# R-KER with Threaded Rods

**High performance vinylester resin approved for use in cracked and non-cracked concrete**


## Approvals and Reports

- ETA-10/0055

## Product information

### Features and benefits

- Approved for use with threaded rods for use in cracked and non-cracked concrete (EAD 330499-00-0601)
- Suitable for use in low temperatures (down to -20°C for winter option) enables use throughout the year
- Winter version can be used in warmer temperatures for faster curing
- Suitable for use in dry or wet substrates and water filled holes
- Rapid bonding time enables quick execution of works
- Very high load capacity
- Anchor does not generate tensions in the substrate which enables R-KER to be specified where closer edge and spacing distances are required

### Applications

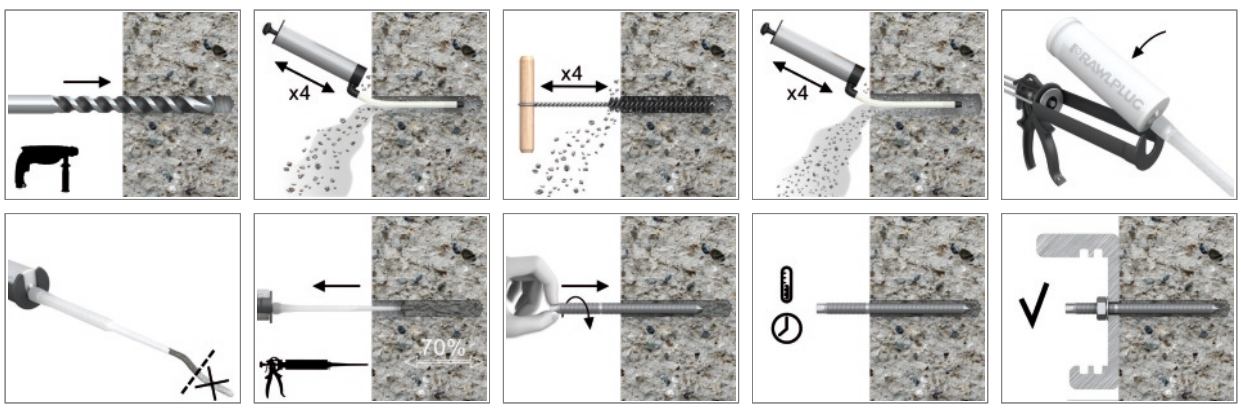
- Curtain walling
- Balustrading
- Handrails
- Canopies
- Large panel reinforcing system - Copy Eco
- Cable conduits and trays
- Fencing & gates manufacturing and installation
- Pipework/ductwork supports
- Platforms
- Pipelines systems
- Passenger lifts

### Base materials

**Approved for use in:**

- Cracked concrete C20/25-C50/60
- Non-cracked concrete C20/25-C50/60

## Installation guide



## Product information

1. Drill hole to the required diameter and depth for stud size being used.
2. Clean the hole thoroughly with brush and hand pump at least four times before installation.
3. Insert cartridge into gun and attach nozzle.
4. Dispense to waste until even colour is obtained.
5. Insert the mixer nozzle to the bottom of the drill hole and inject resin, slowly withdrawing the nozzle as the hole is filled to 70% of its depth.
6. Immediately insert the stud, slowly and with slight twisting motion. 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.

| Product Code | Resin | Description / Resin Type | Volume [ml] |
|---|---|---|---|
| R-KER-300 | R-KER | Styrene Free Vinylester Resin | 300 |
| R-KER-345 | | | 345 |
| R-KER-380 | | | 380 |
| R-KER-400 | | | 400 |
| R-KER-300-W | R-KER-W | Low Temperature (Winter) / Rapid Cure Styrene Free Vinylester Resin | 300 |
| R-KER-380-W | | | 380 |
| R-KER-400-W | | | 400 |
| R-KER-380-S | R-KER-S | High Temperature (Summer) / Slow Cure Styrene Free Vinylester Resin | 380 |
| R-KER-400-S | | | 400 |

R-STUDS

| Size | Product Code | | | Anchor | | Fixture | | |
|---|---|---|---|---|---|---|---|---|
| | Steel class 5.8 | Steel class 8.8 | Steel grade A4 | Diameter | Length | Hole diameter | Max. thickness $t_{fix}$ for: | |
| | | | | d | L | $d_f$ | $h_{nom,min}$ | $h_{nom,max}$ |
| | | | | [mm] | [mm] | [mm] | [mm] | [mm] |
| M8 | R-STUDS-08110 | R-STUDS-08110-88 | R-STUDS-08110-A4 | 8 | 110 | 9 | 40 | - |
| | R-STUDS-08160 | - | R-STUDS-08160-A4 | 8 | 160 | 9 | 90 | 50 |
| M10 | R-STUDS-10130 | R-STUDS-10130-88 | R-STUDS-10130-A4 | 10 | 130 | 12 | 48 | - |
| | R-STUDS-10170 | - | R-STUDS-10170-A4 | 10 | 170 | 12 | 88 | 38 |
| | R-STUDS-10190 | - | R-STUDS-10190-A4 | 10 | 190 | 12 | 108 | 58 |
| M12 | R-STUDS-12160 | R-STUDS-12160-88 | R-STUDS-12160-A4 | 12 | 160 | 14 | 65 | - |
| | R-STUDS-12190 | - | R-STUDS-12190-A4 | 12 | 190 | 14 | 95 | 30 |
| | R-STUDS-12220 | - | R-STUDS-12220-A4 | 12 | 220 | 14 | 125 | 60 |
| | R-STUDS-12260 | - | R-STUDS-12260-A4 | 12 | 260 | 14 | 165 | 100 |
| | R-STUDS-12300 | - | R-STUDS-12300-A4 | 12 | 300 | 14 | 205 | 140 |
| M16 | R-STUDS-16190 | R-STUDS-16190-88 | R-STUDS-16190-A4 | 16 | 190 | 18 | 71 | - |
| | R-STUDS-16220 | R-STUDS-16220-88 | R-STUDS-16220-A4 | 16 | 220 | 18 | 101 | 11 |
| | R-STUDS-16260 | - | R-STUDS-16260-A4 | 16 | 260 | 18 | 141 | 51 |
| | R-STUDS-16300 | - | R-STUDS-16300-A4 | 16 | 300 | 18 | 181 | 91 |
| | R-STUDS-16380 | - | R-STUDS-16380-A4 | 16 | 380 | 18 | 261 | 171 |
| M20 | R-STUDS-20260 | R-STUDS-20260-88 | R-STUDS-20260-A4 | 20 | 260 | 22 | 117 | - |
| | R-STUDS-20300 | - | R-STUDS-20300-A4 | 20 | 300 | 22 | 157 | 37 |
| | R-STUDS-20350 | - | R-STUDS-20350-A4 | 20 | 350 | 22 | 207 | 87 |
| M24 | R-STUDS-24300 | R-STUDS-24300-88 | R-STUDS-24300-A4 | 24 | 300 | 26 | 132 | - |
| M30 | R-STUDS-30380 | R-STUDS-30380-88 | R-STUDS-30380-A4 | 30 | 380 | 32 | 180 | - |

# Installation data

R-STUDS

| 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 | 35 |
| Hole diameter in fixture | $d_f$ | [mm] | 9 | 12 | 14 | 18 | 22 | 26 | 32 |
| Min. hole depth in substrate | $h_0$ | [mm] | $h_{nom}$ + 5 | $h_{nom}$ + 5 | $h_{nom}$ + 5 | $h_{nom}$ + 5 | $h_{nom}$ + 5 | $h_{nom}$ + 5 | $h_{nom}$ + 5 |
| Min. substrate thickness | $h_{min}$ | [mm] | $h_{nom}$ + 30 ≥ 100 | $h_{nom}$ + 30 ≥ 100 | $h_{nom}$ + 30 ≥ 100 | $h_{nom}$ + 30 ≥ 100 | $h_{nom}$ + $2d_0$ | $h_{nom}$ + $2d_0$ | $h_{nom}$ + $2d_0$ |
| Installation torque | $T_{inst}$ | [Nm] | 10 | 20 | 40 | 80 | 120 | 180 | 300 |
| Min. spacing | $s_{min}$ | [mm] | 0.5 * $h_{nom}$ ≥ 40 | 0.5 * $h_{nom}$ ≥ 40 | 0.5 * $h_{nom}$ ≥ 40 | 0.5 * $h_{nom}$ ≥ 40 | 0.5 * $h_{nom}$ ≥ 40 | 0.5 * $h_{nom}$ ≥ 40 | 0.5 * $h_{nom}$ ≥ 40 |
| Min. edge distance | $c_{min}$ | [mm] | 0.5 * $h_{nom}$ ≥ 40 | 0.5 * $h_{nom}$ ≥ 40 | 0.5 * $h_{nom}$ ≥ 40 | 0.5 * $h_{nom}$ ≥ 40 | 0.5 * $h_{nom}$ ≥ 40 | 0.5 * $h_{nom}$ ≥ 40 | 0.5 * $h_{nom}$ ≥ 40 |
| **MINIMUM EMBEDMENT DEPTH** | | | | | | | | | |
| Min. installation depth | $h_{nom,min}$ | [mm] | 60 | 70 | 80 | 100 | 120 | 140 | 165 |
| **MAXIMUM EMBEDMENT DEPTH** | | | | | | | | | |
| Min. installation depth | $h_{nom, max}$ | [mm] | 100 | 120 | 145 | 190 | 240 | 290 | 360 |

## Minimum working and curing time

R-KER

| Resin temperature | Concrete temperature | Curing time* | Working time |
|---|---|---|---|
| [°C] | [°C] | [min] | [min] |
| 5 | -20 | - | - |
| 5 | -15 | - | - |
| 5 | -10 | - | - |
| 5 | -5 | 6 h | 60 |
| 5 | 0 | 3 h | 40 |
| 5 | 5 | 2 h | 20 |
| 10 | 10 | 80 | 12 |
| 15 | 15 | 60 | 8 |
| 20 | 20 | 45 | 5 |
| 25 | 25 | 30 | 3 |
| 25 | 30 | 20 | 2 |
| 25 | 40 | 10 | 0.5 |
| 25 | 45 | - | - |
| 25 | 50 | - | - |

**For wet concrete the curing time must be doubled*

# Installation data

R-KER-W

| Resin temperature | Concrete temperature | Curing time* | Working time |
|---|---|---|---|
| [°C] | [°C] | [min] | [min] |
| 5 | -20 | 24 h | 100 |
| 5 | -15 | 16 h | 60 |
| 5 | -10 | 8 h | 30 |
| 5 | -5 | 4 h | 16 |
| 5 | 0 | 2 h | 12 |
| 5 | 5 | 1 h | 8 |
| 10 | 10 | 45 | 5 |
| 15 | 15 | 30 | 3 |
| 20 | 20 | 10 | 2 |
| 25 | 25 | - | - |
| 25 | 30 | - | - |
| 25 | 40 | - | - |
| 25 | 45 | - | - |
| 25 | 50 | - | - |

**For wet concrete the curing time must be doubled*

R-KER-S

| Resin temperature | Concrete temperature | Curing time* | Working time |
|---|---|---|---|
| [°C] | [°C] | [min] | [min] |
| 5 | -20 | - | - |
| 5 | -15 | - | - |
| 5 | -10 | - | - |
| 5 | -5 | 24 h | 65 |
| 5 | 0 | 16 h | 50 |
| 5 | 5 | 12 h | 35 |
| 10 | 10 | 8 h | 20 |
| 15 | 15 | 6 h | 12 |
| 20 | 20 | 4 h | 9 |
| 25 | 25 | 3 h | 7 |
| 25 | 30 | 2 h | 6 |
| 25 | 40 | 45 | 4 |
| 25 | 45 | 35 | 3 |
| 25 | 50 | 25 | 2 |

**For wet concrete the curing time must be doubled*

# Mechanical properties

| Size | | | M8 | M10 | M12 | M16 | M20 | M24 | M30 |
|---|---|---|---|---|---|---|---|---|---|
| **R-STUDS Metric Threaded Rods - Steel Class 5.8** | | | | | | | | | |
| Nominal ultimate tensile strength - tension | $f_{uk}$ | [N/mm²] | 500 | 500 | 500 | 500 | 500 | 500 | 500 |
| Nominal yield strength - tension | $f_{yk}$ | [N/mm²] | 400 | 400 | 400 | 400 | 400 | 400 | 400 |
| Cross sectional area - tension | $A_s$ | [mm²] | 36.6 | 58 | 84.3 | 157 | 245 | 352.8 | 559.8 |
| Elastic section modulus | $W_{el}$ | [mm³] | 31.2 | 62.3 | 109.2 | 277.5 | 541 | 935 | 1868 |
| Characteristic bending resistance | $M^0_{Rk,s}$ | [Nm] | 19 | 37 | 65 | 166 | 324 | 561 | 1124 |
| Design bending resistance | M | [Nm] | 15 | 30 | 52 | 133 | 259 | 449 | 899 |
| Allowable bending resistance | $M_{rec}$ | [Nm] | 11 | 21 | 37 | 95 | 185 | 321 | 642 |

# Mechanical properties

| Size | | | M8 | M10 | M12 | M16 | M20 | M24 | M30 |
|---|---|---|---|---|---|---|---|---|---|
| **R-STUDS Metric Threaded Rods - Steel Class 8.8** | | | | | | | | | |
| Nominal ultimate tensile strength - tension | $f_{uk}$ | [N/mm²] | 800 | 800 | 800 | 800 | 800 | 800 | 800 |
| Nominal yield strength - tension | $f_{yk}$ | [N/mm²] | 640 | 640 | 640 | 640 | 640 | 640 | 640 |
| Cross sectional area - tension | $A_s$ | [mm²] | 36.6 | 58 | 84.3 | 157 | 245 | 352.8 | 559.8 |
| Elastic section modulus | $W_{el}$ | [mm³] | 31.2 | 62.3 | 109.2 | 277.5 | 541 | 935 | 1868 |
| Characteristic bending resistance | $M^0_{Rk,s}$ | [Nm] | 30 | 60 | 105 | 266 | 519 | 898 | 1799 |
| Design bending resistance | M | [Nm] | 24 | 48 | 84 | 213 | 416 | 718 | 1439 |
| Allowable bending resistance | $M_{rec}$ | [Nm] | 17 | 34 | 60 | 152 | 297 | 513 | 1028 |
| **R-STUDS Metric Threaded Rods - A4** | | | | | | | | | |
| Nominal ultimate tensile strength - tension | $f_{uk}$ | [N/mm²] | 700 | 700 | 700 | 700 | 700 | 700 | 700 |
| Nominal yield strength - tension | $f_{yk}$ | [N/mm²] | 450 | 450 | 450 | 450 | 450 | 450 | 450 |
| Cross sectional area - tension | $A_s$ | [mm²] | 36.6 | 58 | 84.3 | 157 | 245 | 352.8 | 559.8 |
| Elastic section modulus | $W_{el}$ | [mm³] | 31.2 | 62.3 | 109.2 | 277.5 | 541 | 935 | 1868 |
| Characteristic bending resistance | $M^0_{Rk,s}$ | [Nm] | 26 | 52 | 92 | 233 | 454 | 786 | 1574 |
| Design bending resistance | M | [Nm] | 17 | 34 | 59 | 149 | 291 | 504 | 1009 |
| Allowable bending resistance | $M_{rec}$ | [Nm] | 12 | 24 | 42 | 107 | 208 | 360 | 721 |

# Basic performance data

R-STUDS

Performance data for single anchor without influence of edge distance and spacing - ETAG 001

| Size | | M8 | M10 | M12 | M16 | M20 | M24 | M30 | M12 | M16 | M20 | M24 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Substrate | | Non-cracked concrete | | | | | | | Cracked concrete | | | |
| **MEAN ULTIMATE LOAD** | | | | | | | | | | | | |
| TENSION LOAD $N_{Ru,m}$ | | | | | | | | | | | | |
| R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8 | | | | | | | | | | | | |
| Minimum embedment depth | [kN] | 18.9 | 37.4 | 44.1 | 67.5 | 88.7 | 111.8 | 140.0 | 32.2 | 34.2 | 46.6 | 65.1 |
| Maximum embedment depth | [kN] | 18.9 | 43.1 | 44.1 | 81.9 | 128.1 | 184.8 | 294.0 | 44.1 | 64.9 | 93.2 | 134.9 |
| R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8 | | | | | | | | | | | | |
| Minimum embedment depth | [kN] | 25.6 | 37.4 | 48.3 | 67.5 | 88.7 | 111.8 | 140.0 | 32.2 | 34.2 | 46.6 | 65.1 |
| Maximum embedment depth | [kN] | 30.5 | 48.3 | 70.4 | 132.3 | 203.6 | 251.5 | 305.4 | 58.4 | 64.9 | 93.2 | 134.9 |
| R-STUDS METRIC THREADED RODS - A4 | | | | | | | | | | | | |
| Minimum embedment depth | [kN] | 25.6 | 37.4 | 48.3 | 67.5 | 88.7 | 111.8 | 140.0 | 32.2 | 34.2 | 46.6 | 65.1 |
| Maximum embedment depth | [kN] | 27.3 | 43.1 | 62.0 | 115.5 | 179.6 | 251.5 | 305.4 | 58.4 | 64.9 | 93.2 | 134.9 |
| SHEAR LOAD $V_{Ru,m}$ | | | | | | | | | | | | |
| R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8 | | | | | | | | | | | | |
| Minimum embedment depth | [kN] | 11.3 | 25.8 | 26.5 | 49.1 | 76.9 | 110.9 | 176.4 | 26.5 | 49.1 | 76.9 | 110.9 |
| Maximum embedment depth | [kN] | 11.3 | 25.8 | 26.5 | 49.1 | 76.9 | 110.9 | 176.4 | 26.5 | 49.1 | 76.9 | 110.9 |
| R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8 | | | | | | | | | | | | |
| Minimum embedment depth | [kN] | 18.3 | 29.0 | 42.2 | 79.4 | 123.5 | 177.7 | 279.9 | 42.2 | 68.4 | 93.2 | 130.3 |
| Maximum embedment depth | [kN] | 18.3 | 29.0 | 42.2 | 79.4 | 123.5 | 177.7 | 282.9 | 42.2 | 79.4 | 123.5 | 177.7 |
| R-STUDS METRIC THREADED RODS - A4 | | | | | | | | | | | | |
| Minimum embedment depth | [kN] | 16.4 | 25.8 | 37.2 | 69.3 | 107.7 | 155.6 | 247.6 | 37.2 | 68.4 | 93.2 | 130.3 |
| Maximum embedment depth | [kN] | 16.4 | 25.8 | 37.2 | 69.3 | 107.7 | 155.6 | 247.6 | 37.2 | 69.3 | 107.7 | 155.6 |

## Basic performance data

| Size | | M8 | M10 | M12 | M16 | M20 | M24 | M30 | M12 | M16 | M20 | M24 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CHARACTERISTIC LOAD** | | | | | | | | | | | | |
| TENSION LOAD $N_{Rk}$ | | | | | | | | | | | | |
| R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8 | | | | | | | | | | | | |
| Minimum embedment depth | [kN] | 18.0 | 28.6 | 36.1 | 50.5 | 66.4 | 83.7 | 107.0 | 19.6 | 22.6 | 30.2 | 42.2 |
| Maximum embedment depth | [kN] | 18.0 | 41.0 | 42.0 | 78.0 | 122.0 | 176.0 | 237.5 | 35.5 | 43.0 | 60.3 | 87.5 |
| R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8 | | | | | | | | | | | | |
| Minimum embedment depth | [kN] | 19.6 | 28.6 | 36.1 | 50.5 | 66.4 | 83.7 | 107.0 | 19.6 | 22.6 | 30.2 | 42.2 |
| Maximum embedment depth | [kN] | 29.0 | 46.0 | 67.0 | 105.1 | 143.3 | 196.8 | 237.5 | 35.5 | 43.0 | 60.3 | 87.5 |
| R-STUDS METRIC THREADED RODS - A4 | | | | | | | | | | | | |
| Minimum embedment depth | [kN] | 19.6 | 28.6 | 36.1 | 50.5 | 66.4 | 83.7 | 107.0 | 19.6 | 22.6 | 30.2 | 42.2 |
| Maximum embedment depth | [kN] | 26.0 | 41.0 | 59.0 | 105.1 | 143.3 | 196.8 | 237.5 | 35.5 | 43.0 | 60.3 | 87.5 |
| SHEAR LOAD $V_{Rk}$ | | | | | | | | | | | | |
| R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8 | | | | | | | | | | | | |
| Minimum embedment depth | [kN] | 9.00 | 20.0 | 21.0 | 39.0 | 61.0 | 88.0 | 140.0 | 21.0 | 39.0 | 60.3 | 84.5 |
| Maximum embedment depth | [kN] | 9.00 | 20.0 | 21.0 | 39.0 | 61.0 | 88.0 | 140.0 | 21.0 | 39.0 | 61.0 | 88.0 |
| R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8 | | | | | | | | | | | | |
| Minimum embedment depth | [kN] | 15.0 | 23.0 | 34.0 | 63.0 | 98.0 | 141.0 | 214.1 | 34.0 | 45.2 | 60.3 | 84.5 |
| Maximum embedment depth | [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 METRIC THREADED RODS - A4 | | | | | | | | | | | | |
| Minimum embedment depth | [kN] | 13.0 | 20.0 | 29.0 | 55.0 | 86.0 | 124.0 | 196.0 | 29.0 | 45.2 | 60.3 | 84.5 |
| Maximum embedment depth | [kN] | 13.0 | 20.0 | 29.0 | 55.0 | 86.0 | 124.0 | 196.0 | 29.0 | 55.0 | 86.0 | 124.0 |
| **DESIGN LOAD** | | | | | | | | | | | | |
| TENSION LOAD $N_{Rd}$ | | | | | | | | | | | | |
| R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8 | | | | | | | | | | | | |
| Minimum embedment depth | [kN] | 10.9 | 15.9 | 20.1 | 28.1 | 36.9 | 39.8 | 51.0 | 10.9 | 12.6 | 16.8 | 20.1 |
| Maximum embedment depth | [kN] | 12.0 | 21.9 | 28.0 | 52.0 | 79.6 | 93.7 | 113.1 | 19.7 | 23.9 | 33.5 | 41.7 |
| R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8 | | | | | | | | | | | | |
| Minimum embedment depth | [kN] | 10.9 | 15.9 | 20.1 | 28.1 | 36.9 | 39.8 | 51.0 | 10.9 | 12.6 | 16.8 | 20.1 |
| Maximum embedment depth | [kN] | 18.2 | 27.2 | 39.5 | 58.4 | 79.6 | 93.7 | 113.1 | 19.7 | 23.9 | 33.5 | 41.7 |
| R-STUDS METRIC THREADED RODS - A4 | | | | | | | | | | | | |
| Minimum embedment depth | [kN] | 10.9 | 15.9 | 20.1 | 28.1 | 36.9 | 39.8 | 51.0 | 10.9 | 12.6 | 16.8 | 20.1 |
| Maximum embedment depth | [kN] | 13.9 | 21.9 | 31.6 | 58.4 | 79.6 | 93.7 | 113.1 | 19.7 | 23.9 | 33.5 | 41.7 |
| SHEAR LOAD $V_{Rd}$ | | | | | | | | | | | | |
| R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8 | | | | | | | | | | | | |
| Minimum embedment depth | [kN] | 7.20 | 12.8 | 16.8 | 31.2 | 48.8 | 70.4 | 112.0 | 16.8 | 30.2 | 40.2 | 56.3 |
| Maximum embedment depth | [kN] | 7.20 | 12.8 | 16.8 | 31.2 | 48.8 | 70.4 | 112.0 | 16.8 | 31.2 | 48.8 | 70.4 |
| R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8 | | | | | | | | | | | | |
| Minimum embedment depth | [kN] | 12.0 | 18.4 | 27.2 | 50.4 | 78.4 | 111.5 | 142.7 | 26.1 | 30.2 | 40.2 | 56.3 |
| Maximum embedment depth | [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 METRIC THREADED RODS - A4 | | | | | | | | | | | | |
| Minimum embedment depth | [kN] | 8.33 | 12.8 | 18.6 | 35.3 | 55.1 | 79.5 | 125.6 | 18.6 | 30.2 | 40.2 | 56.3 |
| Maximum embedment depth | [kN] | 8.33 | 12.8 | 18.6 | 35.3 | 55.1 | 79.5 | 125.6 | 18.6 | 35.3 | 55.1 | 79.5 |

## Basic performance data

| Size | | M8 | M10 | M12 | M16 | M20 | M24 | M30 | M12 | M16 | M20 | M24 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RECOMMENDED LOAD | | | | | | | | | | | | |
| TENSION LOAD $N_{rec}$ | | | | | | | | | | | | |
| R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8 | | | | | | | | | | | | |
| Minimum embedment depth | [kN] | 7.78 | 11.3 | 14.3 | 20.0 | 26.3 | 28.5 | 36.4 | 7.78 | 8.98 | 12.0 | 14.4 |
| Maximum embedment depth | [kN] | 8.57 | 15.7 | 20.0 | 37.1 | 56.9 | 66.9 | 80.8 | 14.1 | 17.1 | 23.9 | 29.8 |
| R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8 | | | | | | | | | | | | |
| Minimum embedment depth | [kN] | 7.78 | 11.3 | 14.3 | 20.0 | 26.3 | 28.5 | 36.4 | 7.78 | 8.98 | 12.0 | 14.4 |
| Maximum embedment depth | [kN] | 13.0 | 19.5 | 28.2 | 41.7 | 56.9 | 66.9 | 80.8 | 14.1 | 17.1 | 23.9 | 29.8 |
| R-STUDS METRIC THREADED RODS - A4 | | | | | | | | | | | | |
| Minimum embedment depth | [kN] | 7.78 | 11.3 | 14.3 | 20.0 | 26.3 | 28.5 | 36.4 | 7.78 | 8.98 | 12.0 | 14.4 |
| Maximum embedment depth | [kN] | 9.93 | 15.7 | 22.5 | 41.7 | 56.9 | 66.9 | 80.8 | 14.1 | 17.1 | 23.9 | 29.8 |
| SHEAR LOAD $V_{rec}$ | | | | | | | | | | | | |
| R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8 | | | | | | | | | | | | |
| Minimum embedment depth | [kN] | 5.14 | 9.16 | 12.0 | 22.3 | 34.9 | 50.3 | 80.0 | 12.0 | 21.5 | 28.7 | 40.2 |
| Maximum embedment depth | [kN] | 5.14 | 9.16 | 12.0 | 22.3 | 34.9 | 50.3 | 80.0 | 12.0 | 22.3 | 34.9 | 50.3 |
| R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8 | | | | | | | | | | | | |
| Minimum embedment depth | [kN] | 8.57 | 13.1 | 19.4 | 36.0 | 56.0 | 79.7 | 101.9 | 18.7 | 21.5 | 28.7 | 40.2 |
| Maximum embedment depth | [kN] | 8.57 | 13.1 | 19.4 | 36.0 | 56.0 | 80.6 | 128.0 | 19.4 | 36.0 | 56.0 | 80.6 |
| R-STUDS METRIC THREADED RODS - A4 | | | | | | | | | | | | |
| Minimum embedment depth | [kN] | 5.95 | 9.16 | 13.3 | 25.2 | 39.4 | 56.8 | 89.7 | 13.3 | 21.5 | 28.7 | 40.2 |
| Maximum embedment depth | [kN] | 5.95 | 9.16 | 13.3 | 25.2 | 39.4 | 56.8 | 89.7 | 13.3 | 25.2 | 39.4 | 56.8 |

# Design performance data

R-STUDS

| Size | | | M8 | M10 | M12 | M16 | M20 | M24 | M30 |
|---|---|---|---|---|---|---|---|---|---|
| **TENSION LOAD** | | | | | | | | | |
| **STEEL FAILURE; STEEL CLASS 5.8** | | | | | | | | | |
| Characteristic resistance | $N_{Rk,s}$ | [kN] | 18.00 | 29.00 | 42.00 | 78.00 | 122.00 | 176.00 | 280.00 |
| Partial safety factor | $\gamma_{Ms}$ | - | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| **STEEL FAILURE; STEEL CLASS 8.8** | | | | | | | | | |
| Characteristic resistance | $N_{Rk,s}$ | [kN] | 29.00 | 46.00 | 67.00 | 126.00 | 196.00 | 282.00 | 448.00 |
| Partial safety factor | $\gamma_{Ms}$ | - | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| **STEEL FAILURE; STEEL GRADE A4-70** | | | | | | | | | |
| Characteristic resistance | $N_{Rk,s}$ | [kN] | 26.00 | 41.00 | 59.00 | 110.00 | 171.00 | 247.00 | 392.00 |
| Partial safety factor | $\gamma_{Ms}$ | - | 1.87 | 1.87 | 1.87 | 1.87 | 1.87 | 1.87 | 1.87 |
| **COMBINED PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE, C20/25 (40°C/24°C)** | | | | | | | | | |
| Characteristic bond resistance | $T_{Rk}$ | [N/mm²] | 13.00 | 13.00 | 13.00 | 11.00 | 9.50 | 9.00 | 7.00 |
| **COMBINED PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE, C20/25 (80°C/50°C)** | | | | | | | | | |
| Characteristic bond resistance | $T_{Rk}$ | [N/mm²] | 10.00 | 11.00 | 10.00 | 9.00 | 7.50 | 7.00 | 5.50 |
| **COMBINED PULL-OUT AND CONCRETE CONE FAILURE; CRACKED CONCRETE, C20/25 (40°C/24°C)** | | | | | | | | | |
| Characteristic bond resistance | $T_{Rk}$ | [N/mm²] | - | - | 6.50 | 4.50 | 4.00 | 4.00 | - |
| **COMBINED PULL-OUT AND CONCRETE CONE FAILURE; CRACKED CONCRETE, C20/25 (80°C/50°C)** | | | | | | | | | |
| Characteristic bond resistance | $T_{Rk}$ | [N/mm²] | - | - | 5.50 | 4.00 | 3.00 | 3.00 | - |
| **COMBINED PULL-OUT AND CONCRETE CONE FAILURE** | | | | | | | | | |
| Installation safety factor | $\gamma_2$ | - | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 | 1.40 | 1.40 |
| Increasing factors for $N_{Rd,p}$ - C30/37 | $\Psi_c$ | - | 1.04 | 1.04 | 1.04 | 1.04 | 1.04 | 1.04 | 1.04 |
| Increasing factors for $N_{Rd,p}$ - C40/50 | $\Psi_c$ | - | 1.07 | 1.07 | 1.07 | 1.07 | 1.07 | 1.07 | 1.07 |
| Increasing factors for $N_{Rd,p}$ - C50/60 | $\Psi_c$ | - | 1.09 | 1.09 | 1.09 | 1.09 | 1.09 | 1.09 | 1.09 |
| **CONCRETE CONE FAILURE** | | | | | | | | | |
| Installation safety factor | $\gamma_2$ | - | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 | 1.40 | 1.40 |
| Factor for cracked concrete | k | - | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 |
| Factor for cracked concrete | $k_{cr,N}$ | - | 7.70 | 7.70 | 7.70 | 7.70 | 7.70 | 7.70 | 7.70 |
| Factor for non-cracked concrete | k | - | 10.10 | 10.10 | 10.10 | 10.10 | 10.10 | 10.10 | 10.10 |
| Factor for non-cracked concrete | $k_{ucr,N}$ | - | 11.00 | 11.00 | 11.00 | 11.00 | 11.00 | 11.00 | 11.00 |
| Edge distance | $c_{cr,N}$ | [mm] | $1.5*h_{ef}$ | $1.5*h_{ef}$ | $1.5*h_{ef}$ | $1.5*h_{ef}$ | $1.5*h_{ef}$ | $1.5*h_{ef}$ | $1.5*h_{ef}$ |
| Spacing | $s_{cr,N}$ | [mm] | $3.0*h_{ef}$ | $3.0*h_{ef}$ | $3.0*h_{ef}$ | $3.0*h_{ef}$ | $3.0*h_{ef}$ | $3.0*h_{ef}$ | $3.0*h_{ef}$ |
| **CONCRETE SPLITTING FAILURE** | | | | | | | | | |
| Installation safety factor | $\gamma_2$ | - | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 | 1.40 | 1.40 |

## Design performance data

| Size | | | M8 | M10 | M12 | M16 | M20 | M24 | M30 |
|---|---|---|---|---|---|---|---|---|---|
| **SHEAR LOAD** | | | | | | | | | |
| **STEEL FAILURE; STEEL CLASS 5.8** | | | | | | | | | |
| Characteristic resistance without lever arm | $V_{Rk,s}$ | [kN] | 9.00 | 14.00 | 21.00 | 39.00 | 61.00 | 88.00 | 140.00 |
| Ductility factor | $k_7$ | - | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 |
| Characteristic resistance with lever arm | $M_{Rk,s}$ | [Nm] | 19.00 | 37.00 | 65.00 | 166.00 | 324.00 | 561.00 | 1124.00 |
| Partial safety factor | $\gamma_{Ms}$ | - | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| **STEEL FAILURE; STEEL CLASS 8.8** | | | | | | | | | |
| Characteristic resistance without lever arm | $V_{Rk,s}$ | [kN] | 15.00 | 23.00 | 34.00 | 63.00 | 98.00 | 141.00 | 224.00 |
| Ductility factor | $k_7$ | - | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 |
| Characteristic resistance with lever arm | $M_{Rk,s}$ | [Nm] | 30.00 | 60.00 | 105.00 | 266.00 | 519.00 | 898.00 | 1799.00 |
| Partial safety factor | $\gamma_{Ms}$ | - | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| **STEEL FAILURE; STEEL GRADE A4-70** | | | | | | | | | |
| Characteristic resistance without lever arm | $V_{Rk,s}$ | [kN] | 13.00 | 20.00 | 29.00 | 55.00 | 86.00 | 124.00 | 196.00 |
| Ductility factor | $k_7$ | - | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 |
| Characteristic resistance with lever arm | $M_{Rk,s}$ | [Nm] | 26.00 | 52.00 | 92.00 | 233.00 | 454.00 | 786.00 | 1574.00 |
| Partial safety factor | $\gamma_{Ms}$ | - | 1.56 | 1.56 | 1.56 | 1.56 | 1.56 | 1.56 | 1.56 |
| **CONCRETE PRY-OUT FAILURE** | | | | | | | | | |
| Factor | k | - | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Installation safety factor | $\gamma_2$ | - | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| **CONCRETE EDGE FAILURE** | | | | | | | | | |
| Anchor diameter | $d_{nom}$ | [mm] | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | 24.00 | 30.00 |
| Effective length of anchor | $\ell_f$ | [mm] | min ($h_{ef}$;8$d_{nom}$) | min ($h_{ef}$;8$d_{nom}$) | min ($h_{ef}$;8$d_{nom}$) | min ($h_{ef}$;8$d_{nom}$) | min ($h_{ef}$;8$d_{nom}$) | min ($h_{ef}$;8$d_{nom}$) | min ($h_{ef}$;8$d_{nom}$) |
| Installation safety factor | $\gamma_2$ | - | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |

Combined pull-out and concrete cone failure (TR 029, p.5.2.2.3. acc. to formula 5.2a - $N^0_{Rk,p}=\pi*d*h_{ef}*\tau_{Rk}$).
Concrete cone failure (TR 029, p.5.2.2.4. acc. to formula 5.3a - $N^0_{Rk,c}=k_1*f_{ck,cube}{}^{0,5}*h_{ef}{}^{1,5}$).
$h_{ef} = h_{nom}$

## Product commercial data

| Size | Product Code | Volume [ml] | Quantity [pcs] | | | Weight [kg] | | | Bar Codes |
|---|---|---|---|---|---|---|---|---|---|
| | | | Box | Outer | Pallet | Box | Outer | Pallet | |
| M16 | R-KER-300 | 300 | 10 | 10 | 840 | 6.3 | 6.3 | 559.2 | 5906675075167 |
| | R-KER-345 | 345 | 10 | 10 | 840 | 7.1 | 7.1 | 623.3 | 5906675291086 |
| | R-KER-380 | 380 | 10 | 10 | 560 | 8.2 | 8.2 | 486.6 | 5906675222707 |
| | R-KER-400 | 400 | 10 | 10 | 560 | 8.1 | 8.1 | 483.8 | 5906675329444 |
| | R-KER-300-W | 300 | 10 | 10 | 840 | 6.3 | 6.3 | 559.2 | 5906675432021 |
| | R-KER-380-W | 380 | 10 | 10 | 560 | 8.2 | 8.2 | 486.6 | 5906675222981 |
| | R-KER-400-W | 400 | 10 | 10 | 560 | 8.2 | 8.2 | 489.2 | 5906675380445 |
| | R-KER-380-S | 380 | 10 | 10 | 560 | 6.5 | 6.5 | 391.2 | 5906675099088 |
| | R-KER-400-S | 400 | 10 | 10 | 560 | 8.2 | 8.2 | 489.2 | 5906675380452 |

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