# SpaTec™ Xtrem™

## FIRE RATED MECHANICAL ANCHOR



## GENERAL INFORMATION

| Performance Related | Material | Installation Related |
|---|---|---|

## Product

**A high security, high performance, through fixing, torque controlled expansion anchor which has approval for use in cracked and non-cracked concrete.**

## Compliance

**European Technical Assessment (option 1) - ETA-10/0276**
**Design according to:**

- AS5216 (formerly TS101)
- AS1170.4 - Earthquake Actions
- EN1992-4 (formerly ETAG001 Annex C, E & TR045)
- NZS3101 (A3) Section 17 - Seismic Design C1 and C2
- Use enclosed data for simplified calculation method

**Use Ramset™ iExpert Anchor Software for optimised calculation or where a greater range of anchor layout detail is needed..**

## Benefits, Advantages and Features

**Fire tested to TR020**

- Fire rated performance up to 120 minutes
- Highest level of European approval for mechanical expansion anchors
- Approved for all directions (floor, wall, overhead)
- Shallow embedment depths
- Highest performance in cracked concrete
- Zinc Plated to 5µm

Anchor diameters from M10 to M20

**Suitable for structural loads:**

- Safety critical loads
- High tensile capacity of Grade 8.8 Steel Bolt.
- Heavy duty, heat treated washer. Heavy duty, thick expansion sleeve that provides secure grip to concrete.

**Improved security:**

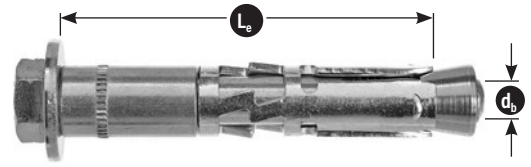
- Large expansion reserve that ensures retention in concrete if overloaded.
- Torque induced pull down closes gaps and induces preload.

**Resistant to cyclic loading:**

- Heavy duty sleeve with integrated pull-down section works to retain 65% of initial preload.

**Fast installation:**

- Hex Nut & Hex Bolt versions available
- Countersunk heads available.
- Through fixing eliminates marking out and repositioning of fixtures.

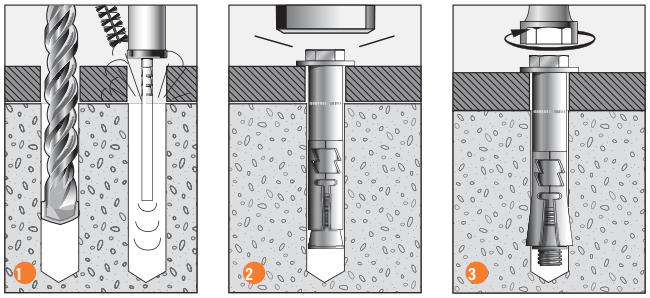



**Hex Head**

### Principal Applications

- Anchoring into cracked & non cracked concrete
- Safety critical loads
- Steel columns & walkways
- Road barrier hold down
- Bridge refurbishment
- Road & Rail tunnel construction
- Wall Plates
- Safety Rails
- Intended working life of the anchor of 50 years

## Installation




1. Drill or core a hole to the recommended diameter and depth using the fixture as a template. Clean the hole thoroughly with a hole cleaning brush. Remove the debris with a hand pump, compressed air, or vacuum.
2. After ensuring that the anchor is assembled correctly, insert the anchor through the fixture and drive with a hammer until the washer contacts the fixture.
3. Tighten the bolt with a torque wrench to the specified assembly torque.

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### Installation Details

| Anchor size, $d_b$ (mm) | Drilled hole diameter, $d_h$ (mm) | Fixture hole diameter, $d_f$ (mm) | Anchor effective depth, h (mm) | Depth of drill hole, $h_1$ (mm) | Tightening torque, $T_r$ (Nm) | Optimum dimensions* | | Concrete substrate thickness, $b_m$ (mm) |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Anchor* spacing, $a_c$ (mm) | Edge** distance, $e_c$ (mm) | |
| M10 | 15 | 17 | 70 | 90 | 50 | 280 | 140 | 140 |
| M12 | 18 | 20 | 80 | 105 | 80 | 320 | 160 | 160 |
| M16 | 24 | 26 | 100 | 131 | 120 | 400 | 200 | 200 |
| M20 | 28 | 30 | 125 | 157 | 200 | 500 | 250 | 250 |

* For optimised performance data, please use Ramset iExpert Anchoring Software.
** If the fire attack is from more than one side,the edge distance of the anchor has to be ≥ 300mm and 2xh.

### DESCRIPTION AND PART NUMBERS

| Anchor size, $d_b$ (mm) | Drilled hole diameter, $d_h$ (mm) | Effective Length, $L_e$ (mm) | Fixture thickness, t (mm) | ETA Designation Number | Part Number |
|---|---|---|---|---|---|
| | | | | | Zinc (Hex Hd) |
| M10 | 15 | 90 | 20 | V10-15/20 | SP10105 |
| M12 | 18 | 90 | 10 | V12-18/10 | SP12105 |
| | | 105 | 25 | V12-18/25 | SP12120 |
| M16 | 24 | 125 | 25 | V16-24/25 | SP16145 |
| M20 | 28 | 150 | 25 | V20-28/25 | SP20170 |

### ENGINEERING PROPERTIES - Carbon Steel

| Anchor size, $d_b$ (mm) | Shank diameter, $d_s$ (mm) | Bolt stress area, $A_s$ ($mm^2$) | Bolt yield strength, $f_y$ (MPa) | Bolt UTS, $f_u$ (MPa) | Spacer area, $A_s$ ($mm^2$) | Spacer yield strength, $f_y$ (MPa) | Spacer UTS, $f_u$ (MPa) | Section modulus Z ($mm^3$) |
|---|---|---|---|---|---|---|---|---|
| M10 | 9.8 | 58.0 | 640 | 800 | 83.4 | 350 | 480 | 62.3 |
| M12 | 11.7 | 84.3 | 640 | 800 | 119.8 | 330 | 430 | 109.2 |
| M16 | 15.7 | 157.0 | 640 | 800 | 201.7 | 330 | 430 | 277.5 |
| M20 | 19.7 | 245.0 | 660 | 800 | 242.5 | 330 | 430 | 540.9 |

# SpaTec™ Xtrem™

## FIRE RATED MECHANICAL ANCHOR



**Design Case 1**

## Fire resistance duration = 30 minutes

**Table 1a Characteristic values of resistance to tension loads in 20 MPa to 50 MPa concrete strength for Fire resistance duration = 30 minutes**

| Anchor size, $d_b$ | | M10 | M12 | M16 | M20 |
|---|---|---|---|---|---|
| Drilled hole diam, $d_h$ (mm) | | 15 | 18 | 24 | 28 |
| Effective depth, h (mm) | Characteristic Resistance | | | | |
| 70 | Steel Failure - $N_{Rk,s,fi,30}$ (kN) | 4.5 | | | |
| | Pull-out failure concrete - $N_{Rk,p,fi,30}$ (kN) | **4.0** | | | |
| | Concrete cone failure - $N_{Rk,c,fi,30}$ (kN) | 7.4 | | | |
| 80 | Steel Failure - $N_{Rk,s,fi,30}$ (kN) | | 17.6 | | |
| | Pull-out failure - $N_{Rk,p,fi,30}$ (kN) | | - | | |
| | Concrete cone failure - $N_{Rk,c,fi,30}$ (kN) | | **10.3** | | |
| 100 | Steel Failure - $N_{Rk,s,fi,30}$ (kN) | | | 32.8 | |
| | Pull-out failure concrete - $N_{Rk,p,fi,30}$ (kN) | | | - | |
| | Concrete cone failure - $N_{Rk,c,fi,30}$ (kN) | | | **18.0** | |
| 125 | Steel Failure - $N_{Rk,s,fi,30}$ (kN) | | | | 51.1 |
| | Pull-out failure - $N_{Rk,p,fi,30}$ (kN) | | | | - |
| | Concrete cone failure - $N_{Rk,c,fi,30}$ (kN) | | | | **31.4** |

Note: Bold values indicates limiting load. Data in table lists all possible failure mechanisms due to fire.

**Table 1b Characteristic values of resistance to shear loads in 20 MPa concrete strength for Fire resistance duration = 30 minutes**

| Anchor size, $d_b$ | | M10 | M12 | M16 | M20 |
|---|---|---|---|---|---|
| Drilled hole diam, $d_h$ (mm) | | 15 | 18 | 24 | 28 |
| Edge distance, $e_c$ (mm) | Characteristic Resistance | | | | |
| 140 | Steel Failure without lever arm - $V^0_{Rk,s,fi,30}$ (kN) | **4.5** | | | |
| | Steel Failure with lever arm - $M^0_{Rk,s,fi,30}$ (N.m) | 5.8 | | | |
| | Concrete edge failure - $V^0_{Rk,c,fi,30}$ (kN) | 4.9 | | | |
| 160 | Steel Failure without lever arm - $V^0_{Rk,s,fi,30}$ (kN) | | 17.6 | | |
| | Steel Failure with lever arm - $M^0_{Rk,s,fi,30}$ (N.m) | | 27.3 | | |
| | Concrete edge failure - $V^0_{Rk,c,fi,30}$ (kN) | | **6.5** | | |
| 200 | Steel Failure without lever arm - $V^0_{Rk,s,fi,30}$ (kN) | | | 32.8 | |
| | Steel Failure with lever arm - $M^0_{Rk,s,fi,30}$ (N.m) | | | 69.5 | |
| | Concrete edge failure - $V^0_{Rk,c,fi,30}$ (kN) | | | **10.4** | |
| 300 | Steel Failure without lever arm - $V^0_{Rk,s,fi,30}$ (kN) | | | | 51.1 |
| | Steel Failure with lever arm - $M^0_{Rk,s,fi,30}$ (N.m) | | | | 135.5 |
| | Concrete edge failure - $V^0_{Rk,c,fi,30}$ (kN) | | | | **15.9** |

Note: Bold values indicates limiting load. Data in table lists all possible failure mechanisms due to fire.
Note: Concrete edge failure values are based on 20 MPa concrete strength. For values in higher concrete strengths, please multiply $V^0_{Rk,c,fi,30}$ by the concrete compressive strength effect $X_{vc}$ , as follows;

| $f'_c$ (MPa) | 20 | 30 | 40 | 50 |
|---|---|---|---|---|
| $X_{vc}$ | 1 | 1.22 | 1.41 | 1.55 |

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## FIRE RATED MECHANICAL ANCHOR



Design Case 2

## Fire resistance duration = 60 minutes

**Table 2a Characteristic values of resistance to tension loads in 20 MPa to 50 MPa concrete strength for Fire resistance duration = 60 minutes**

| Anchor size, $d_b$ | | M10 | M12 | M16 | M20 |
|---|---|---|---|---|---|
| Drilled hole diam, $d_h$ (mm) | | 15 | 18 | 24 | 28 |
| Effective depth, h (mm) | Characteristic Resistance | | | | |
| 70 | Steel Failure - $N_{Rk,s,fi,60}$(kN) | **3.3** | | | |
| | Pull-out failure concrete - $N_{Rk,p,fi,60}$ (kN) | 4.0 | | | |
| | Concrete cone failure - $N_{Rk,c,fi,60}$ (kN) | 7.4 | | | |
| 80 | Steel Failure - $N_{Rk,s,fi,60}$ (kN) | | 11.4 | | |
| | Pull-out failure - $N_{Rk,p,fi,60}$ (kN) | | - | | |
| | Concrete cone failure - $N_{Rk,c,fi,60}$ (kN) | | **10.3** | | |
| 100 | Steel Failure - $N_{Rk,s,fi,60}$(kN) | | | 21.3 | |
| | Pull-out failure concrete - $N_{Rk,p,fi,60}$ (kN) | | | - | |
| | Concrete cone failure - $N_{Rk,c,fi,60}$ (kN) | | | **18.0** | |
| 125 | Steel Failure - $N_{Rk,s,fi,60}$ (kN) | | | | 33.2 |
| | Pull-out failure - $N_{Rk,p,fi,60}$ (kN) | | | | - |
| | Concrete cone failure - $N_{Rk,c,fi,60}$ (kN) | | | | **31.4** |

Note: Bold values indicates limiting load. Data in table lists all possible failure mechanisms due to fire.

**Table 2b Characteristic values of resistance to shear loads in 20 MPa concrete strength for Fire resistance duration = 60 minutes**

| Anchor size, $d_b$ | | M10 | M12 | M16 | M20 |
|---|---|---|---|---|---|
| Drilled hole diam, $d_h$ (mm) | | 15 | 18 | 24 | 28 |
| Edge distance, $e_c$ (mm) | Characteristic Resistance | | | | |
| 140 | Steel Failure without lever arm - $V^0_{Rk,s,fi,60}$ (kN) | **3.3** | | | |
| | Steel Failure with lever arm - $M^0_{Rk,s,fi,60}$ (N.m) | 4.2 | | | |
| | Concrete edge failure - $V^0_{Rk,c,fi,60}$(kN) | 4.9 | | | |
| 160 | Steel Failure without lever arm - $V^0_{Rk,s,fi,60}$ (kN) | | 11.4 | | |
| | Steel Failure with lever arm - $M^0_{Rk,s,fi,60}$ (N.m) | | 17.8 | | |
| | Concrete edge failure - $V^0_{Rk,c,fi,60}$ (kN) | | **6.5** | | |
| 200 | Steel Failure without lever arm - $V^0_{Rk,s,fi,60}$ (kN) | | | 21.3 | |
| | Steel Failure with lever arm - $M^0_{Rk,s,fi,60}$ (N.m) | | | 45.2 | |
| | Concrete edge failure - $V^0_{Rk,c,fi,60}$(kN) | | | **10.4** | |
| 300 | Steel Failure without lever arm - $V^0_{Rk,s,fi,60}$ (kN) | | | | 33.2 |
| | Steel Failure with lever arm - $M^0_{Rk,s,fi,60}$ (N.m) | | | | 88.1 |
| | Concrete edge failure - $V^0_{Rk,c,fi,60}$ (kN) | | | | **15.9** |

Note: Bold values indicates limiting load. Data in table lists all possible failure mechanisms due to fire.
Note: Concrete edge failure values are based on 20 MPa concrete strength. For values in higher concrete strengths, please multiply $V^0_{Rk,c,fi,60}$ by the concrete compressive strength effect $X_{vc}$, as follows;

| $f'_c$ (MPa) | 20 | 30 | 40 | 50 |
|---|---|---|---|---|
| $X_{vc}$ | 1 | 1.22 | 1.41 | 1.55 |

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**Design Case 3**

## Fire resistance duration = 90 minutes

**Table 2a Characteristic values of resistance to tension loads in 20 MPa to 50 MPa concrete strength for Fire resistance duration = 90 minutes**

| Anchor size, $d_b$ | | M10 | M12 | M16 | M20 |
|---|---|---|---|---|---|
| Drilled hole diam, $d_h$ (mm) | | 15 | 18 | 24 | 28 |
| Effective depth, h (mm) | Characteristic Resistance | | | | |
| 70 | Steel Failure - $N_{Rk,s,fi,90}$(kN) | **2.1** | | | |
| | Pull-out failure concrete - $N_{Rk,p,fi,90}$ (kN) | 4.0 | | | |
| | Concrete cone failure - $N_{Rk,c,fi,90}$ (kN) | 7.4 | | | |
| 80 | Steel Failure - $N_{Rk,s,fi,90}$ (kN) | | **5.3** | | |
| | Pull-out failure - $N_{Rk,p,fi,90}$ (kN) | | - | | |
| | Concrete cone failure - $N_{Rk,c,fi,90}$ (kN) | | 10.3 | | |
| 100 | Steel Failure - $N_{Rk,s,fi,90}$(kN) | | | **9.8** | |
| | Pull-out failure concrete - $N_{Rk,p,fi,90}$ (kN) | | | - | |
| | Concrete cone failure - $N_{Rk,c,fi,90}$ (kN) | | | 18.0 | |
| 125 | Steel Failure - $N_{Rk,s,fi,90}$ (kN) | | | | **15.3** |
| | Pull-out failure - $N_{Rk,p,fi,90}$ (kN) | | | | - |
| | Concrete cone failure - $N_{Rk,c,fi,90}$ (kN) | | | | 31.4 |

Note: Bold values indicates limiting load. Data in table lists all possible failure mechanisms due to fire.

**Table 2b Characteristic values of resistance to shear loads in 20 MPa concrete strength for Fire resistance duration = 90 minutes**

| Anchor size, $d_b$ | | M10 | M12 | M16 | M20 |
|---|---|---|---|---|---|
| Drilled hole diam, $d_h$ (mm) | | 15 | 18 | 24 | 28 |
| Edge distance, $e_c$ (mm) | Characteristic Resistance | | | | |
| 140 | Steel Failure without lever arm - $V^0_{Rk,s,fi,90}$ (kN) | **2.1** | | | |
| | Steel Failure with lever arm - $M^0_{Rk,s,fi,90}$ (N.m) | 2.7 | | | |
| | Concrete edge failure - $V^0_{Rk,c,fi,90}$(kN) | 4.9 | | | |
| 160 | Steel Failure without lever arm - $V^0_{Rk,s,fi,90}$ (kN) | | **5.3** | | |
| | Steel Failure with lever arm - $M^0_{Rk,s,fi,90}$ (N.m) | | 8.2 | | |
| | Concrete edge failure - $V^0_{Rk,c,fi,90}$ (kN) | | 6.5 | | |
| 200 | Steel Failure without lever arm - $V^0_{Rk,s,fi,90}$ (kN) | | | **9.8** | |
| | Steel Failure with lever arm - $M^0_{Rk,s,fi,90}$ (N.m) | | | 20.9 | |
| | Concrete edge failure - $V^0_{Rk,c,fi,90}$(kN) | | | 10.4 | |
| 300 | Steel Failure without lever arm - $V^0_{Rk,s,fi,90}$ (kN) | | | | **15.3** |
| | Steel Failure with lever arm - $M^0_{Rk,s,fi,90}$ (N.m) | | | | 40.7 |
| | Concrete edge failure - $V^0_{Rk,c,fi,90}$ (kN) | | | | 15.9 |

Note: Bold values indicates limiting load. Data in table lists all possible failure mechanisms due to fire.
Note: Concrete edge failure values are based on 20 MPa concrete strength. For values in higher concrete strengths, please multiply $V^0_{Rk,c,fi,90}$ by the concrete compressive strength effect $X_{vc}$, as follows;

| $f'_c$ (MPa) | 20 | 30 | 40 | 50 |
|---|---|---|---|---|
| $X_{vc}$ | 1 | 1.22 | 1.41 | 1.55 |

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**Design Case 4**

## Fire resistance duration = 120 minutes

**Table 4a Characteristic values of resistance to tension loads in 20 MPa to 50 MPa concrete strength for Fire resistance duration = 120 minutes**

| Anchor size, $d_b$ | | M10 | M12 | M16 | M20 |
|---|---|---|---|---|---|
| Drilled hole diam, $d_h$ (mm) | | 15 | 18 | 24 | 28 |
| Effective depth, h (mm) | Characteristic Resistance | | | | |
| 70 | Steel Failure - $N_{Rk,s,fi,120}$ (kN) | **1.5** | | | |
| | Pull-out failure concrete - $N_{Rk,p,fi,120}$ (kN) | 3.2 | | | |
| | Concrete cone failure - $N_{Rk,c,fi,120}$ (kN) | 5.9 | | | |
| 80 | Steel Failure - $N_{Rk,s,fi,120}$ (kN) | | **2.2** | | |
| | Pull-out failure - $N_{Rk,p,fi,120}$ (kN) | | - | | |
| | Concrete cone failure - $N_{Rk,c,fi,120}$ (kN) | | 8.2 | | |
| 100 | Steel Failure - $N_{Rk,s,fi,120}$ (kN) | | | **4.1** | |
| | Pull-out failure concrete - $N_{Rk,p,fi,120}$ (kN) | | | - | |
| | Concrete cone failure - $N_{Rk,c,fi,120}$ (kN) | | | 14.4 | |
| 125 | Steel Failure - $N_{Rk,s,fi,120}$ (kN) | | | | **6.4** |
| | Pull-out failure - $N_{Rk,p,fi,120}$ (kN) | | | | - |
| | Concrete cone failure - $N_{Rk,c,fi,120}$ (kN) | | | | 25.2 |

Note: Bold values indicates limiting load. Data in table lists all possible failure mechanisms due to fire.

**Table 4b Characteristic values of resistance to shear loads in 20 MPa concrete strength for Fire resistance duration = 120 minutes**

| Anchor size, $d_b$ | | M10 | M12 | M16 | M20 |
|---|---|---|---|---|---|
| Drilled hole diam, $d_h$ (mm) | | 15 | 18 | 24 | 28 |
| Edge distance, $e_c$ (mm) | Characteristic Resistance | | | | |
| 140 | Steel Failure without lever arm - $V^0_{Rk,s,fi,120}$ (kN) | **1.5** | | | |
| | Steel Failure with lever arm - $M^0_{Rk,s,fi,120}$ (N.m) | 1.9 | | | |
| | Concrete edge failure - $V^0_{Rk,c,fi,120}$ (kN) | 3.9 | | | |
| 160 | Steel Failure without lever arm - $V^0_{Rk,s,fi,120}$ (kN) | | **2.2** | | |
| | Steel Failure with lever arm - $M^0_{Rk,s,fi,120}$ (N.m) | | 3.4 | | |
| | Concrete edge failure - $V^0_{Rk,c,fi,120}$ (kN) | | 5.2 | | |
| 200 | Steel Failure without lever arm - $V^0_{Rk,s,fi,120}$ (kN) | | | **4.1** | |
| | Steel Failure with lever arm - $M^0_{Rk,s,fi,120}$ (N.m) | | | 8.7 | |
| | Concrete edge failure - $V^0_{Rk,c,fi,120}$ (kN) | | | 8.3 | |
| 300 | Steel Failure without lever arm - $V^0_{Rk,s,fi,120}$ (kN) | | | | **6.4** |
| | Steel Failure with lever arm - $M^0_{Rk,s,fi,120}$ (N.m) | | | | 17.0 |
| | Concrete edge failure - $V^0_{Rk,c,fi,120}$ (kN) | | | | 12.7 |

Note: Bold values indicates limiting load. Data in table lists all possible failure mechanisms due to fire.
Note: Concrete edge failure values are based on 20 MPa concrete strength. For values in higher concrete strengths, please multiply $V^0_{Rk,c,fi,120}$ by the concrete compressive strength effect $X_{vc}$, as follows;

| $f'_c$ (MPa) | 20 | 30 | 40 | 50 |
|---|---|---|---|---|
| $X_{vc}$ | 1 | 1.22 | 1.41 | 1.55 |