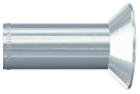
# High performance anchor FH II. General product information

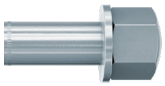


FH II S (M6 – M24)

FH II B (M6 – M24)



FH II SK (M6 – M12)



FH II H (M6 – M16)

FH II S R (M6 – M16)

FH II SK R (M8 – M12)

## Features and advantages

- European Technical Assessment *) for cracked and non-cracked concrete and Seismic Categories C1 and C2 and including Fire Resistance R30 – R120
- ICC-ES Evaluation Report *) for cracked and non-cracked concrete
- Alternative head designs for flexible design solutions: Hexagonal head (type S), countersunk head (type SK), bolt version with nut and washer (type B) and cap nut (type H)
- Various drilling methods – Hammer-, Hollow drill bit drilling

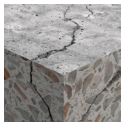
## Anchor materials

**Sleeve anchor:**

- Carbon steel, zinc plated (5 µm) and passivated (gvz)
- Stainless steel (R) of corrosion resistance class (CRC) III, e.g. 1.4401 optional 1.4571, 1.4362 and according to ASTM/AISI steel grade 316

## Base materials

- Cracked concrete, C20/25 – C50/60



- Non-cracked concrete, C20/25 – C50/60

- *) The conditions of use (e.g. design resistances, characteristic distance, ...) in the European Technical Assessment or in the ICC-ES Evaluation Report may vary from those of the Technical Handbook.

## Certificates

- ETA-07/0025 (2020-09-23)


- ESR-2691 (2021-04)


- BBK, Germany (2007-12-31)


- VdS CEA 4001:2008-11(03) (Internet listing)

- FM ID: 0003023222 (2015-02-12)


## Design features

- FiXperience Design Software


- Static and quasi-static design


- Seismic design


- Design under fire exposure


## Installation features

- Hammer drilling

- Hollow drill bit drilling

# Technical product information

## 1. Ultimate resistance of single anchors with large spacing and large edge distance

| Mean values[1] | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **FH II gvz** (carbon steel, zinc-plated) | | | | **10** (M6) | | **12** (M8) | | **15** (M10) | | **18** (M12) | | **24** (M16) | | **28** (M20) | | **32** (M24) | |
| **Head shape** | | | | **B/H** | **S/SK** | **B/H** | **S/SK** | **B/H** | **S/SK** | **B/H** | **S/SK** | **B/H** | **S** | **B** | **S** | **B** | **S** |
| **Embedment depth** | | $h_{ef}$ | **[mm]** | **40** | **40** | **60** | **60** | **70** | **70** | **80** | **80** | **100** | **100** | **125** | **125** | **150** | **150** |
| **Non-cracked concrete** | | | | | | | | | | | | | | | | | |
| **Tension** | C 20/25 | $N_{Ru,m}$ | **[kN]** | *16.9* | *16.9* | 28.5 | 28.5 | 35.8 | 35.8 | 48.5 | 48.5 | 71.7 | 71.7 | 106.2 | 106.2 | 145.9 | 145.9 |
| | C 50/60 | $N_{Ru,m}$ | **[kN]** | *16.9* | *16.9* | *30.8* | *30.8* | *48.7* | *48.7* | *70.8* | *70.8* | 113.4 | 113.4 | 167.9 | 167.9 | 230.7 | 230.7 |
| **Shear** | ≥ C 20/25 | $V_{Ru,m}$ | **[kN]** | *17.7* | *17.7* | *34.3* | *42.4* | *52.7* | *71.7* | *79.1* | *96.3* | *143.4* | *143.4* | *212.4* | *212.4* | *210.6* | *266.4* |
| **Cracked concrete** | | | | | | | | | | | | | | | | | |
| **Tension** | C 20/25 | $N_{Ru,m}$ | **[kN]** | 13.8 | 13.8 | 20.8 | 20.8 | 28.9 | 28.9 | 36.2 | 36.2 | 61.0 | 61.0 | 88.8 | 88.8 | 131.7 | 131.7 |
| | C 50/60 | $N_{Ru,m}$ | **[kN]** | *16.9* | *16.9* | *30.8* | *30.8* | 45.7 | 45.7 | 57.3 | 57.3 | 96.4 | 96.4 | 140.4 | 140.4 | 208.3 | 208.3 |
| **Shear** | ≥ C 20/25 | $V_{Ru,m}$ | **[kN]** | 13.8 | 13.8 | *34.3* | 41.5 | *52.7* | 57.8 | 72.5 | 72.5 | 121.9 | 121.9 | 177.6 | 177.6 | *210.6* | 263.4 |

| Mean values[1] | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **FH II R** (stainless steel, CRC III) | | | | **10** (M6) | **12** (M8) | **15** (M10) | **18** (M12) | **24** (M16) | |
| **Head shape** | | | | **S** | **S/SK** | **S/SK** | **S/SK** | **S** | |
| **Embedment depth** | | $h_{ef}$ | **[mm]** | **40** | **60** | **70** | **80** | **100** | |
| **Non-cracked concrete** | | | | | | | | | |
| **Tension** | C 20/25 | $N_{Ru,m}$ | **[kN]** | *14.8* | *26.9* | 35.8 | 48.5 | 71.7 | |
| | C 50/60 | $N_{Ru,m}$ | **[kN]** | *14.8* | *26.9* | *42.6* | *62.0* | 113.4 | |
| **Shear** | ≥ C 20/25 | $V_{Ru,m}$ | **[kN]** | 17.7 | *34.2* | *52.5* | *80.6* | 143.4 | |
| **Cracked concrete** | | | | | | | | | |
| **Tension** | C 20/25 | $N_{Ru,m}$ | **[kN]** | 13.8 | 20.8 | 28.9 | 36.2 | 61.0 | |
| | C 50/60 | $N_{Ru,m}$ | **[kN]** | *14.8* | *26.9* | *42.6* | 57.3 | 96.4 | |
| **Shear** | ≥ C 20/25 | $V_{Ru,m}$ | **[kN]** | 13.8 | *34.2* | *52.5* | 72.5 | 121.9 | |

[1] **Above values base on fischer ENSO specification and apply for following requirements:**
- Concrete strength based on $f_{ck,cube}$.
- For countersunk head version FH II SK (gvz/R) the minimum thickness of fixture has to be for M6 and M8 $t_{fix}$ = 10 mm or respectively for M10 and M12 $t_{fix}$ = 15 mm.
- Steel failure decisive = *Figures in blue italics*.

# Technical product information

## 2. Static and quasi-static resistance of single anchors with large spacing and large edge distance

### 2.1 Characteristic resistance



| Characteristic values[1] | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **FH II gvz** (carbon steel, zinc-plated) | | | | **10** (M6) | | **12** (M8) | | **15** (M10) | | **18** (M12) | | **24** (M16) | | **28** (M20) | | **32** (M24) | |
| **Head shape** | | | | **B/H** | **S/SK** | **B/H** | **S/SK** | **B/H** | **S/SK** | **B/H** | **S/SK** | **B/H** | **S** | **B** | **S** | **B** | **S** |
| **Embedment depth** | | $h_{ef}$ | **[mm]** | **40** | **40** | **60** | **60** | **70** | **70** | **80** | **80** | **100** | **100** | **125** | **125** | **150** | **150** |
| **Non-cracked concrete** | | | | | | | | | | | | | | | | | |
| **Tension** | C 20/25 | $N_{Rk}$ | **[kN]** | 12.5 | 12.5 | 22.9 | 22.9 | 28.8 | 28.8 | 35.2 | 35.2 | 49.2 | 49.2 | 68.8 | 68.8 | 90.4 | 90.4 |
| | C 50/60 | $N_{Rk}$ | **[kN]** | *16.1* | *16.1* | *29.3* | *29.3* | 44.6 | 44.6 | 54.6 | 54.6 | 76.3 | 76.3 | 106.6 | 106.6 | 140.1 | 140.1 |
| **Shear** | ≥ C 20/25 | $V_{Rk}$ | **[kN]** | 12.8 | 12.8 | *27.2* | *33.0* | *42.8* | *59.0* | *61.9* | 72.3 | 101.0 | 101.0 | 141.2 | 141.2 | *169.0* | 185.5 |
| **Cracked concrete** | | | | | | | | | | | | | | | | | |
| **Tension** | C 20/25 | $N_{Rk}$ | **[kN]** | 7.5 | 7.5 | 12.0 | 12.0 | 16.0 | 16.0 | 25.0 | 25.0 | 34.4 | 34.4 | 48.1 | 48.1 | 63.3 | 63.3 |
| | C 50/60 | $N_{Rk}$ | **[kN]** | 11.6 | 11.6 | 18.6 | 18.6 | 24.8 | 24.8 | 38.8 | 38.8 | 53.3 | 53.3 | 74.6 | 74.6 | 98.1 | 98.1 |
| **Shear** | ≥ C 20/25 | $V_{Rk}$ | **[kN]** | 9.1 | 9.1 | *27.2* | *33.0* | 42.2 | 42.2 | 51.5 | 51.5 | 72.0 | 72.0 | 100.6 | 100.6 | 132.3 | 132.3 |

| Characteristic values[1] | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **FH II R** (stainless steel, CRC III) | | | | **10** (M6) | **12** (M8) | **15** (M10) | **18** (M12) | **24** (M16) | |
| **Head shape** | | | | **S** | **S/SK** | **S/SK** | **S/SK** | **S** | |
| **Embedment depth** | | $h_{ef}$ | **[mm]** | **40** | **60** | **70** | **80** | **100** | |
| **Non-cracked concrete** | | | | | | | | | |
| **Tension** | C 20/25 | $N_{Rk}$ | **[kN]** | 12.5 | 20.0 | 28.8 | 35.2 | 49.2 | |
| | C 50/60 | $N_{Rk}$ | **[kN]** | *16.1* | *29.3* | 44.6 | 54.6 | 76.3 | |
| **Shear** | ≥ C 20/25 | $V_{Rk}$ | **[kN]** | 12.8 | *33.0* | *59.0* | 72.3 | 101.0 | |
| **Cracked concrete** | | | | | | | | | |
| **Tension** | C 20/25 | $N_{Rk}$ | **[kN]** | 7.5 | 12.0 | 16.0 | 25.0 | 34.4 | |
| | C 50/60 | $N_{Rk}$ | **[kN]** | 11.6 | 18.6 | 24.8 | 38.8 | 53.3 | |
| **Shear** | ≥ C 20/25 | $V_{Rk}$ | **[kN]** | 9.1 | *33.0* | 42.2 | 51.5 | 72.0 | |

### 2.2 Design resistance

| Design values[1] | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **FH II gvz** (carbon steel, zinc-plated) | | | | **10** (M6) | | **12** (M8) | | **15** (M10) | | **18** (M12) | | **24** (M16) | | **28** (M20) | | **32** (M24) | |
| **Head shape** | | | | **B/H** | **S/SK** | **B/H** | **S/SK** | **B/H** | **S/SK** | **B/H** | **S/SK** | **B/H** | **S** | **B** | **S** | **B** | **S** |
| **Embedment depth** | | $h_{ef}$ | **[mm]** | **40** | **40** | **60** | **60** | **70** | **70** | **80** | **80** | **100** | **100** | **125** | **125** | **150** | **150** |
| **Non-cracked concrete** | | | | | | | | | | | | | | | | | |
| **Tension** | C 20/25 | $N_{Rd}$ | **[kN]** | 8.3 | 8.3 | 15.3 | 15.3 | 19.2 | 19.2 | 23.5 | 23.5 | 32.8 | 32.8 | 45.9 | 45.9 | 60.3 | 60.3 |
| | C 50/60 | $N_{Rd}$ | **[kN]** | 10.7 | 10.7 | 19.5 | 19.5 | 29.8 | 29.8 | 36.4 | 36.4 | 50.8 | 50.8 | 71.1 | 71.1 | 93.4 | 93.4 |
| **Shear** | ≥ C 20/25 | $V_{Rd}$ | **[kN]** | 8.5 | 8.5 | 21.8 | 26.4 | 34.2 | 39.4 | 48.2 | 48.2 | 67.3 | 67.3 | 94.1 | 94.1 | 123.7 | 123.7 |
| **Cracked concrete** | | | | | | | | | | | | | | | | | |
| **Tension** | C 20/25 | $N_{Rd}$ | **[kN]** | 5.0 | 5.0 | 8.0 | 8.0 | 10.7 | 10.7 | 16.7 | 16.7 | 22.9 | 22.9 | 32.1 | 32.1 | 42.2 | 42.2 |
| | C 50/60 | $N_{Rd}$ | **[kN]** | 7.8 | 7.8 | 12.4 | 12.4 | 16.5 | 16.5 | 25.8 | 25.8 | 35.5 | 35.5 | 49.7 | 49.7 | 65.4 | 65.4 |
| **Shear** | ≥ C 20/25 | $V_{Rd}$ | **[kN]** | 6.1 | 6.1 | 21.8 | 22.3 | 28.1 | 28.1 | 34.3 | 34.3 | 48.0 | 48.0 | 67.1 | 67.1 | 88.2 | 88.2 |

[1] **Above values base on fischer ENSO specification and apply for following requirements:**

- Concrete strength based on $f_{ck,cube}$.
- For countersunk head version FH II SK (gvz/R) the minimum thickness of fixture has to be for M6 and M8 $t_{fix}$ = 10 mm or respectively for M10 and M12 $t_{fix}$ = 15 mm.
- Working life ≤ 50 years.
- Steel failure decisive = *Figures in blue italics*.

# Technical product information

## 2. Static and quasi-static resistance of single anchors with large spacing and large edge distance

### 2.2 Design resistance

| Design values[1] | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **FH II R** (stainless steel, CRC III) | | | | **10** (M6) | **12** (M8) | **15** (M10) | **18** (M12) | **24** (M16) | |
| **Head shape** | | | | **S** | **S/SK** | **S/SK** | **S/SK** | **S** | |
| **Embedment depth** | | $h_{ef}$ | [mm] | **40** | **60** | **70** | **80** | **100** | |
| **Non-cracked concrete** | | | | | | | | | |
| **Tension** | C 20/25 | $N_{Rd}$ | [kN] | 8.3 | 13.3 | 19.2 | 23.5 | 32.8 | |
| | C 50/60 | $N_{Rd}$ | [kN] | 10.1 | 18.3 | 29.0 | 36.4 | 50.8 | |
| **Shear** | ≥ C 20/25 | $V_{Rd}$ | [kN] | 8.5 | 24.8 | 39.4 | 48.2 | 67.3 | |
| **Cracked concrete** | | | | | | | | | |
| **Tension** | C 20/25 | $N_{Rd}$ | [kN] | 5.0 | 8.0 | 10.7 | 16.7 | 22.9 | |
| | C 50/60 | $N_{Rd}$ | [kN] | 7.8 | 12.4 | 16.5 | 25.8 | 35.5 | |
| **Shear** | ≥ C 20/25 | $V_{Rd}$ | [kN] | 6.1 | 22.3 | 28.1 | 34.3 | 48.0 | |

### 2.3 Recommended loads

| Recommended values[1] | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **FH II gvz** (carbon steel, zinc-plated) | | | | **10** (M6) | | **12** (M8) | | **15** (M10) | | **18** (M12) | | **24** (M16) | | **28** (M20) | | **32** (M24) | |
| **Head shape** | | | | **B/H** | **S/SK** | **B/H** | **S/SK** | **B/H** | **S/SK** | **B/H** | **S/SK** | **B/H** | **S** | **B** | **S** | **B** | **S** |
| **Embedment depth** | | $h_{ef}$ | [mm] | **40** | **40** | **60** | **60** | **70** | **70** | **80** | **80** | **100** | **100** | **125** | **125** | **150** | **150** |
| **Non-cracked concrete** | | | | | | | | | | | | | | | | | |
| **Tension** | C 20/25 | $N_{rec}$ | [kN] | 6.0 | 6.0 | 10.9 | 10.9 | 13.7 | 13.7 | 16.8 | 16.8 | 23.4 | 23.4 | 32.8 | 32.8 | 43.0 | 43.0 |
| | C 50/60 | $N_{rec}$ | [kN] | 7.7 | 7.7 | 14.0 | 14.0 | 21.3 | 21.3 | 26.0 | 26.0 | 36.3 | 36.3 | 50.8 | 50.8 | 66.7 | 66.7 |
| **Shear** | ≥ C 20/25 | $V_{rec}$ | [kN] | 6.1 | 6.1 | 15.5 | 18.9 | 24.5 | 28.2 | 34.4 | 34.4 | 48.1 | 48.1 | 67.2 | 67.2 | 88.4 | 88.4 |
| **Cracked concrete** | | | | | | | | | | | | | | | | | |
| **Tension** | C 20/25 | $N_{rec}$ | [kN] | 3.6 | 3.6 | 5.7 | 5.7 | 7.6 | 7.6 | 11.9 | 11.9 | 16.4 | 16.4 | 22.9 | 22.9 | 30.1 | 30.1 |
| | C 50/60 | $N_{rec}$ | [kN] | 5.5 | 5.5 | 8.9 | 8.9 | 11.8 | 11.8 | 18.5 | 18.5 | 25.4 | 25.4 | 35.5 | 35.5 | 46.7 | 46.7 |
| **Shear** | ≥ C 20/25 | $V_{rec}$ | [kN] | 4.3 | 4.3 | 15.5 | 15.9 | 20.1 | 20.1 | 24.5 | 24.5 | 34.3 | 34.3 | 47.9 | 47.9 | 63.0 | 63.0 |

| Recommended values[1] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **FH II R** (stainless steel, CRC III) | | | | **10** (M6) | **12** (M8) | **15** (M10) | **18** (M12) | **24** (M16) |
| **Head shape** | | | | **S** | **S/SK** | **S/SK** | **S/SK** | **S** |
| **Embedment depth** | | $h_{ef}$ | [mm] | **40** | **60** | **70** | **80** | **100** |
| **Non-cracked concrete** | | | | | | | | |
| **Tension** | C 20/25 | $N_{rec}$ | [kN] | 6.0 | 9.5 | 13.7 | 16.8 | 23.4 |
| | C 50/60 | $N_{rec}$ | [kN] | 7.2 | 13.1 | 20.7 | 26.0 | 36.3 |
| **Shear** | ≥ C 20/25 | $V_{rec}$ | [kN] | 6.1 | 17.7 | 28.2 | 34.4 | 48.1 |
| **Cracked concrete** | | | | | | | | |
| **Tension** | C 20/25 | $N_{rec}$ | [kN] | 3.6 | 5.7 | 7.6 | 11.9 | 16.4 |
| | C 50/60 | $N_{rec}$ | [kN] | 5.5 | 8.9 | 11.8 | 18.5 | 25.4 |
| **Shear** | ≥ C 20/25 | $V_{rec}$ | [kN] | 4.3 | 15.9 | 20.1 | 24.5 | 34.3 |

[1] **Above values base on fischer ENSO specification and apply for following requirements:**
- Concrete strength based on $f_{ck,cube}$.
- For countersunk head version FH II SK (gvz/R) the minimum thickness of fixture has to be for M6 and M8 $t_{fix}$ = 10 mm or respectively for M10 and M12 $t_{fix}$ = 15 mm.
- Working life ≤ 50 years.
- Recommended loads consider a partial safety factor for action load of $\gamma_L$ = 1.4.

# Technical product information



## 3. Seismic resistance of single anchors with large spacing and large edge distance

### 3.1 Characteristic resistance ($N_{Rk,C1/C2} = \min\{N_{Rk,s,C1/C2}; N_{Rk,p,C1/C2}; N_{Rk,c,C1/C2}\}$; $V_{Rk,C1/C2} = \min\{V_{Rk,s,C1/C2}; V_{Rk,cp,C1/C2}\}$)

| Characteristic values[1] | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **FH II gvz** (carbon steel, zinc-plated) | | | | **10** (M6) | | **12** (M8) | | **15** (M10) | | **18** (M12) | | **24** (M16) | | **28** (M20) | | **32** (M24) | |
| **Head shape** | | | | **B/H** | **S/SK** | **B/H** | **S/SK** | **B/H** | **S/SK** | **B/H** | **S/SK** | **B/H** | **S** | **B** | **S** | **B** | **S** |
| **Embedment depth** | | $h_{ef}$ | **[mm]** | **40** | **40** | **60** | **60** | **70** | **70** | **80** | **80** | **100** | **100** | **125** | **125** | **150** | **150** |
| **Cracked concrete, seismic performance category C1** | | | | | | | | | | | | | | | | | |
| **Tension** | ≥ C 20/25 | $N_{Rk,C1}$ | **[kN]** | – | – | 12.0 | 12.0 | 16.0 | 16.0 | 21.9 | 21.9 | 30.6 | 30.6 | 42.8 | 42.8 | 56.2 | 56.2 |
| **Shear** | ≥ C 20/25 | $V_{Rk,C1}$ | **[kN]** | – | – | *8.5* | *12.5* | *15.0* | 17.9 | 21.9 | 21.9 | 30.6 | 30.6 | 42.8 | 42.8 | 56.2 | 56.2 |
| **Cracked concrete, seismic performance category C2** | | | | | | | | | | | | | | | | | |
| **Tension** | ≥ C 20/25 | $N_{Rk,C2}$ | **[kN]** | – | – | 6.2 | 6.2 | 11.3 | 11.3 | 21.8 | 21.8 | 30.6 | 30.6 | 42.8 | 42.8 | 56.2 | 56.2 |
| **Shear** | ≥ C 20/25 | $V_{Rk,C2}$ | **[kN]** | – | – | *4.9* | *7.4* | *10.5* | *11.7* | *17.1* | *16.9* | 30.6 | 30.6 | *33.6* | 42.8 | *33.6* | *50.4* |

| Characteristic values[1] | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **FH II R** (stainless steel, CRC III) | | | | **10** (M6) | **12** (M8) | **15** (M10) | **18** (M12) | **24** (M16) | |
| **Head shape** | | | | **S** | **S/SK** | **S/SK** | **S/SK** | **S** | |
| **Embedment depth** | | $h_{ef}$ | **[mm]** | **40** | **60** | **70** | **80** | **100** | |
| **Cracked concrete, seismic performance category C1** | | | | | | | | | |
| **Tension** | ≥ C 20/25 | $N_{Rk,C1}$ | **[kN]** | – | 12.0 | 16.0 | 21.9 | 30.6 | |
| **Shear** | ≥ C 20/25 | $V_{Rk,C1}$ | **[kN]** | – | *12.5* | 17.9 | 21.9 | 30.6 | |
| **Cracked concrete, seismic performance category C2** | | | | | | | | | |
| **Tension** | ≥ C 20/25 | $N_{Rk,C2}$ | **[kN]** | – | 6.2 | 11.3 | 21.8 | 30.6 | |
| **Shear** | ≥ C 20/25 | $V_{Rk,C2}$ | **[kN]** | – | *7.4* | *11.7* | *16.9* | 30.6 | |

### 3.2 Design resistance ($N_{Rd,C1/C2} = \min\{N_{Rd,s,C1/C2}; N_{Rd,p,C1/C2}; N_{Rd,c,C1/C2}\}$; $V_{Rd,C1/C2} = \min\{V_{Rd,s,C1/C2}; V_{Rd,cp,C1/C2}\}$)

| Design values[1] | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **FH II gvz** (carbon steel, zinc-plated) | | | | **10** (M6) | | **12** (M8) | | **15** (M10) | | **18** (M12) | | **24** (M16) | | **28** (M20) | | **32** (M24) | |
| **Head shape** | | | | **B/H** | **S/SK** | **B/H** | **S/SK** | **B/H** | **S/SK** | **B/H** | **S/SK** | **B/H** | **S** | **B** | **S** | **B** | **S** |
| **Embedment depth** | | $h_{ef}$ | **[mm]** | **40** | **40** | **60** | **60** | **70** | **70** | **80** | **80** | **100** | **100** | **125** | **125** | **150** | **150** |
| **Cracked concrete, seismic performance category C1** | | | | | | | | | | | | | | | | | |
| **Tension** | ≥ C 20/25 | $N_{Rd,C1}$ | **[kN]** | – | – | 8.0 | 8.0 | 10.7 | 10.7 | 14.6 | 14.6 | 20.4 | 20.4 | 28.5 | 28.5 | 37.5 | 37.5 |
| **Shear** | ≥ C 20/25 | $V_{Rd,C1}$ | **[kN]** | – | – | 6.8 | 9.5 | 11.9 | 11.9 | 14.6 | 14.6 | 20.4 | 20.4 | 28.5 | 28.5 | 37.5 | 37.5 |
| **Cracked concrete, seismic performance category C2** | | | | | | | | | | | | | | | | | |
| **Tension** | ≥ C 20/25 | $N_{Rd,C2}$ | **[kN]** | – | – | 4.1 | 4.1 | 7.5 | 7.5 | 14.5 | 14.5 | 20.4 | 20.4 | 28.5 | 28.5 | 37.5 | 37.5 |
| **Shear** | ≥ C 20/25 | $V_{Rd,C2}$ | **[kN]** | – | – | 3.9 | 5.9 | 8.4 | 9.3 | 13.6 | 13.5 | 20.4 | 20.4 | 26.9 | 28.5 | 26.9 | 37.5 |

| Design values[1] | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **FH II R** (stainless steel, CRC III) | | | | **10** (M6) | **12** (M8) | **15** (M10) | **18** (M12) | **24** (M16) | |
| **Head shape** | | | | **S** | **S/SK** | **S/SK** | **S/SK** | **S** | |
| **Embedment depth** | | $h_{ef}$ | **[mm]** | **40** | **60** | **70** | **80** | **100** | |
| **Cracked concrete, seismic performance category C1** | | | | | | | | | |
| **Tension** | ≥ C 20/25 | $N_{Rd,C1}$ | **[kN]** | – | 8.0 | 10.7 | 14.6 | 20.4 | |
| **Shear** | ≥ C 20/25 | $V_{Rd,C1}$ | **[kN]** | – | 9.4 | 11.9 | 14.6 | 20.4 | |
| **Cracked concrete, seismic performance category C2** | | | | | | | | | |
| **Tension** | ≥ C 20/25 | $N_{Rd,C2}$ | **[kN]** | – | 4.1 | 7.5 | 14.5 | 20.4 | |
| **Shear** | ≥ C 20/25 | $V_{Rd,C2}$ | **[kN]** | – | 5.5 | 8.8 | 12.7 | 20.4 | |

[1] **Above values base on fischer ENSO specification and apply for following requirements:**

- Concrete strength based on $f_{ck,cube}$.
- For countersunk head version FH II SK (gvz/R) the minimum thickness of fixture has to be for M6 and M8 $t_{fix}$ = 10 mm or respectively for M10 and M12 $t_{fix}$ = 15 mm.
- Working life ≤ 50 years.
- Reduction factor considering gap between anchor and fixture is $\alpha_{gap}$ = 0.5.
- Steel failure decisive = *Figures in blue italics*.

# Technical product information

## 4. Fire resistance of single anchors with large spacing and large edge distance

| Design values[1] for fire resistance classes R30, R60, R90 and R120 | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **FH II gvz** (carbon steel, zinc-plated) | | | | **10** (M6) | | **12** (M8) | | **15** (M10) | | **18** (M12) | | **24** (M16) | | **28** (M20) | | **32** (M24) | |
| **Head shape** | | | | **B/H** | **S/SK** | **B/H** | **S/SK** | **B/H** | **S/SK** | **B/H** | **S/SK** | **B/H** | **S** | **B** | **S** | **B** | **S** |
| **Embedment depth** | | $h_{ef}$ | **[mm]** | **40** | **40** | **60** | **60** | **70** | **70** | **80** | **80** | **100** | **100** | **125** | **125** | **150** | **150** |
| **Cracked concrete, fire resistance class R30** | | | | | | | | | | | | | | | | | |
| **Tension** | ≥ C 20/25 | $N_{Rd,fi,30}$ | **[kN]** | 0.2 | 0.2 | 2.0 | 2.0 | 3.2 | 3.2 | 4.8 | 4.8 | 8.9 | 8.9 | 12.6 | 12.6 | 16.5 | 16.5 |
| **Shear** | ≥ C 20/25 | $V_{Rd,fi,30}$ | **[kN]** | 0.3 | 0.3 | 2.0 | 2.0 | 3.2 | 3.2 | 4.8 | 4.8 | 8.9 | 8.9 | 13.9 | 13.9 | 20.0 | 20.0 |
| **Cracked concrete, fire resistance class R60** | | | | | | | | | | | | | | | | | |
| **Tension** | ≥ C 20/25 | $N_{Rd,fi,60}$ | **[kN]** | 0.2 | 0.2 | 1.3 | 1.3 | 2.3 | 2.3 | 3.9 | 3.9 | 7.3 | 7.3 | 11.3 | 11.3 | 16.3 | 16.3 |
| **Shear** | ≥ C 20/25 | $V_{Rd,fi,60}$ | **[kN]** | 0.3 | 0.3 | 1.3 | 1.3 | 2.3 | 2.3 | 3.9 | 3.9 | 7.3 | 7.3 | 11.3 | 11.3 | 16.3 | 16.3 |
| **Cracked concrete, fire resistance class R90** | | | | | | | | | | | | | | | | | |
| **Tension** | ≥ C 20/25 | $N_{Rd,fi,90}$ | **[kN]** | 0.1 | 0.1 | 0.6 | 0.6 | 1.4 | 1.4 | 3.0 | 3.0 | 5.6 | 5.6 | 8.8 | 8.8 | 12.6 | 12.6 |
| **Shear** | ≥ C 20/25 | $V_{Rd,fi,90}$ | **[kN]** | 0.2 | 0.2 | 0.6 | 0.6 | 1.4 | 1.4 | 3.0 | 3.0 | 5.6 | 5.6 | 8.8 | 8.8 | 12.6 | 12.6 |
| **Cracked concrete, fire resistance class R120** | | | | | | | | | | | | | | | | | |
| **Tension** | ≥ C 20/25 | $N_{Rd,fi,120}$ | **[kN]** | 0.1 | 0.1 | 0.2 | 0.2 | 1.0 | 1.0 | 2.6 | 2.6 | 4.8 | 4.8 | 7.5 | 7.5 | 10.8 | 10.8 |
| **Shear** | ≥ C 20/25 | $V_{Rd,fi,120}$ | **[kN]** | 0.1 | 0.1 | 0.2 | 0.2 | 1.0 | 1.0 | 2.6 | 2.6 | 4.8 | 4.8 | 7.5 | 7.5 | 10.8 | 10.8 |

| Design values[1] for fire resistance classes R30, R60, R90 and R120 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **FH II R** (stainless steel, CRC III) | | | | **10** (M6) | **12** (M8) | **15** (M10) | **18** (M12) | **24** (M16) | |
| **Head shape** | | | | **S** | **S/SK** | **S/SK** | **S/SK** | **S** | |
| **Embedment depth** | | $h_{ef}$ | **[mm]** | **40** | **60** | **70** | **80** | **100** | |
| **Cracked concrete, fire resistance class R30** | | | | | | | | | |
| **Tension** | ≥ C 20/25 | $N_{Rd,fi,30}$ | **[kN]** | 0.2 | 2.0 | 3.2 | 4.8 | 8.9 | |
| **Shear** | ≥ C 20/25 | $V_{Rd,fi,30}$ | **[kN]** | 0.3 | 2.0 | 3.2 | 4.8 | 8.9 | |
| **Cracked concrete, fire resistance class R60** | | | | | | | | | |
| **Tension** | ≥ C 20/25 | $N_{Rd,fi,60}$ | **[kN]** | 0.2 | 1.3 | 2.3 | 3.9 | 7.3 | |
| **Shear** | ≥ C 20/25 | $V_{Rd,fi,60}$ | **[kN]** | 0.3 | 1.3 | 2.3 | 3.9 | 7.3 | |
| **Cracked concrete, fire resistance class R90** | | | | | | | | | |
| **Tension** | ≥ C 20/25 | $N_{Rd,fi,90}$ | **[kN]** | 0.1 | 0.6 | 1.4 | 3.0 | 5.6 | |
| **Shear** | ≥ C 20/25 | $V_{Rd,fi,90}$ | **[kN]** | 0.2 | 0.6 | 1.4 | 3.0 | 5.6 | |
| **Cracked concrete, fire resistance class R120** | | | | | | | | | |
| **Tension** | ≥ C 20/25 | $N_{Rd,fi,120}$ | **[kN]** | 0.1 | 0.2 | 1.0 | 2.6 | 4.8 | |
| **Shear** | ≥ C 20/25 | $V_{Rd,fi,120}$ | **[kN]** | 0.1 | 0.2 | 1.0 | 2.6 | 4.8 | |

[1] **Above values base on fischer ENSO specification and apply for following requirements:**

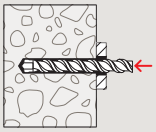
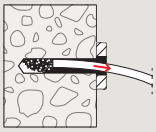
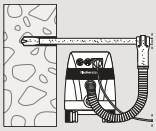
- Concrete strength based on $f_{ck,cube}$.
- Working life ≤ 50 years.
- Partial safety factor for resistance under fire exposure in accordance with EN 1992-4:2018 for steel failure and all shear failure modes $\gamma_{M,fi} = 1.0$ is considered. For concrete failure modes for tension the partial safety factor for resistance under fire exposure $\gamma_{M,fi} = 1.0 \times \gamma_{inst}$ is considered.

# Technical product information

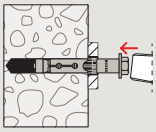
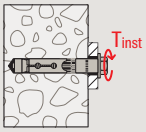
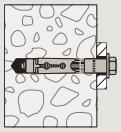
## 5. Installation data

### 5.1 Installation instructions – Bore hole drilling and cleaning



| Drill method | Bore hole drilling | Cleaning procedure |
|---|---|---|
| Hammer drilling |  Drill bore hole. |  Remove drill dust. |
| Hollow drill bit drilling |  Drill bore hole. |   Cleaning obsolete. |

### 5.2 Installation instructions – Anchor installation

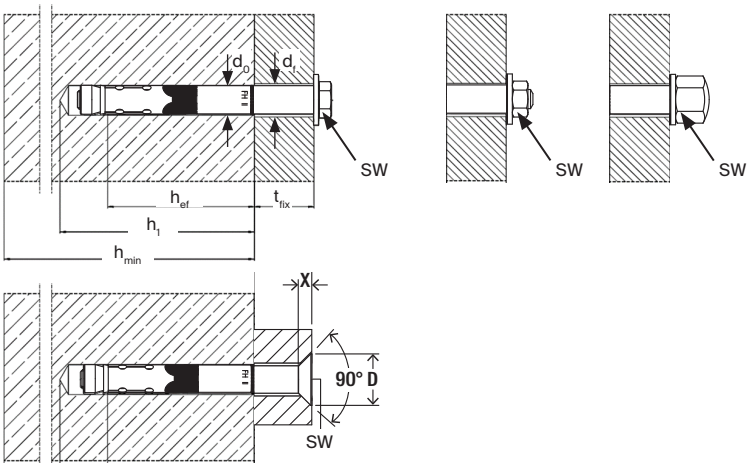
| Application condition | Anchor installation procedure |
|---|---|
| Push-through installation – Static, quasi-static and seismic application in all types of bore holes (see 5.1) |  Set anchor.   Apply torque.  Installed anchor. |

# Technical product information

## 5. Installation data

### 5.3 Installation parameters

| Parameters for anchor installation | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **FH II** | | | **10** (M6) | | | | **12** (M8) | | | | **15** (M10) | | | | **18** (M12) | | | | **24** (M16) | | | **28** (M20) | | **32** (M24) | |
| **Head shape** | | | **B** | **H** | **S** | **SK** | **B** | **H** | **S** | **SK** | **B** | **H** | **S** | **SK** | **B** | **H** | **S** | **SK** | **B** | **H** | **S** | **B** | **S** | **B** | **S** |
| **Minimum effective anchorage depth** | $h_{ef}$ | **[mm]** | | | | 40 | | | | 60 | | | | 70 | | | | 80 | | | 100 | 125 | | 150 | |
| **Drill hole depth in concrete** | $h_1$ | **[mm]** | | | | 55 | | | | 80 | | | | 90 | | | | 105 | | | 125 | 155 | | 180 | |
| **Drill hole depth for through fixing** | $t_d$ | **[mm]** | | | | $h_1 + t_{fix}$ | | | | | | | | | | | | | | | | | | | |
| **Nominal drill hole diameter** | $d_0$ | **[mm]** | | | | 10 | | | | 12 | | | | 15 | | | | 18 | | | 24 | 28 | | 32 | |
| **Maximum cutting diameter of drill bit for hammer and hollow drilling** | $d_{cut,max}$ | **[mm]** | | | | 10.45 | | | | 12.50 | | | | 15.50 | | | | 18.50 | | | 24.55 | 28.55 | | 32.70 | |
| **Diameter of clearance hole in fixture (push-through)** | $d_f$ | **[mm]** | | | | 12 | | | | 14 | | | | 17 | | | | 20 | | | 26 | 31 | | 35 | |
| **Width across nut** | SW | **[mm]** | 10 | 13 | 10 | 4 | 13 | 17 | 13 | 5 | 17 | 17 | 17 | 6 | 19 | 19 | 19 | 8 | | | 24 | 30 | | 36 | |
| **FH II gvz** (carbon steel, zinc-plated) | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Torque impact screw driver for zinc plated anchor** (gvz) | $T_{inst}$ | **[Nm]** | | | | 10 | 17.5 | 22.5 | 22.5 | 22.5 | 38 | 40 | 40 | 40 | | | | 80 | 120 | | 160 | 180 | | 200 | |
| **FH II R** (stainless steel, CRC III) | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Torque impact screw driver for stainless steel anchor** (R) | $T_{inst}$ | **[Nm]** | – | – | 15 | – | – | – | 25 | 25 | – | – | 40 | 40 | – | – | 100 | 100 | – | | 160 | | | | |




**Legend:**

| | | |
|---|---|---|
| $h_{ef}$ | = | Effective anchorage depth |
| $t_{fix}$ | = | Thickness of the fixture |
| $h_1$ | = | Drill hole depth to the deepest point |
| $d_0$ | = | Nominal drill hole diameter |
| $d_f$ | = | Diameter of clearance hole in fixture |
| $h_{min}$ | = | Minimum thickness of the concrete member |
| SW | = | Width across nut |

| Dimensions of the countersunk | | | | | | |
|---|---|---|---|---|---|---|
| **FH II SK** (gvz/R) | | | **10** | **12** | **15** | **18** |
| **Head diameter** | D | **[mm]** | 19.5 | 22.0 | 25.0 | 32.0 |
| **Depth of countersunk** | X | **[mm]** | 5.0 | 5.8 | 5.8 | 8.0 |

# Technical product information

## 5. Installation data

### 5.4 Minimum spacings, minimum edge distances and minimum concrete member thicknesses



| Parameters of the installed anchor in the concrete | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **FH II gvz** (carbon steel, zinc-plated)<br>**FH II R** (stainless steel, CRC III) | | | **10** (M6) | **12** (M8) | **15** (M10) | **18** (M12) | **24** (M16) | **28** (M20) | **32** (M24) |
| **Embedment depth** | $h_{ef}$ | **[mm]** | **40** | **60** | **70** | **80** | **100** | **125** | **150** |
| **Minimum thickness of concrete member** | $h_{min}$ | **[mm]** | 80 | 120 | 140 | 160 | 200 | 250 | 300 |
| **Non-cracked concrete, ambient temperature** | | | | | | | | | |
| **Minimum edge distance** | $c_{min}$ | **[mm]** | 40 | 60 | 70 | 80 | 100 | 120 | 180 |
| **for spacing** | s | **[mm]** | 70 | 100 | 140 | 200 | 220 | 240 | 380 |
| **Minimum spacing** | $s_{min}$ | **[mm]** | 40 | 60 | 70 | 80 | 100 | 120 | 160 |
| **for edge distance** | c | **[mm]** | 70 | 100 | 100 | 160 | 200 | 220 | 360 |
| **Cracked concrete, ambient temperature** | | | | | | | | | |
| **Minimum edge distance** | $c_{min}$ | **[mm]** | 40 | 50 | 60 | 70 | 80 | 100 | 120 |
| **for spacing** | s | **[mm]** | 40 | 80 | 120 | 160 | 200 | 220 | 280 |
| **Minimum spacing** | $s_{min}$ | **[mm]** | 40 | 50 | 60 | 70 | 80 | 100 | 120 |
| **for edge distance** | c | **[mm]** | 40 | 80 | 120 | 140 | 180 | 200 | 260 |
| **Cracked concrete, under fire exposure** | | | | | | | | | |
| **Minimum edge distance**[1)] | $c_{min,fi}$ | **[mm]** | 80 | 120 | 140 | 160 | 200 | 250 | 300 |
| **Minimum spacing** | $s_{min,fi}$ | **[mm]** | 40 | 50 | 60 | 70 | 80 | 100 | 120 |

1) **For fire exposure from more than one side the minimum edge distance is $c_{min,fi} \geq 300$ mm.**

# Technical product information

## 6. Materials

### 6.1 Approved materials of the anchor components

| Overview about the materials used in the anchor system | | |
|---|---|---|
| **Anchor component** | **General material definition** | **Common used material** |
| **FH II B/H gvz** (carbon steel, zinc plated) | | |
| Threaded rod | Steel $f_{uk} \geq 800$ N/mm², $f_{yk} \geq 640$ N/mm² (zinc plated) | Carbon steel, zinc plated (5µm) and passivated |
| Hexagonal/cap nut | Steel class 8 (zinc plated) | |
| Washer | Steel EN 10139:2020 (zinc plated) | |
| Distance sleeve | Steel EN 10305:2016 (zinc plated) | |
| Plastic sleeve | ABS (plastic) | |
| Expansion sleeve | Steel EN 10139:2020/EN 10277:2018 (zinc plated) | |
| Cone nut | Steel EN 10277:2018 (zinc plated) | |
| **FH II S/SK gvz** (carbon steel, zinc plated) | | |
| Hexagonal/countersunk screw | Steel class 8.8, EN ISO 898-1:2013 (zinc plated) | Carbon steel, zinc plated (5µm) and passivated |
| Washer (type S) | Steel EN 10139:2020 (zinc plated) | |
| Conical washer (type SK) | Steel EN 10277:2018 (zinc plated) | |
| Distance sleeve | Steel EN 10305:2016 (zinc plated) | |
| Plastic sleeve | ABS (plastic) | |
| Expansion sleeve | Steel EN 10139:2020/EN 10277:2018 (zinc plated) | |
| Cone nut | Steel EN 10277:2018 (zinc plated) | |
| **FH II S/SK R** (stainless steel, CRC III) | | |
| Hexagonal/countersunk screw | Stainless steel class 80, EN ISO 3506:2020 | Stainless steel of corrosion resistance class III, e.g. Mat.-No. 1.4401, 1.4571 or 1.4362 |
| Washer (type S) | Stainless steel EN 10088:2014 | |
| Conical washer (type SK) | Stainless steel EN 10088:2014 | |
| Distance sleeve | Stainless steel EN 10088:2014 | |
| Plastic sleeve | ABS (plastic) | |
| Expansion sleeve | Stainless steel EN 10088:2014 | |
| Cone nut | Stainless steel EN 10088:2014 | |

### 6.2 Product marking

| Marking of FH II | | |
|---|---|---|
| **Type of steel** | **Descrition of the marking** | **Example** |
| Carbon steel, zinc plated | Brand logo, type of anchor, nominal drill hole diameter / maximum thickness of fixture ($t_{fix}$) | FH II 15/25 |
| Stainless steel, CRC III | Brand logo, type of anchor, nominal drill hole diameter / maximum thickness of fixture ($t_{fix}$), "R" for stainless steel | FH II 15/25 R |

# Technical product information

## 6.3 Mechanical properties

| Characteristics of the anchor | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **FH II gvz** (carbon steel, zinc-plated) | | | **10** (M6) | **12** (M8) | **15** (M10) | **18** (M12) | **24** (M16) | **28** (M20) | **32** (M24) |
| **Embedment depth** | $h_{ef}$ | **[mm]** | **40** | **60** | **70** | **80** | **100** | **125** | **150** |
| **Stressed cross sectional area cone bolt** | $A_s$ | **[mm²]** | 20.1 | 36.6 | 58.0 | 84.3 | 157.0 | 245.0 | 353.0 |
| **Section modules cone bolt** | W | **[mm³]** | 12.7 | 31.2 | 62.3 | 109.2 | 277.5 | 541.0 | 935.0 |
| **Design value of bending moment** | $M^0_{Rd,s}$ | **[Nm]** | 9.6 | 24.0 | 48.0 | 84.0 | 212.8 | 414.4 | 716.8 |
| **Yield strength cone bolt** | $f_{yk}$ | **[N/mm²]** | 640 | 640 | 640 | 640 | 640 | 640 | 640 |
| **Tensile strength cone bolt** | $f_{uk}$ | **[N/mm²]** | 800 | 800 | 800 | 800 | 800 | 800 | 800 |

| Characteristics of the anchor | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **FH II R** (stainless steel, CRC III) | | | **10** (M6) | **12** (M8) | **15** (M10) | **18** (M12) | **24** (M16) | |
| **Embedment depth** | $h_{ef}$ | **[mm]** | **40** | **60** | **70** | **80** | **100** | |
| **Stressed cross sectional area cone bolt** | $A_s$ | **[mm²]** | 20.1 | 36.6 | 58.0 | 84.3 | 157.0 | |
| **Section modules cone bolt** | W | **[mm³]** | 12.7 | 31.2 | 62.3 | 109.2 | 277.5 | |
| **Design value of bending moment** | $M^0_{Rd,s}$ | **[Nm]** | 9.0 | 22.6 | 45.1 | 78.9 | 200.0 | |
| **Yield strength cone bolt** | $f_{yk}$ | **[N/mm²]** | 560 | 560 | 560 | 560 | 560 | |
| **Tensile strength cone bolt** | $f_{uk}$ | **[N/mm²]** | 700 | 700 | 700 | 700 | 700 | |

# Notes