

# R-HPTII-A4 Stainless Steel Throughbolt

Stainless steel throughbolt anchor for cracked and non-cracked concrete



## Approvals and Reports

- ETA 17/0185



## Product information

### Features and benefits

- Stainless steel anchor for the highest corrosion resistance
- High performance in cracked and non-cracked concrete confirmed by ETA Option 1
- Highest quality ensures maximum load capability
- For applications requiring fire resistance up to 120 minutes
- Suitable for reduced embedment to avoid contact with reinforcement
- Embedment depth markings help to ensure precise installation of the anchor
- Design of R-HPTII allows drilling and installing directly through the fixture and helps to reduce installation time
- Suitable for installation in corrosive environments category C1, C2, C3, C4 and C5

### Applications

- Cladding restraints
- Barriers
- Structural steel
- Curtain walling
- Handrails
- Heavy Plant
- Balustrading
- Passenger lifts
- Facades
- Fencing & gates manufacturing and installation
- Masonry support
- Platforms
- Public seating
- Racking systems

### Base materials

#### Approved for use in:

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

#### Also suitable for use in:

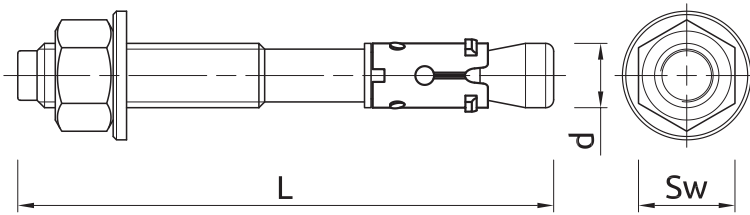
- Natural Stone (after site testing)

## Installation guide



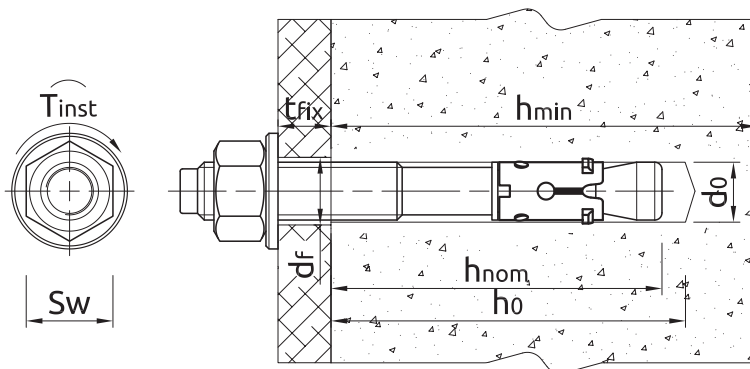
1. Drill a hole of required diameter and depth
2. Clear the hole of drilling dust and debris (using blowpump or equivalent method)
3. Lightly tap the throughbolt through the fixture into hole with a hammer, until fixing depth is reached
4. Tighten to the recommended torque

## Product information



| Size | Product Code       | Anchor   |        | Fixture                       |               |               |
|------|--------------------|----------|--------|-------------------------------|---------------|---------------|
|      |                    | Diameter | Length | Max. thickness $t_{fix}$ for: |               | Hole diameter |
|      |                    | d        | L      | $h_{nom,red}$                 | $h_{nom,std}$ | $d_f$         |
|      |                    | [mm]     | [mm]   | [mm]                          | [mm]          | [mm]          |
| M8   | R-HPTIIA4-08060/10 | 8        | 60     | 10                            | -             | 9             |
|      | R-HPTIIA4-08075/10 | 8        | 75     | 25                            | 10            | 9             |
|      | R-HPTIIA4-08085/20 | 8        | 85     | 35                            | 20            | 9             |
|      | R-HPTIIA4-08095/30 | 8        | 95     | 45                            | 30            | 9             |
|      | R-HPTIIA4-08105/40 | 8        | 105    | 55                            | 40            | 9             |
|      | R-HPTIIA4-08115/50 | 8        | 115    | 65                            | 50            | 9             |
| M10  | R-HPTIIA4-10065/5  | 10       | 65     | 5                             | -             | 11            |
|      | R-HPTIIA4-10080/20 | 10       | 80     | 20                            | -             | 11            |
|      | R-HPTIIA4-10095/15 | 10       | 95     | 35                            | 15            | 11            |
|      | R-HPTIIA4-10115/35 | 10       | 115    | 55                            | 35            | 11            |
|      | R-HPTIIA4-10130/50 | 10       | 130    | 70                            | 50            | 11            |
|      | R-HPTIIA4-10140/60 | 10       | 140    | 80                            | 60            | 11            |
| M12  | R-HPTIIA4-12080/5  | 12       | 80     | 5                             | -             | 13            |
|      | R-HPTIIA4-12100/5  | 12       | 100    | 25                            | 5             | 13            |
|      | R-HPTIIA4-12115/20 | 12       | 115    | 40                            | 20            | 13            |
|      | R-HPTIIA4-12125/30 | 12       | 125    | 50                            | 30            | 13            |
|      | R-HPTIIA4-12150/55 | 12       | 150    | 75                            | 55            | 13            |
|      | R-HPTIIA4-12180/85 | 12       | 180    | 105                           | 85            | 13            |
| M16  | R-HPTIIA4-16125/5  | 16       | 125    | 25                            | 5             | 18            |
|      | R-HPTIIA4-16140/20 | 16       | 140    | 40                            | 20            | 18            |
|      | R-HPTIIA4-16150/30 | 16       | 150    | 50                            | 30            | 18            |
|      | R-HPTIIA4-16180/60 | 16       | 180    | 80                            | 60            | 18            |

## Installation data



| Size                        |            |      | M8 | M10 | M12 | M16 |
|-----------------------------|------------|------|----|-----|-----|-----|
| Thread diameter             | d          | [mm] | 8  | 10  | 12  | 16  |
| Hole diameter in substrate  | $d_0$      | [mm] | 8  | 10  | 12  | 16  |
| Installation torque         | $T_{inst}$ | [Nm] | 15 | 30  | 50  | 100 |
| Wrench size                 | Sw         | [mm] | 13 | 17  | 19  | 24  |
| External diameter of washer |            | [mm] | 16 | 20  | 24  | 30  |

## Installation data

| Size                                      |             |      | M8  | M10 | M12 | M16 |
|-------------------------------------------|-------------|------|-----|-----|-----|-----|
| STANDARD EMBEDMENT DEPTH                  |             |      |     |     |     |     |
| Min. hole depth in substrate              | $h_{0,s}$   | [mm] | 65  | 80  | 90  | 110 |
| Min. installation depth                   | $h_{nom,s}$ | [mm] | 55  | 69  | 80  | 100 |
| Min. substrate thickness                  | $h_{min,s}$ | [mm] | 100 | 120 | 140 | 170 |
| Min. spacing (Non-cracked concrete)       | $s_{min,s}$ | [mm] | 55  | 70  | 90  | 135 |
| Min. spacing (Cracked concrete)           | $s_{min,s}$ | [mm] | 55  | 70  | 90  | 135 |
| Min. edge distance (Non-cracked concrete) | $c_{min,s}$ | [mm] | 40  | 50  | 55  | 80  |
| Min. edge distance (Cracked concrete)     | $c_{min,s}$ | [mm] | 40  | 45  | 55  | 70  |
| REDUCED EMBEDMENT DEPTH                   |             |      |     |     |     |     |
| Min. hole depth in substrate              | $h_{0,r}$   | [mm] | 50  | 60  | 70  | 90  |
| Min. installation depth                   | $h_{nom,r}$ | [mm] | 40  | 49  | 60  | 80  |
| Min. substrate thickness                  | $h_{min,r}$ | [mm] | 100 | 100 | 100 | 130 |
| Min. spacing (Non-cracked concrete)       | $s_{min,r}$ | [mm] | 50  | 70  | 120 | 150 |
| Min. spacing (Cracked concrete)           | $s_{min,r}$ | [mm] | 50  | 70  | 120 | 150 |
| Min. edge distance (Non-cracked concrete) | $c_{min,r}$ | [mm] | 50  | 60  | 70  | 90  |
| Min. edge distance (Cracked concrete)     | $c_{min,r}$ | [mm] | 40  | 50  | 70  | 85  |

## Mechanical properties

| Size                                        |              |                      | M8    | M10   | M12    | M16    |
|---------------------------------------------|--------------|----------------------|-------|-------|--------|--------|
| Nominal ultimate tensile strength - tension | $f_{uk}$     | [N/mm <sup>2</sup> ] | 600   | 600   | 550    | 550    |
| Nominal yield strength - tension            | $f_{yk}$     | [N/mm <sup>2</sup> ] | 450   | 450   | 413    | 413    |
| Cross sectional area - tension              | $A_s$        | [mm <sup>2</sup> ]   | 36.6  | 58    | 84.3   | 157    |
| Elastic section modulus                     | $W_{el}$     | [mm <sup>3</sup> ]   | 50.27 | 98.17 | 169.65 | 402.12 |
| Characteristic bending resistance           | $M_{Rk,s}^0$ | [Nm]                 | 22    | 45    | 72     | 180    |
| Design bending resistance                   | M            | [Nm]                 | 18    | 36    | 57     | 144    |

## Basic performance data

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

| Size                              |      | M8    | M10   | M12   | M16   |
|-----------------------------------|------|-------|-------|-------|-------|
| NON-CRACKED CONCRETE              |      |       |       |       |       |
| Standard embedment depth $h_{ef}$ | [mm] | 47.00 | 59.00 | 68.00 | 85.00 |
| Reduced embedment depth $h_{ef}$  | [mm] | 32.00 | 39.00 | 48.00 | 65.00 |
| CRACKED CONCRETE                  |      |       |       |       |       |
| Standard embedment depth $h_{ef}$ | [mm] | 47.00 | 59.00 | 68.00 | 85.00 |
| Reduced embedment depth $h_{ef}$  | [mm] | 32.00 | 39.00 | 48.00 | 65.00 |
| MEAN ULTIMATE LOAD                |      |       |       |       |       |
| TENSION LOAD $N_{Ru,m}$           |      |       |       |       |       |
| NON-CRACKED CONCRETE              |      |       |       |       |       |
| Standard embedment depth          | [kN] | 15.40 | 22.80 | 29.20 | 55.80 |
| Reduced embedment depth           | [kN] | 10.40 | 16.00 | 22.10 | 37.90 |
| CRACKED CONCRETE                  |      |       |       |       |       |
| Standard embedment depth          | [kN] | 9.70  | 11.50 | 18.60 | 30.40 |
| Reduced embedment depth           | [kN] | 5.60  | 9.80  | 13.40 | 22.20 |
| SHEAR LOAD $V_{Ru,m}$             |      |       |       |       |       |
| NON-CRACKED CONCRETE              |      |       |       |       |       |
| Standard embedment depth          | [kN] | 14.00 | 22.20 | 29.60 | 54.50 |
| Reduced embedment depth           | [kN] | 11.80 | 19.20 | 29.60 | 54.50 |
| CRACKED CONCRETE                  |      |       |       |       |       |
| Standard embedment depth          | [kN] | 14.00 | 21.20 | 29.60 | 54.50 |
| Reduced embedment depth           | [kN] | 8.50  | 13.60 | 15.40 | 54.50 |

## Basic performance data

| Size                     |      | M8    | M10   | M12   | M16   |
|--------------------------|------|-------|-------|-------|-------|
| CHARACTERISTIC LOAD      |      |       |       |       |       |
| TENSION LOAD $N_{Rk}$    |      |       |       |       |       |
| NON-CRACKED CONCRETE     |      |       |       |       |       |
| Standard embedment depth | [kN] | 9.00  | 16.00 | 25.00 | 39.50 |
| Reduced embedment depth  | [kN] | 7.50  | 12.00 | 16.80 | 26.40 |
| CRACKED CONCRETE         |      |       |       |       |       |
| Standard embedment depth | [kN] | 6.00  | 9.00  | 12.00 | 25.00 |
| Reduced embedment depth  | [kN] | 3.00  | 7.50  | 9.00  | 16.00 |
| SHEAR LOAD $V_{Rk}$      |      |       |       |       |       |
| NON-CRACKED CONCRETE     |      |       |       |       |       |
| Standard embedment depth | [kN] | 11.70 | 18.50 | 24.60 | 45.40 |
| Reduced embedment depth  | [kN] | 9.14  | 14.70 | 16.79 | 45.40 |
| CRACKED CONCRETE         |      |       |       |       |       |
| Standard embedment depth | [kN] | 11.60 | 16.31 | 24.60 | 45.40 |
| Reduced embedment depth  | [kN] | 6.52  | 10.52 | 11.97 | 37.70 |
| DESIGN LOAD              |      |       |       |       |       |
| TENSION LOAD $N_{Rd}$    |      |       |       |       |       |
| NON-CRACKED CONCRETE     |      |       |       |       |       |
| Standard embedment depth | [kN] | 5.00  | 10.70 | 16.70 | 26.30 |
| Reduced embedment depth  | [kN] | 4.17  | 6.67  | 11.20 | 17.60 |
| CRACKED CONCRETE         |      |       |       |       |       |
| Standard embedment depth | [kN] | 3.33  | 6.00  | 8.00  | 16.70 |
| Reduced embedment depth  | [kN] | 1.67  | 4.17  | 6.00  | 10.70 |
| SHEAR LOAD $V_{Rd}$      |      |       |       |       |       |
| NON-CRACKED CONCRETE     |      |       |       |       |       |
| Standard embedment depth | [kN] | 9.40  | 14.80 | 19.70 | 36.30 |
| Reduced embedment depth  | [kN] | 6.09  | 9.84  | 11.20 | 35.30 |
| CRACKED CONCRETE         |      |       |       |       |       |
| Standard embedment depth | [kN] | 7.73  | 10.88 | 19.68 | 36.30 |
| Reduced embedment depth  | [kN] | 4.34  | 7.01  | 7.98  | 25.15 |
| RECOMMENDED LOAD         |      |       |       |       |       |
| TENSION LOAD $N_{rec}$   |      |       |       |       |       |
| NON-CRACKED CONCRETE     |      |       |       |       |       |
| Standard embedment depth | [kN] | 3.57  | 7.62  | 11.90 | 18.80 |
| Reduced embedment depth  | [kN] | 2.98  | 4.76  | 8.00  | 12.60 |
| CRACKED CONCRETE         |      |       |       |       |       |
| Standard embedment depth | [kN] | 2.38  | 4.29  | 5.71  | 11.90 |
| Reduced embedment depth  | [kN] | 1.19  | 2.98  | 4.29  | 7.62  |
| SHEAR LOAD $V_{rec}$     |      |       |       |       |       |
| NON-CRACKED CONCRETE     |      |       |       |       |       |
| Standard embedment depth | [kN] | 6.69  | 10.60 | 14.10 | 25.90 |
| Reduced embedment depth  | [kN] | 4.35  | 7.03  | 8.00  | 25.20 |
| CRACKED CONCRETE         |      |       |       |       |       |
| Standard embedment depth | [kN] | 5.52  | 7.77  | 14.06 | 25.90 |
| Reduced embedment depth  | [kN] | 3.10  | 5.01  | 5.70  | 18.00 |

## Design performance data

Standard embedment depth

(-) failure is not decisive

| Size                                          |               |      | M8     | M10    | M12    | M16    |
|-----------------------------------------------|---------------|------|--------|--------|--------|--------|
| Effective embedment depth                     | $h_{ef}$      | [mm] | 47.00  | 59.00  | 68.00  | 85.00  |
| TENSION LOAD                                  |               |      |        |        |        |        |
| STEEL FAILURE                                 |               |      |        |        |        |        |
| Characteristic resistance                     | $N_{Rk,s}$    | [kN] | 21.20  | 33.60  | 44.80  | 82.60  |
| Partial safety factor                         | $\gamma_{Ms}$ | -    | 1.50   | 1.50   | 1.50   | 1.50   |
| PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25 |               |      |        |        |        |        |
| Characteristic resistance                     | $N_{Rk,p}$    | [kN] | 9.00   | 16.00  | 25.00  | -      |
| PULL-OUT FAILURE; CRACKED CONCRETE C20/25     |               |      |        |        |        |        |
| Characteristic resistance                     | $N_{Rk,p}$    | [kN] | 6.00   | 9.00   | 12.00  | 25.00  |
| PULL-OUT FAILURE                              |               |      |        |        |        |        |
| Installation safety factor                    | $\gamma_2$    | -    | 1.20   | 1.00   | 1.00   | 1.00   |
| Increasing factors for $N_{Rd,p}$ - C30/37    | $\psi_c$      | -    | 1.16   | 1.26   | 1.23   | 1.18   |
| Increasing factors for $N_{Rd,p}$ - C40/50    | $\psi_c$      | -    | 1.33   | 1.52   | 1.45   | 1.37   |
| Increasing factors for $N_{Rd,p}$ - C50/60    | $\psi_c$      | -    | 1.50   | 1.78   | 1.67   | 1.55   |
| CONCRETE CONE FAILURE                         |               |      |        |        |        |        |
| Factor for cracked concrete                   | $k$           | -    | 7.20   | 7.20   | 7.20   | 7.20   |
| Factor for cracked concrete                   | $k_{cr,N}$    | -    | 7.70   | 7.70   | 7.70   | 7.70   |
| Factor for non-cracked concrete               | $k$           | -    | 10.10  | 10.10  | 10.10  | 10.10  |
| Factor for non-cracked concrete               | $k_{ucr,N}$   | -    | 11.00  | 11.00  | 11.00  | 11.00  |
| Installation safety factor                    | $\gamma_2$    | -    | 1.20   | 1.00   | 1.00   | 1.00   |
| Spacing                                       | $s_{cr,N}$    | [mm] | 141.00 | 177.00 | 204.00 | 255.00 |
| Edge distance                                 | $c_{cr,N}$    | [mm] | 71.00  | 89.00  | 102.00 | 128.00 |
| CONCRETE SPLITTING FAILURE                    |               |      |        |        |        |        |
| Spacing                                       | $s_{cr,sp}$   | [mm] | 240.00 | 300.00 | 340.00 | 430.00 |
| Edge distance                                 | $c_{cr,sp}$   | [mm] | 120.00 | 150.00 | 170.00 | 215.00 |
| Installation safety factor                    | $\gamma_2$    | -    | 1.20   | 1.00   | 1.00   | 1.00   |
| SHEAR LOAD                                    |               |      |        |        |        |        |
| STEEL FAILURE                                 |               |      |        |        |        |        |
| Characteristic resistance without lever arm   | $V_{Rk,s}$    | [kN] | 11.70  | 18.50  | 24.60  | 45.40  |
| Ductility factor                              | $k_\gamma$    | -    | 0.80   | 0.80   | 0.80   | 0.80   |
| Characteristic resistance with lever arm      | $M_{Rk,s}$    | [Nm] | 22.00  | 45.00  | 72.00  | 180.00 |
| Partial safety factor                         | $\gamma_{Ms}$ | -    | 1.25   | 1.25   | 1.25   | 1.25   |
| CONCRETE PRY-OUT FAILURE                      |               |      |        |        |        |        |
| Factor                                        | $k$           | -    | 1.00   | 1.00   | 2.00   | 2.00   |
| Installation safety factor                    | $\gamma_2$    | -    | 1.00   | 1.00   | 1.00   | 1.00   |
| CONCRETE EDGE FAILURE                         |               |      |        |        |        |        |
| Effective length of anchor                    | $\ell_f$      | [mm] | 47.00  | 59.00  | 68.00  | 85.00  |
| Anchor diameter                               | $d_{nom}$     | [mm] | 8.00   | 10.00  | 12.00  | 16.00  |
| Installation safety factor                    | $\gamma_2$    | -    | 1.00   | 1.00   | 1.00   | 1.00   |

## Design performance data

Resistance to tension and shear loads under fire exposure - Standard embedment depth

| Size                                        |            |      |  | M8   | M10  | M12  | M16   |
|---------------------------------------------|------------|------|--|------|------|------|-------|
| R (For EI) = 30 min                         |            |      |  |      |      |      |       |
| TENSION LOAD                                |            |      |  |      |      |      |       |
| STEEL FAILURE                               |            |      |  |      |      |      |       |
| Characteristic resistance                   | $N_{Rk,s}$ | [kN] |  | 0.70 | 1.50 | 2.50 | 4.70  |
| PULL-OUT FAILURE                            |            |      |  |      |      |      |       |
| Characteristic resistance                   | $N_{Rk,p}$ | [kN] |  | 1.50 | 2.30 | 3.00 | 6.30  |
| CONCRETE CONE FAILURE                       |            |      |  |      |      |      |       |
| Characteristic resistance                   | $N_{Rk,c}$ | [kN] |  | 2.70 | 4.80 | 6.90 | 12.00 |
| SHEAR LOAD                                  |            |      |  |      |      |      |       |
| STEEL FAILURE                               |            |      |  |      |      |      |       |
| Characteristic resistance without lever arm | $V_{Rk,s}$ | [kN] |  | 0.70 | 1.50 | 2.50 | 4.70  |
| Characteristic resistance with lever arm    | $M_{Rk,s}$ | [kN] |  | 0.70 | 1.90 | 3.90 | 10.00 |
| R (For EI) = 60 min                         |            |      |  |      |      |      |       |
| TENSION LOAD                                |            |      |  |      |      |      |       |
| STEEL FAILURE                               |            |      |  |      |      |      |       |
| Characteristic resistance                   | $N_{Rk,s}$ | [kN] |  | 0.60 | 1.20 | 2.10 | 3.90  |
| PULL-OUT FAILURE                            |            |      |  |      |      |      |       |
| Characteristic resistance                   | $N_{Rk,p}$ | [kN] |  | 1.50 | 2.30 | 3.00 | 6.30  |
| CONCRETE CONE FAILURE                       |            |      |  |      |      |      |       |
| Characteristic resistance                   | $N_{Rk,c}$ | [kN] |  | 2.70 | 4.80 | 6.90 | 12.00 |
| SHEAR LOAD                                  |            |      |  |      |      |      |       |
| STEEL FAILURE                               |            |      |  |      |      |      |       |
| Characteristic resistance without lever arm | $V_{Rk,s}$ | [kN] |  | 0.60 | 1.20 | 2.10 | 3.90  |
| Characteristic resistance with lever arm    | $M_{Rk,s}$ | [kN] |  | 0.60 | 1.50 | 3.30 | 8.30  |
| R (For EI) = 90 min                         |            |      |  |      |      |      |       |
| TENSION LOAD                                |            |      |  |      |      |      |       |
| STEEL FAILURE                               |            |      |  |      |      |      |       |
| Characteristic resistance                   | $N_{Rk,s}$ | [kN] |  | 0.40 | 0.90 | 1.70 | 3.10  |
| PULL-OUT FAILURE                            |            |      |  |      |      |      |       |
| Characteristic resistance                   | $N_{Rk,p}$ | [kN] |  | 1.50 | 2.30 | 3.00 | 6.30  |
| CONCRETE CONE FAILURE                       |            |      |  |      |      |      |       |
| Characteristic resistance                   | $N_{Rk,c}$ | [kN] |  | 2.70 | 4.80 | 6.90 | 12.00 |
| SHEAR LOAD                                  |            |      |  |      |      |      |       |
| STEEL FAILURE                               |            |      |  |      |      |      |       |
| Characteristic resistance without lever arm | $V_{Rk,s}$ | [kN] |  | 0.40 | 0.90 | 1.70 | 3.10  |
| Characteristic resistance with lever arm    | $M_{Rk,s}$ | [kN] |  | 0.40 | 1.20 | 2.60 | 6.70  |
| R (For EI) = 120 min                        |            |      |  |      |      |      |       |
| TENSION LOAD                                |            |      |  |      |      |      |       |
| STEEL FAILURE                               |            |      |  |      |      |      |       |
| Characteristic resistance                   | $N_{Rk,s}$ | [kN] |  | 0.40 | 0.80 | 1.30 | 2.50  |
| PULL-OUT FAILURE                            |            |      |  |      |      |      |       |
| Characteristic resistance                   | $N_{Rk,p}$ | [kN] |  | 1.20 | 1.80 | 2.40 | 5.00  |
| CONCRETE CONE FAILURE                       |            |      |  |      |      |      |       |
| Characteristic resistance                   | $N_{Rk,c}$ | [kN] |  | 2.20 | 3.90 | 5.50 | 9.60  |
| SHEAR LOAD                                  |            |      |  |      |      |      |       |
| STEEL FAILURE                               |            |      |  |      |      |      |       |
| Characteristic resistance without lever arm | $V_{Rk,s}$ | [kN] |  | 0.40 | 0.80 | 1.30 | 2.50  |
| Characteristic resistance with lever arm    | $M_{Rk,s}$ | [kN] |  | 0.40 | 1.00 | 2.10 | 5.30  |

## Design performance data

Allowable values for resistance in case of Seismic performance category C1 - Standard embedment depth

| Size                                        |                        |      | M8    | M10   | M12   | M16   |
|---------------------------------------------|------------------------|------|-------|-------|-------|-------|
| Effective embedment depth                   | $h_{ef}$               | [mm] | 47.00 | 59.00 | 68.00 | 85.00 |
| TENSION LOAD, STEEL FAILURE                 |                        |      |       |       |       |       |
| Characteristic resistance                   | $N_{Rk,s}$             | [kN] | 21.20 | 33.60 | 44.80 | 82.60 |
| Partial safety factor                       | $\gamma_{Ms,N,seisC1}$ | -    | 1.50  |       |       |       |
| TENSION LOAD, PULL-OUT FAILURE              |                        |      |       |       |       |       |
| Characteristic resistance                   | $N_{Rk,p}$             | [kN] | 6.00  | 9.00  | 12.00 | 25.00 |
| Partial safety factor                       | $\gamma_{Mp,seisC1}$   | -    | 1.80  | 1.50  |       |       |
| SHEAR LOAD, STEEL FAILURE                   |                        |      |       |       |       |       |
| Characteristic resistance without lever arm | $V_{Rk,s}$             | [kN] | 6.70  | 12.50 | 18.40 | 39.00 |
| Partial safety factor                       | $\gamma_{MsV,seisC1}$  | -    | 1.25  |       |       |       |

Reduced embedment depth

(-) failure is not decisive

| Size                                                 |               |      | M8     | M10    | M12    | M16    |
|------------------------------------------------------|---------------|------|--------|--------|--------|--------|
| Effective embedment depth                            | $h_{ef}$      | [mm] | 32.00  | 39.00  | 48.00  | 65.00  |
| <b>TENSION LOAD</b>                                  |               |      |        |        |        |        |
| <b>STEEL FAILURE</b>                                 |               |      |        |        |        |        |
| Characteristic resistance                            | $N_{Rk,s}$    | [kN] | 21.20  | 33.60  | 44.80  | 82.60  |
| Partial safety factor                                | $\gamma_{Ms}$ | -    | 1.50   | 1.50   | 1.50   | 1.50   |
| <b>PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25</b> |               |      |        |        |        |        |
| Characteristic resistance                            | $N_{Rk,p}$    | [kN] | 7.50   | 12.00  | -      | -      |
| <b>PULL-OUT FAILURE; CRACKED CONCRETE C20/25</b>     |               |      |        |        |        |        |
| Characteristic resistance                            | $N_{Rk,p}$    | [kN] | 3.00   | 7.50   | 9.00   | 16.00  |
| <b>PULL-OUT FAILURE</b>                              |               |      |        |        |        |        |
| Installation safety factor                           | $\gamma_2$    | -    | 1.20   | 1.20   | 1.00   | 1.00   |
| Increasing factors for $N_{Rd,p}$ - C30/37           | $\psi_c$      | -    | 1.07   | 1.07   | 1.16   | 1.18   |
| Increasing factors for $N_{Rd,p}$ - C40/50           | $\psi_c$      | -    | 1.13   | 1.13   | 1.32   | 1.37   |
| Increasing factors for $N_{Rd,p}$ - C50/60           | $\psi_c$      | -    | 1.20   | 1.20   | 1.49   | 1.55   |
| <b>CONCRETE CONE FAILURE</b>                         |               |      |        |        |        |        |
| Factor for cracked concrete                          | $k$           | -    | 7.20   | 7.20   | 7.20   | 7.20   |
| Factor for cracked concrete                          | $k_{cr,N}$    | -    | 7.70   | 7.70   | 7.70   | 7.70   |
| Factor for non-cracked concrete                      | $k$           | -    | 10.10  | 10.10  | 10.10  | 10.10  |
| Factor for non-cracked concrete                      | $k_{ucr,N}$   | -    | 11.00  | 11.00  | 11.00  | 11.00  |
| Installation safety factor                           | $\gamma_2$    | -    | 1.20   | 1.20   | 1.00   | 1.00   |
| Spacing                                              | $s_{cr,N}$    | [mm] | 96.00  | 117.00 | 144.00 | 195.00 |
| Edge distance                                        | $c_{cr,N}$    | [mm] | 48.00  | 59.00  | 72.00  | 98.00  |
| <b>CONCRETE SPLITTING FAILURE</b>                    |               |      |        |        |        |        |
| Spacing                                              | $s_{cr,sp}$   | [mm] | 160.00 | 200.00 | 250.00 | 320.00 |
| Edge distance                                        | $c_{cr,sp}$   | [mm] | 80.00  | 100.00 | 125.00 | 160.00 |
| Installation safety factor                           | $\gamma_2$    | -    | 1.20   | 1.20   | 1.00   | 1.00   |

## Design performance data

| Size                                        |               |      |  | M8    | M10   | M12   | M16    |
|---------------------------------------------|---------------|------|--|-------|-------|-------|--------|
| SHEAR LOAD                                  |               |      |  |       |       |       |        |
| STEEL FAILURE                               |               |      |  |       |       |       |        |
| Characteristic resistance without lever arm | $V_{Rk,s}$    | [kN] |  | 11.70 | 18.50 | 24.60 | 45.40  |
| Ductility factor                            | $k_\gamma$    | -    |  | 0.80  | 0.80  | 0.80  | 0.80   |
| Characteristic resistance with lever arm    | $M_{Rk,s}$    | [Nm] |  | 22.00 | 42.00 | 72.00 | 180.00 |
| Partial safety factor                       | $\gamma_{Ms}$ | -    |  | 1.25  | 1.25  | 1.25  | 1.25   |
| CONCRETE PRY-OUT FAILURE                    |               |      |  |       |       |       |        |
| Factor                                      | k             | -    |  | 1.00  | 1.00  | 1.00  | 2.00   |
| Installation safety factor                  | $\gamma_2$    | -    |  | 1.00  | 1.00  | 1.00  | 1.00   |
| CONCRETE EDGE FAILURE                       |               |      |  |       |       |       |        |
| Effective length of anchor                  | $\ell_r$      | [mm] |  | 32.00 | 39.00 | 48.00 | 65.00  |
| Anchor diameter                             | $d_{nom}$     | [mm] |  | 8.00  | 10.00 | 12.00 | 16.00  |
| Installation safety factor                  | $\gamma_2$    | -    |  | 1.00  | 1.00  | 1.00  | 1.00   |

## Design performance data

Resistance to tension and shear loads under fire exposure - Reduced embedment depth

| Size                                        |            |      |  | M8   | M10  | M12  | M16   |
|---------------------------------------------|------------|------|--|------|------|------|-------|
| R (For EI) = 30 min                         |            |      |  |      |      |      |       |
| TENSION LOAD                                |            |      |  |      |      |      |       |
| STEEL FAILURE                               |            |      |  |      |      |      |       |
| Characteristic resistance                   | $N_{Rk,s}$ | [kN] |  | 0.70 | 1.50 | 2.50 | 4.70  |
| PULL-OUT FAILURE                            |            |      |  |      |      |      |       |
| Characteristic resistance                   | $N_{Rk,p}$ | [kN] |  | 0.80 | 1.90 | 2.30 | 4.00  |
| CONCRETE CONE FAILURE                       |            |      |  |      |      |      |       |
| Characteristic resistance                   | $N_{Rk,c}$ | [kN] |  | 1.00 | 1.70 | 2.90 | 6.10  |
| SHEAR LOAD                                  |            |      |  |      |      |      |       |
| STEEL FAILURE                               |            |      |  |      |      |      |       |
| Characteristic resistance without lever arm | $V_{Rk,s}$ | [kN] |  | 0.70 | 1.50 | 2.50 | 4.70  |
| Characteristic resistance with lever arm    | $M_{Rk,s}$ | [kN] |  | 0.70 | 1.90 | 3.90 | 10.00 |
| R (For EI) = 60 min                         |            |      |  |      |      |      |       |
| TENSION LOAD                                |            |      |  |      |      |      |       |
| STEEL FAILURE                               |            |      |  |      |      |      |       |
| Characteristic resistance                   | $N_{Rk,s}$ | [kN] |  | 0.60 | 1.20 | 2.10 | 3.90  |
| PULL-OUT FAILURE                            |            |      |  |      |      |      |       |
| Characteristic resistance                   | $N_{Rk,p}$ | [kN] |  | 0.80 | 1.90 | 2.30 | 4.00  |
| CONCRETE CONE FAILURE                       |            |      |  |      |      |      |       |
| Characteristic resistance                   | $N_{Rk,c}$ | [kN] |  | 1.00 | 1.70 | 2.90 | 6.10  |
| SHEAR LOAD                                  |            |      |  |      |      |      |       |
| STEEL FAILURE                               |            |      |  |      |      |      |       |
| Characteristic resistance without lever arm | $V_{Rk,s}$ | [kN] |  | 0.60 | 1.20 | 2.10 | 3.90  |
| Characteristic resistance with lever arm    | $M_{Rk,s}$ | [kN] |  | 0.60 | 1.50 | 3.30 | 8.30  |
| R (For EI) = 90 min                         |            |      |  |      |      |      |       |
| TENSION LOAD                                |            |      |  |      |      |      |       |
| STEEL FAILURE                               |            |      |  |      |      |      |       |
| Characteristic resistance                   | $N_{Rk,s}$ | [kN] |  | 0.40 | 0.90 | 1.70 | 3.10  |
| PULL-OUT FAILURE                            |            |      |  |      |      |      |       |
| Characteristic resistance                   | $N_{Rk,p}$ | [kN] |  | 0.80 | 1.90 | 2.30 | 4.00  |
| CONCRETE CONE FAILURE                       |            |      |  |      |      |      |       |
| Characteristic resistance                   | $N_{Rk,c}$ | [kN] |  | 1.00 | 1.70 | 2.90 | 6.10  |
| SHEAR LOAD                                  |            |      |  |      |      |      |       |
| STEEL FAILURE                               |            |      |  |      |      |      |       |
| Characteristic resistance without lever arm | $V_{Rk,s}$ | [kN] |  | 0.40 | 0.90 | 1.70 | 3.10  |
| Characteristic resistance with lever arm    | $M_{Rk,s}$ | [kN] |  | 0.40 | 1.20 | 2.60 | 6.70  |
| R (For EI) = 120 min                        |            |      |  |      |      |      |       |
| TENSION LOAD                                |            |      |  |      |      |      |       |
| STEEL FAILURE                               |            |      |  |      |      |      |       |
| Characteristic resistance                   | $N_{Rk,s}$ | [kN] |  | 0.40 | 0.80 | 1.30 | 2.50  |
| PULL-OUT FAILURE                            |            |      |  |      |      |      |       |
| Characteristic resistance                   | $N_{Rk,p}$ | [kN] |  | 0.60 | 1.50 | 1.80 | 3.20  |
| CONCRETE CONE FAILURE                       |            |      |  |      |      |      |       |
| Characteristic resistance                   | $N_{Rk,c}$ | [kN] |  | 0.80 | 1.40 | 2.30 | 4.90  |
| SHEAR LOAD                                  |            |      |  |      |      |      |       |
| STEEL FAILURE                               |            |      |  |      |      |      |       |
| Characteristic resistance without lever arm | $V_{Rk,s}$ | [kN] |  | 0.40 | 0.80 | 1.30 | 2.50  |
| Characteristic resistance with lever arm    | $M_{Rk,s}$ | [kN] |  | 0.40 | 1.00 | 2.10 | 5.30  |

## Design performance data

Allowable values for resistance in case of Seismic performance category C1 - Reduced embedment depth

| Size                                        |                       |      | M8    | M10   | M12   | M16   |
|---------------------------------------------|-----------------------|------|-------|-------|-------|-------|
| Effective embedment depth                   | $h_{ef}$              | [mm] | 32.00 | 39.00 | 48.00 | 65.00 |
| TENSION LOAD, STEEL FAILURE                 |                       |      |       |       |       |       |
| Characteristic resistance                   | $N_{Rk,s}$            | [kN] | 21.20 | 33.60 | 44.80 | 82.60 |
| Partial safety factor                       | $\gamma_{MsN,seisC1}$ | -    | 1.50  |       |       |       |
| TENSION LOAD, PULL-OUT FAILURE              |                       |      |       |       |       |       |
| Characteristic resistance                   | $N_{Rk,p}$            | [kN] | 3.00  | 7.50  | 9.00  | 16.00 |
| Partial safety factor                       | $\gamma_{Mp,seisC1}$  | -    | 1.80  |       | 1.50  |       |
| SHEAR LOAD, STEEL FAILURE                   |                       |      |       |       |       |       |
| Characteristic resistance without lever arm | $V_{Rk,s}$            | [kN] | -     |       | 18.40 | 39.00 |
| Partial safety factor                       | $\gamma_{MsV,seisC1}$ | -    | 1.25  |       |       |       |

## Product commercial data

| Size | Product Code                     | Anchor        |             | Quantity [pcs] |       |        | Weight [kg] |       |        | Bar Codes     |
|------|----------------------------------|---------------|-------------|----------------|-------|--------|-------------|-------|--------|---------------|
|      |                                  | Diameter [mm] | Length [mm] | Box            | Outer | Pallet | Box         | Outer | Pallet |               |
| M8   | R-HPTIIA4-08060/10 <sup>1)</sup> | 8             | 60          | 100            | 100   | 16000  | 2.6         | 2.6   | 441.0  | 5906675046419 |
|      | R-HPTIIA4-08075/10 <sup>1)</sup> | 8             | 75          | 100            | 100   | 16000  | 3.1         | 3.1   | 519.6  | 5906675046426 |
|      | R-HPTIIA4-08085/20 <sup>1)</sup> | 8             | 85          | 100            | 100   | 16000  | 3.3         | 3.3   | 563.6  | 5906675046433 |
|      | R-HPTIIA4-08095/30 <sup>1)</sup> | 8             | 95          | 100            | 100   | 12000  | 3.7         | 3.7   | 474.0  | 5906675046440 |
|      | R-HPTIIA4-08105/40 <sup>1)</sup> | 8             | 105         | 50             | 50    | 16000  | 2.2         | 2.2   | 734.0  | 5906675046457 |
|      | R-HPTIIA4-08115/50 <sup>1)</sup> | 8             | 115         | 100            | 100   | 16000  | 4.3         | 4.3   | 717.0  | 5906675046464 |
| M10  | R-HPTIIA4-10065/5 <sup>1)</sup>  | 10            | 65          | 50             | 50    | 8000   | 2.4         | 2.4   | 409.0  | 5906675046471 |
|      | R-HPTIIA4-10080/20 <sup>1)</sup> | 10            | 80          | 50             | 50    | 8000   | 2.8         | 2.8   | 469.7  | 5906675046488 |
|      | R-HPTIIA4-10095/15 <sup>1)</sup> | 10            | 95          | 50             | 50    | 8000   | 3.1         | 3.1   | 529.7  | 5906675046495 |
|      | R-HPTIIA4-10115/35 <sup>1)</sup> | 10            | 115         | 50             | 50    | 6000   | 3.7         | 3.7   | 468.1  | 5906675046501 |
|      | R-HPTIIA4-10130/50 <sup>1)</sup> | 10            | 130         | 50             | 50    | 6000   | 4.0         | 4.0   | 508.3  | 5906675046518 |
|      | R-HPTIIA4-10140/60 <sup>1)</sup> | 10            | 140         | 50             | 50    | 8000   | 4.2         | 4.2   | 707.0  | 5906675046532 |
| M12  | R-HPTIIA4-12080/5 <sup>1)</sup>  | 12            | 80          | 50             | 50    | 8000   | 4.1         | 4.1   | 688.7  | 5906675046549 |
|      | R-HPTIIA4-12100/5 <sup>1)</sup>  | 12            | 100         | 50             | 50    | 8000   | 4.8         | 4.8   | 797.4  | 5906675046556 |
|      | R-HPTIIA4-12115/20 <sup>1)</sup> | 12            | 115         | 50             | 50    | 6000   | 5.4         | 5.4   | 677.9  | 5906675388106 |
|      | R-HPTIIA4-12125/30 <sup>1)</sup> | 12            | 125         | 50             | 50    | 6000   | 5.8         | 5.8   | 721.9  | 5906675046563 |
|      | R-HPTIIA4-12150/55 <sup>1)</sup> | 12            | 150         | 50             | 50    | 4000   | 6.7         | 6.7   | 561.6  | 5906675046570 |
|      | R-HPTIIA4-12180/85 <sup>1)</sup> | 12            | 180         | 50             | 50    | 4000   | 7.8         | 7.8   | 651.3  | 5906675046587 |
| M16  | R-HPTIIA4-16125/5 <sup>1)</sup>  | 16            | 125         | 25             | 25    | 4000   | 5.4         | 5.4   | 888.2  | 5906675046594 |
|      | R-HPTIIA4-16140/20 <sup>1)</sup> | 16            | 140         | 25             | 25    | 4000   | 5.8         | 5.8   | 957.4  | 5906675034898 |
|      | R-HPTIIA4-16150/30 <sup>1)</sup> | 16            | 150         | 25             | 25    | 4000   | 6.1         | 6.1   | 1006.5 | 5906675046600 |
|      | R-HPTIIA4-16180/60 <sup>1)</sup> | 16            | 180         | 25             | 25    | 3000   | 7.2         | 7.2   | 888.7  | 5906675046617 |

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