# HPE injection mortar

Technical Data Sheet

VJ Technology


## Description

HPE is a high performance epoxy injection mortar with approvals for anchoring and rebar connections. This product is used in conjunction with a hand, battery or pneumatic tool and static mixer nozzle.

HPE consists of 2 components, resin and hardener, which are stored in separate compartments. These are mixed when extruded through the mixer nozzle and allow the mortar to set. Cartridges may be reused up to end of shelf life by replacing the static mixer nozzle or resealing the cap.

## Usage/Purpose

HPE is suitable for anchoring of façades, roofs, timber construction, metal profiles, columns, beams, consoles, railings, sanitary devices, cable trays, piping, post-installed rebar connections and more. Especially suitable for applications with deeper embedment depths due to high flow properties.

## Key Benefits

- ETA for cracked and non-cracked concrete, C20/25 to C50/60
- ETA for post installed rebar connections
- Approved for seismic performance categories C1 (threaded rods and rebar) and C2 (threaded rods)
- Suitable for dry and wet concrete including flooded holes (not sea water)
- Suitable for overhead application
- Fire rating resistance ~ F120
- NSF approval for potable water
- High chemical resistance once cured - suitable for swimming pool (chlorine) and sea (salt) water environments
- Low shrinkage
- Small allowable edge distance and anchor spacing
- Design check can be performed using free VJT DesignFiX software - alternatively contact technical@vjtechnology.com to model applications

## Applications

HPE epoxy injection mortar is used in conjunction with the following:

- Threaded rods eg. VJT Chemical Anchor Studs (zinc, HDG, A2, A4, HCR)
- Rebar - designed with either anchor theory (ETAG 001) or post-installed rebar theory (EN1992-1)

## Handling & Storage

- Storage and transportation: store in a cool dry place from +5°C to +35°C. Keep out of direct sunlight
- Shelf life: 24 months for cartridges when stored as recommended in original, unopened condition

## Certificates

CE 1343
VJ Technology
Plant 1
10
DoP: 1343-CPR-M 532-1
ETA-10/0087
ETAG 001 Part 5
M8 - M30 / rebar ø8 - ø32
for cracked and non-cracked concrete incl. seismic C1+C2

CE 1343
VJ Technology
Plant 1
13
DoP: 1343-CPR-M 532-9
ETA-13/0319
EAD 330087-00-0601
ø8 - ø40
for post-installed rebar connections

NSF

Feuerwider-standsklasse F 120

LEED tested

ÉMISSIONS DANS L'AIR INTÉRIEUR
A+
A+ A B C

## Approvals & Certificates

| Description | Authority / Laboratory | Guideline for Assessment | Number / Issue Date |
|---|---|---|---|
| ETA "Bonded anchor with anchor rod for use in concrete" | DiBt, Berlin | ETAG 001 Part 5 | ETA-10/0087: Oct-2014 |
| ETA "Post-installed rebar connection" | DiBt, Berlin | EAD 330087-00-0601 | ETA-13/0319: September-2017 |
| Fire resistance | IBMB, Braunschweig | DIN EN 1363-1:2012 | Test Report No: 170019_38en Assessment Report 210104 |
| VOC Emissions test report | Eurofins | DEVL 1101903D, DEVL 1104875A | 392-2019-00382110_E_EN_03 |
| Test report LEED | Eurofins | Leed 2009 EQ c4.1 | 392-2017-00105901_HA_EN_10 |
| NSF International | NSF International | NSF/ANSI Standard 61 | August-2014 |

## Loads - Threaded Rod


## Static/Quasi-static Loads

Data in this section is based on the following criteria:

- VJ Technology Injection system HPE: HPE injection mortar with threaded rod (zinc plated steel grade 5.8 / zinc plated steel grade 8.8 / stainless steel A4-70 and A4-50)
- Correct anchor setting according to installation instructions
- Static and quasi-static loading
- Single anchor with edge distance, $c \geq 2{,}4 \times h_{ef}$ and axial spacing, $s \geq 4{,}8 \times h_{ef}$
- A single "typical" effective embedment depth as detailed in the table below
- Minimum thickness of base material as per typical effective embedment depth
- Temperature range I: -40°C to +40°C (max long term temperature +24°C and max short term temperature +40°C)
- Hammer drilled holes
- **Bold** figures denote steel failure

Note that for full design with combinations of tensile/shear loads and edge distance/spacing influence, the complete assessment ETA-10/0087 must be considered. Contact VJT Technical for further advice.

## Embedment

| Anchor size | | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
|---|---|---|---|---|---|---|---|---|---|
| Typical effective embedment depth[1)], $h_{ef}$ | [mm] | 80 | 90 | 110 | 125 | 170 | 210 | 240 | 270 |
| Min base material thickness for typical effective embedment, $h_{min}$ | [mm] | 110 | 120 | 140 | 165 | 220 | 270 | 305 | 340 |

1) Full embedment depth range is shown in the Installation Parameters table

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## Characteristic Resistance

| Anchor size | | | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
|---|---|---|---|---|---|---|---|---|---|---|
| Non-cracked normal concrete class C20/25 | | | | | | | | | | |
| Tension $N_{Rk}$ | 5.8 | [kN] | **18,0** | **29,0** | **42,0** | 70,6 | 111,9 | 153,7 | 187,8 | 224,0 |
| | 8.8 | [kN] | **29,0** | 42,4 | 58,3 | 70,6 | 111,9 | 153,7 | 187,8 | 224,0 |
| | A4-50 | [kN] | - | - | - | - | - | - | 187,8 | 224,0 |
| | A4-70 | [kN] | **26,0** | **41,0** | 58,3 | 70,6 | 111,9 | 153,7 | - | - |
| Shear $V_{Rk}$ | 5.8 | [kN] | **9,0** | **16,0** | **21,0** | **39,0** | **61,0** | **88,0** | **115,0** | **140,0** |
| | 8.8 | [kN] | **15,0** | **23,0** | **34,0** | **63,0** | **98,0** | **141,0** | **184,0** | **224,0** |
| | A4-50 | [kN] | - | - | - | - | - | - | **115,0** | **140,0** |
| | A4-70 | [kN] | **13,0** | **20,0** | **30,0** | **55,0** | **86,0** | **124,0** | - | - |
| Cracked normal concrete class C20/25 | | | | | | | | | | |
| Tension $N_{Rk}$ | 5.8 | [kN] | - | - | 31,1 | 40,8 | 64,1 | 87,1 | 112,0 | 140,0 |
| | 8.8 | [kN] | - | - | 31,1 | 40,8 | 64,1 | 87,1 | 112,0 | 140,0 |
| | A4-50 | [kN] | - | - | - | - | - | - | 112,0 | 140,0 |
| | A4-70 | [kN] | - | - | 31,1 | 40,8 | 64,1 | 87,1 | - | - |
| Shear $V_{Rk}$ | 5.8 | [kN] | - | - | **21,0** | **39,0** | **61,0** | **88,0** | **115,0** | **140,0** |
| | 8.8 | [kN] | - | - | **34,0** | **63,0** | **98,0** | **141,0** | **184,0** | **224,0** |
| | A4-50 | [kN] | - | - | - | - | - | - | **115,0** | **140,0** |
| | A4-70 | [kN] | - | - | **30,0** | **55,0** | **86,0** | **124,0** | - | - |

## Design Resistance

| Anchor size | | | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
|---|---|---|---|---|---|---|---|---|---|---|
| Non-cracked normal concrete class C20/25 | | | | | | | | | | |
| Tension $N_{Rd}$ | 5.8 | [kN] | 12,0 | 19,3 | 28,0 | 39,2 | 53,3 | 73,2 | 89,4 | 106,7 |
| | 8.8 | [kN] | 16,8 | 23,6 | 32,4 | 39,2 | 53,3 | 73,2 | 89,4 | 106,7 |
| | A4-50 | [kN] | - | - | - | - | - | - | 80,4 | 98,3 |
| | A4-70 | [kN] | 13,9 | 21,9 | 31,6 | 39,2 | 53,3 | 73,2 | - | - |
| Shear $V_{Rd}$ | 5.8 | [kN] | 7,2 | 12,0 | 16,8 | 31,2 | 48,8 | 70,4 | 92,0 | 112,0 |
| | 8.8 | [kN] | 12,0 | 18,4 | 27,2 | 50,4 | 78,4 | 112,8 | 147,2 | 179,2 |
| | A4-50 | [kN] | - | - | - | - | - | - | 48,3 | 58,8 |
| | A4-70 | [kN] | 8,3 | 12,8 | 19,2 | 35,3 | 55,1 | 79,5 | - | - |
| Cracked normal concrete class C20/25 | | | | | | | | | | |
| Tension $N_{Rd}$ | 5.8 | [kN] | - | - | 17,3 | 22,7 | 30,5 | 41,5 | 53,3 | 66,6 |
| | 8.8 | [kN] | - | - | 17,3 | 22,7 | 30,5 | 41,5 | 53,3 | 66,6 |
| | A4-50 | [kN] | - | - | - | - | - | - | 53,3 | 66,6 |
| | A4-70 | [kN] | - | - | 17,3 | 22,7 | 30,5 | 41,5 | - | - |
| Shear $V_{Rd}$ | 5.8 | [kN] | - | - | 16,8 | 31,2 | 48,8 | 70,4 | 92,0 | 112,0 |
| | 8.8 | [kN] | - | - | 27,2 | 50,4 | 78,4 | 112,8 | 147,2 | 179,2 |
| | A4-50 | [kN] | - | - | - | - | - | - | 48,3 | 58,8 |
| | A4-70 | [kN] | - | - | 19,2 | 35,3 | 55,1 | 79,5 | - | - |

## Recommended Load[1)]

| Anchor size | | | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Non-cracked normal concrete class C20/25** | | | | | | | | | | |
| Tension $N_{Rec}$ | 5.8 | [kN] | 8,6 | 13,8 | 20,0 | 28,0 | 38,1 | 52,3 | 63,9 | 76,2 |
| | 8.8 | [kN] | 12,0 | 16,8 | 23,1 | 28,0 | 38,1 | 52,3 | 63,9 | 76,2 |
| | A4-50 | [kN] | - | - | - | - | - | - | 57,4 | 70,2 |
| | A4-70 | [kN] | 9,9 | 15,7 | 22,5 | 28,0 | 38,1 | 52,3 | - | - |
| Shear $V_{Rec}$ | 5.8 | [kN] | 5,1 | 8,6 | 12,0 | 22,3 | 34,9 | 50,3 | 65,7 | 80,0 |
| | 8.8 | [kN] | 8,6 | 13,1 | 19,4 | 36,0 | 56,0 | 80,6 | 105,1 | 128,0 |
| | A4-50 | [kN] | - | - | - | - | - | - | 34,5 | 42,0 |
| | A4-70 | [kN] | 6,0 | 9,2 | 13,7 | 25,2 | 39,4 | 56,8 | - | - |
| **Cracked normal concrete class C20/25** | | | | | | | | | | |
| Tension $N_{Rec}$ | 5.8 | [kN] | - | - | 12,3 | 16,2 | 21,8 | 29,6 | 38,1 | 47,6 |
| | 8.8 | [kN] | - | - | 12,3 | 16,2 | 21,8 | 29,6 | 38,1 | 47,6 |
| | A4-50 | [kN] | - | - | - | - | - | - | 38,1 | 47,6 |
| | A4-70 | [kN] | - | - | 12,3 | 16,2 | 21,8 | 29,6 | - | - |
| Shear $V_{Rec}$ | 5.8 | [kN] | - | - | 12,0 | 22,3 | 34,9 | 50,3 | 65,7 | 80,0 |
| | 8.8 | [kN] | - | - | 19,4 | 36,0 | 56,0 | 80,6 | 105,1 | 128,0 |
| | A4-50 | [kN] | - | - | - | - | - | - | 34,5 | 42,0 |
| | A4-70 | [kN] | - | - | 13,7 | 25,2 | 39,4 | 56,8 | - | - |

1) Partial safety factor $\gamma$ = 1.4 for load actions is considered

## Fire Resistance

Data in this section is based on the following criteria:

- Normal non-cracked and cracked concrete minimum C20/25
- Embedment depth as stated in table
- Fire attack from one side only
- $c \geq 2\ h_{ef}$ and $s \geq 4\ h_{ef}$

Values are valid for the use of carbon steel (minimum grade 5.8 acc. to EN 1993-1-8:2005+AC:2009) or stainless steel and high corrosion resistant steel (minimum grade 70 acc. to EN ISO 3506-1:2009) threaded rods.

If the edge distance, c is chosen in a way that steel failure / pullout is determined in the fire design, the following load values can also be applied to anchors under shear load.

| Fire resistance $N_{rk,fi}$ (kN) | Anchor size | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
|---|---|---|---|---|---|---|---|---|---|
| | Min. embedment $h_{ef,min}$ (mm) | ≥ 80 | ≥ 90 | ≥ 110 | ≥ 125 | ≥ 170 | ≥ 210 | ≥ 250 | ≥ 280 |
| Fire resistance duration $t_u$ (min) | 30 | 0,5 | 1,5 | 3,2 | 8,0 | 15,6 | 22,5 | 29,2 | 35,7 |
| | 60 | 0,4 | 1,1 | 2,3 | 5,9 | 11,7 | 16,9 | 21,9 | 26,8 |
| | 90 | 0,2 | 0,6 | 1,4 | 3,8 | 7,8 | 11,3 | 14,7 | 17,9 |
| | 120 | 0,1 | 0,4 | 0,9 | 2,7 | 5,9 | 8,5 | 11,0 | 13,5 |

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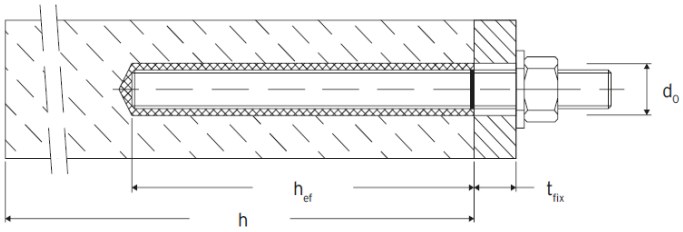
## Setting and Installation - Threaded Rod




## Installation Parameters

| Anchor size | | | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
|---|---|---|---|---|---|---|---|---|---|---|
| Nominal drill hole diameter | $d_0$ | [mm] | 10 | 12 | 14 | 18 | 24 | 28 | 32 | 35 |
| Effective embedment depth | $h_{ef,min}$ | [mm] | 60 | 60 | 70 | 80 | 90 | 96 | 108 | 120 |
| | $h_{ef,max}$ | [mm] | 96 | 120 | 144 | 192 | 240 | 288 | 324 | 360 |
| Maximum torque moment | $T_{inst} \leq$ | [Nm] | 10 | 20 | 40 | 80 | 120 | 160 | 180 | 200 |
| Minimum base material thickness | $h_{min}$ | [mm] | $h_{ef}$ + 30mm ≥ 100mm | | | $h_{ef} + 2d_0$ | | | | |
| 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 |
| Critical spacing for splitting failure | $s_{cr,sp}$ | [mm] | $2\ c_{cr,sp}$ | | | | | | | |
| Critical edge distance for splitting failure | $c_{cr,sp}$ | [mm] | $1{,}0\ h_{ef}$ | | | | | for $h/h_{ef} \geq 2{,}0$ | | |
| | | | $2\ h_{ef}(2{,}5 - h/h_{ef})$ | | | | | for $2{,}0 > h/h_{ef} > 1{,}3$ | | |
| | | | $2{,}4\ h_{ef}$ | | | | | for $h/h_{ef} \leq 1{,}3$ | | |
| Critical spacing for concrete cone failure | $s_{cr,N}$ | [mm] | $2\ c_{cr,N}$ | | | | | | | |
| Critical edge distance for concrete cone failure | $c_{cr,N}$ | [mm] | $1{,}5\ h_{ef}$ | | | | | | | |

## Working and Curing Time

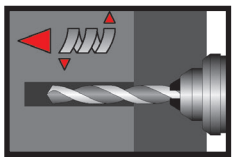
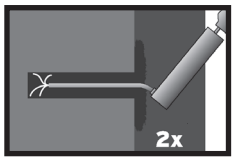
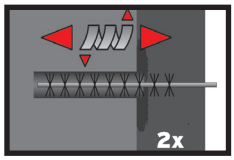
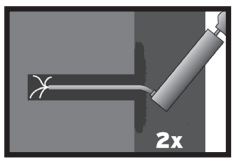
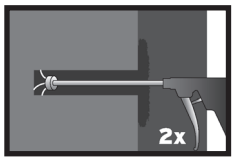
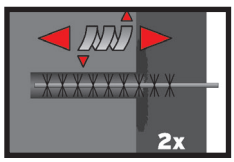
| Concrete temperature | Gelling working time | Minimum curing time in dry concrete | Minimum curing time in wet concrete |
|---|---|---|---|
| ≥ +5°C | 120 mins | 50 hours | 100 hours |
| ≥ +10°C | 90 mins | 30 hours | 60 hours |
| ≥ +20°C | 30 mins | 10 hours | 20 hours |
| ≥ +30°C | 20 mins | 6 hours | 12 hours |
| ≥ +40°C | 12 mins | 4 hours | 8 hours |

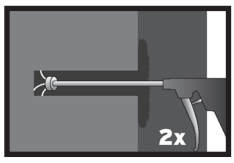
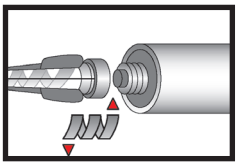
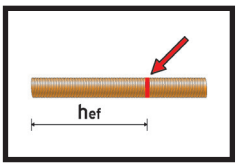
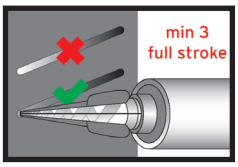
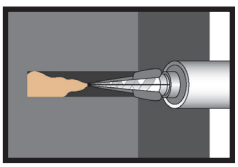
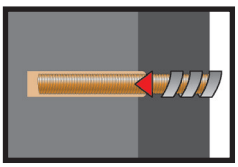
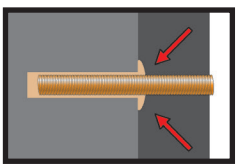
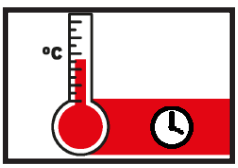
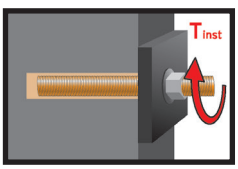
## Cleaning and Setting Tools

| Threaded rod size | Drill bit diameter, $d_0$ (mm) | Brush diameter (min-max) [mm] | Piston plug diameter (mm) |
|---|---|---|---|
| M8 | 10 | 10,5 - 12,0 | No plug required |
| M10 | 12 | 12,5 - 14,0 | |
| M12 | 14 | 14,5 - 16,0 | |
| M16 | 18 | 18,5 - 20,0 | |
| M20 | 24 | 24,5 - 26,0 | 24 |
| M24 | 28 | 28,5 - 30,0 | 28 |
| M27 | 32 | 32,5 - 34,0 | 32 |
| M30 | 35 | 35,5 - 37,0 | 35 |

## Installation Instructions

Refer to the Material Safety Data Sheet (MSDS) for guidance on safe and proper handling.

| | | |
|---|---|---|
| **Drilling of the bore hole** | | |
|  | **1a.** | Drill with hammer drill a hole into the base material to the size and embedment depth required by the selected anchor (page 6). In cases of aborted drill holes, the drill hole must be filled with mortar. |
| **Attention! Standing water in the bore hole must be removed before cleaning.** | | |
| **Hand pump cleaning for dry and wet bore holes with diameter $d_0 \leq 20$mm and bore hole depth $h_0 \leq 240$mm** | | |
|  | **2a.** | Starting from the bottom or back of the bore hole, blow the hole clean by a hand pump a minimum of two times. |
|  | **2b.** | Check brush diameter (table above). Brush the hole with an appropriate sized wire brush a minimum of two times in a twisting motion. If the brush does not reach the bottom of the bore hole a brush extension must be used. |
|  | **2c.** | Finally blow the hole clean again with a hand pump a minimum of two times. |
| **Compressed air cleaning for dry, wet and water-filled bore holes with all diameter in non-cracked and cracked concrete** | | |
|  | **2a.** | Starting from the bottom or back of the bore hole, blow the hole clean with compressed air (oil free, min. 6 bar) a minimum of two times until return air stream is free of noticeable dust. If the tool does not reach the bottom of the bore hole an extension must be used. |
|  | **2b.** | Check brush diameter (table above). Brush the hole with an appropriate sized wire brush a minimum of two times in a twisting motion. If the brush does not reach the bottom of the bore hole a brush extension must be used. |

| | | |
|---|---|---|
|  | **2c.** | Finally blow the hole clean again with compressed air (oil free, min. 6 bar) a minimum of two times until return air stream is free of noticeable dust. If the tool does not reach the bottom of the bore hole an extension must be used. |
| **After cleaning, the bore hole has to be protected against re-contamination in an appropriate way, until dispensing the mortar in the bore hole. If necessary, the cleaning has to be repeated directly before dispensing the mortar. In-flowing water must not contaminate the bore hole again.** | | |
|  | **3.** | Attach the supplied static mixer nozzle to the cartridge and load the cartridge into the correct dispensing tool. For every working interruption longer than the recommended working time (page 5) as well as for new cartridges, a new static mixer nozzle shall be used. |
|  | **4.** | Prior to inserting the anchor rod into the filled bore hole, the position of the embedment depth shall be marked on the anchor rods. |
|  | **5.** | Prior to dispensing into the anchor hole, squeeze out separately a minimum of three full strokes and discard non-uniformly mixed adhesive components until the mortar shows a consistent grey colour. |
|  | **6.** | Starting from the bottom or back of the cleaned anchor hole, fill the hole up to approximately two-thirds with mortar. Slowly withdraw the static mixing nozzle as the hole fills to avoid creating air pockets. For embedment larger than 190mm an extension nozzle must be used. For overhead and horizontal installation a piston plug (page 6) and extension nozzle must be used. Observe the gel/working times given on page 5. |
|  | **7.** | Push the threaded rod or reinforcing bar into the anchor hole while turning slightly to ensure positive distribution of the mortar until the embedment depth is reached. The anchor should be free of dirt, grease, oil or other foreign material. |
|  | **8.** | Be sure that the anchor is fully seated at the bottom of the hole and that excess mortar is visible at the top of the hole. If these requirements are not fulfilled the application has to be restarted. For overhead applications the anchor rod should be fixed (eg. using wedges). |
|  | **9.** | Allow the adhesive to cure to the specified time prior to applying any load or torque. Do not move or load the anchor until it is fully cured (refer to page 5). |
|  | **10.** | After full curing, the fixture can be installed up to the max. torque (page 5) by using a calibrated torque wrench. |

VJ Technology

## Loads - Rebar


## Criteria

Data in this section is based on the following criteria:

- VJ Technology Injection System HPE: HPE injection mortar with rebar (grade B500B)
- Correct anchor setting according to installation instructions
- Static and quasi-static loading
- Single anchor with edge distance, $c \geq 2{,}4 \times h_{ef}$ and spacing, $s \geq 4{,}8 \times h_{ef}$
- A single "typical" effective embedment depth as detailed in the table below
- Minimum thickness of base material as per typical effective embedment depth
- Temperature range I: -40°C to +40°C (max long term temperature +24°C and max short term temperature +40°C)
- Hammer drilled holes
- **Bold** figures denote steel failure

Note that for full design with combinations of tensile/shear loads and edge distance/spacing influence, the complete assessment ETA-10/0087 must be considered.

## Embedment

| Anchor size | | ø8 | ø10 | ø12 | ø14 | ø16 | ø20 | ø25 | ø28 | ø32 |
|---|---|---|---|---|---|---|---|---|---|---|
| Typical effective embedment depth[1], $h_{ef}$ | [mm] | 80 | 90 | 110 | 125 | 145 | 170 | 210 | 270 | 300 |
| Min base material thickness for typical effective embedment, $h_{min}$ | [mm] | 110 | 120 | 145 | 165 | 185 | 220 | 275 | 340 | 380 |

1) Full embedment depth range is shown in the Installation Parameters table

## Characteristic Resistance

| Anchor size | | | ø8 | ø10 | ø12 | ø14 | ø16 | ø20 | ø25 | ø28 | ø32 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Non-cracked normal concrete class C20/25** | | | | | | | | | | | |
| Tension $N_{Rk}$ | B500B | [kN] | **27,5** | 39,6 | 53,9 | 70,6 | 87,5 | 111,9 | 153,7 | 224,0 | 262,4 |
| Shear $V_{Rk}$ | B500B | [kN] | **13,8** | **21,7** | **31,1** | **42,2** | **55,3** | **86,4** | **135,0** | **169,4** | **221,1** |
| **Cracked normal concrete class C20/25** | | | | | | | | | | | |
| Tension $N_{Rk}$ | B500B | [kN] | - | - | 31,1 | 38,5 | 47,4 | 64,1 | 90,7 | 130,6 | 165,9 |
| Shear $V_{Rk}$ | B500B | [kN] | - | - | **31,1** | **42,4** | **55,3** | **86,4** | **135,0** | **169,4** | **221,1** |

## Design Resistance

| Anchor size | | | ø8 | ø10 | ø12 | ø14 | ø16 | ø20 | ø25 | ø28 | ø32 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Non-cracked normal concrete class C20/25** | | | | | | | | | | | |
| Tension $N_{Rd}$ | B500B | [kN] | 15,6 | 22,0 | 29,9 | 39,2 | 48,6 | 53,3 | 73,2 | 106,7 | 125,0 |
| Shear $V_{Rd}$ | B500B | [kN] | 9,2 | 14,5 | 20,7 | 28,2 | 36,9 | 57,6 | 90,0 | 112,9 | 147,4 |
| **Cracked normal concrete class C20/25** | | | | | | | | | | | |
| Tension $N_{Rd}$ | B500B | [kN] | - | - | 17,3 | 21,4 | 26,3 | 30,5 | 43,2 | 62,2 | 79,0 |
| Shear $V_{Rd}$ | B500B | [kN] | - | - | 20,7 | 28,2 | 36,9 | 57,6 | 90,0 | 112,9 | 147,4 |

## Recommended Load[1)]

| Anchor size | | | ø8 | ø10 | ø12 | ø14 | ø16 | ø20 | ø25 | ø28 | ø32 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Non-cracked normal concrete class C20/25** | | | | | | | | | | | |
| Tension $N_{Rec}$ | B500B | [kN] | 11,2 | 15,7 | 21,4 | 28,0 | 34,7 | 38,1 | 52,3 | 76,2 | 89,3 |
| Shear $V_{Rec}$ | B500B | [kN] | 6,5 | 10,3 | 14,8 | 20,2 | 26,3 | 41,1 | 64,3 | 80,7 | 105,3 |
| **Cracked normal concrete class C20/25** | | | | | | | | | | | |
| Tension $N_{Rec}$ | B500B | [kN] | - | - | 12,3 | 15,3 | 18,8 | 21,8 | 30,9 | 44,4 | 56,4 |
| Shear $V_{Rec}$ | B500B | [kN] | - | - | 14,8 | 20,2 | 26,3 | 41,1 | 64,3 | 80,7 | 105,3 |

1) Partial safety factor $\gamma$ = 1.4 for load actions is considered

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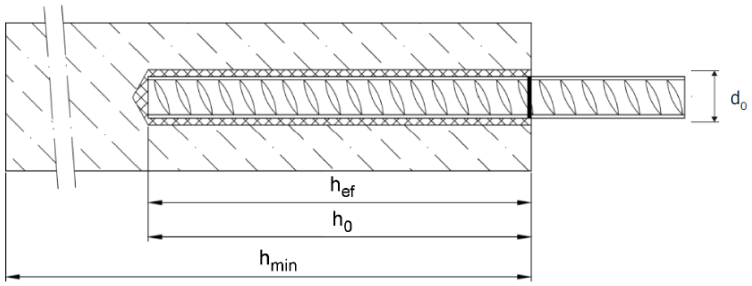
## Setting and Installation - Rebar




### Installation Parameters

| Anchor size | | | ø8 | ø10 | ø12 | ø14 | ø16 | ø20 | ø25 | ø28 | ø32 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Nominal drill hole diameter | $d_0$ | [mm] | 12 | 14 | 16 | 18 | 20 | 24 | 32 | 35 | 40 |
| Effective embedment depth | $h_{ef,min}$ | [mm] | 60 | 60 | 70 | 75 | 80 | 90 | 100 | 112 | 128 |
| | $h_{ef,max}$ | [mm] | 96 | 120 | 144 | 168 | 192 | 240 | 300 | 336 | 384 |
| Minimum base material thickness | $h_{min}$ | [mm] | $h_{ef}$ + 30mm ≥ 100mm | | $h_{ef} + 2d_0$ | | | | | | |
| 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 |

### Working and Curing Time

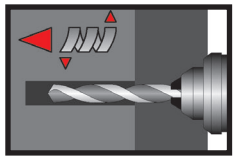
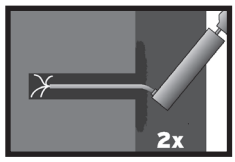
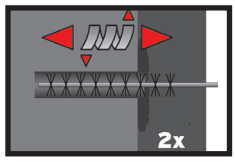
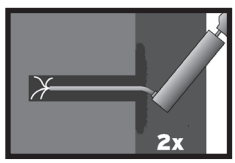
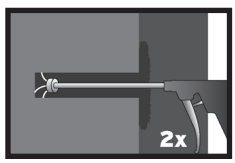
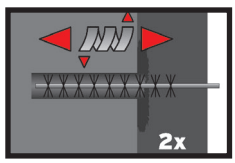
| Concrete temperature | Gelling working time | Minimum curing time in dry concrete | Minimum curing time in wet concrete |
|---|---|---|---|
| ≥ +5°C | 120 mins | 50 hours | 100 hours |
| ≥ +10°C | 90 mins | 30 hours | 60 hours |
| ≥ +20°C | 30 mins | 10 hours | 20 hours |
| ≥ +30°C | 20 mins | 6 hours | 12 hours |
| ≥ +40°C | 12 mins | 4 hours | 8 hours |

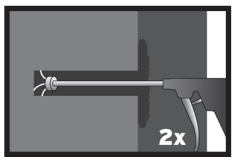
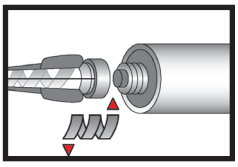
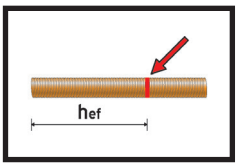
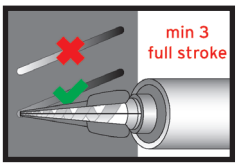
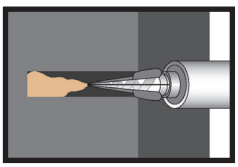
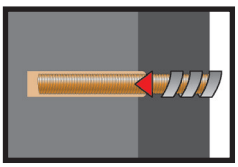
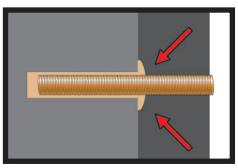
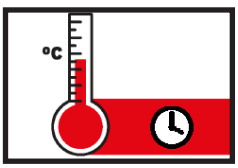
## Cleaning and Setting Tools

| Rebar size | Drill bit diameter, $d_0$ (mm) | Brush diameter (min-max) [mm] | Piston plug diameter (mm) |
|---|---|---|---|
| ø8 | 12 | 12,5 - 14,0 | No plug required |
| ø10 | 14 | 14,5 - 16,0 | |
| ø12 | 16 | 16,5 - 18,0 | |
| ø14 | 18 | 18,5 - 20,0 | |
| ø16 | 20 | 20,5 - 22,0 | |
| ø20 | 24 | 24,5 - 26,0 | 24 |
| ø25 | 32 | 32,5 - 34,0 | 32 |
| ø28 | 35 | 35,5 - 37,0 | 35 |
| ø32 | 40 | 40,5 - 41,5 | 38 |

## Installation Instructions

Refer to the Material Safety Data Sheet (MSDS) for guidance on safe and proper handling.

| | | |
|---|---|---|
| **Drilling of the bore hole** | | |
|  | **1a.** | Drill with hammer drill a hole into the base material to the size and embedment depth required by the selected anchor (page 10). In cases of aborted drill holes, the drill hole must be filled with mortar. |
| **Attention! Standing water in the bore hole must be removed before cleaning.** | | |
| **Hand pump cleaning for dry and wet bore holes with diameter $d_0 \leq 20$mm and bore hole depth $h_0 \leq 240$mm** | | |
|  | **2a.** | Starting from the bottom or back of the bore hole, blow the hole clean by a hand pump a minimum of two times. |
|  | **2b.** | Check brush diameter (table above). Brush the hole with an appropriate sized wire brush a minimum of two times in a twisting motion. If the brush does not reach the bottom of the bore hole a brush extension must be used. |
|  | **2c.** | Finally blow the hole clean again with a hand pump a minimum of two times. |
| **Compressed air cleaning for dry, wet and water-filled bore holes with all diameter in non-cracked and cracked concrete** | | |
|  | **2a.** | Starting from the bottom or back of the bore hole, blow the hole clean with compressed air (oil free, min. 6 bar) a minimum of two times until return air stream is free of noticeable dust. If the tool does not reach the bottom of the bore hole an extension must be used. |
|  | **2b.** | Check brush diameter (table above). Brush the hole with an appropriate sized wire brush a minimum of two times in a twisting motion. If the brush does not reach the bottom of the bore hole a brush extension must be used. |

| | | |
|---|---|---|
|  | **2c.** | Finally blow the hole clean again with compressed air (oil free, min. 6 bar) a minimum of two times until return air stream is free of noticeable dust. If the tool does not reach the bottom of the bore hole an extension must be used. |
| **After cleaning, the bore hole has to be protected against re-contamination in an appropriate way, until dispensing the mortar in the bore hole. If necessary, the cleaning has to be repeated directly before dispensing the mortar. In-flowing water must not contaminate the bore hole again.** | | |
|  | **3.** | Attach the supplied static mixer nozzle to the cartridge and load the cartridge into the correct dispensing tool. For every working interruption longer than the recommended working time (page 10) as well as for new cartridges, a new static mixer nozzle shall be used. |
|  | **4.** | Prior to inserting the anchor rod into the filled bore hole, the position of the embedment depth shall be marked on the anchor rods. |
|  | **5.** | Prior to dispensing into the anchor hole, squeeze out separately a minimum of three full strokes and discard non-uniformly mixed adhesive components until the mortar shows a consistent grey colour. |
|  | **6.** | Starting from the bottom or back of the cleaned anchor hole, fill the hole up to approximately two-thirds with mortar. Slowly withdraw the static mixing nozzle as the hole fills to avoid creating air pockets. For embedment larger than 190mm an extension nozzle must be used. For overhead and horizontal installation a piston plug (page 11) and extension nozzle must be used. Observe the gel/working times given on page 10. |
|  | **7.** | Push the threaded rod or reinforcing bar into the anchor hole while turning slightly to ensure positive distribution of the mortar until the embedment depth is reached. The anchor should be free of dirt, grease, oil or other foreign material. |
|  | **8.** | Be sure that the anchor is fully seated at the bottom of the hole and that excess mortar is visible at the top of the hole. If these requirements are not fulfilled the application has to be restarted. For overhead applications the anchor rod should be fixed (eg. using wedges). |
|  | **9.** | Allow the adhesive to cure to the specified time prior to applying any load or torque. Do not move or load the anchor until it is fully cured (refer to page 10). |

VJ Technology

## Material Properties

### Mechanical Properties

| Properties | Test Method | Result |
|---|---|---|
| UV resistance | | pass |
| watertightness | DIN EN 12390-8 | pass |
| temperature stability | | 72°C |
| viscosity (A-component) | ASTM D 2556 | 16600 mPas |
| viscosity (B-component) | ASTM D 2556 | 16400 mPas |
| pH-value | | > 12 |
| density | | 1,41 kg/dm$^3$ |
| compressive strength | EN 196-1 | 120 N/mm$^2$ |
| flexural strength | EN 196-1 | 42 N/mm$^2$ |
| E modulus | EN 196-1 | 10800 N/mm$^2$ |
| shrinkage | | < 0,02 % |
| shore D hardness | | 85 |
| electrical resistance | IEC 93 | 1,2 x 10$^{12}$ Ωm |
| thermal conductivity | IEC 60093 | 0,47 W/m ·K |

### Chemical Resistance

| Chemical | Concentration | Resistant |
|---|---|---|
| acetic acid | 40 | X |
| laitance | | O |
| acetone | 10 | X |
| ammonia, aqueous solution | 5 | O |
| aniline | 100 | X |
| beer | 100 | O |
| chlorine | all | O |
| benzol | 100 | X |
| boric acid, aqueous solution | | O |
| calcium carbonate, suspended in water | all | O |
| calcium chloride, suspended in water | | O |
| calcium hydroxide, suspended in water | | O |
| carbon tetrachloride | 100 | O |
| caustic soda solution | 40 | O |
| citric acid | all | O |
| chlorine water, swimming pool | all | O |
| deisel oil | 100 | O |
| ethyl alcohol, aqueous solution | 50 | X |

| Chemical | Concentration | Resistant |
|---|---|---|
| formic acid | 100 | X |
| formaldehyde, aqueous solution | 30 | O |
| freon | | O |
| fuel oil | | O |
| gasoline (premium grade) | 100 | O |
| glycol (ethylene glycol) | | O |
| hydrochloric acid (muriatic acid) | conc. | X |
| hydrogen peroxide | 30 | X |
| isopropyl alcohol | 100 | X |
| lactic acid | all | X |
| linseed oil | 100 | O |
| lubricating oil | 100 | O |
| magnesium chloride, aqueous solution | all | O |
| methanol | 100 | O |
| motor oil (SAE 20 W-50) | 100 | O |
| nitric acid | 10 | X |
| oleic acid | 100 | O |
| perchloroethylene | 100 | O |
| petroleum | 100 | O |

## Chemical Resistance Cont.

| Chemical | Concentration | Resistant |
|---|---|---|
| phenol, aqueous solution | 8 | X |
| phosphoric acid | 85 | O |
| phosphoric acid | 10 | O |
| potash lye (potassium hydroxide, 10% and 40% solution) | | O |
| potassium carbonate, aqueous solution | all | O |
| potassium chlorite, aqueous solution | all | O |
| potassium nitrate, aqueous solution | all | O |

| Chemical | Concentration | Resistant |
|---|---|---|
| sea water, salty | all | O |
| sodium carbonate | all | O |
| sodium chloride, aqueous solution | all | O |
| sulfuric acid | 30 | X |
| tartaric acid | all | O |
| tetrachloroethylene | 100 | O |
| toluene | | X |
| trichloroethylene | 100 | X |
| turpentine | 100 | O |

O Resistant when subject to brief periods of chemical contact with a fully cured product
X Not resistant

For further advice please contact VJT Technical dept.

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