

# Injection System VMU plus



**Threaded Stud V-A**

**Threaded Stud VMU-A**

**Threaded Stud VM-A**  
1 meter length, to be cut to the required length

**Internally Threaded Sleeve VMU-IG**

**Perfo Sleeve VM-SH**

**Cartridge VMU plus 150**  
Coaxial cartridge suitable for silicone guns  
Content: 150ml

**Cartridge VMU plus 280**  
Coaxial cartridge suitable for silicone guns  
Content: 280ml, including 2 mixers, attached to the cartridge

**Cartridge VMU plus 300**  
Foil tube cartridge suitable for silicone guns  
Content: 300 ml

**Cartridge VMU plus 345**  
Side-by-side cartridge  
Content: 345ml

**Range of loading:** 0,17 kN–217,0 kN  
**Concrete quality:** C20/25–C50/60  
**Brickwork:** Solid and perforated brick  
**Material:** Steel, zinc plated, Steel, hot dip galvanized, Stainless steel A4, Stainless steel HCR



## Description

The injection system VMU plus is a universal injection system for almost all applications and materials. Besides the use in uncracked concrete and masonry, VMU plus is also approved for fixings in cracked concrete and for post installed rebar connections<sup>1)</sup>. The European Technical Assessment ETA-13/0909 includes 6 sizes of perforated sleeves up to 200 mm length and is approved in 15 different types of bricks. To complete the fastening, various anchor rods or internal sleeves can be used from the existing MKT-range (VMU-A, VMU-IG, VM-A and V-A), as well as standard threaded rods or reinforcing bars. In perforated brick, a perfo sleeve is required. The choice between VMU plus and VMU plus Polar injection adhesives allows processing temperatures from -20°C to +40°C for the base material and cartridges.

## Advantages

- Approved in cracked and uncracked concrete
- Approved for autoclaved aerated concrete, solid and perforated brickwork
- Approved for post-installed rebar connections (Ø8–Ø32)<sup>1)</sup>
- Approved for threaded studs V-A, VMU-A, standard threaded studs with strength verification (strength test certificate 3.1), internally threaded sleeves VMU-IG as well as perfo sleeves VM-SH
- Approved for use under seismic action according to the performance category C1
- Only one adhesive for almost all applications, more flexibility, less inventory, greater application safety
- Variable anchorage depths for optimum adaptation to the respective installation situation for maximum economy
- Approved application in wet concrete
- Approved application in wet or water-filled drill holes (Threaded Stud M8–M16, Internally Threaded Sleeve IG M6–IG M10, Rebar Ø8–Ø16)
- Fire test report for all diameters
- ICC Evaluation Service listing, USA (ESR-4004)
- Base material temperature during application for VMU plus from -10°C to +40°C, for VMU plus Polar from -20°C to +10°C
- Opened cartridges can be re-used with a new mixer nozzle
- Styrene-free vinyl ester resin

<sup>1)</sup>only with Coaxial- and Side-by-side VMU plus cartridge



**Cartridge  
VMU plus 410**  
Coaxial cartridge  
Content: 410ml



**Cartridge  
VMU plus 825**  
Side-by-side cartridge  
Content: 825 ml  
With big mixer VM-XL  
and reducer / extension  
tube for drill holes down  
to 12mm diameter



**Cartridge  
VMU plus 300 Polar**  
Foil tube cartridge  
suitable for silicone guns  
Content: 300 ml



**Cartridge  
VMU plus 345 Polar**  
Side-by-side cartridge  
Content: 345ml



**Cartridge  
VMU plus 420 Polar**  
Coaxial cartridge  
Content: 420ml



**Additional advantages VMU plus Polar**

- Fast and reliable curing even at low temperatures and minus degrees
- Approved for cracked and uncracked concrete as well as masonry even at icy -20 °C
- Approved temperature range from + 10 °C to -20 °C for base material and cartridge. Heating and keeping the cartridge warm before installation is not necessary.
- The same European Technical Assessments (ETA-11/0415 and ETA-13/0909) for VMU plus and VMU plus Polar; therefore the Installation is possible from + 40 °C to -20 °C temperature without recalculation of the application.

**Applications**

**Fastenings in cracked and uncracked concrete:**

Base plates, supports, mounting of joint tapes, shelves, brackets, railings, facade substructures, wooden structures, cable trays, etc.

**Fastenings with rebars in cracked and uncracked concrete - with shear forces:**

Shear connectors, wall connecting reinforcement, concrete overlay

**Post-installed rebar connections<sup>1)</sup>:**

Ceiling and wall connections, structural reinforcement, structural complement building extensions, connection of balconies and canopies, subsequent attaching of „forgotten or misplaced“ reinforcing bars

**Fastenings in Brickwork:**

Canopies, door and window frames, facade substructures, battens, gates etc.

<sup>1)</sup>Only with Coaxial- and Side-by-side VMU plus cartridge

### Injection Cartridge VMU plus



- Two component cartridge, styrene-free
- Approved for uncracked concrete and brickwork

Description	Ref. No.	Content ml	Cont. of master box pcs	Weight per master box kg	Weight per piece kg
Cartridge VMU plus 150	28255271	150	12	4,20	0,34
Cartridge VMU plus 280 <sup>1)</sup>	28252401	280	12	6,70	0,56
Cartridge VMU plus 300	28255126	300	12	6,40	0,53
Cartridge VMU plus 300 Polar	28252901	300	12	6,40	0,53
Cartridge VMU plus 345	28254001	345	12	8,00	0,65
Cartridge VMU plus 345 Polar	28253901	345	12	8,00	0,65
Cartridge VMU plus 410	28256041	410	12	10,1	0,83
Cartridge VMU plus 420 Polar	28257121	420	12	10,1	0,83
Cartridge VMU plus 825	28259001	825	8	13,0	1,63
Static mixer VM-X	28305111	-	12	0,12	0,01
Static mixer VM-XL <sup>2)</sup>	28305201	-	10	0,28	0,03

One static mixer VM-X (VMU plus 825: VM-XL) comes with each cartridge.

<sup>1)</sup>Cartridge VMU plus 280 comes with 2 mixers.

<sup>2)</sup>With larger cross section for larger drill holes or post-installed rebar connection.

### Curing Time Injection Adhesive VMU plus

Temperature in drill hole	Cartridge temperature <sup>1)</sup>	Max. Gel time	Curing time	
			Dry base material	Wet base material
-10°C – -6°C	+15°C – +40°C	90 min	24 h	48 h
-5°C – -1°C		90 min	14 h	28 h
0°C – +4°C		45 min	7 h	14 h
+5°C – +9°C	+5°C – +40°C (+5°C – +25°C) <sup>2)</sup>	25 min	2 h	4 h
+10°C – +19°C		15 min	80 min	160 min
+20°C – +24°C		6 min	45 min	90 min
+25°C – +29°C		6 min (4 min) <sup>2)</sup>	45 min (25 min) <sup>2)</sup>	90 min (50 min) <sup>2)</sup>
+30°C – +34°C		4 min (2,5 min) <sup>2)</sup>	25 min (15 min) <sup>2)</sup>	50 min (30 min) <sup>2)</sup>
+35°C – +39°C	+5°C – +40°C (≤ +20°C) <sup>2)</sup>	2 min (2,5 min) <sup>2)</sup>	20 min (15 min) <sup>2)</sup>	40 min (30 min) <sup>2)</sup>
+40°C		1,5 min (2,5 min) <sup>2)</sup>	15 min	30 min

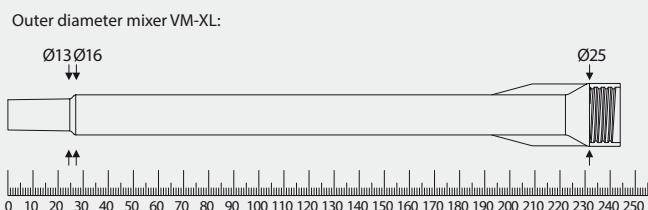
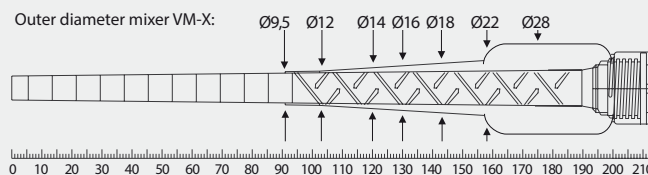
<sup>1)</sup>When installing

<sup>2)</sup>Values in brackets for rebar connection (ETA-11/0514)



### Usable length Static mixer VM-X and VM-XL

Drill holes must always be filled from the bottom of the hole to ensure no air pockets are trapped in the adhesive. This is only possible when the tip of the mixing nozzle reaches the very bottom of the drill hole before injecting the adhesive. If the mixing nozzle does not reach the bottom of the drill hole, a mixer extension tube must be used.



### Curing Time Injection Adhesive VMU plus Polar<sup>1)</sup>

→ Cartridge temperature during installing -20°C to +10°C

Temperature (°C) of the base material	Gel time	Curing time	
		dry base material	wet base material
-20°C to -16°C	75 min	24 h	48 h
-15°C to -11°C	55 min	16 h	32 h
-10°C to -6°C	35 min	10 h	20 h
-5°C to -1°C	20 min	5 h	10 h
0°C to +4°C	10 min	2,5 h	5 h
+5°C to +9°C	6 min	80 min	160 min
+10°C	6 min	60 min	120 min

<sup>1)</sup>The injection adhesive VMU plus Polar cannot be used for post-installed rebar connection according to ETA-11/0415.

### Storage Box

- In stackable multi-purpose container
- Storage box, the container for various items

Description	Ref. No.	Contents	Quantity	Weight per Box kg
			pcs.	
Storage box VMU plus 280	28999148	Cartridge VMU plus 280	20	12,8
		Static mixer VM-X	40	
Storage box VMU plus 300 Polar	28999661	Cartridge VMU plus 300 Polar	20	12,8
		Static mixer VM-X	40	
Storage box VMU plus 345	28999640	Cartridge VMU plus 345	20	15,3
		Static mixer VM-X	40	
Storage box VMU plus 345 Polar	28999670	Cartridge VMU plus 345 Polar	20	15,3
		Static mixer VM-X	40	
Storage box VMU plus 410	28999652	Cartridge VMU plus 410	20	18,0
		Static mixer VM-X	40	
Storage box VMU plus 420 Polar	28999680	Cartridge VMU plus 420 Polar	20	18,0
		Static mixer VM-X	40	

### Dimensions storage box

Description	Height mm	Width mm	Depth mm
Storage box	220	400	300

**Accessories for Injection System VMU plus in concrete**

Threaded Stud	Internally threaded stud	Rebar Ø	Drill bit Ø	Blow-out pump / Air gun	Cleaning brush RB	Retaining Washer VM-IA <sup>2)</sup>	Extension tube <sup>2)</sup>	Extension tube <sup>1)</sup>
mm	mm	mm	mm					
M8			10	VM-AP360 <sup>1)</sup> VM-ABP 200	RB 10 M6		VM-XE 10	
M10	VMU-IG M6	8	12	VM-AP360 <sup>1)</sup> VM-ABP 200	RB 12 M6 RB 12 M8		VM-XE 10	
M12	VMU-IG M8	10	14	VM-AP360 <sup>1)</sup> VM-ABP 200	RB 14 M6 RB 14 M8		VM-XE 10	
		12	16	VM-AP360 <sup>1)</sup> VM-ABP 200	RB 16 M6 RB 16 M8		VM-XE 10	
M16	VMU-IG M10	14	18	VM-AP 360 <sup>1)</sup> VM-ABP 200 / 250 / 500 / 1000	RB 18 M6 RB 18 M8	VM-IA 18	VM-XE 10, VM-XLE 16 <sup>3)</sup>	VM-P 345 Standard, VM-P 345 Profi, VM-P 380 Standard, VM-P 380 Profi, VM-P 345 Akku, VM-P 380 Akku,
		16	20	VM-AP 360 <sup>1)</sup> VM-ABP 200 / 250 / 500 / 1000	RB 20 M6 RB 20 M8	VM-IA 20	VM-XE 10, VM-XLE 16 <sup>3)</sup>	VM-P 345 Pneumatic Eco, VM-P 380 Pneumatic Eco, VM-P 380 Pneumatic, VM-P 825 Pneumatic
M20	VMU-IG M12	20	24	VM-ABP 250/ 500 / 1000	RB 24 M6	VM-IA 24	VM-XE 10, VM-XLE 16 <sup>3)</sup>	
M24	VMU-IG M16		28	VM-ABP 250/ 500 / 1000	RB 28 M6	VM-IA 28	VM-XE 10, VM-XLE 16 <sup>3)</sup>	
M27		25	32	VM-ABP 250/ 500 / 1000	RB 32 M6 RB 32 M8	VM-IA 32	VM-XE 10, VM-XLE 16 <sup>3)</sup>	
M30	VMU-IG M20	28	35	VM-ABP 250/ 500 / 1000	RB 35 M6 RB 35 M8	VM-IA 35	VM-XE 10, VM-XLE 16 <sup>3)</sup>	
		32	40	VM-ABP 250/ 500 / 1000	RB 40 M6	VM-IA 40	VM-XE 10, VM-XLE 16 <sup>3)</sup>	
<b>See page</b>				<b>178</b>	<b>179</b>	<b>181</b>	<b>180</b>	<b>181/182</b>

<sup>1)</sup>Approved in uncracked concrete up to a maximum drilling depth of 10 times the outer diameter of the anchor rod/anchor sleeve (for cracked concrete and load reduction, see ETA).

<sup>2)</sup>If the static mixer does not reach the bottom of the borehole (see usable length of static mixer), an extension tube must be used. From a drill-Ø  $d_0 \geq 18$  mm, retaining washer and extension tube must be used for overhead installation and for drill hole depths  $> 250$  mm.

<sup>3)</sup>Only in connection with static mixer VM-XL

**Accessories for Injection System VMU plus in brickwork**

Threaded Stud (without perfor sleeve)	Internally Threaded Sleeve (without perfor sleeve)	Rebar Ø	Drill bit Ø	Blow-out pump / Air gun	Cleaning brush RB	Extension tube <sup>1)</sup>	Extension tube
mm	mm		mm				
M8			10	VM-AP 360 VM-ABP 200	RB 10 M6	VM-XE 10	
M10	VMU-IG M6	VM-SH 12 x 80	12	VM-AP 360 VM-ABP 200	RB 12 M6	VM-XE 10	VM-P 345 Standard, VM-P 345 Profi, VM-P 380 Standard, VM-P 380 Profi, VM-P 345 Akku, VM-P 380 Akku, VM-P 825 Akku,
M12	VMU-IG M8		14	VM-AP 360 VM-ABP 200	RB 14 M6	VM-XE 10	VM-P 345 Pneumatic Eco, VM-P 380 Pneumatic Eco, VM-P 380 Pneumatic, VM-P 825 Pneumatic
		VM-SH 16 x 85 VM-SH 16 x 130	16	VM-AP 360 VM-ABP 200	RB 16 M6	VM-XE 10	
M16	VMU-IG M10		18	VM-AP 360 VM-ABP 200 / 250	RB 18 M6	VM-XE 10 VM-XLE 16 <sup>2)</sup>	
		VM-SH 20 x 85 VM-SH 20 x 130 VM-SH 20 x 200	20	VM-AP 360 VM-ABP 200 / 250	RB 20 M6	VM-XE 10 VM-XLE 16 <sup>2)</sup>	
<b>See page</b>				<b>178</b>	<b>179</b>	<b>180</b>	<b>181 / 182</b>

<sup>1)</sup>If the static mixer does not reach the bottom of the borehole (see usable length of static mixer), the extension tube VM-XE 10 must be used.

<sup>2)</sup>Only in connection with static mixer VM-XL



## Threaded studs for Injection System VMU plus in concrete and brickwork

### Threaded Stud VMU-A

Steel, zinc plated 5.8  
Dimensions see page 172



- For use in structures subject to dry internal conditions
- Stahl verzinkt 8.8 auf Anfrage

### Threaded Stud VMU-A fvz

Steel, hot dip galvanized 5.8  
Dimensions see page 172



- For use in structures subject to dry internal conditions

### Threaded Stud VMU-A A4

Stainless steel A4-70  
Dimensions see page 172



- For use in structures subject to dry internal conditions or external atmospheric exposure
- Stainless steel HCR on request

### Internally Threaded Sleeve VMU-IG

Steel, zinc plated 5.8  
Dimensions see page 174



- For use in structures subject to dry internal conditions
- With internal thread

### Internally Threaded Sleeve VMU-IG A4

Stainless steel A4-70  
Dimensions see page 174



- For use in structures subject to dry internal conditions or external atmospheric exposure
- With internal thread

### Threaded Stud V-A

Steel, zinc plated 5.8  
Dimensions see page 173



- For use in structures subject to dry internal conditions

### Threaded Stud V-A fvz

Steel, hot dip galvanized 5.8  
Dimensions see page 173



- For use in structures subject to dry internal conditions

### Threaded Stud V-A 8.8

Steel, zinc plated 8.8  
Dimensions see page 173



- For use in structures subject to dry internal conditions

### Threaded Stud V-A A4

Stainless steel A4-70  
Dimensions see page 173



- For use in structures subject to dry internal conditions or external atmospheric exposure

### Threaded Stud V-A HCR

Stainless steel HCR-70  
Dimensions see page 173



- For use in particularly corrosive environments
- High corrosion resistant steel 1.4529 (HCR)

### Threaded Stud VM-A

Steel, zinc plated 5.8  
Dimensions see page 174



- For use in structures subject to dry internal conditions
- Threaded studs, of 1 meter length, to be cut to the required length
- Comes with manufacturer's certificate (3.1 EN 10204) in every package

### Threaded Stud VM-A 8.8

Steel, zinc plated 8.8  
Dimensions see page 174



- For use in structures subject to dry internal conditions
- Threaded studs, of 1 meter length, to be cut to the required length
- Comes with manufacturer's certificate (3.1 EN 10204) in every package

### Threaded Stud VM-A A4

Stainless steel A4-70  
Dimensions see page 174



- For use in structures subject to dry internal conditions or external atmospheric exposure
- Threaded studs, of 1 meter length, to be cut to the required length
- Comes with manufacturer's certificate (3.1 EN 10204) in every package

### Perfo Sleeve VM-SH

Polypropylen  
Dimensions see page 175



- Approved for hollow base material



### Extract from Permissible Service Conditions of European Technical Assessment ETA-11/0415 for use in cracked and uncracked concrete (Option 1)

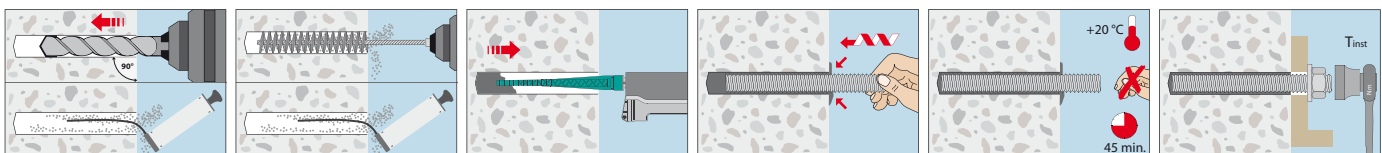
Approved loads according to EN 1992-4 for single anchors without the influence of spacing and edge distances in dry and wet concrete for temperature range I -40°C to +24°C (short term temperature +40°C) and for temperature range II -40°C to +50°C (short term temperature +80°C). The influence of the sustained load has been taken into account by the factor  $\Psi_{sus} = 1,0$  and the total safety factor ( $\gamma_M$  und  $\gamma_p$ ) is included. For further details and temperature ranges see ETA. Load capacities under fire exposure see page 199.

**Loads and performance data**

				M8	M10	M12	M16	M20	M24	M27	M30
<b>Injection System VMU plus, threaded stud steel 5.8</b>											
Range of anchorage depths	$h_{ef,min} - h_{ef,max}$	[mm]		60 - 160	60 - 200	70 - 240	80 - 320	90 - 400	96 - 480	108 - 540	120 - 600
Approved loads, tension for $h_{ef,min} - h_{ef,max}$				cracked concrete							
Range of temperature	24°C/40°C <sup>1)</sup>	C20/25	appr. N [kN]	2,9-7,7	3,7-12,5	5,8-19,7	8,8-35,1	11,7-54,9	12,9-79,0	15,3-109,5	18,0-133,3
	50°C/80°C <sup>1)</sup>	C20/25	appr. N [kN]	1,8-4,8	2,6-8,7	4,2-14,4	6,4-25,5	9,0-39,9	11,5-57,4	15,3-81,8	18,0-101,0
Approved loads, tension for $h_{ef,min} - h_{ef,max}$				uncracked concrete							
Range of temperature	24°C/40°C <sup>1)</sup>	C20/25	appr. N [kN]	7,2-8,6	9,0-13,8	11,4-20,0	14,0-37,1	16,7-58,1	18,4-83,8	21,9-109,5	25,7-133,3
	50°C/80°C <sup>1)</sup>	C20/25	appr. N [kN]	5,4-8,6	6,7-13,8	9,4-20,0	14,0-37,1	16,7-58,1	18,4-83,8	21,9-109,5	25,7-133,3
Approved loads, shear for $h_{ef,min} - h_{ef,max}$				cracked concrete							
Range of temperature	24°C/40°C <sup>1)</sup>	C20/25	appr. V [kN]	5,7-6,3	9,0-9,7	13,8-14,3	21,1-26,9	28,0-42,3	30,8-60,6	36,8-78,9	43,1-96,0
	50°C/80°C <sup>1)</sup>	C20/25	appr. V [kN]	3,6-6,3	6,3-9,7	10,1-14,3	15,3-26,9	21,5-42,3	27,6-60,6	36,8-78,9	43,1-96,0
Approved loads, shear for $h_{ef,min} - h_{ef,max}$				uncracked concrete							
Range of temperature	24°C/40°C <sup>1)</sup>	C20/25	appr. V [kN]	6,3	9,7	14,3	26,9	40,0-42,3	44,1-60,6	52,6-78,9	61,6-96,0
	50°C/80°C <sup>1)</sup>	C20/25	appr. V [kN]	6,3	9,7	14,3	26,9	40,0-42,3	44,1-60,6	52,6-78,9	61,6-96,0
<b>Injection System VMU plus, threaded stud steel 8.8</b>											
Approved loads, tension for $h_{ef,min} - h_{ef,max}$				cracked concrete							
Range of temperature	24°C/40°C <sup>1)</sup>	C20/25	appr. N [kN]	2,9-7,7	3,7-12,5	5,8-19,7	8,8-35,1	11,7-54,9	12,9-79,0	15,3-118,1	18,0-145,9
	50°C/80°C <sup>1)</sup>	C20/25	appr. N [kN]	1,8-4,8	2,6-8,7	4,2-14,4	6,4-25,5	9,0-39,9	11,5-57,4	15,3-81,8	18,0-101,0
Approved loads, tension for $h_{ef,min} - h_{ef,max}$				uncracked concrete							
Range of temperature	24°C/40°C <sup>1)</sup>	C20/25	appr. N [kN]	7,2 - 13,8	9,0 - 21,9	11,4 - 31,9	14,0 - 59,5	16,7 - 93,3	18,4 - 134,3	21,9 - 175,2	25,7 - 202,0
	50°C/80°C <sup>1)</sup>	C20/25	appr. N [kN]	5,4 - 13,8	6,7 - 21,9	9,4 - 31,9	14,0 - 57,4	16,7 - 89,8	18,4 - 122,1	21,9 - 136,3	25,7 - 145,9
Approved loads, shear for $h_{ef,min} - h_{ef,max}$				cracked concrete							
Range of temperature	24°C/40°C <sup>1)</sup>	C20/25	appr. V [kN]	5,7-8,6	9,0-13,1	13,8-19,4	21,1-36,0	28,0-56,0	30,8-80,6	36,8-105,1	43,1-128,0
	50°C/80°C <sup>1)</sup>	C20/25	appr. V [kN]	3,6-8,6	6,3-13,1	10,1-19,4	15,3-36,0	21,5-56,0	27,6-80,6	36,8-105,1	43,1-128,0
Approved loads, shear for $h_{ef,min} - h_{ef,max}$				uncracked concrete							
Range of temperature	24°C/40°C <sup>1)</sup>	C20/25	appr. V [kN]	8,6	13,1	19,4	33,5 - 36,0	40,0 - 56,0	44,1 - 80,6	52,6 - 105,1	61,6 - 128,0
	50°C/80°C <sup>1)</sup>	C20/25	appr. V [kN]	8,6	13,1	19,4	33,5 - 36,0	40,0 - 56,0	44,1 - 80,6	52,6 - 105,1	61,6 - 128,0
<b>Injection System VMU plus, threaded stud stainless steel A4-70, HCR-70</b>											
Approved loads, tension for $h_{ef,min} - h_{ef,max}$				cracked concrete							
Range of temperature	24°C/40°C <sup>1)</sup>	C20/25	appr. N [kN]	2,9 - 7,7	3,7 - 12,5	5,8 - 19,7	8,8 - 35,1	11,7 - 54,9	12,9 - 79,0	15,3 - 57,4	18,0 - 70,2
	50°C/80°C <sup>1)</sup>	C20/25	appr. N [kN]	1,8 - 4,8	2,6 - 8,7	4,2 - 14,4	6,4 - 25,5	9,0 - 39,9	11,5 - 57,4	15,3 - 57,4	18,0 - 70,2
Approved loads, tension for $h_{ef,min} - h_{ef,max}$				uncracked concrete							
Range of temperature	24°C/40°C <sup>1)</sup>	C20/25	appr. N [kN]	7,2 - 9,9	9,0 - 15,7	11,4 - 22,5	14,0 - 42,0	16,7 - 65,3	18,4 - 94,3	21,9 - 57,4	25,7 - 70,2
	50°C/80°C <sup>1)</sup>	C20/25	appr. N [kN]	5,4 - 9,9	6,7 - 15,7	9,4 - 22,5	14,0 - 42,0	16,7 - 65,3	18,4 - 94,3	21,9 - 57,4	25,7 - 70,2
Approved loads, shear for $h_{ef,min} - h_{ef,max}$				cracked concrete							
Range of temperature	24°C/40°C <sup>1)</sup>	C20/25	appr. V [kN]	5,7 - 6,0	9,0 - 9,2	13,7	21,1 - 25,2	28,0 - 39,4	30,8 - 56,8	34,5	42,0
	50°C/80°C <sup>1)</sup>	C20/25	appr. V [kN]	3,6 - 6,0	6,3 - 9,2	10,1 - 13,7	15,3 - 25,2	21,5 - 39,4	27,6 - 56,8	34,5	42,0
Approved loads, shear for $h_{ef,min} - h_{ef,max}$				uncracked concrete							
Range of temperature	24°C/40°C <sup>1)</sup>	C20/25	appr. V [kN]	6,0	9,2	13,7	25,2	39,4	44,1 - 56,8	34,5	42,0
	50°C/80°C <sup>1)</sup>	C20/25	appr. V [kN]	6,0	9,2	13,7	25,2	39,4	44,1 - 56,8	34,5	42,0
<b>Spacing and edge distance</b>											
Min. thickness of concrete slab for $h_{ef,min} - h_{ef,max}$	$h_{min}$	[mm]		100-190	100-230	100-270	116-356	138-448	152-536	172-604	190-670
Minimum spacing	$s_{min}$	[mm]		40	50	60	80	100	120	135	150
Minimum edge distance	$c_{min}$	[mm]		40	50	60	80	100	120	135	150
<b>Installation parameters</b>											
Drill hole diameter	$d_o$	[mm]		10	12	14	18	24	28	32	35
Clearance hole in the fixture for Pre-setting installation	$d_r \leq$	[mm]		9	12	14	18	22	26	30	33
Clearance hole in the fixture for Through-setting installation	$d_r \leq$	[mm]		12	14	16	20	25	30	33	38
Range of drill hole depth for $h_{ef,min} - h_{ef,max}$	$h_o$	[mm]		60 - 160	60 - 200	70 - 240	80 - 320	90 - 400	96 - 480	108 - 540	120 - 600
Installation torque	$T_{inst} \leq$	[Nm]		10	20	40	80	120	160	180	200
Amount of mortar per 100 mm drill ole depth		[ml]		6,53	8,16	9,82	13,61	26,71	32,25	42,03	48,70

<sup>1)</sup> Max. long term temperature / max. short term temperature  
 Higher concrete strength may lead to higher approved loads. Technical data for water-filled drill holes see approval.  
 For anchor designing, an easy to operate Software is available on request or can be downloaded at [www.mkt.de](http://www.mkt.de)

**Installation in concrete and solid base material**





**Extract from Permissible Service Conditions of European Technical Assessment ETA-11/0415 for use in cracked and uncracked concrete (Option 1)**

Approved loads according to EN 1992-4 for single anchors without the influence of spacing and edge distances in dry and wet concrete for temperature range I -40°C to +24°C (short term temperature +40°C) and for temperature range II -40°C to +50°C (short term temperature +80°C). The influence of the sustained load has been taken into account by the factor  $\Psi_{sus} = 1,0$  and the total safety factor ( $\gamma_M$  und  $\gamma_F$ ) is included. For further details and temperature ranges see ETA.

**Loads and performance data**

<b>Internally Threaded Sleeve</b>				<b>IG M6 x 80</b>	<b>IG M6 x 90</b>	<b>IG M8 x 80</b>	<b>IG M8 x 100</b>	<b>IG M10 x 80</b>	<b>IG M10 x 100</b>	<b>IG M12 x125</b>	<b>IG M16 x 170</b>	<b>IG M20 x 200</b>
Anchorage depth $h_{ef}$	[mm]			80	90	80	100	80	100	125	170	200
<b>Injection System VMU plus, Internally threaded steel VMU-IG, Steel 5.8</b>												
Approved loads, tension for $h_{ef}$				cracked concrete								
Temperature range	24°C/40°C <sup>1)</sup>	C20/25	appr. N [kN]	4,8	4,8	6,6	8,1	8,8	11,0	17,1	28,0	38,7
	50°C/80°C <sup>1)</sup>	C20/25	appr. N [kN]	3,5	3,9	4,8	6,0	6,4	8,0	12,5	20,3	33,7
Approved loads, tension for $h_{ef}$				uncracked concrete								
Temperature range	24°C/40°C <sup>1)</sup>	C20/25	appr. N [kN]	4,8	4,8	8,1	8,1	13,8	13,8	20,0	36,2	55,2
	50°C/80°C <sup>1)</sup>	C20/25	appr. N [kN]	4,8	4,8	8,1	8,1	13,8	13,8	20,0	36,2	48,6
Approved loads, shear for $h_{ef}$				cracked concrete								
Temperature range	24°C/40°C <sup>1)</sup>	C20/25	appr. V [kN]	3,4	3,4	5,7	5,7	9,7	9,7	14,3	25,7	42,3
	50°C/80°C <sup>1)</sup>	C20/25	appr. V [kN]	3,4	3,4	5,7	5,7	9,7	9,7	14,3	25,7	42,3
Approved loads, shear for $h_{ef}$				uncracked concrete								
Temperature range	24°C/40°C <sup>1)</sup>	C20/25	appr. V [kN]	3,4	3,4	5,7	5,7	9,7	9,7	14,3	25,7	42,3
	50°C/80°C <sup>1)</sup>	C20/25	appr. V [kN]	3,4	3,4	5,7	5,7	9,7	9,7	14,3	25,7	42,3
<b>Injection System VMU plus, Internally threaded VMU-IG, Stainless steel A4-70, HCR-70</b>												
Approved loads, tension for $h_{ef}$				cracked concrete								
Temperature range	24°C/40°C <sup>1)</sup>	C20/25	appr. N [kN]	5,0	5,3	6,6	8,2	8,8	11,0	17,1	28,0	31,0
	50°C/80°C <sup>1)</sup>	C20/25	appr. N [kN]	3,5	3,9	4,8	6,0	6,4	8,0	12,5	20,3	31,0
Approved loads, tension for $h_{ef}$				uncracked concrete								
Temperature range	24°C/40°C <sup>1)</sup>	C20/25	appr. N [kN]	5,3	5,3	9,9	9,9	14,0	15,7	22,5	42,0	31,0
	50°C/80°C <sup>1)</sup>	C20/25	appr. N [kN]	5,3	5,3	9,9	9,9	14,0	15,7	22,5	42,0	31,0
Approved loads, shear for $h_{ef}$				cracked concrete								
Temperature range	24°C/40°C <sup>1)</sup>	C20/25	appr. V [kN]	3,2	3,2	6,0	6,0	9,2	9,2	13,7	25,2	18,6
	50°C/80°C <sup>1)</sup>	C20/25	appr. V [kN]	3,2	3,2	6,0	6,0	9,2	9,2	13,7	25,2	18,6
Approved loads, shear for $h_{ef}$				uncracked concrete								
Temperature range	24°C/40°C <sup>1)</sup>	C20/25	appr. V [kN]	3,2	3,2	6,0	6,0	9,2	9,2	13,7	25,2	18,6
	50°C/80°C <sup>1)</sup>	C20/25	appr. V [kN]	3,2	3,2	6,0	6,0	9,2	9,2	13,7	25,2	18,6
<b>Spacing and edge distance</b>												
Minimum thickness of concrete slab for $h_{ef}$	$h_{min}$	[mm]		110	120	110	130	116	136	173	226	270
Minimum spacing	$s_{min}$	[mm]		50	50	60	60	80	80	100	120	150
Minimum edge distance	$c_{min}$	[mm]		50	50	60	60	80	80	100	120	150
<b>Installation parameters</b>												
Drill hole diameter	$d_o$	[mm]		12	12	14	14	18	18	24	28	35
Clearance hole in the fixture	$d_f \leq$	[mm]		7	7	9	9	12	12	14	18	22
Range of drill hole depth for $h_{ef}$	$h_o$	[mm]		80	90	80	100	80	100	125	170	200
Installation	$T_{inst} \leq$	[Nm]		10	10	10	10	20	20	40	60	100
Amount of adhesive per drill hole		[ml]		6,6	7,4	7,9	9,9	10,9	13,6	33,4	54,9	97,4

<sup>1)</sup>Max. long term temperature / max. short term temperature

Higher concrete strength may lead to higher approved loads. Technical data for water-filled drill holes see approval.

For anchor designing, an easy to operate Software is available on request or can be downloaded at [www.mkt.de](http://www.mkt.de).

<b>Injection System VMU plus, reinforcement bars B500B</b>				<b>ø8</b>	<b>ø10</b>	<b>ø12</b>	<b>ø14</b>	<b>ø16</b>	<b>ø20</b>	<b>ø25</b>	<b>ø28</b>	<b>ø32</b>
Range of anchorage depths	$h_{ef,min} - h_{ef,max}$	[mm]		60-160	60-200	70-240	75-280	80-320	90-400	100-500	112-560	128-640
Approved loads, tension for $h_{ef,min} - h_{ef,max}$				cracked concrete								
Range of temperature	24°C/40°C <sup>1)</sup>	C20/25	appr. N [kN]	2,9 - 7,7	3,7 - 12,5	5,8 - 19,7	7,2 - 26,9	8,8 - 35,1	11,7 - 54,9	13,7 - 85,7	16,2 - 127,1	19,8 - 166,0
	50°C/80°C <sup>1)</sup>	C20/25	appr. N [kN]	1,8 - 4,8	2,6 - 8,7	4,2 - 14,4	5,2 - 19,5	6,4 - 25,5	9,0 - 39,9	12,5 - 62,3	16,2 - 88,0	19,8 - 114,9
Approved loads, tension for $h_{ef,min} - h_{ef,max}$				uncracked concrete								
Range of temperature	24°C/40°C <sup>1)</sup>	C20/25	appr. N [kN]	7,2 - 13,8	9,0 - 21,6	11,4 - 31,2	12,7 - 42,4	14,0 - 55,4	16,7 - 86,6	19,5 - 135,2	23,1 - 169,6	28,3 - 217,0
	50°C/80°C <sup>1)</sup>	C20/25	appr. N [kN]	5,4 - 13,8	6,7 - 21,6	9,4 - 31,2	11,8 - 42,4	14,0 - 55,4	16,7 - 86,6	19,5 - 124,7	23,1 - 136,8	28,3 - 153,2
Approved loads, shear for $h_{ef,min} - h_{ef,max}$				cracked concrete								
Range of temperature	24°C/40°C <sup>1)</sup>	C20/25	appr. V [kN]	5,7 - 6,5	9,0 - 10,1	13,8 - 14,5	17,3 - 19,8	21,1 - 25,9	28,0 - 40,4	32,8 - 63,1	38,9 - 79,2	47,5 - 103,4
	50°C/80°C <sup>1)</sup>	C20/25	appr. V [kN]	3,6 - 6,5	6,3 - 10,1	10,1 - 14,5	12,6 - 19,8	15,3 - 25,9	21,5 - 40,4	29,9 - 63,1	38,9 - 79,2	47,5 - 103,4
Approved loads, shear for $h_{ef,min} - h_{ef,max}$				uncracked concrete								
Range of temperature	24°C/40°C <sup>1)</sup>	C20/25	appr. V [kN]	6,5	10,1	14,5	19,8	25,9	40,4	46,9 - 63,1	55,5 - 79,2	67,8 - 103,4
	50°C/80°C <sup>1)</sup>	C20/25	appr. V [kN]	6,5	10,1	14,5	19,8	25,9	40,4	46,9 - 63,1	55,5 - 79,2	67,8 - 103,4
<b>Spacing and edge distance</b>												
Minimum thickness of concrete slab for $h_{ef}$	$h_{min}$	[mm]		100-190	100-230	102-272	111-316	120-360	138-448	164-564	182-630	208-720
Minimum spacing	$s_{min}$	[mm]		40	50	60	70	80	100	125	140	160
Minimum edge distance	$c_{min}$	[mm]		40	50	60	70	80	100	125	140	160
<b>Installation parameters</b>												
Drill hole diameter	$d_o$	[mm]		12	14	16	18	20	24	32	35	40
Range of drill hole depth for $h_{ef,min} - h_{ef,max}$	$h_o$	[mm]		60 - 160	60 - 200	70 - 240	75-280	80 - 320	90 - 400	100 - 500	112 - 560	128-640
Amount of adhesive per 100 mm drill hole depth		[ml]		8,46	10,12	11,78	13,44	15,09	18,41	40,03	44,22	57,32

<sup>1)</sup>Max. long term temperature / max. short term temperature

Higher concrete strength may lead to higher approved loads. Technical data for water-filled drill holes see approval.

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**Extract from Permissible Service Conditions of European Technical Assessment ETA-13/0909 for use in masonry**

Approved loads for single anchor without influence of spacing and edge distance. Butt joint and horizontal joint with adhesive. Temperature range -40°C to +24°C (short term temperature +40°C) – use category dry/dry. The total safety factor according ETAG 029 ( $\gamma_M$  and  $\gamma_F$ ) is included. For further details and temperature ranges see ETA.

**Injection system VMU plus, solid base material without perfo sleeve<sup>1)</sup>**

<b>Clay solid brick Mz-DF according EN 771-1, Bulk density <math>\rho</math>: 1,6 kg/dm<sup>3</sup>, Minimum brick size: 240x115x55 mm (e.g. Unipor)</b>										
Threaded Stud: Steel: $\geq$ FKL 5.8, A4, HCR: $\geq$ FKL 70				<b>M8</b>	<b>M10</b>	<b>M12</b>	<b>M16</b>	<b>IG-M6</b>	<b>IG-M8</b>	<b>IG-M10</b>
Anchorage depth	$h_{ef}$	[mm]		80	90	100	100	90	100	100
Spacing	$S_{cr}$	[mm]		240	270	300	300	270	300	300
Minimum spacing	$S_{min}$	[mm]		120	120	120	120	120	120	120
Edge distance	$C_{cr}$	[mm]		120	135	150	150	135	150	150
Minimum edge distance	$C_{min}$	[mm]		60	60	60	60	60	60	60
Approved tension load for compressive strength	$f_b \geq 10$ N/mm <sup>2</sup>	appr. N	[kN]	1,00	1,00	1,14	1,14	1,00	1,14	1,14
	$f_b \geq 20$ N/mm <sup>2</sup>	appr. N	[kN]	1,29	1,57	1,71	1,71	1,57	1,71	1,71
	$f_b \geq 28$ N/mm <sup>2</sup>	appr. N	[kN]	1,57	1,71	1,94	1,94	1,71	1,94	1,94
Approved shear load for compressive strength	$f_b \geq 10$ N/mm <sup>2</sup>	appr. V	[kN]	1,00	1,00	1,00	1,57	1,00	1,00	1,57
	$f_b \geq 20$ N/mm <sup>2</sup>	appr. V	[kN]	1,43	1,43	1,43	2,29	1,43	1,43	2,29
	$f_b \geq 28$ N/mm <sup>2</sup>	appr. V	[kN]	1,57	1,57	1,57	2,57	1,57	1,57	2,57
Drilling method							Hammer drilling			

<b>Calcium silicate solid brick KS-NF according EN 771-2, Bulk density <math>\rho</math>: 2,0 kg/dm<sup>3</sup>, Minimum brick size: 240x115x71 mm (e.g. Wemding)</b>										
Threaded Stud: Steel: $\geq$ FKL 5.8, A4, HCR: $\geq$ FKL 70				<b>M8</b>	<b>M10</b>	<b>M12</b>	<b>M16</b>	<b>IG-M6</b>	<b>IG-M8</b>	<b>IG-M10</b>
Anchorage depth	$h_{ef}$	[mm]		80	90	100	100	90	100	100
Spacing	$S_{cr}$	[mm]		240	270	300	300	270	300	300
Minimum spacing	$S_{min}$	[mm]		120	120	120	120	120	120	120
Edge distance	$C_{cr}$	[mm]		120	135	150	150	135	150	150
Minimum edge distance	$C_{min}$	[mm]		60	60	60	60	60	60	60
Approved tension load for compressive strength	$f_b \geq 10$ N/mm <sup>2</sup>	appr. N	[kN]	1,29	1,29	1,29	1,00	1,29	1,29	1,00
	$f_b \geq 20$ N/mm <sup>2</sup>	appr. N	[kN]	1,71	1,71	1,71	1,43	1,71	1,71	1,43
	$f_b \geq 27$ N/mm <sup>2</sup>	appr. N	[kN]	2,00	2,00	2,00	1,71	2,00	2,00	1,71
Approved shear load for compressive strength	$f_b \geq 10$ N/mm <sup>2</sup>	appr. V	[kN]	0,71	0,86	0,71	0,71	0,86	0,71	0,71
	$f_b \geq 20$ N/mm <sup>2</sup>	appr. V	[kN]	1,14	1,29	1,14	1,14	1,29	1,14	1,14
	$f_b \geq 27$ N/mm <sup>2</sup>	appr. V	[kN]	1,29	1,57	1,29	1,29	1,57	1,29	1,29
Drilling method							Hammer drilling			

<b>Brickwork of solid lightweight concrete LAC according EN 771-3, Bulk density <math>\rho</math>: 0,6 kg/dm<sup>3</sup>, Minimum brick size: 300x123x248 mm (e.g. Bisotherm)</b>										
Threaded Stud: Steel: $\geq$ FKL 5.8, A4, HCR: $\geq$ FKL 70				<b>M8</b>	<b>M10</b>	<b>M12</b>	<b>M16</b>	<b>IG-M6</b>	<b>IG-M8</b>	<b>IG-M10</b>
Anchorage depth	$h_{ef}$	[mm]		80	90	100	100	90	100	100
Spacing	$S_{cr}$	[mm]		240	270	300	300	270	300	300
Minimum spacing	$S_{min}$	[mm]		120	120	120	120	120	120	120
Edge distance	$C_{cr}$	[mm]		120	135	150	150	135	150	150
Minimum edge distance	$C_{min}$	[mm]		60	60	60	60	60	60	60
Approved tension load for compressive strength	$f_b \geq 2$ N/mm <sup>2</sup>	appr. N	[kN]	0,86	0,86	1,00	0,86	0,86	1,00	0,86
Approved shear load for compressive strength	$f_b \geq 2$ N/mm <sup>2</sup>	appr. V	[kN]	0,86	0,86	0,86	0,86	0,86	0,86	0,86
Drilling method							Rotary drilling			

<b>Autoclaved aerated concrete AAC6 according EN 771-4, Bulk density <math>\rho</math>: 0,6 kg/dm<sup>3</sup>, Minimum brick size: 499x240x249 mm (e.g. Porit)</b>										
Threaded Stud: Steel: $\geq$ FKL 5.8, A4, HCR: $\geq$ FKL 70				<b>M8</b>	<b>M10</b>	<b>M12</b>	<b>M16</b>	<b>IG-M6</b>	<b>IG-M8</b>	<b>IG-M10</b>
Anchorage depth	$h_{ef}$	[mm]		80	90	100	100	90	100	100
Achsabstand	$S_{cr}$	[mm]		240	270	300	300	270	300	300
Minimum spacing	$S_{min}$	[mm]		100	100	100	100	100	100	100
Edge distance	$C_{cr}$	[mm]		120	135	150	150	135	150	150
Minimum edge distance	$C_{min,N}$	[mm]		75	75	75	75	75	75	75
	$C_{min,v,II}^{2)}$	[mm]		75	75	75	75	75	75	75
	$C_{min,v,I}^{3)}$	[mm]		120	135	150	150	135	150	150
Approved tension load for compressive strength	$f_b \geq 6$ N/mm <sup>2</sup>	appr. N	[kN]	0,89	1,43	1,79	2,32	1,43	1,79	2,32
Approved shear load for compressive strength	$f_b \geq 6$ N/mm <sup>2</sup>	appr. V	[kN]	2,14	3,57	3,57	3,57	2,86	3,57	3,57
Drilling method							Rotary drilling			

<b>Installation parameters in solid base material (without Perfo Sleeve)</b>										
Threaded Stud: Steel: $\geq$ FKL 5.8, A4, HCR: $\geq$ FKL 70				<b>M8</b>	<b>M10</b>	<b>M12</b>	<b>M16</b>	<b>IG-M6</b>	<b>IG-M8</b>	<b>IG-M10</b>
Drill hole diameter	$d_o$	[mm]		10	12	14	18	12	14	18
Depth of drill hole	$h_o$	[mm]		80	90	100	100	90	100	100
Minimum wall thickness	$h_{min}$	[mm]		110	120	130	130	120	130	130
Clearance hole in the fixture	$d_r \leq$	[mm]		9	12	14	18	7	9	12
Installation torque	$T_{inst,max}$	[Nm]		2 (14 for clay solid brick Mz-DF)						
Amount of adhesive per drill hole		[ml]		5,2	7,3	9,8	13,6	7,3	9,8	13,6
Drill holes per cartridge VMU plus 280 / 300		[pcs.]		46 / 50	33 / 36	24 / 26	18 / 19	33 / 36	24 / 26	18 / 19
Drill holes per cartridge VMU plus 345 / 410		[pcs.]		59 / 71	42 / 51	31 / 38	22 / 27	42 / 51	31 / 38	22 / 27

<sup>1)</sup>Installation with perforated sleeve allowed; technical data, see ETA-13/0909

<sup>2)</sup>Minimum edge distance  $C_{min,v,II}$  for shear loads parallel to free edge

<sup>3)</sup>Minimum edge distance  $C_{min,v,I}$  for shear loads perpendicular to free edge







## Extract from Permissible Service Conditions of European Technical Assessment ETA-13/0909 for use in masonry

Approved loads for single anchor without influence of spacing and edge distance. Butt joint and horizontal joint with adhesive. Temperature range -40°C to +24°C (short term temperature +40°C) – use category dry/dry. The total safety factor according ETAG 029 ( $\gamma_M$  and  $\gamma_F$ ) is included. For further details and temperature ranges see ETA.

### Injection system VMU plus, perforated brick with Perfo Sleeve

#### Clay hollow brick Porotherm Homebric according EN 771-1, Bulk density $\rho$ : 0,7 kg/dm<sup>3</sup>, Minimum brick size: 500x200x299mm (e.g. Wienerberger)

Threaded Stud: Steel: $\geq$ FKL 5.8, A4, HCR: $\geq$ FKL 70			M8	M8 / M10		M12 / M16		IG-M6	IG-M8 / IG-M10	
Perfo Sleeve VM-SH			12x80	16x85	16x130	20x85	20x130	16x85	20x85	
Anchorage depth	hef	[mm]	80	85	130	85	130	85	85	
Spacing parallel to horizontal joint	Scr,II	[mm]	500	500	500	500	500	500	500	
Spacing perpendicular to horizontal joint	Scr,L	[mm]	299	299	299	299	299	299	299	
Minimum spacing	Smin	[mm]	100	100	100	100	100	100	100	
Edge distance	Ccr	[mm]	100	100	100	120	120	100	120	
Minimum edge distance	Cmin <sup>1)</sup>	[mm]	100	100	100	120	120	100	120	
Approved tension load for compressive strength	$f_b \geq 4$ N/mm <sup>2</sup>	appr. N	[kN]	0,26	0,26	0,34	0,26	0,34	0,26	0,26
	$f_b \geq 6$ N/mm <sup>2</sup>	appr. N	[kN]	0,26	0,26	0,34	0,26	0,34	0,26	0,26
	$f_b \geq 10$ N/mm <sup>2</sup>	appr. N	[kN]	0,34	0,34	0,43	0,34	0,43	0,34	0,34
Approved shear load for compressive strength	$f_b \geq 4$ N/mm <sup>2</sup>	appr. V	[kN]	0,57	0,57	0,57	0,71	0,71	0,57	0,71
	$f_b \geq 6$ N/mm <sup>2</sup>	appr. V	[kN]	0,71	0,71	0,71	0,86	0,86	0,71	0,86
	$f_b \geq 10$ N/mm <sup>2</sup>	appr. V	[kN]	0,86	0,86	1,00	1,14	1,14	0,86	1,14

#### Clay hollow brick HLZ-16-DF according EN 771-1, Bulk density $\rho$ : 0,8 kg/dm<sup>3</sup>, Minimum brick size: 497x240x238 mm (e.g. Unipor)

Threaded Stud: Steel: $\geq$ FKL 5.8, A4, HCR: $\geq$ FKL 70			M8	M8 / M10		M12 / M16		IG-M6	IG-M8 / IG-M10		
Perfo Sleeve VM-SH			12x80	16x85	16x130	20x85	20x130	20x200	16x85	20x85	
Anchorage depth	hef	[mm]	80	85	130	85	130	200	85	85	
Spacing parallel to horizontal joint	Scr,II	[mm]	497	497	497	497	497	497	497	497	
Spacing perpendicular to horizontal joint	Scr,L	[mm]	238	238	238	238	238	238	238	238	
Minimum spacing	Smin	[mm]	100	100	100	100	100	100	100	100	
Edge distance	Ccr	[mm]	100	100	100	120	120	100	120	120	
Minimum edge distance	Cmin <sup>1)</sup>	[mm]	100	100	100	120	120	100	120	120	
Approved tension load for compressive strength	$f_b \geq 6$ N/mm <sup>2</sup>	appr. N	[kN]	0,71	0,71	1,00	0,71	1,00	1,00	0,71	0,71
	$f_b \geq 8$ N/mm <sup>2</sup>	appr. N	[kN]	0,86	0,86	1,29	0,86	1,29	1,29	0,86	0,86
	$f_b \geq 12$ N/mm <sup>2</sup>	appr. N	[kN]	1,00	1,00	1,43	1,00	1,43	1,43	1,00	1,00
	$f_b \geq 14$ N/mm <sup>2</sup>	appr. N	[kN]	1,14	1,14	1,57	1,14	1,57	1,57	1,14	1,14
Approved shear load for compressive strength	$f_b \geq 6$ N/mm <sup>2</sup>	appr. V	[kN]	0,71	1,29	1,29	1,43	1,71	1,71	1,29	1,43
	$f_b \geq 8$ N/mm <sup>2</sup>	appr. V	[kN]	0,86	1,57	1,57	1,71	2,00	2,00	1,57	1,71
	$f_b \geq 12$ N/mm <sup>2</sup>	appr. V	[kN]	1,14	1,86	1,86	2,00	2,57	2,57	1,86	2,00
	$f_b \geq 14$ N/mm <sup>2</sup>	appr. V	[kN]	1,14	1,86	1,86	2,00	2,57	2,57	1,86	2,00

#### Clay hollow brick Doppio Uni according EN 771-1, Bulk density $\rho$ : 0,9 kg/dm<sup>3</sup>, Minimum brick size: 250x120x120 mm (e.g. Wienerberger)

Threaded Stud: Steel: $\geq$ FKL 5.8, A4, HCR: $\geq$ FKL 70			M8	M8 / M10		M12 / M16		IG-M6	IG-M8 / IG-M10		
Perfo Sleeve VM-SH			12x80	16x85	16x130	20x85	20x130	20x200	16x85	20x85	
Anchorage depth	hef	[mm]	80	85	130	85	130	200	85	85	
Spacing parallel to horizontal joint	Scr,II	[mm]	250	250	250	250	250	250	250	250	
Spacing perpendicular to horizontal joint	Scr,L	[mm]	120	120	120	120	120	120	120	120	
Min. spacing parallel to horizontal joint	Smin,II	[mm]	100	100	100	100	100	100	100	100	
Min. Perpendicular to horizontal joint	Smin,L	[mm]	120	120	120	120	120	120	120	120	
Edge distance	Ccr	[mm]	100	100	100	120	120	120	100	120	
Minimum edge distance	Cmin <sup>1)</sup>	[mm]	60	60	60	60	60	60	60	60	
Approved tension load for compressive strength	$f_b \geq 10$ N/mm <sup>2</sup>	appr. N	[kN]	0,17	0,17	0,17	0,17	0,17	0,17	0,17	0,17
	$f_b \geq 16$ N/mm <sup>2</sup>	appr. N	[kN]	0,21	0,21	0,21	0,21	0,21	0,21	0,21	0,21
	$f_b \geq 20$ N/mm <sup>2</sup>	appr. N	[kN]	0,26	0,26	0,26	0,26	0,26	0,26	0,26	0,26
	$f_b \geq 28$ N/mm <sup>2</sup>	appr. N	[kN]	0,34	0,34	0,34	0,34	0,34	0,34	0,34	0,34
Approved shear load for compressive strength	$f_b \geq 10$ N/mm <sup>2</sup>	appr. V	[kN]	0,43	0,43	0,43	0,43	0,43	0,43	0,43	0,43
	$f_b \geq 16$ N/mm <sup>2</sup>	appr. V	[kN]	0,57	0,57	0,57	0,57	0,57	0,57	0,57	0,57
	$f_b \geq 20$ N/mm <sup>2</sup>	appr. V	[kN]	0,57	0,57	0,57	0,57	0,57	0,57	0,57	0,57
	$f_b \geq 28$ N/mm <sup>2</sup>	appr. V	[kN]	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71

#### Calcium silicate hollow brick KSL-3DF according EN 771-2, Bulk density $\rho$ : 1,4 kg/dm<sup>3</sup>, Minimum brick size: 240x175x113 mm (e.g. Wemding)

Threaded Stud: Steel: $\geq$ FKL 5.8, A4, HCR: $\geq$ FKL 70			M8	M8 / M10		M12 / M16		IG-M6	IG-M8 / IG-M10	
Perfo Sleeve VM-SH			12x80	16x85	16x130	20x85	20x130	20x200	16x85	20x85
Anchorage depth	hef	[mm]	80	85	130	85	130	200	85	85
Spacing parallel to horizontal joint	Scr,II	[mm]	240	240	240	240	240	240	240	240
Spacing perpendicular to horizontal joint	Scr,L	[mm]	120	120	120	120	120	120	120	120
Minimum spacing	Smin	[mm]	120	120	120	120	120	120	120	120
Edge distance	Ccr	[mm]	100	100	100	120	120	120	100	120
Minimum edge distance	Cmin <sup>1)</sup>	[mm]	60	60	60	60	60	60	60	60
Approved tension load for compressive strength	$f_b \geq 8$ N/mm <sup>2</sup>	appr. N	[kN]	0,43	0,43	0,43	1,29	1,29	0,43	1,29
	$f_b \geq 12$ N/mm <sup>2</sup>	appr. N	[kN]	0,57	0,57	0,71	1,71	1,71	0,57	1,71
	$f_b \geq 14$ N/mm <sup>2</sup>	appr. N	[kN]	0,71	0,71	0,71	1,86	1,86	0,71	1,86
Approved shear load for compressive strength	$f_b \geq 8$ N/mm <sup>2</sup>	appr. V	[kN]	0,71	1,14	1,14	1,14	1,14	1,14	1,14
	$f_b \geq 12$ N/mm <sup>2</sup>	appr. V	[kN]	0,86	1,29	1,29	1,29	1,29	1,29	1,29
	$f_b \geq 14$ N/mm <sup>2</sup>	appr. V	[kN]	1,00	1,71	1,71	1,71	1,71	1,71	1,71

<sup>1)</sup>For V<sub>Rk,c</sub>: C<sub>min</sub> see ETAG 029, Annex C



**Extract from Permissible Service Conditions of European Technical Assessment ETA-13/0909 for use in masonry**

Approved loads for single anchor without influence of spacing and edge distance. Butt joint and horizontal joint with adhesive. Temperature range -40°C to +24°C (short term temperature +40°C) – use category dry/dry. The total safety factor according ETAG 029 ( $\gamma_M$  and  $\gamma_F$ ) is included. For further details and temperature ranges see ETA.

**Injection system VMU plus, perforated brick with Perfo Sleeve**

Calcium silicate hollow brick KSL-12DF according EN 771-2, Bulk density $\rho$ : 1,4 kg/dm <sup>3</sup> , Minimum brick size: 498x175x238 mm (e.g. Wemding)			M8	M8 / M10		M12 / M16		IG-M6	IG-M8 / IG-M10
Threaded Stud: Steel: $\geq$ FKL 5.8, A4, HCR: $\geq$ FKL 70									
Perfo Sleeve VM-SH			12x80	16x85	16x130	20x85	20x130	16x85	20x85
Anchorage depth	$h_{ef}$	[mm]	80	85	130	85	130	85	85
Spacing parallel to horizontal joint	$s_{cr,  }$	[mm]	498	498	498	498	498	498	498
Spacing perpendicular to horizontal joint	$s_{cr,\perp}$	[mm]	238	238	238	238	238	238	238
Minimum spacing	$s_{min}$	[mm]	120	120	120	120	120	120	120
Edge distance	$c_{cr}$	[mm]	100	100	100	120	120	100	120
Minimum edge distance	$c_{min}^{1)}$	[mm]	100	100	100	120	120	100	120
Approved tension load for compressive strength	$f_b \geq 10$ N/mm <sup>2</sup>	appr. N [kN]	0,17	0,17	0,71	0,43	0,71	0,17	0,43
	$f_b \geq 12$ N/mm <sup>2</sup>	appr. N [kN]	0,21	0,21	0,86	0,43	0,86	0,21	0,43
	$f_b \geq 16$ N/mm <sup>2</sup>	appr. N [kN]	0,26	0,26	1,14	0,57	1,14	0,26	0,57
Approved shear load for compressive strength	$f_b \geq 10$ N/mm <sup>2</sup>	appr. V [kN]	0,71	1,57	1,57	1,57	1,57	1,57	1,57
	$f_b \geq 12$ N/mm <sup>2</sup>	appr. V [kN]	0,86	1,86	1,86	1,86	1,86	1,86	1,86
	$f_b \geq 16$ N/mm <sup>2</sup>	appr. V [kN]	1,00	2,29	2,29	2,29	2,29	2,29	2,29

Hollow lightweight concrete Bloc creux B40 according EN 771-3, Bulk density $\rho$ : 0,8 kg/dm <sup>3</sup> , Minimum brick size: 494x200x190 mm (e.g. Sepa)			M8	M8 / M10		M12 / M16		IG-M6	IG-M8 / IG-M10
Threaded Stud: Steel: $\geq$ FKL 5.8, A4, HCR: $\geq$ FKL 70									
Perfo Sleeve VM-SH			12x80	16x85	16x130	20x85	20x130	16x85	20x85
Anchorage depth	$h_{ef}$	[mm]	80	85	130	85	130	85	85
Spacing parallel to horizontal joint	$s_{cr,  }$	[mm]	494	494	494	494	494	494	494
Spacing perpendicular to horizontal joint	$s_{cr,\perp}$	[mm]	190	190	190	190	190	190	190
Minimum spacing	$s_{min}$	[mm]	100	100	100	100	100	100	100
Edge distance	$c_{cr}$	[mm]	100	100	100	120	120	100	120
Minimum edge distance	$c_{min}^{1)}$	[mm]	100	100	100	120	120	100	120
Approved tension load for compressive strength	$f_b \geq 4$ N/mm <sup>2</sup>	appr. N [kN]	0,34	0,34	0,34	0,34	0,34	0,34	0,34
Approved shear load for compressive strength	$f_b \geq 4$ N/mm <sup>2</sup>	appr. V [kN]	0,86	0,86	0,86	0,86	0,86	0,86	0,86

Installation parameter in perforated bricks with Perfo Sleeve			M8	M8 / M10		M12 / M16		IG-M6	IG-M8 / IG-M10	
Threaded Stud: Steel: $\geq$ FKL 5.8, A4, HCR: $\geq$ FKL 70										
Perfo Sleeve VM-SH			12x80	16x85	16x130	20x85	20x130	20x200	16x85	20x85
Drill hole diameter	$d_o$	[mm]	12	16	16	20	20	20	16	20
Depth of drill hole	$h_o$	[mm]	85	90	135	90	135	205	90	90
Minimum wall thickness	$h_{min}$	[mm]	115	115	145	115	175	240	115	115
Clearance hole in the fixture	$df \leq$	[mm]	9	9 / 12	9 / 12	14 / 18	14 / 18	14 / 18	7	9 / 12
Installation torque	$T_{inst,max}$	[Nm]				2				
Amount of adhesive per drill hole		[ml]	11,2	24,9	38,0	41,1	62,9	96,7	24,9	41,1
Drill holes per cartridge VMU plus 280 / 300		[pcs.]	21 / 23	9 / 10	6 / 6	5 / 6	3 / 4	2 / 2	9 / 10	5 / 6
Drill holes per cartridge VMU plus 345 / 410		[pcs.]	27 / 33	12 / 14	8 / 9	7 / 9	4 / 5	3 / 3	12 / 14	7 / 9
Drilling method						Rotary drilling				

<sup>1)</sup>For  $V_{Rk,c}$ :  $c_{min}$  see ETAG 029, Annex C

**Installation in perforated brickwork**

