

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 165
Foil tube cartridge suitable for silicone guns
Content: 165ml



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 connections¹⁾. 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)¹⁾
- 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

¹⁾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 $+10^{\circ}\text{C}$ 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 $+40^{\circ}\text{C}$ 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 connections¹⁾:

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.

¹⁾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 |
|--------------------------------------|----------|------------|-------------------------|--------------------------|---------------------|
| NEW Cartridge VMU plus 165 | 28252301 | 165 | 12 | 4,20 | 0,35 |
| Cartridge VMU plus 280 ¹⁾ | 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 ²⁾ | 28305201 | - | 10 | 0,28 | 0,03 |

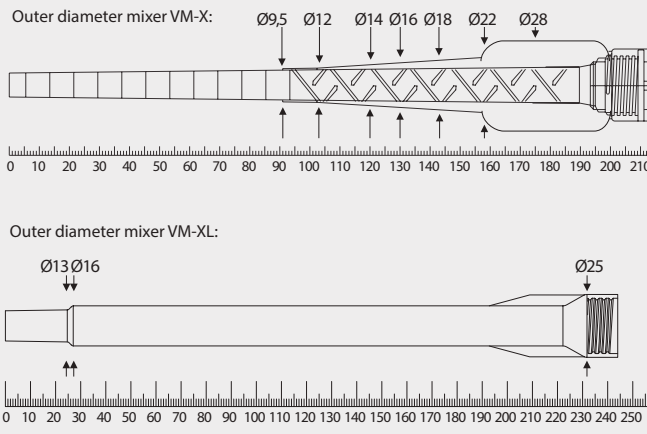
One static mixer VM-X (VMU plus 825: VM-XL) comes with each cartridge.

¹⁾Cartridge VMU plus 280 comes with 2 mixers.

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

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

| Temperature in drill hole | Cartridge temperature ¹⁾ | 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) ²⁾ | 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) ²⁾ | 45 min (25 min) ²⁾ | 90 min (50 min) ²⁾ |
| +30°C – +34°C | | 4 min (2,5 min) ²⁾ | 25 min (15 min) ²⁾ | 50 min (30 min) ²⁾ |
| +35°C – +39°C | +5°C – +40°C (≤ +20°C) ²⁾ | 2 min (2,5 min) ²⁾ | 20 min (15 min) ²⁾ | 40 min (30 min) ²⁾ |
| +40°C | | 1,5 min (2,5 min) ²⁾ | 15 min | 30 min |

¹⁾When installing

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

Curing Time Injection Adhesive VMU plus Polar¹⁾

→ 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 |

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



Storage Box

- In the handy storage box
- In stackable multi-purpose container

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

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 ²⁾ | Extension tube ²⁾ | Extension tube ¹⁾ |
|-----------------|--------------------------|--|----------------------|--|--------------------------------------|--------------------------------------|--------------------------------------|---|
| mm | mm | mm | mm | | | | | |
| M8 | | | 10 | VM-AP360 ¹⁾ VM-ABP 200 | RB 10 M6 | | VM-XE 10 | |
| M10 | VMU-IG M6 | 8 | 12 | VM-AP360 ¹⁾ VM-ABP 200 | RB 12 M6 RB 12 M8 | | VM-XE 10 | |
| M12 | VMU-IG M8 | 10 | 14 | VM-AP360 ¹⁾ VM-ABP 200 | RB 14 M6 RB 14 M8 | | VM-XE 10 | |
| M16 | VMU-IG M10 | 12 | 16 | VM-AP360 ¹⁾ VM-ABP 200 | RB 16 M6 RB 16 M8 | | VM-XE 10 | |
| | | 14 | 18 | VM-AP 360 ¹⁾ VM-ABP 200 / 250 / 500 / 1000 | RB 18 M6 RB 18 M8 | VM-IA 18 | VM-XE 10, VM-XLE 16 ³⁾ | 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 345 Pneumatic Eco, VM-P 380 Pneumatic Eco, VM-P 380 Pneumatic, VM-P 825 Pneumatic |
| 16 | 20 | VM-AP 360 ¹⁾ VM-ABP 200 / 250 / 500 / 1000 | RB 20 M6 RB 20 M8 | VM-IA 20 | VM-XE 10, VM-XLE 16 ³⁾ | | | |
| M20 | VMU-IG M12 | 20 | 24 | VM-ABP 250 / 500 / 1000 | RB 24 M6 | VM-IA 24 | VM-XE 10, VM-XLE 16 ³⁾ | |
| M24 | VMU-IG M16 | | 28 | VM-ABP 250 / 500 / 1000 | RB 28 M6 | VM-IA 28 | VM-XE 10, VM-XLE 16 ³⁾ | |
| M27 | | 25 | 32 | VM-ABP 250 / 500 / 1000 | RB 32 M6 RB 32 M8 | VM-IA 32 | VM-XE 10, VM-XLE 16 ³⁾ | |
| 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 ³⁾ | |
| | | 32 | 40 | VM-ABP 250 / 500 / 1000 | RB 40 M6 | VM-IA 40 | VM-XE 10, VM-XLE 16 ³⁾ | |
| See page | | | | 179 | 180 | 182 | 181 | 182 / 183 |

¹⁾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).

²⁾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 ≥ 18 mm, retaining washer and extension tube must be used for overhead installation and for drill hole depths > 250 mm.

³⁾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 ¹⁾ | Extension tube |
|---------------------------------------|--|---|-------------|-------------------------------|-------------------|-------------------------------------|---|
| mm | mm | | mm | | | | |
| M8 | | | 10 | VM-AP 360 VM-ABP 200 | RB 10 M6 | VM-XE 10 | |
| M10 | VMU-IG M6 VZ-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, VM-P 345 Pneumatic Eco, VM-P 380 Pneumatic Eco, VM-P 380 Pneumatic, VM-P 825 Pneumatic |
| M12 | VMU-IG M8 VZ-IG M8 | | 14 | VM-AP 360 VM-ABP 200 | RB 14 M6 | VM-XE 10 | |
| M16 | VMU-IG M10 VZ-IG M10 | VM-SH 16 x 85 VM-SH 16 x 130 | 16 | VM-AP 360 VM-ABP 200 | RB 16 M6 | VM-XE 10 | |
| | | | 18 | VM-AP 360 VM-ABP 200 / 250 | RB 18 M6 | VM-XE 10 VM-XLE 16 ²⁾ | |
| | | 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 ²⁾ | |
| See page | | | | 179 | 180 | 181 | |

¹⁾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.

²⁾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 173



→ For use in structures subject to dry internal conditions

→ Steel verzinkt 8.8 auf Anfrage

Threaded Stud VMU-A fvz

Steel, hot dip galvanized 5.8
Dimensions see page 173



→ For use in structures subject to dry internal conditions

Threaded Stud VMU-A A4

Stainless steel A4-70
Dimensions see page 173



→ 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 175



→ 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 175



→ 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 174



→ For use in structures subject to dry internal conditions

Threaded Stud V-A fvz

Steel, hot dip galvanized 5.8
Dimensions see page 174



→ For use in structures subject to dry internal conditions

Threaded Stud V-A 8.8

Steel, zinc plated 8.8
Dimensions see page 174



→ For use in structures subject to dry internal conditions

Threaded Stud V-A A4

Stainless steel A4-70
Dimensions see page 174



→ 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 174



→ For use in particularly corrosive environments

→ High corrosion resistant steel 1.4529 (HCR)

Internally Threaded Anchor Rod VZ-IG

Steel, zinc plated 8.8
Dimensions see page 175



→ Verwendung im trockenen Innenbereich

→ Nur für Befestigungen in Mauerwerk

Internally Threaded Anchor Rod VZ-IG A4

Stainless steel HCR-70
Dimensions see page 175



→ Verwendung im Innen- und Außenbereich

→ Nur für Befestigungen in Mauerwerk

Threaded Stud VM-A

Steel, zinc plated 5.8
Dimensions see page 175



→ 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 175



→ 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 175



→ 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 176



→ 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 (γ_M und γ_p) is included. For further details and temperature ranges see ETA. Load capacities under fire exposure see page 201.

Loads and performance data

| Injection System VMU plus, threaded stud steel 5.8 | | | | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
|--|---------------------------|--------|--------------|----------|----------|-----------|-----------|-----------|-----------|------------|------------|
| 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 ¹⁾ | 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 ¹⁾ | 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 ¹⁾ | 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 ¹⁾ | 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 ¹⁾ | 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 ¹⁾ | 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 ¹⁾ | 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 ¹⁾ | 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 |

| Injection System VMU plus, threaded stud steel 8.8 | | | | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
|--|-------------------------|--------|--------------|------------|------------|-------------|-------------|-------------|--------------|--------------|--------------|
| Approved loads, tension for $h_{ef,min} - h_{ef,max}$ cracked concrete | | | | | | | | | | | |
| Range of temperature | 24°C/40°C ¹⁾ | 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 ¹⁾ | 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 ¹⁾ | 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 ¹⁾ | 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 ¹⁾ | 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 ¹⁾ | 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 ¹⁾ | 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 ¹⁾ | 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 |

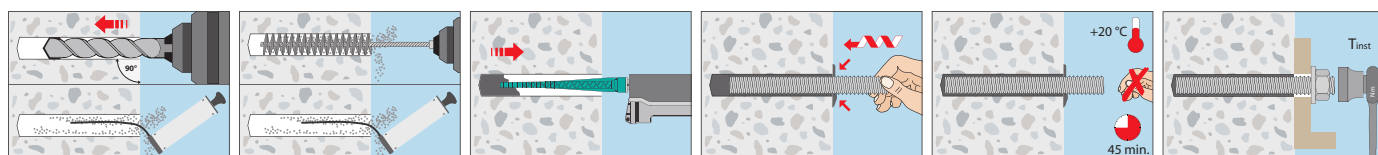
| Injection System VMU plus, threaded stud stainless steel A4-70, HCR-70 | | | | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
|--|-------------------------|--------|--------------|-----------|------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Approved loads, tension for $h_{ef,min} - h_{ef,max}$ cracked concrete | | | | | | | | | | | |
| Range of temperature | 24°C/40°C ¹⁾ | 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 ¹⁾ | 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 ¹⁾ | 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 ¹⁾ | 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 ¹⁾ | 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 ¹⁾ | 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 ¹⁾ | 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 ¹⁾ | C20/25 | appr. V [kN] | 6,0 | 9,2 | 13,7 | 25,2 | 39,4 | 44,1 - 56,8 | 34,5 | 42,0 |

| Spacing and edge distance | | | | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
|---|-----------|------|--|---------|---------|---------|---------|---------|---------|---------|---------|
| 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 |

| Installation parameters | | | | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
|--|----------------|------|--|----------|----------|----------|----------|----------|----------|-----------|-----------|
| 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 |

¹⁾ 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

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 (γ_M und γ_P) is included. For further details and temperature ranges see ETA.

Loads and performance data

| Internally Threaded Sleeve | | | | IG M6 x 80 | IG M6 x 90 | IG M8 x 80 | IG M8 x 100 | IG M10 x 80 | IG M10 x 100 | IG M12 x125 | IG M16 x 170 | IG M20 x 200 |
|---|-------------------------|--------|--------------|--------------------|-------------------|-------------------|--------------------|--------------------|---------------------|--------------------|---------------------|---------------------|
| Anchorage depth h_{ef} | [mm] | 80 | 90 | 80 | 100 | 80 | 100 | 125 | 170 | 200 | | |
| Injection System VMU plus, Internally threaded steel VMU-IG, Steel 5.8 | | | | | | | | | | | | |
| Approved loads, tension for h_{ef} | | | | cracked concrete | | | | | | | | |
| Temperature range | 24°C/40°C ¹⁾ | 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 ¹⁾ | 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 ¹⁾ | 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 ¹⁾ | 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 ¹⁾ | 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 ¹⁾ | 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 ¹⁾ | 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 ¹⁾ | C20/25 | appr. V [kN] | 3,4 | 3,4 | 5,7 | 5,7 | 9,7 | 9,7 | 14,3 | 25,7 | 42,3 |
| Injection System VMU plus, Internally threaded VMU-IG, Stainless steel A4-70, HCR-70 | | | | | | | | | | | | |
| Approved loads, tension for h_{ef} | | | | cracked concrete | | | | | | | | |
| Temperature range | 24°C/40°C ¹⁾ | 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 ¹⁾ | 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 ¹⁾ | 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 ¹⁾ | 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 ¹⁾ | 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 ¹⁾ | 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 ¹⁾ | 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 ¹⁾ | C20/25 | appr. V [kN] | 3,2 | 3,2 | 6,0 | 6,0 | 9,2 | 9,2 | 13,7 | 25,2 | 18,6 |
| Spacing and edge distance | | | | | | | | | | | | |
| 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 |
| Installation parameters | | | | | | | | | | | | |
| Drill hole diameter | d_o | [mm] | | 12 | 12 | 14 | 14 | 18 | 18 | 24 | 28 | 35 |
| Clearance hole in the fixture | $d_{r \leq}$ | [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 |

¹⁾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.

| Injection System VMU plus, reinforcement bars B500B | | | | ø8 | ø10 | ø12 | ø14 | ø16 | ø20 | ø25 | ø28 | ø32 |
|--|---------------------------|--------|--------------|--------------------|------------|-------------|-------------|-------------|-------------|--------------|--------------|--------------|
| 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 ¹⁾ | 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 ¹⁾ | 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 ¹⁾ | 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 ¹⁾ | 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 ¹⁾ | 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 ¹⁾ | 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 ¹⁾ | 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 ¹⁾ | 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 |
| Spacing and edge distance | | | | | | | | | | | | |
| 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 |
| Installation parameters | | | | | | | | | | | | |
| 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 |

¹⁾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.



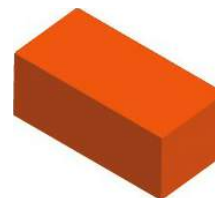
Extract from Permissible Service Conditions of the European Technical Assessment ETA-13/0909 for use in masonry

Approved loads for single anchor without influence of spacing and edge distance. Butt joint and horizontal joint with mortar. Use category dry/dry. No fire exposure. The total safety factor according EOTA TR 054 (γ_M and γ_P) is included. For further masonry types, details and temperature ranges see ETA.

| Autoclaved Aerated Concrete AAC 2 / AAC 4 / AAC 6 | | | | according to EN 771-4:2011+A1:2015 | | | | | | |
|---|--------------------------------|-----------------------|------|---|--------------------|--------------------|--------------------|-------|-------|--------|
| Bulk density | ρ | [kg/dm ³] | | ≥ 0,35 / 0,50 / 0,60 | | | | | | |
| Compressive strength | f_b | [N/mm ²] | | ≥ 2 / ≥ 4 / ≥ 6 | | | | | | |
| Producer (country code) | | [-] | | e.g. Porit (DE) | | | | | | |
| Brick dimension (LxBxH) | | [mm] | | ≥ 499 x 240 x 249 | | | | | | |
| Drilling method | | [-] | | Rotary | | | | | | |
| Installation moment, spacing and edge distance | | | | M8 | M10 | M12 | M16 | IG M6 | IG M8 | IG M10 |
| Installation torque | T_{inst} | [Nm] | | ≤ 5 | ≤ 5 | ≤ 10 | ≤ 10 | ≤ 5 | ≤ 5 | ≤ 10 |
| Edge distance | c_{cr} | [mm] | | 150 (for shear loads perpendicular to free edge: $c_{cr} = 210$) | | | | | | |
| Minimum edge distance | c_{min} | [mm] | | 50 | | | | | | |
| Spacing parallel to joint | $s_{cr, }$ | [mm] | | 300 | | | | | | |
| Spacing perpendicular to joint | $s_{cr,\perp}$ | [mm] | | 250 | | | | | | |
| Minimum spacing | $s_{min, }$, $s_{min,\perp}$ | [mm] | | 50 | | | | | | |
| Threaded studs: ≥ Steel 5.8, ≥ A4-70, ≥ HCR-70 | | | | M8 | M10 / IG M6 | M12 / IG M8 | M16 / IG M10 | | | |
| Anchorage depth | h_{ef} | [mm] | | 80 | 90 | 100 | 100 | | | |
| Approved tension load | | | | for normalized mean compressive strength $f_b \geq 2 / 4 / 6$ N/mm ² | | | | | | |
| Temperature range | 24°C/40°C ²⁾ | apr. N | [kN] | 0,43 / 1,07 / 1,43 | 0,43 / 1,07 / 1,43 | 0,71 / 1,79 / 2,50 | 0,71 / 1,79 / 2,50 | | | |
| | 50°C/80°C ²⁾ | apr. N | [kN] | 0,32 / 0,89 / 1,25 | 0,32 / 0,89 / 1,25 | 0,54 / 1,61 / 2,14 | 0,54 / 1,61 / 2,14 | | | |
| Approved shear load | | | | for normalized mean compressive strength $f_b \geq 2 / 4 / 6$ N/mm ² | | | | | | |
| Temperature range | 24°C/40°C ²⁾ | apr. V | [kN] | 0,54 / 1,61 / 2,14 | 0,89 / 2,68 / 2,86 | 0,89 / 2,68 / 3,57 | 0,89 / 2,68 / 3,57 | | | |
| | 50°C/80°C ²⁾ | apr. V | [kN] | 0,54 / 1,61 / 2,14 | 0,89 / 2,68 / 2,86 | 0,89 / 2,68 / 3,57 | 0,89 / 2,68 / 3,57 | | | |



| Clay brick MZ-2DF | | | | according to EN 771-1:2011+A1:2015 | | | | | | |
|--|--------------------------------|-----------------------|------|--|-------------|-------------|--------------|---------------------------|-------------|--------|
| Bulk density | ρ | [kg/dm ³] | | ≥ 2,0 | | | | | | |
| Compressive strength | f_b | [N/mm ²] | | ≥ 28 | | | | | | |
| Producer (country code) | | [-] | | e.g. Wienerberger (DE) | | | | | | |
| Brick dimension (LxBxH) | | [mm] | | ≥ 240 x 115 x 113 | | | | | | |
| Drilling method | | [-] | | Hammer | | | | | | |
| Installation moment, spacing and edge distance | | | | M8 | M10 | M12 | M16 | IG M6 | IG M8 | IG M10 |
| Installation torque | T_{inst} | [Nm] | | ≤ 10 | ≤ 10 | ≤ 10 | ≤ 10 | ≤ 10 | ≤ 10 | ≤ 10 |
| Edge distance | c_{cr} | [mm] | | 150 (for shear loads perpendicular to free edge: $c_{cr} = 240$) | | | | | | |
| Minimum edge distance | c_{min} | [mm] | | 50 | | | | | | |
| Spacing parallel to joint | $s_{cr, }$ | [mm] | | 240 | | | | | | |
| Spacing perpendicular to joint | $s_{cr,\perp}$ | [mm] | | 240 | | | | | | |
| Minimum spacing | $s_{min, }$, $s_{min,\perp}$ | [mm] | | 50 | | | | | | |
| Threaded studs: ≥ Steel 5.8, ≥ A4-70, ≥ HCR-70 | | | | M8 | M10 / IG M6 | M12 / IG M8 | M16 / IG M10 | M10 – M12 / IG M6 – IG M8 | M16 / IGM10 | |
| Anchorage depth | h_{ef} | [mm] | | 80 | 90 | 100 | 100 | 200 | 200 | |
| Approved tension load | | | | for normalized mean compressive strength $f_b \geq 28$ N/mm ² | | | | | | |
| Temperature range | 24°C/40°C ²⁾ | apr. N | [kN] | 2,57 | 2,57 | 2,57 | 2,57 | 3,29 | 3,29 | |
| | 50°C/80°C ²⁾ | apr. N | [kN] | 2,57 | 2,57 | 2,57 | 2,57 | 3,29 | 3,29 | |
| Approved shear load | | | | for normalized mean compressive strength $f_b \geq 28$ N/mm ² | | | | | | |
| Temperature range | 24°C/40°C ²⁾ | apr. V | [kN] | 2,71 | 2,71 | 3,43 | 3,43 | 2,29 | 3,43 | |
| | 50°C/80°C ²⁾ | apr. V | [kN] | 2,71 | 2,71 | 3,43 | 3,43 | 2,29 | 3,43 | |
| Conversion for lower compressive strengths ¹⁾ | | | | $(f_b / 28)^{0,5} \leq 1,01$ | | | | | | |



¹⁾For lower compressive strengths, the resistances must be multiplied by the conversion factor for low compressive strengths. For bricks with higher strengths, the given values are valid without conversion

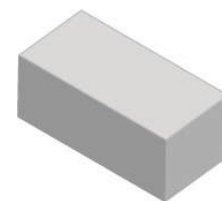
²⁾Max. long time temperature / max. short time temperature



Extract from Permissible Service Conditions of the 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 mortar. Use category dry/dry. No fire exposure. The total safety factor according EOTA TR 054 (γ_{M1} and γ_p) is included. For further masonry types, details and temperature ranges see ETA.

| Solid calcium silica brick KS-NF | | | | according to EN 771-2:2011+A1:2015 | | | | | | |
|--|----------------------------|-----------------------|------|---|-------------|-----------------------------|--------------|----------------------------|-------|--------|
| Bulk density | ρ | [kg/dm ³] | | ≥ 2,0 | | | | | | |
| Compressive strength | f_b | [N/mm ²] | | ≥ 28 | | | | | | |
| Producer (country code) | | [-] | | e.g. Wemding (DE) | | | | | | |
| Brick dimension (LxBxH) | | [mm] | | ≥ 240 x 115 x 71 | | | | | | |
| Drilling method | | [-] | | Hammer | | | | | | |
| Installation moment, spacing and edge distance | | | | M8 | M10 | M12 | M16 | IG M6 | IG M8 | IG M10 |
| Installation torque | T_{inst} | [Nm] | | ≤ 10 | ≤ 10 | ≤ 15 | ≤ 15 | ≤ 10 | ≤ 10 | ≤ 10 |
| Edge distance | c_{cr} | [mm] | | 150 (for shear loads perpendicular to free edge: $c_{cr} = 240$) | | | | | | |
| Minimum edge distance | c_{min} | [mm] | | 60 | | | | | | |
| Spacing parallel to joint | $s_{cr,II}$ | [mm] | | 240 | | | | | | |
| Spacing perpendicular to joint | $s_{cr,L}$ | [mm] | | 150 | | | | | | |
| Minimum spacing | $s_{min,II}$ / $s_{min,L}$ | [mm] | | 75 | | | | | | |
| Threaded studs: ≥ Steel 5.8, ≥ A4-70, ≥ HCR-70 | | | | M8 | M10 / IG M6 | M12 / IG M8 | M16 / IG M10 | M10 - M16 / IG M6 - IG M10 | | |
| Anchorage depth | h_{ef} | [mm] | | 80 | 90 | 100 | 100 | 200 | | |
| Approved tension load | | | | for normalized mean compressive strength $f_b \geq 28 \text{ N/mm}^2$ ¹⁾ | | | | | | |
| Temperature range | 24°C/40°C ²⁾ | apr. N | [kN] | 2,00 | 2,00 | 2,00 | 2,00 | 2,57 | | |
| | 50°C/80°C ²⁾ | apr. N | [kN] | 1,86 | 1,86 | 1,86 | 1,86 | 2,43 | | |
| Approved shear load | | | | for normalized mean compressive strength $f_b \geq 28 \text{ N/mm}^2$ ¹⁾ | | | | | | |
| Temperature range | 24°C/40°C ²⁾ | apr. V | [kN] | 2,00 | 2,00 | 2,00 | 2,00 | 2,00 | | |
| | 50°C/80°C ²⁾ | apr. V | [kN] | 2,00 | 2,00 | 2,00 | 2,00 | 2,00 | | |
| Conversion for lower compressive strengths ¹⁾ | | | | | | $(f_b / 28)^{0,5} \leq 1,0$ | | | | |



| Solid light weight concrete brick VBL | | | | according to EN 771-3:2011+A1:2015 | | | | | | |
|--|----------------------------|-----------------------|------|--|-------------|----------------------------|--------------|-------|-------|--------|
| Bulk density | ρ | [kg/dm ³] | | ≥ 0,6 | | | | | | |
| Compressive strength | f_b | [N/mm ²] | | ≥ 2 | | | | | | |
| Producer (country code) | | [-] | | e.g. Bisotherm (DE) | | | | | | |
| Brick dimension (LxBxH) | | [mm] | | ≥ 240 x 300 x 113 | | | | | | |
| Drilling method | | [-] | | Rotary | | | | | | |
| Installation moment, spacing and edge distance | | | | M8 | M10 | M12 | M16 | IG M6 | IG M8 | IG M10 |
| Installation torque | T_{inst} | [Nm] | | ≤ 2 | ≤ 2 | ≤ 2 | ≤ 2 | ≤ 2 | ≤ 2 | ≤ 2 |
| Edge distance | c_{cr} | [mm] | | 150 | | | | | | |
| Minimum edge distance | c_{min} | [mm] | | 60 | | | | | | |
| Spacing parallel to joint | $s_{cr,II}$ | [mm] | | 300 | | | | | | |
| Spacing perpendicular to joint | $s_{cr,L}$ | [mm] | | 300 | | | | | | |
| Minimum spacing | $s_{min,II}$ / $s_{min,L}$ | [mm] | | 120 | | | | | | |
| Threaded studs: Steel: ≥ Steel 5.8, ≥ A4-70, ≥ HCR-70 | | | | M8 | M10 / IG M6 | M12 / IG M8 | M16 / IG M10 | | | |
| Anchorage depth | h_{ef} | [mm] | | 80 | 90 | 100 | 100 | | | |
| Approved tension load | | | | for normalized mean compressive strength $f_b \geq 2 \text{ N/mm}^2$ | | | | | | |
| Temperature range | 24°C/40°C ²⁾ | apr. N | [kN] | 0,86 | 0,86 | 0,86 | 0,86 | 0,86 | | |
| | 50°C/80°C ²⁾ | apr. N | [kN] | 0,71 | 0,71 | 0,71 | 0,71 | 0,71 | | |
| Approved shear load | | | | for normalized mean compressive strength $f_b \geq 2 \text{ N/mm}^2$ | | | | | | |
| Temperature range | 24°C/40°C ²⁾ | apr. V | [kN] | 0,86 | 0,86 | 0,86 | 0,86 | 0,86 | | |
| | 50°C/80°C ²⁾ | apr. V | [kN] | 0,86 | 0,86 | 0,86 | 0,86 | 0,86 | | |
| Conversion for lower compressive strengths ¹⁾ | | | | | | $(f_b / 2)^{0,5} \leq 1,0$ | | | | |



Installation data for solid bricks (without Perfo sleeve)

| Threaded studs: ≥ Steel 5.8, ≥ A4-70, ≥ HCR-70 | | | | M8 | M10 | M12 | M16 | IG-M6 | IG-M8 | IG-M10 |
|---|----------------|---------|--|----------------------------------|---------|---------|---------|---------|---------|---------|
| Borehole diameter | d_o | [mm] | | 10 | 12 | 14 | 18 | 12 | 14 | 18 |
| Borehole depth | 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 | $d_f \leq$ | [mm] | | 9 | 12 | 14 | 18 | 7 | 9 | 12 |
| Installation torque | $T_{inst,max}$ | [Nm] | | see tables for the masonry types | | | | | | |
| Required mortar volume per borehole | | [ml] | | 5,2 | 7,3 | 9,8 | 13,6 | 7,3 | 9,8 | 13,6 |
| Boreholes per cartridge VMU plus 280 / 300 | | [Stück] | | 46 / 50 | 33 / 36 | 24 / 26 | 18 / 19 | 33 / 36 | 24 / 26 | 18 / 19 |
| Boreholes per cartridge VMU plus 345 / 410 | | [Stück] | | 59 / 71 | 42 / 51 | 31 / 38 | 22 / 27 | 42 / 51 | 31 / 38 | 22 / 27 |

¹⁾For lower compressive strengths, the resistances must be multiplied by the conversion factor for low compressive strengths. For bricks with higher strengths, the given values are valid without conversion

²⁾Max. long time temperature / max. short time temperature



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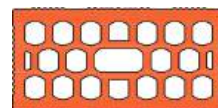
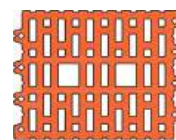
Approved loads for single anchor without influence of spacing and edge distance. Butt joint and horizontal joint with mortar. Use category dry/dry. No fire exposure. The total safety factor according EOTA TR 054 (γ_M and γ_P) is included. For further masonry types, details and temperature ranges see ETA.

| Hollow clay brick Hlz-10 DF | | | according to EN 771-1:2011+A1:2015 | | | | | | | |
|--|-------------------------|-----------------------|---|-------------------------------|--------------|-----------------------------|-------|-------|--------|--|
| Bulk density | ρ | [kg/dm ³] | ≥ 1,25 | | | | | | | |
| Compressive strength | f_b | [N/mm ²] | ≥ 20 | | | | | | | |
| Producer (country code) | | [-] | e.g. Wienerberger (DE) | | | | | | | |
| Brick dimension (LxBxH) | | [mm] | 300 x 240 x 249 | | | | | | | |
| Drilling method | | [-] | Rotary | | | | | | | |
| Installation moment, spacing and edge distance | | | M8 | M10 | M12 | M16 | IG M6 | IG M8 | IG M10 | |
| Installation torque | T_{inst} | [Nm] | ≤ 5 | ≤ 10 | ≤ 10 | ≤ 10 | ≤ 5 | ≤ 5 | ≤ 10 | |
| Edge distance | c_{cr} | [mm] | 120 (for shear loads perpendicular to free edge: $c_{cr} = 300$) | | | | | | | |
| Minimum edge distance | c_{min} | [mm] | 50 | | | | | | | |
| Spacing parallel to joint | $s_{cr,II}$ | [mm] | 300 | | | | | | | |
| Spacing perpendicular to joint | $s_{cr,I}$ | [mm] | 250 | | | | | | | |
| Minimum spacing | $s_{min,II}, s_{min,I}$ | [mm] | 50 | | | | | | | |
| Threaded studs: ≥ Steel 5.8, ≥ A4-70, ≥ HCR-70 | | | M8 | M8 / M10 / IG M6 | M12 / IG M8 | M16 / IG M10 | | | | |
| Perfo sleeve VM-SH | | | VM-SH 12 x 80 | VM-H 16 x 85 VM-H 16 x 130 | VM-H 20 x 85 | VM-H 20 x 85 | | | | |
| Anchorage depth | h_{ef} | [mm] | 80 | ≥ 85 | | 85 | 85 | | | |
| Approved tension load | | | for normalized mean compressive strength $f_b \geq 20 \text{ N/mm}^2$ ¹⁾ | | | | | | | |
| Temperature range | 24°C/40°C ²⁾ | apr. N | [kN] | 0,71 | 0,71 | 1,43 | 1,43 | | | |
| | 50°C/80°C ²⁾ | apr. N | [kN] | 0,71 | 0,71 | 1,43 | 1,43 | | | |
| Approved shear load | | | for normalized mean compressive strength $f_b \geq 20 \text{ N/mm}^2$ ¹⁾ | | | | | | | |
| Temperature range | 24°C/40°C ²⁾ | apr. V | [kN] | 2,29 | 2,29 | 2,29 | 3,29 | | | |
| | 50°C/80°C ²⁾ | apr. V | [kN] | 2,29 | 2,29 | 2,29 | 3,29 | | | |
| Conversion for lower compressive strengths ¹⁾ | | | | | | $(f_b / 20)^{0,5} \leq 1,0$ | | | | |

| Hollow clay brick Doppio Uni | | | according to EN 771-2:2011+A1:2015 | | | | | | | |
|--|-------------------------|-----------------------|---|---------------------------------|----------------------------|-----------------------------|-------|-------|--------|--|
| Bulk density | ρ | [kg/dm ³] | ≥ 0,9 | | | | | | | |
| Compressive strength | f_b | [N/mm ²] | ≥ 28 | | | | | | | |
| Producer (country code) | | [-] | e.g. Wienerberger (IT) | | | | | | | |
| Brick dimension (LxBxH) | | [mm] | 250 x 120 x 120 | | | | | | | |
| Drilling method | | [-] | Rotary | | | | | | | |
| Installation moment, spacing and edge distance | | | M8 | M10 | M12 | M16 | IG M6 | IG M8 | IG M10 | |
| Installation torque | T_{inst} | [Nm] | ≤ 2 | ≤ 2 | ≤ 2 | ≤ 2 | ≤ 2 | ≤ 2 | ≤ 2 | |
| Edge distance | c_{cr} | [mm] | 120 (für Querlasten zum freien Rand: $c_{cr} = 250$) | | | | | | | |
| Minimum edge distance | c_{min} | [mm] | 100 | | | | | | | |
| Spacing parallel to joint | $s_{cr,II}$ | [mm] | 250 | | | | | | | |
| Spacing perpendicular to joint | $s_{cr,I}$ | [mm] | 120 | | | | | | | |
| Minimum spacing | $s_{min,II}, s_{min,I}$ | [mm] | 100 | | | | | | | |
| Threaded studs: ≥ Steel 5.8, ≥ A4-70, ≥ HCR-70 | | | M8 | M8 / M10 / IG M6 | M12 / M16 / IG M8 / IG M10 | | | | | |
| Perfo sleeve VM-SH | | | VM-SH 12 x 80 | VM-SH 16 x 85 VM-SH 16 x 130 | VM-SH 20 x 85 | | | | | |
| Anchorage depth | h_{ef} | [mm] | 80 | ≥ 85 | | 85 | 85 | | | |
| Approved tension load | | | for normalized mean compressive strength $f_b \geq 14 \text{ N/mm}^2$ ¹⁾ | | | | | | | |
| Temperature range | 24°C/40°C ²⁾ | apr. N | [kN] | 0,34 | 0,34 | 0,34 | 0,34 | | | |
| | 50°C/80°C ²⁾ | apr. N | [kN] | 0,34 | 0,34 | 0,34 | 0,34 | | | |
| Approved shear load | | | for normalized mean compressive strength $f_b \geq 14 \text{ N/mm}^2$ ¹⁾ | | | | | | | |
| Temperature range | 24°C/40°C ²⁾ | apr. V | [kN] | 0,71 | 0,71 | 0,71 | 0,71 | | | |
| | 50°C/80°C ²⁾ | apr. V | [kN] | 0,71 | 0,71 | 0,71 | 0,71 | | | |
| Conversion for lower compressive strengths ¹⁾ | | | | | | $(f_b / 28)^{0,5} \leq 1,0$ | | | | |

¹⁾For lower compressive strengths, the resistances must be multiplied by the conversion factor for low compressive strengths.

²⁾Max. long time temperature / max. short time temperature





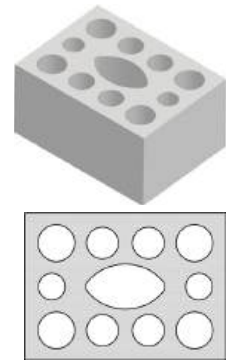
Extract from Permissible Service Conditions of the European Technical Assessment ETA-13/0909 for use in masonry

Approved loads for single anchor without influence of spacing and edge distance. Butt joint and horizontal joint with mortar. Use category dry/dry. No fire exposure. The total safety factor according EOTA TR 054 (γ_{M1} and γ_p) is included. For further masonry types, details and temperature ranges see ETA.

| Hollow clay brick Poroton FZ9 with insulation | | | according to EN 771-1:2011+A1:2015 | | | | | | |
|--|------------------------------|-----------------------|---|-------------------------|---------------------------------------|--------------------|---------------------|---------------------|---------------------|
| Fill | | | Mineral wool | | | | | | |
| Bulk density | ρ | [kg/dm ³] | ≥ 0,90 | | | | | | |
| Compressive strength | f_b | [N/mm ²] | ≥ 10 | | | | | | |
| Producer (country code) | | [-] | e.g. Wienerberger (DE) | | | | | | |
| Brick dimension (LxBxH) | | [mm] | 248 x 365 x 249 | | | | | | |
| Drilling method | | [-] | Rotary | | | | | | |
| Installation moment, spacing and edge distance | | | M8 | M10 | M12 | M16 | IG M6 | IG M8 | IG M10 |
| Installation torque | T_{inst} | [Nm] | ≤ 5 | ≤ 5 | ≤ 10 | ≤ 10 | ≤ 5 | ≤ 5 | ≤ 5 |
| Edge distance | c_{cr} | [mm] | 120 (for shear loads perpendicular to free edge: $c_{cr} = 250$) | | | | | | |
| Minimum edge distance | c_{min} | [mm] | 50 | | | | | | |
| Spacing parallel to joint | $s_{cr, }$ | [mm] | 250 | | | | | | |
| Spacing perpendicular to joint | $s_{cr,\perp}$ | [mm] | 250 | | | | | | |
| Minimum spacing | $s_{min, } / s_{min,\perp}$ | [mm] | 50 | | | | | | |
| Threaded studs: ≥ Steel 5.8, ≥ A4-70, ≥ HCR-70 | | | M8 | M8 / M10 / IG M6 | | M12 / IG M8 | | M16 / IG M10 | |
| Perfo sleeve VM-SH | | | VM-SH 12 x 80 | | VM-H 16 x 85 VM-H 16 x 130 | | VM-H 20 x 85 | | VM-H 20 x 85 |
| Anchorage depth | h_{ef} | [mm] | 80 | | ≥ 85 | | 85 | | 85 |
| Approved tension load | | | for normalized mean compressive strength $f_b \geq 10 \text{ N/mm}^2$ ¹⁾ | | | | | | |
| Temperature range | 24°C/40°C ²⁾ | apr. N | [kN] | | 0,57 | | 0,57 | | 0,57 |
| | 50°C/80°C ²⁾ | apr. N | [kN] | | 0,57 | | 0,57 | | 0,57 |
| Approved shear load | | | for normalized mean compressive strength $f_b \geq 10 \text{ N/mm}^2$ ¹⁾ | | | | | | |
| Temperature range | 24°C/40°C ²⁾ | apr. V | [kN] | | 0,86 | | 0,86 | | 1,29 |
| | 50°C/80°C ²⁾ | apr. V | [kN] | | 0,86 | | 0,86 | | 1,29 |
| Conversion for lower compressive strengths ¹⁾ | | | $(f_b / 10)^{0,5} \leq 1,0$ | | | | | | |



| Hollow calcium silica brick KSL-3DF | | | according to EN 771-2:2011+A1:2015 | | | | | | |
|--|------------------------------|-----------------------|---|------------|------------|-------------------------|--------------|-----------------------------------|---------------|
| Bulk density | ρ | [kg/dm ³] | ≥ 1,4 | | | | | | |
| Compressive strength | f_b | [N/mm ²] | ≥ 14 | | | | | | |
| Producer (country code) | | [-] | e.g. Wemding (DE) | | | | | | |
| Brick dimension (LxBxH) | | [mm] | ≥ 240 x 175 x 113 | | | | | | |
| Drilling method | | [-] | Rotary | | | | | | |
| Installation moment, spacing and edge distance | | | M8 | M10 | M12 | M16 | IG M6 | IG M8 | IG M10 |
| Installation torque | T_{inst} | [Nm] | ≤ 5 | ≤ 5 | ≤ 8 | ≤ 8 | ≤ 5 | ≤ 8 | ≤ 8 |
| Edge distance | c_{cr} | [mm] | 120 (for shear loads perpendicular to free edge: $c_{cr} = 240$) | | | | | | |
| Minimum edge distance | c_{min} | [mm] | 60 | | | | | | |
| Spacing parallel to joint | $s_{cr, }$ | [mm] | 240 | | | | | | |
| Spacing perpendicular to joint | $s_{cr,\perp}$ | [mm] | 120 | | | | | | |
| Minimum spacing | $s_{min, } / s_{min,\perp}$ | [mm] | 120 | | | | | | |
| Threaded studs: ≥ Steel 5.8, ≥ A4-70, ≥ HCR-70 | | | M8 / M10 / IG M6 | | | M8 / M10 / IG M6 | | M12 / M16 / IG M8 / IG M10 | |
| Perfo sleeve VM-SH | | | VM-SH 16 x 85 | | | VM-SH 16 x 130 | | VM-SH 20 x 85 | |
| Anchorage depth | h_{ef} | [mm] | 85 | | | 130 | | 85 | |
| Approved tension load | | | for normalized mean compressive strength $f_b \geq 14 \text{ N/mm}^2$ | | | | | | |
| Temperature range | 24°C/40°C ²⁾ | apr. N | [kN] | | | 0,71 | | 1,86 | |
| | 50°C/80°C ²⁾ | apr. N | [kN] | | | 0,71 | | 1,71 | |
| Approved shear load | | | for normalized mean compressive strength $f_b \geq 14 \text{ N/mm}^2$ | | | | | | |
| Temperature range | 24°C/40°C ²⁾ | apr. V | [kN] | | | 1,71 | | 1,71 | |
| | 50°C/80°C ²⁾ | apr. V | [kN] | | | 1,71 | | 1,71 | |
| Conversion for lower compressive strengths ¹⁾ | | | $(f_b / 14)^{0,75} \leq 1,0$ | | | | | | |



¹⁾For lower compressive strengths, the resistances must be multiplied by the conversion factor for low compressive strengths.

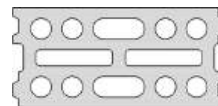
²⁾Max. long time temperature / max. short time temperature



Extract from Permissible Service Conditions of the 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 mortar. Use category dry/dry. No fire exposure. The total safety factor according EOTA TR 054 (γ_M and γ_P) is included. For further masonry types, details and temperature ranges see ETA.

| Hollow light weight concrete brick HBL 16DF | | | | according to EN 771-3:2011+A1:2015 | | | | | | |
|---|-------------------------|-----------------------|------|---|------------|------------|----------------------|------------------------------|----------------------|---------------|
| Bulk density | ρ | [kg/dm ³] | | $\geq 1,0$ | | | | | | |
| Compressive strength | f_b | [N/mm ²] | | $\geq 3,1$ | | | | | | |
| Producer (country code) | | [-] | | e.g. KLB Klimaleichtblock (DE) | | | | | | |
| Brick dimension (LxBxH) | | [mm] | | 500 x 250 x 240 | | | | | | |
| Drilling method | | [-] | | Rotary | | | | | | |
| Installation moment, spacing and edge distance | | | | M8 | M10 | M12 | M16 | IG M6 | IG M8 | IG M10 |
| Installation torque | T_{inst} | [Nm] | | ≤ 2 | ≤ 2 | ≤ 5 | ≤ 5 | ≤ 2 | ≤ 5 | ≤ 5 |
| Edge distance | c_{cr} | [mm] | | 120 (for shear loads perpendicular to free edge: $c_{cr} = 250$) | | | | | | |
| Minimum edge distance | c_{min} | [mm] | | 50 | | | | | | |
| Spacing parallel to joint | $s_{cr,II}$ | [mm] | | 500 | | | | | | |
| Spacing perpendicular to joint | $s_{cr,I}$ | [mm] | | 250 | | | | | | |
| Minimum spacing | $s_{min,II}, s_{min,I}$ | [mm] | | 50 | | | | | | |
| Threaded studs: \geq Steel 5.8, \geq A4-70, \geq HCR-70 | | | | M8 / M10 / IG M6 | | | M12 / IG M8 | | M16 / IG M10 | |
| Perfo sleeve VM-SH | | | | VM-SH 16 x 85 | | | VM-SH 20 x 85 | | VM-SH 20 x 85 | |
| Anchorage depth | h_{ef} | [mm] | | 85 | | | 85 | | 85 | |
| Approved tension load | | | | for normalized mean compressive strength $f_b \geq 3,1$ N/mm ² ¹⁾ | | | | | | |
| Temperature range | 24°C/40°C ²⁾ | apr. N | [kN] | 0,34 | | | 0,43 | | 0,43 | |
| | 50°C/80°C ²⁾ | apr. N | [kN] | 0,34 | | | 0,43 | | 0,43 | |
| Approved shear load | | | | for normalized mean compressive strength $f_b \geq 3,1$ N/mm ² ¹⁾ | | | | | | |
| Temperature range | 24°C/40°C ²⁾ | apr. V | [kN] | 0,57 | | | 0,86 | | 1,43 | |
| | 50°C/80°C ²⁾ | apr. V | [kN] | 0,57 | | | 0,86 | | 1,43 | |
| Conversion for lower compressive strengths ¹⁾ | | | | | | | | $(f_b / 3,1)^{0,5} \leq 1,0$ | | |



Installation data for hollow bricks with Perfo sleeve

| Threaded studs: \geq Steel 5.8, \geq A4-70, \geq HCR-70 | | | | M8 | | M8 / M10 | | M12 / M16 | | IG-M6 | | IG-M8 / IG-M10 | |
|---|----------------|---------|--|----------------------------------|---------|-----------------|---------|------------------|---------|--------------|---------|-----------------------|--------|
| Perfo sleeve VM-SH | | | | 12x80 | 16x85 | 16x130 | 20x85 | 20x130 | 20x200 | 16x85 | 16x85 | 20x85 | 20x85 |
| Borehole diameter | d_o | [mm] | | 12 | 16 | 16 | 20 | 20 | 20 | 16 | 16 | 20 | 20 |
| Borehole depth | h_o | [mm] | | 85 | 90 | 135 | 90 | 135 | 205 | 90 | 90 | 90 | 90 |
| Minimum wall thickness | h_{min} | [mm] | | 115 | 115 | 195 | 115 | 195 | 240 | 115 | 115 | 115 | 115 |
| Clearance hole in the fixture | $d_f \leq$ | [mm] | | 9 | 9 / 12 | 9 / 12 | 14 / 18 | 14 / 18 | 14 / 18 | 7 | 7 | 9 / 12 | 9 / 12 |
| Installation torque | $T_{inst,max}$ | [Nm] | | see tables for the masonry types | | | | | | | | | |
| Required mortar volume per borehole | | [ml] | | 11,2 | 24,9 | 38,0 | 41,1 | 62,9 | 96,7 | 24,9 | 24,9 | 41,1 | 41,1 |
| Boreholes per cartridge VMU plus 280 / 300 | | [Stück] | | 21 / 23 | 9 / 10 | 6 / 6 | 5 / 6 | 3 / 4 | 2 / 2 | 9 / 10 | 9 / 10 | 5 / 6 | 5 / 6 |
| Boreholes per cartridge VMU plus 345 / 410 | | [Stück] | | 27 / 33 | 12 / 14 | 8 / 9 | 7 / 9 | 4 / 5 | 3 / 3 | 12 / 14 | 12 / 14 | 7 / 9 | 7 / 9 |

¹⁾For lower compressive strengths, the resistances must be multiplied by the conversion factor for low compressive strengths.

²⁾Max. long time temperature / max. short time temperature