage depth	40°C/24°C	d/d 80°C/50°C	Char 120°C/72°C	acteristic res Use categor	istance y w/d w/w		72°C 1	w/d w/w All temperature
Anchor size Sleeve M8 12x80 M8 / M10/ IG-M6 16x85 16x130	Effective anchorage depth	40°C/24°C	d/d 80°C/50°C	Char 120°C/72°C	acteristic res Use categor	istance y w/d w/w		72°C 1	w/d w/w All temperatur
M8 12x80 //B / M10/ IG-M6 16x85 16x130	h _{əf} [mm]	1. 16 4	80°C/50°C	120°C/72°C	Use categor	y w/d w/w	120°C/	72°C 1	w/d w/w All temperature
M8 12x80 //8 / M10/ IG-M6 16x85 16x130	h _{əf} [mm]	1. 16 4	80°C/50°C	i dan secol		w/d w/w	120°C/	72°C 1	w/d w/w All temperatur
M8 12x80 M8 / M10/ IG-M6 16x85 16x130	h _{əf} [mm]	1. 16 4	80°C/50°C	i dan secol	40°C/24°C	w/w	120°C/	72°C 1	w/w All temperatur
M8 12x80 M8 / M10/ IG-M6 16x85 16x130	h _{əf} [mm]	1. 16 4		i dan secol	40°C/24°C	80°C/50°C	120°C/	72°C 1	All temperatur
M8 / M10/ IG-M6 16x85 16x130	[mm]		$N_{Rk,b} = N_{Rk,p}^{1)}$						
M8 / M10/ IG-M6 16x85 16x130	[mm]		tittle tittle		1	Rk,b = NRK,p	1)		V _{Rk,b} ²⁾³⁾
M8 / M10/ IG-M6 16x85 16x130		A	· · · · · · · · · · · · · · · · · · ·		[kN]	Turke		2	- 1.111
//8 / M10/ IG-M6 16x85 16x130		Compre	essive stren	gth f _b ≥4N	l/mm ²				
//////////////////////////////////////	80	11-27			0,9				
00.05	85		0,9	0,75	1,2	0,9			
M12/M16/ 20X00	130	1,2			1,2		0,7	5	3,0
	85				1,2			-	
202130	130	1			1,2	_			
 ²⁾ Calculation of V_{Rkc} se ³⁾ The values are valid f 	e ETAG 029	r higher. For s				n c ≥ 250 mm	n: V _{Rk.c.II} =	=V _{Rk,b}	
Anchor size Sleeve	h _{ef}	N	δ _N / N	δ _{N0}	δη∞	V	ě	δνο	δγ∞
	[mm]	[kN]	[mm/kN]	[mm]	[mm]	[kN]	[n	nm]	[mm]
All sizes All sizes	All sizes	0,34	0,90	0,31	0,62	0,86	(0,9	1,35
Injection System VMU	olus for m	asonry							



Code Producer (country code) Brick dimensions	ρ [kg/dm³] f _b ≥ [N/mm²]	LAC	tweight concrete				
Compressive strength Code Producer (country code) Brick dimensions Drilling method		0,6			-	ALL NOVAR	
Code Producer (country code) Brick dimensions	10 - [rannu]	2			C'SE .	新日本 書	
Producer (country code) Brick dimensions		EN 771-3			気を言		
			herm (DE)				
Drilling method	[mm]	300 x 123			A CONTRACTOR	A. M. T. Mar	
		Rotary					
Table C112: S	Spacing and e	dge distar	nces				
Anchor size				All sizes			
Edge distance	Ccr	[mm]		1,5*h _{ef}	<		
Ainimum edge distance c _{min}			[mm] 60				
Spacing Minimum spacing	[mm] [mm]		3*h _{ef} 120				
	S _{min}		anto States	122 TO 17 100 T			
Table C113: G Configuration			c [mm] ≥	of tension loading with s [mm] ≥	1		
II: anchors placed			90	120			1,1
parallel to horizontal joint		1	,5*hef	3*h _{ef}	α _{g,N,II}	1	2,0
L: anchors placed perpendicular to horizontal joint			124	120		[-]	1,1
		1	,5*hef	23.8	α _{g,N,L}		
horizontal joint			.5 nei	3*hef			2.0
				3*h _{ef}	1.4.7.6		2,0
Table C114: G		or anchor	group in case	of shear loading pa	rallel to fr	ee edge	2,0
Table C114: G Configuration		or anchor	group in case c [mm] ≥	of shear loading pa with s [mm] ≥	rallel to fr	ee edge	
Table C114: G		or anchor	group in case c[mm]≥ 60	of shear loading pa with s [mm] ≥ 120	1	ee edge	0,6
Table C114: G Configuration II: anchors placed		or anchor	group in case c [mm] ≥	of shear loading pa with s [mm] ≥	rallel to fr		
Table C114: G Configuration II: anchors placed parallel to horizontal joint Joint ⊥: anchors placed Joint		or anchor	group in case c[mm]≥ 60	of shear loading pa with s [mm] ≥ 120	α _{g,V,II}	ee edge [-]	0,6
Table C114: G Configuration II: anchors placed parallel to horizontal joint		or anchor	group in case c [mm] ≥ 60 90	of shear loading pa with s [mm] ≥ 120 120	1		0,6 2,0
Table C114: G Configuration II: anchors placed parallel to horizontal joint ⊥: anchors placed perpendicular to horizontal joint		with	group in case c [mm] ≥ 60 90 60 124	of shear loading pa with s [mm] ≥ 120 120 120 120 120	α _{g,V,1} ,	[-]	0,6 2,0 0,6 2,0
Table C114: G Configuration II: anchors placed parallel to horizontal joint ⊥: anchors placed perpendicular to horizontal joint Table C115:	v •••	or anchor g	group in case c [mm] ≥ 60 90 60 124 group in case	of shear loading pa with s [mm] ≥ 120 120 120 120 120 120	α _{g,V,1} ,	[-]	0,6 2,0 0,6 2,0
Table C114: G Configuration II: anchors placed parallel to horizontal joint ⊥: anchors placed perpendicular to horizontal joint Table C115: G Configuration	v •••	or anchor g	group in case c [mm] ≥ 60 90 60 124	of shear loading pa with s [mm] ≥ 120 120 120 120 120	α _{g,V,1} ,	[-]	0,6 2,0 0,6 2,0
Table C114: G Configuration II: anchors placed parallel to horizontal joint ⊥: anchors placed perpendicular to horizontal joint Table C115: G Configuration II: anchors placed perpendicular to horizontal joint	v •••	or anchor g	group in case c [mm] ≥ 60 90 60 124 group in case c [mm] ≥	of shear loading pa with s [mm] ≥ 120 120 120 120 120 120 vith s [mm] ≥	α _{g,V,1} ,	[-]	0,6 2,0 0,6 2,0 Ige 0,6
Table C114: G Configuration II: anchors placed parallel to horizontal joint ⊥: anchors placed perpendicular to horizontal joint Gamma Configuration Table C115: Gamma Configuration II: anchors placed parallel to horizontal joint	Froup factor fo	or anchor g	group in case c [mm] ≥ 60 90 60 124 group in case c [mm] ≥ 60	of shear loading pa with s [mm] ≥ 120 120 120 120 120 120 0f shear load perpention with s [mm] ≥ 120	α _{g,V,II} α _{g,V,⊥}	[-]	0,6 2,0 0,6 2,0
Table C114: G Configuration II: anchors placed parallel to horizontal joint ⊥: anchors placed perpendicular to horizontal joint Table C115: G Configuration II: anchors placed parallel to horizontal joint	Froup factor fo	or anchor g	group in case c [mm] ≥ 60 90 60 124 group in case c [mm] ≥ 60 90	e of shear loading pa with s [mm] ≥ 120 120 120 120 120 0 f shear load perpendent with s [mm] ≥ 120 120 120	α _{g,V,II} α _{g,V,⊥}	[-] o free ec	0,6 2,0 0,6 2,0 Ige 0,6 2,0



Brick type: So	lid lightwe	eight con	crete - LA	С					
Table C116	: Cha	aracterist	ic values	of resistar	nce under t	ension and	d shear loa	ad	
					Char	racteristic re	sistance		
		0				Use catego	ory		
A nahan sina	Anchor size Sleeve	Effective anchorage depth		d/d			w/d w/w		d/d w/d w/w
Anchor size	Sieeve		40°C/24°C	80°C/50°C	120°C/72°C	40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges
			$N_{Rk,b} = N_{Rk,p}^{1}$				V _{Rk,b} ²⁾³⁾		
		[mm]				[kN]			
			Compr	essive stre	ngth f _b ≥2N	l/mm²			
M8	-	80	3,0	2,5	2,0	2,5	2,0	1,5	3,0
M8 / M10/ IG-M6	-	90	3,0	3,0	2,0	2,5	2,5	2,0	3,0
M10 / IG-M8	-	100	3,5	3,0	2,5	3,0	2,5	2,0	3,0
M16 / IG-M10	-	100	3,0	3,0	2,0	3,0	3,0	2,0	3,0
M8	12x80	80	2,5	2,5	2,0	2,5	2,0	1,5	3,0
M8 / M10/	16x85	85	3,0	2,5	2,0	3,0	2,5	2,0	3,0
IG-M6	16x130	130	3,0	2,5	2,0	3,0	2,5	2,0	3,0
M12 / M16 /	20x85	85							
IG-M8 /	20x130	130	2,5	2,5	2,0	2,5	2,5	2,0	3,0
IG-M10	20x200	200							

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

²⁾ For calculation of $V_{Rk,c}$ see ETAG029, Annex C

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

Table C117: Displacements

Anchor size	Sleeve	h _{ef}	Ν	δ _N / N	δ _{ΝΟ}	δ _{N∞}	V	δ_{V0}	δ∨∞
		[mm]	[kN]	[mm/kN]	[mm]	[mm]	[kN]	[mm]	[mm]
M8	-	80							
M8 / M10/ IG-M6	-	90	0,86	0,50	0,43	0,86	0,9	0,25	0,38
M10 / IG-M8	-	100	1,00	0,35	0,35	0,70		-,	- ,
M16 / IG-M10	-	100	0,86	0,35	0,30	0,60			
M8	12x80	80		0,50	0,36	0,71			
M8 / M10/	16x85	85							
IG-M6	16x130	130	0.71				0.0	0.05	0.20
	20x85	85	0,71	0,35	0,25	0,50	0,9	0,25	0,38
M12 / M16 / IG-M8 / IG-M10	20x130	130							
	20x200	200							

Injection System VMU plus for masonry

Performance - Solid lightweight concrete - LAC Characteristic values of resistance, Displacements