DECLARATION OF PERFORMANCE
DoP No. Sikla-621 - en

1. Unique identification code of the product-type: **Sikla Injection System VMU plus (masonry)**

2. Type, batch or serial number or any other element allowing identification of the construction product as required pursuant to Article 11(4):
   ETA-17/307, Annex A2 and A3
   Batch number: see packaging of the product.

3. Intended use or uses of the construction product, in accordance with the applicable harmonised technical specification, as foreseen by the manufacturer:

generic type	bonded anchor
for use in	masonry
option	b, c, d
loading	static or quasi-static
material	hot-dip galvanized steel: dry internal conditions only covered sizes: VMU-A, V-A: M8, M10, M12, M16 VMU-IG: M6, M8, M10 zinc-plated steel: dry internal conditions only covered sizes: VMU-A, V-A: M8, M10, M12, M16 VMU-IG: M6, M8, M10 stainless steel (marking A4): internal and external use without particular aggressive conditions covered sizes: VMU-A, V-A: M8, M10, M12, M16 VMU-IG: M6, M8, M10 high corrosion resistant steel (marking HCR): internal and external use with particular aggressive conditions covered sizes: VMU-A, V-A: M8, M10, M12, M16 VMU-IG: M6, M8, M10
temperature range (if applicable)	T_a: -40 °C to +40 °C T_b: -40 °C to +80 °C T_c: -40 °C to +120 °C

4. Name, registered trade name or registered trade mark and contact address of the manufacturer as required pursuant to Article 11(5):
   Sikla GmbH
   Kornstraße 4
   4615 Marchtrenk
   Austria

5. Where applicable, name and contact address of the authorised representative whose mandate covers the tasks specified in Article 12(2): --

6. System or systems of assessment and verification of constancy of performance of the construction product as set out in Annex V: **System 1**

7. In case of the declaration of performance concerning a construction product covered by a harmonised standard: --

8. In case of the declaration of performance concerning a construction product for which a European Technical Assessment has been issued:

Deutsches Institut für Bautechnik, Berlin

issued

ETA-17/307

on the basis of

ETAG 029

The notified body 1343-CPR performed under system 1:

(i) determination of the product type on the basis of type testing (including sampling), type calculation, tabulated values or descriptive documentation of the product;

(ii) initial inspection of the manufacturing plant and of factory production control;

(iii) continuous surveillance, assessment and evaluation of factory production control.

and issued: certificate of conformity 1343-CPR-M 557-1/11.14

9. Declared performance:

Essential Characteristics	**Design Method**	**Performance**	**Harmonized Technical Specification**
characteristic values for resistance in masonry	ETAG 029, Annex C	ETA-17/307, Annex C	ETAG 029
minimum spacing and minimum edge distance	ETAG 029, Annex C	ETA-17/307, Annex C	
displacement for serviceability limit state	ETAG 029, Annex C	ETA-17/307, Annex C	

Where pursuant to Article 37 or 38 in the Specific Technical Documentation has been used, the requirements with which the product complies: --

10. The performance of the product identified in points 1 and 2 is in conformity with the declared performance in point 9.

This declaration of performance is issued under the sole responsibility of the manufacturer identified in point 4.

Signed for and on behalf of the manufacturer by:

Dieter Klauß
(Geschäftsführer)
VS – Schwenningen, 26.07.17

Deutsches Institut für Bautechnik DIBt

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

Brick-No. and abbreviation	Installation & Use category	β-Factor					
		T_a: 40°C / 24°C		T_b: 80°C / 50°C		T_c: 120°C / 72°C	
		d/d	w/d w/w	d/d	w/d w/w	d/d	w/d w/w
1 AAC6	All sizes	0,95	0,86	0,81	0,73	0,81	0,73
2 KS-NF	$d_0 \leq 14$ mm	0,93	0,80	0,87	0,74	0,65	0,56
	$d_0 \geq 16$ mm	0,93	0,93	0,87	0,87	0,65	0,65
3 KSL-3DF	$d_0 \leq 12$ mm	0,93	0,80	0,87	0,74	0,65	0,56
	$d_0 \geq 16$ mm	0,93	0,93	0,87	0,87	0,65	0,65
4 KSL-12DF	$d_0 \leq 12$ mm	0,93	0,80	0,87	0,74	0,65	0,56
	$d_0 \geq 16$ mm	0,93	0,93	0,87	0,87	0,65	0,65
5 MZ-DF	all sizes	0,86	0,86	0,86	0,86	0,73	0,73
6 Hlz-16DF							
7 Porotherm Homebric							
8 BGV-Thermo							
9 Calibric R+							
10 Urbanbric							
11 Brique creuse C40							
12 Blocchi Leggeri							
13 Doppio Uni							
14 Bloc creux B40	$d_0 \leq 12$ mm	0,93	0,80	0,87	0,74	0,65	0,56
	$d_0 \geq 16$ mm	0,93	0,93	0,87	0,87	0,65	0,65
15 Solid lightweight concrete	$d_0 \leq 12$ mm	0,93	0,80	0,87	0,74	0,65	0,56
	$d_0 \geq 16$ mm	0,93	0,93	0,87	0,87	0,65	0,65

Sikla Injection System VMU plus for masonry

Performances
β - factors for job site testing under tension load

Annex C1

Deutsches Institut für Bautechnik DIBt

Table C2: Characteristic steel resistance under tension and shear 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
	γ_{Ms}	[-]		-			2,0		
Steel, property class 4.8	$N_{Rk,s}$	[kN]	-	-	-	15	23	34	63
	γ_{Ms}	[-]		-			1,5		
Steel, property class 5.6	$N_{Rk,s}$	[kN]	10	18	29	18	29	42	79
	γ_{Ms}	[-]		2,0			2,0		
Steel, property class 5.8	$N_{Rk,s}$	[kN]	10	17	29	18	29	42	79
	γ_{Ms}	[-]		1,5			1,5		
Steel, property class 8.8	$N_{Rk,s}$	[kN]	16	27	46	29	46	67	126
	γ_{Ms}	[-]		1,5			1,5		
Stainless steel A4 / HCR, property class 70	$N_{Rk,s}$	[kN]	14	26	41	26	41	59	110
	γ_{Ms}	[-]		1,87			1,87		
Stainless steel A4 / HCR, property class 80	$N_{Rk,s}$	[kN]	16	29	46	29	46	67	126
	γ_{Ms}	[-]		1,6			1,6		
Characteristic shear resistance									
Steel, property class 4.6	$V_{Rk,s}$	[kN]	-	-	-	7	12	17	31
	γ_{Ms}	[-]		-			1,67		
Steel, property class 4.8	$V_{Rk,s}$	[kN]	-	-	-	7	12	17	31
	γ_{Ms}	[-]		-			1,25		
Steel, property class 5.6	$V_{Rk,s}$	[kN]	5	9	15	9	15	21	39
	γ_{Ms}	[-]		1,67			1,67		
Steel, property class 5.8	$V_{Rk,s}$	[kN]	5	9	15	9	15	21	39
	γ_{Ms}	[-]		1,25			1,25		
Steel, property class 8.8	$V_{Rk,s}$	[kN]	8	14	23	15	23	34	63
	γ_{Ms}	[-]		1,25			1,25		
Stainless steel A4 / HCR, property class 70	$V_{Rk,s}$	[kN]	7	13	20	13	20	30	55
	γ_{Ms}	[-]		1,56			1,56		
Stainless steel A4 / HCR, property class 80	$V_{Rk,s}$	[kN]	8	15	23	15	23	34	63
	γ_{Ms}	[-]		1,33			1,33		
Characteristic bending moment									
Steel, property class 4.6	$M_{Rk,s}$	[Nm]	-	-	-	15	30	52	133
	γ_{Ms}	[-]		-			1,67		
Steel, property class 4.8	$M_{Rk,s}$	[Nm]	-	-	-	15	30	52	133
	γ_{Ms}	[-]		-			1,25		
Steel, property class 5.6	$M_{Rk,s}$	[Nm]	8	19	37	19	37	66	167
	γ_{Ms}	[-]		1,67			1,67		
Steel, property class 5.8	$M_{Rk,s}$	[Nm]	8	19	37	19	37	66	167
	γ_{Ms}	[-]		1,25			1,25		
Steel, property class 8.8	$M_{Rk,s}$	[Nm]	12	30	60	30	60	105	266
	γ_{Ms}	[-]		1,25			1,25		
Stainless steel A4 / HCR, property class 70	$M_{Rk,s}$	[Nm]	11	26	52	26	52	92	233
	γ_{Ms}	[-]		1,56			1,56		
Stainless steel A4 / HCR, property class 80	$M_{Rk,s}$	[Nm]	12	30	60	30	60	105	266
	γ_{Ms}	[-]		1,33			1,33		

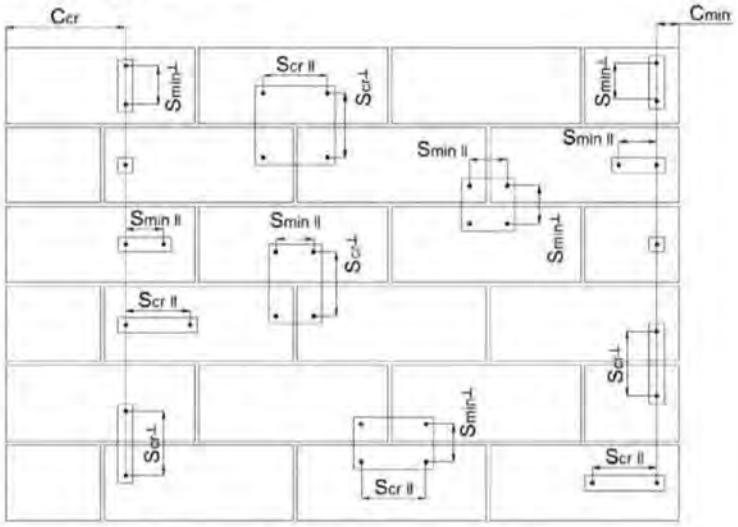
Sikla Injection System VMU plus for masonry

Performances
Characteristic steel resistance under tension and shear load

Annex C2

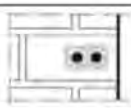
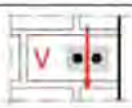
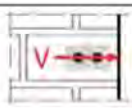
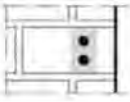
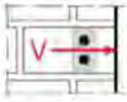
Deutsches Institut für Bautechnik DIBt

Spacing and edge distance



c_{cr} = Characteristic edge distance
c_{min} = Minimum edge distance
s_{cr} = Characteristic spacing
s_{min} = Minimum spacing

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

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

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

Group of **2** anchors: $N^{g}_{Rk} = \alpha_{g,N} * N_{RK}$ and $V^{g}_{Rk} = \alpha_{g,V} * V_{Rk}$

Group of **4** anchors: $N^{g}_{Rk} = \alpha_{g,N,II} * \alpha_{g,N,\perp} * N_{RK}$ and $V^{g}_{Rk} = \alpha_{g,V,II} * \alpha_{g,V,\perp} * V_{Rk}$

(N_{Rk}: $N_{Rk,b}$ or $N_{Rk,b,j}$ for c_{cr})
(V_{Rk}: $V_{Rk,c}$; $V_{Rk,c,j}$; $V_{Rk,b}$ or $V_{Rk,b,j}$ for c_{cr})
(with the relevant α_g)

Sikla Injection System VMU plus for masonry

Performances
Edge distance and Spacing

Annex C3

Brick type: Autoclaved Aerated Concrete – AAC6

Table C3: Description of the brick

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

Table C4: Spacing and edge distance

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

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

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

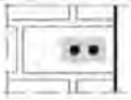
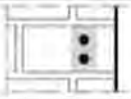
Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		125 (120 for M8)	100	$\alpha_{g,N,II}$	[-]	1,8
		$1{,}5 \cdot h_{ef}$	$3 \cdot h_{ef}$			2,0
⊥: anchors placed perpendicular to horizontal joint		75	100	$\alpha_{g,N,\perp}$		1,4
		$1{,}5 \cdot h_{ef}$	$3 \cdot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

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

Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		75	100	$\alpha_{g,V,II}$	[-]	1,2
		$1{,}5 \cdot h_{ef}$	$3 \cdot h_{ef}$			2,0
⊥: anchors placed perpendicular to horizontal joint		$1{,}5 \cdot h_{ef}$	$3 \cdot h_{ef}$	$\alpha_{g,V,\perp}$		2,0

Sikla Injection System VMU plus for masonry

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

Annex C4

Deutsches Institut für Bautechnik DIBt

Brick type: Autoclaved Aerated Concrete – AAC6

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

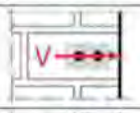
Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		1,5*hef	3,0*hef	$\alpha_{g,V,II}$	[-]	2,0
⊥: anchors placed perpendicular to horizontal joint		1,5*hef	3,0*hef	$\alpha_{g,V,\perp}$		2,0

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

Anchor size	Effective anchorage depth	Characteristic resistance						
		Use category						
		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}	$N_{Rk,b} = N_{Rk,p}$ [1]			$N_{Rk,b} = N_{Rk,p}$ [1]			$V_{Rk,b}$ [2)3)]
	[mm]	[kN]						
Compressive strength $f_b \geq 6$ 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 steel 4.6 and 4.8 multiply $V_{Rk,b}$ by 0,8

Table C9: Displacements

Anchor size	h_{ef}	N	δ_N / N	δ_{N0}	$\delta_{N\infty}$	V	δ_{V0}	$\delta_{V\infty}$
	[mm]	[kN]	[mm/kN]	[mm]	[mm]	[kN]	[mm]	[mm]
M8	80	0,9	0,18	0,16	0,32	1,3	0,8	1,20
M10/IG-M6	90	1,4		0,26	0,51	1,8	1,2	1,80
M12/IG-M8	100	1,8	0,08	0,14	0,29	2,1	1,4	2,10
M16/IG-M10	100	2,3		0,19	0,37	2,3	1,5	2,25

Sikla Injection System VMU plus for masonry

Performances - Autoclaved Aerated Concrete – AAC6
Group factor, Characteristic values of resistance, Displacements

Annex C5

Deutsches Institut für Bautechnik DIBt

Brick type: Calcium silicate solid brick KS-NF

Table C10: Description of the brick

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

Table C11: Spacing and edge distance

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

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

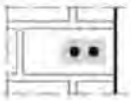
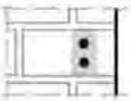
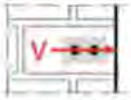
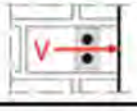
Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		60	120	$\alpha_{g,N,II}$	[-]	1,0
		140	120			1,5
		1,5*hef	$3*h_{ef}$			2,0
⊥: anchors placed perpendicular to horizontal joint		60	120	$\alpha_{g,N,\perp}$		0,5
		1,5*hef	120			1,0
		1,5*hef	$3*h_{ef}$			2,0

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

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

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

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

Sikla Injection System VMU plus for masonry

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

Annex C6

Deutsches Institut für Bautechnik DIBt

Brick type: Calcium silicate solid brick KS-NF

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

Anchor size	Sleeve	Effective anchorage depth	Characteristic resistance						
			Use category						
			d/d			w/d w/w			d/d w/d w/w
			40°C/24°C	80°C/50°C	120°C/72°C	40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges
		h_{ef}	$N_{Rk,b} = N_{Rk,p}$ [1]			$N_{Rk,b} = N_{Rk,p}$ [1]			$V_{Rk,b}$ [2)3)]
		[mm]	[kN]						
Compressive strength $f_b \geq 10$ N/mm²									
M8	-	80	4,5 (2,0)	4,5 (2,0)	3,0 (1,5)	3,5 (1,5)	3,5 (1,5)	2,5 (1,2)	2,5 (1,5)
M10 / IG-M6	-	90							3,0 (2,0)
M12 / IG-M8	-	100							2,5 (1,5)
M16 / IG-M10	-	100	3,5 (1,5)	3,5 (1,5)	2,5 (1,2)	3,0 (1,5)	3,5 (1,5)	2,0 (0,9)	2,5 (1,5)
M8	12x80	80	3,5 (1,5)	3,5 (1,5)	2,5 (1,2)	3,5 (1,5)	3,0 (1,5)	2,5 (1,2)	2,5 (1,5)
M8 / M10/ IG-M6	16x85	85	3,5 (1,5)	3,0 (1,5)	2,0 (0,9)	3,5 (1,5)	3,0 (1,5)	2,5 (1,2)	2,5 (1,5)
	16x130	130	3,5 (1,5)	3,0 (1,5)	2,0 (0,9)	3,5 (1,5)	3,0 (1,5)	2,5 (1,2)	2,5 (1,5)
M12 / M16 / IG-M8 / IG-M10	20x85	85	3,0 (1,5)	2,5 (1,2)	2,0 (0,9)	3,0 (1,5)	2,5 (1,2)	2,0 (0,9)	2,5 (1,5)
	20x130	130							
	20x200	200							
Compressive strength $f_b \geq 20$ N/mm²									
M8	-	80	6,0 (3,0)	5,5 (2,5)	4,0 (2,0)	5,0 (2,5)	5,0 (2,5)	3,5 (1,5)	4,0 (2,5)
M10 / IG-M6	-	90							4,5 (2,5)
M12/ IG-M8	-	100							4,0 (2,5)
M16/ IG-M10	-	100	5,0 (2,5)	5,0 (2,5)	3,5 (1,5)	5,0 (2,5)	5,0 (2,5)	3,5 (1,5)	4,0 (2,5)
M8	12x80	80	5,5 (2,5)	5,0 (2,5)	3,5 (1,5)	4,5 (2,0)	4,5 (2,0)	3,0 (1,5)	4,0 (2,5)
M8 / M10/ IG-M6	16x85	85	5,0 (2,5)	4,5 (2,0)	3,5 (1,5)	5,0 (2,5)	4,5 (2,0)	3,5 (1,5)	4,0 (2,5)
	16x130	130	5,0 (2,5)	4,5 (2,0)	3,5 (1,5)	5,0 (2,5)	4,5 (2,0)	3,5 (1,5)	4,0 (2,5)
M12 / M16 / IG-M8 / IG-M10	20x85	85	4,0 (2,0)	4,0 (2,0)	3,0 (1,5)	4,0 (2,0)	4,0 (2,0)	3,0 (1,5)	4,0 (2,5)
	20x130	130							
	20x200	200							

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

Sikla Injection System VMU plus for masonry

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

Annex C7

Deutsches Institut für Bautechnik DIBt

Brick type: Calcium silicate solid brick KS-NF

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

Anchor size	Sleeve	Effective anchorage depth	Characteristic resistance						
			Use category						
			d/d			w/d w/w			d/d w/d w/w
			40°C/24°C	80°C/50°C	120°C/72°C	40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges
		h_{ef}	$N_{Rk,b} = N_{Rk,p}$ [1]			$N_{Rk,b} = N_{Rk,p}$ [1]			$V_{Rk,b}$ [2)3)]
		[mm]	[kN]						
Compressive strength $f_b \geq 27$ N/mm²									
M8	-	80	7,0 (3,5)	6,5 (3,0)	5,0 (2,5)	6,0 (3,0)	5,5 (2,5)	4,0 (2,0)	4,5 (2,5)
M10 / IG-M6	-	90							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/ IG-M6	16x85	85	5,5 (2,5)	5,0 (2,5)	4,0 (2,0)	5,5 (2,5)	5,0 (2,5)	4,0 (2,0)	4,5 (2,5)
	16x130	130	5,5 (2,5)	5,0 (2,5)	4,0 (2,0)	5,5 (2,5)	5,0 (2,5)	4,0 (2,0)	4,5 (2,5)
M12 / M16 / IG-M8 / IG-M10	20x85	85	5,0 (2,5)	4,5 (2,0)	3,5 (1,5)	5,0 (2,5)	4,5 (2,0)	3,5 (1,5)	4,5 (2,5)
	20x130	130							
	20x200	200							

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

Table C17: Displacements

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

Sikla Injection System VMU plus for masonry

Performances - Calcium solid brick KS-NF
Characteristic values of resistance (continue), Displacements

Annex C8

Deutsches Institut für Bautechnik DIBt

Brick type: Calcium silicate hollow brick KSL-3DF

Table C18: Description of the brick

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

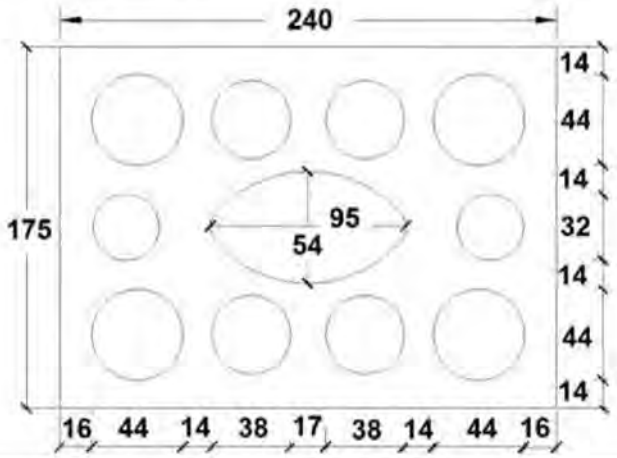
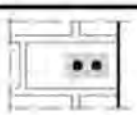


Table C19: Spacing and edge distance

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

[1] 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

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

Sikla Injection System VMU plus for masonry

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

Annex C9

Deutsches Institut für Bautechnik DIBt

Brick type: Calcium silicate hollow brick KSL-3DF

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

Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		60	120	$\alpha_{g,V,II}$	[-]	1,0
		160	120			1,6
		c_{cr}	240			2,0
⊥: anchors placed perpendicular to horizontal joint		60	120	$\alpha_{g,V,\perp}$		1,0
		c_{cr}	120			2,0

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

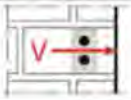
Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		60	120	$\alpha_{g,V,II}$	[-]	1,0
		c_{cr}	240			2,0
⊥: anchors placed perpendicular to horizontal joint		60	120	$\alpha_{g,V,\perp}$		1,0
		c_{cr}	120			2,0

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

Anchor size	Sleeve	Effective anchorage depth	Characteristic resistance						
			Use category						
			d/d			w/d; w/w			d/d; w/d; w/w
			40°C/24°C	80°C/50°C	120°C/72°C	40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges
		h_{ef}	$N_{Rk,b} = N_{Rk,p}$ [1]			$N_{Rk,b} = N_{Rk,p}$ [1]			$V_{Rk,b}$ [4]
		[mm]	[kN]						
			Compressive strength $f_b \geq 8$ N/mm²						
M8	12x80	80	1,5	1,5	1,2	1,5	1,2	0,9	2,5 [2] (0,9) [3]
M8 / M10 / IG-M6	16x85	85					1,5	1,2	4,0 [2] (1,5) [3]
	16x130	130					1,5	1,2	4,0 [2] (1,5) [3]
M12 / M16 / IG-M8 / IG-M10	20x85	85	4,5	4,0	3,0	4,5	4,0	3,0	4,0 [2] (1,5) [3]
	20x130	130							
	20x200	200							
			Compressive strength $f_b \geq 12$ N/mm²						
M8	12x80	80	2,0	2,0	1,5	2,0	1,5	1,2	3,0 [2] (1,2) [3]
M8 / M10 / IG-M6	16x85	85	2,0	2,0	1,5	2,0	2,0	1,5	4,5 [2] (1,5) [3]
	16x130	130	2,5	2,5	1,5	2,5	2,5	1,5	4,5 [2] (1,5) [3]
M12 / M16 / IG-M8 / IG-M10	20x85	85	6,0	5,5	4,0	6,0	5,5	4,0	4,5 [2] (1,5) [3]
	20x130	130							
	20x200	200							

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

Sikla Injection System VMU plus for masonry

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

Annex C10

Deutsches Institut für Bautechnik DIBt

Brick type: Calcium silicate hollow brick KSL-3DF

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

Anchor size	Sleeve	Effective anchorage depth	Characteristic resistance						
			Use category						
			d/d			w/d; w/w			d/d; w/d; w/w
			40°C/24°C	80°C/50°C	120°C/72°C	40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges
		h_{ef}	$N_{Rk,b} = N_{Rk,p}$ [1]			$N_{Rk,b} = N_{Rk,p}$ [1]			$V_{Rk,b}$ [4]
		[mm]	[kN]						
			Compressive strength $f_b \geq 14$ N/mm²						
M8	12x80	80	2,5	2,5	1,5	2,0	2,0	1,5	3,5 [2] (1,5) [3]
M8 / M10 / IG-M6	16x85	85	2,5	2,5	1,5	2,5	2,5	1,5	6,0 [2] (2,0) [3]
	16x130	130	2,5	2,5	2,0	2,5	2,5	2,0	6,0 [2] (2,0) [3]
M12 / M16 / IG-M8 / IG-M10	20x85	85	6,5	6,0	4,5	6,5	6,0	4,5	6,0 [2] (2,0) [3]
	20x130	130							
	20x200	200							

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

Table C25: Displacements

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

Sikla Injection System VMU plus for masonry

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

Annex C11

Deutsches Institut für Bautechnik DIBt

Brick type: Calcium silicate hollow brick KSL-12DF

Table C26: Description of the brick

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

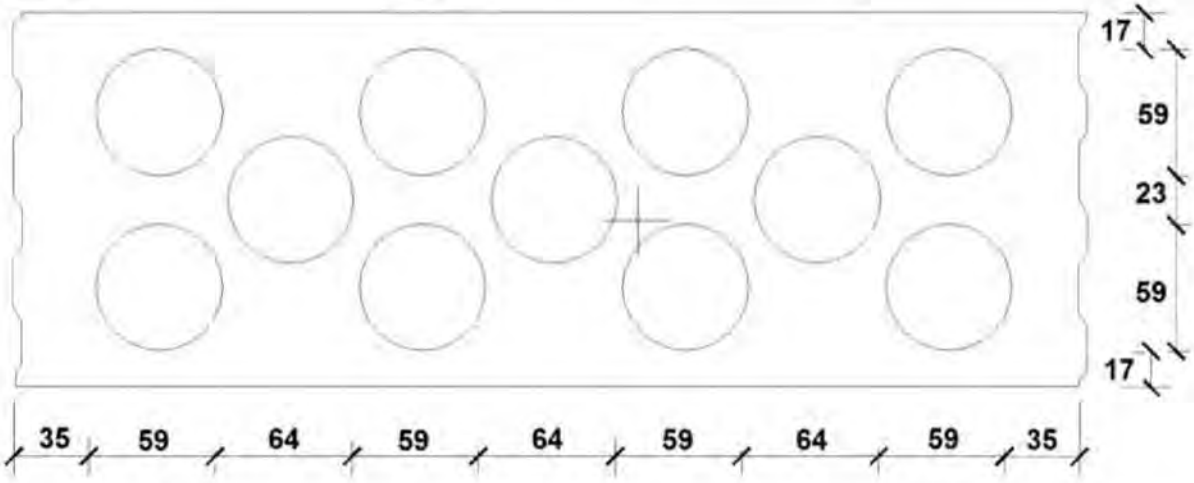
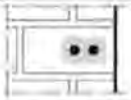
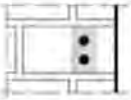


Table C27: Spacing and edge distances

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

1) Value in brackets for 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

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

Sikla Injection System VMU plus for masonry

Performance - Calcium silicate hollow brick KSL-12DF
Description of the brick, Spacing and edge distances, Group factor

Annex C12

Deutsches Institut für Bautechnik DIBt

Brick type: Calcium silicate hollow brick KSL-12DF

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

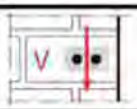
Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		c_{cr}	498	$\alpha_{g,V,II}$	[-]	2,0
⊥: anchors placed perpendicular to horizontal joint		c_{cr}	238	$\alpha_{g,V,\perp}$		2,0

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

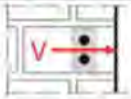
Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		c_{cr}	498	$\alpha_{g,V,II}$	[-]	2,0
⊥: anchors placed perpendicular to horizontal joint		c_{cr}	238	$\alpha_{g,V,\perp}$		2,0

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

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

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

Sikla Injection System VMU plus for masonry

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

Annex C13

Deutsches Institut für Bautechnik DIBt

Brick type: Calcium silicate hollow brick KSL-12DF

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

Anchor size	Sleeve	Effective anchorage depth	Characteristic resistance						
			Use category						
			d/d			w/d; w/w			d/d w/d w/w
			40°C/24°C	80°C/50°C	120°C/72°C	40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges
		h_{ef}	$N_{Rk,b} = N_{Rk,p}$ [1]			$N_{Rk,b} = N_{Rk,p}$ [1]			$V_{Rk,b}$ [2)3)]
		[mm]	[kN]						
			Compressive strength $f_b \geq 16$ N/mm²						
M8	12x80	80	0,9	0,9	0,6	0,75	0,75	0,5	3,5
M8 / M10 / IG-M6	16x85	85	0,9	0,9	0,6	0,9	0,9	0,6	8,0
	16x130	130	4,0	3,5	2,5	4,0	3,5	2,5	8,0
M12 / M16 / IG-M8 / IG-M10	20x85	85	2,0	2,0	1,5	2,0	2,0	1,5	8,0
	20x130	130	4,0	3,5	2,5	4,0	3,5	2,5	8,0

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

Table C33: Displacements

Anchor size	Sleeve	h_{ef}	N	δ_N / N	δ_{N0}	$\delta_{N\infty}$	V	δ_{V0}	$\delta_{V\infty}$
		[mm]	[kN]	[mm/kN]	[mm]	[mm]	[kN]	[mm]	[mm]
M8	12x80	80	0,26	0,90	0,23	0,46	1,0	1,3	1,95
M8 / M10 / IG-M6	16x85	85					2,3	2,5	3,75
	16x130	130	1,14		1,03	2,06			
M12 / M16 / IG-M8 / IG-M10	20x85	85	0,57		0,51	1,03			
	20x130	130	1,14		1,03	2,06			

Sikla Injection System VMU plus for masonry

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

Annex C14

Deutsches Institut für Bautechnik DIBt

Brick type: Clay solid brick Mz-DF

Table C34: Description of the brick

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

Table C35: Spacing and edge distances

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

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

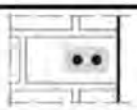
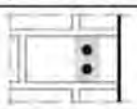
Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		60	120	$\alpha_{g,N,II}$	[-]	0,7
		1,5*hef	3*h_{ef}			2,0
⊥: anchors placed perpendicular to horizontal joint		60	120	$\alpha_{g,N,\perp}$		0,5
		1,5*hef	120			1,0
		1,5*hef	3*h_{ef}			2,0

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

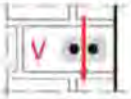
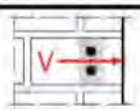
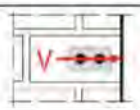
Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		60	120	$\alpha_{g,V,II}$	[-]	0,5
		90	120			1,1
		1,5*hef	3*h_{ef}			2,0
⊥: anchors placed perpendicular to horizontal joint		60	120	$\alpha_{g,V,\perp}$		0,5
		1,5*hef	120			1,0
		1,5*hef	3*h_{ef}			2,0

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

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

Sikla Injection System VMU plus for masonry

Performance - Clay solid brick Mz-DF
Description of the brick , Spacing and edge distances, Group factor

Annex C15

Deutsches Institut für Bautechnik DIBt

Brick type: Clay solid brick Mz-DF

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

Anchor size	Sleeve	Effective Anchorage depth	Characteristic resistance			
			Use category			
			d/d w/d w/w			d/d w/d w/w
			40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges
		h_{ef}	$N_{Rk,b} = N_{Rk,p}$ [1]			$V_{Rk,b}$ [2)3)]
		[mm]	[kN]			
Compressive strength $f_b \geq 10$ N/mm²						
M8	-	80	3,5 (1,5)	3,5 (1,5)	2,5 (1,2)	3,5 (1,2)
M10 / IG-M6	-	90	3,5 (1,5)	3,5 (1,5)	3,0 (1,5)	3,5 (1,2)
M12 / IG-M8	-	100	4,0 (2,0)	4,0 (2,0)	3,5 (1,5)	3,5 (1,2)
M16 / IG-M10	-	100	4,0 (2,0)	4,0 (2,0)	3,5 (1,5)	5,5 (1,5)
M8	12x80	80	3,5 (1,5)	3,5 (1,5)	3,0 (1,2)	3,5 (1,2)
M8 / M10 / IG-M6	16x85	85	3,5 (1,5)	3,5 (1,5)	3,0 (1,5)	3,5 (1,2)
	16x130	130				
M12 / M16 / IG-M8 / IG-M10	20x85	85				
	20x130	130				
	20x200	200				
Compressive strength $f_b \geq 20$ N/mm²						
M8	-	80	4,5 (2,5)	4,5 (2,5)	4,0 (2,0)	5,0 (1,5)
M10 / IG-M6	-	90	5,5 (2,5)	5,5 (2,5)	4,5 (2,0)	5,0 (1,5)
M12 / IG-M8	-	100	6,0 (3,0)	6,0 (3,0)	5,0 (2,5)	5,0 (1,5)
M16 / IG-M10	-	100	6,0 (3,0)	6,0 (3,0)	5,0 (2,5)	8,0 (2,5)
M8	12x80	80	4,5 (2,5)	4,5 (2,5)	4,0 (2,0)	5,0 (1,5)
M8 / M10 / IG-M6	16x85	85	5,0 (2,5)	5,0 (2,5)	4,0 (2,0)	5,0 (1,5)
	16x130	130				
M12 / M16 / IG-M8 / IG-M10	20x85	85				
	20x130	130				
	20x200	200				
Compressive strength $f_b \geq 28$ 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 / IG-M6	16x85	85	6,0 (3,0)	6,0 (3,0)	5,0 (2,5)	5,5 (2,0)
	16x130	130				
M12 / M16 / IG-M8 / IG-M10	20x85	85				
	20x130	130				
	20x200	200				

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

2) For c_{cr} calculation of $V_{Rk,c}$ see 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.

Sikla Injection System VMU plus for masonry

Performance - Clay solid brick Mz-DF
Characteristic values of resistance

Annex C16

Deutsches Institut für Bautechnik DIBt

Brick type: Clay solid brick Mz-DF

Table C40: Displacements

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

Deutsches Institut für Bautechnik DIBt

Brick type: Clay hollow brick HLz-16-DF

Table C41: Description of the brick

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

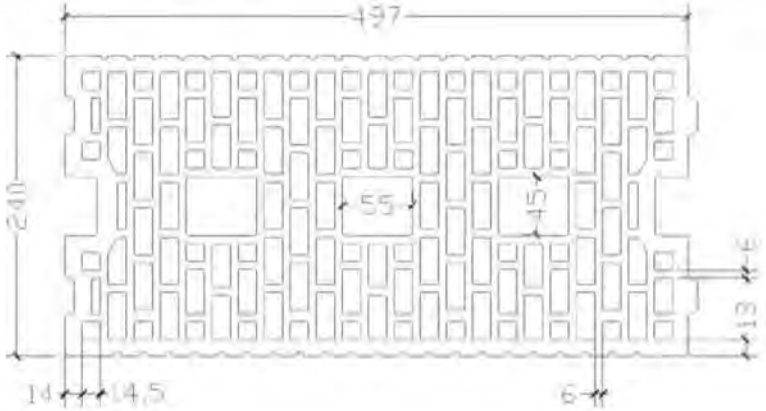
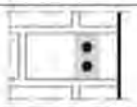


Table C42: Spacing and edge distances

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

1) Value in bracket for 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

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

Sikla Injection System VMU plus for masonry

Performance - Clay hollow brick HLz-16DF
Description of the brick, Spacing and edge distances, Group factor

Annex C18

Deutsches Institut für Bautechnik DIBt

Brick type: Clay hollow brick HLz-16-DF

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

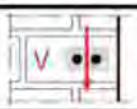
Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		c_{cr}	497	$\alpha_{g,V,II}$	[-]	2,0
⊥: anchors placed perpendicular to horizontal joint		c_{cr}	238	$\alpha_{g,V,\perp}$		2,0

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

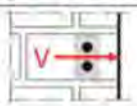
Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		c_{cr}	497	$\alpha_{g,V,II}$	[-]	2,0
⊥: anchors placed perpendicular to horizontal joint		c_{cr}	238	$\alpha_{g,V,\perp}$		2,0

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

Anchor size	Sleeve	Effective Anchorage depth	Characteristic resistance			
			Use category			
			d/d w/d w/w			d/d w/d w/w
			40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges
		h_{ef}	$N_{Rk,b} = N_{Rk,p}$ [1]			$V_{Rk,b}$ [2)3)]
		[mm]	[kN]			[kN]
Compressive strength $f_b \geq 6$ N/mm²						
M8	12x80	80	2,5	2,5	2,0	2,5
M8 / M10/ IG-M6	16x85	85	2,5	2,5	2,0	4,5
	16x130	130	3,5	3,5	3,0	4,5
M12 / M16 / IG-M8 / IG-M10	20x85	85	2,5	2,5	2,0	5,0
	20x130	130	3,5	3,5	3,0	6,0
	20x200	200	3,5	3,5	3,0	6,0
Compressive strength $f_b \geq 8$ N/mm²						
M8	12x80	80	3,0	3,0	2,5	3,0
M8 / M10/ IG-M6	16x85	85	3,0	3,0	2,5	5,5
	16x130	130	4,5	4,5	3,5	5,5
M12 / M16 / IG-M8 / IG-M10	20x85	85	3,0	3,0	2,5	6,0
	20x130	130	4,5	4,5	3,5	7,0
	20x200	200	4,5	4,5	3,5	7,0

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

2) Calculation of $V_{Rk,c}$ see ETAG 029, Annex C, except for shear load parallel to free edge with $c \geq 125$ 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

Sikla Injection System VMU plus for masonry

Performance - Clay hollow brick HLz-16DF
Group factor, Characteristic values of resistance

Annex C19

Brick type: Clay hollow brick HLz-16DF

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

Anchor size	Sleeve	Effective Anchorage depth	Characteristic resistance			
			Use category			
			d/d w/d w/w			d/d w/d w/w
			40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges
		h_{ef}	$N_{Rk,b} = N_{Rk,p}$ [1]			$V_{Rk,b}$ [2)3)]
		[mm]	[kN]			[kN]
Compressive strength $f_b \geq 12$ N/mm²						
M8	12x80	80	3,5	3,5	3,0	4,0
M8 / M10/ IG-M6	16x85	85	3,5	3,5	3,0	6,5
	16x130	130	5,0	5,0	4,5	6,5
M12 / M16 / IG-M8 / IG-M10	20x85	85	3,5	3,5	3,0	7,0
	20x130	130	5,0	5,0	4,5	9,0
	20x200	200	5,0	5,0	4,5	9,0
Compressive strength $f_b \geq 14$N/mm²						
M8	12x80	80	4,0	4,0	3,0	4,0
M8 / M10/ IG-M6	16x85	85	4,0	4,0	3,0	6,5
	16x130	130	5,5	5,5	4,5	6,5
M12 / M16 / IG-M8 / IG-M10	20x85	85	4,0	4,0	3,0	7,0
	20x130	130	5,5	5,5	4,5	9,0
	20x200	200	5,5	5,5	4,5	9,0

1) Values are valid for c_{cr} and c_{min}
2) Calculation of $V_{Rk,c}$ see ETAG 029, Annex C, except for shear load parallel to free edge with $c \geq 125$ mm: $V_{Rk,c,II} = V_{Rk,b}$
3) The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply $V_{Rk,b}$ by 0,8

Table C48: Displacements

Anchor size	Sleeve	h_{ef}	N	δ_N / N	δ_{N0}	$\delta_{N\infty}$	V	δ_{V0}	$\delta_{V\infty}$
		[mm]	[kN]	[mm/kN]	[mm]	[mm]	[kN]	[mm]	[mm]
M8	12x80	80	1,14	0,10	0,11	0,23	1,10	1,20	1,80
M8 / M10/ IG-M6	16x85	85					1,86	1,50	2,25
	16x130	130	1,57		0,16	0,31			
M12 / M16 / IG-M8 / IG-M10	20x85	85	1,14		0,11	0,23	1,86	1,50	2,25
	20x130	130	1,57		0,16	0,31	2,57	2,10	3,15
	20x200	200							

Sikla Injection System VMU plus for masonry

Performance - Clay hollow brick HLz-16DF
Characteristic values of resistance (continue), Displacements

Annex C20

Deutsches Institut für Bautechnik DIBt

Brick type: Clay hollow brick Porotherm Homebric

Table C49: Description of the brick

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

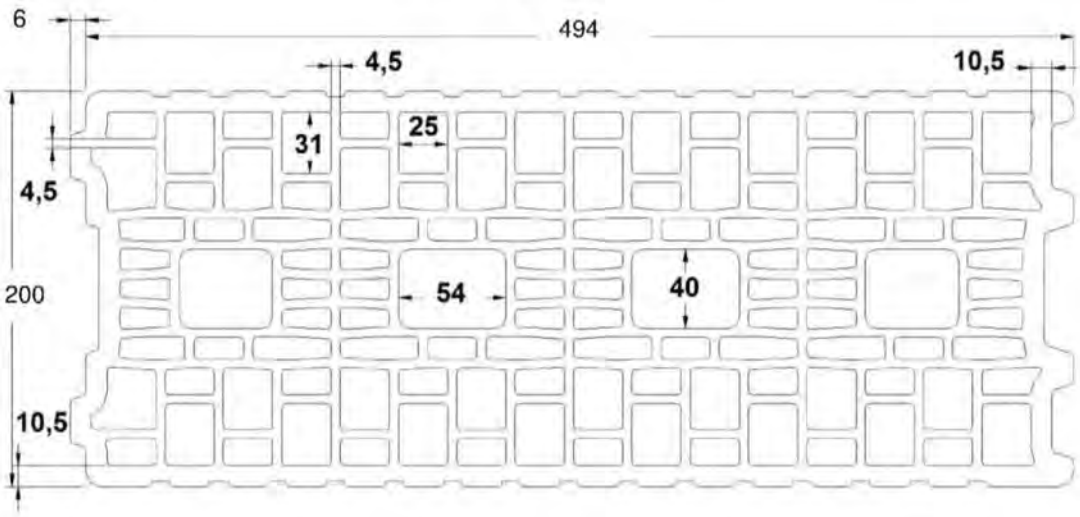
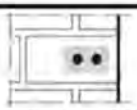
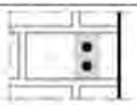


Table C50: Spacing and edge distances

Anchor size			**All sizes**
Edge distance	c_{cr}	[mm]	100 (120)[1]
Minimum edge distance	c_{min}[2]	[mm]	100 (120)[1]
Spacing	$s_{cr,II}$	[mm]	500
	$s_{cr,\perp}$	[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] ≥			
II: anchors placed parallel to horizontal joint		200	100	$\alpha_{g,N,II}$	[-]	2,0
		c_{cr}	500			2,0
⊥: anchors placed perpendicular to horizontal joint		200	100	$\alpha_{g,N,\perp}$		1,2
		c_{cr}	299			2,0

Sikla Injection System VMU plus for masonry

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

Annex C21

Deutsches Institut für Bautechnik DIBt

Brick type: Clay hollow brick Porotherm Homebric

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

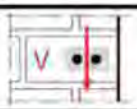
Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		c_{cr}	500	$\alpha_{g,V,II}$	[-]	2,0
⊥: anchors placed perpendicular to horizontal joint		c_{cr}	299	$\alpha_{g,V,\perp}$		2,0

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

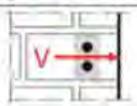
Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		c_{cr}	500	$\alpha_{g,V,II}$	[-]	2,0
⊥: anchors placed perpendicular to horizontal joint		c_{cr}	299	$\alpha_{g,V,\perp}$		2,0

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

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

1) Values are valid for c_{cr} and c_{min}
2) Calculation of $V_{Rk,c}$ see ETAG 029, Annex C, except for shear load parallel to free edge with c ≥ 200 mm: $V_{Rk,c,II} = V_{Rk,b}$
3) The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply $V_{Rk,b}$ by 0,8

Sikla Injection System VMU plus for masonry

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

Annex C22

Brick type: Clay hollow brick Porotherm Homebric

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

Anchor size	Sleeve	Effective Anchorage depth	Characteristic resistance			
			Use category			
			d/d w/d w/w			d/d w/d w/w
			40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges
		h_{ef}	$N_{Rk,b} = N_{Rk,p}$ [1]			$V_{Rk,b}$ [2)3)]
		[mm]	[kN]			[kN]
Compressive strength $f_b \geq 10$ N/mm²						
M8	12x80	80	1,2	1,2	1,2	3,0
M8 / M10/ IG-M6	16x85	85	1,2	1,2	1,2	3,0
	16x130	130	1,5	1,5	1,5	3,5
M12 / M16 / IG-M8 / IG-M10	20x85	85	1,2	1,2	1,2	4,0
	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 $c \geq 200$ mm: $V_{Rk,c,II} = V_{Rk,b}$
3) The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply $V_{Rk,b}$ by 0,8

Table C56: Displacements

Anchor size	Sleeve	h_{ef}	N	δ_N / N	δ_{N0}	$\delta_{N\infty}$	V	δ_{V0}	$\delta_{V\infty}$
		[mm]	[kN]	[mm/kN]	[mm]	[mm]	[kN]	[mm]	[mm]
M8	12x80	80	0,34	0,80	0,27	0,55	0,9	1,20	1,80
M8 / M10/ IG-M6	16x85	85					0,9		
	16x130	130	0,43		0,34	0,69	1,0		
M12 / M16 / IG-M8 / IG-M10	20x85	85	0,34		0,27	0,55	1,14		
	20x130	130	0,43		0,34	0,69			

Sikla Injection System VMU plus for masonry

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

Annex C23

Deutsches Institut für Bautechnik DIBt

Brick type: Clay hollow brick BGV Thermo

Table C57: Description of the brick

Brick type		Clay hollow brick BGV Thermo
Bulk density	ρ [kg/dm^3]	0,6
Compressive strength	$f_b \geq$ [N/mm^2]	4, 6 or 10
Code		EN 771-1
Producer (country code)		e.g. Leroux (FR)
Brick dimensions	[mm]	500 x 200 x 314
Drilling method		Rotary

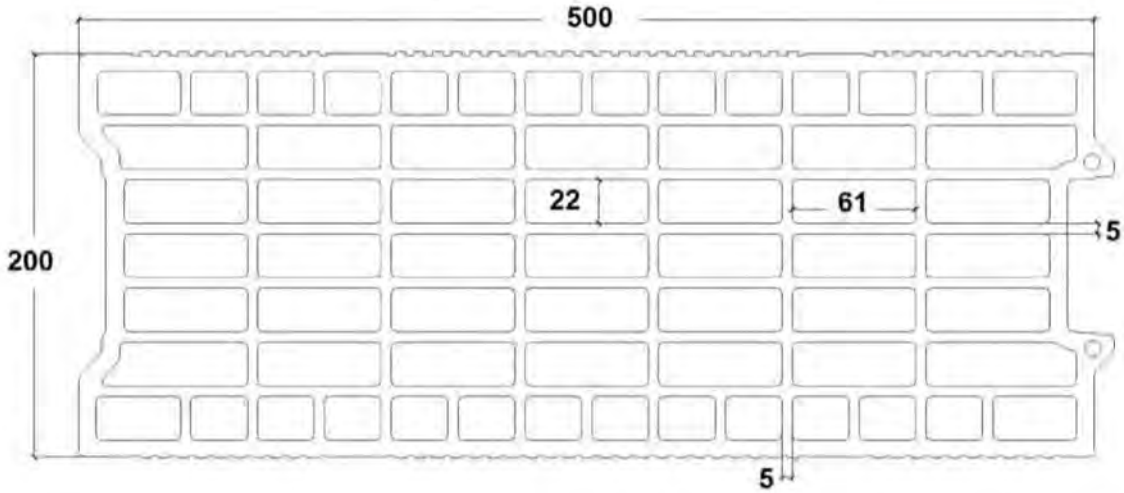
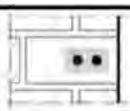
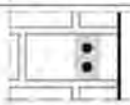


Table C58: Spacing and edge distances

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

1) Values in brackets for VM-SH 20x85 and VM-SH 20x130
2) For $V_{Rk,c}$: c_{min} according to ETAG 029, Annex C

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

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

Sikla Injection System VMU plus for masonry

Performance - Clay hollow brick BGV Thermo
Description of the brick, Spacing and edge distances, Group factor

Annex C24

Deutsches Institut für Bautechnik DIBt

Brick type: Clay hollow brick BGV Thermo

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

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

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

Sikla Injection System VMU plus for masonry	Annex C25
Performance - Clay hollow brick BGV Thermo Group factor	

Deutsches Institut für Bautechnik DIBt

Brick type: Clay hollow brick BGV Thermo

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

Anchor size	Sleeve	Effective Anchorage depth	Characteristic resistance			
			Use category			
			d/d w/d w/w			d/d w/d w/w
			40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges
		h_{ef}	$N_{Rk,b} = N_{Rk,p}$ [1]			$V_{Rk,b}$ [2)3)]
		[mm]	[kN]			[kN]
Compressive strength $f_b \geq 4$ N/mm²						
M8	12x80	80	0,6	0,6	0,6	2,0
M8 / M10/ IG-M6	16x85	85	0,6	0,6	0,6	2,0
	16x130	130	1,2	1,2	0,9	2,5
M12 / M16 / IG-M8 / IG-M10	20x85	85	0,6	0,6	0,6	2,5
	20x130	130	1,2	1,2	0,9	2,5
Compressive strength $f_b \geq 6$ N/mm²						
M8	12x80	80	0,9	0,9	0,75	2,5
M8 / M10/ IG-M6	16x85	85	0,9	0,9	0,75	2,5
	16x130	130	1,5	1,5	1,2	3,0
M12 / M16 / IG-M8 / IG-M10	20x85	85	0,9	0,9	0,75	3,0
	20x130	130	1,5	1,5	1,2	3,0
Compressive strength $f_b \geq 10$ N/mm²						
M8	12x80	80	0,9	0,9	0,9	3,5
M8 / M10/ IG-M6	16x85	85	0,9	0,9	0,9	3,5
	16x130	130	2,0	2,0	1,5	4,0
M12 / M16 / IG-M8 / IG-M10	20x85	85	0,9	0,9	0,9	4,0
	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 $c \geq 250$ 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 C63: Displacements

Anchor size	Sleeve	h_{ef}	N	δ_N / N	δ_{N0}	$\delta_{N\infty}$	V	δ_{V0}	$\delta_{V\infty}$
		[mm]	[kN]	[mm/kN]	[mm]	[mm]	[kN]	[mm]	[mm]
M8	12x80	80	0,26	0,80	0,21	0,41	0,7	1,00	1,50
M8 / M10/ IG-M6	16x85	85							
	16x130	130	0,43		0,34	0,69	0,86		
M12 / M16 / IG-M8 / IG-M10	20x85	85	0,26		0,21	0,41			
	20x130	130	0,43		0,34	0,69			

Sikla Injection System VMU plus for masonry

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

Annex C26

Deutsches Institut für Bautechnik DIBt

Brick type: Clay hollow brick Calibric R+

Table C64: Description of the brick

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

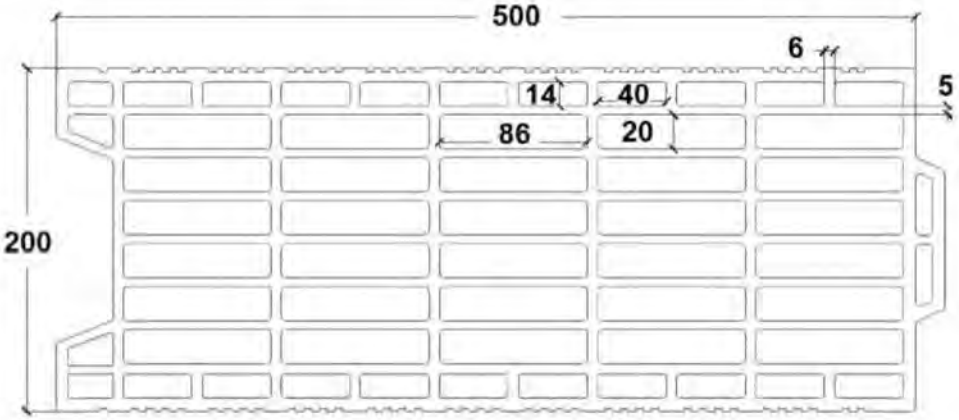
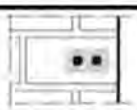
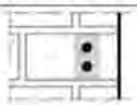


Table C65: Spacing and edge distances

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

[1] Value in brackets for 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 joint		175	100	$\alpha_{g,N,II}$	[-]	1,7
		c_{cr}	500			2,0
⊥: anchors placed perpendicular to horizontal joint		175	100	$\alpha_{g,N,\perp}$		1,0
		c_{cr}	314			2,0

Sikla Injection System VMU plus for masonry

Performance - Clay hollow brick Calibric R+
Description of the brick, Spacing and edge distances, Group factor

Annex C27

Deutsches Institut für Bautechnik DIBt

Brick type: Clay hollow brick Calibric R+

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

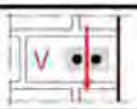
Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		c_{cr}	500	$\alpha_{g,V,II}$	[-]	2,0
⊥: anchors placed perpendicular to horizontal joint		c_{cr}	314	$\alpha_{g,V,\perp}$		2,0

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

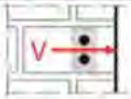
Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		c_{cr}	500	$\alpha_{g,V,II}$	[-]	2,0
⊥: anchors placed perpendicular to horizontal joint		c_{cr}	314	$\alpha_{g,V,\perp}$		2,0

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

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

1) Values are valid for c_{cr} and c_{min}
2) Calculation of $V_{Rk,c}$ see 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

Sikla Injection System VMU plus for masonry

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

Annex C28

Brick type: Clay hollow brick Calibric R+

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

Anchor size	Sleeve	Effective Anchorage depth	Characteristic resistance			
			Use category			
			d/d w/d w/w			d/d w/d w/w
			40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges
		h_{ef}	$N_{Rk,b} = N_{Rk,p}$ [1]			$V_{Rk,b}$ [2)3)]
		[mm]	[kN]			[kN]
Compressive strength $f_b \geq 12$ N/mm²						
M8	12x80	80	1,2	1,2	0,9	4,0
M8 / M10/ IG-M6	16x85	85	1,2	1,2	0,9	5,5
	16x130	130	1,5	1,5	1,2	5,5
M12 / M16 / IG-M8 / IG-M10	20x85	85	1,2	1,2	0,9	8,5
	20x130	130	1,5	1,5	1,2	8,5

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

2) Calculation of $V_{Rk,c}$ see 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}	N	δ_N / N	δ_{N0}	$\delta_{N\infty}$	V	δ_{V0}	$\delta_{V\infty}$
		[mm]	[kN]	[mm/kN]	[mm]	[mm]	[kN]	[mm]	[mm]
M8	12x80	80	0,34	0,80	0,27	0,55	1,0	1,10	1,65
M8 / M10/ IG-M6	16x85	85					1,43	2,0	3,0
	16x130	130	0,43		0,34	0,69			
M12 / M16 / IG-M8 / IG-M10	20x85	85	0,34		0,27	0,55	2,14		
	20x130	130	0,43		0,34	0,69			

Sikla Injection System VMU plus for masonry

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

Annex C29

Deutsches Institut für Bautechnik DIBt

Brick type: Clay hollow brick Urbanbric

Table C72: Description of the brick

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

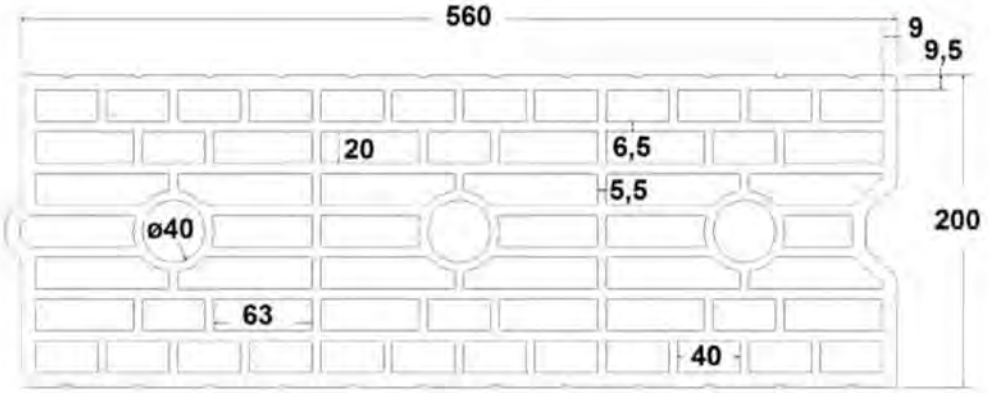
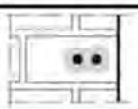
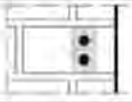


Table C73: Spacing and edge distances

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

1) Value in brackets for 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 joint		185	100	$\alpha_{g,N,II}$	[-]	1,9
		c_{cr}	560			2,0
⊥: anchors placed perpendicular to horizontal joint		185	100	$\alpha_{g,N,\perp}$		1,1
		c_{cr}	274			2,0

Sikla Injection System VMU plus for masonry

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

Annex C30

Deutsches Institut für Bautechnik DIBt

Brick type: Clay hollow brick Urbanbric

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

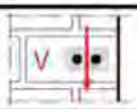
Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		c_{cr}	560	$\alpha_{g,V,II}$	[-]	2,0
⊥: anchors placed perpendicular to horizontal joint		c_{cr}	274	$\alpha_{g,V,\perp}$		2,0

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

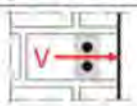
Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		c_{cr}	560	$\alpha_{g,V,II}$	[-]	2,0
⊥: anchors placed perpendicular to horizontal joint		c_{cr}	274	$\alpha_{g,V,\perp}$		2,0

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

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

1) Values are valid for c_{cr} and c_{min}
2) Calculation of $V_{Rk,c}$ see 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

Sikla Injection System VMU plus for masonry

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

Annex C31

Brick type: Clay hollow brick Urbanbric

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

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

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

2) Calculation of $V_{Rk,c}$ see ETAG 029, Annex C, except for shear load parallel to free edge with $c \geq 190$ 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}	N	δ_N / N	δ_{N0}	$\delta_{N\infty}$	V	δ_{V0}	$\delta_{V\infty}$
		[mm]	[kN]	[mm/kN]	[mm]	[mm]	[kN]	[mm]	[mm]
M8	12x80	80	0,34	0,80	0,27	0,55	1,30	1,00	1,50
M8 / M10/ IG-M6	16x85	85							
	16x130	130	0,86		0,69	1,37			
M12 / M16 / IG-M8 / IG-M10	20x85	85	0,34		0,27	0,55	1,43		
	20x130	130	0,86		0,69	1,37			

Sikla Injection System VMU plus for masonry

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

Annex C32

Deutsches Institut für Bautechnik DIBt

Brick type: Clay hollow brick Brique creuse C40

Table C80: Description of the brick

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

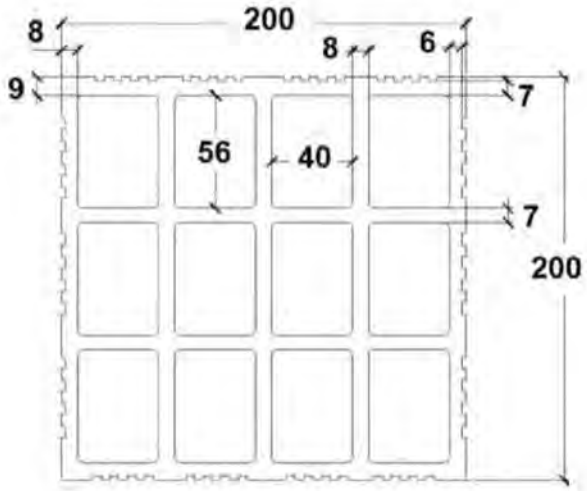
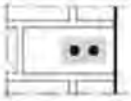
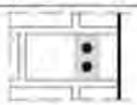


Table C81: Spacing and edge distances

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

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

Sikla Injection System VMU plus for masonry

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

Annex C33

Deutsches Institut für Bautechnik DIBt

Brick type: Clay hollow brick Brique creuse C40

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

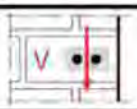
Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		c_{cr}	500	$\alpha_{g,V,II}$	[-]	2,0
⊥: anchors placed perpendicular to horizontal joint		c_{cr}	200	$\alpha_{g,V,\perp}$		2,0

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

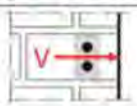
Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		c_{cr}	500	$\alpha_{g,V,II}$	[-]	2,0
⊥: anchors placed perpendicular to horizontal joint		c_{cr}	200	$\alpha_{g,V,\perp}$		2,0

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

Anchor size	Sleeve	Effective Anchorage depth	Characteristic resistance			
			Use category			
			d/d w/d w/w			d/d w/d w/w
			40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges
		h_{ef}	$N_{Rk,b} = N_{Rk,p}$ [1]			$V_{Rk,b}$ [2)3)]
		[mm]	[kN]			[kN]
Compressive strength $f_b \geq 4$ N/mm²						
M8	12x80	80	0,6	0,6	0,6	0,9
M8 / M10/ IG-M6	16x85	85				
	16x130	130				
M12 / M16 / IG-M8 / IG-M10	20x85	85				
	20x130	130				
Compressive strength $f_b \geq 8$ N/mm²						
M8	12x80	80	0,9	0,9	0,75	1,2
M8 / M10/ IG-M6	16x85	85				
	16x130	130				
M12 / M16 / IG-M8 / IG-M10	20x85	85				
	20x130	130				

1) Values are valid for c_{cr} and c_{min}
2) Calculation of $V_{Rk,c}$ see 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

Sikla Injection System VMU plus for masonry

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

Annex C34

Deutsches Institut für Bautechnik DIBt

Brick type: Clay hollow brick Brique creuse C40

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

Anchor size	Sleeve	Effective Anchorage depth	Characteristic resistance			
			Use category			
			d/d w/d w/w			d/d w/d w/w
			40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges
		h_{ef}	$N_{Rk,b} = N_{Rk,p}$ [1]			$V_{Rk,b}$ [2)3)]
		[mm]	[kN]			[kN]
Compressive strength $f_b \geq 12$ N/mm²						
M8	12x80	80	1,2	1,2	0,9	1,5
M8 / M10/ IG-M6	16x85	85				
	16x130	130				
M12 / M16 / IG-M8 / IG-M10	20x85	85				
	20x130	130				

1) Values are valid for c_{cr} and c_{min}
2) Calculation of $V_{Rk,c}$ see 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}	N	δ_N / N	δ_{N0}	$\delta_{N\infty}$	V	δ_{V0}	$\delta_{V\infty}$
		[mm]	[kN]	[mm/kN]	[mm]	[mm]	[kN]	[mm]	[mm]
M8	12x80	80	0,17	0,80	0,14	0,27	0,3	0,9	1,35
M8 / M10/ IG-M6	16x85	85							
	16x130	130	0,14		0,11	0,23			
M12 / M16 / IG-M8 / IG-M10	20x85	85	0,17		0,14	0,27			
	20x130	130	0,14		0,11	0,23			

Sikla Injection System VMU plus for masonry

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

Annex C35

Deutsches Institut für Bautechnik DIBt

Brick type: Clay hollow brick Blocchi Leggeri

Table C88: Description of the brick

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

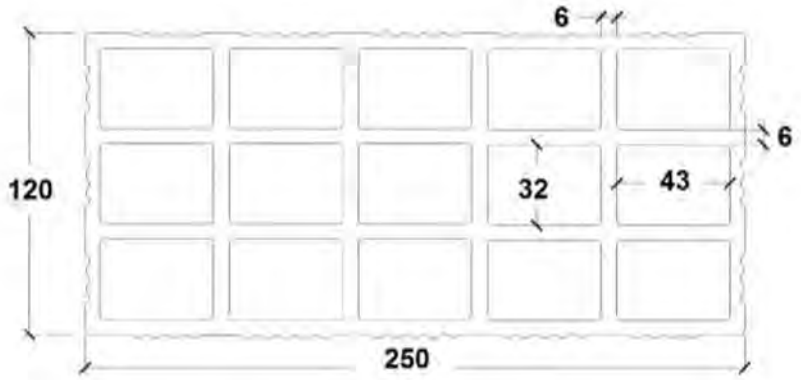
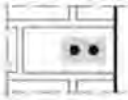
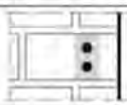


Table C89: Spacing and edge distances

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

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

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

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

Sikla Injection System VMU plus for masonry

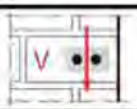
Performance - Clay hollow brick Blocchi Leggeri
Description of the brick, Spacing and edge distances, Group factor

Annex C36

Deutsches Institut für Bautechnik DIBt

Brick type: Clay hollow brick Blocchi Leggeri

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

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

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

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

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

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

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

Anchor size	Sleeve	Effective Anchorage depth	Characteristic resistance			
			Use category			
			d/d w/d w/w			d/d w/d w/w
			40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges
		h_{ef} [mm]	$N_{Rk,b} = N_{Rk,p}$[1] [kN]			$V_{Rk,b}$[4] [kN]
Compressive strength $f_b \geq 4$ N/mm²						
M8	12x80	80	0,4	0,4	0,3	2,0[2] (0,9)[3]
M8 / M10/ IG-M6	16x85	85				
	16x130	130				
M12 / M16 / IG-M8 / IG-M10	20x85	85				
	20x130	130				
	20x200	200				

1) Values are valid for c_{cr} and c_{min}
2) Calculation of $V_{Rk,c}$ see ETAG 029, Annex C, except for shear load parallel to free edge with c ≥ 125 mm: $V_{Rk,c,II} = V_{Rk,b}$
3) Values in brackets $V_{Rk,c} = V_{Rk,b}$ for anchors with c_{min}
4) The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply $V_{Rk,b}$ by 0.8

Sikla Injection System VMU plus for masonry

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

Annex C37

Deutsches Institut für Bautechnik DIBt

Brick type: Clay hollow brick Blocchi Leggeri

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

Anchor size	Sleeve	Effective Anchorage depth	Characteristic resistance			
			Use category			
			d/d w/d w/w			d/d w/d w/w
			40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges
		h_{ef}	$N_{Rk,b} = N_{Rk,p}$ [1]			$V_{Rk,b}$ [4]
		[mm]	[kN]			[kN]
Compressive strength $f_b \geq 6$ N/mm²						
M8	12x80	80	0,5	0,5	0,4	2,5 [2] (1,2) [3]
M8 / M10/ IG-M6	16x85	85				
	16x130	130				
M12 / M16 / IG-M8 / IG-M10	20x85	85				
	20x130	130				
	20x200	200				
Compressive strength $f_b \geq 8$ N/mm²						
M8	12x80	80	0,6	0,6	0,5	3,0 [2] (1,2) [3]
M8 / M10/ IG-M6	16x85	85				
	16x130	130				
M12 / M16 / IG-M8 / IG-M10	20x85	85				
	20x130	130				
	20x200	200				
Compressive strength $f_b \geq 12$ N/mm²						
M8	12x80	80	0,6	0,6	0,6	3,5 [2] (1,5) [3]
M8 / M10/ IG-M6	16x85	85				
	16x130	130				
M12 / M16 / IG-M8 / IG-M10	20x85	85				
	20x130	130				
	20x200	200				

1) Values are valid for c_{cr} and c_{min}
2) Calculation of $V_{Rk,c}$ see ETAG 029, Annex C, except for shear load parallel to free edge with $c \geq 125$ mm: $V_{Rk,c,II} = V_{Rk,b}$
3) Values in brackets $V_{Rk,c} = V_{Rk,b}$ for anchors with c_{min}
4) The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply $V_{Rk,b}$ by 0,8

Table C95: Displacements

Anchor size	Sleeve	h_{ef}	N	δ_N / N	δ_{N0}	$\delta_{N\infty}$	V	δ_{V0}	$\delta_{V\infty}$
		[mm]	[kN]	[mm/kN]	[mm]	[mm]	[kN]	[mm]	[mm]
All sizes	All sizes	All sizes	0,17	1,20	0,21	0,41	0,9	1,20	1,80

Sikla Injection System VMU plus for masonry

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

Annex C38

Deutsches Institut für Bautechnik DIBt

Brick type: Clay hollow brick Doppio Uni

Table C96: Description of the brick

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

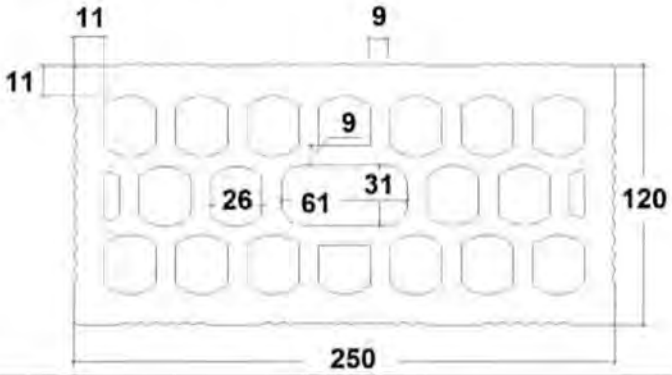
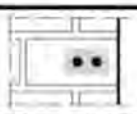
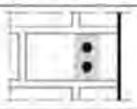


Table C97: Spacing and edge distances

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

1) Value in brackets for 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 parallel to horizontal joint		60	100	$\alpha_{g,N,II}$	[-]	1,0
		c_{cr}	250			2,0
⊥: anchors placed perpendicular to horizontal joint		60	120	$\alpha_{g,N,\perp}$		2,0

Sikla Injection System VMU plus for masonry

Performance - Clay hollow brick Doppio Uni
Description of the brick, Spacing and edge distances, Group factor

Annex C39

Deutsches Institut für Bautechnik DIBt

Brick type: Clay hollow brick Doppio Uni

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

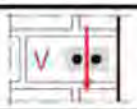
Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		c_{cr}	250	$\alpha_{g,V,II}$	[-]	2,0
⊥: anchors placed perpendicular to horizontal joint		c_{cr}	120	$\alpha_{g,V,\perp}$		2,0

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

Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		c_{cr}	250	$\alpha_{g,V,II}$	[-]	2,0
⊥: anchors placed perpendicular to horizontal joint		c_{cr}	120	$\alpha_{g,V,\perp}$		2,0

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

Anchor size	Sleeve	Effective Anchorage depth	Characteristic resistance			
			Use category			
			d/d w/d w/w			d/d w/d w/w
			40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges
		h_{ef}	$N_{Rk,b} = N_{Rk,p}$ [1]			$V_{Rk,b}$ [2)3)]
		[mm]	[kN]			[kN]
Compressive strength $f_b \geq 10$ N/mm²						
M8	12x80	80	0,6	0,6	0,5	1,5
M8 / M10/ IG-M6	16x85	85				
	16x130	130				
M12 / M16 / IG-M8 / IG-M10	20x85	85				
	20x130	130				
	20x200	200				

1) Values are valid for c_{cr} and c_{min}
2) Calculation of $V_{Rk,c}$ see 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

Sikla Injection System VMU plus for masonry

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

Annex C40

Brick type: Clay hollow brick Doppio Uni

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

Anchor size	Sleeve	Effective Anchorage depth	Characteristic resistance			
			Use category			
			d/d w/d w/w			d/d w/d w/w
			40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges
		h_{ef}	$N_{Rk,b} = N_{Rk,p}$ [1]			$V_{Rk,b}$ [2)3)]
		[mm]	[kN]			[kN]
Compressive strength $f_b \geq 16$ N/mm²						
M8	12x80	80	0,75	0,75	0,6	2,0
M8 / M10/ IG-M6	16x85	85				
	16x130	130				
M12 / M16 / IG-M8 / IG-M10	20x85	85				
	20x130	130				
	20x200	200				
Compressive strength $f_b \geq 20$ N/mm²						
M8	12x80	80	0,9	0,9	0,75	2,0
M8 / M10/ IG-M6	16x85	85				
	16x130	130				
M12 / M16 / IG-M8 / IG-M10	20x85	85				
	20x130	130				
	20x200	200				
Compressive strength $f_b \geq 28$ N/mm²						
M8	12x80	80	1,2	1,2	0,9	2,5
M8 / M10/ IG-M6	16x85	85				
	16x130	130				
M12 / M16 / IG-M8 / IG-M10	20x85	85				
	20x130	130				
	20x200	200				

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

2) Calculation of $V_{Rk,c}$ see 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 C103: Displacements

Anchor size	Sleeve	h_{ef}	N	δ_N / N	δ_{N0}	$\delta_{N\infty}$	V	δ_{V0}	$\delta_{V\infty}$
		[mm]	[kN]	[mm/kN]	[mm]	[mm]	[kN]	[mm]	[mm]
All sizes	All sizes	All sizes	0,26	1,20	0,31	0,62	0,6	0,3	0,45

Sikla Injection System VMU plus for masonry

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

Annex C41

Deutsches Institut für Bautechnik DIBt

Brick type: Hollow lightweight concrete Bloc creux B40

Table C104: Description of the brick

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

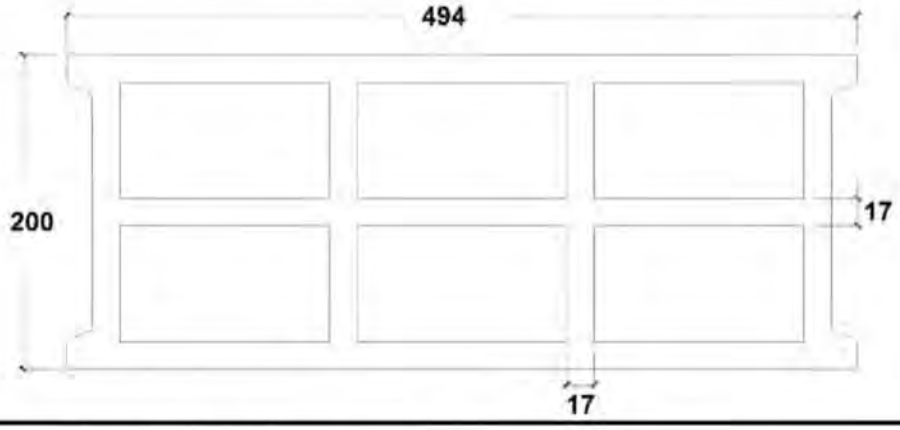
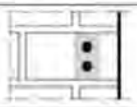


Table C105: Spacing and edge distances

Anchor size			**All sizes**
Edge distance	c_{cr}	[mm]	100 (120)[1]
Minimum edge distance	c_{min}[2]	[mm]	100 (120)[1]
Spacing	$s_{cr,\parallel}$	[mm]	494
	$s_{cr,\perp}$	[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 joint		100	100	$\alpha_{g,N,\parallel}$	[-]	1,5
		c_{cr}	494			2,0
⊥: anchors placed perpendicular to horizontal joint		100	100	$\alpha_{g,N,\perp}$		1,0
		c_{cr}	190			2,0

Sikla Injection System VMU plus for masonry

Performance - Hollow Lightweight concrete Bloc creux B40
Description of the brick, Spacing and edge distances, Group factor

Annex C42

Deutsches Institut für Bautechnik DIBt

Brick type: Hollow lightweight concrete Bloc creux B40

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

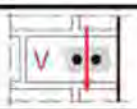
Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		50	100	$\alpha_{g,V,II}$	[-]	1,1
		c_{cr}	494			2,0
⊥: anchors placed perpendicular to horizontal joint		100	100	$\alpha_{g,V,\perp}$		1,1
		c_{cr}	190			2,0

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

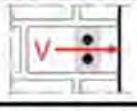
Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		c_{cr}	494	$\alpha_{g,V,II}$	[-]	2,0
⊥: anchors placed perpendicular to horizontal joint		c_{cr}	190	$\alpha_{g,V,\perp}$		2,0

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

Anchor size	Sleeve	Effective anchorage depth	Characteristic resistance						
			Use category						
			d/d			w/d w/w			d/d w/d w/w
			40°C/24°C	80°C/50°C	120°C/72°C	40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges
		h_{ef}	$N_{Rk,b} = N_{Rk,p}$ [1]			$N_{Rk,b} = N_{Rk,p}$ [1]			$V_{Rk,b}$ [2)3)]
		[mm]	[kN]						
Compressive strength $f_b \geq 4$ N/mm²									
M8	12x80	80	1,2	0,9	0,75	0,9	0,9	0,75	3,0
M8 / M10/ IG-M6	16x85	85				1,2			
	16x130	130				1,2			
M12 / M16 / IG-M8 / IG-M10	20x85	85				1,2			
	20x130	130				1,2			

1) Values are valid for c_{cr} and c_{min}
2) Calculation of $V_{Rk,c}$ see ETAG 029, Annex C, except for shear load parallel to free edge with c ≥ 250 mm: $V_{Rk,c,II} = V_{Rk,b}$
3) The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply $V_{Rk,b}$ by 0,8

Table C110: Displacements

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

Sikla Injection System VMU plus for masonry

Performance - Hollow lightweight concrete Bloc creux B40
Group factor, Characteristic values of resistance, Displacements

Annex C43

Deutsches Institut für Bautechnik DIBt

Brick type: Solid lightweight concrete - LAC

Table C111: Description of the brick

Brick type		Solid lightweight concrete LAC
Bulk density	ρ [kg/dm³]	0,6
Compressive strength	$f_b \geq$ [N/mm²]	2
Code		EN 771-3
Producer (country code)		e.g. Bisotherm (DE)
Brick dimensions	[mm]	300 x 123 x 248
Drilling method		Rotary

Table C112: Spacing and edge distances

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

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

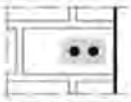
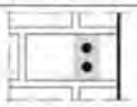
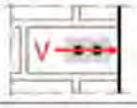
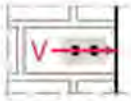
Configuration		with c [mm] ≥	with s [mm] ≥			
II: anchors placed parallel to horizontal joint		90	120	$\alpha_{g,N,II}$	[-]	1,1
		1,5*hef	$3*h_{ef}$			2,0
⊥: anchors placed perpendicular to horizontal joint		124	120	$\alpha_{g,N,\perp}$		1,1
		1,5*hef	$3*h_{ef}$			2,0

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 parallel to horizontal joint		60	120	$\alpha_{g,V,II}$	[-]	0,6
		90	120			2,0
⊥: anchors placed perpendicular to horizontal joint		60	120	$\alpha_{g,V,\perp}$		0,6
		124	120			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	$\alpha_{g,V,II}$	[-]	0,6
		90	120			2,0
⊥: anchors placed perpendicular to horizontal joint		60	120	$\alpha_{g,V,\perp}$		0,6
		1,5*hef	120			1,0
		1,5*hef	$3*h_{ef}$			2,0

Sikla Injection System VMU plus for masonry

Performance - Solid lightweight concrete - LAC
Description of the brick, Spacing and edge distances, Group factor

Annex C44

Deutsches Institut für Bautechnik DIBt

Brick type: Solid lightweight concrete - LAC

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

Anchor size	Sleeve	Effective anchorage depth	Characteristic resistance						
			Use category						
			d/d			w/d w/w			d/d w/d w/w
			40°C/24°C	80°C/50°C	120°C/72°C	40°C/24°C	80°C/50°C	120°C/72°C	All temperature ranges
		h_{ef}	$N_{Rk,b} = N_{Rk,p}$ [1]			$N_{Rk,b} = N_{Rk,p}$ [1]			$V_{Rk,b}$ [2)3)]
		[mm]	[kN]						
Compressive strength $f_b \geq 2$ N/mm²									
M8	-	80	3,0	2,5	2,0	2,5	2,0	1,5	3,0
M8 / M10/ IG-M6	-	90	3,0	3,0	2,0	2,5	2,5	2,0	3,0
M10 / IG-M8	-	100	3,5	3,0	2,5	3,0	2,5	2,0	3,0
M16 / IG-M10	-	100	3,0	3,0	2,0	3,0	3,0	2,0	3,0
M8	12x80	80	2,5	2,5	2,0	2,5	2,0	1,5	3,0
M8 / M10/ IG-M6	16x85	85	3,0	2,5	2,0	3,0	2,5	2,0	3,0
	16x130	130	3,0	2,5	2,0	3,0	2,5	2,0	3,0
M12 / M16 / IG-M8 / IG-M10	20x85	85	2,5	2,5	2,0	2,5	2,5	2,0	3,0
	20x130	130							
	20x200	200							

1) Values are valid for c_{cr}, values in brackets are valid for single anchors with c_{min}
2) For calculation of $V_{Rk,c}$ see ETAG029, Annex C
3) The values are valid for steel 5.6 or higher. For steel 4.6 and 4.8 multiply $V_{Rk,b}$ by 0,8

Table C117: Displacements

Anchor size	Sleeve	h_{ef}	N	δ_N / N	δ_{N0}	$\delta_{N\infty}$	V	δ_{V0}	$\delta_{V\infty}$
		[mm]	[kN]	[mm/kN]	[mm]	[mm]	[kN]	[mm]	[mm]
M8	-	80	0,86	0,50	0,43	0,86	0,9	0,25	0,38
M8 / M10/ IG-M6	-	90							
M10 / IG-M8	-	100	1,00	0,35	0,35	0,70			
M16 / IG-M10	-	100	0,86		0,30	0,60			
M8	12x80	80	0,71	0,35	0,25	0,50	0,9	0,25	0,38
M8 / M10/ IG-M6	16x85	85							
	16x130	130							
M12 / M16 / IG-M8 / IG-M10	20x85	85							
	20x130	130							
	20x200	200							

Sikla Injection System VMU plus for masonry

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

Annex C45