

# Injection System VME



**Threaded Stud V-A**



**Threaded Stud VMU-A**



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



**Reinforcement Bars BSt 500 S**



**Cartridge VME 385**  
Side-by-side cartridge  
Content: 385ml  
With big mixer VM-XL and reducers / extension tube for drill holes from 12mm diameter



**Cartridge VME 585**  
Side-by-side cartridge  
Content: 585ml  
With big mixer VM-XL and reducers / extension tube for drill holes from 12mm diameter



**Cartridge VME 1400**  
Side-by-side cartridge  
Content: 1400ml  
With big mixer VM-XL and reducers / extension tube for drill holes from 12mm diameter

**Range of loading: 3,1 - 128 kN**

**Concrete quality: C20/25 - C50/60**

**Material: Steel zinc plated, hot dip galvanized, Stainless steel A4/316, Stainless steel HCR, BSt 500 S**

### Description

The Injection System VME is an approved system for fixings of threaded studs or reinforcement bars in cracked and non-cracked concrete. In the cartridge, the epoxy resin and the hardener are separated. By means of the dispenser gun VM-P the components are pushed through the mixer nozzle, activated and injected into the drill hole. The Injection System VME can be used with the threaded Studs V-A, VMU-A and also the internally threaded sleeves VMU-IG. It can also be used with VM-A studs, sold by meter to be cut to the required length or with standard reinforcement bars.



### Applications

Fixing of rack systems, railings, steel structures, noise barriers, stairs and machines.

Subsequent closure of wall and ceiling openings, reinforcement of existing concrete structures, installation of reinforcement for the connection of the following concrete components (if the installation of reinforcement was missed or not possible because of the working process), connection of steel structures.

### Advantages:

- approved in cracked and non-cracked concrete
- approved with threaded studs, internally threaded sleeves and reinforcement bars
- approved with standard threaded studs (test certificate required)
- approved to use under seismic action according to the performance category C1 and C2 (M12-M16)
- also approved for post-installed rebar connections according to ETA-07/0299 / Z-21.8-1872
- approved for diamond coring (ETA-13/0773) in non-cracked concrete
- ICC Evaluation Service listing for cracked and non-cracked concrete
- variable anchorage depth for less drilling efforts
- long curing times for an economic working process with serial installations and/or large drill holes
- suitable for dry and wet concrete and in water-filled drill holes
- styrene-free
- fire test report

### Injection Cartridge VME



- Very high loads
- No shrinkage

Description	Ref. No.	Content ml	Content of master box pcs	Weight per master box kg	Weight per piece kg
Cartridge VME 385	28255501	385	12	8,5	0,70
Cartridge VME 585	28255601	585	12	12,09	0,98
Cartridge VME 1400	28255701	1400	5	12,34	2,40
Static mixer VM-XL <sup>1)</sup>	28305201	-	10	0,28	0,03
Static mixer VM-X <sup>2)</sup>	28305111	-	12	0,12	0,01

One static mixer VM-XL as well as one screw-on cap comes with each cartridge.  
<sup>1)</sup> Mixer VM-XL comes with a reducers / extension tube. Suitable for drill holes from 12mm diameter.  
<sup>2)</sup> Static mixer VM-X only required for drill hole diameter of 10mm (special accessories).

Chemical Anchors

## Threaded studs for use in **cracked and non-cracked concrete**

### Threaded Stud VMU-A

Steel, zinc plated 5.8  
Dimensions see page 107



- For use in structures subject to dry internal conditions
- Steel, zinc plated 8.8 on demand

### Threaded Stud VMU-A A4

Stainless steel A4  
Dimensions see page 107



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

### Internally Threaded Sleeve VMU-IG

Steel, zinc plated 5.8  
Dimensions see page 108



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

### Internally Threaded Sleeve VMU-IG A4

Stainless steel A4  
Dimensions see page 108



- 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 144



- For use in structures subject to dry internal conditions
- Steel, zinc plated 8.8 on demand

### Threaded Stud V-A A4

Stainless steel A4  
Dimensions see page 144



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

### Threaded Stud V-A fvz

Steel, hot dip galvanized 5.8  
Dimensions see page 144



- For use in structures subject to dry internal conditions
- Steel hot dip galvanized 8.8 on demand

### Threaded Stud V-A HCR

Stainless steel HCR  
Dimensions see page 144



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

### Threaded stud VM-A

Steel 5.8, zinc plated  
Dimensions see page 108



- 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

Stainless steel A4  
Dimensions see page 108



- 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

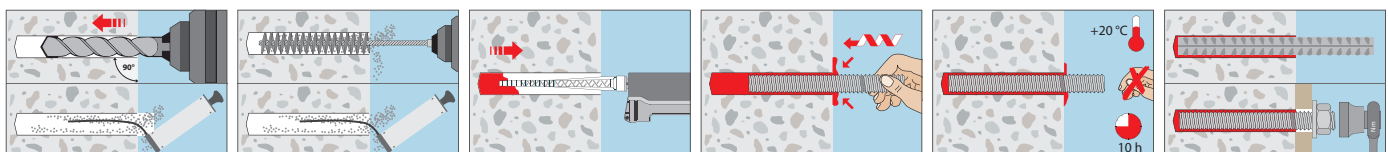
### Threaded stud VM-A

Steel 8.8, zinc plated  
Dimensions see page 108



- 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

## Installation



## Injecting equipment

### Retaining Washer



- For bubble-free filling of the drill hole
- Only for horizontal or overhead installation for drill hole diameter of 24 mm and bigger.
- Fits to extension tubes VM-XE 10 and VM-XLE 16

Description	Ref. No.	Colour	Suitable for drill hole Ø mm	To use in conjunction with	Package content pcs	Weight per pkg. kg
VM-IA 24	85924101	black	24	VM-XL + VM-XE / VM-XLE	20	0,06
VM-IA 25	85925201	black	25	VM-XL + VM-XE / VM-XLE	20	0,06
VM-IA 28	85928101	black	28	VM-XL + VM-XE / VM-XLE	20	0,08
VM-IA 32	85932201	black	32	VM-XL + VM-XE / VM-XLE	20	0,08
VM-IA 35	85935201	black	35	VM-XL + VM-XE / VM-XLE	20	0,08
VM-IA 40	85938201	black	40	VM-XL + VM-XE / VM-XLE	20	0,08

### Extension Tubes

Description	Ref. No.	Length mm	Diameters mm	To use in conjunction with	Pkg. cont. pcs.	Weight per pkg. kg
VM-XE 10/200	28306011	200	10	VM-XL, VM-X	12	0,12
VM-XE 10/500	85951101	500	10	VM-XL, VM-X	10	0,20
VM-XE 10/1000	85952101	1000	10	VM-XL, VM-X	10	0,30

## Drill hole Cleaning

### Cleaning Brush RB M6



- With connection thread M6
- Extension for large depths of drill hole
- For drilling machines with keyed chuck
- Separate SDS plus adaptor with internal thread M6 for SDS plus drill holder

Description	Ref. No.	Suitable for drill hole Ø mm	Total length of brush mm	Suitable for Threaded stud	Reinforcement Bars	Pkg. cont. pcs.	Weight per piece kg
RB 10 M6	33510101	10	130	M8	-	1	0,05
RB 12 M6	33512101	12	140	M10	Ø8	1	0,05
RB 14 M6	33514101	14	180	M12	Ø10	1	0,05
RB 16 M6	33516101	16	200	-	Ø12	1	0,05
RB 18 M6	33518101	18	200	M16	Ø14	1	0,05
RB 20 M6	33520101	20	220	-	Ø16	1	0,05
RB 24 M6	33524101	24	250	M20	Ø20	1	0,06
RB 28 M6	33528101	28	260	M24	-	1	0,06
RB 32 M6	33532101	32	350	M27	Ø25	1	0,08
RB 35 M6	33535101	35	350	M30	Ø28	1	0,08
RB 40 M6	33537101	40	350	-	Ø32	1	0,08
RBL M6	33968101	Brush extension 150mm with connection thread M6				1	0,09
RBL M6 SDS	33350101	SDS Plus adapter with internal thread M6				1	0,06

### Blow-out pump VM-AP



- For approval-compliant air-cleaning of drill holes in non-cracked concrete with a diameter up to 20 mm and a drill hole depth at most ten times larger than the diameter of the threaded stud (VME)
- For best drill hole cleaning, the hose must reach the bottom of the drill hole

Description	Ref. No.	Hose Ø mm	For drill hole Ø mm	Max. drill hole depth <sup>2)</sup> mm	Pkg. cont. pcs	Weight per piece kg
Blow-out pump VM-AP 360	33200101	8	8 <sup>1)</sup> -20	330	1	0,27

<sup>1)</sup>With extension tube Ø 6 x 100mm

<sup>2)</sup>For through fastening: Maximum drill hole depth through fixture

### Air gun VM-ABP



- For approval-compliant drill hole cleaning with compressed air for drill holes with a diameter larger than 6 mm
- For best drill hole cleaning, the nozzle of the air gun must reach the bottom of the drill hole

Description	Ref. No.	Nozzle-Ø mm	For drill hole Ø mm	Max. drill hole depth <sup>1)</sup> mm	Pkg. cont. pcs.	Weight per piece kg
VM-ABP 200	33090101	5	6-20	240	1	0,55
VM-ABP 250	33100101	16	18-40	240	1	1,00
VM-ABP 500	33106101	16	18-40	480	1	1,30

<sup>1)</sup>For through fastening: Maximum drill hole depth through fixture

### Dispenser VM-P Standard



→ For occasional use, metal version

→ Piston rod with adjusting screw

Description	Ref. No.	Suitable for cartridge	Pkg. cont. pcs.	Weight per piece kg
VM-P 385 Standard	28353010	385ml	1	1,33

### Dispenser VM-P 385 Profi



→ Professional dispenser with an ideal center of gravity for more comfortable working

→ Automatic pressure release for minimum adhesive overrun

Description	Ref. No.	Suitable for cartridge	Pkg. cont. pcs.	Weight per piece kg
VM-P 385 Profi	28353015	385ml	1	1,20

### Dispenser VM-P 585 Profi



→ Professional dispenser with an ideal center of gravity for more comfortable working

→ Combi-tool for many different types of cartridges

→ Automatic pressure release for minimum adhesive overrun

Description	Ref. No.	Suitable for cartridge	Pkg. cont. pcs.	Weight per piece kg
VM-P 585 Profi	28353201	280ml, 300ml, 330ml, 380ml, 385ml, 410ml, 420ml, 585ml	1	1,67

### Dispenser VM-P Pneumatic



VM-P 1400 Pneumatik

→ Professional air tool with an optimum center of gravity and quick cartridge exchange

→ Automatic pressure release system reduces adhesive overrun to a minimum

→ Single-hand pressure regulation to adjust the piston speed

→ With compressed air connection nipple

Description	Ref. No.	Suitable for cartridge	max. working pressure 8bar, 40l/min	Pkg. cont. pcs.	Weight per piece kg
VM-P 585 Pneumatic	28352101	385ml, 585ml	1	3,60	
VM-P 1400 Pneumatic	28352201	1400ml	1	6,40	

### Dispenser VM-P Akku



→ Professional, solid battery cartridge dispenser in a plastic case

→ Repeat function, for retrieving the last fill quantity

→ Stepless variable pressing speed

→ Overrun-quantity-stop by automatic return after release of the dispensing switch

Description	Ref. No.	Suitable for cartridge	Press-out force kN	Weight <sup>1)</sup> kg	Dimensions <sup>1)</sup> L x B x H mm	Pkg. cont. pcs.	Weight per piece kg
VM-P 585 Akku	28353301	385ml, 585ml	5,0	3,86	440 x 180 x 285	1	8,05
Accessories (for all models)							
Replacement battery	28352411			18 V/2,0 Ah		1	1,00
Shoulder strap	28359991			adjustable		1	0,02



**Extract from Permissible Service Conditions of ETA-09/0350.**

Approved loads for single anchor without influence of spacing and edge distance in dry or wet concrete for temperature range I to -40°C to +24°C/+40°C<sup>1)</sup> and for temperature range III -40°C to +43°C/+72°C (For temperature range II -40°C to +43°C/60°C and loads for threaded studs 4.6/4.8/5.6/ see ETA-09/350). Total safety factor as per ETAG 001 included ( $\gamma_M$  and  $\gamma_P$ ). Load capacities under fire exposure see page 168.

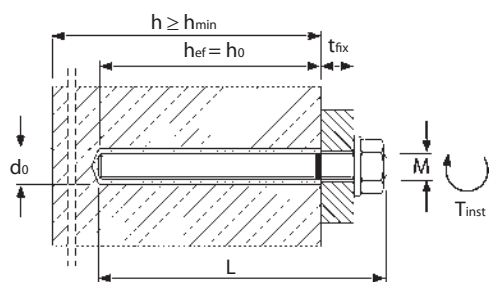
Loads and performance data				M8	M10	M12	M16	M20	M24	M27	M30	
<b>Injection System VME, threaded stud steel grade 5.8</b>												
Range of anchorage depths	$h_{ef,min} - h_{ef,max}$	[mm]		60 - 96	60 - 120	70 - 144	80 - 192	90 - 240	96 - 288	108 - 324	120 - 360	
Approved loads, tension for $h_{ef,min} - h_{ef,max}$ cracked concrete												
Range of temperature	24°C/40°C <sup>1)</sup>	C20/25	appr. N	[kN]	4,2-6,7	5,2-10,5	7,9-16,2	10,2-24,9	10,5-30,8	11,5-40,6	13,7-51,4	16,1-63,5
	43°C/72°C <sup>1)</sup>	C20/25	appr. N	[kN]	2,4-3,8	3,0-6,0	4,2-8,6	5,6-13,4	5,8-15,4	7,4-22,2	9,3-28,0	11,5-34,6
non-cracked concrete												
Range of temperature	24°C/40°C <sup>1)</sup>	C20/25	appr. N	[kN]	8,6	9,3-13,8	11,7-20,0	14,3-37,1	14,7-58,1	16,2-83,8	19,3-100,2	22,6-117,3
	43°C/72°C <sup>1)</sup>	C20/25	appr. N	[kN]	5,1-8,1	6,4-12,7	8,4-17,2	12,0-28,7	13,5-35,9	16,2-51,7	19,3-60,8	22,6-75,0
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]	5,1	8,6	12,0	22,3	29,3-34,9	32,3-50,3	38,5-65,7	45,1-80,0
	43°C/72°C <sup>1)</sup>	C20/25	appr. V	[kN]	5,1	7,2-8,6	10,1-12,0	13,4-22,3	16,2-34,9	20,7-50,3	26,2-65,7	32,3-80,0
non-cracked concrete												
Range of temperature	24°C/40°C <sup>1)</sup>	C20/25	appr. V	[kN]	5,1	8,6	12,0	22,3	34,9	45,2-50,3	54,0-65,7	63,2-80,0
	43°C/72°C <sup>1)</sup>	C20/25	appr. V	[kN]	5,1	8,6	12,0	22,3	34,9	45,2-50,3	54,0-65,7	63,2-80,0
<b>Injection System VME, threaded stud steel grade 8.8</b>												
Range of anchorage depths	$h_{ef,min} - h_{ef,max}$	[mm]		60 - 96	60 - 120	70 - 144	80 - 192	90 - 240	96 - 288	108 - 324	120 - 360	
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]	4,2-6,7	5,2-10,5	7,9-16,2	10,2-24,9	10,5-30,8	11,5-40,6	13,7-51,4	16,1-63,5
	43°C/72°C <sup>1)</sup>	C20/25	appr. N	[kN]	2,4-3,8	3,0-6,0	4,2-8,6	5,6-13,4	5,8-15,4	7,4-22,2	9,3-28,0	11,5-34,6
non-cracked concrete												
Range of temperature	24°C/40°C <sup>1)</sup>	C20/25	appr. N	[kN]	9,0-13,8	9,3-21,9	11,7-31,9	14,3-53,3	14,7-63,9	16,2-84,0	19,3-100,2	22,6-117,3
	43°C/72°C <sup>1)</sup>	C20/25	appr. N	[kN]	5,1-8,1	6,4-12,7	8,4-17,2	12-28,7	13,5-35,9	16,2-51,7	19,3-60,8	22,6-75,0
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]	8,6	12,6-13,1	18,8-19,4	24,5-36,0	29,3-56,0	32,3-80,6	38,5-105,1	45,1-128,0
	43°C/72°C <sup>1)</sup>	C20/25	appr. V	[kN]	5,7-8,6	7,2-13,1	10,1-19,4	13,4-32,2	16,2-43,1	20,7-62,0	26,2-78,5	32,3-96,9
non-cracked concrete												
Range of temperature	24°C/40°C <sup>1)</sup>	C20/25	appr. V	[kN]	8,6	13,1	19,4	34,4-36,0	41,1-56,0	45,2-80,6	54,0-105,1	63,2-128,0
	43°C/72°C <sup>1)</sup>	C20/25	appr. V	[kN]	8,6	13,1	19,4	28,7-36,0	37,7-56,0	45,2-80,6	54,0-105,1	63,2-128,0
<b>Injection System VME, threaded stud ss A4/316 / ss HCR</b>												
Range of anchorage depths	$h_{ef,min} - h_{ef,max}$	[mm]		60 - 96	60 - 120	70 - 144	80 - 192	90 - 240	96 - 288	108 - 324	120 - 360	
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]	4,2-6,7	5,2-10,5	7,9-16,2	10,2-24,9	10,5-30,8	11,5-40,6	13,7-51,4	16,1-63,5
	43°C/72°C <sup>1)</sup>	C20/25	appr. N	[kN]	2,4-3,8	3,0-6,0	4,2-8,6	5,6-13,4	5,8-15,4	7,4-22,2	9,3-28,0	11,5-34,6
non-cracked concrete												
Range of temperature	24°C/40°C <sup>1)</sup>	C20/25	appr. N	[kN]	9,0-9,9	9,3-15,7	11,7-22,5	14,3-42,0	14,7-63,9	16,2-84,0	19,3-57,4	22,6-70,2
	43°C/72°C <sup>1)</sup>	C20/25	appr. N	[kN]	5,1-8,1	6,4-12,7	8,4-17,2	12,0-28,7	13,5-35,9	16,2-51,7	19,3-57,4	22,6-70,2
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]	6,0	9,2	13,7	24,5-25,2	29,3-39,4	32,2-56,8	34,5	42,0
	43°C/72°C <sup>1)</sup>	C20/25	appr. V	[kN]	5,7-6,0	7,2-9,2	10,1-13,7	13,4-25,2	16,2-39,4	20,7-56,8	26,2-34,5	32,3-42,0
non-cracked 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	45,2-56,8	34,5	42,0
	43°C/72°C <sup>1)</sup>	C20/25	appr. V	[kN]	6,0	9,2	13,7	25,2	37,7-39,4	45,2-56,8	34,5	42,0

Spacing and edge distance											
Min. thickness of concrete slab for $h_{ef,min} - h_{ef,max}$	$h_{min}$	[mm]		100-126	100-150	100-174	116-228	138-288	152-344	172-388	190-430
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											
Drill hole diameter	$d_o$	[mm]		10	12	14	18	24	28	32	35
Clearance hole in the fixture	$d_f$	[mm]		9	12	14	18	22	26	30	33
Range of drill hole depth for $h_{ef,min} - h_{ef,max}$	$h_o$	[mm]		60 - 96	60 - 120	70 - 144	80 - 192	90 - 240	96 - 288	108 - 324	120 - 360
Installation torque	$\leq T_{inst}$	[Nm]		10	20	40	80	120	160	180	200

<sup>1)</sup> Max long term temperature / max short term temperature  
Higher concrete strength may lead to higher approved loads.

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



**Curing time Injection Adhesive VME**

→ Cartridge temperature when installing min. +5°C - +40°C

Temperature (°C) of the base material	maximum working time	minimum curing time	
		dry base material	wet base material
+5°C to +9°C	120 min	50 h	100 h
+10°C to +19°C	90 min	30 h	60 h
+20°C to +29°C	30 min	10 h	20 h
+30°C to +39°C	20 min	6 h	12 h
40°C	12 min	4 h	8 h





**Extract from Permissible Service Conditions of ETA-09/0350.**

Approved loads for single anchor without influence of spacing and edge distance in dry or wet concrete for temperature range I to -40°C to +24°C/+40°C<sup>1)</sup> and for temperature range III -40°C to +43°C/+72°C<sup>1)</sup> (For temperature range II -40°C to +43°C/60°C<sup>1)</sup> see ETA-09/350). Total safety factor as per ETAG 001 included ( $\gamma_M$  and  $\gamma_F$ ).

**Loads and performance data**

**Internally threaded sleeves** 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 x 125 IG M6 x 170 IG M20 x 200

Effective anchorage depth $h_{ef}$	[mm]	80	90	80	100	80	100	125	170	200
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**Injection System VME, Internally threaded sleeve VMU-IG, Steel 5.8**

Approved loads, tension for $h_{ef}$		cracked concrete									
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Temperature range	24°C/40°C <sup>1)</sup>	C20/25	appr. N	[kN]	4,8	4,8	8,6	8,6	10,2	13,0	16,0	24,0	34,6
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	43°C/72°C <sup>1)</sup>	C20/25	appr. N	[kN]	4,0	4,5	4,8	6,0	5,6	7,0	8,0	13,1	19,2
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Approved loads, tension for $h_{ef}$		non-cracked concrete									
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Temperature range	24°C/40°C <sup>1)</sup>	C20/25	appr. N	[kN]	4,8	4,8	8,6	8,6	13,8	13,8	20,0	37,6	48,6
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	43°C/72°C <sup>1)</sup>	C20/25	appr. N	[kN]	4,8	4,8	8,6	8,6	12,0	13,8	18,7	30,5	41,7
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Approved loads, tension for $h_{ef}$		cracked concrete									
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Temperature range	24°C/40°C <sup>1)</sup>	C20/25	appr. V	[kN]	2,9	2,9	5,1	5,1	8,6	8,6	12,0	22,3	34,9
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	43°C/72°C <sup>1)</sup>	C20/25	appr. V	[kN]	2,9	2,9	5,1	5,1	8,6	8,6	12,0	22,3	34,9
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Approved loads, tension for $h_{ef}$		non-cracked concrete									
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Temperature range	24°C/40°C <sup>1)</sup>	C20/25	appr. V	[kN]	2,9	2,9	5,1	5,1	8,6	8,6	12,0	22,3	34,9
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	43°C/72°C <sup>1)</sup>	C20/25	appr. V	[kN]	2,9	2,9	5,1	5,1	8,6	8,6	12,0	22,3	34,9
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**Injection System VME, Internally threaded sleeve VMU-IG, Stainless steel A4,**

Approved loads, tension for $h_{ef}$		cracked concrete									
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Temperature range	24°C/40°C <sup>1)</sup>	C20/25	appr. N	[kN]	5,3	5,3	9,0	9,9	10,2	13,0	16,0	24,0	31,0
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	43°C/72°C <sup>1)</sup>	C20/25	appr. N	[kN]	4,0	4,5	4,8	6,0	5,6	7,0	8,0	13,1	19,2
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Approved loads, tension for $h_{ef}$		non-cracked concrete									
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Temperature range	24°C/40°C <sup>1)</sup>	C20/25	appr. N	[kN]	5,3	5,3	9,9	9,9	14,3	15,7	22,5	38,1	31,0
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	43°C/72°C <sup>1)</sup>	C20/25	appr. N	[kN]	5,3	5,3	9,6	9,9	12,0	15,0	18,7	30,5	31,0
--	-------------------------	--------	---------	------	-----	-----	-----	-----	------	------	------	------	------

Approved loads, tension for $h_{ef}$		cracked concrete									
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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
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	43°C/72°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, tension for $h_{ef}$		non-cracked concrete									
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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
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	43°C/72°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
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**Spacing and edge distance**

Minimum thickness of concrete slab for $h_{ef}$	$h_{min}$	[mm]	110	120	110	130	116	136	169	226	270
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Minimum spacing	$s_{min}$	[mm]	50	50	60	60	80	80	100	120	150
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Minimum edge distance	$c_{min}$	[mm]	50	50	60	60	80	80	100	120	150
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**Installation parameters**

Diameter of drill hole	$d_o$	[mm]	12	12	14	14	18	18	22	28	35
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Clearance hole in the fixture	$d_f \leq$	[mm]	7	7	9	9	12	12	14	18	22
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Range of drill hole depth for $h_{ef}$	$h_o$	[mm]	80	90	80	100	80	100	125	170	200
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Installation torque	$T_{inst} \leq$	[Nm]	10	10	10	10	20	20	40	60	100
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Amount of adhesive per drill hole	[ml]	6,6	7,4	7,9	9,9	10,9	13,6	22,4	54,9	97,4
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**Injection System VME, reinforcement bars B 500 B** Ø8 Ø10 Ø12 Ø14 Ø16 Ø20 Ø25 Ø28 Ø32

Range of anchorage depths	$h_{ef,min} - h_{ef,max}$	[mm]	60 - 96	60 - 120	70 - 144	75 - 168	80 - 192	90 - 240	100 - 300	112 - 336	128 - 384
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Approved loads, tension for $h_{ef,min} - h_{ef,max}$		cracked concrete									
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Range of temperature	24°C/40°C <sup>1)</sup>	C20/25	appr. N	[kN]	4,2-6,7	5,2-10,5	7,9-16,2	9,2-20,5	10,2-24,9	10,5-30,8	12,2-44,1	14,5-55,3	17,7-72,2
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	43°C/72°C <sup>1)</sup>	C20/25	appr. N	[kN]	2,4-3,8	3,0-6,0	4,2-8,6	4,6-10,3	5,6-13,4	5,8-15,4	8,0-24,0	10,1-30,2	13,1-39,4
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Approved loads, tension for $h_{ef,min} - h_{ef,max}$		non-cracked concrete									
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Range of temperature	24°C/40°C <sup>1)</sup>	C20/25	appr. N	[kN]	8,4-13,4	9,3-20,9	11,7-28,0	13,0-38,1	14,3-46,0	14,7-61,5	17,2-88,2	20,4-105,8	24,9-129,3
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	43°C/72°C <sup>1)</sup>	C20/25	appr. N	[kN]	4,5-7,2	5,6-11,2	7,9-16,2	9,2-20,5	11,2-26,8	12,5-33,3	16,0-48,1	20,1-60,3	24,9-78,8
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Approved loads, shear for $h_{ef,min} - h_{ef,max}$		cracked concrete									
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Range of temperature	24°C/40°C <sup>1)</sup>	C20/25	appr. V	[kN]	6,5	10,1	14,5	19,8	24,5-25,9	29,3-40,4	34,3-63,1	40,6-79,2	49,7-103,4
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	43°C/72°C <sup>1)</sup>	C20/25	appr. V	[kN]	5,7-6,5	7,2-10,1	10,1-14,5	11,0-19,8	13,4-25,9	16,2-40,4	22,4-63,1	28,1-79,2	36,8-103,4
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Approved loads, shear for $h_{ef,min} - h_{ef,max}$		non-cracked concrete									
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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	48,1-63,1	57,0-79,2	69,6-103,4
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	43°C/72°C <sup>1)</sup>	C20/25	appr. V	[kN]	6,5	10,1	14,5	19,8	25,9	35,0-40,4	44,9-63,1	56,3-79,2	69,6-103,4
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**Spacing and edge distance**

Min. thickness of concrete slab for $h_{ef,min} - h_{ef,max}$	$h_{min}$	[mm]	100-126	100-150	102-176	111-204	120-232	138-288	164-364	182-406	208-464
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Minimum spacing	$s_{min}$	[mm]	40	50	60	70	80	100	125	140	160
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Minimum edge distance	$c_{min}$	[mm]	40	50	60	70	80	100	125	140	160
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**Installation parameters**

Drill hole diameter	$d_o$	[mm]	12	14	16	18	20	24	32	35	40
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Range of drill hole depth for $h_{ef,min} - h_{ef,max}$	$h_o$	[mm]	60 - 96	60 - 120	70 - 144	75 - 168	80 - 192	90 - 240	100 - 300	112 - 336	128 - 384
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<sup>1)</sup> Max long term temperature / max short term temperature

Higher concrete strength may lead to higher approved loads.

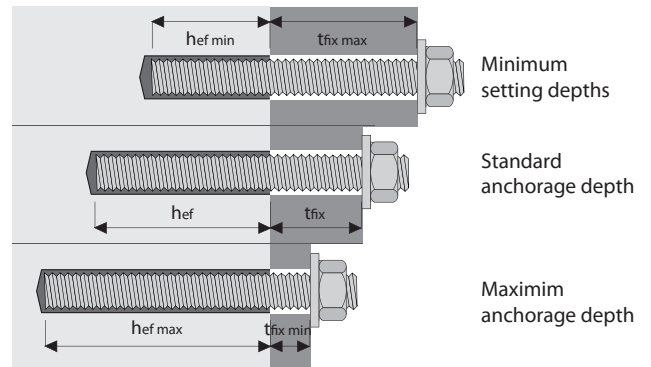
For anchor designing an easy to operate CD-ROM is available on request or can be downloaded at [www.mkt.de](http://www.mkt.de).

**Threaded Studs for the Injection System VMU plus in concrete:**  
**A flexible system means less inventory**

The flexible anchoring depths of the Injection System VMU plus make it possible to adjust the setting depths to the required load. This allows at low loads, the use of shorter anchor rods with correspondingly shorter drilling depths, high loads can be supported by correspondingly deeper anchorage depths.

All anchor rod groups from the existing MKT range listed below can be used with the Injection System VMU plus. But these anchor rods can, according to the applied load, be set deeper or shallower. The minimum and maximum possible anchorage depths are specified in the assessment for each diameter and can be found in the extract from Permissible Service Conditions of ETA-11/0415 on the following pages.

**Variable anchorage depth:**



hef + tfix = Usable length of the threaded rod (without nut and washer)

**Threaded Studs for applications in cracked and non-cracked concrete**

**Threaded Stud VMU-A**

Steel, zinc plated 5.8



- May be used in structures subject to dry internal conditions
- Steel, zinc plated grade 8.8 on demand or as threaded studs VM-A

**Threaded Stud VMU-A A4**

Stainless steel A4



- May be used in structures subject to dry internal conditions or to external atmospheric exposure
- Stainless steel HCR (1.4529) on demand

Description	Ref. No.	Usable length in concrete mm	Pkg. cont. pcs.	Weight per pkg. kg
VMU-A 8x100	31510101	90	10	0,42
VMU-A 8x110	31515101	100	10	0,46
VMU-A 8x130	31525101	120	10	0,52
VMU-A 8x145	31528101	135	10	0,55
VMU-A 8x160	31530101	150	10	0,60
VMU-A 8x205	31550101	195	10	0,74
VMU-A 10x110	31605101	100	10	0,75
VMU-A 10x130	31625101	120	10	0,85
VMU-A 10x150	31630101	140	10	0,95
VMU-A 10x165	31635101	155	10	1,02
VMU-A 10x190	31645101	180	10	1,15
VMU-A 10x260	31655101	250	10	1,50
VMU-A 12x120	31717101	105	10	1,14
VMU-A 12x130	31718101	115	10	1,21
VMU-A 12x135	31710101	120	10	1,25
VMU-A 12x155	31720101	140	10	1,42
VMU-A 12x175	31730101	160	10	1,54
VMU-A 12x185	31734101	170	10	1,63
VMU-A 12x210	31740101	195	10	1,82
VMU-A 12x225	31748101	210	10	1,89
VMU-A 12x250	31750101	235	10	2,13
VMU-A 12x265	31757101	250	10	2,18
VMU-A 12x300	31760101	285	10	2,50
VMU-A 16x160	31810101	140	10	2,65
VMU-A 16x175	31815101	155	10	2,85
VMU-A 16x205	31820101	185	10	3,25
VMU-A 16x235	31830101	215	10	3,65
VMU-A 16x300	31840101	280	10	4,53
VMU-A 20x240	31910101	220	10	5,85
VMU-A 20x260	31915101	240	10	6,30
VMU-A 20x285	31920101	265	10	6,75
VMU-A 20x300	31925101	280	10	7,15
VMU-A 20x350	31930101	330	10	8,10
VMU-A 20x400	31935101	380	10	9,10
VMU-A 24x290	31960101	265	5	4,95
VMU-A 24x350	31965101	325	5	5,85
VMU-A 24x400	31970101	375	5	6,60
VMU-A 30x370	31990101	340	5	9,90

Description	Ref. No.	Usable length in concrete mm	Pkg. cont. pcs.	Weight per pkg. kg
VMU-A 8x100 A4	31510501	90	10	0,42
VMU-A 8x110 A4	31515501	100	10	0,46
VMU-A 8x130 A4	31525501	120	10	0,52
VMU-A 8x145 A4	31528501	135	10	0,55
VMU-A 8x160 A4	31530501	150	10	0,60
VMU-A 8x205 A4	31550501	195	10	0,74
VMU-A 10x110 A4	31605501	100	10	0,75
VMU-A 10x130 A4	31625501	120	10	0,85
VMU-A 10x150 A4	31630501	140	10	0,95
VMU-A 10x165 A4	31635501	155	10	1,02
VMU-A 10x190 A4	31645501	180	10	1,15
VMU-A 10x260 A4	31655501	250	10	1,50
VMU-A 12x120 A4	31717501	105	10	1,14
VMU-A 12x130 A4	31718501	115	10	1,21
VMU-A 12x135 A4	31710501	120	10	1,25
VMU-A 12x155 A4	31720501	140	10	1,42
VMU-A 12x175 A4	31730501	160	10	1,54
VMU-A 12x185 A4	31734501	170	10	1,63
VMU-A 12x210 A4	31740501	195	10	1,82
VMU-A 12x225 A4	31748501	210	10	1,89
VMU-A 12x250 A4	31750501	235	10	2,13
VMU-A 12x265 A4	31757501	250	10	2,18
VMU-A 12x300 A4	31760501	285	10	2,50
VMU-A 16x160 A4	31810501	140	10	2,65
VMU-A 16x175 A4	31815501	155	10	2,85
VMU-A 16x205 A4	31820501	185	10	3,25
VMU-A 16x235 A4	31830501	215	10	3,65
VMU-A 16x300 A4	31840501	280	10	4,53
VMU-A 20x240 A4	31910501	220	10	5,85
VMU-A 20x260 A4	31915501	240	10	6,30
VMU-A 20x285 A4	31920501	265	10	6,75
VMU-A 20x300 A4	31925501	280	10	7,15
VMU-A 24x290 A4	31960501	265	5	4,95
VMU-A 24x350 A4	31965501	325	5	5,85
VMU-A 24x400 A4	31970501	375	5	6,60
VMU-A 30x370 A4	31990501	340	5	9,90

**Threaded Studs and Internally Threaded Sleeves for applications in cracked and non-cracked concrete**

**Threaded Stud VM-A**

Steel, zinc plated 5.8

- Threaded studs, of 1 meter length, to be cut to the required length
- Comes with manufacturer's certificate (3.1 EN10204) in every package

Description	Ref. No.	Thread	Length mm	Package content pcs.	Weight per pkg. kg
VM-A 10x1000	31299101	M10	1000	10	5,5
VM-A 12x1000	31399101	M12	1000	10	7,76
VM-A 16x1000	31599101	M16	1000	10	13,6
VM-A 20x1000	31699101	M20	1000	5	10,8
VM-A 24x1000	31799101	M24	1000	5	15,35

**Threaded Stud VM-A**

Stainless steel A4



- Threaded studs, of 1 meter length, to be cut to the required length
- Comes with manufacturer's certificate (3.1 EN10204) in every package

Description	Ref. No.	Thread	Length mm	Package content pcs.	Weight per pkg. kg
VM-A 10x1000 A4	31299501	M10	1000	10	5,43
VM-A 12x1000 A4	31399501	M12	1000	10	8,03
VM-A 16x1000 A4	31599501	M16	1000	10	13,95
VM-A 20x1000 A4	31699501	M20	1000	5	11,0
VM-A 24x1000 A4	31799501	M24	1000	5	15,6

**Threaded Stud VM-A**

Steel, zinc plated 8.8

- Threaded studs, of 1 meter length, to be cut to the required length
- Comes with manufacturer's certificate (3.1 EN10204) in every package

Description	Ref. No.	Thread	Length mm	Package content pcs.	Weight per pkg. kg
VM-A 10x1000 8.8	31299181	M10	1000	10	5,5
VM-A 12x1000 8.8	31399181	M12	1000	10	7,76
VM-A 16x1000 8.8	31599181	M16	1000	10	13,6

**Threaded Stud V-A**

Steel, zinc plated 5.8

Dimensions see page 144



- For use in structures subject to dry internal conditions
- Steel, zinc plated 8.8 on demand

**Threaded Stud V-A A4**

Stainless steel A4

Dimensions see page 144



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

**Threaded Stud V-A fvz**

Steel, hot dip galvanized 5.8

Dimensions see page 144



- For use in structures subject to dry internal conditions
- Steel hot dip galvanized 8.8 on demand

**Threaded Stud V-A HCR**

Stainless steel HCR

Dimensions see page 144



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

**Internally Threaded Sleeve VMU-IG**

Steel, zinc plated 5.8/Stainless steel A4



- With internal thread
- For cracked and non-cracked concrete

Description	Ref. No.		Drill hole-Ø x depth mm	Outer-Ø x Length mm	Thread depth min / max mm	Package content pcs.	Weight per pkg. kg
	Steel, zinc plated	Stainless steel A4					
VMU-IG M6x80	31502101	31502501	12 x 80	10 x 80	8 / 20	10	0,38
VMU-IG M6x90	31503101	31503501	12 x 90	10 x 90	8 / 20	10	0,42
VMU-IG M8x80	31562101	31562501	14 x 80	12 x 80	8 / 20	10	0,52
VMU-IG M8x100	31563101	31563501	14 x 100	12 x 100	8 / 20	10	0,66
VMU-IG M10x80	31601101	31601501	18 x 80	16 x 80	10 / 25	10	0,92
VMU-IG M10x100	31602101	31602501	18 x 100	16 x 100	10 / 25	10	1,18

Other dimensions on demand.



### Threaded Stud V-A



- May be used in structures subject to dry internal conditions
- Steel, zinc plated 5.8
- Approved for non-cracked concrete

Description	Ref. No.	Drill hole Ø x depth mm	Fixture thickness t <sub>fix</sub> mm	Usable length in concrete <sup>1)</sup> mm	Package content pcs.	Weight per package kg
V-A 8-20/110	21101101	10 x 80	20	100	10	0,43
V-A 8-60/150	21105101	10 x 80	60	140	10	0,53
V-A 10-15/115	21202101	12 x 90	15	105	10	0,73
V-A 10-30/130	21203101	12 x 90	30	120	10	0,81
V-A 10-65/165	21207101	12 x 90	65	155	10	0,98
V-A 10-90/190	21210101	12 x 90	90	180	10	1,11
V-A 10-150/250	21216101	12 x 90	150	240	10	1,42
V-A 10-200/300	21221101	12 x 90	200	290	10	1,71
V-A 12-10/135	21304101	14 x 110	10	120	10	1,19
V-A 12-35/160	21306101	14 x 110	35	145	10	1,37
V-A 12-85/210	21312101	14 x 110	85	195	10	1,73
V-A 12-95/220	21313101	14 x 110	95	205	10	1,82
V-A 12-125/250	21316101	14 x 110	125	235	10	2,02
V-A 12-175/300	21321101	14 x 110	175	285	10	2,83
V-A 14-35/170 <sup>2)</sup>	21408101	16 x 120	35	155	10	1,91
V-A 16-20/165	21507101	18 x 125	20	145	10	2,77
V-A 16-45/190	21510101	18 x 125	45	170	10	2,96
V-A 16-85/230	21514101	18 x 125	85	210	10	3,65
V-A 16-105/250	21516101	18 x 125	105	230	10	3,91
V-A 16-155/300	21521101	18 x 125	155	280	10	4,58
V-A 20-20/220	21613101	22 x 170	20	190	10	5,56
V-A 20-60/260	21617101	22 x 170	60	230	10	6,39
V-A 20-100/300	21621101	22 x 170	100	270	10	7,23
V-A 24-15/260	21717101	26 x 210	15	225	5	4,89
V-A 24-55/300	21721101	26 x 210	55	265	5	5,54
V-A 30-70/380 <sup>2)3)</sup>	21829101	32 x 280	70	350	5	10,00

Other lengths and grade 8.8 on demand.

<sup>1)</sup>For VMH/VMU plus/VM-EA/VME

<sup>2)</sup>Not part of assessment

<sup>3)</sup>Setting tool V-A 30-70/380 ref. no. 27805160 to be ordered separately.

### Threaded Stud V-A A4



- May be used in structures subject to dry internal conditions or external atmospheric exposure
- Stainless Steel A4
- Approved for non-cracked concrete

Description	Ref. No.	Drill hole Ø x depth mm	Fixture thickness t <sub>fix</sub> mm	Usable length in concrete <sup>1)</sup> mm	Package content pcs.	Weight per package kg
V-A 8-20/110 A4	21101501	10 x 80	20	100	10	0,43
V-A 8-60/150 A4	21105501	10 x 80	60	140	10	0,53
V-A 10-15/115 A4	21202501	12 x 90	15	105	10	0,73
V-A 10-30/130 A4	21203501	12 x 90	30	120	10	0,81
V-A 10-65/165 A4	21207501	12 x 90	65	155	10	0,98
V-A 10-90/190 A4	21210501	12 x 90	90	180	10	1,11
V-A 10-150/250 A4	21216501	12 x 90	150	240	10	1,42
V-A 10-200/300 A4	21221501	12 x 90	200	290	10	1,71
V-A 12-10/135 A4	21304501	14 x 110	10	120	10	1,19
V-A 12-35/160 A4	21306501	14 x 110	35	145	10	1,37
V-A 12-55/180 A4	21309501	14 x 110	55	165	10	1,51
V-A 12-85/210 A4	21312501	14 x 110	85	195	10	1,73
V-A 12-95/220 A4	21313501	14 x 110	95	205	10	1,82
V-A 12-125/250 A4	21316501	14 x 110	125	235	10	2,02
V-A 12-175/300 A4	21321501	14 x 110	175	285	10	2,83
V-A 14-35/170 A4 <sup>2)</sup>	21408501	16 x 120	35	155	10	1,91
V-A 16-5/150 A4	21505501	18 x 125	5	130	10	2,38
V-A 16-20/165 A4	21507501	18 x 125	20	145	10	2,77
V-A 16-45/190 A4	21510501	18 x 125	45	170	10	2,96
V-A 16-65/210 A4	21512501	18 x 125	65	190	10	3,20
V-A 16-85/230 A4	21514501	18 x 125	85	210	10	3,65
V-A 16-105/250 A4	21516501	18 x 125	105	230	10	3,91
V-A 16-155/300 A4	21521501	18 x 125	155	280	10	4,58
V-A 20-20/220 A4	21613501	22 x 170	20	190	10	5,56
V-A 20-60/260 A4	21617501	22 x 170	60	230	10	6,39
V-A 20-100/300 A4	21621501	22 x 170	100	270	10	7,23
V-A 24-15/260 A4	21717501	26 x 210	15	225	5	4,89
V-A 24-55/300 A4	21721501	26 x 210	55	265	5	5,54
V-A 30-70/380 A4 <sup>2)3)</sup>	21829501	32 x 280	70	350	5	10,00

Other lengths on demand.

<sup>1)</sup>For VMH/VMU plus/VM-EA/VME

<sup>2)</sup>Not part of assessment

<sup>3)</sup>Setting tool V-A 30-70/380 ref. no. 27805160 to be ordered separately.

### Threaded Stud V-A fvz



- Improved corrosion protection
- Steel, hot dip galvanized 5.8 (≥ 40µm, EN ISO 1461)
- Approved for non-cracked concrete

Description	Ref. No.	Drill hole Ø x depth mm	Fixture thickness t <sub>fix</sub> mm	Usable length in concrete <sup>1)</sup> mm	Package content pcs.	Weight per package kg
V-A 8-20/110 fvz	21101201	10 x 80	20	100	10	0,43
V-A 10-30/130 fvz	21203201	12 x 90	30	120	10	0,81
V-A 10-90/190 fvz	21210201	12 x 90	90	180	10	1,11
V-A 12-35/160 fvz	21306201	14 x 110	35	145	10	1,37
V-A 12-95/220 fvz	21313201	14 x 110	95	205	10	1,82
V-A 16-20/165 fvz	21507201	18 x 125	20	145	10	2,77
V-A 16-45/190 fvz	21510201	18 x 125	45	170	10	2,96
V-A 16-65/210 fvz	21512201	18 x 125	65	190	10	3,20
V-A 20-20/220 fvz	21613201	22 x 170	20	190	10	5,56
V-A 20-60/260 fvz	21617201	22 x 170	60	230	10	6,39
V-A 24-15/260 fvz	21717201	26 x 210	15	235	5	4,89
V-A 24-55/300 fvz	21721201	26 x 210	55	265	5	5,54

Other lengths and grade 8.8 on demand.

<sup>1)</sup>For VMH/VMU plus/VM-EA/VME

### Threaded Stud V-A HCR



- For use in particularly corrosive environments
- High corrosion resistant steel 1.4529 (HCR)
- Approved for non-cracked concrete

Description	Ref. No.	Drill hole Ø x depth mm	Fixture thickness t <sub>fix</sub> mm	Usable length in concrete <sup>1)</sup> mm	Package content pcs.	Weight per package kg
V-A 8-20/110 HCR	21101651	10 x 80	20	100	10	0,43
V-A 10-30/130 HCR	21203651	12 x 90	30	120	10	0,81
V-A 12-35/160 HCR	21306651	14 x 110	35	145	10	1,37
V-A 16-45/190 HCR	21510651	18 x 125	45	170	10	2,96

Other lengths on demand.

<sup>1)</sup>For VMH/VMU plus/VM-EA/VME