# KER-VSF-380 KON VINYLESTER BONDED ANCHOR FOR USE IN CONCRETE

| SIZE | Product Code | | | Anchor | | Fixture | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Thread Dia. | Length | Maximum Thickness | | | Hole Dia. |
| | Steel Class 5.8 | Steel Class 8.8 | Steel Grade A4 | d | L | $t_{fix}$ for $h_{nom,min}$ | $t_{fix}$ for $h_{nom,std}$ | $t_{fix}$ for $h_{nom,max}$ | $d_f$ |
| | | | | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] |
| M8 | R-STUDS-08810 | R-STUDS-088110-88 | R-STUDS-08110-A4 | 8 | 110 | 40 | 20 | - | 9 |
| | R-STUDS-08160 | - | R-STUDS-08160-A4 | 8 | 160 | 90 | 70 | 50 | 9 |
| M10 | R-STUDS-10130 | R-STUDS-10130-88 | R-STUDS-10130-A4 | 10 | 130 | 48 | 28 | - | 12 |
| | R-STUDS-10170 | - | R-STUDS-10170-A4 | 10 | 170 | 88 | 68 | 38 | 12 |
| | R-STUDS-10190 | - | R-STUDS-10190-A4 | 10 | 190 | 108 | 88 | 58 | 12 |
| M12 | R-STUDS-12160 | R-STUDS-12160-88 | R-STUDS-12160-A4 | 12 | 160 | 65 | 35 | - | 14 |
| | R-STUDS-12190 | - | R-STUDS-12190-A4 | 12 | 190 | 95 | 65 | 30 | 14 |
| | R-STUDS-12220 | - | R-STUDS-12220-A4 | 12 | 220 | 125 | 95 | 60 | 14 |
| | R-STUDS-12260 | - | R-STUDS-12260-A4 | 12 | 260 | 165 | 135 | 100 | 14 |
| | R-STUDS-12300 | - | R-STUDS-12300-A4 | 12 | 300 | 205 | 175 | 140 | 14 |
| M16 | R-STUDS-16190 | R-STUDS-16190-88 | R-STUDS-16190-A4 | 16 | 190 | 71 | 46 | - | 18 |
| | R-STUDS-16220 | - | R-STUDS-16220-A4 | 16 | 220 | 101 | 76 | 11 | 18 |
| | R-STUDS-16260 | - | R-STUDS-16260-A4 | 16 | 260 | 141 | 116 | 51 | 18 |
| | R-STUDS-16300 | - | R-STUDS-16300-A4 | 16 | 300 | 181 | 156 | 91 | 18 |
| | R-STUDS-16380 | - | R-STUDS-16380-A4 | 16 | 380 | 261 | 236 | 171 | 18 |
| M20 | R-STUDS-20260 | R-STUDS-20260-88 | R-STUDS-20260-A4 | 20 | 260 | 117 | 67 | - | 22 |
| | R-STUDS-20300 | - | R-STUDS-20300-A4 | 20 | 300 | 157 | 107 | 37 | 22 |
| | R-STUDS-20350 | - | R-STUDS-20350-A4 | 20 | 350 | 207 | 157 | 87 | 22 |
| M24 | R-STUDS-24300 | R-STUDS-24300-88 | R-STUDS-24300-A4 | 24 | 300 | 132 | 62 | - | 26 |
| M30 | R-STUDS-30380 | R-STUDS-30380-88 | R-STUDS-30380-A4 | 30 | 380 | 181 | 70 | - | 32 |

## SUBSTRATE:

- Cracked and non-cracked concrete C20/25 - C50/60
- Reinforced and unreinforced concrete
- Dry or wet concrete (Category 1)
- Flooded holes, except sea water (Category 2)

## FEATURES

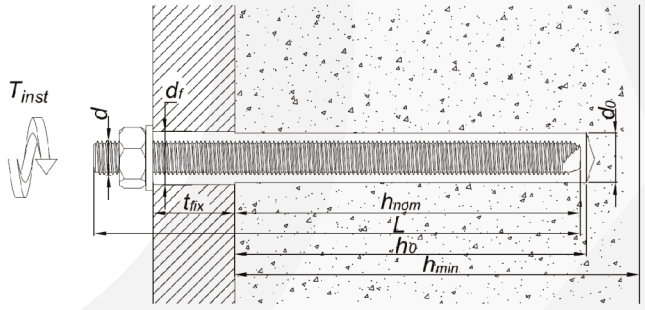
- Severl embedment depths
- Styrene free resin (odourless)
- ETAG 001-5 option 1
- R-KER – basic version
- R-KER-W – winter version
- R-KER-S – summer version
- R-STUDS – carbon steel, class 5.8 acc. EN ISO 898-1
- R-STUDS-88 – carbon steel, class 8.8 acc. EN ISO 898-1
- Coating thickness min. 5µm acc. EN ISO 4042
- R-STUDS-A4 – stainless steel, grade A4-70, A4-80acc. EN ISO 3506
- Steel material 1.4401, 1.4404, 1.457 acc. EN 10088

# KER-VSF-380 KON VINYLESTER BONDED ANCHOR FOR USE IN CONCRETE

## MECHANICAL PROPERTIES

| SIZE | | | | M8 | M10 | M12 | M16 | M20 | M24 | M30 |
|---|---|---|---|---|---|---|---|---|---|---|
| **NOMINAL TENSILE STRENGTH** | R-STUDS | $f_{uk}$ | [N/mm²] | 500 | 500 | 500 | 500 | 500 | 500 | 500 |
| | R-STUDS-88 | | | 800 | 800 | 800 | 800 | 800 | 800 | 800 |
| | R-STUDS-A4 | | | 700 | 700 | 700 | 700 | 700 | 700 | 700 |
| **NOMINAL YIELD STRESS** | R-STUDS | $f_{YK}$ | [N/mm²] | 400 | 400 | 400 | 400 | 400 | 400 | 400 |
| | R-STUDS-88 | | | 640 | 640 | 640 | 640 | 640 | 640 | 640 |
| | R-STUDS-A4 | | | 350 | 350 | 350 | 350 | 350 | 350 | 350 |
| **CROSS-SECTIONAL AREA** | | $A_s$ | [mm²] | 36.6 | 58.0 | 84.3 | 157.0 | 245.0 | 352.8 | 559.8 |
| **SECTION MODULUS** | | $W_{el}$ | [mm³] | 31.2 | 62.3 | 109.2 | 277.5 | 541.0 | 935.0 | 1868.0 |
| **CHARACTERISTIC BENDING RESISTANCE** | R-STUDS | $M^0_{Rks}$ | [Nm] | 19 | 37 | 65 | 166 | 324 | 561 | 1124 |
| | R-STUDS-88 | | | 30 | 60 | 105 | 266 | 519 | 898 | 1799 |
| | R-STUDS-A4 | | | 26 | 52 | 92 | 233 | 454 | 786 | 1574 |
| **DESIGN BENDING MOMENT** | R-STUDS | M | [Nm] | 11 | 21 | 37 | 95 | 185 | 321 | 642 |
| | R-STUDS-88 | | | 17 | 34 | 60 | 152 | 297 | 513 | 1028 |
| | R-STUDS-A4 | | | 12 | 24 | 42 | 107 | 208 | 360 | 721 |

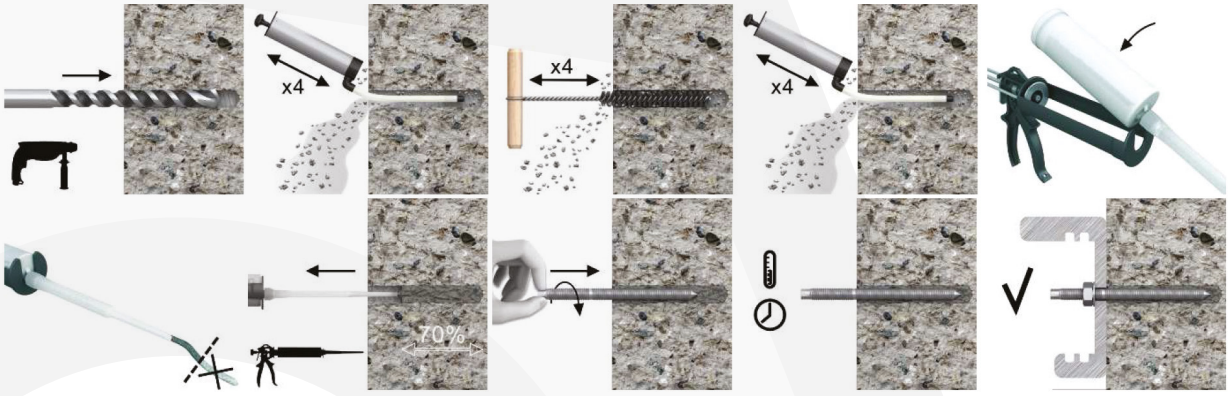
## INSTALLATION DATA




| SIZE | | | M8 | M10 | M12 | M16 | M20 | M24 | M30 |
|---|---|---|---|---|---|---|---|---|---|
| **Thread Diameter** | **d** | **[mm]** | 8 | 10 | 12 | 16 | 20 | 24 | 30 |
| **Hole Diameter in Substrate** | $d_0$ | **[mm]** | 10 | 12 | 14 | 18 | 24 | 28 | 25 |
| **Installation Torque** | $T_{inst}$ | **[Nm]** | 10 | 20 | 40 | 80 | 120 | 180 | 300 |
| **Min. Hole Depth in Substrate** | $h_0$ | **[mm]** | $h_{ef} + 5$ | | | | | | |
| **Installation Depth** | $h_{nom,min}$ | **[mm]** | 60 | 70 | 80 | 100 | 120 | 140 | 165 |
| | $h_{nom,std}$ | **[mm]** | 80 | 90 | 110 | 125 | 170 | 210 | 240 |
| | $h_{nom,max}$ | **[mm]** | 100 | 120 | 145 | 190 | 240 | 290 | 360 |
| **Min. Substrate Thickness** | $h_{min}$ | **[mm]** | $h_{ef} + 30 \geq 100$ | | | | $h_{ef} + 2 \cdot d_0$ | | |
| **Min. Spacing** | $s_{min}$ | **[mm]** | $0.5 \cdot h_{ef} \geq 40$ | | | | | | |
| **Min. Edge Distance** | $c_{min}$ | **[mm]** | $0.5 \cdot h_{ef} \geq 40$ | | | | | | |

# KER-VSF-380 KON VINYLESTER BONDED ANCHOR FOR USE IN CONCRETE

## INSTALLATION GUIDE




## INSTALLATION GUIDE:

1. Drill hole to the correct diameter and depth for stud size being used.
2. Clean the hole with brush and hand pump at least four times each.
3. Insert cartridge into gun and attach nozzle.
4. Dispense to waste until an even colour is obtained. Insert the mixing nozzle to the far end of the hole and inject the resin, slowly withdrawing the nozzle as the hole is filled to 70% of its depth.
5. Immediately insert the rod, slowly and with a slight twisting motion.
6. Remove any excess resin around the hole before it sets and leave it undisturbed until the curing time elapses.
7. Attach fixture and tighten the nut to the required torque.

## MINIMUM CURING AND WORKING TIME

| RESIN TEMPERATURE [°C] | CONCRETE TEMPERATURE [°C] | CURING TIME* [h] | WORKING TIME [min] |
|---|---|---|---|
| 5 | -20 | - | - |
| 5 | -15 | - | - |
| 5 | -10 | - | - |
| 5 | -5 | 360 | 60 |
| 5 | 0 | 180 | 40 |
| 5 | 5 | 120 | 20 |
| 10 | 10 | 80 | 12 |
| 15 | 15 | 60 | 8 |
| 20 | 20 | 45 | 5 |
| 25 | 30 | 20 | 2 |
| 25 | 40 | 10 | 0,5 |
| 25 | 45 | - | - |
| 25 | 50 | - | - |

* FOR WET CONCRETE THE CURING TIME MUST BE DOUBLED.

# KER-VSF-380 KON VINYLESTER BONDED ANCHOR FOR USE IN CONCRETE

## BASIC PERFORMANCE FOR SINGLE ANCHOR
## MINIMUM EMBEDMENT DEPTH

Performance data for single anchor without influence of edge distance and spacing

| SUBSTRATE | | | NON-CRACKED CONCRETE | | | | | | | CRACKED CONCRETE | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SIZE | | | M8 | M10 | M12 | M16 | M20 | M24 | M30 | M12 | M16 | M20 | M24 |
| MINIMUM EMBEDMENT DEPTH | | | | | | | | | | | | | |
| EMBEDMENT DEPTH | $h_{ef}$ | [mm] | 60 | 70 | 80 | 100 | 120 | 140 | 165 | 80 | 100 | 120 | 140 |
| MEAN ULTIMATE LOADS | | | | | | | | | | | | | |
| R-STUDS (5.8) | TENSION LOADS $N_{RU,m}$ | [kN] | 21.6 | 34.8 | 50.4 | 78.0 | 102.5 | 129.1 | 165.0 | 30.2 | 34.8 | 46.6 | 65.1 |
| | SHEAR LOADS $V_{RU,m}$ | [kN] | 18.3 | 29.0 | 42.2 | 78.5 | 122.5 | 176.5 | 280.5 | 42.2 | 78.5 | 122.5 | 176.5 |
| R-STUDS-88 (8.8) | TENSION LOADS $N_{RU,m}$ | [kN] | 30.2 | 44.1 | 55.6 | 78.0 | 102.5 | 129.1 | 165.0 | 30.2 | 34.8 | 46.6 | 65.1 |
| | SHEAR LOADS $V_{RU,m}$ | [kN] | 29.3 | 46.4 | 67.4 | 125.6 | 196.0 | 282.4 | 448.4 | 67.4 | 125.6 | 196.0 | 282.4 |
| R-STUDS-A4 (A4-70) | TENSION LOADS $N_{RU,m}$ | [kN] | 30.2 | 44.1 | 55.6 | 78.0 | 102.5 | 129.1 | 165.0 | 30.2 | 34.8 | 46.6 | 65.1 |
| | SHEAR LOADS $V_{RU,m}$ | [kN] | 25.6 | 40.6 | 59.0 | 109.9 | 171.5 | 247.1 | 392.7 | 59.0 | 109.9 | 171.5 | 247.1 |
| CHARACTERISTIC LOADS | | | | | | | | | | | | | |
| R-STUDS (5.8) | TENSION LOADS $N_{RK}$ | [kN] | 18.0 | 29.0 | 36.1 | 50.5 | 66.4 | 83.7 | 107.0 | 19.6 | 22.6 | 30.2 | 42.2 |
| | SHEAR LOADS $V_{RK}$ | [kN] | 9.0 | 14.0 | 21.0 | 39.0 | 61.0 | 88.0 | 140.0 | 21.0 | 39.0 | 61.0 | 88.0 |
| R-STUDS-88 (8.8) | TENSION LOADS $N_{RK}$ | [kN] | 19.6 | 28.6 | 36.1 | 50.5 | 66.4 | 83.7 | 107.0 | 19.6 | 22.6 | 30.2 | 42.2 |
| | SHEAR LOADS $V_{RK}$ | [kN] | 15.0 | 23.0 | 34.0 | 63.0 | 98.0 | 141.0 | 224.0 | 34.0 | 63.0 | 98.0 | 141.0 |
| R-STUDS-A4 (A4-70) | TENSION LOADS $N_{RK}$ | [kN] | 19.6 | 28.6 | 36.1 | 50.5 | 66.4 | 83.7 | 107.0 | 19.6 | 22.6 | 30.2 | 42.2 |
| | SHEAR LOADS $V_{RK}$ | [kN] | 13.0 | 20.0 | 29.0 | 55.0 | 86.0 | 124.0 | 196.0 | 29.0 | 55.0 | 86.0 | 124.0 |
| DESIGN LOADS | | | | | | | | | | | | | |
| R-STUDS (5.8) | SHEAR LOADS $V_{Rd}$ | [kN] | 10.9 | 15.9 | 20.1 | 28.1 | 36.9 | 39.9 | 50.9 | 10.9 | 12.6 | 16.8 | 20.1 |
| | TENSION LOADS $N_{Rd}$ | [kN] | 7.2 | 11.2 | 16.8 | 31.2 | 48.8 | 70.4 | 112.0 | 16.8 | 31.2 | 44.8 | 70.4 |
| R-STUDS-88 (8.8) | SHEAR LOADS $V_{Rd}$ | [kN] | 10.9 | 15.9 | 20.1 | 28.1 | 36.9 | 39.9 | 50.9 | 10.9 | 12.6 | 16.8 | 20.1 |
| | TENSION LOADS $N_{Rd}$ | [kN] | 12.0 | 18.4 | 27.2 | 50.4 | 78.4 | 112.8 | 179.2 | 27.2 | 50.4 | 78.4 | 112.8 |
| R-STUDS-A4 (A4-70) | SHEAR LOADS $V_{Rd}$ | [kN] | 10.9 | 15.9 | 20.1 | 28.1 | 36.9 | 39.9 | 50.9 | 10.9 | 12.6 | 16.8 | 20.1 |
| | TENSION LOADS $N_{Rd}$ | [kN] | 8.3 | 12.8 | 18.6 | 35.3 | 55.1 | 79.5 | 125.6 | 18.6 | 35.3 | 55.1 | 79.5 |
| RECOMMENDED LOADS* | | | | | | | | | | | | | |
| R-STUDS (5.8) | TENSION LOADS $N_{rec}$ | [kN] | 7.8 | 11.3 | 14.3 | 20.0 | 26.3 | 28.5 | 36.4 | 7.8 | 9.0 | 12.0 | 14.7 |
| | SHEAR LOADS $V_{rec}$ | [kN] | 5.1 | 8.0 | 12.0 | 22.3 | 34.9 | 50.3 | 80.0 | 12.0 | 22.3 | 34.9 | 50.3 |
| R-STUDS-88 (8.8) | TENSION LOADS $N_{rec}$ | [kN] | 7.8 | 11.3 | 14.3 | 20.0 | 26.3 | 28.5 | 36.4 | 7.8 | 9.0 | 12.0 | 14.7 |
| | SHEAR LOADS $V_{rec}$ | [kN] | 8.6 | 13.1 | 19.4 | 36.0 | 56.0 | 80.6 | 128.0 | 19.4 | 36.0 | 56.0 | 80.6 |
| R-STUDS-A4 (A4-70) | TENSION LOADS $N_{rec}$ | [kN] | 7.8 | 11.3 | 14.3 | 20.0 | 26.3 | 28.5 | 36.4 | 7.8 | 9.0 | 12.0 | 14.7 |
| | SHEAR LOADS $V_{rec}$ | [kN] | 5.9 | 9.1 | 13.3 | 25.2 | 39.4 | 56.8 | 89.7 | 13.3 | 25.2 | 39.4 | 56.8 |

STEEL FAILURE

CONCRETE CONE FAILURE

* Partial safety factor 1,4

Load for category of use: 1 – Dry or wet concrete; 2 – Water filled holes

For reinforecment concentrated (∅10mm in spacing <100mm or ∅> 10mm in spacing <150mm) apply a reduction factor for concrete

$\psi_{re} = 0,5 + h_{ef} / 200 \leq 1$

# KER-VSF-380 KON VINYLESTER BONDED ANCHOR FOR USE IN CONCRETE

## BASIC PERFORMANCE FOR SINGLE ANCHOR
## STANDARD EMBEDMENT DEPTH

Performance data for single anchor without influence of edge distance and spacing

| SUBSTRATE | | | NON-CRACKED CONCRETE | | | | | | | CRACKED CONCRETE | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SIZE | | | M8 | M10 | M12 | M16 | M20 | M24 | M30 | M12 | M16 | M20 | M24 |
| STANDARD EMBEDMENT DEPTH | | | | | | | | | | | | | |
| EMBEDMENT DEPTH | $h_{ef}$ | [mm] | 80 | 90 | 110 | 125 | 170 | 210 | 240 | 110 | 125 | 170 | 210 |
| MEAN ULTIMATE LOADS | | | | | | | | | | | | | |
| R-STUDS (5.8) | TENSION LOADS $N_{RU,m}$ | [kN] | 21.6 | 34.8 | 50.4 | 87.3 | 115.2 | 156.1 | 185.4 | 41.7 | 43.7 | 65.9 | 97.6 |
| | SHEAR LOADS $V_{RU,m}$ | [kN] | 18.3 | 29.0 | 42.2 | 78.5 | 122.5 | 176.5 | 280.5 | 42.2 | 78.5 | 122.5 | 176.5 |
| R-STUDS-88 (8.8) | TENSION LOADS $N_{RU,m}$ | [kN] | 34.9 | 55.3 | 56.6 | 87.3 | 115.2 | 156.1 | 185.4 | 41.7 | 73.7 | 65.9 | 97.6 |
| | SHEAR LOADS $V_{RU,m}$ | [kN] | 29.3 | 46.4 | 67.4 | 125.6 | 196.0 | 282.4 | 448.4 | 67.4 | 125.6 | 196.0 | 282.4 |
| R-STUDS-A4 (A4-70) | TENSION LOADS $N_{RU,m}$ | [kN] | 31.3 | 49.3 | 56.6 | 87.3 | 115.2 | 156.1 | 185.4 | 41.7 | 73.7 | 65.9 | 97.6 |
| | SHEAR LOADS $V_{RU,m}$ | [kN] | 25.6 | 40.6 | 59.0 | 109.9 | 171.5 | 247.1 | 392.7 | 59.0 | 109.9 | 171.5 | 247.1 |
| CHARACTERISTIC LOADS | | | | | | | | | | | | | |
| R-STUDS (5.8) | TENSION LOADS $N_{RK}$ | [kN] | 18.0 | 29.0 | 42.0 | 69.1 | 101.5 | 142.5 | 158.3 | 26.9 | 28.3 | 42.7 | 63.3 |
| | SHEAR LOADS $V_{RK}$ | [kN] | 9.0 | 14.0 | 21.0 | 39.0 | 60.0 | 88.0 | 140.0 | 21.0 | 39.0 | 61.0 | 88.0 |
| R-STUDS-88 (8.8) | TENSION LOADS $N_{RK}$ | [kN] | 26.1 | 36.8 | 53.9 | 69.1 | 101.5 | 142.5 | 158.3 | 26.9 | 28.3 | 42.7 | 63.3 |
| | SHEAR LOADS $V_{RK}$ | [kN] | 15.0 | 23.0 | 34.0 | 63.0 | 98.0 | 141.0 | 224.0 | 34.0 | 63.0 | 98.0 | 141.0 |
| R-STUDS-A4 (A4-70) | TENSION LOADS $N_{RK}$ | [kN] | 26.0 | 36.8 | 53.9 | 69.1 | 101.5 | 142.5 | 158.3 | 26.9 | 28.3 | 42.7 | 63.3 |
| | SHEAR LOADS $V_{RK}$ | [kN] | 13.0 | 20.0 | 29.0 | 55.0 | 86.0 | 124.0 | 196.0 | 29.0 | 55.0 | 86.0 | 124.0 |
| DESIGN LOADS | | | | | | | | | | | | | |
| R-STUDS (5.8) | SHEAR LOADS $V_{Rd}$ | [kN] | 12.0 | 19.3 | 28.0 | 38.4 | 56.4 | 67.9 | 75.4 | 15.0 | 15.7 | 23.7 | 30.1 |
| | TENSION LOADS $N_{Rd}$ | [kN] | 7.2 | 11.2 | 16.8 | 31.2 | 48.8 | 70.4 | 112.0 | 16.8 | 31.2 | 44.8 | 70.4 |
| R-STUDS-88 (8.8) | SHEAR LOADS $V_{Rd}$ | [kN] | 14.5 | 20.4 | 29.9 | 38.4 | 56.4 | 67.9 | 75.4 | 15.0 | 15.7 | 23.7 | 30.1 |
| | TENSION LOADS $N_{Rd}$ | [kN] | 12.0 | 18.4 | 17.2 | 50.4 | 78.4 | 112.8 | 179.2 | 27.2 | 50.4 | 78.4 | 112.8 |
| R-STUDS-A4 (A4-70) | SHEAR LOADS $V_{Rd}$ | [kN] | 13.9 | 20.4 | 29.9 | 38.4 | 56.4 | 67.9 | 75.4 | 15.0 | 15.7 | 23.7 | 30.1 |
| | TENSION LOADS $N_{Rd}$ | [kN] | 8.3 | 12.8 | 18.6 | 35.3 | 55.1 | 79.5 | 125.6 | 18.6 | 35.3 | 55.1 | 79.5 |
| RECOMMENDED LOADS* | | | | | | | | | | | | | |
| R-STUDS (5.8) | TENSION LOADS $N_{rec}$ | [kN] | 8.6 | 13.8 | 20.0 | 27.4 | 40.3 | 48.5 | 53.8 | 10.7 | 11.2 | 17.0 | 21.5 |
| | SHEAR LOADS $V_{rec}$ | [kN] | 5.1 | 8.0 | 12.0 | 22.3 | 34.9 | 50.3 | 80.0 | 12.0 | 22.3 | 34.9 | 50.3 |
| R-STUDS-88 (8.8) | TENSION LOADS $N_{rec}$ | [kN] | 10.4 | 14.6 | 21.4 | 27.4 | 40.3 | 48.5 | 53.8 | 10.7 | 11.2 | 17.0 | 21.5 |
| | SHEAR LOADS $V_{rec}$ | [kN] | 8.6 | 13.1 | 19.4 | 36.0 | 56.0 | 80.6 | 128.0 | 19.4 | 36.0 | 56.0 | 80.6 |
| R-STUDS-A4 (A4-70) | TENSION LOADS $N_{rec}$ | [kN] | 9.9 | 14.6 | 21.4 | 27.4 | 40.3 | 48.5 | 53.8 | 10.7 | 11.2 | 17.0 | 21.5 |
| | SHEAR LOADS $V_{rec}$ | [kN] | 5.9 | 9.1 | 13.3 | 25.2 | 39.4 | 56.8 | 89.7 | 13.1 | 25.2 | 39.4 | 56.8 |

STEEL FAILURE

* Partial safety factor 1,4

Load for category of use: 1 – Dry or wet concrete; 2 – Water filled holes

For reinforecment concentrated (∅10mm in spacing <100mm or ∅> 10mm in spacing <150mm) apply a reduction factor for concrete

$\psi_{re} = 0,5 + h_{ef} / 200 \leq 1$

# KER-VSF-380 KON VINYLESTER BONDED ANCHOR FOR USE IN CONCRETE

## BASIC PERFORMANCE FOR SINGLE ANCHOR
## MAXIMUM EMBEDMENT DEPTH

Performance data for single anchor without influence of edge distance and spacing

| SUBSTRATE | | | NON-CRACKED CONCRETE | | | | | | | CRACKED CONCRETE | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SIZE | | | M8 | M10 | M12 | M16 | M20 | M24 | M30 | M12 | M16 | M20 | M24 |
| MAXIMUM EMBEDMENT DEPTH | | | | | | | | | | | | | |
| EMBEDMENT DEPTH | $h_{ef}$ | [mm] | 80 | 90 | 110 | 125 | 170 | 210 | 240 | 110 | 125 | 170 | 210 |
| MEAN ULTIMATE LOADS | | | | | | | | | | | | | |
| R-STUDS (5.8) | TENSION LOADS $N_{RU,m}$ | [kN] | 21.6 | 34.8 | 50.4 | 93.8 | 146.7 | 211.6 | 256.7 | 50.4 | 66.3 | 93.0 | 135.0 |
| | SHEAR LOADS $V_{RU,m}$ | [kN] | 18.3 | 29.0 | 42.2 | 78.5 | 122.5 | 176.5 | 280.5 | 42.2 | 78.5 | 122.5 | 176.5 |
| R-STUDS-88 (8.8) | TENSION LOADS $N_{RU,m}$ | [kN] | 34.9 | 55.3 | 76.0 | 114.4 | 156.6 | 215.5 | 256.7 | 50.4 | 66.3 | 93.0 | 135.0 |
| | SHEAR LOADS $V_{RU,m}$ | [kN] | 29.3 | 46.4 | 67.4 | 125.6 | 196.0 | 282.4 | 448.4 | 67.4 | 125.6 | 196.0 | 282.4 |
| R-STUDS-A4 (A4-70) | TENSION LOADS $N_{RU,m}$ | [kN] | 31.3 | 49.3 | 70.9 | 114.4 | 156.6 | 215.5 | 256.7 | 50.4 | 66.3 | 93.0 | 135.0 |
| | SHEAR LOADS $V_{RU,m}$ | [kN] | 25.6 | 40.6 | 59.0 | 109.9 | 171.5 | 247.1 | 392.7 | 59.0 | 109.9 | 171.5 | 247.1 |
| CHARACTERISTIC LOADS | | | | | | | | | | | | | |
| R-STUDS (5.8) | TENSION LOADS $N_{RK}$ | [kN] | 18.0 | 29.0 | 42.0 | 78.0 | 122.0 | 176.0 | 237.5 | 35.5 | 43.0 | 60.3 | 87.3 |
| | SHEAR LOADS $V_{RK}$ | [kN] | 9.0 | 14.0 | 21.0 | 39.0 | 61.0 | 88.0 | 140.0 | 21.0 | 39.0 | 61.0 | 88.0 |
| R-STUDS-88 (8.8) | TENSION LOADS $N_{RK}$ | [kN] | 29.0 | 46.0 | 67.0 | 105.1 | 143.3 | 196.8 | 237.5 | 35.5 | 43.0 | 60.3 | 87.3 |
| | SHEAR LOADS $V_{RK}$ | [kN] | 15.0 | 23.0 | 34.0 | 63.0 | 98.0 | 141.0 | 224.0 | 34.0 | 63.0 | 98..0 | 141.0 |
| R-STUDS-A4 (A4-70) | TENSION LOADS $N_{RK}$ | [kN] | 26.0 | 41.0 | 59.0 | 105.1 | 143.3 | 196.8 | 237.5 | 35.5 | 43.0 | 60.3 | 87.3 |
| | SHEAR LOADS $V_{RK}$ | [kN] | 13.0 | 20.0 | 29.0 | 55.0 | 86.0 | 124.0 | 196.0 | 29.0 | 55.0 | 86.0 | 124.0 |
| DESIGN LOADS | | | | | | | | | | | | | |
| R-STUDS (5.8) | SHEAR LOADS $V_{Rd}$ | [kN] | 12.0 | 19.3 | 28.0 | 52.0 | 79.6 | 93.7 | 113.1 | 19.7 | 23.9 | 33.5 | 41.6 |
| | TENSION LOADS $N_{Rd}$ | [kN] | 7.2 | 11.2 | 16.8 | 31.2 | 48.8 | 70.4 | 112.0 | 16.8 | 31.2 | 48.8 | 70.4 |
| R-STUDS-88 (8.8) | SHEAR LOADS $V_{Rd}$ | [kN] | 18.2 | 27.2 | 39.4 | 58.4 | 79.6 | 93.7 | 113.1 | 19.7 | 23.9 | 33.5 | 41.6 |
| | TENSION LOADS $N_{Rd}$ | [kN] | 12.0 | 18.4 | 27.2 | 50.4 | 78.4 | 112.8 | 179.2 | 27.2 | 50.4 | 78.4 | 112.8 |
| R-STUDS-A4 (A4-70) | SHEAR LOADS $V_{Rd}$ | [kN] | 13.9 | 21.9 | 31.6 | 58.4 | 79.6 | 93.7 | 113.1 | 19.7 | 23.9 | 33.5 | 41.6 |
| | TENSION LOADS $N_{Rd}$ | [kN] | 8.3 | 12.8 | 18.5 | 35.3 | 55.1 | 79.5 | 125.6 | 18.5 | 35.3 | 55.1 | 79.5 |
| RECOMMENDED LOADS* | | | | | | | | | | | | | |
| R-STUDS (5.8) | TENSION LOADS $N_{rec}$ | [kN] | 8.6 | 13.8 | 20.0 | 37.1 | 56.9 | 66.9 | 80.8 | 14.1 | 17.1 | 23.9 | 29.7 |
| | SHEAR LOADS $V_{rec}$ | [kN] | 5.1 | 8.0 | 12.0 | 22.3 | 34.9 | 50.3 | 80.0 | 12.0 | 22.3 | 34.9 | 50.3 |
| R-STUDS-88 (8.8) | TENSION LOADS $N_{rec}$ | [kN] | 13.0 | 19.4 | 28.2 | 41.7 | 56.9 | 66.9 | 80.8 | 14.1 | 17.1 | 23.9 | 29.7 |
| | SHEAR LOADS $V_{rec}$ | [kN] | 8.6 | 13.1 | 19.4 | 36.0 | 56.0 | 80.6 | 128.0 | 19.4 | 36.0 | 56.0 | 80.6 |
| R-STUDS-A4 (A4-70) | TENSION LOADS $N_{rec}$ | [kN] | 9.9 | 15.7 | 22.6 | 41.7 | 56.9 | 66.9 | 80.8 | 14.1 | 17.1 | 23.9 | 29.7 |
| | SHEAR LOADS $V_{rec}$ | [kN] | 5.9 | 9.1 | 13.3 | 25.2 | 39.4 | 56.8 | 89.7 | 13.3 | 25.2 | 39.4 | 56.8 |

STEEL FAILURE

* Partial safety factor 1,4

Load for category of use: 1 – Dry or wet concrete; 2 – Water filled holes

For reinforecment concentrated (∅10mm in spacing <100mm or ∅> 10mm in spacing <150mm) apply a reduction factor for concrete

$\psi_{re} = 0,5 + h_{ef} / 200 \leq 1$