

... eine starke Verbindung

DECLARACIÓN DE PRESTACIONES

DoP No.: MKT-2.2-100_es

1

- Código de identificación única del producto tipo:
- ♦ Usos previstos:
- ♦ Fabricante:

Sistema de inyección VMU plus para mampostería

Sistema de inyección para anclaje en mampostería, ver Anexo / Annex B

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

- Sistema o sistemas de evaluación y Verificación de la constancia de las prestaciones:
- Documento de evaluación europeo: Valuación técnica europea: Organismo de evaluación técnica: Organismos notificados:

ETAG 029 ETA-13/0909, 08.12.2016 DIBt, Berlin NB 2873 – Technische Universität Darmstadt

♦ Prestaciones declaradas:

Características esenciales	Prestaciones
Resistencia mecánica y estabilidad (BWR1)	
Factor de reducción para ensayos en obra (factor β)	Anexo / Annex C1
Capacidad de carga característica de los elementos de acero	Anexo / Annex C2
Capacidad de carga característica de los anclajes en mampostería	Anexo / Annex C3 – C45
Desplazamientos (cargas de tracción y cortante)	Anexo / Annex C4 – C45
Distancias al borde y al centro	Anexo / Annex C3 – C45
Factor de grupo para fijaciones de grupo	Anexo / Annex C3 – C45
Seguridad en caso de incendio (BWR 2)	
El comportamiento del fuego	Clase A1
Resistencia al fuego	Prestación no determinada

Las prestaciones del producto identificado anteriormente son conformes con el conjunto de prestaciones declaradas. La presente declaración de prestaciones se emite, de conformidad con el Reglamento (EU) no 305/2011, bajo la sola responsabilidad del fabricante arriba identificado.

Firmado por y en nombre del fabricante por:

Stefan Weustenhagen

(Director general)

Weilerbach, 01.01.2021

p.p Rigally



Dipl.-Ing. Detlef Bigalke (Director de Desarrollo de Productos)

El original de esta declaración de rendimiento fue escrito en alemán. En caso de desviaciones en la traducción, la versión alemana es.

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:

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

Design:

- Verifiable calculation notes and drawings are prepared taking account the relevant masonry in the region of the anchorage, the loads to be transmitted and their transmission to the supports of the structure. The position of the anchor is indicated on the design drawings.
- The anchorages are designed in accordance with 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:

$$N_{Rk,p,j} = 0,18 * N_{Rk,p}$$
 and $N_{Rk,b,j} = 0,18 * N_{Rk,b}$

$$N_{Rk,p} = N_{Rk,b}$$
 see Annex C4 to C45)

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

Installation:

- Dry or wet structures
- Drill method acc. to Annex C4 to C45.
- Anchor Installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- When using anchor rods with internal thread (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

Annex B1

Brick-No.	Brick type	Picture	Brick size length width height	Compressive strength	Bulk density	Sleeve - Anchor type	Annex
			[mm]		[kg/dm ³]		
Aut	oclaved aerated	d concrete units ac	cording EN	771-4			1
1	Autoclaved aerated concrete AAC6	Ī	499 240 249	6	0,6	M8/M10/M12/M16 IG-M6/IG-M8/IG-M10	C4 _ C5
Calc	cium silicate ma	asonry units acco	ding 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 C11
4	Calcium silicate hollow brick KSL-12DF	in the second	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 C12
Clay	/ masonry units	s according EN 77	1-1	1			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
Inte	nded use	VMU plus for ma	-	ng eleme	nts	Annex	B2

Brick-No.	Brick type	Picture	Brick size length width height	Compressive strength	Bulk density	Sleeve - Anchor type	e	Annex
			[mm]	[N/mm ²]	[kg/dm ³]			
Clay	/ masonry units	s according EN 77	1-1					
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-M VM-SH 20x130 – M12/M16/IG-M	6 18/IG-M10	C24 - C26
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-M VM-SH 20x130 – M12/M16/IG-M	6 18/IG-M10	C21
10	Clay hollow brick Urbanbric	-	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-M VM-SH 20x130 – M12/M16/IG-M	6 18/IG-M10	C3 - 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-M VM-SH 20x130 – M12/M16/IG-M	6 18/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-M VM-SH 20x130 – M12/M16/IG-M VM-SH 20x200 – M12/M16/IG-M	6 18/IG-M10 18/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-M VM-SH 20x130 – M12/M16/IG-M VM-SH 20x200 – M12/M16/IG-M	8 8 18/IG-M10 18/IG-M10	C3 - C4
Ligh		ete according EN 7	71-3	-				
14	Hollow lightweight concrete Bloc creux B40		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-M VM-SH 20x130 – M12/M16/IG-M	6 18/IG-M10	C4 - C4
15	Solid lightweight concrete		300 123 248	2	0,6	M8/M10/M12/M16/IG-M6/IG-M8/ VM-SH 12x80 – M8 VM-SH 16x85 – M8/M10/IG-M6 VM-SH 16x130 – M8/M10/IG-M6 VM-SH 20x85 – M12/M16/IG-M VM-SH 20x130 – M12/M16/IG-M VM-SH 20x200 – M12/M16/IG-M	'IG-M10 5 18/IG-M10 18/IG-M10	C4 - C4
Injection System VMU plus for masonry Intended use Brick types and properties with corresponding fastening elements								3

Installation: Steel brush

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

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
			N ->	ĭ≥ .>	N	5 >	N	l> ≻	5
Nominal drill hole diameter	d ₀	[mm]	10	12		14		18	
Drill hole depth	h ₀	[mm]	80	9	0	100		100	
Effective anchorage depth	h _{ef}	[mm]	80	9	90 100		00	100	
Minimum wall thickness	h _{min}	[mm]				h _{ef} + 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	14		16		2	0
Min. diameter of steel brush	d _{b,min}	[mm]	10,5	10,5 12,5		12,5 14,5		18	,5
Max. installation torque moment	T _{inst,max}	[Nm]		2 (14 for Mz DF)					

[†] d₀

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

Anchor size	M8	M8 / N IG-I	-	M12 / M16 IG-M8 IG-M10				
Sleeve			12x80	16x85	16x130	20x85	20x130	20×200
Nominal drill hole diameter	d_0	[mm]	12	16			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-M6) 9 (M8) 12 (M10)			9 (IG-M8) 12 (IG-M10) 14 (M12) 18 (M16)	
Diameter of steel brush	db	[mm]	14	18		22		
Min. diameter of steel brush	$d_{b,min}$	[mm]	12,5	16,5			20,5	
Max. installation torque moment	T _{inst,max}	[Nm]		2				

Injection System VMU plus for masonry

Intended use

Cleaning brush and installation parameters

Annex B4

Temperature in the base material	Temperature of cartridge	Working time	Minimum curing time in 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

Table B4: Maximum working time and minimum curing time VMU plus

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

Table B5: Maximum working time and minimum curing timeVMU 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]	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

Annex B5

Installation Instruction - Solid masonry without sleeve Drill hole perpendicular to the surface of base material with drill method according to Annex C4-C45, with nominal drill hole diameter and bore hole depth according to the size and embedment 1. depth required by the selected anchor. In case of aborted drill hole the hole shall be filled with mortar. Drill hole must be cleaned prior to installation of the anchor. 2a Blow out from the bottom of the bore hole two times. Attach the appropriate sized brush (acc.to Annex B4) to a drilling machine or a battery THEFT 2b screwdriver, brush the hole clean two times. 2x 📥 🖬 Finally blow out the hole again two times. 2c. 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. 3. 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. The position of the embedment depth shall be marked on the threaded rod. 4 The anchor rod shall be free of dirt, grease, oil or other foreign material. Initial adhesive is not suitable for fixing the anchor. Prior to dispensing into the anchor hole. 5. squeeze out separately a minimum of three full strokes, for foil tube cartridges six full strokes and discard non-uniformly mixed adhesive components until the mortar shows a consistent grev color. Starting from the bottom or back of the cleaned anchor hole, fill up the hole to min two-thirds with 6. adhesive. Slowly withdraw the static mixing nozzle will avoid creating air pockets. Observe the working times given in Table B4 and B5. Push the threaded rod into the anchor hole while turning slightly to ensure positive distribution of the adhesive until the embedment depth is reached. Be sure that the annular gap is fully filled with 7. mortar. If no excess mortar is visible at the top of the hole, the application has to be renewed. Allow the adhesive to cure to the specified curing time given in Table B4 or B5. 8. Do not move or load the anchor until it is fully cured. After curing time remove access mortar. Tinst After full curing, the fixture can be installed with up to the max, installation torque acc, to Table B2 9. or B3 with calibrated torque wrench. Injection System VMU plus for masonry Annex B6 Intended Use Installation instructions (Solid masonry without sleeve)

Insta	allation Instructions	s - Solid or hollow masonry - <u>with</u> sleeve						
1.	90°+	Drill hole perpendicular to the surface of base material with drill method accord C45, with nominal drill hole diameter and bore hole depth according to the size depth required by the selected anchor. In case of aborted drill hole the drill hol mortar.	e and embedment					
		Drill hole must be cleaned prior to installation of the anchor.						
2a.		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 brush the hole clean two times.	a battery screwdriver,					
2c.		Finally blow out the hole again two times.						
З.		Insert the perforated sleeve flush with the surface of the masonry or plaster. O have the right length. Never cut the sleeve.	only use sleeves that					
4.	AN TRACTOR	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 ne cartridges, a new static-mixer shall be used.						
5.	her h	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.	min. 3x	Initial adhesive is not suitable for fixing the anchor. Prior to dispensing into the anchor hole, squeeze out separately a minimum of three full strokes, for foil tube cartridges six full strokes and discard non-uniformly mixed adhesive components until the mortar shows a consistent grey colour						
7.	++++	Starting from the bottom or back fill the sleeve with adhesive. For embedm larger than 130 mm an extension nozzle shall be used. For quantity of mortar 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 pos adhesive until the embedment depth is reached.	itive distribution of the					
9.		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.	i.					
10.	Tinst	ue acc. to Table B2						
1	ation Ductors MA							
inje	cuon system vM	U plus for masonry						
	nded Use		Annex B7					
Insta	Ilation Instruction (S	olid or hollow masonry - <u>with</u> sleeve)						

		β-Factor								
Brick-No. and	Installation & Use category	T _a : 40°(C / 24°C	Т _ь : 80°0	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			
MZ-DF 6 Hlz-16DF 7 Porotherm Homebric 8 BGV-Thermo 9 Calibric R+	all sizes	0,86	0,86	0,86	0,86	0,73	0,73			
10 Urbanbric										
11 Brique creuse C40										
12 Blocchi Leggeri										
13 Doppio Uni										
14	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

Annex C1

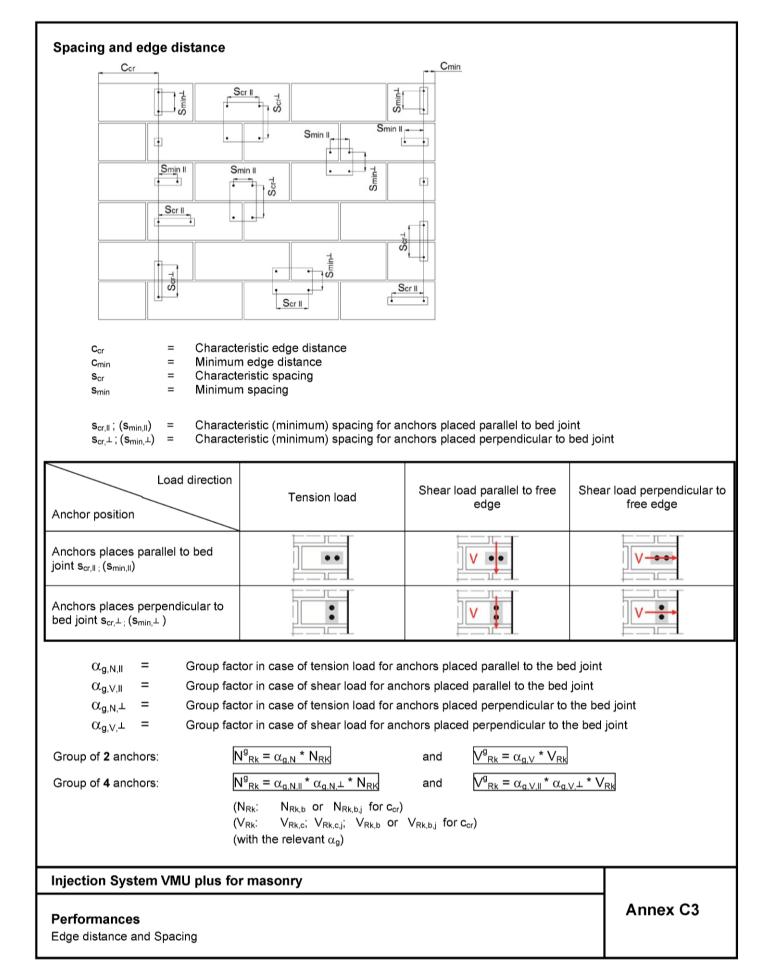
 $\boldsymbol{\beta}$ - factors for job site testing under tension load

Anchor type				VMU-IG			VMU-A	, V-A	
Anchor size			M6	M8	M10	M8	M10	M12	M16
Characteristic tension resistance									
Steel, property class 4.6	$N_{Rk,s}$	[kN]	-	-	-	15	23	34	63
	γMs	[-]		-			2,0		
Steel, property class 4.8	N _{Rk,s}	[kN]	-	-	-	15	23	34	63
	γMs	[-]		-			1,5	5	
Steel, property class 5.6	N _{Rk,s}	[kN]	10	18	29	18	29	42	79
	γMs	[-]		2,0			2,0		
Steel, property class 5.8	N _{Rk,s}	[kN]	10	17	29	18	29	42	79
	γMs	[-]		1,5			1,5		
Steel, property class 8.8	N _{Rk,s}	[kN]	16	27	46	29	46	67	126
	γMs	[-]		1,5			1,5		
Stainless steel A4 / HCR,	N _{Rk,s}	[kN]	14	26	41	26	41	59	110
property class 70	γMs	[-]		1,87			1,8		
Stainless steel A4 / HCR,	N _{Rk,s}	[kN]	16	29	46	29	46	67	126
property class 80	γMs	[-]		1,6			1,6	6	
Characteristic shear resistance									
Steel, property class 4.6	V _{Rk,s}	[kN]	-	-	-	7	12	17	31
	γMs	[-]		-			1,6		
Steel, property class 4.8	V _{Rk,s}	[kN]	-	-	-	7	12	17	31
	γMs	[-]		-			1,2		
Steel property class 5.6	V _{Rk,s}	[kN]	5	9	15	9	15	21	39
Steel, property class 5.6	γMs	[-]		1,67			1,6	1	
iteel, property class 5.8	V _{Rk,s}	[kN]	5	9	15	9	15	21	39
	γMs	[-]		1,25			1,2		
Steel, property class 8.8	V _{Rk,s}	[kN]	8	14	23	15	23	34	63
	γMs	[-]		1,25			1,2		
Stainless steel A4 / HCR,	V _{Rk,s}	[kN]	7	13	20	13	20	30	55
property class 70	γMs	[-]		1,56			1,5		
Stainless steel A4 / HCR,	V _{Rk,s}	[kN]	8	15	23	15	23	34	63
property class 80	γMs	[-]		1,33			1,3	3	
Characteristic bending moment									
Steel, property class 4.6	$M_{Rk,s}$	[Nm]	-	-	-	15	30	52	133
Steel, property class 4.0	γMs	[-]		-			1,6	7	
Steel, property class 4.8	$M_{Rk,s}$	[Nm]	-	-	-	15	30	52	133
	γMs	[-]		-			1,2	5	
Steel, property class 5.6	$M_{Rk,s}$	[Nm]	8	19	37	19	37	66	167
Steel, property class 5.0	γMs	[-]		1,67			1,6	7	
Steel, property class 5.8	$M_{Rk,s}$	[Nm]	8	19	37	19	37	66	167
	γMs	[-]		1,25			1,2		
Steel, property class 8.8	M _{Rk,s}	[Nm]	12	30	60	30	60	105	266
	γMs	[-]		1,25			1,2		
Stainless steel A4 / HCR,	M _{Rk,s}	[Nm]	11	26	52	26	52	92	233
property class 70	γMs	[-]		1,56			1,5	6	
Stainless steel A4 / HCR,	$M_{Rk,s}$	[Nm]	12	30	60	30	60	105	266
property class 80	γMs	[-]		1,33			1,3	3	

Injection System VMU plus for masonry

Performances

Characteristic steel resistance under tension and shear load



Brick type: Autoclaved Aerated Concrete – AAC6

Table C3: Description of the brick

Brick type		Autoclaved Aerated Concrete AAC6	
Bulk density	$ ho$ [kg/dm 3]	0,6	
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	C _{cr}	[mm]	1,5*h _{ef}
Minimum odgo distanco	C _{min,N}	[mm]	75
Minimum edge distance	C _{min,V,II} (C _{min,v,} ⊥) ¹⁾	[mm]	75 (1,5*h _{ef})
Spacing	S _{cr}	[mm]	3*h _{ef}
Minimum spacing	S _{min}	[mm]	100

¹⁾ c_{min,V,II} for shear loading parallel to the free edge; c_{min,v,} ⊥ for shear loading perpendicular free edge

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

Configura	ation	with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal		125 (120 for M8)	100	6 1		1,8
joint		1,5*hef	3*hef	α _{g,N,II}		2,0
⊥: anchors placed		75	100		[-]	1,4
perpendicular to horizontal joint		1,5*hef	3*hef	α _{g,N,⊥}		2,0

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

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

Injection System VMU plus for masonry

Performances - Autoclaved Aerated Concrete - AAC6

Annex C4

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

Brick type: Autoclaved Aerated Concrete – AAC6

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

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

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

				Cha	racteristic resi	stance					
			Use category								
Anchor size	Effective anchorage depth	d/d			w/w w/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}	$N_{Rk,p} = N_{Rk,p}^{1}$			$N_{Rk,b} = N_{Rk,p}^{1}$			V _{Rk,b} ²⁾³⁾			
	[mm]				[kN]						
			Compressi	ive strength f _t	≥ 6 N/mm²						
M8	80	2,5 (2,0)	2,5 (1,5)	2,0 (1,2)	2,5 (1,5)	2,0 (1,5)	1,5 (1,2)	6,0			
M10/IG-M6	90	4,0 (2,5)	3,0 (2,0)	2,5 (1,5)	3,5 (2,5)	3,0 (2,0)	2,5 (1,5)	10,0			
M12/IG-M8	100	5,0 (3,5)	4,0 (3,0)	3,0 (2,5)	4,5 (3,0)	3,5 (2,5)	3,0 (2,5)	10,0			
M16/IG-M10	100	6,5 (4,5)	5,5 (3,5)	4,0 (3,0)	5,5 (4,0)	5,0 (3,5)	4,0 (3,0)	10,0			

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

²⁾ For calculation of $V_{Rk,c}$ see ETAG029, Annex C; ³⁾ The values are valid for steel 5.6 or higher. For

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

Table C9: Displacements

Anchor size	h _{ef} [mm]	N [kN]	δ <mark>N</mark> / N [mm/kN]	δ <mark>N0</mark> [mm]	δ _{N∞} [mm]	V [kN]	δ <mark>∨0</mark> [mm]	δ γ ∞ [mm]
M8	80	0,9	0.19	0,16	0,32	1,3	0,8	1,20
M10/IG-M6	90	1,4	0,18	0,26	0,51	1,8	1,2	1,80
M12/IG-M8	100	1,8	0.08	0,14	0,29	2,1	1,4	2,10
M16/IG-M10	100	2,3	0,08	0,19	0,37	2,3	1,5	2,25

Injection System VMU plus for masonry

Performances - Autoclaved Aerated Concrete – AAC6

Annex C5

Group factor, Characteristic values of resistance, Displacements

Brick type: Calcium silicate solid brick KS-NF

Table C10:	Description of	the brick	
Brick type		Calcium silicate solid brick KS-NF	
Bulk density	ho [kg/dm³]	2,0	
Compressive strength	f _b ≥ [N/mm²]	10, 20 or 27	
Code		EN 771-2	
Producer (country code)		e.g. Wemding (DE)	
Brick dimensions	[mm]	240 x 115 x 71	
Drilling method		Hammer	

Table C11: Spacing and edge distance

Anchor size			All sizes			
Edge distance	Ccr	[mm]	1,5*h _{ef}			
Minimum edge distance	Cmin	[mm]	60			
Spacing	Scr	[mm]	3*h _{ef}			
Minimum spacing	S _{min}	[mm]	120			

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

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

Table C13:

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

	-	• •	• ·		-	
Configura	ation	with c [mm] ≥	with s [mm] ≥			
II: anchors placed		60	120			1,0
parallel to horizontal	V ••	115	120	$\alpha_{\text{g,V,II}}$		1,7
joint		1,5*hef	3*h _{ef}			2,0
⊥: anchors placed		60	120		[-]	1,0
perpendicular to	V 💲	1,5*hef	120	$\alpha_{\text{g,V,}\perp}$		1,0
horizontal joint		1,5*hef	3*h _{ef}			2,0

Table C14:

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

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

Injection System VMU plus for masonry

Performances - Calcium solid brick KS-NF

Annex C6

Description, Spacing and edge distance, Group factor

Brick type:	Brick type: Calcium silicate solid brick KS-NF									
Table C ²	15:	Charact	teristic val	ues of resi	istance und	ler tension	and shear	r loads		
				Characteristic resistance						
		υ				Use categ	jory			
Anchor size	Sleeve	Effective anchorage depth		d/d			w/d w/w		d/d w/d w/w	
		ω							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]				
			Cc	mpressive	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	· · · · ·					!	1	
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	<u> </u>	<u> </u>						
			Co	mpressive	strength f _b ≥	20 N/mm ²		1		
M8	-	80	1						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	1							
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: Calcium silicate solid brick KS-NF

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

									,		
					Cha	aracteristic r	esistance				
		a <u>u</u>	Use category								
Anchor size	Sleeve	Effective anchorage depth		d/d			d/d w/d w/w				
		σ	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)

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)

		Displac	Jennenits						
Anchor	Sleeve	h _{ef}	Ν	δ _N / N	δ_{N0}	δ _{N∞}	V	δ _{V0}	δv∞
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	0.45	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

Characteristic values of resistance (continue), Displacements

Brick type: Calcium silicate hollow brick KSL-3DF

Table C18:	Description of	the brick	
Brick type		Calcium silicate hollow brick KSL-3DF	
Bulk density	$ ho$ [kg/dm 3]	1,4	
Compressive strength	$f_b \ge [N/mm^2]$	8, 12 or 14	
Code		EN 771-2	
Producer (country code)		e.g. Wemding (DE)	
Brick dimensions	[mm]	240 x 175 x 113	
Drilling method		Rotary	

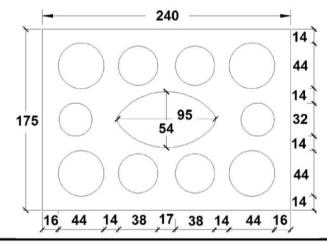


Table C19: Spacing and edge distance

Anchor size			All sizes		
Edge distance	Ccr	[mm]	100 (120) ¹⁾		
Minimum edge distance	Cmin	[mm]	60		
Specing	S _{cr,II}	[mm]	240		
Spacing	S _{cr,⊥}	[mm]	120		
Minimum spacing	S _{min}	[mm]	120		
¹⁾ Value in brackets for VM-S	H 20x85 VM	-SH 20x13	30 and VM-SH 20x200		

Value in brackets for VM-SH 20x85; VM-SH 20x130 and VM-SH 20x200

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

Configura	ation	with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		60	120		. [-]	1,5
		C _{cr}	240	$\alpha_{g,N,II}$		2,0
		160	120			2,0
⊥: anchors placed		60	120		[]	1,0
perpendicular to horizontal joint		C _{cr}	120	α _{g,N,⊥}		2,0

Injection System VMU plus for masonry

Performances - Calcium silicate hollow brick KSL-3DF

Annex C9

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

Table C	:21:	Group fac	tor for and	hor group	in case of	shear load	ing parall	el to fr	ee edg	je	
	Configurati	on		with c [mm]≥	with s [mr	n] ≥				
II: anchors	placed		T	60		120				1,0	
parallel to h		V ••	1	160		120		λg,∨,II		1,6	
join	t		1	Ccr		240		3, , ,	r 1	2,0	
⊥: anchors	placed		T	60		120			[-]	1,0	
perpendic horizonta	ular to			C _{cr}		120		Xg,V,⊥		2,0	
Table C	22:	Group fac	tor for and	hor group	in case of	shear load	ing perpe	ndicul	ar to fi	ree edge	
	Configurati	ion		with c [mm]≥	with s [mr	n] ≥				
II: anchors	placed	<u> </u>	Ŧ	60		120				1,0	
parallel to h	orizontal	V						λg,∨,∥			
join	t		1.	Ccr		240			[-]	2,0	
⊥: anchors			T I	60		120				1,0	
perpendic horizonta				Ccr		120		α _{g,V,⊥}		2,0	
10120116		<u>↓</u> ⊥⊥	L	-01							
Table C	23:	Character	istic value	s of resist	ance under	[,] tension ar	nd shear I	oads			
					Cha	racteristic res	sistance				
		n D	Use category								
		Effective anaelS depth		d/d			w/d; w/w	,		d/d; w/d; w/	
Anchor size	Sleeve									All	
	Oleeve		ал	ar E	40°C/24°C	80°C/50°C	120°C/72°C	40°C/24°C	80°C/50°C	2 120°0	C/72°C
							1)		ranges		
		h _{ef}		$N_{Rk,b} = N_{Rk,p}$	1)	$N_{Rk,b} = N_{Rk,p}^{1}$				V _{Rk,b} ⁴⁾	
		[mm]			-	[kN]	6 > 0 N/	2			
MO	40,00	00			Compress	sive strength				2,5 ²⁾ (0,9) ³	
M8	12x80 16x85	80 85	1,5	1,5	1,2	1,5	1,2),9 I,2	$2,5^{-7}(0,9)$ $4,0^{2}(1,5)^{3}$	
M8 / M10 / IG-M6			1,5	1,5	1,2	1,5	1,5			$4,0^{2}(1,5)$ $4,0^{2}(1,5)^{3}$	
10-1010	16x130 20x85	130 85					1,5		,2	4,0 (1,5)	
	20x85	130	4,5	4,0	3,0	4,5	4,0		3,0	4,0 ²⁾ (1,5) ³	
M12 / M16 /	202130	200	4,5	4,0	3,0	4,5	4,0		5,0	4,0 (1,5)	
IG-M8 /	20,200					ive etrepeth	5 > 10 N/m	2			
	20x200	200			Compress	ive strength				3,0 ²⁾ (1,2) ³	
IG-M8 / IG-M10			2.0	2.0			15	1			
IG-M8 / IG-M10 M8	12x80	80	2,0	2,0	1,5	2,0	1,5		,2 5		
IG-M8 / IG-M10 M8 M8 / M10 /	12x80 16x85	80 85	2,0	2,0	1,5 1,5	2,0 2,0	2,0	1	,5	4,5 ²⁾ (1,5) ³	
IG-M8 / IG-M10 M8 M8 / M10 / IG-M6	12x80 16x85 16x130	80 85 130			1,5	2,0		1			
IG-M8 / IG-M10 M8 M8 / M10 /	12x80 16x85	80 85	2,0	2,0	1,5 1,5	2,0 2,0	2,0	1	,5	4,5 ²⁾ (1,5)	

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

Performances - Calcium silicate hollow brick KSL-3DF

Group factor, Characteristic values of resistance

Brick typ	Brick type: Calcium silicate hollow brick KSL-3DF										
Table C	24:	Character	istic value	s of resista	ance under	tension ar	nd shear lo	ads (contin	ue)		
				Characteristic resistance							
		ge /e	Use category								
		Effective nchorage depth		d/d			w/d; w/w		d/d; w/d; w/w		
Anchor size	Sleeve	Effective anchorage depth	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/mr	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_{cr} and c_{min} $V_{Rk,c,II}$ = $V_{Rk,b}$ valid for shear load parallel to free edge 2)

3)

 $V_{Rk,c,\perp} = V_{Rk,b}$ (values in brackets) valid for shear load in direction to free edge The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply $V_{Rk,b}$ by 0,8 4)

Table C25:

Displacements

Anchor	Sleeve	h _{ef}	N	δ _N / N	δ _{ΝΟ}	δ _{N∞}	V	δ_{V0}	δγ∞
size	Sieeve	[mm]	[kN]	[mm/kN]	[mm]	[mm]	[kN]	[mm]	[mm]
M8	12x80	80					1,0	1,0	1,50
M8 / M10 /	16x85	85	0,71		0,64	1,29			
IG-M6	16x130	130		0.90					
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							

Injection System VMU plus for masonry

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

Table C26:	Description of t	he brick	
Brick type		Calcium silicate hollow brick KSL-12DF	
Bulk density	ho [kg/dm³]	1,4	
Compressive strength	f _b ≥ [N/mm ²]	10, 12 or 16	
Code		EN 771-2	
Producer (country code)		e.g. Wemding (DE)	
Brick dimensions	[mm]	498 x 175 x 238	
Drilling method		Rotary	

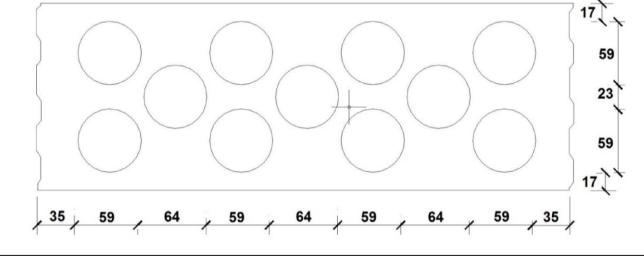


Table C27:

Spacing and edge distances

Anchor size			All sizes
Edge distance	Ccr	[mm]	100 (120) ¹⁾
Minimum edge distance	C _{min} ²⁾	[mm]	100 (120) ¹⁾
Spacing	S _{cr,II}	[mm]	498
Spacing	S _{cr,⊥}	[mm]	238
Minimum spacing	S _{min}	[mm]	120

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

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

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

	-		-			
Configura	ation	with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal	o horizontal	100	120			1,0
joint		C _{cr}	498	α _{g,N,II}	1	2,0
⊥: anchors placed		100	120		[-]	1,0
perpendicular to horizontal joint		C _{cr}	238	α _{g,N,⊥}		2,0

Injection System VMU plus for masonry

Performance - Calcium silicate hollow brick KSL-12DF

Annex C12

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

Table C	29:	Group factor for anchor group in case of shear loading parallel to free edge								
	Configurati	on		with c [mm]	≥	with s [mr	n] ≥			
II: anchors parallel to ho joint	orizontal			c _{cr} 498 α _{g,V,II}					2,0	
⊥: anchors perpendici horizonta	ular to	V		C _{cr}			Q	g,V,⊥	[-]	2,0
Table C30: Group factor for anchor group in case of shear load perpendicular to free edge										
	Configurati	on		with c [mm]]≥	with s [mr	n] ≥			
II: anchors parallel to ho joint	orizontal			C _{cr}		4 98 α _{g,∨,II}			2,0	
⊥: anchors perpendici horizonta	ular to		V → C _{cr} 238		o	^l g,V,⊥	[-]	2,0		
Table C	31:	Character	istic value	s of resista				bads		
Table C	31:		istic value	es of resista		racteristic res	sistance	oads		
			istic value	es of resista			sistance	bads		d/d w/d w/w
Table C Anchor size	31: Sleeve	Effective anchorage depth	40°C/24°C	d/d 80°C/50°C	Cha 120°C/72°C	racteristic res Use catego 40°C/24°C	sistance ry w/d; w/w 80°C/50°C	120°0	C/72°C	w/d w/w All temperatur ranges
		Effective anchorage depth	40°C/24°C	d/d	Cha 120°C/72°C	racteristic res Use catego 40°C/24°C	sistance ry w/d; w/w	120°0	C/72°C	w/d w/w All temperatur
		Effective anchorage depth	40°C/24°C	d/d 80°C/50°C	Cha 120°C/72°C	racteristic res Use catego 40°C/24°C [kN]	sistance ry w/d; w/w 80°C/50°C N _{Rk,b} = N _{Rk,}	120°0	C/72°C	w/d w/w All temperatu ranges
Anchor size	Sleeve	Effective [uw] depth	40°C/24°C	d/d 80°C/50°C N _{Rk,b} = N _{Rk,p}	Cha 120°C/72°C ¹⁾ Compressi	racteristic res Use catego 40°C/24°C [kN] ve strength	sistance ry w/d; w/w 80°C/50°C N _{Rk,b} = N _{Rk,} f_b ≥ 10 N/m	120°(w/d w/w All temperatu ranges V _{Rk,b} ²⁾³⁾
Anchor size M8	Sleeve 12x80	Effective anchorage depth	40°C/24°C	d/d 80°C/50°C N _{Rk,b} = N _{Rk,p}	Cha 120°C/72°C 1) Compressi 0,4	racteristic res Use catego 40°C/24°C [kN] ve strength 0,5	sistance ry w/d; w/w 80°C/50°C N _{Rk,b} = N _{Rk,} f_b ≥ 10 N/m 0,5	120°C),4	w/d w/w All temperatu ranges $V_{Rk,b}^{2)3)}$ 2,5
Anchor size M8 M8 / M10 /	Sleeve 12x80 16x85	Effective anchorage depth 82	40°C/24°C	d/d 80°C/50°C N _{Rk,b} = N _{Rk,p} 0,6 0,6	Cha 120°C/72°C)) Compressi 0,4 0,4	40°C/24°C [kN] ve strength 0,5 0,6	sistance ry w/d; w/w 80°C/50°C N _{Rk,b} = N _{Rk,} f_b ≥ 10 N/m 0,5 0,6	120°(),4),4	w/d w/w All temperatu ranges $V_{Rk,b}^{(2)3)}$ 2,5 5,5
Anchor size M8 M8 / M10 / IG-M6	Sleeve 12x80 16x85 16x130	Effective anchorage 60th 130	40°C/24°C 0,6 0,6 2,5	d/d 80°C/50°C N _{Rk,b} = N _{Rk,p} 0,6 0,6 2,5	Cha 120°C/72°C 1) Compress 0,4 0,4 2,0	40°C/24°C [kN] ve strength 0,5 0,6 2,5	sistance ry w/d; w/w 80°C/50°C N _{Rk,b} = N _{Rk,} f_b ≥ 10 N/m 0,5 0,6 2,5	120°(1) 100°(1) 100°()))) (100°()))) (100°()))) (100°())))) (100°())))))))))))))))))))))))))))))))))	0,4 0,4 2,0	w/d w/w All temperatu ranges $V_{Rk,b}^{2(3)}$ 2,5 5,5 5,5
Anchor size	Sleeve 12x80 16x85 16x130 20x85	Hef (mm] B0 80 85 130 85 130	40°C/24°C 0,6 0,6 2,5 1,5	d/d 80°C/50°C N _{Rk,b} = N _{Rk,p} 0,6 0,6 2,5 1,5	Cha 120°C/72°C)) Compressi 0,4 0,4 2,0 0,9	40°C/24°C [kN] ve strength 0,5 0,6 2,5 1,5	sistance ry w/d; w/w 80°C/50°C N _{Rk,b} = N _{Rk,} f_b ≥ 10 N/m 0,5 0,6 2,5 1,5	120°(0,4 0,4 2,0 0,9	w/d w/w All temperatu ranges $V_{Rk,b}^{(2)3)}$ 2,5 5,5 5,5 5,5 5,5 5,5
Anchor size	Sleeve 12x80 16x85 16x130	Effective anchorage 60th 130	40°C/24°C 0,6 0,6 2,5	d/d 80°C/50°C N _{Rk,b} = N _{Rk,p} 0,6 0,6 2,5	Cha 120°C/72°C 1) Compressi 0,4 0,4 2,0 0,9 2,0	racteristic res Use catego 40°C/24°C [kN] ve strength 0,5 0,6 2,5 1,5 2,5	sistance ry w/d; w/w 80°C/50°C N _{Rk,b} = N _{Rk,} f_b ≥ 10 N/m 0,5 0,6 2,5 1,5 2,5	120°0	0,4 0,4 2,0	w/d w/w All temperatu ranges $V_{Rk,b}^{2(3)}$ 2,5 5,5 5,5
M8 M8 / M10 / IG-M6 M12 / M16 / IG-M8 / IG-M10	Sleeve 12x80 16x85 16x130 20x85 20x130	h _{ef} [mm] 80 85 130 85 130	40°C/24°C 0,6 0,6 2,5 1,5 2,5	d/d 80°C/50°C N _{Rk,b} = N _{Rk,p} 0,6 0,6 2,5 1,5 2,5	Cha 120°C/72°C 1) Compress 0,4 0,4 2,0 0,9 2,0 Compress	40°C/24°C [kN] ve strength 0,5 0,6 2,5 1,5 2,5 ve strength	sistance ry w/d; w/w 80°C/50°C N _{Rk,b} = N _{Rk,} f_b ≥ 10 N/m 0,5 0,6 2,5 1,5 2,5 f_b ≥ 12 N/m	120°0	0,4 0,4 2,0 0,9 2,0	w/d w/w All temperatu ranges $V_{Rk,b}^{2(3)}$ 2,5 5,5 5,5 5,5 5,5 5,5 5,5
Anchor size M8 M8 / M10 / IG-M6 M12 / M16 / IG-M8 / IG-M10 M8	Sleeve 12x80 16x85 16x130 20x85 20x130 12x80	h _{ef} [mm] 80 85 130 85 130 85 130 85 130	40°C/24°C 0,6 0,6 2,5 1,5 2,5 0,75	d/d 80°C/50°C N _{Rk,b} = N _{Rk,p} 0,6 0,6 2,5 1,5 2,5 0,6	Cha 120°C/72°C 1) Compressi 0,4 0,4 2,0 0,9 2,0 Compressi 0,5	racteristic res Use catego 40°C/24°C [kN] ve strength 0,5 0,6 2,5 1,5 2,5 ve strength 0,6	sistance ry w/d; w/w 80°C/50°C N _{Rk,b} = N _{Rk,} f _b ≥ 10 N/m 0,5 0,6 2,5 1,5 2,5 f _b ≥ 12 N/m 0,6	120°0	0,4 0,4 2,0 0,9 2,0	w/d w/w All temperatu ranges $V_{Rk,b}^{(2)3)}$ 2,5 5,5 5,5 5,5 5,5 5,5 5,5 5,5 5,5 5,5
Anchor size M8 M8 / M10 / IG-M6 M12 / M16 / IG-M8 / IG-M10 M8 M8 / M10 /	Sleeve 12x80 16x85 16x130 20x85 20x130 12x80 16x85	h _{ef} [mm] 80 85 130 85 130 85 130 85 130 85	40°C/24°C 40°C/24°C 0,6 2,5 1,5 2,5 1,5 2,5 0,75 0,75	d/d 80°C/50°C N _{Rk,b} = N _{Rk,p} 0,6 2,5 1,5 2,5 0,6 0,6 0,6	Cha 120°C/72°C 1) Compressi 0,4 2,0 0,9 2,0 Compressi 0,5 0,5	racteristic res Use catego 40°C/24°C [kN] ve strength 0,5 0,6 2,5 1,5 2,5 ve strength 0,6 0,75	sistance ry w/d; w/w 80°C/50°C N _{Rk,b} = N _{Rk,j} f _b ≥ 10 N/m 0,5 0,6 2,5 1,5 2,5 f _b ≥ 12 N/m 0,6 0,6	120°0 120°0 10 10 10 10 10 10 10 10 10 1	0,4 0,4 2,0 0,9 2,0 0,4 0,5	w/d w/w All temperatu ranges $V_{Rk,b}^{2)3)}$ 2,5 5,5 5,5 5,5 5,5 5,5 5,5 5,5 5,5 5,5
Anchor size M8 M8 / M10 / IG-M6 M12 / M16 / IG-M8 / IG-M10 M8	Sleeve 12x80 16x85 16x130 20x85 20x130 12x80	h _{ef} [mm] 80 85 130 85 130 85 130 85 130	40°C/24°C 0,6 0,6 2,5 1,5 2,5 0,75	d/d 80°C/50°C N _{Rk,b} = N _{Rk,p} 0,6 0,6 2,5 1,5 2,5 0,6	Cha 120°C/72°C 1) Compressi 0,4 0,4 2,0 0,9 2,0 Compressi 0,5	racteristic res Use catego 40°C/24°C [kN] ve strength 0,5 0,6 2,5 1,5 2,5 ve strength 0,6	sistance ry w/d; w/w 80°C/50°C N _{Rk,b} = N _{Rk,} f _b ≥ 10 N/m 0,5 0,6 2,5 1,5 2,5 f _b ≥ 12 N/m 0,6	120°0	0,4 0,4 2,0 0,9 2,0	w/d w/w All temperatu ranges $V_{Rk,b}^{(2)3)}$ 2,5 5,5 5,5 5,5 5,5 5,5 5,5 5,5 5,5 5,5

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 $V_{Rk,b}$ by 0,8

Injection System VMU plus for masonry

Performance - Calcium silicate hollow brick KSL-12DF

Annex C13

Group factor, Characteristic values of resistance

Brick type: Calcium silicate hollow brick KSL-12DF

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

	V Z .	onaraotei	sharacteristic values of resistance under tension and shear loads (continue)									
				Characteristic resistance								
				Use category								
Anchoroine	Sleeve	Effective anchorage depth		d/d			w/d; w/w		d/d w/d w/w			
Anchor size	Sleeve	a u	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			sive strength f _b ≥ 16 N/mm²					
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 $V_{Rk b}$ by 0.8

Table C33: Displacements

Anchor	Sleeve	h _{ef}	N	δ _N / N	δ _{N0}	δ _{N∞}	V	δνο	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

Brick type: Clay solid brick Mz-DF

Table C34:	Description of	the brick	
Brick type		Clay solid brick Mz-DF	
Bulk density	$ ho$ [kg/dm 3]	1,6	
Compressive strength	$f_b \ge [N/mm^2]$	10, 20 or 28	
Code		EN 771-1	
Producer (country code)		e.g. Unipor (DE)	
Brick dimensions	[mm]	240 x 115 x 55	
Drilling method		Hammer	

Table C35: Spacing and edge distances

Anchor size			Alle Größen		
Edge distance	Ccr	[mm]	1,5*h _{ef}		
Minimum edge distance	Cmin	[mm]	60		
Spacing	Scr	[mm]	3*h _{ef}		
Minimum spacing	S _{min}	[mm]	120		

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

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

Table C37:

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

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

Table C38:

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

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

Injection System VMU plus for masonry

Performance - Clay solid brick Mz-DF

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

Table C3	9: C	haracteristic v	alues of resistan	ce under tension a	and shear loads				
				Characterist	tic resistance				
		υ	Use category						
		tive th			d/d				
		tep		w/d w/w		w/d			
Anchor size	Sleeve	Effective Anchorage depth			w/w				
			40°C/24°C	80°C/50°C	120°C/72°C	All temperature			
		h _{ef}		$N_{Rk,b} = N_{Rk,p}^{1}$		ranges V _{Rk,b} ²⁾³⁾			
		[mm]			(N]	V Rk,b			
		[IIIII]			ngth 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	5,5 (1,5)	0,0 (1,0)	5,5 (1,2)	5,5 (1,2)			
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	0,0 (1,0)	0,0 (1,0)		-,-(-,-)			
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							
				Compressive stre	ngth f _b ≥ 28 N/mm²				
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							
IG-M10	20x200	200				1			

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

²⁾ For c_{cr} calculation of $V_{Rk,c}$ see 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: Displacement	Table C40:	Displacements
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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	-	80	1,3		0,19	0,39			
M10 / IG-M6	-	90	1,6		0,24	0,47	1,9		
M12 / IG-M8	-	100	17		0.26	0.51			
M16 / IG-M10	-	100	1,7		0,26	0,51	2,9		
M8	12x80	80		0.15				1 00	1 50
M8 / M10 /	16x85	85		0,15			1,9	1,00	1,50
IG-M6	16x130	130	1 2		0.10	0.20			
M12 / M16 /	20x85	85	1,3		0,19	0,39			
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

Table C41:	Description of	the brick	
Brick type		Clay hollow brick HLz-16-DF	
Bulk density	ho [kg/dm³]	0,8	
Compressive strength	f _b ≥ [N/mm ²]	6, 8, 12 or 14	
Code		EN 771-1	
Producer (country code)		e.g. Unipor (DE)	
Brick dimensions	[mm]	497 x 240 x 238	
Drilling method		Rotary	
		-	

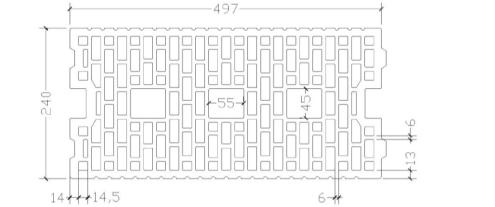


Table C42:

Spacing and edge distances

Anchor size			All sizes
Edge distance	Ccr	[mm]	100 (120) ¹⁾
Minimum edge distance	C _{min} ²⁾	[mm]	100 (120) ¹⁾
Specing	S _{cr,II}	[mm]	497
Spacing	S _{cr,⊥}	[mm]	238
Minimum spacing	S _{min}	[mm]	100

¹⁾ Value in bracket for VM-SH 20x85; VM-SH 20x130 and VM-SH 20x200

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

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

Configura	ation	with c [mm] ≥ with s [mm] ≥				
II: anchors placed parallel to horizontal		C _{cr}	100			1,3
joint		C _{cr}	497	α _{g,N,II}		2,0
⊥: anchors placed		C _{cr}	100		[-]	1,1
perpendicular to horizontal joint		C _{cr}	238	α _{g,N,⊥}		2,0

Injection System VMU plus for masonry

Performance - Clay hollow brick HLz-16DF

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

Brick type: Cla Table C44:	-			n case of shear loa	ding nar	allel to fr	ree edre	
	nfiguration		with c [mm] ≥				ee euge	
II: anchors plac parallel to horizo joint		V ••	C _{cr}	497	7	α _{g,∨,II}	.,	2,0
perpendicular	anchors placed perpendicular to horizontal joint		C _{cr}	238	3	$lpha_{g,V,\perp}$	[-]	2,0
Table C45:	Gro	oup factor f	for anchor group i	n case of shear loa	d perper	ndicular f	to free e	dge
Co	nfiguration		with c [mm] ≥	₂ with s [r	nm] ≥			
II: anchors plac parallel to horizo joint		V	C _{cr}	497	7	α _{g,V,II}		2,0
⊥: anchors plac perpendicular horizontal joir	to	V-••	C _{cr}	c _{cr} 23		$\alpha_{g,V,\perp}$	[-]	2,0
Table C46:	Ch	aracteristic	values of resistar	nce under tension a	and shea	r loads		
Table C46:	Ch		values of resistar	Characteristi	c resistanc			
Table C46:	Ch		values of resistar	Characteristi Use ca	c resistanc			
Table C46:	Ch		values of resistar	Characteristi	c resistanc			d/d w/d w/w
		e e	values of resistar 40°C/24°C	Characteristi Use ca d/d w/d w/w 80°C/50°C	c resistand tegory		1	w/d w/w mperature ranges
				Characteristic Use ca d/d w/d w/w 80°C/50°C N _{Rk,b} = N _{Rk,p} ¹⁾	c resistand tegory	ce	1	w/d w/w mperatur
		Effective Anchorage depth	40°C/24°C	Characteristi Use ca d/d w/d w/w 80°C/50°C N _{Rk,b} = N _{Rk,p} ¹⁾ [kN]	c resistand tegory	ce	1	w/d w/w mperatur anges
Anchor size	Sleeve	Effective ^a Anchorage depth	40°C/24°C	$\begin{tabular}{c} Characteristic Use car \\ d/d \\ w/d \\ w/w \\ \hline 80^\circ C/50^\circ C \\ \hline N_{Rk,b} = N_{Rk,p}^{1)} \\ \hline [kN] \\ \hline ngth f_b \ge 6 \ N/mm^2 \\ \hline \end{tabular}$	c resistance tegory 120°	ce °C/72°C	1	w/d w/w emperature ranges / _{Rk,b} ²⁾³⁾ [kN]
	Sleeve 12x80	08 [ui] [ui] [ui] [ui] (uepth depth	40°C/24°C Compressive stre 2,5	CharacteristicUse catd/dw/dw/w80°C/50°C $N_{Rk,b} = N_{Rk,p}^{1)}$ [kN]ngth $f_b \ge 6 N/mm^2$ 2,5	c resistance tegory 120°	°C/72°C 2,0	1	w/d w/w emperature ranges / _{Rk,b} ²⁾³⁾ [kN] 2,5
Anchor size M8	Sleeve 12x80 16x85	28 19 19 19 19 10 10 10 10 10 10 10 10 10 10	40°C/24°C Compressive stre 2,5 2,5	$\begin{tabular}{lllllllllllllllllllllllllllllllllll$	c resistance tegory 120°	2,0 2,0	1	w/d w/w emperature anges $/_{Rk,b}^{2)3)}$ [kN] 2,5 4,5
Anchor size M8	Sleeve 12x80 16x85 16x130	Effective Bandworage Anchorage depth 130	40°C/24°C Compressive stre 2,5 2,5 3,5	CharacteristiUse catd/dw/dw/w80°C/50°CN _{Rk,b} = N _{Rk,p} ¹⁾ [kN]ngth $f_b \ge 6 N/mm^2$ 2,52,52,53,5	c resistance tegory 120°	2,0 2,0 3,0	1	w/d w/w emperature anges / _{Rk,b} ²⁾³⁾ [kN] 2,5 4,5 4,5
Anchor size M8 M8 / M10/ IG-M6	Sleeve 12x80 16x85 16x130 20x85	Effective background b	40°C/24°C Compressive stre 2,5 2,5 3,5 2,5	CharacteristicUse cad/dw/dw/w $80^{\circ}C/50^{\circ}C$ N _{Rk,b} = N _{Rk,p} ¹⁾ [kN]ngth f _b ≥ 6 N/mm²2,52,53,52,5	c resistance tegory 120°	2,0 2,0 2,0 2,0 2,0 2,0	1	w/d w/w emperature ranges / _{Rk,b} ²⁾³⁾ [kN] 2,5 4,5 4,5 5,0
Anchor size M8	Sleeve 12x80 16x85 16x130 20x85 20x130	Particle Control of the second	40°C/24°C Compressive stre 2,5 2,5 3,5 2,5 3,5 3,5	Characteristic Use cat d/d w/d w/w 80°C/50°C $N_{Rk,b} = N_{Rk,p}^{1/3}$ [kN] ngth $f_b \ge 6 N/mm^2$ 2,5 2,5 2,5 3,5 2,5 3,5 2,5 3,5 3,5	c resistance tegory 120°	2,0 2,0 2,0 3,0 3,0 3,0	1	w/d w/w emperature ranges / _{Rk,b} ^{2]33} [kN] 2,5 4,5 4,5 5,0 6,0
Anchor size <u>M8</u> M8 / M10/ IG-M6 M12 / M16 /	Sleeve 12x80 16x85 16x130 20x85	Effective background b	40°C/24°C Compressive stre 2,5 2,5 3,5 2,5 3,5 3,5 3,5 3,5	Characteristi Use cat d/d w/d w/w 80°C/50°C N _{Rk,b} = N _{Rk,p} ¹⁾ [kN] Igkn f _b ≥ 6 N/mm ² 2,5 3,5 3,5 3,5 3,5 3,5 3,5 3,5	c resistance tegory 120°	2,0 2,0 2,0 2,0 2,0 2,0	1	w/d w/w emperature ranges / _{Rk,b} ²⁾³⁾ [kN] 2,5 4,5 4,5 5,0
Anchor size <u>M8</u> M8 / M10/ IG-M6 M12 / M16 / IG-M8 / IG-M10	Sleeve 12x80 16x85 16x130 20x85 20x130 20x200	H _{ef} Effective h _{ef} [mm] 80 85 130 85 130 85 130 200	40°C/24°C Compressive stre 2,5 2,5 3,5 2,5 3,5 3,5 3,5 3,5 3,5 3,5 Compressive stre	Characteristic Use ca d/d w/d w/w 80°C/50°C N _{Rk,b} = N _{Rk,p} ¹⁾ [kN] ngth $f_b \ge 6 N/mm^2$ 2,5 2,5 3,5 2,5 3,5 3,5 3,5 3,5 3,5 3,5 3,5 3,5 3,5 3,5 3,5 3,5 3,5	c resistance tegory 120°	2,0 2,0 2,0 3,0 2,0 3,0 3,0 3,0	1	w/d w/w emperature ranges / _{Rk,b} ²⁾³⁾ [kN] 2,5 4,5 4,5 5,0 6,0 6,0
Anchor size <u>M8</u> M8 / M10/ IG-M6 M12 / M16 /	Sleeve 12x80 16x85 16x130 20x85 20x130 20x200 12x80	Hef (mm) Hef 130 85 130 85 130 85 130 200 85 130 200	40°C/24°C Compressive stre 2,5 2,5 3,5 2,5 3,5 3,5 3,5 Compressive stre 3,0	Characteristic Use cat d/d w/d w/w 80°C/50°C N _{Rk,b} = N _{Rk,p} ¹⁾ [kN] ngth $f_b \ge 6 N/mm^2$ 2,5 2,5 2,5 3,5 2,5 3,5 3,5 3,5 3,5 3,5 3,5 3,5 3,5 3,5 3,5 3,5 3,5 3,0 3,0	c resistance tegory 120°	2,0 2,0 2,0 3,0 3,0 3,0 2,5	1	w/d w/w emperatur ranges / _{Rk,b} ²⁾³⁾ [kN] 2,5 4,5 4,5 5,0 6,0 6,0 6,0 3,0
Anchor size M8 M8 / M10/ IG-M6 M12 / M16 / IG-M8 / IG-M10 M8	Sleeve 12x80 16x85 16x130 20x85 20x130 20x200 12x80 16x85	Hef (mm) Hef (mm) Hef 130 85 130 85 130 200 200 80 85 130 200	40°C/24°C Compressive stre 2,5 2,5 3,5 2,5 3,5 3,5 3,5 Compressive stre 3,0 3,0 3,0	Characteristi Use cat d/d w/w 80°C/50°C N _{Rk,b} = N _{Rk,p} ¹⁾ [kN] IKN] ngth $f_b \ge 6 N/mm^2$ 2,5 3,5 3,5 2,5 3,5 3,5 3,5 3,5 ngth $f_b \ge 8 N/mm^2$ 3,0	c resistance tegory 120°	2,0 2,0 2,0 3,0 2,0 3,0 2,5 2,5 2,5	1	w/d w/w emperature anges / $_{Rk,b}^{2)3)}$ [kN] 2,5 4,5 4,5 4,5 5,0 6,0 6,0 6,0 5,5
Anchor size M8 M8 / M10/ IG-M6 M12 / M16 / IG-M8 / IG-M10 M8	Sleeve 12x80 16x85 16x130 20x85 20x130 20x200 12x80 16x85 16x130	Hef Hef [mm] Hof B0 B5 130 200 B5 130 200 B0 B5 130 200 B0 B5 130 200 B0 B5 130 200 B5 130 200 B5 130 200 B5 130 200 B5 130 200 B5 130 200 B5 130 200 B5 130 200 B5 130 200 200 200 200 200 200 200 2	40°C/24°C Compressive stre 2,5 2,5 3,5 2,5 3,5 2,5 3,5 Compressive stre 3,0 3,0 4,5	Characteristi Use cat d/d w/d w/d w/w 80°C/50°C N _{Rk,b} = N _{Rk,p} ¹⁾ [kN] ngth $f_b \ge 6 N/mm^2$ 2,5 2,5 3,5 2,5 3,5 3,5 3,5 3,5 3,5 3,5 3,5 3,5 3,5 3,0 3,0 3,0 3,0 4,5 4,5	c resistance tegory 120°	2,0 2,0 2,0 3,0 2,0 3,0 2,5 2,5 2,5 3,5	1	w/d w/w emperature anges / $_{Rk,b}^{2)3)}$ [kN] 2,5 4,5 4,5 5,0 6,0 6,0 6,0 6,0 5,5 5,5
Anchor size <u>M8</u> M8 / M10/ IG-M6 M12 / M16 / IG-M8 / IG-M10	Sleeve 12x80 16x85 16x130 20x85 20x130 20x200 12x80 16x85	Hef (mm) Hef (mm) Hef 130 85 130 85 130 200 80 80 85 130 200	40°C/24°C Compressive stre 2,5 2,5 3,5 2,5 3,5 3,5 3,5 Compressive stre 3,0 3,0 3,0	Characteristi Use cat d/d w/w 80°C/50°C N _{Rk,b} = N _{Rk,p} ¹⁾ [kN] IKN] ngth $f_b \ge 6 N/mm^2$ 2,5 3,5 3,5 2,5 3,5 3,5 3,5 3,5 ngth $f_b \ge 8 N/mm^2$ 3,0	c resistance tegory 120°	2,0 2,0 2,0 3,0 2,0 3,0 2,5 2,5 2,5	1	w/d w/w mperatur anges / _{Rk,b} ²⁾³⁾ [kN] 2,5 4,5 4,5 4,5 5,0 6,0 6,0 6,0 6,0 5,5

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 \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

Injection System VMU plus for masonry

Performance - Clay hollow brick HLz-16DF

Annex C19

Group factor, Characteristic values of resistance

Brick type: Clay hollow brick HLz-16DF

Table C47: Characteristic values of resistance under tension and shear loads (continue)									
				Characteristic	resistance				
		n O		Use cate	egory				
		Effective Anchorage depth		d/d					
Anchoraina	Sleave	iffed Icho dep		w/d		w/d w/w			
Anchor size	Sleeve	Sleeve H Z		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]		[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			
1010 / 10110/ 13-1010	16x130	130	5,0	5,0	4,5	6,5			
M12 / M16 /	20x85	85	3,5	3,5	3,0	7,0			
M12 / M16 / IG-M8 / IG-M10	20x130	130	5,0	5,0	4,5	9,0			
	20x200	200	5,0	5,0	4,5	9,0			
			Compressive stren	igth f _b ≥ 14N/mm ²					
M8	12x80	80	4,0	4,0	3,0	4,0			
M8 / M10/ IG-M6	16x85	85	4,0	4,0	3,0	6,5			
	16x130	130	5,5	5,5	4,5	6,5			
M12 / M16 /	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			
19-100 / 19-10110	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

Displacements Table C48:

Anchor size	Sleeve	h _{ef} [mm]	N [kN]	δ _N / N [mm/kN]	δ _{Ν0} [mm]	δ _{N∞} [mm]	V [kN]	δ _{V0} [mm]	δ _{∨∞} [mm]
M8	12x80	80	4.4.4		0.11	0.00	1,10	1,20	1,80
M8 / M10/ IG-	16x85	85	1,14		0,11	0,23	1.96	1,50	2.25
M6	16x130	130	1,57	0.10	0,16	0,31	1,86		2,25
M12 / M16 /	20x85	85	1,14	0,10	0,11	0,23	1,86	1,50	2,25
IG-M8 / IG-	20x130	130	1 57	F 7	0.46	0.24	0.67	2.10	3,15
M10	20x200	200	1,57		0,16	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

Brick type: Clay hollow brick Porotherm Homebric

Table C49:	Description of	the brick	
Brick type		Clay hollow brick Porotherm Homebric	
Bulk density	$ ho$ [kg/dm 3]	0,7	
Compressive strength	$f_b \ge [N/mm^2]$	4, 6 or 10	
Code		EN 771-1	
Producer (country code)		e.g. Wienerberger (FR)	
Brick dimensions	[mm]	500 x 200 x 299	
Drilling method		Rotary	

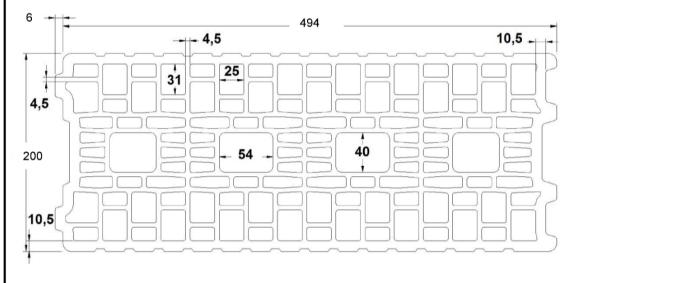


Table C50:

Spacing and edge distances

Anchor size			All sizes
Edge distance	C _{cr}	[mm]	100 (120) ¹⁾
Minimum edge distance	C _{min} ²⁾	[mm]	100 (120) ¹⁾
Spacing	S _{cr,II}	[mm]	500
Spacing	S _{cr,⊥}	[mm]	299
Minimum spacing	S _{min}	[mm]	100

1) Value in brackets for VM-SH 20x85 and VM-SH 20x130 2)

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

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

Configuration with c [mm] ≥ with s [mm] ≥						
Connguia		with c [min] 2	with s [min] 2			
II: anchors placed parallel to horizontal		200	100			2,0
joint		C _{cr}	500	α _{g,N,II}	1	2,0
⊥: anchors placed		200	100		[-]	1,2
perpendicular to horizontal joint		C _{cr}	299	α _{g,N,⊥}		2,0

Injection System VMU plus for masonry

Performance - Clay hollow brick Porotherm Homebric

Annex C21

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

Brick type: Clay hollow brick Porotherm Homebric

Table C52:	Group factor for anchor group in case of shear loading parallel to free edge							
Configura	ation	with c [mm] ≥	with s [mm] ≥					
II: anchors placed parallel to horizontal joint		C _{cr}	500	α _{g,V,II}		2,0		
⊥: anchors placed perpendicular to horizontal joint		C _{cr}	299	$\alpha_{g,V,\perp}$	[-]	2,0		

Table C53:

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

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

Table C54:

Characteristic values of resistance under tension and shear loads

				<u> </u>					
				Characteristic	resistance				
		a e	Use category						
		tive th		d/d		d/d			
		Effective inchoragi depth			w/d				
Anchor size	Sleeve	Effective Anchorage depth		w/w		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]					
Compressive strength f _b ≥ 4 N/mm ²									
M8	12x80	80	0,9	0,9	0,75	2,0			
	16x85	85	0,9	0,9	0,75	2,0			
M8 / M10 / IG-M6	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	ոgth f _b ≥6 N/mm²					
M8	12x80	80	0,9	0,9	0,9	2,5			
M8 / M10 / IG-M6	16x85	85	0,9	0,9	0,9	2,5			
100 / 101 10 / 1G-106	16x130	130	1,2	1,2	1,2	2,5			
M12 / M16 /	20x85	85	0,9	0,9	0,9	3,0			
IG-M8 / IG-M10	20x130	130	1,2	1,2	1,2	3,0			

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

²⁾ Calculation of V_{Rk,c} see 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

Injection System VMU plus for masonry

Performance - Clay hollow brick Porotherm Homebric

Annex C22

Group factor, Characteristic values of resistance

Brick type: Clay hollow brick Porotherm Homebric

Table C55:	Cha	aracteristic	values of resistan	ce under tension a	nd shear loads (co	ontinue)		
		Effective Anchorage depth	Characteristic resistance					
			Use category					
Anchor size	Sleeve		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	All temperature ranges	
				h _{ef}		V _{Rk,b} ²⁾³⁾		
		[mm]		[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		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

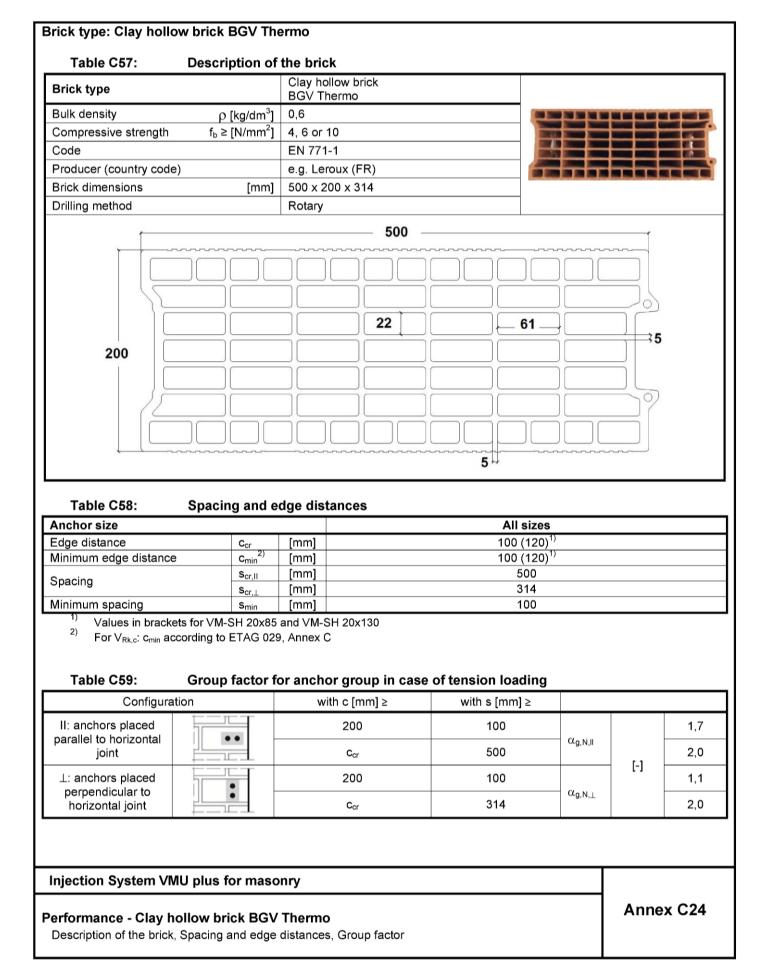
Anchor size Sleeve	Sloovo	h _{ef}	Ν	δ _N / N	δ_{N0}	δ _{N∞}	V	δ_{V0}	δv∞
	[mm]	[kN]	[mm/kN]	[mm]	[mm]	[kN]	[mm]	[mm]	
M8	12x80	80	0,34	0,80	0,27	.27 0,55	0,9		1,80
M8 / M10/	16x85	85					0,9	1,20	
IG-M6	16x130	130	0,43		0,34	0,69	1,0		
M12 / M16 /	20x85	85	0,34		0,27	0,55			
IG-M8 / IG-M10	20x130	130	0,43		0,34	0,69	1,14		

Injection System VMU plus for masonry

Performance - Clay hollow brick Porotherm Homebric

Annex C23

Characteristic values of resistance (continue), Displacements



Brick type: Clay hollow brick BGV Thermo

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

		• •	01			
Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		C _{cr}	500	α _{g,V,II}	. 1	2,0
⊥: anchors placed perpendicular to horizontal joint		C _{cr}	314	$\alpha_{g,V,\perp}$	[-]	2,0

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

						<u> </u>
Configuration		with c [mm] ≥ with s [mm] ≥				
II: anchors placed parallel to horizontal joint		C _{cr}	500	$\alpha_{g,V,II}$		2,0
⊥: anchors placed perpendicular to horizontal joint		C _{cr}	314	$\alpha_{g,V,\perp}$	[-]	2,0

Injection System VMU plus for masonry

Brick type: Clay hollow brick BGV Thermo
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Table C62:	Cha	aracteristic	values of resistan	ce under tension a	nd shear loads				
		e O	Characteristic resistance						
			Use category						
Anchor size Sleeve	Sleeve	Effective Anchorage depth		d/d w/d w/w					
	A	40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges				
	h _{ef}		V _{Rk,b} ²⁾³⁾						
		[mm]		[kN]					
			Compressive stren	ngth f _b ≥4N/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	igth f _b ≥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/mm ²					
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

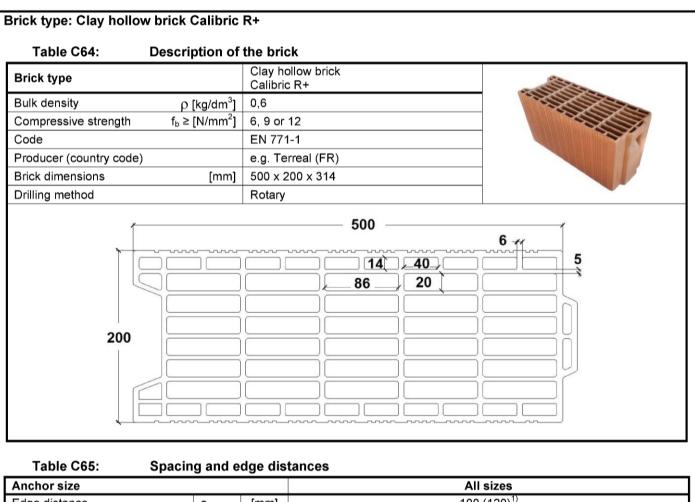
Anchor size	Sleeve	h _{ef} [mm]	N [kN]	δ _N / N [mm/kN]	δ _{N0} [mm]	δ _{N∞} [mm]	V [kN]	δ _{V0} [mm]	δ _{∨∞} [mm]
M8	12x80	80	[]	[[]	[]	[[0]]	[]	[]
M8 / M10/	16x85	85	0,26	0,80	0,21	0,41	0,7	1,00	1,50
IG-M6	16x130	130	0,43		0,34	0,69			
M12 / M16 /	20x85	85	0,26		0,21	0,41	0,86		
IG-M8 / IG-M10	20x130	130	0,43		0,34	0,69	1		

Injection System VMU plus for masonry

Performance - Clay hollow brick BGV Thermo

Annex C26

Characteristic values of resistance, Displacements



Anchor size			All sizes
Edge distance	Ccr	[mm]	100 (120) ¹⁾
Minimum edge distance	C _{min} ²⁾	[mm]	100 (120) ¹⁾
Specing	S _{cr,II}	[mm]	500
Spacing	$\mathbf{S}_{\mathrm{cr},\perp}$	[mm]	314
Minimum spacing	S _{min}	[mm]	100
1)			

1) Value in brackets for VM-SH 20x85 and VM-SH 20x130 2)

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

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

Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal		175	100	C(1,7
joint		C _{cr}	500	α _{g,N,II}	r 1	2,0
⊥: anchors placed		175	100		[-]	1,0
perpendicular to horizontal joint		C _{cr}	314	α _{g,N,⊥}		2,0

Injection System VMU plus for masonry

Performance - Clay hollow brick Calibric R+

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

	oup factor fo	or anchor group ir	n case of shear load	ding parallel to fr	ee edge			
figuration	-							
II: anchors placed parallel to horizontal joint		C _{cr}	500	α _{g,V,II}		2,0		
⊥: anchors placed perpendicular to horizontal joint		C _{cr}	314	$\alpha_{g,V,\perp}$	[-]	2,0		
Gro	oup factor fo	or anchor group ir	n case of shear loa	d perpendicular t	o free e	dge		
figuration		with c [mm] ≥	with s [n	nm] ≥				
II: anchors placed parallel to horizontal joint		C _{cr}	500	α _{g,V,II}		2,0		
ed to t		C _{cr}	314	$\alpha_{g,V,\perp}$	[-]	2,0		
Cha	aracteristic	values of resistan						
	_							
	age		egory		d/d			
	ecti hora epth		w/d		w/d			
Sleeve	, d Eff		w/w			w/w		
		40°C/24°C	80°C/50°C	°C 120°C/72°C		mperatur anges		
	h _{ef}		$N_{Rk,b} = N_{Rk,p}^{(1)}$		١	/ _{Rk,b} ²⁾³⁾		
	[mm]			[kN]				
		Compressive stre	ngth f _b ≥6 N/mm²					
12x80	80	0,9	0,9	0,75		3,0		
16x85	85	0,9	0,9	0,75		4,0		
						4,0		
			0,9			6,0		
20x130	130			0,9		6,0		
			1,2	,		3,5		
						5,0		
						5,0		
20x85	85	1,2	1,2	0,9		7,5		
	ed Image: Constraint of the sector of th	ed ntal $V \bullet \bullet$ ed to $V \bullet \bullet$ ed to $V \bullet \bullet$ figuration ed to ed o t $V \bullet \bullet$ ed o t $V \bullet \bullet$ ed o t $V \bullet \bullet$ ed o t $V \bullet \bullet$ Sleeve $P \bullet O \bullet O \bullet$ Sleeve $P \bullet O \bullet O \bullet$ hef [mm] [mm] 12x80 80 16x85 16x85 85 16x130 12x80 80 130 12x80 80 130 12x80 80 130 12x80 80 130	ed ntal C_{cr} Group factor for anchor group in figurationwith c [mm] \geq ed of tCorCharacteristic values of resistantOcrCharacteristic values of resistantSleeveND OC DO TCompressive street12x80800.916x13013012x80800.916x13013012x80800.912x80800.920x13013012x80800.920x13013012x80800.920x13013012x808012x808012x808012x808012x808012x808012x808012x808012x808012x808012x80 </td <td>ed on tal $V \bullet \bullet$ c_{cr} 500 ed o $V \bullet \bullet$ c_{cr} 314 Group factor for anchor group in case of shear load figuration figuration with c [mm] \geq with s [m with s [m] ed ntal $V \bullet \bullet \bullet$ c_{cr} 500 ed ot $V \bullet \bullet \bullet$ c_{cr} 500 ed ot $V \bullet \bullet \bullet$ c_{cr} 500 Characteristic Characteristic values of resistance under tension a Open do t Characteristic Use cat Sleeve Φ_{ef} N_{Rk,b} = N_{Rk,p}¹ Ψ Φ O O Ψ Ψ Compressive strength $f_b \ge 6$ N/mm² 12x80 80 0.9 0.9 16x130 130 1.2 1.2 Compressive strength $f_b \ge 9$ N/mm² 12x80 80 1.2 1.2 Compressive strength $f_b \ge 9$ N/mm² 12x80 80<!--</td--><td>ed ntal C_{cr} 500 $\alpha_{g,V,II}$ ed o C_{cr} 314 $\alpha_{g,V,II}$ Group factor for anchor group in case of shear load perpendicular f figuration with c [mm] \geq with s [mm] \geq cor 500 $\alpha_{g,V,II}$ d figuration with c [mm] \geq with s [mm] \geq cor 500 $\alpha_{g,V,II}$ cor 500 $\alpha_{g,V,II}$ compressive strength figuration with s [mm] \geq Characteristic values of resistance under tension and shear loads Characteristic resistance Use category Wide Wide Characteristic resistance Use category Wide Mide Compressive strength fig \geq N/mm^2 Compressive strength fig \geq N/mm^2 Compressive strength fig \geq N/mm^2 Compressive strength fig \geq N/mm^2 <td>ed ntal C_{cr} 500 $\alpha_{g,V,II}$ [-] ed ot C_{cr} 314 $\alpha_{g,V,II}$ [-] Group factor for anchor group in case of shear load perpendicular to free er figuration with c [mm] \geq with s [mm] \geq Group factor for anchor group in case of shear load perpendicular to free er figuration with c [mm] \geq with s [mm] \geq Characteristic values of resistance under tension and shear loads Characteristic values of resistance under tension and shear loads Characteristic resistance Use category M_{cr} $N_{Rk,D} = N_{Rk,P}^{10}$ $N_{Rk,D}$ Compressive strength $f_b \geq 6 N/mm^2$ 12x80 80 0,9 0,9 0,75 16x4130 130 1,2 0,9 Compressive strength $f_b \geq 9 N/mm^2$ 12x80 80 1,2 0,9 Compressive strength $f_b \geq 9 N/mm^2$ 12x80 80 1,2 0,9 Compressive strength $f_b \geq 9 N/mm^2$</td></td></td>	ed on tal $V \bullet \bullet$ c_{cr} 500 ed o $V \bullet \bullet$ c_{cr} 314 Group factor for anchor group in case of shear load figuration figuration with c [mm] \geq with s [m with s [m] ed ntal $V \bullet \bullet \bullet$ c_{cr} 500 ed ot $V \bullet \bullet \bullet$ c_{cr} 500 ed ot $V \bullet \bullet \bullet$ c_{cr} 500 Characteristic Characteristic values of resistance under tension a Open do t Characteristic Use cat Sleeve Φ_{ef} N _{Rk,b} = N _{Rk,p} ¹ Ψ Φ O O Ψ Ψ Compressive strength $f_b \ge 6$ N/mm ² 12x80 80 0.9 0.9 16x130 130 1.2 1.2 Compressive strength $f_b \ge 9$ N/mm ² 12x80 80 1.2 1.2 Compressive strength $f_b \ge 9$ N/mm ² 12x80 80 </td <td>ed ntal C_{cr} 500 $\alpha_{g,V,II}$ ed o C_{cr} 314 $\alpha_{g,V,II}$ Group factor for anchor group in case of shear load perpendicular f figuration with c [mm] \geq with s [mm] \geq cor 500 $\alpha_{g,V,II}$ d figuration with c [mm] \geq with s [mm] \geq cor 500 $\alpha_{g,V,II}$ cor 500 $\alpha_{g,V,II}$ compressive strength figuration with s [mm] \geq Characteristic values of resistance under tension and shear loads Characteristic resistance Use category Wide Wide Characteristic resistance Use category Wide Mide Compressive strength fig \geq N/mm^2 Compressive strength fig \geq N/mm^2 Compressive strength fig \geq N/mm^2 Compressive strength fig \geq N/mm^2 <td>ed ntal C_{cr} 500 $\alpha_{g,V,II}$ [-] ed ot C_{cr} 314 $\alpha_{g,V,II}$ [-] Group factor for anchor group in case of shear load perpendicular to free er figuration with c [mm] \geq with s [mm] \geq Group factor for anchor group in case of shear load perpendicular to free er figuration with c [mm] \geq with s [mm] \geq Characteristic values of resistance under tension and shear loads Characteristic values of resistance under tension and shear loads Characteristic resistance Use category M_{cr} $N_{Rk,D} = N_{Rk,P}^{10}$ $N_{Rk,D}$ Compressive strength $f_b \geq 6 N/mm^2$ 12x80 80 0,9 0,9 0,75 16x4130 130 1,2 0,9 Compressive strength $f_b \geq 9 N/mm^2$ 12x80 80 1,2 0,9 Compressive strength $f_b \geq 9 N/mm^2$ 12x80 80 1,2 0,9 Compressive strength $f_b \geq 9 N/mm^2$</td></td>	ed ntal C_{cr} 500 $\alpha_{g,V,II}$ ed o C_{cr} 314 $\alpha_{g,V,II}$ Group factor for anchor group in case of shear load perpendicular f figuration with c [mm] \geq with s [mm] \geq cor 500 $\alpha_{g,V,II}$ d figuration with c [mm] \geq with s [mm] \geq cor 500 $\alpha_{g,V,II}$ cor 500 $\alpha_{g,V,II}$ compressive strength figuration with s [mm] \geq Characteristic values of resistance under tension and shear loads Characteristic resistance Use category Wide Wide Characteristic resistance Use category Wide Mide Compressive strength fig \geq N/mm^2 Compressive strength fig \geq N/mm^2 Compressive strength fig \geq N/mm^2 Compressive strength fig \geq N/mm^2 <td>ed ntal C_{cr} 500 $\alpha_{g,V,II}$ [-] ed ot C_{cr} 314 $\alpha_{g,V,II}$ [-] Group factor for anchor group in case of shear load perpendicular to free er figuration with c [mm] \geq with s [mm] \geq Group factor for anchor group in case of shear load perpendicular to free er figuration with c [mm] \geq with s [mm] \geq Characteristic values of resistance under tension and shear loads Characteristic values of resistance under tension and shear loads Characteristic resistance Use category M_{cr} $N_{Rk,D} = N_{Rk,P}^{10}$ $N_{Rk,D}$ Compressive strength $f_b \geq 6 N/mm^2$ 12x80 80 0,9 0,9 0,75 16x4130 130 1,2 0,9 Compressive strength $f_b \geq 9 N/mm^2$ 12x80 80 1,2 0,9 Compressive strength $f_b \geq 9 N/mm^2$ 12x80 80 1,2 0,9 Compressive strength $f_b \geq 9 N/mm^2$</td>	ed ntal C_{cr} 500 $\alpha_{g,V,II}$ [-] ed ot C_{cr} 314 $\alpha_{g,V,II}$ [-] Group factor for anchor group in case of shear load perpendicular to free er figuration with c [mm] \geq with s [mm] \geq Group factor for anchor group in case of shear load perpendicular to free er figuration with c [mm] \geq with s [mm] \geq Characteristic values of resistance under tension and shear loads Characteristic values of resistance under tension and shear loads Characteristic resistance Use category M_{cr} $N_{Rk,D} = N_{Rk,P}^{10}$ $N_{Rk,D}$ Compressive strength $f_b \geq 6 N/mm^2$ 12x80 80 0,9 0,9 0,75 16x4130 130 1,2 0,9 Compressive strength $f_b \geq 9 N/mm^2$ 12x80 80 1,2 0,9 Compressive strength $f_b \geq 9 N/mm^2$ 12x80 80 1,2 0,9 Compressive strength $f_b \geq 9 N/mm^2$		

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

Injection System VMU plus for masonry

Performance - Clay hollow brick Calibric R+

Annex C28

Group factor, Characteristic values of resistance

Brick type: Clay hollow brick Calibric R+

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

Table C70. Characteristic values of resistance under tension and shear load (continue)								
		0	Characteristic resistance Use category					
Anchor size	Effective Anchorage depth	michorage hp/p p/p				d/d w/d w/w		
		40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges			
		h _{ef}		V _{Rk,b} ²⁾³⁾				
		[mm]		[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 \geq 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 _№ [mm]	δ _{N∞} [mm]	V [kN]	δ _{∨0} [mm]	δ _{∨∞} [mm]
M8	12x80	80	0.04		0.07	0.55	1,0	1,10	1,65
M8 / M10/ IG-	16x85	85	0,34	0,80	0,27	0,55	1,43		
M6	16x130	130	0,43		0,34	0,69			
M12 / M16 /	20x85	85	0,34		0,27	0,55	0.14	2,0	3,0
IG-M8 / IG-M10	20x130	130	0,43		0,34	0,69	2,14		

Injection System VMU plus for masonry

Brick type: Clay hollow brick Urbanbric

Table C72: Description of the brick

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

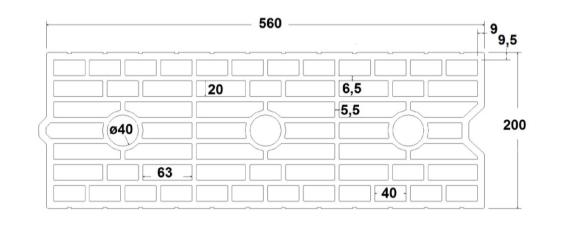


Table C73:

Spacing and edge distances

Anchor size			All sizes
Edge distance	Ccr	[mm]	100 (120) ¹⁾
Minimum edge distance	C _{min} ²⁾	[mm]	100 (120) ¹⁾
Specing	S _{cr,II}	[mm]	560
Spacing	S _{cr,⊥}	[mm]	274
Minimum spacing	S _{min}	[mm]	100

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

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

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

Configuration		with c [mm] ≥ with s [mm] ≥				
II: anchors placed parallel to horizontal		185	100			1,9
joint		C _{cr}	560	α _{g,N,II}	. 1	2,0
⊥: anchors placed		185	100		- [-]	1,1
perpendicular to horizontal joint		C _{cr}	274	α _{g,N,⊥}		2,0

Injection System VMU plus for masonry

Performance - Clay hollow brick Urbanbric

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

		un factor f						
Table C75:	Gro	up lactor i	or anchor group in	case of shear load	ling parallel to fro	ee edge		
Co	nfiguration		with c [mm] ≥	with s [m	i 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	$\alpha_{g,V,\perp}$	[-]	2,0	
Table C76:	Gro	oup factor f	or anchor groups	in case of shear loa	ad perpendicular	to free o	edge	
Co	nfiguration		with c [mm] ≥	with s [m	im] ≥			
II: anchors plac parallel to horizo joint		V	C _{cr}	560	α _{g,∨,II}		2,0	
⊥: anchors plac perpendicular horizontal joir	to	V	C _{cr}	c _{cr} 274		[-]	2,0	
Table C77:	Cha	aracteristic	values of resistan	ce under tension a	nd shear load			
			Characteristic resistance Use category					
		Effective Anchorage depth		egory		d/d		
		ectiv		d/d w/d			w/d	
Anchor size	nchor size Sleeve			w/w				
		4	40°C/24°C	80°C/50°C	120°C/72°C	All temperature		
		h _{ef}		$N_{Rk,b} = N_{Rk,p}^{1)}$		V _{Rk,b} ²⁾³⁾		
	[mm] [kN] [kN] [kN] [kN]							
		- T	0,9	0,9	0,75		3,0	
M8	12x80	80	0,9				3,0	
M8 M8 / M10/	12x80 16x85	80 85	0,9	0,9	0,75		0,0	
							3,0	
M8 / M10/	16x85	85	0,9	0,9	0,75			
M8 / M10/ IG-M6	16x85 16x130	85 130	0,9 2,0	0,9 2,0	0,75 1,5		3,0	
M8 / M10/ IG-M6 M12 / M16 /	16x85 16x130 20x85	85 130 85	0,9 2,0 0,9	0,9 2,0 0,9 2,0	0,75 1,5 0,75		3,0 3,5	
M8 / M10/ IG-M6 M12 / M16 /	16x85 16x130 20x85	85 130 85	0,9 2,0 0,9 2,0	0,9 2,0 0,9 2,0	0,75 1,5 0,75		3,0 3,5	
M8 / M10/ IG-M6 M12 / M16 / IG-M8 / IG-M10 M8	16x85 16x130 20x85 20x130	85 130 85 130	0,9 2,0 0,9 2,0 Compressive stren	0,9 2,0 0,9 2,0 gth f _b ≥9 N/mm ²	0,75 1,5 0,75 1,5		3,0 3,5 3,5	
M8 / M10/ IG-M6 M12 / M16 / IG-M8 / IG-M10 M8	16x85 16x130 20x85 20x130 12x80	85 130 85 130 80	0,9 2,0 0,9 2,0 Compressive stren 0,9	0,9 2,0 0,9 2,0 ngth f _b ≥ 9 N/mm ² 0,9	0,75 1,5 0,75 1,5 0,9		3,0 3,5 3,5 4,0	
M8 / M10/ IG-M6 M12 / M16 / IG-M8 / IG-M10	16x85 16x130 20x85 20x130 12x80 16x85	85 130 85 130 80 85	0,9 2,0 0,9 2,0 Compressive stren 0,9 0,9	0,9 2,0 0,9 2,0 ngth f _b ≥ 9 N/mm ² 0,9 0,9	0,75 1,5 0,75 1,5 0,9 0,9		3,0 3,5 3,5 4,0 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 ≥ 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

Injection System VMU plus for masonry

Performance - Clay hollow brick Urbanbric

Annex C31

Group factor, Characteristic values of resistance

Brick type: Clay hollow brick Urbanbric

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

Table 076. Characteristic values of resistance under tension and shear load (continue)									
			Characteristic resistance						
		a O		Use category					
		Effective Anchorage depth		d/d		d/d			
		ep ec		w/d		w/d			
Anchor size	Sleeve	d Eff		w/w		w/w			
	≺ h _{ef}	4	40°C/24°C	80°C/50°C	120°C/72°C	All temperature			
			40 0/24 0	$N_{Rk,b} = N_{Rk,p}^{1}$	120 0/12 0	ranges			
		h _{ef}		V _{Rk,b} ²⁾³⁾					
		[mm]		[kN]					
			Compressive stren	gth f _b ≥12 N/mm ²					
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 _{vo} [mm]	δ _{∨∞} [mm]
M8	12x80	80							
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	1 42		
IG-M8 / IG-M10	20x130	130	0,86		0,69	1,37	1,43		

Injection System VMU plus for masonry

Brick type: Clay hollow brick Brique creuse C40

Table C80:	Description of	the brick	
Brick type		Clay hollow brick Brique creuse C40	
Bulk density	ho [kg/dm³]	0,7	
Compressive strength	f _b ≥ [N/mm²]	4, 8 or 12	
Code		EN 771-1	
Producer (country code)		e.g. Terreal (FR)	
Brick dimensions	[mm]	500 x 200 x 200	
Drilling method		Rotary	

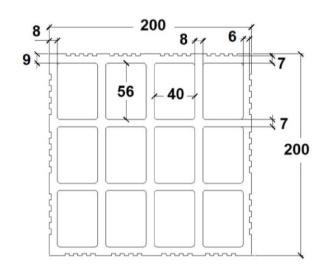


Table C81:

Spacing and edge distances

Anchor size			All sizes
Edge distance	Ccr	[mm]	100 (120) ¹⁾
Minimum edge distance	C _{min} ²⁾	[mm]	100 (120) ¹⁾
Specing	S _{cr,II}	[mm]	500
Spacing	S _{cr,⊥}	[mm]	200
Minimum spacing	S _{min}	[mm]	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

Configura	ation	with c [mm] \geq with s [mm] \geq				
II: anchors placed parallel to horizontal joint		C _{cr}	200	α _{g,N,II}	1 1	2,0
⊥: anchors placed perpendicular to horizontal joint		C _{cr}	200	$lpha_{g,N,\perp}$	[-]	2,0

Injection System VMU plus for masonry

Performance - Clay hollow brick Brique creuse C40

Annex C33

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

Table C83:		oup factor	for anchor group in			to free edge	;
Co	onfiguration		with c [mm] ≥	with s [n	nm] ≥		
II: anchors pla parallel to horiz joint		V•	C _{cr}	500) α _{g,V,}		2,0
⊥: anchors pla perpendicular horizontal joi	to	V	C _{cr}	200) α _{g,V,}		2,0
Table C84:	Gr	oup factor f	for anchor group in	case of shear loa	d perpendicu	lar to free e	dge
Co	Configuration		with c [mm] ≥	th c [mm] ≥ with s [mm] ≥			
	anchors placed allel to horizontal joint		C _{cr}	500) α _{g,V}	." [-]	2,0
⊥: anchors pla perpendicular horizontal joi	to		C _{cr}	200) α _{g,V}		2,0
Table C85:	Ch	aracteristic	values of resistan	ce under tension a	and shear load	d	
				Characteristic			
		ge ge		Use cat	tegory		
Anchor size Slee		a Effective Anchorage depth		d/d w/d			d/d w/d
	Sleeve	An	40°C/24°C	w/w 80°C/50°C	120°C/72°	C All te	w/w emperatur
			40 0/24 0	$N_{\text{Rk,b}} = N_{\text{Rk,p}}^{1)}$	120 0/12		ranges
		h _{ef}			2)3)		
		[mm]	Compressive stren	[kN]			[kN]
M8	12x80	80					
M8 / M10/	16x85	85					
IG-M6	16x130	130	0,6	0,6	0,6		0,9
M12 / M16 /	20x85	85					
G-M8 / IG-M10	20x130	130					
		-	Compressive stren	gth f _b ≥8N/mm ²			
M8	12x80	80					
M8 / M10/	16x85	85					
IG-M6	16x130	130	0,9	0,9	0,75		1,2
M12 / M16 / IG-M8 / IG-M10	20x85	85					
¹⁾ Values a	20x130 are valid for c	130 _{cr} and c _{min}					
		ee ETAG 029, for steel 5.6 or	Annex C higher. For steel 4.6 an	d 4.8 multiply $V_{Rk,b}$ by	0,8		

Table C86: Characteristic values of resistance under tension and shear load (continue)								
				Characteristic	-	,		
		υ		Use cat	egory			
Anchor size	ze Sleeve	Effective Anchorage depth		d/d w/d w/w				
					120°C/72°C	All temperature ranges		
		h _{ef}		V _{Rk,b} ²⁾³⁾				
		[mm]		$N_{Rk,b} = N_{Rk,p}^{1}$ [kN]		[kN]		
			Compressive stren	ngth 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						

²⁾ Calculation of $V_{Rk,c}$ see ETAG 029, 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 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	0.17		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

Annex C35

Brick type: Clay hollow brick Blocchi Leggeri

Table C88:	Description of	the brick	
Brick type		Clay hollow brick Blocchi Leggeri	
Bulk density	ho [kg/dm ³]	0,6	
Compressive strength	$f_b \ge [N/mm^2]$	4, 6, 8 or 12	
Code		EN 771-1	
Producer (country code))	e.g. Wienerberger (IT)	
Brick dimensions	[mm]	250 x 120 x 250	
Drilling method		Rotary	

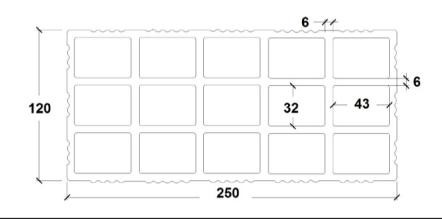


Table C89:	Spacing and e	dge distance	95
Anchor size			All sizes
Edge distance	C _{cr}	[mm]	100 (120) ¹⁾
Minimum edge distance	C _{min}	[mm]	60
Spacing	S _{cr,II}	[mm]	250
Spacing	${f s}_{{ m cr},\perp}$	[mm]	120
Minimum spacing	S _{min}	[mm]	100

¹⁾ Value in brackets for VM-SH 20x85; VM-SH 20x130 and VM-SH 20x200

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

Configura	Configuration		with s [mm] ≥			
II: anchors placed parallel to horizontal		60	100			1,0
joint		C _{cr}	250	α _{g,N,II}	[-]	2,0
⊥: anchors placed perpendicular to horizontal joint		60	100	$\alpha_{g,N,\perp}$	[-]	2,0

Injection System VMU plus for masonry

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Performance - Clay hollow brick Blocchi Leggeri

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

Table C91:	Gro	oup factor fo	or anchor group ii	n case of shear load	ding parallel to	free edge		
Cc	onfiguration		with c [mm] ≥	with s [m	ım] ≥			
II: anchors pla		V de	60 ¹⁾	100 ¹			1,0	
parallel to horiz joint			C _{cr}	250	α _{g,∨,II}		2,0	
⊥: anchors pla			60 ¹⁾	100 ¹)	[-]	1,6	
perpendicular horizontal joi		V	C _{cr}	250	α _{g,V,⊥}		2,0	
¹⁾ Only valid fo	r V _{Rk,b} accor	ding to Table	C93 and C94 values	in brackets				
Table C92:	Gro	oup factor fo	or anchor group i	n case of shear load	d perpendicular	to free e	dae	
	onfiguration		with c [mm] ≥					
II: anchors pla			60 ¹⁾	100 ¹))		1,0	
parallel to horiz joint	zontal		C _{cr}	250	α _{g,∨,II}		2,0	
⊥: anchors pla	ced by		60 ¹⁾	100 ¹)	[-]	1,6	
perpendicular horizontal joi	to 📗	V	Ccr	250	α _{g,V,⊥}		2,0	
	+	according to T	able C93 and C94 va	lues in brackets			_,-	
-		-						
Table C93:	Cha	aracteristic	values of resistar	ice under tension a				
				Characteristic Use cate				
		tive th		d/d	ogoly		d/d	
Anchensing	Clasura	Effective Anchorage depth	w/d w/w 40°C/24°C 80°C/50°C 120°C/				w/d w/w	
Anchor size	Sleeve	An E			120°C/72°C	All te	mperatu	
		h _{ef}	40 0/24 0	$N_{Rk,b} = N_{Rk,p}^{1}$	120 0/12 0		anges V _{Rk,b} 4)	
		[mm]	[kN]				[kN]	
			Compressive stre	ngth f _b ≥4 N/mm²		•		
M8	12x80	80						
M8 / M10/	16x85	85						
IG-M6	16x130	130	0,4	0,4	0,3	2,0	0 ²⁾ (0,9) ³⁾	
M12 / M16 / IG-M8 /	20x85 20x130	85 130						
	20x130	200						
IG-M10			Annex C. except for sh	ear load narallel to free		•••••• •• RK,C,II	¥ KK,D	
IG-M10 ¹⁾ Values a ²⁾ Calculat ³⁾ Values in	ion of V _{Rk,c} se n brackets V _R les are valid fi	_{k,c} = V _{Rk,b} for ar or steel 5.6 or l	nchors with c _{min} nigher. For steel 4.6 a	ear load parallel to free nd 4.8 multiply V _{Rk,b} by 0				

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Table C94:	Cha	aracteristic	values of resistar	nce under tension a	ind shear load (co	ontinue)	
				Characteristic	c resistance		
			e O		Use cat	egory	
		Effective Anchorage depth		d/d		d/d	
		fec cho dep		w/d		w/d	
Anchor size	Sleeve	And		w/w		w/w	
			40°C/24°C	80°C/50°C	120°C/72°C	All temperatur ranges	
		h _{ef}		V _{Rk,b} ⁴⁾			
		[mm]		[kN]			
Compressive strength f _b ≥ 6 N/mm ²							
M8	12x80	80					
M8 / M10/	16x85	85	0,5				
IG-M6	16x130	130		0,5	0,4	2,5 ²⁾ (1,2) ³⁾	
M12 / M16 /	20x85	85		0,0		2,0 (1,2)	
IG-M8 /	20x130	130					
IG-M10	20x200	200					
			Compressive stre	ngth f _b ≥8N/mm ²			
M8	12x80	80			0,5		
M8 / M10/	16x85	85					
IG-M6	16x130	130	0,6	0,6		3,0 ²⁾ (1,2) ³⁾	
M12/M16/	20x85	85	0,0	0,0	0,0	0,0 (1,2)	
IG-M8 /	20x130	130					
IG-M10	20x200	200					
			Compressive stren	igth $f_b \ge 12 \text{ N/mm}^2$			
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	-,-		5,0	0,0 (1,0)	
IG-M8 / IG-M10	20x130 20x200	130 200					

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,ll} = V_{Rk,b}

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

Displacements

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

Table C95:

Anchorsizo	Sleeve	h _{ef}	N	δ _N / N	δ_{N0}	δ _{N∞}	V	δ_{V0}	δv∞
Anchor size	Sleeve	[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

Annex C38

Brick type: Clay hollow brick Doppio Uni

Table C96:	Description of	the brick	
Brick type		Clay hollow brick Doppio Uni	
Bulk density	$ ho$ [kg/dm 3]	0,9	
Compressive strength	$f_b \ge [N/mm^2]$	10, 16, 20 or 28	
Code		EN 771-1	
Producer (country code)		e.g. Wienerberger (IT)	
Brick dimensions	[mm]	250 x 120 x 120	
Drilling method		Rotary	

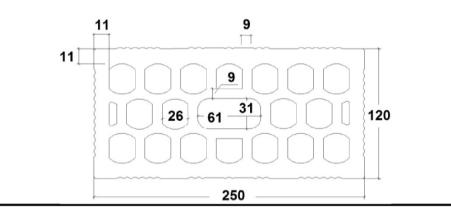


Table C97: Spacing and edge distances

Anchor size			All sizes
Edge distance	Ccr	[mm]	100 (120) ¹⁾
Minimum edge distance	C _{min} ²⁾	[mm]	60
Specing	S _{cr,II}	[mm]	250
Spacing	S _{cr,⊥}	[mm]	120
Minimum spacing	S _{min,II}	[mm]	100
Minimum spacing	S _{min,⊥}	[mm]	120

¹⁾ Value in brackets for VM-SH 20x85; VM-SH 20x130 and VM-SH 20x200

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

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

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

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Performance - Clay hollow brick Doppio Uni

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

Table C99:	Gr	oup factor f	or anchor group in	case of shear loa	ding parallel to	free edge	
Co	onfiguration		with c [mm] ≥	with s [r	nm] ≥		
II: anchors pla parallel to horiz joint		V •	C _{cr}	250) $lpha_{g,V,II}$	[-]	2,0
⊥: anchors pla perpendiculaı horizontal joi	to	V 🛊	C _{cr}	120) α _{g,V,⊥}	[-]	2,0
Table C10	0: Gr	oup factor f	or anchor group in	case of shear loa	d perpendicular	to free e	dge
Configuration			with c [mm] ≥	with s [r	nm] ≥		-
II: anchors pla parallel to horiz joint		V	C _{cr}	250) α _{g,V,II}	[-]	2,0
⊥: anchors pla perpendicular horizontal joi	ular to		C _{cr}	120	ο α _{g,V,⊥}		2,0
Table C10 [,]	1: Ch	aracteristic	values of resistan	ce under tension a	and shear load		
	Characteristic resistance						
		Effective Anchorage depth		Use ca	tegory		
		ctiv ora <u>(</u>		d/d w/d			d/d
Anchor size	Sleeve	de	w/w				w/d w/w
	0.ceve		40°C/24°C	40°C/24°C 80°C/50°C 120°C/72°			mperatur
		h _{ef}	$N_{Rk,b} = N_{Rk,p}^{1}$			١	2)3) Rk,b
		[mm]			[kN]		
			Compressive stren	gth f _b ≥10 N/mm ²			
M8	12x80	80					
M8 / M10/	16x85	85					
IG-M6	16x130	130	0,6	0,6	0,5		1,5
M12 / M16 /	20x85	85	-,-	- , -	- 1 -		.,-
IG-M8 / IG-M10	20x130 20x200	130 200					
²⁾ Calculat		e ETAG 029,	Annex C higher. For steel 4.6 an	id 4.8 multiply V _{Rk.b} by	0,8		
njection Syst	em VMU p	lus for mas	onry				

				Characteristic	resistance	
		ω	υ Use category			
		th th		0 /	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 N _{Rk,b} = N _{Rk,p} ¹⁾	120°C/72°C	All temperatur ranges
		h _{ef}		V _{Rk,b} ²⁾³⁾		
		[mm]		[kN]		[kN]
			Compressive strer	igth f _b ≥16 N/mm ²		
M8	12x80	80				
M8 / M10/	16x85	85				
IG-M6	16x130	130	0.75	0.75		
M12 / M16 /	20x85	85	0,75	0,75	0,6	2,0
IG-M8 /	20x130	130				
IG-M10	20x200	200				
			Compressive strer	igth f _b ≥ 20 N/mm ²		
M8	12x80	80		0,9		
M8 / M10/	16x85	85				
IG-M6	16x130	130	0,9		0,75	2,0
M12 / M16 /	20x85	85	0,0			2,0
IG-M8 /	20x130	130				
IG-M10	20x200	200		2		
	10.00		Compressive strer	igth f _b ≥28 N/mm²		
M8	12x80	80				
M8 / M10/ IG-M6	16x85 16x130	85 130				
	20x85	85	1,2	1,2	0,9	2,5
M12 / M16 / IG-M8 /	20x85 20x130	130				
IG-M10	20x200	200				
²⁾ Calculati	re valid for c _{cr} on of V _{Rk,c} see	and c _{min} ETAG 029, Ann		4.8 multiply $V_{Rk,b}$ by 0,8		

	h _{ef}	N	δ _N / N	δ _{ΝΟ}	δ _{N∞}	V	δ _{V0}	δ∨∞	
Anchor size	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

Annex C41

Brick type: Hollow lightweight concrete Bloc creux B40 Table C104: **Description of the brick** Hollow Lightweight concrete Brick type Bloc creux B40 Bulk density 0.8 ρ [kg/dm³] Compressive strength $f_b \ge [N/mm^2]$ 4 Code EN 771-3 e.g. Sepa (FR) Producer (country code) 494 x 200 x 190 Brick dimensions [mm] Drilling method Rotary 494 17 200 17

Table C105:

Spacing and edge distances

Anchor size			All sizes
Edge distance	Ccr	[mm]	100 (120) ¹⁾
Minimum edge distance	C _{min} ²⁾	[mm]	100 (120) ¹⁾
Specing	S _{cr,II}	[mm]	494
Spacing	S _{cr,⊥}	[mm]	190
Minimum spacing	S _{min}	[mm]	100

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

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

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

Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal		100	100	<i>a</i>		1,5
joint		C _{cr}	494	α _{g,N,II}	[-]	2,0
⊥: anchors placed		100	100		[-]	1,0
perpendicular to horizontal joint		C _{cr}	190	$lpha_{g,N,\perp}$		2,0

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Performance - Hollow Lightweight concrete Bloc creux B40

Annex C42

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

. . . light weight a subject Disc subject D 40

	7: Gr	oup lacto	or for anche	or group in	case of sl	hear loadir	ig parallel	to free edg	е	
Co	onfiguration		w	vith c [mm] ≥		with s [mm]	≥			
II: anchors pla				50		100			1,1	
parallel to horiz joint	ontal			C _{cr}		494	α _{g,\}		2,0	
⊥: anchors pla				100		100		[-]	1,1	
perpendicula horizontal jo		V		C _{cr}		190	α _{g,\}	/,⊥	2,0	
Table C10	8: Gr	oup facto	or for anch	or aroup ir	n case of sl	hear load r	erpendicu	lar to free	edae	
	onfiguration			vith c [mm] ≥		with s [mm]	-			
II: anchors pla parallel to horiz joint		V-•••		C _{cr}		494	α _g ,		2,0	
⊥: anchors pla perpendicula horizontal jo	r to			C _{cr}		190	α _g ,	(-]	2,0	
Table C10	9: Cł	aracteris	tic values o	of resistan	ce under to			d		
				Characteristic resistance Use category						
		Effective anchorage depth		d/d		w/d w/w			d/d w/d w/w	
Anchor size	Sleeve	Sleeve	anc	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]				
			Compr	essive strer	ngth f _b ≥4N	l/mm²				
M8	12x80	80				0,9				
WIO	16x85	85			-	1,2		0,75	3.0	
			1.2	0.0	0.75	1 2	0,9	0,75	3,0	
M8 / M10/ IG-M6	16x130	130	1,2	0,9	0,75	1,2	0,9		-	
//8 / M10/ IG-M6 M12 / M16 /	16x130 20x85	130 85	1,2	0,9	0,75	1,2	0,9			
//8 / M10/ IG-M6 M12 / M16 / IG-M8 / IG-M10	16x130 20x85 20x130	130 85 130	1,2	0,9	0,75		0,9			
M8 / M10/ IG-M6 M12 / M16 / IG-M8 / IG-M10 1) Values a 2) Calculat	16x130 20x85 20x130 are valid for c _c ion of V _{Rkc} set set are valid for	130 85 130 and c _{min} ∋ ETAG 029,	Annex C, exc r higher. For s	cept for shear	0,75 load parallel to .8 multiply V _{Rk}	1,2 1,2		:' V _{Rk,c,II} = V _{Rk,b}		
M8 / M10/ IG-M6 M12 / M16 / IG-M8 / IG-M10 1) Values a 2) Calculat 3) The valu	16x130 20x85 20x130 are valid for c _c ion of V _{Rkc} set set are valid for	130 85 130 and c _{min} ETAG 029, or steel 5.6 o splaceme	Annex C, exc r higher. For s nts	cept for shear l teel 4.6 and 4	load parallel to .8 multiply V _{Rk}	1,2 1,2 o free edge wit	h c ≥ 250 mm			
M8 / M10/ IG-M6 M12 / M16 / IG-M8 / IG-M10 1) Values a 2) Calculat 3) The valu	16x130 20x85 20x130 are valid for c _c ion of V _{Rkc} set set are valid for	130 85 130 and c _{min} ETAG 029, or steel 5.6 o	Annex C, exc r higher. For s	cept for shear	load parallel to	1,2 1,2		$\frac{\delta_{V0}}{[mm]}$	δ _{∨∞} [mm]	

Injection System VMU plus for masonry

Performance - Hollow lightweight concrete Bloc creux B40

Annex C43

Group factor, Characteristic values of resistance, Displacements

Brick type: Solid lightweight concrete - LAC

Table C111: Description of the brick

	2000p		
Brick type		Solid lightweight concrete LAC	
Bulk density	ho [kg/dm ³]	0,6	
Compressive strength	$f_b \ge [N/mm^2]$	2	
Code		EN 771-3	
Producer (country code)		e.g. Bisotherm (DE)	
Brick dimensions	[mm]	300 x 123 x 248	and the second second
Drilling method		Rotary	

Table C112: Spacing and edge distances

Anchor size			All sizes
Edge distance	Ccr	[mm]	1,5*h _{ef}
Minimum edge distance	Cmin	[mm]	60
Spacing	Scr	[mm]	3*h _{ef}
Minimum spacing	S _{min}	[mm]	120

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

	-					
Configura	ation	with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal	90	120			1,1	
joint		1,5*hef	3*h _{ef}	α _{g,N,II}	[-]	2,0
⊥: anchors placed		124	120		[-]	1,1
perpendicular to horizontal joint		1,5*hef	3*h _{ef}	α _{g,N,⊥}		2,0

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

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

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

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

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

Brick type: So	lid lightwe	eight con	crete - LA	с							
Table C116	: Cha	aracterist	tic values	of resistar	nce under t	ension and	d shear loa	ad			
					Cha	racteristic re	sistance				
	Sleeve	Effective anchorage depth	Use category								
Anchor size				d/d		w/d w/w			d/d w/d w/w		
								120°C/72°C	ranges		
		h _{ef}	$N_{Rk,b} = N_{Rk,p}^{1}$				V _{Rk,b} ²⁾³⁾				
		[mm]	[kN]								
			Compr	essive stre	ngth f _b ≥2N	N/mm ²					
M8	-	80	3,0	2,5	2,0	2,5	2,0	1,5	3,0		
M8 / M10/ IG-M6	-	90	3,0	3,0	2,0	2,5	2,5	2,0	3,0		
M10 / IG-M8	-	100	3,5	3,0	2,5	3,0	2,5	2,0	3,0		
M16 / IG-M10	-	100	3,0	3,0	2,0	3,0	3,0	2,0	3,0		
M8	12x80	80	2,5	2,5	2,0	2,5	2,0	1,5	3,0		
M8 / M10/	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		

2,5

2,0

2,5

2,5

2,0

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

85

130

200

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

20x85

20x130

20x200

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

2,5

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M12 / M16 / IG-M8 /

IG-M10

splacements

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	0.25	0,35 0,70		,	,	
M16 / IG-M10	-	100	0,86	0,35	0,30	0,60			
M8	12x80	80	0,71	0,50	0,36	0,71	0,9	0,25	0,38
M8 / M10/ IG-M6	16x85	85		0,35	0,25	0,50			
	16x130	130							
M12 / M16 / IG-M8 / IG-M10	20x85	85							
	20x130	130							
	20x200	200							

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Annex C45

3,0