Deutsches Institut für Bautechnik

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**European Technical Assessment Body for construction products**

Designated in accordance with Article 39 of Regulation (EU) No 2024/3110 and member of EOTA (European Organisation for Technical Assessment)

# European Technical Assessment ETA-20/0229 of 27 August 2026

English translation prepared by DIBt - Original version in German language

**General Part**

| | |
|---|---|
| Technical Assessment Body issuing the European Technical Assessment: | Deutsches Institut für Bautechnik |
| Trade name of the construction product | Würth Fixanchor W-FAZ PRO |
| Product family to which the construction product belongs | Mechanical fasteners for use in concrete |
| Manufacturer | Adolf Würth GmbH & Co. KG<br>Reinhold-Würth-Straße 12-17<br>74653 Künzelsau<br>GERMANY |
| Manufacturing plant | Werk W1 |
| This European Technical Assessment contains | 56 pages including 3 annexes which form an integral part of this assessment |
| This European Technical Assessment is issued in accordance with Article 95(4) of Regulation (EU) 2024/3110, on the basis of | EAD 330232-02-0601 |
| This version replaces | ETA-20/0229 issued on 27 January 2025 |

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## Specific Part

### 1 Technical description of the product

The Würth Fixanchor W-FAZ PRO is a fastener which is placed into a drilled hole and anchored by torque-controlled expansion. The following fastener types are covered:

- Anchor type W-FAZ PRO made of galvanized steel or stainless steel or high corrosion resistant steel with external thread, washer and hexagon nut, sizes M8 to M20 with a fastener length ≤ 200 mm
- Anchor type W-FAZ PRO-L made of galvanized steel or stainless steel or high corrosion resistant steel with external thread, washer and hexagon nut, sizes M8 to M20 with a fastener length ≥ 200 mm and M24, M27 in all lengths
- Anchor type W-FAZ PRO-SH made of sherardized steel with external thread, washer and hexagon nut, sizes M8 to M27
- Anchor type W-FAZ PRO-IG made of galvanized steel or stainless steel or high corrosion resistant steel with internal thread, washer and hexagon head screw or countersunk head screw or hexagon nut and commercial standard rod, sizes M6 to M12.

The product description is given in Annex A.

### 2 Specification of the intended use in accordance with the applicable European Assessment Document

The performances given in Section 3 are only valid if the fastener is used in compliance with the specifications and conditions given in Annex B.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the fastener of at least 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

### 3 Performance of the product and references to the methods used for its assessment

### 3.1 Mechanical resistance and stability (BWR 1)

| Essential characteristic | Performance |
|---|---|
| Characteristic resistance to tension load (static and quasi-static loading) | W-FAZ-PRO: see Annex B4, C1, C2<br>W-FAZ PRO-L: see Annex C11 - C13<br>W-FAZ PRO-SH: see Annex C17 and C18<br>W-FAZ PRO-IG: see Annex C23 and C24 |
| Characteristic resistance to shear load (static and quasi-static loading) | W-FAZ-PRO: see Annex C3<br>W-FAZ PRO-L: see Annex C14<br>W-FAZ PRO-SH: see Annex C19<br>W-FAZ PRO-IG: see Annex C25 |
| Displacements (static and quasi-static loading) | W-FAZ-PRO: see Annex C8 - C10<br>W-FAZ PRO-L: see Annex C16<br>W-FAZ PRO-SH: see Annex C22<br>W-FAZ PRO-IG: see Annex C27 |
| Stiffness | No performance assessed |

| Essential characteristic | Performance |
|---|---|
| Characteristic resistance and displacements for seismic performance categories C1 and C2 | W-FAZ-PRO: see Annex C4 and C5<br>W-FAZ PRO-SH: see Annex C20 |

### 3.2 Safety in case of fire (BWR 2)

| Essential characteristic | Performance |
|---|---|
| Reaction to fire | Class A1 |
| Resistance to fire | W-FAZ-PRO: see Annex C6 and C7<br>W-FAZ PRO-L: see Annex C15<br>W-FAZ PRO-SH: see Annex C21<br>W-FAZ PRO-IG: see Annex C26 |

### 3.3 Aspects of durability

| Essential characteristic | Performance |
|---|---|
| Durability | See Annex B1 and B2 |

## 4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

In accordance with the European Assessment Document EAD 330232-02-0601 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

## 5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

Issued in Berlin on 27 August 2026 by Deutsches Institut für Bautechnik

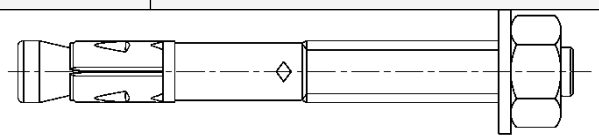
Dipl.-Ing. Beatrix Wittstock
Head of Section

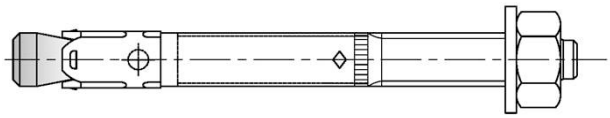
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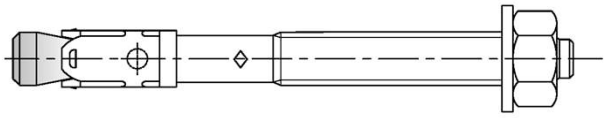
## Product Overview

| W-FAZ PRO | | W-FAZ PRO-L | | |
|---|---|---|---|---|
| **M8 – M20** | **W-FAZ PRO/S** (galvanized)<br>**W-FAZ PRO/R3**<br>**W-FAZ PRO/R5** | **M8 – M20** | **M24, M27** | **W-FAZ PRO-L/S** (galvanized)<br>**W-FAZ PRO-L/R3**<br>**W-FAZ PRO-L/R5** |
| **L ≤ 200mm** | | **L ≥ 200mm** | **All lengths** | |





| W-FAZ PRO-SH | | W-FAZ PRO-IG | |
|---|---|---|---|
| **M8 – M27** | **W-FAZ PRO-SH** (sherardized) | **M6 – M12** | **W-FAZ PRO-IG/S** (galvanized)<br>**W-FAZ PRO-IG/R3**<br>**W-FAZ PRO-IG/R5** |





## Table of Contents

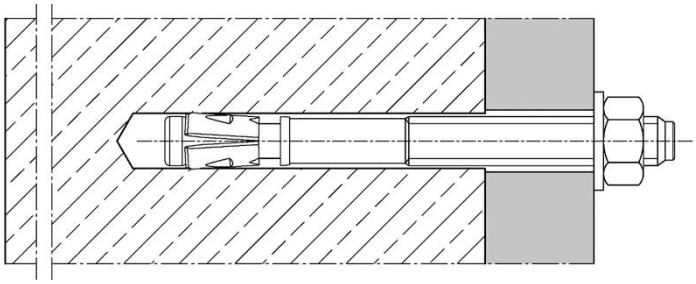

| | Product Type | | W-FAZ PRO | W-FAZ PRO-L | W-FAZ PRO-SH | W-FAZ PRO-IG |
|---|---|---|---|---|---|---|
| **Product description** | **Annex A** | | | | | |
| | Installation condition<br>Marking<br>Length identification<br>Materials | | A2 – A3 | A4 – A6 | A7 – A8 | A9 – A11 |
| | Filling washer | | A12 | | | - |
| | Setting tool | | A12 | | | |
| | Cap nut | | A3 & A12 | - | - | - |
| **Intended use** | **Annex B** | | | | | |
| | Specification of intended use | | B1 - B2 | | | |
| | Installation parameters | | B3 – B5 | B6 – B7 | B6 – B8 | B9 |
| | Installation instruction | | B10 – B12 | B10 – B11 | B10 – B11 | B10 + B13 |
| **Performance** | **Annex C** | | | | | |
| | Characteristic resistance under | Tension load | C1 – C2 | C11 – C13 | C17 – C18 | C23 – C24 |
| | | Shear load | C3 | C14 | C19 | C25 |
| | | Seismic C1 | C4 | - | C20 | - |
| | | Seismic C2 | C5 | - | C20 | - |
| | | Fire | C6 – C7 | C15 | C21 | C26 |
| | Displacement | | C8 – C10 | C16 | C22 | C27 |


**Würth Fixanchor W-FAZ PRO**

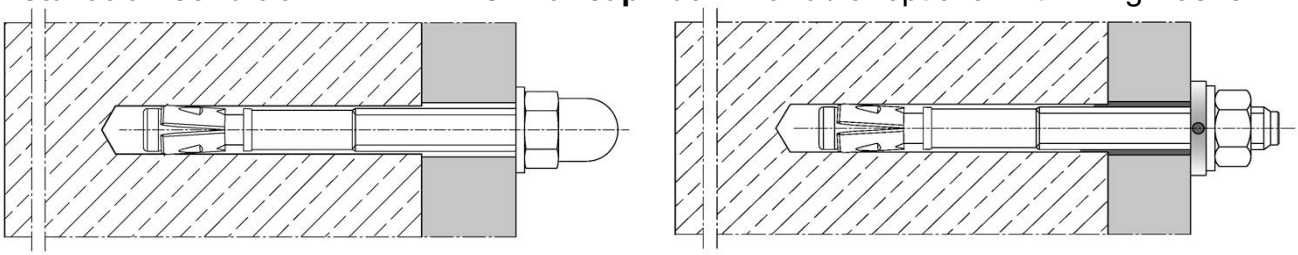
**Product description**
Product overview and table of content

**Annex A1**

## Installation condition W-FAZ PRO

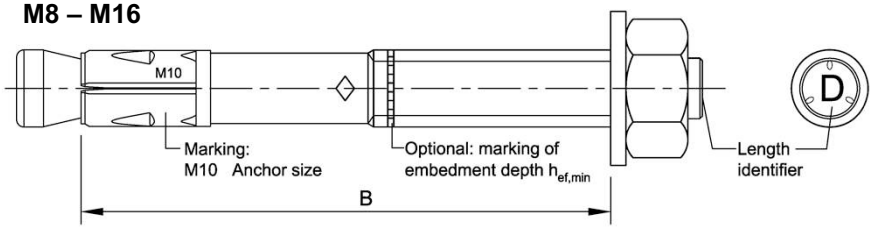


## Installation condition W-FAZ PRO with cap nut HM and / or optional with filling washer

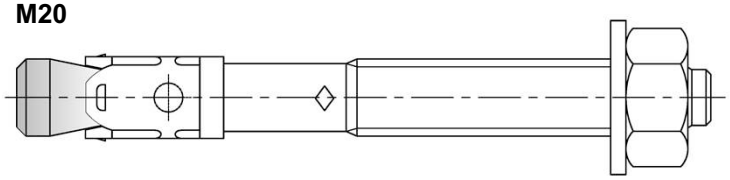


### Marking W-FAZ PRO

**M8 – M16**




**M20**



**Marking**
e.g. ◇ BZ3 15

◇ Identifying mark of manufacturing plant
BZ3 fastener identity
15 max. thickness of fixture $t_{fix,max}$ for $h_{ef,min}$ (optional)

Additional marking:
A4 stainless steel, corrosion resistance class CRC III
HCR high corrosion resistant steel corrosion resistance class CRC V

Usable length: $\mathbf{B = h_{ef} + t_{fix}}$
$h_{ef}$: (existing) effective anchorage depth
$t_{fix}$: fixture thickness (including e.g. levelling layers or other non-load-bearing layers or additional filling washer)

### Table A1: Length identification W-FAZ PRO

| Length identifier | | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Usable length B | ≥ | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 105 |

| Length identifier | | P | Q | R | S | T | U | V | W | X | Y | Z | AA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Usable length B | ≥ | 110 | 115 | 120 | 125 | 130 | 135 | 140 | 145 | 150 | 160 | 170 | 180 |

Dimensions in mm

**Würth Fixanchor W-FAZ PRO**

**Product description**
Installation condition, marking, length identification **W-FAZ PRO**

**Annex A2**

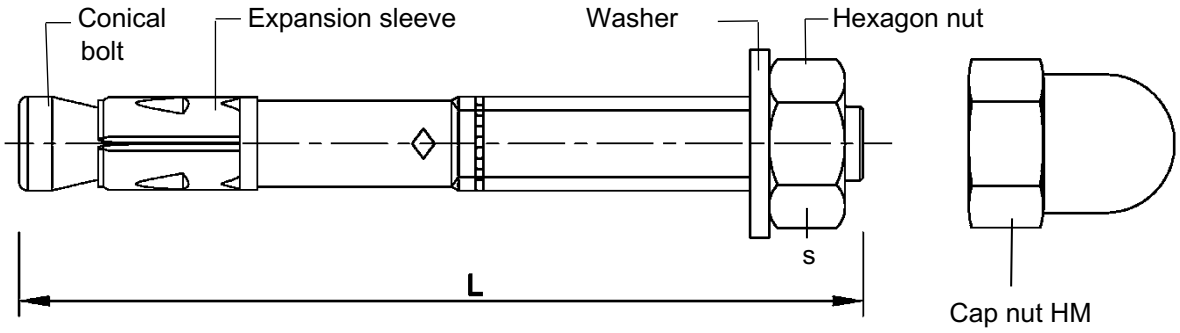
## Table A2: Material W-FAZ PRO

| Part | W-FAZ PRO/S | W-FAZ PRO/R3 | W-FAZ PRO/R5 |
|---|---|---|---|
| | **Steel, galvanized** | **Stainless steel Corrosion resistance class CRC III** according to EN 1993-1-4:2025 | **High corrosion resistant steel, Corrosion resistance class CRC V** according to EN 1993-1-4:2025 |
| Conical bolt | Steel, galvanized ≥ 5 µm fracture elongation $A_5$ ≥ 8% | Stainless steel EN 10088-1:2023, fracture elongation $A_5$ ≥ 8% | High corrosion resistant steel EN 10088-1:2023, fracture elongation $A_5$ ≥ 8% |
| Expansion sleeve | Stainless steel EN 10088-1:2023 | Stainless steel EN 10088-1:2023 | Stainless steel EN 10088-1:2023 |
| Washer | Steel, galvanized ≥ 5 µm | Stainless steel EN 10088-1:2023 | High corrosion resistant steel EN 10088-1:2023 |
| Filling washer WIT-SHB | | | |
| Hexagon nut | | | |
| Cap nut HM | | | |

## Table A3: Fastener dimensions W-FAZ PRO

| Fastener size | | | M8 | M10 | M12 | M16 | M20 |
|---|---|---|---|---|---|---|---|
| Width across hexagon nut / cap nut HM | s | [mm] | 13 | 17 | 19 | 24 | 30 |
| Length of fastener | L | [mm] | $h_{ef} + t_{fix} +$ 18,0 | $h_{ef} + t_{fix} +$ 21,5 | $h_{ef} + t_{fix} +$ 26,0 | $h_{ef} + t_{fix} +$ 33,0 | $h_{ef} + t_{fix} +$ 37,0 |
| Length of fastener | L | [mm] | ≤ 200 mm | | | | |
| Thickness of filling washer WIT-SHB [1] (see Annex A12) | t | [mm] | 5 | | | | |

[1] With additional use of filling washer 3b the usable thickness of fixture is reduced by the thickness of filling washer t [mm]



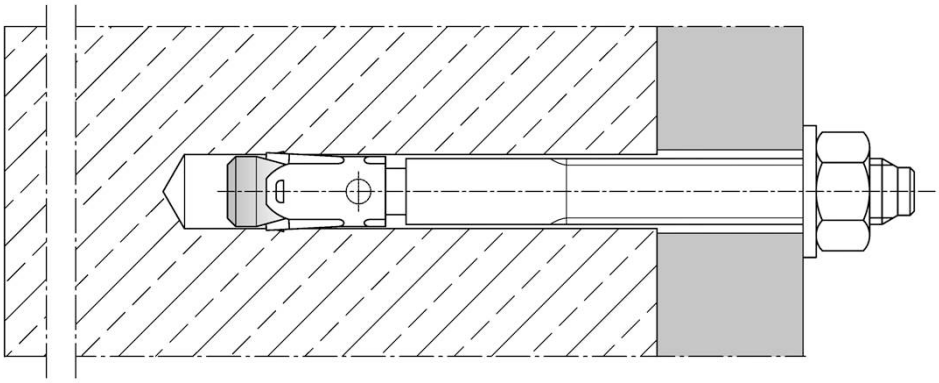

**Würth Fixanchor W-FAZ PRO**

**Product description**
Material and fastener dimensions **W-FAZ PRO**

**Annex A3**

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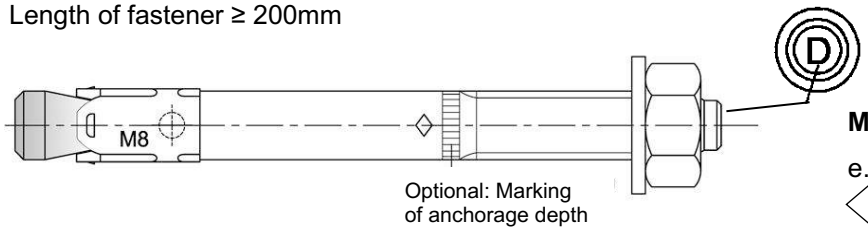
## Installation condition W-FAZ PRO-L



## Marking

**Fastener size M8 to M20, W-FAZ PRO-L**

Length of fastener ≥ 200mm




Marking of length

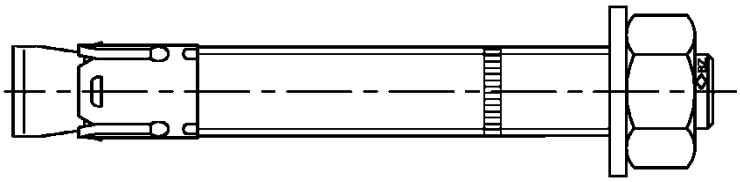
**Marking 1 (M8 to M20)**

e.g.: ◇ BZ 15

◇ identifying mark of manufacturing plant
BZ fastener identity
15 maximum thickness of fixture for $h_{ef}$
M8 thread diameter
Additional marking:
A4 stainless steel, corrosion resistance class CRC III
HCR high corrosion resistant steel, corrosion resistance class CRC V

**Fastener size M24 and M27, W-FAZ PRO-L**

M27 galvanized only



**Marking 2 (M24, M27)**

e.g. ◇ BZ M24-30

◇ identifying mark of manufacturing plant
BZ fastener identity
M24 thread diameter
30 maximum thickness of fixture
Additional marking **M24**:
A4 stainless steel, corrosion resistance class CRC III
HCR high corrosion resistant steel, corrosion resistance class CRC V

| | |
|---|---|
| **Würth Fixanchor W-FAZ PRO** | **Annex A4** |
| **Product description**<br>Installation condition and marking **W-FAZ PRO-L** | |

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## Table A4: Marking of length W-FAZ PRO-L

| Marking of length | L (l) | M (m) | N (n) | O (o) | P (p) | Q (q) | R (r) | S (s) | T (t) | U (u) | V (v) | W (w) | X (x) | Y (y) | Z (z) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Length of fastener min L ≥ | 177,8 | 190,5 | 203,2 | 215,9 | 228,6 | 241,3 | 254,0 | 279,4 | 304,8 | 330,2 | 355,6 | 381,0 | 406,4 | 431,8 | 457,2 |
| Length of fastener max L < | 190,5 | 203,2 | 215,9 | 228,6 | 241,3 | 254,0 | 279,4 | 304,8 | 330,2 | 355,6 | 381,0 | 406,4 | 431,8 | 457,2 | 483,0 |

Dimensions in mm

## Table A5: Material W-FAZ PRO-L

| Part | W-FAZ PRO-L/S | W-FAZ PRO-L/R3 | W-FAZ PRO-L/R5 |
|---|---|---|---|
| | **galvanized ≥ 5µm** | **Stainless steel, Corrosion resistance class CRC III** according to EN 1993-1-4:2025 | **High corrosion resistant steel, Corrosion resistance class CRC V** according to EN 1993-1-4:2025 |
| Conical bolt | M8 to M20: machined steel, galvanized, fracture elongation $A_5$ ≥ 8%, cone plastic coated | M8 to M20: Stainless steel, EN 10088-1:2023, fracture elongation $A_5$ ≥ 8%, cone plastic coated | M8 to M20: High corrosion resistant steel, EN 10088-1-1:2023, fracture elongation $A_5$ ≥ 8%, cone plastic coated |
| Threaded bolt | M24 and M27: Steel, galvanized | M24: Stainless steel EN 10088-1:2023 | M24: High corrosion resistant steel EN 10088-1:2023 |
| Threaded cone | | | |
| Expansion sleeve | M8 to M20: Stainless steel, EN 10088-1:2023, M24 and M27: Steel, zinc plated | Stainless steel, EN 10088-1:2023 | Stainless steel, EN 10088-1:2023 |
| Washer | Steel, zinc plated | Stainless steel EN 10088-1:2023 | High corrosion resistant steel, EN 10088-1:2023 |
| Filling washer | | | |
| Hexagon nut | Steel, galvanized, coated | Stainless steel, EN 10088-1:2023 | High corrosion resistant steel, EN 10088-1:2023 |

**Würth Fixanchor W-FAZ PRO**

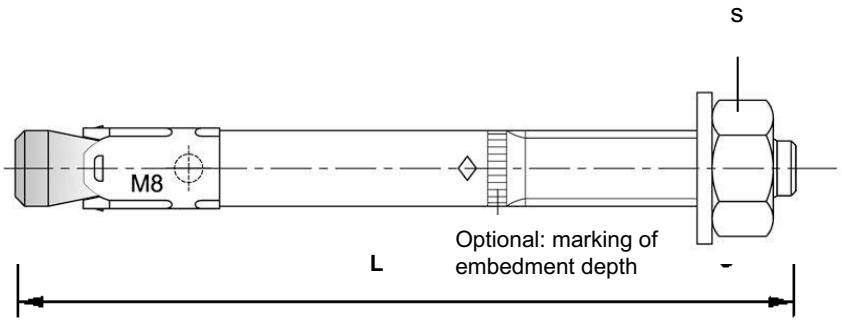
**Product description**
Length identification and material **W-FAZ PRO-L**

**Annex A5**

## Table A6: Fastener dimensions W-FAZ PRO-L

| Fastener size | | | | W-FAZ PRO-L | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | **M8** | **M10** | **M12** | **M16** | **M20** | **M24** | **M27** |
| Conical bolt | | Thread | [-] | M8 | M10 | M12 | M16 | M20 | M24 | M27 |
| Length of fastener | Steel, zinc plated | L | [mm] | 65 + $t_{fix}$ | 80 + $t_{fix}$ | 96,5+$t_{fix}$ | 118+$t_{fix}$ | 137+$t_{fix}$ | 161+$t_{fix}$ | 178+$t_{fix}$ |
| | Stainless steel R3 / R5 | L | [mm] | 65 + $t_{fix}$ | 80 + $t_{fix}$ | 96,5+$t_{fix}$ | 118+$t_{fix}$ | 137+$t_{fix}$ | 168+$t_{fix}$ | - [1] |
| Length of fastener | | L | [mm] | ≥ 200 mm | | | | | | |
| Thickness of filling washer [2] (see Annex A12) | | t | [mm] | 5 | 5 | 5 | 5 | 5 | 6 | 6 |
| Wrench size Hexagon nut | | s | [mm] | 13 | 17 | 19 | 24 | 30 | 36 | 41 |

1) No performance assessed
2) With additional use of filling washer the usable thickness of fixture is reduced by the thickness of filling washer t [mm]



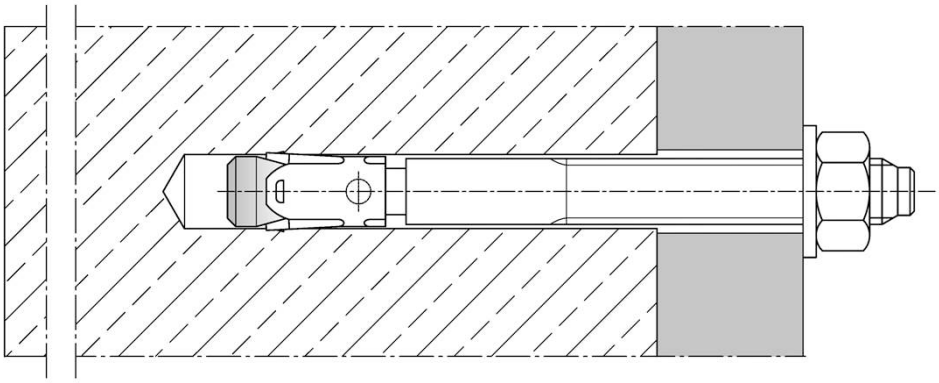

**Würth Fixanchor W-FAZ PRO**

**Product description**
Fastener dimension **W-FAZ PRO-L**

**Annex A6**

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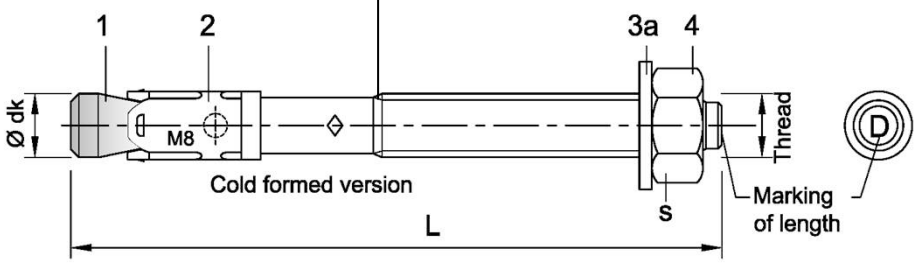
## Installation condition W-FAZ PRO-SH



## Marking

**Fastener size M8 to M20, W-FAZ PRO-SH**

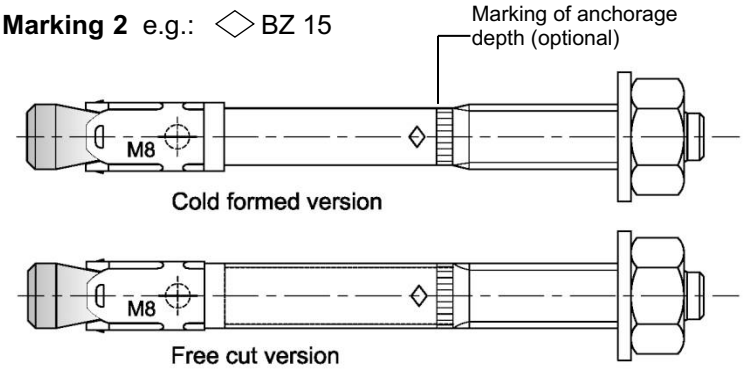
**Marking 1** e.g.: ◇ BZ 15/35




**Marking 1 (M8 to M20):**
e.g. ◇ BZ 15/35

◇ identifying mark of manufacturing plant
BZ fastener identity
15 maximum thickness of fixture for $h_{ef}$
35 maximum thickness of fixture for $h_{ef,red}$
M8 thread diameter

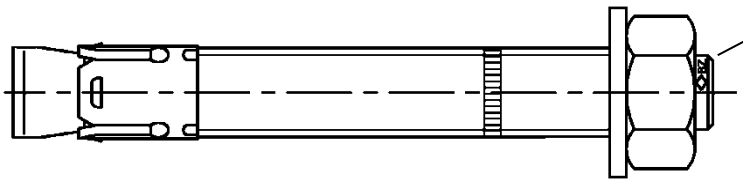
**Marking 2** e.g.: ◇ BZ 15




**Marking 2 (M8 to M20):**
e.g. ◇ BZ 15

◇ identifying mark of manufacturing plant
BZ fastener identity
15 maximum thickness of fixture for $h_{ef}$
M8 thread diameter

**Fastener size M24 and M27, W-FAZ PRO-SH**



**Marking 3 (M24, M27):**
e.g. ◇ BZ M24-30

◇ identifying mark of manufacturing plant
BZ fastener identity
M24 thread diameter
30 maximum thickness of fixture for $h_{ef}$

| | |
|---|---|
| **Würth Fixanchor W-FAZ PRO** | |
| **Product description**<br>Installation condition, Marking **W-FAZ PRO-SH** | **Annex A7** |

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## Table A7: Length identification W-FAZ PRO-SH

| Marking of length | C (c) | D (d) | E (e) | F (f) | G (g) | H (h) | I (i) | J (j) | K (k) | L (l) | M (m) | N (n) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Length of fastener min L ≥ | 63,5 | 76,2 | 88,9 | 101,6 | 114,3 | 127,0 | 139,7 | 152,4 | 165,1 | 177,8 | 190,5 | 203,2 |
| Length of fastener max L < | 76,2 | 88,9 | 101,6 | 114,3 | 127,0 | 139,7 | 152,4 | 165,1 | 177,8 | 190,5 | 203,2 | 215,9 |

| Marking of length | O (o) | P (p) | Q (q) | R (r) | S (s) | T (t) | U (u) | V (v) | W (w) | X (x) | Y (y) | Z (z) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Length of fastener min L ≥ | 215,9 | 228,6 | 241,3 | 254,0 | 279,4 | 304,8 | 330,2 | 355,6 | 381,0 | 406,4 | 431,8 | 457,2 |
| Length of fastener max L < | 228,6 | 241,3 | 254,0 | 279,4 | 304,8 | 330,2 | 355,6 | 381,0 | 406,4 | 431,8 | 457,2 | 483,0 |

Dimensions in mm

## Table A8: Material W-FAZ PRO-SH

| Parts | W-FAZ PRO-SH |
|---|---|
| | **sherardized** ≥ 45µm |
| Conical bolt | M8 to M20<br>Cold formed or machined steel, sherardized, cone plastic coated |
| Threaded bolt | M24 and M27:<br>Steel, sherardized |
| Threaded cone | M24 and M27:<br>Steel, galvanized |
| Expansion sleeve | M8 to M20:<br>Steel according to EN 10088-1:2023<br>M24 to M27<br>Steel, zinc plated |
| Washer | Steel, zinc plated |
| Filling washer | |
| Hexagon nut | Steel, zinc plated |

## Table A9: Fastener dimensions W-FAZ PRO-SH

| Fastener size | | | W-FAZ PRO-SH | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | M8 | M10 | M12 | M16 | M20 | M24 | M27 |
| Conical bolt | Thread | [-] | M8 | M10 | M12 | M16 | M20 | M24 | M27 |
| Length of fastener | L | [mm] | $65 + t_{fix}$ | $80 + t_{fix}$ | $96{,}5+t_{fix}$ | $118+t_{fix}$ | $137+t_{fix}$ | $161+t_{fix}$ | $178+t_{fix}$ |
| Length of fastener for $h_{ef,red}$ | $L_{hef,red}$ | [mm] | $54 + t_{fix}$ | $60 + t_{fix}$ | $76{,}5+t_{fix}$ | $98+t_{fix}$ | -[1)] | -[1)] | -[1)] |
| Thickness of filling washer WIT-SHB[2)] (see Annex A12) | t | [mm] | 5 | 5 | 5 | 5 | 5 | 6 | 6 |
| Hexagon nut | s | [mm] | 13 | 17 | 19 | 24 | 30 | 36 | 41 |

1) No performance assessed
2) With additional use of filling washer 3b the usable thickness of fixture is reduced by the thickness of filling washer t [mm]

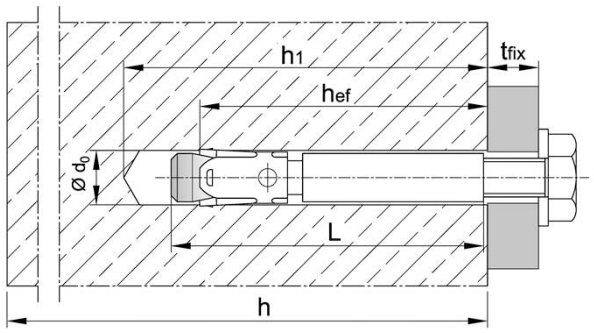
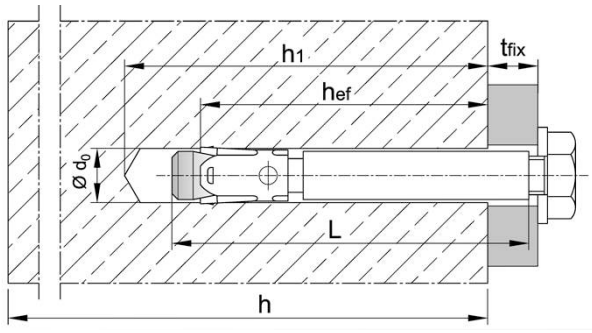
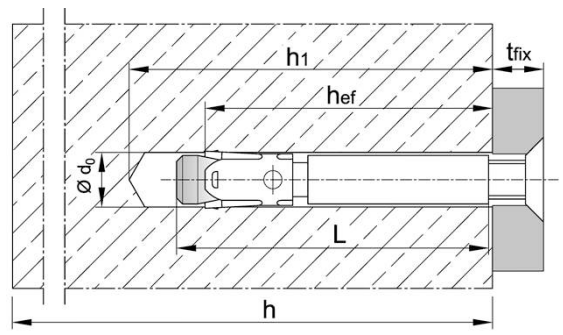
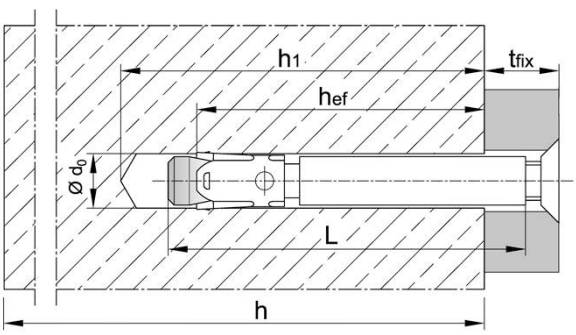
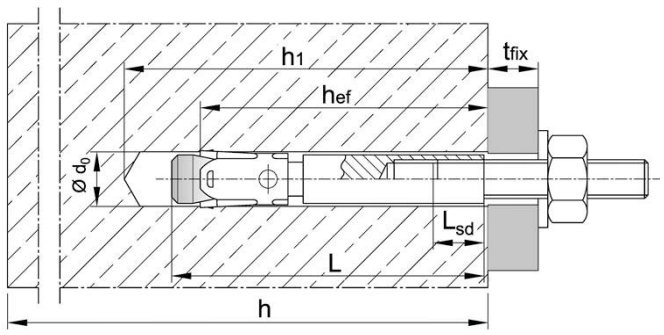
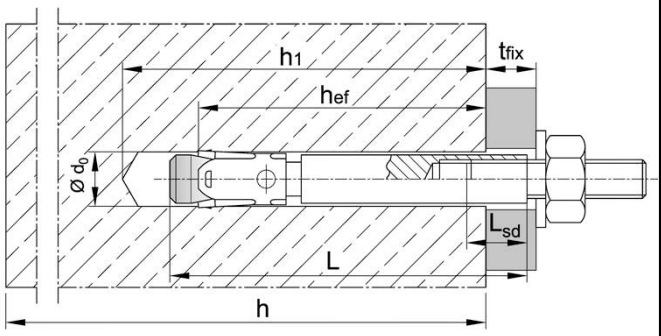
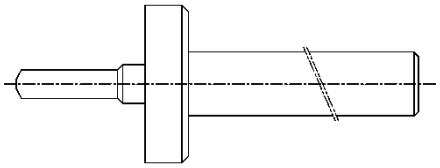
**Würth Fixanchor W-FAZ PRO**

**Product description**
Length identification, material and fastener dimensions **W-FAZ PRO-SH**

**Annex A8**

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## Installation condition W-FAZ PRO-IG

| Pre-setting installation (V) | Through-setting installation (D) |
|---|---|
| Pre-set fastener body W-FAZ PRO-IG, the fixture bears on the screw or thread rod only | The fastener is set through the fixture, the fixture bears on the conical bolt W-FAZ PRO-IG |
| **W-FAZ PRO-S-IG** consisting of W-FAZ PRO-IG and S-IG | |
|  |  |
| **W-FAZ PRO-SK-IG** consisting of W-FAZ PRO-IG and SK-IG | |
|  |  |
| **W-FAZ PRO-A-IG** consisting of W-FAZ PRO-IG and A-IG | |
|  |  |
| **Setting tool** | |
| <br>Setting tool for W-FAZ PRO-IG Pre-setting installation W-SFV | <br>Setting tool for W-FAZ PRO IG Through-setting installation W-SFD |

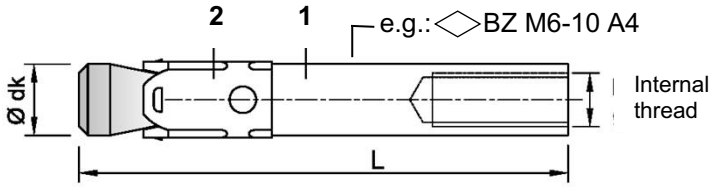
**Würth Fixanchor W-FAZ PRO**

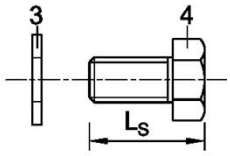
**Product description**
Installation condition **W-FAZ PRO-IG**

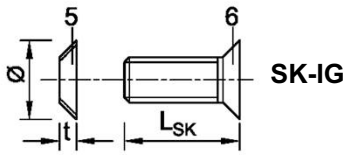
**Annex A9**

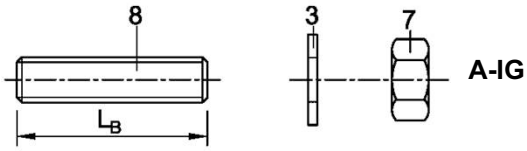
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**Marking:** ◇ identifying mark of manufacturing plant
BZ fastener identity
M6 size of internal thread
10 maximum thickness of fixture
(only Through-setting installation)
Additional marking:
A4 stainless steel, corrosion resistance class CRC III
HCR high corrosion resistant steel, corrosion resistance class CRC V




## Table A10: Fastener dimensions W-FAZ PRO-IG

| | Fastener size | | | W-FAZ PRO-IG | | | |
|---|---|---|---|---|---|---|---|
| | | | | **M6** | **M8** | **M10** | **M12** |
| **1** | Conical bolt with internal thread | | Ø $d_k$ | 7,9 | 9,8 | 11,8 | 15,7 |
| | Pre-setting installation | | L | 50 | 62 | 70 | 86 |
| | Through-setting installation | | L | 50 + $t_{fix}$ | 62 + $t_{fix}$ | 70 + $t_{fix}$ | 86 + $t_{fix}$ |
| **2** | Expansion sleeve | | | see Table A11 | | | |
| **3** | Washer | | | see Table A11 | | | |
| **4** | Hexagon head screw | width across flats | | 10 | 13 | 17 | 19 |
| | Pre-setting installation | | $L_S$ | $t_{fix}$ + (13 to 21) | $t_{fix}$ + (17 to 23) | $t_{fix}$ + (21 to 25) | $t_{fix}$ + (24 to 29) |
| | Through-setting installation | | $L_S$ | 14 to 20 | 18 to 22 | 20 to 22 | 25 to 28 |
| **5** | Countersunk washer | Ø countersunk | | 17,3 | 21,5 | 25,9 | 30,9 |
| | | | t | 3,9 | 5,0 | 5,7 | 6,7 |
| **6** | Countersunk head screw | | bit size | Torx T30 | Torx T45 (Steel, zinc plated) T40 (Stainless steel R3, R5) | Hexagon socket 6 mm | Hexagon socket 8 mm |
| | Pre-setting installation | | $L_{SK}$ | $t_{fix}$ + (11 to 19) | $t_{fix}$ + (15 to 21) | $t_{fix}$ + (19 to 23) | $t_{fix}$ + (21 to 27) |
| | Through-setting installation | | $L_{SK}$ | 16 bis 20 | 20 bis 25 | 25 | 30 |
| **7** | Hexagon nut | width across flats | | 10 | 13 | 17 | 19 |
| **8** | Commercial standard rod [1] | Type V | $L_B \geq$ | $t_{fix}$ + 21 | $t_{fix}$ + 28 | $t_{fix}$ + 34 | $t_{fix}$ + 41 |
| | | Type D | $L_B \geq$ | 21 | 28 | 34 | 41 |

[1] According to specifications (Table A11)

Dimensions in mm

**Würth Fixanchor W-FAZ PRO**

**Product description**
Marking and fastener dimension **W-FAZ PRO-IG**

**Annex A10**

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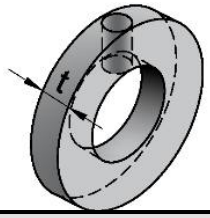
## Table A11: Material W-FAZ PRO-IG

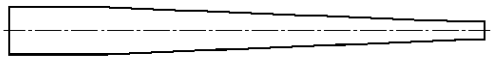
| Nr. | Part | W-FAZ PRO-IG/S | W-FAZ PRO-IG/R3 | W-FAZ PRO-IG/R5 |
|---|---|---|---|---|
| | | **Steel, galvanized ≥ 5 µm** | **Stainless steel A4, Corrosion resistance class CRC III** according to EN 1993-1-4:2025 | **High corrosion resistant steel, Corrosion resistance class CRC V** according to EN 1993-1-4:2025 |
| **1** | Conical bolt with internal thread | Machined steel, Cone plastic coated | Stainless steel EN 10088-1:2023, Cone plastic coated | High corrosion resistant steel, EN 10088-1:2023, Cone plastic coated |
| **2** | Expansion sleeve | Stainless steel EN 10088-1:2023 | Stainless steel EN 10088-1:2023 | Stainless steel EN 10088-1:2023 |
| **3** | Washer S-IG / A-IG | Steel, galvanized | Stainless steel EN 10088-1:2023 | High corrosion resistant steel, EN 10088-1:2023 |
| **4** | Hexagon head screw S-IG | Steel, galvanized, coated | Stainless steel EN 10088-1:2023, coated | High corrosion resistant steel, EN 10088-1:2023, coated |
| **5** | Countersunk washer SK-IG | Steel, galvanized | Stainless steel EN 10088-1:2023, zinc plated, coated | High corrosion resistant steel, EN 10088-1:2023, zinc plated, coated |
| **6** | Countersunk head screw SK-IG | Steel, galvanized coated | Stainless steel EN 10088-1:2023, coated | High corrosion resistant steel, EN 10088-1:2023, coated |
| **7** | Hexagon nut A-IG | Steel, galvanized coated | Stainless steel EN 10088-1:2023, coated | High corrosion resistant steel, EN 10088-1:2023, coated |
| **8** | Commercial standard rod | Property class 8.8, EN ISO 898-1:2013 $A_5$ > 8 % ductile | Stainless steel EN 10088-1:2023, property class 70, EN ISO 3506-1:2020 | High corrosion resistant steel, EN 10088-1:2023, property class 70, EN ISO 3506-1:2020 |

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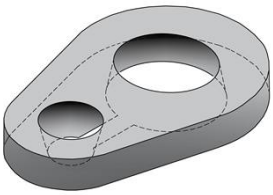
| | | |
|---|---|---|
| **Filling Washer** | **W-FAZ PRO** | ✓ |
| | **W-FAZ PRO-L** | ✓ |
| | **W-FAZ PRO-SH** | ✓ |
| | **W-FAZ PRO-IG** | - |

**Filling washer WIT-SHB with mixer extension** **Alternate filling washer**

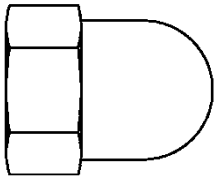


see Annex A3, A6 and A8



| | | |
|---|---|---|
| **Cap Nut HM** | **W-FAZ PRO** | ✓ |
| | **W-FAZ PRO-L** | - |
| | **W-FAZ PRO-SH** | - |
| | **W-FAZ PRO-IG** | - |

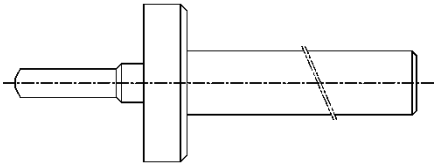
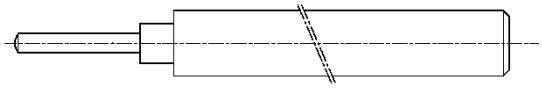


| | | |
|---|---|---|
| **Setting Tool** | **W-FAZ PRO** | ✓ |
| | **W-FAZ PRO-L** | ✓ |
| | **W-FAZ PRO-SH** | ✓ |
| | **W-FAZ PRO-IG** | - |

**Setting tool W-SFM**



| | | |
|---|---|---|
| **Setting Tool for W-FAZ PRO-IG** | **W-FAZ PRO** | - |
| | **W-FAZ PRO-L** | - |
| | **W-FAZ PRO-SH** | - |
| | **W-FAZ PRO-IG** | ✓ |

| **Pre-setting installation** | **Through-setting installation** |
|---|---|
| **Setting tool for W-FAZ PRO-IG pre-setting installation** | **Setting tool for W-FAZ PRO-IG through-setting installation** |
|  W-SFV: M6, M8, M10, M12 |  W-SFD: M6, M8, M10, M12 |

**Würth Fixanchor W-FAZ PRO**

**Product description**
Supplies

**Annex A12**

## Specifications of intended use

| | Product type | W-FAZ PRO | W-FAZ PRO-L | W-FAZ PRO-SH | W-FAZ PRO-IG |
|---|---|---|---|---|---|
| | **Size** | **M8 - M20** | **M8 - M27** | **M8 – M27** | **M6 – M12** |
| **L** | Length of fastener | ≤ 200 mm | M8 - M20<br>≥ 200 mm<br>M24, M27:<br>all lengths | all lengths | all lengths |
| **$h_{ef}$** | Standard anchorage depth $h_{ef,std}$ | variable | ✓ | ✓ | ✓ |
| | Reduced anchorage depth $h_{ef,red}$ | | - 1) | M8 – M16<br>and<br>L≤ 200mm | - 1) |
| **Material** | Steel, galvanized | ✓ | ✓ | - 1) | ✓ |
| | Steel, sherardized | - 1) | - 1) | ✓ | - 1) |
| | Stainless steel R3 | ✓ | ✓<br>(M8-M24) | - 1) | ✓ |
| | High corrosion resistant steel R5 | | | | |
| **Anchorages subject to** | Static or quasi-static action | ✓ | ✓ | ✓ | ✓ |
| | Seismic action 3)<br>performance categories **C1+C2** | ✓ | - 1) | M8 - M20<br>with $h_{ef,std}$<br>and L≤ 200mm | - 1) |
| | Fire exposure<br>R30 / R60 / R90 / R120 | ✓ | ✓ | ✓ | ✓ |
| **Base materials** | Cracked or uncracked concrete | ✓ | ✓ | ✓ | ✓ |
| | **Normal weight concrete** compacted reinforced or unreinforced normal weight concrete according to EN 206:2013+A2:2021 | ✓ | ✓ | ✓ | ✓ |
| | **Steel fibre reinforced concrete (SFRC)**3) according to EN 206:2013+A2:2021 including steel fibres according to EN 14889-1:2006, clause 5, group I; maximum content of steel fibres 80 kg/m³ | ✓ | - 1) | - 1) | - 1) |
| | **Strength classes C20/25 to C50/60** according to EN 206:2013+A2:2021 | ✓ | ✓ | ✓ | ✓ |
| | **Strength classes C50/60 to C80/95** according to EN 206:2013+A2:2021 | ✓ 2) | - 1) | - 1) | - 1) |
| **Drilling / cleaning** | Hammer drilling with cleaning | ✓ | ✓ | ✓ | ✓ |
| | Hammer drilling without cleaning (3x ventilate) | ✓ 2) | - 1) | - 1) | - 1) |
| | Vacuum drilling (automatic cleaning) | ✓ | ✓ | ✓ | ✓ |

1) No performance assessed
2) Except W-FAZ PRO M8 R3/R5
3) Strength class C20/50 to C50/60

**Würth Fixanchor W-FAZ PRO**

**Intended Use**
Specification

**Annex B1**

**Use conditions (Environmental conditions):**

- Structures subject to dry internal conditions: all materials
- For all other conditions corresponding to corrosion resistance classes CRC according to EN 1993-1-4:2006 + A1:2015: stainless steel according to Annex A3, Table A2 (W-FAZ PRO); Annex A5, Table A5 (W-FAZ PRO-L) and Annex A11, Table A11 (W-FAZ PRO-IG) of this ETA

**Design:**

- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored. The position of the fastener is indicated on the design drawings (e.g. position of the fastener relative to reinforcement or to supports, etc.).
- Design method EN 1992-4:2018.

**Installation:**

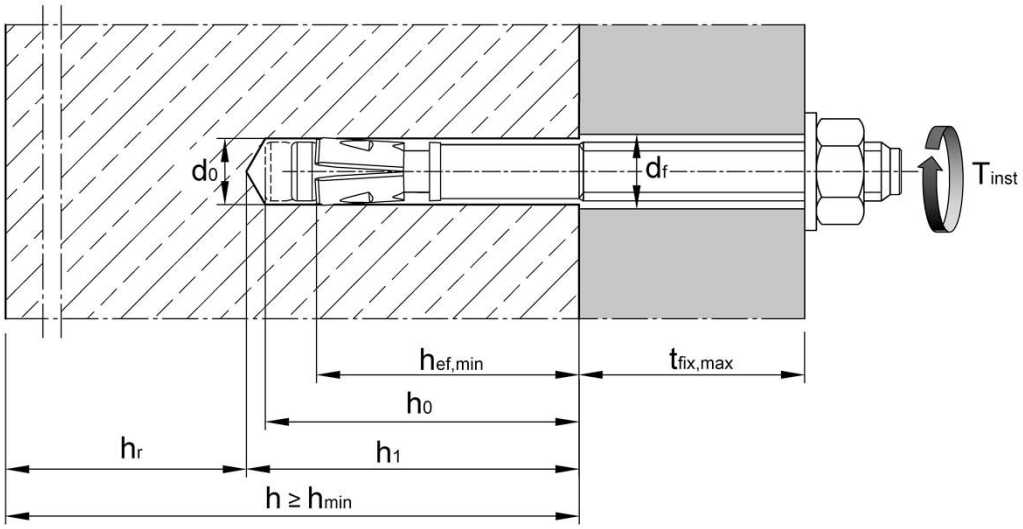
- Use of the fastener only as supplied by the manufacturer without exchanging the components of the fastener (exception: when using the cap nut HM for W-FAZ PRO).
- The anchor can be set in pre- or through-setting installation.
- Optionally, the annular gap between fixture and stud of W-FAZ PRO can be filled to reduce the hole clearance. For this purpose, the filling washer (Annex A3; Annex A6 and Annex A8) must be used in addition to the supplied washer. For filling use Würth Injection Adhesive WIT-UH 300, WIT-VM 250, WIT-VIZ or other high-strength injection mortar with compressive strength ≥ 40 N/mm².

| | |
|---|---|
| **Würth Fixanchor W-FAZ PRO** | **Annex B2** |
| **Intended Use**<br>Specifications of intended use – Continuation | |

## Table B1: Installation parameters W-FAZ PRO

| **Fastener size** | | | | **M8** | **M10** | **M12** | **M16** | **M20** |
|---|---|---|---|---|---|---|---|---|
| Nominal drill hole diameter | | $d_0$ | [mm] | 8 | 10 | 12 | 16 | 20 |
| Cutting diameter of drill bit | | $d_{cut} \leq$ | [mm] | 8,45 | 10,45 | 12,5 | 16,5 | 20,55 |
| Thickness of fixture | | $t_{fix}$ | [mm] | B - $h_{ef}$ | B - $h_{ef}$ | B - $h_{ef}$ | B - $h_{ef}$ | B - $h_{ef}$ |
| Minimum effective anchorage depth | | $h_{ef,min}$ | [mm] | 35 | 40 | 50 | 65 | 90 |
| Maximum effective anchorage depth | | $h_{ef,max}$ | [mm] | 90 | 100 | 125 | 160 | 140 |
| Depth of drill hole | Hammer drilling vacuum drilling | $h_0 \geq$ | [mm] | $h_{ef}$ + 8 | $h_{ef}$ + 9 | $h_{ef}$ + 10 | $h_{ef}$ + 14 | $h_{ef}$ + 14 |
| | | $h_1 \geq$ | [mm] | $h_{ef}$ + 10 | $h_{ef}$ + 11 | $h_{ef}$ + 13 | $h_{ef}$ + 17 | $h_{ef}$ + 17 |
| | Hammer drilling without cleaning | $h_0 \geq$ | [mm] | $h_{ef}$ + 23 | $h_{ef}$ + 23 | $h_{ef}$ + 24 | $h_{ef}$ + 28 | $h_{ef}$ + 28 |
| | | $h_1 \geq$ | [mm] | $h_{ef}$ + 25 | $h_{ef}$ + 25 | $h_{ef}$ + 27 | $h_{ef}$ + 31 | $h_{ef}$ + 31 |
| Rest thickness below borehole bottom | | $h_r \geq$ | [mm] | min (2*$d_0$ ; 30 mm ; ($h_{min}$ – $h_1$)) | | | | |
| Diameter of clearance hole in the fixture[1)] | | $d_f \leq$ | [mm] | 9 | 12 | 14 | 18 | 22 |
| Projection after insertion of the fastener for mounting with cap nut HM (see Annex B12, Figure 3) | | C | [mm] | 10,5 | 12,5 | 16,0 | 19,5 | 23,0 |
| Installation torque | W-FAZ PRO/S | $T_{inst}$ | [Nm] | 15 | 40 | 60 | 110 | 160 |
| | W-FAZ PRO/R3 and W-FAZ PRO/R5 | $T_{inst}$ | [Nm] | 15 | 40 | 55 | 100 | 200 |

1) For larger diameters of clearance hole in the fixture, see EN 1992-4:2018, chapter 6.2.2.2




**Würth Fixanchor W-FAZ PRO**

**Intended Use**
Installation parameters **W-FAZ PRO**

**Annex B3**

## Table B2: Minimum thickness of concrete member, minimum spacings, edge distances W-FAZ PRO

| **Fastener size** | | | **M8** | **M10** | **M12** | **M16** | **M20** |
|---|---|---|---|---|---|---|---|
| Minimum member thickness[1] depending on $h_{ef}$ | $h_{min} \geq$ | [mm] | max ($1{,}5 \cdot h_{ef}$ ; 80) | | max ($1{,}5 \cdot h_{ef}$;100) | max ($1{,}5 \cdot h_{ef}$;120) | max ($1{,}5 \cdot h_{ef}$;150) |
| **Minimum edge distances and spacings** | | | | | | | |
| Minimum edge distance | $c_{min}$ | [mm] | 40 | 45 | 55 | 65 | 90 |
| | for s ≥ | [mm] | see Table B4 | | | | |
| Minimum spacings | $s_{min}$ | [mm] | 35 | 40 | 50 | 65 | 95 |
| | for c ≥ | [mm] | see Table B4 | | | | |
| **The following equation must be fulfilled for the calculation of the minimum spacing and edge distance during installation in combination with variable anchorage depth and member thickness:** | | | | | | | |
| $\mathbf{A_{sp,rqd} \leq A_{sp,ef}}$<br>Required splitting area $A_{sp,rqd}$ and idealized splitting area $A_{sp,ef}$ according to Table B4. | | | | | | | |

[1] With $h_{min} \geq h_r + h_1$ (see Annex B3)

## Table B3: Applicable concrete thickness $h_{sp}$ and area $A_{sp}$ to determine characteristic edge distance $c_{cr,sp;}$ W-FAZ PRO

| **Fastener size** | | | | **M8** | **M10** | **M12** | **M16** | **M20** |
|---|---|---|---|---|---|---|---|---|
| Applicable concrete thickness | | $h_{sp}$ | [mm] | $\min(h\,;\, h_{ef} + 1{,}5 \cdot c \cdot \sqrt{2})$ | | | | |
| Area to determine $c_{cr,sp}$[1] | W-FAZ PRO/S | $A_{sp}$ | [mm²] | $\frac{N^0_{Rk,sp} - 2{,}573}{0{,}000436}$ | $\frac{N^0_{Rk,sp} + 2{,}040}{0{,}000693}$ | $\frac{N^0_{Rk,sp} + 3{,}685}{0{,}000692}$ | $\frac{N^0_{Rk,sp} + 3{,}738}{0{,}000875}$ | $\frac{N^0_{Rk,sp} + 2{,}423}{0{,}000453}$ |
| | W-FAZ PRO/R3 W-FAZ PRO/R5 | $A_{sp}$ | [mm²] | $\frac{N^0_{Rk,sp} + 4{,}177}{0{,}000862}$ | $\frac{N^0_{Rk,sp} + 7{,}235}{0{,}000967}$ | $\frac{N^0_{Rk,sp} + 7{,}847}{0{,}000951}$ | $\frac{N^0_{Rk,sp} + 11{,}415}{0{,}000742}$ | $\frac{N^0_{Rk,sp} + 2{,}423}{0{,}000453}$ |

[1] With $N^0_{Rk,sp}$ in kN

**Würth Fixanchor W-FAZ PRO**

**Intended Use**
Minimum spacing and edge distances and applicable concrete thickness and area,
**W-FAZ PRO**

**Annex B4**

## Table B4: Areas to determine spacings and edge distances for installation, W-FAZ PRO

| **Fastener size** | | | | **M8** | **M10** | **M12** | **M16** | **M20** |
|---|---|---|---|---|---|---|---|---|
| **The following equation must be fulfilled for the calculation of the minimum spacing and edge distance during installation in combination with variable anchorage depth and member thickness:** $A_{sp,rqd} \leq A_{sp,ef}$ | | | | | | | | |
| **Idealized splitting area $A_{sp,ef}$** The edge distances and spacings shall be selected or rounded in steps of 5 mm. | | | | | | | | |
| **Member thickness: $h > h_{ef} + 1{,}5 \cdot c$** | | | | | | | | |
| Single fastener or fastener group with **$s \geq 3 \cdot c$** | | | | | | | | |
| Idealized splitting area | | $A_{sp,ef}$ | [mm²] | $(6 \cdot c) \cdot (1{,}5 \cdot c + h_{ef})$ | | | | |
| Fastener group ($s < 3 \cdot c$) | | | | | | | | |
| Idealized splitting area | | $A_{sp,ef}$ | [mm²] | $(3 \cdot c + s) \cdot (1{,}5 \cdot c + h_{ef})$ | | | | |
| **Member thickness**: **$h \leq h_{ef} + 1{,}5 \cdot c$** | | | | | | | | |
| Single fastener or fastener group with **$s \geq 3 \cdot c$** | | | | | | | | |
| Idealized splitting area | | $A_{sp,ef}$ | [mm²] | $(6 \cdot c) \cdot h$ | | | | |
| Fastener group ($s < 3 \cdot c$) | | | | | | | | |
| Idealized splitting area | | $A_{sp,ef}$ | [mm²] | $(3 \cdot c + s) \cdot h$ | | | | |
| **Required splitting area $A_{sp,rqd}$** | | | | | | | | |
| W-FAZ PRO/S | cracked concrete | $A_{sp,rqd}$ | [mm²] | 13 900 | 23 700 | 31 500 | 42 300 | 91 250 |
| | uncracked concrete | $A_{sp,rqd}$ | [mm²] | 22 500 | 34 700 | 41 300 | 50 200 | 110 000 |
| W-FAZ PRO/R3 W-FAZ PRO/R5 | cracked concrete | $A_{sp,rqd}$ | [mm²] | 16 900 | 25 900 | 29 800 | 44 300 | 91 250 |
| | uncracked concrete | $A_{sp,rqd}$ | [mm²] | 19 700 | 35 700 | 35 300 | 54 800 | 110 000 |

**Würth Fixanchor W-FAZ PRO**

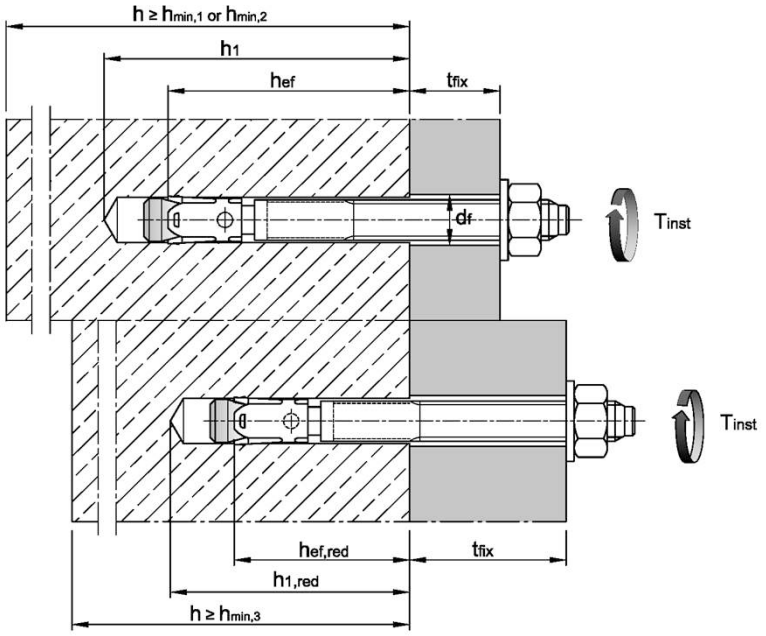
**Intended Use**
Areas to determine spacings and edge distances for installation, **W-FAZ PRO**

**Annex B5**

## Table B5: Installation parameters W-FAZ PRO-L and W-FAZ PRO-SH

| **Fastener size** | | | | **M8** | **M10** | **M12** | **M16** | **M20** | **M24** | **M27** |
|---|---|---|---|---|---|---|---|---|---|---|
| Nominal drill hole diameter | | $d_0$ | [mm] | 8 | 10 | 12 | 16 | 20 | 24 | 28 |
| Cutting diameter of drill bit | | $d_{cut} \leq$ | [mm] | 8,45 | 10,45 | 12,5 | 16,5 | 20,55 | 24,55 | 28,55 |
| Installation torque | Steel, galvanized | $T_{inst}$ | [Nm] | 20 | 25 | 45 | 90 | 160 | 200 | 300 |
| | Steel, sherardized | $T_{inst}$ | [Nm] | 16 | 22 | 40 | 90 | 160 | 260 | 300 |
| | Stainless steel R3 / R5 | $T_{inst}$ | [Nm] | 20 | 35 | 50 | 110 | 200 | 290 | -[1] |
| Diameter of clearance hole in the fixture | | $d_f \leq$ | [mm] | 9 | 12 | 14 | 18 | 22 | 26 | 30 |
| **Standard anchorage depth** | | | | | | | | | | **W-FAZ PRO-L und W-FAZ PRO SH** |
| Depth of drill hole | Steel, galvanized / Steel, sherardized | $h_1 \geq$ | [mm] | 60 | 75 | 90 | 110 | 125 | 145 | 160 |
| | Stainless steel R3 / R5 | $h_1 \geq$ | [mm] | 60 | 75 | 90 | 110 | 125 | 155 | -[1] |
| Effective anchorage depth | Steel, galvanized / Steel, sherardized | $h_{ef}$ | [mm] | 46 | 60 | 70 | 85 | 100 | 115 | 125 |
| | Stainless steel R3 / R5 | $h_{ef}$ | [mm] | 46 | 60 | 70 | 85 | 100 | 125 | -[1] |
| **Reduced anchorage depth** | | | | | | | | | | **W-FAZ PRO SH** |
| Depth of drill hole | | $h_{1,red} \geq$ | [mm] | 49 | 55 | 70 | 90 | -[1] | -[1] | -[1] |
| Reduced effective anchorage depth | | $h_{ef,red}$ | [mm] | 35 | 40 | 50 | 65 | | | |

[1] No performance assessed




**Würth Fixanchor W-FAZ PRO**

**Intended Use**
Installation parameters **W-FAZ PRO-L** and **W-FAZ PRO SH**

**Annex B6**

Deutsches Institut für Bautechnik DIBt

## Table B6: Minimum **spacings** and **edge distances, standard anchorage depth, W-FAZ PRO-L und W-FAZ PRO-SH**

| **Fastener size** | | | **M8** | **M10** | **M12** | **M16** | **M20** | **M24** | **M27** |
|---|---|---|---|---|---|---|---|---|---|
| **Standard thickness of concrete member** | | | | | | | | | |
| **Steel, galvanized / Steel, sherardized** | | | | | | | | | |
| Standard thickness of member | $h_{min,1}$ | [mm] | 100 | 120 | 140 | 170 | 200 | 230 | 250 |
| **Cracked concrete** | | | | | | | | | |
| Minimum spacing | $s_{min}$ | [mm] | 40 | 45 | 60 | 60 | 95 | 100 | 125 |
| | for c ≥ | [mm] | 70 | 70 | 100 | 100 | 150 | 180 | 300 |
| Minimum edge distance | $c_{min}$ | [mm] | 40 | 45 | 60 | 60 | 95 | 100 | 180 |
| | for s ≥ | [mm] | 80 | 90 | 140 | 180 | 200 | 220 | 540 |
| **Uncracked concrete** | | | | | | | | | |
| Minimum spacing | $s_{min}$ | [mm] | 40 | 45 | 60 | 65 | 90 | 100 | 125 |
| | for c ≥ | [mm] | 80 | 70 | 120 | 120 | 180 | 180 | 300 |
| Minimum edge distance | $c_{min}$ | [mm] | 50 | 50 | 75 | 80 | 130 | 100 | 180 |
| | for s ≥ | [mm] | 100 | 100 | 150 | 150 | 240 | 220 | 540 |
| **Stainless steel R3, R5** | | | | | | | | | |
| Standard thickness of member | $h_{min,1}$ | [mm] | 100 | 120 | 140 | 160 | 200 | 250 | -[1] |
| **Cracked concrete** | | | | | | | | | |
| Minimum spacing | $s_{min}$ | [mm] | 40 | 50 | 60 | 60 | 95 | 125 | -[1] |
| | for c ≥ | [mm] | 70 | 75 | 100 | 100 | 150 | 125 | |
| Minimum edge distance | $c_{min}$ | [mm] | 40 | 55 | 60 | 60 | 95 | 125 | |
| | for s ≥ | [mm] | 80 | 90 | 140 | 180 | 200 | 125 | |
| **Uncracked concrete** | | | | | | | | | |
| Minimum spacing | $s_{min}$ | [mm] | 40 | 50 | 60 | 65 | 90 | 125 | -[1] |
| | for c ≥ | [mm] | 80 | 75 | 120 | 120 | 180 | 125 | |
| Minimum edge distance | $c_{min}$ | [mm] | 50 | 60 | 75 | 80 | 130 | 125 | |
| | for s ≥ | [mm] | 100 | 120 | 150 | 150 | 240 | 125 | |
| **Minimum thickness of concrete member** | | | | | | | | | |
| **Steel, galvanized / sherardized, stainless steel R3 / R5** | | | | | | | | | |
| Minimum thickness of member | $h_{min,2}$ | [mm] | 80 | 100 | 120 | 140 | -[1] | -[1] | -[1] |
| **Cracked concrete** | | | | | | | | | |
| Minimum spacing | $s_{min}$ | [mm] | 40 | 45 | 60 | 70 | -[1] | -[1] | -[1] |
| | for c ≥ | [mm] | 70 | 90 | 100 | 160 | | | |
| Minimum edge distance | $c_{min}$ | [mm] | 40 | 50 | 60 | 80 | | | |
| | for s ≥ | [mm] | 80 | 115 | 140 | 180 | | | |
| **Uncracked concrete** | | | | | | | | | |
| Minimum spacing | $s_{min}$ | [mm] | 40 | 60 | 60 | 80 | -[1] | -[1] | -[1] |
| | for c ≥ | [mm] | 80 | 140 | 120 | 180 | | | |
| Minimum edge distance | $c_{min}$ | [mm] | 50 | 90 | 75 | 90 | | | |
| | for s ≥ | [mm] | 100 | 140 | 150 | 200 | | | |
| **Fire exposure from one side** | | | | | | | | | |
| Minimum spacing | $s_{min,fi}$ | [mm] | See normal ambient temperature | | | | | | |
| Minimum edge distance | $c_{min,fi}$ | [mm] | See normal ambient temperature | | | | | | |
| **Fire exposure from more than one side** | | | | | | | | | |
| Minimum spacing | $s_{min,fi}$ | [mm] | See normal ambient temperature | | | | | | |
| Minimum edge distance | $c_{min,fi}$ | [mm] | ≥ 300 mm | | | | | | |

Intermediate values by linear interpolation.

[1] No performance assessed

**Würth Fixanchor W-FAZ PRO**

**Intended Use**
Minimum spacings and edge distances, standard anchorage depth, **W-FAZ PRO-L** and **W-FAZ PRO SH**

**Annex B7**

Deutsches Institut für Bautechnik DIBt

**Table B7:** Minimum **spacings** and **edge distances, reduced anchorage depth, W-FAZ PRO-SH**

| **Fastener size** | | | **M8** | **M10** | **M12** | **M16** |
|---|---|---|---|---|---|---|
| Minimum thickness of concrete member | $h_{min,3}$ | [mm] | 80 | 80 | 100 | 140 |
| **Cracked concrete** | | | | | | |
| Minimum spacing | $s_{min}$ | [mm] | 50 | 50 | 50 | 65 |
| | for c ≥ | [mm] | 60 | 100 | 160 | 170 |
| Minimum edge distance | $c_{min}$ | [mm] | 40 | 65 | 65 | 100 |
| | for s ≥ | [mm] | 185 | 180 | 250 | 250 |
| **Uncracked concrete** | | | | | | |
| Minimum spacing | $s_{min}$ | [mm] | 50 | 50 | 50 | 65 |
| | for c ≥ | [mm] | 60 | 100 | 160 | 170 |
| Minimum edge distance | $c_{min}$ | [mm] | 40 | 65 | 100 | 170 |
| | for s ≥ | [mm] | 185 | 180 | 185 | 65 |
| **Fire exposure from one side** | | | | | | |
| Minimum spacing | $s_{min,fi}$ | [mm] | See normal ambient temperature | | | |
| Minimum edge distance | $c_{min,fi}$ | [mm] | See normal ambient temperature | | | |
| **Fire exposure from more than one side** | | | | | | |
| Minimum spacing | $s_{min,fi}$ | [mm] | See normal ambient temperature | | | |
| Minimum edge distance | $c_{min,fi}$ | [mm] | ≥ 300 mm | | | |

Intermediate values by linear interpolation.

## Table B8: Installation parameters W-FAZ PRO-IG

| **Fastener size** | | | | **M6** | **M8** | **M10** | **M12** |
|---|---|---|---|---|---|---|---|
| Effective anchorage depth | | $h_{ef}$ | [mm] | 45 | 58 | 65 | 80 |
| Drill hole diameter | | $d_0$ | [mm] | 8 | 10 | 12 | 16 |
| Cutting diameter of drill bit | | $d_{cut} \leq$ | [mm] | 8,45 | 10,45 | 12,5 | 16,5 |
| Depth of drill hole | | $h_1 \geq$ | [mm] | 60 | 75 | 90 | 105 |
| Screwing depth of threaded rod | | $L_{sd}$ [2] $\geq$ | [mm] | 9 | 12 | 15 | 18 |
| Installation torque, steel zinc plated | $T_{inst}$ | S | [Nm] | 10 | 30 | 30 | 55 |
| | | SK | [Nm] | 10 | 25 | 40 | 50 |
| | | A | [Nm] | 8 | 25 | 30 | 45 |
| Installation torque, stainless steel R3 / R5 | $T_{inst}$ | S | [Nm] | 15 | 40 | 50 | 100 |
| | | SK | [Nm] | 12 | 25 | 45 | 60 |
| | | A | [Nm] | 8 | 25 | 40 | 80 |
| **Pre-setting installation** | | | | | | | |
| Diameter of clearance hole in the fixture | | $d_f \leq$ | [mm] | 7 | 9 | 12 | 14 |
| Minimum thickness of fixture | $t_{fix} \geq$ | S | [mm] | 1 | 1 | 1 | 1 |
| | | SK | [mm] | 5 | 7 | 8 | 9 |
| | | A | [mm] | 1 | 1 | 1 | 1 |
| **Through-setting installation** | | | | | | | |
| Diameter of clearance hole in the fixture | | $d_f \leq$ | [mm] | 9 | 12 | 14 | 18 |
| Minimum thickness of fixture [1] | $t_{fix} \geq$ | S | [mm | 5 | 7 | 8 | 9 |
| | | SK | [mm] | 9 | 12 | 14 | 16 |
| | | A | [mm] | 5 | 7 | 8 | 9 |

1) The minimum thickness of fixture can be reduced to the value of pre-setting installation, if the shear load at steel failure is designed with lever arm.
2) see Annex A9

## Table B9: Minimum spacings and edge distance W-FAZ PRO-IG

| **Fastener size** | | | **M6** | **M8** | **M10** | **M12** |
|---|---|---|---|---|---|---|
| Minimum thickness of concrete member | $h_{min}$ | [mm] | 100 | 120 | 130 | 160 |
| **Cracked concrete** | | | | | | |
| Minimum spacing | $s_{min}$ | [mm] | 50 | 60 | 70 | 80 |
| | for c ≥ | [mm] | 60 | 80 | 100 | 120 |
| Minimum edge distance | $c_{min}$ | [mm] | 50 | 60 | 70 | 80 |
| | for s ≥ | [mm] | 75 | 100 | 100 | 120 |
| **Uncracked concrete** | | | | | | |
| Minimum spacing | $s_{min}$ | [mm] | 50 | 60 | 65 | 80 |
| | for c ≥ | [mm] | 80 | 100 | 120 | 160 |
| Minimum edge distance | $c_{min}$ | [mm] | 50 | 60 | 70 | 100 |
| | for s ≥ | [mm] | 115 | 155 | 170 | 210 |
| **Fire exposure from one side** | | | | | | |
| Minimum spacing | $s_{min,fi}$ | [mm] | See normal temperature | | | |
| Minimum edge distance | $c_{min,fi}$ | [mm] | See normal temperature | | | |
| **Fire exposure from more than one side** | | | | | | |
| Minimum spacing | $s_{min,fi}$ | [mm] | See normal temperature | | | |
| Minimum edge distance | $c_{min,fi}$ | [mm] | ≥ 300 mm | | | |

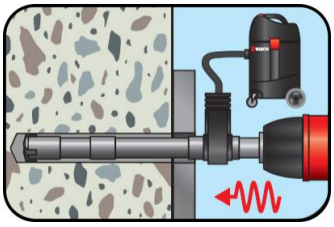
Intermediate values by linear interpolation.

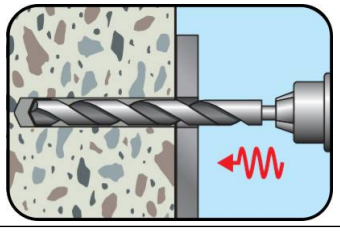
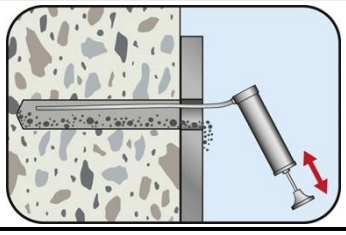
**Würth Fixanchor W-FAZ PRO**

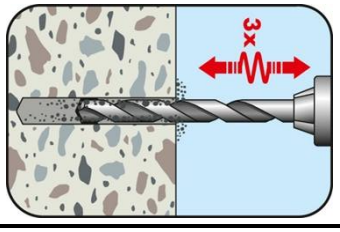
**Intended Use**
Installation parameters, spacing and edge distances, **W-FAZ PRO-IG**

**Annex B9**

## Installation instructions

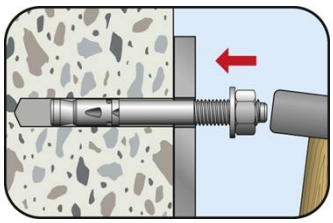
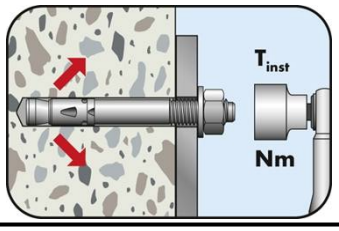
| **Hole drilling – Vacuum drilling** | | | |
|---|---|---|---|
| | | **W-FAZ PRO** | ✓ |
| | | **W-FAZ PRO-L** | ✓ |
| | | **W-FAZ PRO-SH** | ✓ |
| | | **W-FAZ PRO-IG** | ✓ |
| **1** |  | **Vacuum drilling:**<br>Drill hole perpendicular to concrete surface.<br>Proceed with step 3. | |

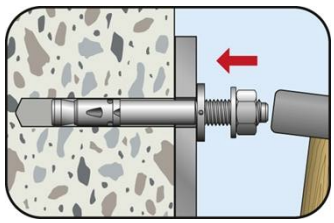
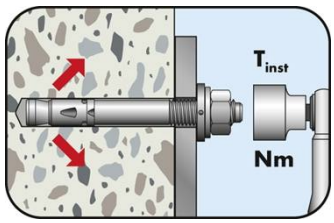
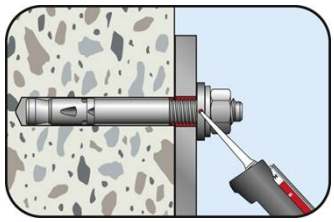
| **Hole drilling - Hammer drilling <u>with</u> cleaning** | | | |
|---|---|---|---|
| | | **W-FAZ PRO** | ✓ |
| | | **W-FAZ PRO-L** | ✓ |
| | | **W-FAZ PRO-SH** | ✓ |
| | | **W-FAZ PRO-IG** | ✓ |
| **1** |  | **Hammer drilling:**<br>Drill hole perpendicular to concrete surface. | |
| **2** |  | Blow out dust. Alternatively vacuum clean down to the bottom of the hole. | |

| **Hole drilling - Hammer drilling <u>without</u> cleaning** | | | |
|---|---|---|---|
| | | **W-FAZ PRO** | ✓ |
| | | **W-FAZ PRO-L** | - |
| | | **W-FAZ PRO-SH** | - |
| | | **W-FAZ PRO-IG** | - |
| **1** |  | When the drill hole depth $h_1$ (see Annex B3, Table B1) is reached, move the drill back and forth at least 3 times with the machine switched on to remove the dust in the drill hole (venting the drill hole).<br>Continue with step 3. | |

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## **Installation instructions** - continuation

| **Insert fastener** | | | **W-FAZ PRO** | ✓ |
|---|---|---|---|---|
| | | | **W-FAZ PRO-L** | ✓ |
| | | | **W-FAZ PRO-SH** | ✓ |
| | | | **W-FAZ PRO-IG** | - |
| **3** |  | Drive in fastener (optionally use setting tool). | | |
| **4** |  | Apply installation torque $T_{inst}$. | | |

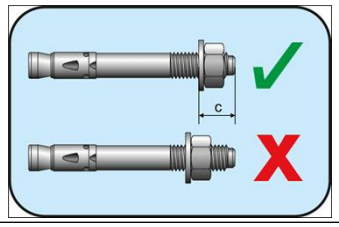
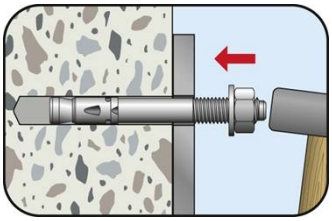
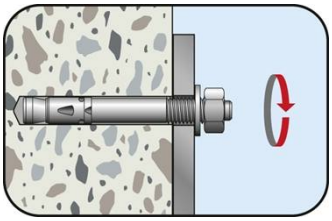
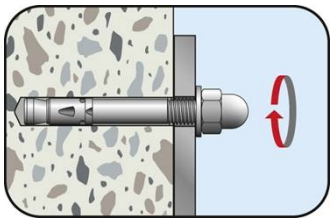
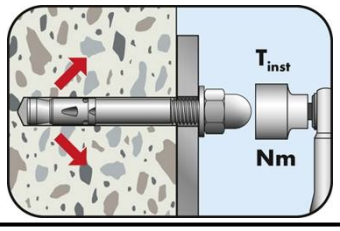
| **Insert fastener with filling of annular gap** | | | **W-FAZ PRO** | ✓ |
|---|---|---|---|---|
| | | | **W-FAZ PRO-L** | ✓ |
| | | | **W-FAZ PRO-SH** | ✓ |
| | | | **W-FAZ PRO-IG** | - |
| **3** |  | Fit the filling washer to the fastener, additionally to the washer.<br>Drive in fastener until the required anchorage depth is met. (Optionally use setting tool) | | |
| **4** |  | Apply installation torque $T_{inst}$. | | |
| **5** |  | Fill the annular gap between anchor and fixture with high strength injection adhesive (see Annex B1).<br>Use enclosed reducing adapter. Observe the processing information of the injection adhesive!<br>The annular gap is completely filled, when excess mortar seeps out. | | |

**Würth Fixanchor W-FAZ PRO**

**Intended Use**
Installation instructions – hole drilling and cleaning

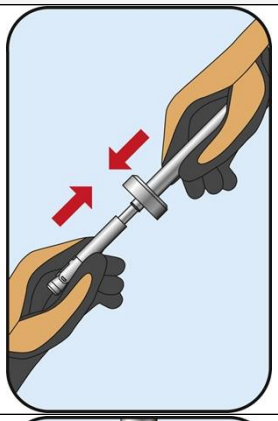
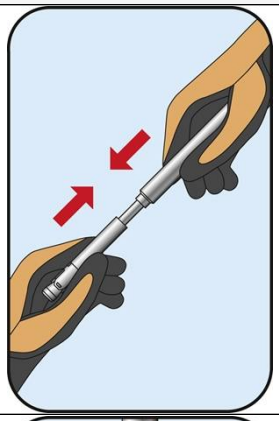
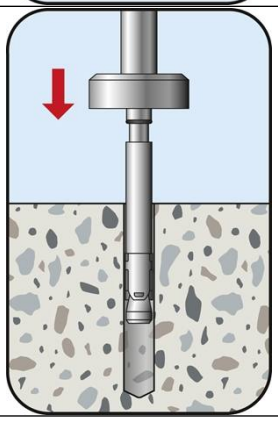
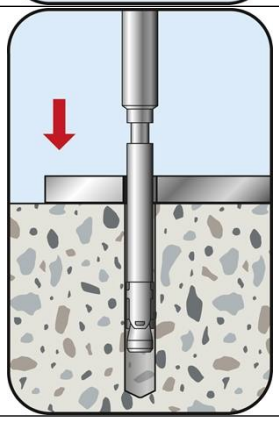
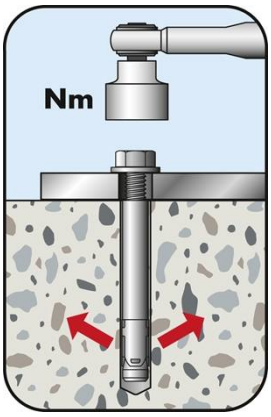
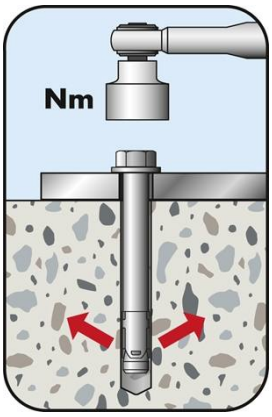
**Annex B11**

## **Installation instruction** – continuation

| **Install fastener with cap nut HM** | | | | |
|---|---|---|---|---|
| | | | **W-FAZ PRO** | ✓ |
| | | | **W-FAZ PRO-L** | - |
| | | | **W-FAZ PRO-SH** | - |
| | | | **W-FAZ PRO-IG** | - |
| **3** |  | | Check position of nut. Projection C after anchor has been inserted see Annex B3, Table B1. | |
| **4** |  | | Drive in fastener (optionally use setting tool). | |
| **5** |  | | Remove nut. | |
| **6** |  | | Screw on cap nut HM. | |
| **7** |  | | Apply installation torque $T_{inst}$. | |

## Installation instruction – continuation

| Install fastener with internal thread | | |
|---|---|---|
| | W-FAZ PRO | - |
| | W-FAZ PRO-L | - |
| | W-FAZ PRO-SH | - |
| | W-FAZ PRO-IG | ✓ |

| | Pre-setting installation | Through setting installation | |
|---|---|---|---|
| |  |  | Insert setting tool for **pre-setting or through setting installation** in fastener. |
| 3 |  |  | Drive in fastener with setting tool. |
| 4 |  |  | Drive in screw.<br>Installation torque $T_{inst}$ may be applied by using calibrated torque wrench. |

**Würth Fixanchor W-FAZ PRO**

**Intended Use**
Installation instructions, **W-FAZ PRO-IG**

**Annex B13**

**Table C1:** Characteristic values for **tension load** under static and quasi-static action, **W-FAZ PRO/S** (steel, galvanized)

| **Fastener size** | | | **M8** | **M10** | **M12** | **M16** | **M20** |
|---|---|---|---|---|---|---|---|
| Installation factor | $\gamma_{inst}$ | [-] | 1,0 | | | | |
| **Steel failure** | | | | | | | |
| Characteristic resistance | $N_{Rk,s}$ | [kN] | 19,8 | 30,4 | 44,9 | 79,3 | 126,2 |
| Partial factor[4)] | $\gamma_{Ms}$ | [-] | 1,5 | | | | |
| **Pull-out** | | | | | | | |
| Characteristic resistance in cracked concrete C20/25 | $N_{Rk,p,cr}$ | [kN] | 9,5 | 15,6 | 22,6 | 30,3 | 45,1 |
| Increasing factor[5)] $N_{Rk,p,cr} = \psi_{c,cr} \cdot N_{Rk,p,cr\ (C20/25)}$ | $\psi_{c,cr}$ | [-] | $\left(\frac{f_{ck}}{20}\right)^{0,439}$ | $\left(\frac{f_{ck}}{20}\right)^{0,265}$ | $\left(\frac{f_{ck}}{20}\right)^{0,5}$ | $\left(\frac{f_{ck}}{20}\right)^{0,339}$ | $\left(\frac{f_{ck}}{20}\right)^{0,338}$ |
| Characteristic resistance in uncracked concrete C20/25 | $N_{Rk,p,ucr}$ | [kN] | 14,0 | 23,9 | 31,4 | 53,7 | 59,1 |
| Increasing factor[5)] $N_{Rk,p,ucr} = \psi_{c,ucr} \cdot N_{Rk,p,ucr\ (C20/25)}$ | $\psi_{c,ucr}$ | [-] | $\left(\frac{f_{ck}}{20}\right)^{0,489}$ | $\left(\frac{f_{ck}}{20}\right)^{0,448}$ | $\left(\frac{f_{ck}}{20}\right)^{0,5}$ | $\left(\frac{f_{ck}}{20}\right)^{0,203}$ | $\left(\frac{f_{ck}}{20}\right)^{0,5}$ |
| **Splitting** | | | | | | | |
| Characteristic resistance | $N^0_{Rk,sp}$ | [kN] | min ( $N_{Rk,p}$ ; $N^0_{Rk,c}$ [3)] ) | | | | |
| Characteristic edge distance[2)] | $c_{cr,sp}$ | [mm] | $min\left(\frac{A_{sp} + 0{,}8 \cdot (h_{sp} - h_{ef})^2}{(3{,}41 \cdot h_{sp} - 0{,}59 \cdot h_{ef})}; \frac{A_{sp}}{h_{sp} \cdot \sqrt{8}}\right) \geq 1{,}5 \cdot h_{ef}$ | | | | |
| Characteristic spacing | $s_{cr,sp}$ | [mm] | $2 \cdot c_{cr,sp}$ | | | | |
| Factor | $\psi_{h,sp}$ | [-] | 1,0 | | | | |
| **Concrete cone failure** | | | | | | | |
| Minimum, effective anchorage depth | $h_{ef,min}$ | [mm] | 35[1)] | 40 | 50 | 65 | 90 |
| Maximum, effective anchorage depth | $h_{ef,max}$ | [mm] | 90 | 100 | 125 | 160 | 140 |
| Characteristic edge distance | $c_{cr,N}$ | [mm] | $1{,}5 \cdot h_{ef}$ | | | | |
| Characteristic spacing | $s_{cr,N}$ | [mm] | $2 \cdot c_{cr,N}$ | | | | |
| Factor — cracked concrete | $k_{cr,N}$ | [-] | 7,7 | 7,7 | 8,3 | 8,9 | 7,7 |
| Factor — uncracked concrete | $k_{ucr,N}$ | [-] | 11,0 | | | | |

1) Fastenings with anchorage depth $h_{ef} < 40$ mm are restricted to the use of structural components which are statically indeterminate and subject to dry internal exposure conditions only.
2) Applicable concrete thickness $h_{sp}$ and area $A_{sp}$ to determine characteristic edge distance $c_{cr,sp}$ according to Table B3
3) $N^0_{Rk,c}$ according to EN 1992-4:2018
4) In absence of other national regulations
5) For concrete strength classes > C50/60: $f_{ck} = 50$ N/mm²

**Würth Fixanchor W-FAZ PRO**

**Performance**
Characteristic values for tension load under static and quasi-static action, **W-FAZ PRO/S** (steel, galvanized)

**Annex C1**

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**Table C2:** Characteristic values for **tension load** under static or quasi-static action, **W-FAZ PRO/R3** and **W-FAZ PRO/R5**

| **Fastener size** | | | | **M8** | **M10** | **M12** | **M16** | **M20** |
|---|---|---|---|---|---|---|---|---|
| Installation factor | | $\gamma_{inst}$ | [-] | 1,0 | | | | |
| **Steel failure** | | | | | | | | |
| Characteristic resistance | | $N_{Rk,s}$ | [kN] | 19,8 | 30,4 | 44,9 | 74,6 | 126,2 |
| Partial factor[4] | | $\gamma_{Ms}$ | [-] | 1,5 | | | | |
| **Pull-out** | | | | | | | | |
| Characteristic resistance in cracked concrete C20/25 | | $N_{Rk,p,cr}$ | [kN] | 9,7 | 17,7 | 22,9 | 35,6 | 45,1 |
| Increasing factor[5] $N_{Rk,p,cr} = \psi_{c,cr} \cdot N_{Rk,p,cr\ (C20/25)}$ | | $\psi_{c,cr}$ | [-] | $\left(\frac{f_{ck}}{20}\right)^{0,488}$ | $\left(\frac{f_{ck}}{20}\right)^{0,5}$ | $\left(\frac{f_{ck}}{20}\right)^{0,435}$ | $\left(\frac{f_{ck}}{20}\right)^{0,350}$ | $\left(\frac{f_{ck}}{20}\right)^{0,338}$ |
| Characteristic resistance in uncracked concrete C20/25 | | $N_{Rk,p,ucr}$ | [kN] | 19,9 | 25,2 | 42,5 | 51,9 | 59,1 |
| Increasing factor[5] $N_{Rk,p,ucr} = \psi_{c,ucr} \cdot N_{Rk,p,ucr\ (C20/25)}$ | | $\psi_{c,ucr}$ | [-] | $\left(\frac{f_{ck}}{20}\right)^{0,240}$ | $\left(\frac{f_{ck}}{20}\right)^{0,364}$ | $\left(\frac{f_{ck}}{20}\right)^{0,213}$ | $\left(\frac{f_{ck}}{20}\right)^{0,196}$ | $\left(\frac{f_{ck}}{20}\right)^{0,5}$ |
| **Splitting** | | | | | | | | |
| Characteristic resistance | | $N^0_{Rk,sp}$ | [kN] | min ( $N_{Rk,p}$ ; $N^0_{Rk,c}$ [3] ) | | | | |
| Characteristic edge distance[2] | | $c_{cr,sp}$ | [mm] | $min\left(\frac{A_{sp} + 0{,}8 \cdot (h_{sp} - h_{ef})^2}{(3{,}41 \cdot h_{sp} - 0{,}59 \cdot h_{ef})}; \frac{A_{sp}}{h_{sp} \cdot \sqrt{8}}\right) \geq 1{,}5 \cdot h_{ef}$ | | | | |
| Characteristic spacing | | $s_{cr,sp}$ | [mm] | $2 \cdot c_{cr,sp}$ | | | | |
| Factor | | $\psi_{h,sp}$ | [-] | 1,0 | | | | |
| **Concrete cone failure** | | | | | | | | |
| Minimum, effective anchorage depth | | $h_{ef,min}$ | [mm] | 35[1] | 40 | 50 | 65 | 90 |
| Maximum, effective anchorage depth | | $h_{ef,max}$ | [mm] | 90 | 100 | 125 | 160 | 140 |
| Characteristic edge distance | | $c_{cr,N}$ | [mm] | $1{,}5 \cdot h_{ef}$ | | | | |
| Characteristic spacing | | $s_{cr,N}$ | [mm] | $2 \cdot c_{cr,N}$ | | | | |
| Factor | cracked concrete | $k_{cr,N}$ | [-] | 7,7 | 7,7 | 8,9 | 8,9 | 7,7 |
| | uncracked concrete | $k_{ucr,N}$ | [-] | 11,0 | | | | |

1) Fastenings with anchorage depth $h_{ef}$ < 40 mm are restricted to the use of structural components which are statically indeterminate and subject to dry internal exposure conditions only
2) Applicable concrete thickness $h_{sp}$ and area $A_{sp}$ according to Table B3 to determine characteristic edge distance $c_{cr,sp}$
3) $N^0_{Rk,c}$ according to EN 1992-4:2018
4) In absence of other national regulations
5) For concrete strength classes > C50/60: $f_{ck}$ = 50 N/mm²

**Würth Fixanchor W-FAZ PRO**

**Performance**
Characteristic values for tension load, **W-FAZ PRO/R3** and **W-FAZ PRO/R5**

**Annex C2**

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**Table C3:** Characteristic values for **shear load** under static and quasi-static action, **W-FAZ PRO**

| **Fastener size** | | | | **M8** | **M10** | **M12** | **M16** | **M20** |
|---|---|---|---|---|---|---|---|---|
| Installation factor | | $\gamma_{inst}$ | [-] | 1,0 | | | | |
| **Steel failure <u>without</u> lever arm** | | | | | | | | |
| Characteristic resistance – **<u>unfilled</u>** annular gap | W-FAZ PRO/S | $V^0_{Rk,s}$ | [kN] | 15,7 | 26,8 | 38,3 | 60,0 | 83,8 |
| | W-FAZ PRO/R3 | $V^0_{Rk,s}$ | [kN] | 20,3 | 31,8 | 41,6 | 71,7 | 108,5 |
| | W-FAZ PRO/R5 | $V^0_{Rk,s}$ | [kN] | 16,8 | 27,8 | 39,8 | 69,5 | 108,5 |
| Characteristic resistance – **<u>filled</u>** annular gap | W-FAZ PRO/S | $V^0_{Rk,s}$ | [kN] | 17,3 | 26,7 | 38,6 | 60,6 | 86,1 |
| | W-FAZ PRO/R3 | $V^0_{Rk,s}$ | [kN] | 18,6 | 27,0 | 44,9 | 80,1 | 108,5 |
| | W-FAZ PRO/ R5 | $V^0_{Rk,s}$ | [kN] | 16,8 | 27,8 | 44,9 | 80,1 | 108,5 |
| Partial factor[2)] | | $\gamma_{Ms}$ | [-] | 1,25 | | | | |
| Ductility factor | | $k_7$ | [-] | 1,0 | | | | |
| **Steel failure <u>with</u> lever arm** | | | | | | | | |
| Characteristic bending resistance | W-FAZ PRO/S | $M^0_{Rk,s}$ | [Nm] | 30 | 60 | 105 | 240 | 412 |
| | W-FAZ PRO/R3 W-FAZ PRO/R5 | $M^0_{Rk,s}$ | [Nm] | 27 | 55 | 99 | 223 | 390 |
| Partial factor[2)] | | $\gamma_{Ms}$ | [-] | 1,25 | | | | |
| **Concrete pry-out failure** | | | | | | | | |
| Pry-out factor | W-FAZ PRO/S | $k_{8,cr}$ | [-] | 2,8 | 3,1 | 2,8 | 3,1 | 3,3 |
| | | $k_{8,ucr}$ | [-] | 2,8 | 3,1 | 3,0 | 3,6 | 3,3 |
| | W-FAZ PRO/R3 W-FAZ PRO/R5 | $k_{8,cr}$ | [-] | 2,7 | 2,8 | 2,9 | 2,9 | 3,3 |
| | | $k_{8,ucr}$ | [-] | 2,7 | 2,8 | 3,3 | 3,4 | 3,3 |
| **Concrete edge failure** | | | | | | | | |
| Effective length of fastener in shear loading | | $l_f$ | [mm] | $h_{ef}$ [1)] | | | | |
| Outside diameter of fastener | | $d_{nom}$ | [mm] | 8 | 10 | 12 | 16 | 20 |

1) Fastenings with anchorage depth $h_{ef} < 40$ mm are restricted to the use of structural components which are statically indeterminate and subject to dry internal exposure conditions only.

2) In absence of other national regulations.

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**Table C4:** Characteristic values for **seismic loading,** performance category **C1, tension load, W-FAZ PRO**

| **Fastener size** | | | | **M8** | **M10** | **M12** | **M16** | **M20** |
|---|---|---|---|---|---|---|---|---|
| Effective anchorage depth | | $h_{ef} \geq$ | [mm] | 40 | 40 | 50 | 65 | 90 |
| Installation factor | | $\gamma_{inst}$ | [-] | 1,0 | | | | |
| **Steel failure** | | | | | | | | |
| Characteristic resistance | W-FAZ PRO/S | $N_{Rk,s,C1}$ | [kN] | 19,8 | 30,4 | 44,9 | 79,3 | 126,2 |
| | W-FAZ PRO/ R3 / R5 | $N_{Rk,s,C1}$ | [kN] | 19,8 | 30,4 | 44,9 | 74,6 | 126,2 |
| **Pull-out** | | | | | | | | |
| Characteristic resistance | W-FAZ PRO/S | $N_{Rk,p,C1}$ | [kN] | 9,1 | 15,3 | 22,6 | 30,3 | 45,1 |
| | W-FAZ PRO/ R3 / R5 | $N_{Rk,p,C1}$ | [kN] | 9,4 | 17,7 | 22,8 | 35,6 | 45,1 |

**Table C5:** Characteristic values for **seismic loading,** performance category **C1, shear load, W-FAZ PRO**

| **Fastener size** | | | | **M8** | **M10** | **M12** | **M16** | **M20** |
|---|---|---|---|---|---|---|---|---|
| Effective anchorage depth | | $h_{ef} \geq$ | [mm] | 40 | 40 | 50 | 65 | 90 |
| **Steel failure without lever arm** | | | | | | | | |
| Characteristic resistance - **unfilled** annular gap | W-FAZ PRO/S | $V_{Rk,s,C1}$ | [kN] | Min ($0,346*h_{ef}$ -2,2;13,4) | Min ($0,094*h_{ef}$ +18,8;24,4) | Min ($0,188*h_{ef}$ +20,6;33,8) | Min ($0,176*h_{ef}$ +37,3;52,3) | 83,8 |
| | W-FAZ PRO/ R3 | $V_{Rk,s,C1}$ | [kN] | Min ($0,424*h_{ef}$ -3,7;15,4) | Min ($0,091*h_{ef}$ +19,9;25,3) | 34,7 | Min ($0,165*h_{ef}$ +52,4;66,4) | 108,5 |
| | W-FAZ PRO/ R5 | $V_{Rk,s,C1}$ | [kN] | Min ($0,350*h_{ef}$ -3,0;12,7) | Min ($0,079*h_{ef}$ +17,4;22,2) | 33,2 | Min ($0,160*h_{ef}$ +50,7;64,3) | 108,5 |
| Characteristic resistance – **filled** annular gap | W-FAZ PRO/S | $V_{Rk,s,C1}$ | [kN] | Min ($0,148*h_{ef}$ +8,0;14,7) | 24,1 | Min ($0,082*h_{ef}$ +32,8;38,6) | 60,2 | 86,1 |
| | W-FAZ PRO/ R3 | $V_{Rk,s,C1}$ | [kN] | Min ($0,934*h_{ef}$ -23,4;18,6) | Min ($0,146*h_{ef}$ +17,9;26,6) | Min ($0,153*h_{ef}$ +29,1;39,8) | Min ($0,325*h_{ef}$ +46,6;74,2) | 108,5 |
| | W-FAZ PRO/ R5 | $V_{Rk,s,C1}$ | [kN] | Min ($0,845*h_{ef}$ -21,2;16,8) | Min ($0,150*h_{ef}$ +18,5;27,5) | Min ($0,153*h_{ef}$ +29,1;39,8) | Min ($0,325*h_{ef}$ +46,6;74,2) | 108,5 |
| Factor for anchorages | **unfilled** annular gap | $\alpha_{gap}$ | [-] | 0,5 | | | | |
| | **filled** annular gap | $\alpha_{gap}$ | [-] | 1,0 | | | | |

**Würth Fixanchor W-FAZ PRO**

**Performance**
Characteristic values for seismic loading, performance category C1, **W-FAZ PRO**

**Annex C4**

**Table C6:** Characteristic values for **seismic loading,** performance category **C2, tension load, W-FAZ PRO**

| **Fastener size** | | | | **M8** | **M10** | **M12** | **M16** | **M20** |
|---|---|---|---|---|---|---|---|---|
| Effective anchorage depth | | $h_{ef} \geq$ | [mm] | 40 | 40 | 50 | 65 | 90 |
| Installation factor | | $\gamma_{inst}$ | [-] | 1,0 | | | | |
| **Steel failure** | | | | | | | | |
| Characteristic resistance | W-FAZ PRO/S | $N_{Rk,s,C2}$ | [kN] | 19,8 | 30,4 | 44,9 | 79,3 | 126,2 |
| | W-FAZ PRO/ R3 / R5 | $N_{Rk,s,C2}$ | [kN] | 19,8 | 30,4 | 44,9 | 74,6 | 126,2 |
| **Pull-out** | | | | | | | | |
| Characteristic resistance | W-FAZ PRO/S | $N_{Rk,p,C2}$ | [kN] | min ($0,150*h_{ef}$ -3,2; 3,6) | min ($0,262*h_{ef}$ -3,2; 12,5) | min ($0,415*h_{ef}$ -10,05; 19,0) | min ($0,77*h_{ef}$ -30,25; 35,2) | $90 \leq h_{ef} \leq 100$: min ($0,248*h_{ef}$ +12,8; 37,6)<br>$100 < h_{ef} \leq 140$: min ($0,134*h_{ef}$ +24,2; 42,9) |
| | W-FAZ PRO/ R3 / R5 | $N_{Rk,p,C2}$ | [kN] | min ($0,198*h_{ef}$ -5,7; 3,2) | min ($0,139*h_{ef}$ -0,6; 7,7) | min ($0,292*h_{ef}$ -6,6; 13,8) | min ($0,520*h_{ef}$ -14,8; 29,4) | |

**Table C7:** Characteristic values for **seismic loading,** performance category **C2, shear load, W-FAZ PRO**

| **Fastener size** | | | | **M8** | **M10** | **M12** | **M16** | **M20** |
|---|---|---|---|---|---|---|---|---|
| Effective anchorage depth | | $h_{ef} \geq$ | [mm] | 40 | 40 | 50 | 65 | 90 |
| **Steel failure without lever arm** | | | | | | | | |
| Characteristic resistance - **unfilled** annular gap | W-FAZ PRO/S | $V_{Rk,s,C2}$ | [kN] | min ($0,818*h_{ef}$ -25,5;11,3) | min ($0,177*h_{ef}$ +8,3;19,0) | min ($0,487*h_{ef}$ -6,1;28,0) | min ($0,195*h_{ef}$ +26,7;43,3) | 69,0 |
| | W-FAZ PRO/ R3 | $V_{Rk,s,C2}$ | [kN] | min ($0,226*h_{ef}$ -1,6;10,4) | min ($0,193*h_{ef}$ +6,5;18,1) | min ($0,170*h_{ef}$ +14,9;26,8) | min ($0,174*h_{ef}$ +32,7;47,6) | 88,9 |
| | W-FAZ PRO/ R5 | $V_{Rk,s,C2}$ | [kN] | min ($0,220*h_{ef}$ -1,3;8,6) | min ($0,169*h_{ef}$ +5,7;15,9) | min ($0,162*h_{ef}$ +14,2;25,6) | min ($0,169*h_{ef}$ +31,7;46,1) | 88,9 |
| Characteristic resistance – **filled** annular gap | W-FAZ PRO/S | $V_{Rk,s,C2}$ | [kN] | min ($0,206*h_{ef}$ +1,5;10,8) | min ($0,111*h_{ef}$ +13,3;19,9) | min ($0,068*h_{ef}$ +24,2;28,9) | min ($0,142*h_{ef}$ +36,7;48,8) | 73,3 |
| | W-FAZ PRO/ R3 | $V_{Rk,s,C2}$ | [kN] | min ($0,071*h_{ef}$ +7,5;10,7) | min ($0,031*h_{ef}$ +14,8;16,6) | min ($0,201*h_{ef}$ +14,4;28,5) | 47,4 | 88,9 |
| | W-FAZ PRO/ R5 | $V_{Rk,s,C2}$ | [kN] | min ($0,064*h_{ef}$ +6,8;9,7) | min ($0,032*h_{ef}$ +15,2;17,1) | min ($0,201*h_{ef}$ +14,4;28,5) | 47,4 | 88,9 |
| Factor for anchorages | **unfilled** annular gap | $\alpha_{gap}$ | [-] | 0,5 | | | | |
| | **filled** annular gap | $\alpha_{gap}$ | [-] | 1,0 | | | | |

**Table C8:** Characteristic values **for tension and shear load** under **fire exposure, W-FAZ PRO/S** (Steel, galvanized)

| **Fastener size** | | | | **M8** | **M10** | **M12** | **M16** | **M20** |
|---|---|---|---|---|---|---|---|---|
| **Tension load** | | | | | | | | |
| **Steel failure** | | | | | | | | |
| Characteristic resistance | R30 | $N_{Rk,s,fi}$ | [kN] | 1,2 | 2,6 | 4,6 | 7,7 | 9,4 |
| | R60 | | | 1,0 | 1,9 | 3,3 | 5,6 | 8,2 |
| | R90 | | | 0,7 | 1,3 | 2,1 | 3,5 | 6,9 |
| | R120 | | | 0,6 | 1,0 | 1,5 | 2,5 | 6,3 |
| **Shear load** | | | | | | | | |
| **Steel failure <u>without</u> lever arm** | | | | | | | | |
| Characteristic resistance | R30 | $V_{Rk,s,fi}$ | [kN] | 4,0 | 7,5 | 12,3 | 20,7 | 11,0 |
| | R60 | | | 2,7 | 5,1 | 8,5 | 14,2 | 10,6 |
| | R90 | | | 1,4 | 2,7 | 4,6 | 7,7 | 10,2 |
| | R120 | | | 0,8 | 1,6 | 2,7 | 4,5 | 10,0 |
| **Steel failure <u>with</u> lever arm** | | | | | | | | |
| Characteristic resistance | R30 | $M^0_{Rk,s,fi}$ | [Nm] | 4,1 | 9,6 | 19,1 | 43,8 | 29,1 |
| | R60 | | | 2,8 | 6,6 | 13,1 | 30,1 | 28,0 |
| | R90 | | | 1,5 | 3,5 | 7,2 | 16,4 | 26,9 |
| | R120 | | | 0,8 | 2,0 | 4,2 | 9,6 | 26,3 |

$N_{Rk,p,fi}$ and $N_{Rk,c,fi}$ according to EN 1992-4:2018

**Table C9:** Characteristic values **for tension and shear load** under **fire exposure** **W-FAZ PRO/R3** und **W-FAZ PRO/R5**

| **Fastener size** | | | | **M8** | **M10** | **M12** | **M16** | **M20** |
|---|---|---|---|---|---|---|---|---|
| **Tension load** | | | | | | | | |
| **Steel failure** | | | | | | | | |
| Characteristic resistance | R30 | $N_{Rk,s,fi}$ | [kN] | 4,0 | 6,9 | 11,0 | 18,1 | 36,9 |
| | R60 | | | 2,9 | 5,0 | 8,0 | 13,1 | 27,4 |
| | R90 | | | 1,8 | 3,1 | 4,9 | 8,1 | 17,9 |
| | R120 | | | 1,2 | 2,1 | 3,4 | 5,6 | 13,1 |
| **Shear load** | | | | | | | | |
| **Steel failure <u>without</u> lever arm** | | | | | | | | |
| Characteristic resistance | R30 | $V_{Rk,s,fi}$ | [kN] | 8,5 | 17,6 | 32,0 | 52,6 | 73,5 |
| | R60 | | | 6,2 | 12,6 | 22,6 | 37,1 | 51,8 |
| | R90 | | | 3,9 | 7,5 | 13,1 | 21,5 | 30,1 |
| | R120 | | | 2,8 | 5,0 | 8,4 | 13,8 | 19,2 |
| **Steel failure <u>with</u> lever arm** | | | | | | | | |
| Characteristic resistance | R30 | $M^0_{Rk,s,fi}$ | [Nm] | 8,7 | 22,7 | 49,8 | 111,5 | 194,7 |
| | R60 | | | 6,3 | 16,2 | 35,1 | 78,6 | 137,2 |
| | R90 | | | 4,0 | 9,7 | 20,4 | 45,6 | 79,7 |
| | R120 | | | 2,8 | 6,5 | 13,0 | 29,2 | 50,9 |

$N_{Rk,p,fi}$ and $N_{Rk,c,fi}$ according to EN 1992-4:2018

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**Table C10:** Displacements under **tension load, W-FAZ PRO/S** (Steel, galvanized)

| **Fastener size** | | | **M8** | | **M10** | | **M12** | | **M16** | | **M20** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Displacements under static or quasi-static action**<br>$\delta_{N0} = \delta_{N0\text{-factor}} * N$<br>$\delta_{N\infty} = \delta_{N\infty\text{-factor}} * N$ | | N: acting tension load | | | | | | | | | | | |
| Effective anchorage depth | $h_{ef} \geq$ | [mm] | 35 | | 40 | | 50 | | 65 | | 90 | | |
| **Cracked concrete** | | | | | | | | | | | | | |
| Factor for displacement | $\delta_{N0\text{-factor}}$ | [mm/kN] | 0,13 | | 0,05 | | 0,04 | | 0,03 | | 0,04 | | |
| | $\delta_{N\infty\text{-factor}}$ | [mm/kN] | 0,29 | | 0,20 | | 0,15 | | 0,11 | | 0,05 | | |
| **Uncracked concrete** | | | | | | | | | | | | | |
| Factor for displacement | $\delta_{N0\text{- factor}}$ | [mm/kN] | 0,03 | | 0,01 | | 0,004 | | 0,005 | | 0,02 | | |
| | $\delta_{N\infty\text{- factor}}$ | [mm/kN] | 0,03 | | 0,03 | | 0,03 | | 0,03 | | 0,03 | | |
| **Displacement under seismic action C2** | | | | | | | | | | | | | |
| Effective anchorage depth | $h_{ef} \geq$ | [mm] | 40 | 45 | 40 | 60 | 50 | 70 | 65 | 85 | 90 | 100 | 140 |
| Displacements for DLS | $\delta_{N,C2\ (DLS)}$ | [mm] | 3,9 | 4,9 | 2,8 | 4,7 | 2,4 | 4,2 | 2,5 | 4,5 | 4,2 | 4,5 | 5,1 |
| Displacements for ULS | $\delta_{N,C2\ (ULS)}$ | [mm] | 11,3 | 14,3 | 9,4 | 16,1 | 7,3 | 12,9 | 7,2 | 12,8 | 11,7 | 12,5 | 14,3 |

**Table C11:** Displacements under **tension load, W-FAZ PRO/R3** and **W-FAZ PRO/R5**

| **Fastener size** | | | **M8** | | **M10** | | **M12** | | **M16** | | **M20** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Displacements under static or quasi-static action**<br>$\delta_{N0} = \delta_{N0\text{-factor}} * N$<br>$\delta_{N\infty} = \delta_{N\infty\text{-factor}} * N$ | | N: acting tension load | | | | | | | | | | | |
| Effective anchorage depth | $h_{ef} \geq$ | [mm] | 35 | | 40 | | 50 | | 65 | | 90 | | |
| **Cracked concrete** | | | | | | | | | | | | | |
| Factor for displacement | $\delta_{N0\text{-factor}}$ | [mm/kN] | 0,11 | | 0,06 | | 0,05 | | 0,06 | | 0,04 | | |
| | $\delta_{N\infty\text{-factor}}$ | [mm/kN] | 0,27 | | 0,17 | | 0,16 | | 0,08 | | 0,05 | | |
| **Uncracked concrete** | | | | | | | | | | | | | |
| Factor for displacement | $\delta_{N0\text{- factor}}$ | [mm/kN] | 0,02 | | 0,00 | | 0,001 | | 0,00 | | 0,02 | | |
| | $\delta_{N\infty\text{- factor}}$ | [mm/kN] | 0,05 | | 0,05 | | 0,05 | | 0,05 | | 0,03 | | |
| **Displacement under seismic action C2** | | | | | | | | | | | | | |
| Effective anchorage depth | $h_{ef} \geq$ | [mm] | 40 | 45 | 40 | 60 | 50 | 70 | 65 | 85 | 90 | 100 | 140 |
| Displacements for DLS | $\delta_{N,C2\ (DLS)}$ | [mm] | 2,0 | 2,9 | 2,6 | 4,1 | 3,3 | 5,7 | 3,3 | 5,1 | 4,2 | 4,5 | 5,1 |
| Displacements for ULS | $\delta_{N,C2\ (ULS)}$ | [mm] | 7,7 | 11,1 | 10,8 | 16,8 | 10,4 | 18,0 | 9,0 | 13,9 | 11,7 | 12,5 | 14,3 |

**Würth Fixanchor W-FAZ PRO**

**Performance**
Displacements under tension load, **W-FAZ PRO**

**Annex C8**

## Table C12: Displacements under **shear load, W-FAZ PRO/S** (Steel, galvanized)

| **Fastener size** | | | **M8** | | **M10** | | **M12** | | **M16** | | **M20** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Displacements under static or quasi-static action**<br>$\delta_{V0} = \delta_{V0\text{-factor}} * V$ V: acting shear load<br>$\delta_{V\infty} = \delta_{V\infty\text{-factor}} * V$ | | | | | | | | | | | |
| Effective anchorage depth | $h_{ef} \geq$ | [mm] | 35 | | 40 | | 50 | | 65 | | 90 |
| Factor for displacement **unfilled** annular gap | $\delta_{V0\text{- factor}}$ | [mm/kN] | 0,157 | | 0,081 | | 0,086 | | 0,080 | | 0,067 |
| | $\delta_{V\infty\text{- factor}}$ | [mm/kN] | 0,235 | | 0,121 | | 0,129 | | 0,120 | | 0,100 |
| Factor for displacement **filled** annular gap | $\delta_{V0\text{- factor}}$ | [mm/kN] | 0,002 | | 0,039 | | 0,047 | | 0,038 | | 0,016 |
| | $\delta_{V\infty\text{- factor}}$ | [mm/kN] | 0,004 | | 0,059 | | 0,070 | | 0,057 | | 0,024 |
| **Displacement under seismic action C2**[1] **unfilled** annular gap | | | | | | | | | | | |
| Effective anchorage depth | $h_{ef} \geq$ | [mm] | 40 | 45 | 40 | 60 | 50 | 70 | 65 | 85 | 90 |
| Displacements for DLS | $\delta_{V,C2(DLS)}$ | [mm] | 2,8 | 2,7 | 3,0 | 3,1 | 3,4 | 3,7 | 3,4 | 3,8 | 5,1 |
| Displacements for ULS | $\delta_{V,C2(ULS)}$ | [mm] | 5,1 | 5,0 | 5,0 | 5,5 | 6,3 | 9,9 | 6,0 | 9,6 | 9,4 |
| **Displacement under seismic action C2 filled** annular gap | | | | | | | | | | | |
| Effective anchorage depth | $h_{ef} \geq$ | [mm] | 40 | 45 | 40 | 60 | 50 | 70 | 65 | 85 | 90 |
| Displacements for DLS | $\delta_{V,C2(DLS)}$ | [mm] | 0,5 | 0,4 | 1,4 | 0,9 | 1,4 | 0,7 | 1,4 | 1,2 | 1,3 |
| Displacements for ULS | $\delta_{V,C2(ULS)}$ | [mm] | 1,7 | 1,9 | 5,8 | 4,5 | 4,5 | 3,1 | 5,0 | 3,9 | 5,2 |

[1] For anchorages with clearance in the fixture the annular gap must also be considered.

## Table C13: Displacements under **shear load, W-FAZ PRO/R3**

| **Fastener size** | | | **M8** | | **M10** | | **M12** | | **M16** | | **M20** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Displacements under static or quasi-static action**<br>$\delta_{V0} = \delta_{V0\text{-factor}} * V$ V: acting shear load<br>$\delta_{V\infty} = \delta_{V\infty\text{-factor}} * V$ | | | | | | | | | | | |
| Effective anchorage depth | $h_{ef} \geq$ | [mm] | 35 | | 40 | | 50 | | 65 | | 90 |
| Factor for displacement **unfilled** annular gap | $\delta_{V0\text{- factor}}$ | [mm/kN] | 0,257 | | 0,137 | | 0,107 | | 0,088 | | 0,086 |
| | $\delta_{V\infty\text{- factor}}$ | [mm/kN] | 0,385 | | 0,205 | | 0,160 | | 0,132 | | 0,129 |
| Factor for displacement **filled** annular gap | $\delta_{V0\text{- factor}}$ | [mm/kN] | 0,016 | | 0,020 | | 0,040 | | 0,025 | | 0,086 |
| | $\delta_{V\infty\text{- factor}}$ | [mm/kN] | 0,024 | | 0,030 | | 0,060 | | 0,037 | | 0,129 |
| **Displacement under seismic action C2**[1] **unfilled** annular gap | | | | | | | | | | | |
| Effective anchorage depth | $h_{ef} \geq$ | [mm] | 40 | 45 | 40 | 60 | 50 | 70 | 65 | 85 | 90 |
| Displacements for DLS | $\delta_{V,C2(DLS)}$ | [mm] | 2,8 | 3,0 | 3,4 | 3,5 | 3,5 | 4,2 | 3,8 | 4,4 | 5,1 |
| Displacements for ULS | $\delta_{V,C2(ULS)}$ | [mm] | 5,2 | 5,1 | 7,0 | 8,4 | 7,5 | 11,8 | 7,8 | 11,1 | 9,4 |
| **Displacement under seismic action C2 filled** annular gap | | | | | | | | | | | |
| Effective anchorage depth | $h_{ef} \geq$ | [mm] | 40 | 45 | 40 | 60 | 50 | 70 | 65 | 85 | 90 |
| Displacements for DLS | $\delta_{V,C2(DLS)}$ | [mm] | 0,9 | 0,6 | 1,2 | 0,5 | 1,5 | 1,5 | 1,6 | 1,6 | 4,1 |
| Displacements for ULS | $\delta_{V,C2(ULS)}$ | [mm] | 2,5 | 2,6 | 5,4 | 3,6 | 6,0 | 7,1 | 6,2 | 6,2 | 8,4 |

[1] For anchorages with clearance in the fixture the annular gap must also be considered.

**Würth Fixanchor W-FAZ PRO**

**Performance**
Displacements under shear load, **W-FAZ PRO/S** and **W-FAZ PRO/R3**

**Annex C9**

## Table C14: Displacements under **shear load, W-FAZ PRO/R5**

| **Fastener size** | | | **M8** | | **M10** | | **M12** | | **M16** | | **M20** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Displacements under static or quasi-static action**<br>$\delta_{V0} = \delta_{V0\text{-factor}} * V$ V: acting shear load<br>$\delta_{V\infty} = \delta_{V\infty\text{-factor}} * V$ | | | | | | | | | | | |
| Effective anchorage depth | $h_{ef} \geq$ | [mm] | 35 | | 40 | | 50 | | 65 | | 90 |
| Factor for displacement **unfilled** annular gap | $\delta_{V0\text{- factor}}$ | [mm/kN] | 0,276 | | 0,137 | | 0,126 | | 0,082 | | 0,086 |
| | $\delta_{V\infty\text{- factor}}$ | [mm/kN] | 0,413 | | 0,205 | | 0,189 | | 0,123 | | 0,129 |
| Factor for displacement **filled** annular gap | $\delta_{V0\text{- factor}}$ | [mm/kN] | 0,308 | | 0,042 | | 0,040 | | 0,025 | | 0,086 |
| | $\delta_{V\infty\text{- factor}}$ | [mm/kN] | 0,462 | | 0,064 | | 0,060 | | 0,037 | | 0,129 |
| **Displacement under seismic action C2**[1] **unfilled** annular gap | | | | | | | | | | | |
| Effective anchorage depth | $h_{ef} \geq$ | [mm] | 40 | 45 | 40 | 60 | 50 | 70 | 65 | 85 | 90 |
| Displacements for DLS | $\delta_{V,C2(DLS)}$ | [mm] | 2,8 | 3,0 | 3,4 | 3,5 | 3,5 | 4,2 | 3,8 | 4,4 | 5,1 |
| Displacements for ULS | $\delta_{V,C2(ULS)}$ | [mm] | 5,2 | 5,1 | 7,0 | 8,4 | 7,5 | 11,8 | 7,8 | 11,1 | 9,4 |
| **Displacement under seismic action C2 filled** annular gap | | | | | | | | | | | |
| Effective anchorage depth | $h_{ef} \geq$ | [mm] | 40 | 45 | 40 | 60 | 50 | 70 | 65 | 85 | 90 |
| Displacements for DLS | $\delta_{V,C2(DLS)}$ | [mm] | 0,9 | 0,6 | 1,2 | 0,5 | 1,5 | 1,5 | 1,6 | 1,6 | 4,1 |
| Displacements for ULS | $\delta_{V,C2(ULS)}$ | [mm] | 2,5 | 2,6 | 5,4 | 3,6 | 6,0 | 7,1 | 6,2 | 6,2 | 8,4 |

[1] For anchorages with clearance in the fixture the annular gap must also be considered

**Würth Fixanchor W-FAZ PRO**

**Performance**
Displacements under shear load, **W-FAZ PRO/R5**

**Annex C10**

**Table C15:** Characteristic values for **tension loads**, **W-FAZ PRO-L/S, cracked concrete,** static and quasi-static action

| **Fastener size** | | | **M8** | **M10** | **M12** | **M16** | **M20** | **M24** | **M27** |
|---|---|---|---|---|---|---|---|---|---|
| Installation factor | $\gamma_{inst}$ | [-] | 1,0 | | | | | | |
| **Steel failure** | | | | | | | | | |
| Characteristic resistance | $N_{Rk,s}$ | [kN] | 16 | 27 | 40 | 60 | 86 | 126 | 196 |
| Partial factor[1)] | $\gamma_{Ms}$ | [-] | 1,53 | | 1,5 | | 1,6 | 1,5 | |
| **Pull-out** | | | | | | | | | |
| Characteristic resistance in cracked concrete C20/25 | $N_{Rk,p}$ | [kN] | 5 | 9 | 16 | 25 | 36 | 44,4 | 50,3 |
| Increasing factor for $N_{Rk,p} = \Psi_c \cdot N_{Rk,p}$ (C20/25) | $\Psi_c$ | [-] | $\left(\frac{f_{ck}}{20}\right)^{0,5}$ | | | | | | |
| **Concrete cone failure** | | | | | | | | | |
| Effective anchorage depth | $h_{ef}$ | [mm] | 46 | 60 | 70 | 85 | 100 | 115 | 125 |
| Factor for cracked concrete | $k_{cr,N}$ | [-] | 7,7 | | | | | | |

1) In absence of other national regulations.

**Table C16:** Characteristic values for **tension loads**, **W-FAZ PRO-L/R3** and **W-FAZ PRO-L/R5, cracked concrete,** static and quasi-static action

| **Fastener size** | | | **M8** | **M10** | **M12** | **M16** | **M20** | **M24** |
|---|---|---|---|---|---|---|---|---|
| Installation factor | $\gamma_{inst}$ | [-] | 1,0 | | | | | |
| **Steel failure** | | | | | | | | |
| Characteristic resistance | $N_{Rk,s}$ | [kN] | 16 | 27 | 40 | 64 | 108 | 110 |
| Partial factor[1)] | $\gamma_{Ms}$ | [-] | 1,5 | | | | 1,68 | 1,5 |
| **Pull-out** | | | | | | | | |
| Characteristic resistance in cracked concrete C20/25 | $N_{Rk,p}$ | [kN] | 5 | 9 | 16 | 25 | 36 | 40 |
| Increasing factor for $N_{Rk,p} = \Psi_c \cdot N_{Rk,p}$ (C20/25) | $\Psi_c$ | [-] | $\left(\frac{f_{ck}}{20}\right)^{0,5}$ | | | | | |
| **Concrete cone failure** | | | | | | | | |
| Effective anchorage depth | $h_{ef}$ | [mm] | 46 | 60 | 70 | 85 | 100 | 125 |
| Factor for cracked concrete | $k_{cr,N}$ | [-] | 7,7 | | | | | |

1) In absence of other national regulations.

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**Table C17:** Characteristic values for **tension loads**, **W-FAZ PRO-L/S**, **uncracked concrete,** static and quasi-static action

| **Fastener size** | | | **M8** | **M10** | **M12** | **M16** | **M20** | **M24** | **M27** |
|---|---|---|---|---|---|---|---|---|---|
| Installation factor | $\gamma_{inst}$ | [-] | 1,0 | | | | | | |
| **Steel failure** | | | | | | | | | |
| Characteristic resistance | $N_{Rk,s}$ | [kN] | 16 | 27 | 40 | 60 | 86 | 126 | 196 |
| Partial factor[2)] | $\gamma_{Ms}$ | [-] | 1,53 | | 1,5 | | 1,6 | 1,5 | |
| **Pull-out** | | | | | | | | | |
| Characteristic resistance in uncracked concrete C20/25 | $N_{Rk,p}$ | [kN] | 12 | 16 | 25 | 35 | 51 | 62,9 | 71,3 |
| **Splitting** | | | | | | | | | |
| Splitting for **standard thickness of concrete member** (The higher resistance of case 1 and case 2 may be applied; $c_{cr,sp}$ may be linearly interpolated for the member thickness $h_{min,2} < h < h_{min,1}$ (Case 2); $\psi_{h,sp}$= 1,0)) | | | | | | | | | |
| Standard thickness of concrete | $h_{min,1} \geq$ | [mm] | 100 | 120 | 140 | 170 | 200 | 230 | 250 |
| **Case 1** | | | | | | | | | |
| Characteristic resistance in uncracked concrete C20/25 | $N^0_{Rk,sp}$ | [kN] | 9 | 12 | 20 | 30 | 40 | 62,3 | 50 |
| Edge distance | $c_{cr,sp}$ | [mm] | $1,5\ h_{ef}$ | | | | | | |
| **Case 2** | | | | | | | | | |
| Characteristic resistance in uncracked concrete C20/25 | $N^0_{Rk,sp}$ | [kN] | 12 | 16 | 25 | 35 | 50,5 | 62,3 | 70,6 |
| Edge distance | $c_{cr,sp}$ | [mm] | $2h_{ef}$ | | | | $2,2\ h_{ef}$ | $1,5\ h_{ef}$ | $2,5\ h_{ef}$ |
| Splitting for **minimum thickness of concrete member** | | | | | | | | | |
| Minimum thickness of concrete | $h_{min,2} \geq$ | [mm] | 80 | 100 | 120 | 140 | -[1)] | -[1)] | -[1)] |
| Characteristic resistance in uncracked concrete C20/25 | $N^0_{Rk,sp}$ | [kN] | 12 | 16 | 25 | 35 | | | |
| Edge distance | $c_{cr,sp}$ | [mm] | $2,5h_{ef}$ | | | | | | |
| Increasing factor $N_{Rk,p} = \Psi_c \cdot N_{Rk,p}$ (C20/25) $N^0_{Rk,sp} = \Psi_c \cdot N^0_{Rk,sp}$ (C20/25) | $\Psi_c$ | [-] | $\left(\frac{f_{ck}}{20}\right)^{0,5}$ | | | | | | |
| **Concrete cone failure** | | | | | | | | | |
| Effective anchorage depth | $h_{ef}$ | [mm] | 46 | 60 | 70 | 85 | 100 | 115 | 125 |
| Factor for uncracked concrete | $k_{ucr,N}$ | [-] | 11,0 | | | | | | |

1) No performance assessed

2) In absence of other national regulations

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**Table C18:** Characteristic values for **tension loads**, **W-FAZ PRO-L/R3** and **W-FAZ PRO-L/R5, uncracked concrete,** static and quasi-static action

| **Fastener size** | | | **M8** | **M10** | **M12** | **M16** | **M20** | **M24** |
|---|---|---|---|---|---|---|---|---|
| Installation factor | $\gamma_{inst}$ | [-] | 1,0 | | | | | |
| **Steel failure** | | | | | | | | |
| Characteristic resistance | $N_{Rk,s}$ | [kN] | 16 | 27 | 40 | 64 | 108 | 110 |
| Partial factor[2)] | $\gamma_{Ms}$ | [-] | 1,5 | | | | 1,68 | 1,5 |
| **Pull-out** | | | | | | | | |
| Characteristic resistance in uncracked concrete C20/25 | $N_{Rk,p}$ | [kN] | 12 | 16 | 25 | 35 | 51 | 71,3 |
| **Splitting** | | | | | | | | |
| Splitting for **standard thickness of concrete member** (The higher resistance of case 1 and case 2 may be applied; $c_{cr,sp}$ may be linearly interpolated for the member thickness $h_{min,2} < h < h_{min,1}$ (Case 2); $\psi_{h,sp}$= 1,0) | | | | | | | | |
| Standard thickness of concrete | $h_{min,1} \geq$ | [mm] | 100 | 120 | 140 | 160 | 200 | 250 |
| **Case 1** | | | | | | | | |
| Characteristic resistance in uncracked concrete C20/25 | $N^0_{Rk,sp}$ | [kN] | 9 | 12 | 20 | 30 | 40 | -[1)] |
| Edge distance | $c_{cr,sp}$ | [mm] | 1,5 $h_{ef}$ | | | | | -[1)] |
| **Case 2** | | | | | | | | |
| Characteristic resistance in uncracked concrete C20/25 | $N^0_{Rk,sp}$ | [kN] | 12 | 16 | 25 | 35 | 50,5 | 70,6 |
| Edge distance | $c_{cr,sp}$ | [mm] | 115 | 125 | 140 | 200 | 220 | 250 |
| Splitting for **minimum thickness of concrete member** | | | | | | | | |
| Minimum thickness of concrete | $h_{min,2} \geq$ | [mm] | 80 | 100 | 120 | 140 | -[1)] | -[1)] |
| Characteristic resistance in uncracked concrete C20/25 | $N^0_{Rk,sp}$ | [kN] | 12 | 16 | 25 | 35 | | |
| Edge distance | $c_{cr,sp}$ | [mm] | 2,5$h_{ef}$ | | | | | |
| Increasing factor<br>$N_{Rk,p} = \Psi_c \cdot N_{Rk,p}$ (C20/25)<br>$N^0_{Rk,sp} = \Psi_c \cdot N^0_{Rk,sp}$ (C20/25) | $\Psi_c$ | [-] | $\left(\frac{f_{ck}}{20}\right)^{0,5}$ | | | | | |
| **Concrete cone failure** | | | | | | | | |
| Effective anchorage depth | $h_{ef}$ | [mm] | 46 | 60 | 70 | 85 | 100 | 125 |
| Factor for uncracked concrete | $k_{ucr,N}$ | [-] | 11,0 | | | | | |

1) No performance assessed

2) In absence of other national regulations

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**Table C19:** Characteristic values for **shear loads**, **W-FAZ PRO-L**, **cracked** and **uncracked concrete,** static or quasi static action

| **Fastener size** | | | | **M8** | **M10** | **M12** | **M16** | **M20** | **M24** | **M27** |
|---|---|---|---|---|---|---|---|---|---|---|
| Installation factor | | $\gamma_{inst}$ | [-] | 1,0 | | | | | | |
| **Steel failure without lever arm, Steel zinc plated** | | | | | | | | | | |
| Characteristic resistance | | $V^0_{Rk,s}$ | [kN] | 12,2 | 20,1 | 30 | 55 | 69 | 114 | 169,4 |
| Ductility factor | | $k_7$ | [-] | 1,0 | | | | | | |
| Partial factor[2)] | | $\gamma_{Ms}$ | [-] | 1,25 | | | | 1,33 | 1,25 | 1,25 |
| **Steel failure <u>without</u> lever arm, Stainless steel R3 / R5** | | | | | | | | | | |
| Characteristic resistance | | $V^0_{Rk,s}$ | [kN] | 13 | 20 | 30 | 55 | 86 | 123,6 | -[1)] |
| Ductility factor | | $k_7$ | [-] | 1,0 | | | | | | |
| Partial factor[2)] | | $\gamma_{Ms}$ | [-] | 1,25 | | | | 1,4 | 1,25 | |
| **Steel failure <u>with</u> lever arm, Steel zinc plated** | | | | | | | | | | |
| Characteristic bending resistance | | $M^0_{Rk,s}$ | [Nm] | 23 | 47 | 82 | 216 | 363 | 898 | 1331,5 |
| Partial factor[2)] | | $\gamma_{Ms}$ | [-] | 1,25 | | | | 1,33 | 1,25 | 1,25 |
| **Steel failure <u>with</u> lever arm, Stainless steel R3 / R5** | | | | | | | | | | |
| Characteristic bending resistance | | $M^0_{Rk,s}$ | [Nm] | 26 | 52 | 92 | 200 | 454 | 785,4 | -[1)] |
| Partial factor[2)] | | $\gamma_{Ms}$ | [-] | 1,25 | | | | 1,4 | 1,25 | |
| **Concrete pry-out failure** | | | | | | | | | | |
| Pry-out factor | | $k_8$ | [-] | 2,4 | | | | 2,8 | | |
| **Concrete edge failure** | | | | | | | | | | |
| Effective length of fastener in shear loading | Steel, galvanized | $l_f$ | [mm] | 46 | 60 | 70 | 85 | 100 | 115 | 125 |
| | Stainless steel R3 / R5 | $l_f$ | [mm] | 46 | 60 | 70 | 85 | 100 | 125 | -[1)] |
| Outside diameter of fastener | | $d_{nom}$ | [mm] | 8 | 10 | 12 | 16 | 20 | 24 | 27 |

[1)] No performance assessed
[2)] In absence of other national regulations

**Table C20:** Characteristic values **for tension and shear load** under **fire exposure**, **W-FAZ PRO-L**, cracked and uncracked concrete C20/25 to C50/60

| **Fastener size** | | | | **M8** | **M10** | **M12** | **M16** | **M20** | **M24** | **M27** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Tension load** | | | | | | | | | | |
| **Steel failure** | | | | | | | | | | |
| **Steel, zinc plated** | | | | | | | | | | |
| Characteristic resistance | R30 | $N_{Rk,s,fi}$ | [kN] | 1,5 | 2,6 | 4,1 | 7,7 | 9,4 | 13,6 | 17,6 |
| | R60 | | | 1,1 | 1,9 | 3,0 | 5,6 | 8,2 | 11,8 | 15,3 |
| | R90 | | | 0,8 | 1,4 | 2,4 | 4,4 | 6,9 | 10,0 | 13,0 |
| | R120 | | | 0,7 | 1,2 | 2,2 | 4,0 | 6,3 | 9,1 | 11,8 |
| **Stainless steel R3 / R5** | | | | | | | | | | |
| Characteristic resistance | R30 | $N_{Rk,s,fi}$ | [kN] | 3,8 | 6,9 | 12,7 | 23,7 | 33,5 | 48,2 | -[1] |
| | R60 | | | 2,9 | 5,3 | 9,4 | 17,6 | 25,0 | 35,9 | |
| | R90 | | | 2,0 | 3,6 | 6,1 | 11,5 | 16,4 | 23,6 | |
| | R120 | | | 1,6 | 2,8 | 4,5 | 8,4 | 12,1 | 17,4 | |
| **Shear load** | | | | | | | | | | |
| **Steel failure <u>without</u> lever arm** | | | | | | | | | | |
| **Steel, zinc plated** | | | | | | | | | | |
| Characteristic resistance | R30 | $V_{Rk,s,fi}$ | [kN] | 1,6 | 2,6 | 4,1 | 7,7 | 11 | 16 | 20,6 |
| | R60 | | | 1,5 | 2,5 | 3,6 | 6,8 | 11 | 15 | 19,8 |
| | R90 | | | 1,2 | 2,1 | 3,5 | 6,5 | 10 | 15 | 19,0 |
| | R120 | | | 1,0 | 2,0 | 3,4 | 6,4 | 10 | 14 | 18,6 |
| **Stainless steel R3 / R5** | | | | | | | | | | |
| Characteristic resistance | R30 | $V_{Rk,s,fi}$ | [kN] | 3,8 | 6,9 | 12,7 | 23,7 | 33,5 | 48,2 | -[1] |
| | R60 | | | 2,9 | 5,3 | 9,4 | 17,6 | 25,0 | 35,9 | |
| | R90 | | | 2,0 | 3,6 | 6,1 | 11,5 | 16,4 | 23,6 | |
| | R120 | | | 1,6 | 2,8 | 4,5 | 8,4 | 12,1 | 17,4 | |
| **Steel failure <u>with</u> lever arm** | | | | | | | | | | |
| **Steel, zinc plated** | | | | | | | | | | |
| Characteristic resistance | R30 | $M^0_{Rk,s,fi}$ | [Nm] | 1,7 | 3,3 | 6,4 | 16,3 | 29 | 50 | 75 |
| | R60 | | | 1,6 | 3,2 | 5,6 | 14 | 28 | 48 | 72 |
| | R90 | | | 1,2 | 2,7 | 5,4 | 14 | 27 | 47 | 69 |
| | R120 | | | 1,1 | 2,5 | 5,3 | 13 | 26 | 46 | 68 |
| **Stainless steel R3 / R5** | | | | | | | | | | |
| Characteristic resistance | R30 | $M^0_{Rk,s,fi}$ | [Nm] | 3,8 | 9,0 | 19,7 | 50,1 | 88,8 | 153,5 | -[1] |
| | R60 | | | 2,9 | 6,8 | 14,6 | 37,2 | 66,1 | 114,3 | |
| | R90 | | | 2,1 | 4,7 | 9,5 | 24,2 | 43,4 | 75,1 | |
| | R120 | | | 1,6 | 3,6 | 7,0 | 17,8 | 32,1 | 55,5 | |

[1] No performance assessed

## Table C21: Displacements under tension load, W-FAZ PRO-L

| **Fastener size** | | | **M8** | **M10** | **M12** | **M16** | **M20** | **M24** | **M27** |
|---|---|---|---|---|---|---|---|---|---|
| **Steel zinc plated** | | | | | | | | | |
| Tension load in cracked concrete | N | [kN] | 2,4 | 4,3 | 7,6 | 11,9 | 17,1 | 21,1 | 24 |
| Displacement | $\delta_{N0}$ | [mm] | 0,6 | 1,0 | 0,4 | 1,0 | 0,9 | 0,7 | 0,9 |
| | $\delta_{N\infty}$ | [mm] | 1,4 | 1,2 | 1,4 | 1,3 | 1,0 | 1,2 | 1,4 |
| Tension load in uncracked concrete | N | [kN] | 5,7 | 7,6 | 11,9 | 16,7 | 23,8 | 29,6 | 34 |
| Displacement | $\delta_{N0}$ | [mm] | 0,4 | 0,5 | 0,7 | 0,3 | 0,4 | 0,5 | 0,3 |
| | $\delta_{N\infty}$ | [mm] | 0,8 | | 1,4 | 0,8 | | | 1,4 |
| **Stainless steel R3 / R5** | | | | | | | | | |
| Tension load in cracked concrete | N | [kN] | 2,4 | 4,3 | 7,6 | 11,9 | 17,1 | 19,0 | -[1] |
| Displacement | $\delta_{N0}$ | [mm] | 0,7 | 1,8 | 0,4 | 0,7 | 0,9 | 0,5 | |
| | $\delta_{N\infty}$ | [mm] | 1,2 | 1,4 | 1,4 | 1,4 | 1,0 | 1,8 | |
| Tension load in uncracked concrete | N | [kN] | 5,8 | 7,6 | 11,9 | 16,7 | 23,8 | 33,5 | -[1] |
| Displacement | $\delta_{N0}$ | [mm] | 0,6 | 0,5 | 0,7 | 0,2 | 0,4 | 0,5 | |
| | $\delta_{N\infty}$ | [mm] | 1,2 | 1,0 | 1,4 | 0,4 | 0,8 | 1,1 | |

[1] No performance assessed.

## Table C22: Displacements under shear load, W-FAZ PRO-L

| **Fastener size** | | | **M8** | **M10** | **M12** | **M16** | **M20** | **M24** | **M27** |
|---|---|---|---|---|---|---|---|---|---|
| **Steel zinc plated** | | | | | | | | | |
| Shear load in cracked and uncracked concrete | V | [kN] | 6,9 | 11,4 | 17,1 | 31,4 | 36,8 | 64,9 | 96,8 |
| Displacement | $\delta_{V0}$ | [mm] | 2,0 | 3,2 | 3,6 | 3,5 | 1,8 | 3,5 | 3,6 |
| | $\delta_{V\infty}$ | [mm] | 3,0 | 4,7 | 5,5 | 5,3 | 2,7 | 5,3 | 5,4 |
| **Stainless steel R3 / R5** | | | | | | | | | |
| Shear load in cracked and uncracked concrete | V | [kN] | 7,3 | 11,4 | 17,1 | 31,4 | 43,8 | 70,6 | -[1] |
| Displacement | $\delta_{V0}$ | [mm] | 1,9 | 2,4 | 4,0 | 4,3 | 2,9 | 2,8 | |
| | $\delta_{V\infty}$ | [mm] | 2,9 | 3,6 | 5,9 | 6,4 | 4,3 | 4,2 | |

[1] No performance assessed.

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**Table C23:** Characteristic values for **tension loads**, **W-FAZ PRO-SH, cracked concrete,** static and quasi-static action

| **Fastener size** | | | **M8** | **M10** | **M12** | **M16** | **M20** | **M24** | **M27** |
|---|---|---|---|---|---|---|---|---|---|
| Installation factor | $\gamma_{inst}$ | [-] | 1,0 | | | | | | |
| **Steel failure** | | | | | | | | | |
| Characteristic resistance | $N_{Rk,s}$ | [kN] | 16 | 27 | 40 | 60 | 86 | 126 | 196 |
| Partial factor[3)] | $\gamma_{Ms}$ | [-] | 1,53 | | 1,5 | | 1,6 | 1,5 | |
| **Pull-out** | | | | | | | | | |
| **Standard anchorage depth** | | | | | | | | | |
| Characteristic resistance in cracked concrete C20/25 | $N_{Rk,p}$ | [kN] | 5 | 9 | 16 | 25 | 36 | 44,4 | 50,3 |
| **Reduced anchorage depth** | | | | | | | | | |
| Characteristic resistance in cracked concrete C20/25 | $N_{Rk,p}$ | [kN] | 5[4)] | 7,5[4)] | 12,7[4)] | 18,9[4)] | -[1)] | -[1)] | -[1)] |
| Increasing factor for $N_{Rk,p} = \Psi_c \cdot N_{Rk,p}$ (C20/25) | $\Psi_c$ | [-] | $\left(\frac{f_{ck}}{20}\right)^{0,5}$ | | | | | | |
| **Concrete cone failure** | | | | | | | | | |
| Effective anchorage depth | $h_{ef}$ | [mm] | 46 | 60 | 70 | 85 | 100 | 115 | 125 |
| Reduced anchorage depth | $h_{ef,red}$ | [mm] | 35 [2) 4)] | 40[4)] | 50[4)] | 65[4)] | -[1)] | -[1)] | -[1)] |
| Factor for cracked concrete | $k_{cr,N}$ | [-] | 7,7 | | | | | | |

1) No performance assessed.
2) Restricted to the use of statically indeterminate structural components, subject to dry internal exposure conditions only
3) In absence of other national regulations
4) Only for a fastener length L ≤ 200 mm

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**Table C24:** Characteristic values for **tension loads**, **W-FAZ PRO-SH, uncracked concrete,** static and quasi-static action

| **Fastener size** | | | **M8** | **M10** | **M12** | **M16** | **M20** | **M24** | **M27** |
|---|---|---|---|---|---|---|---|---|---|
| Installation factor | $\gamma_{inst}$ | [-] | 1,0 | | | | | | |
| **Steel failure** | | | | | | | | | |
| Characteristic resistance | $N_{Rk,s}$ | [kN] | 16 | 27 | 40 | 60 | 86 | 126 | 196 |
| Partial factor[3)] | $\gamma_{Ms}$ | [-] | 1,53 | | 1,5 | | 1,6 | 1,5 | |
| **Pull-out** | | | | | | | | | |
| **Standard anchorage depth** | | | | | | | | | |
| Characteristic resistance in uncracked concrete C20/25 | $N_{Rk,p}$ | [kN] | 12 | 16 | 25 | 35 | 51 | 62,9 | 71,3 |
| **Reduced anchorage depth** | | | | | | | | | |
| Characteristic resistance in uncracked concrete C20/25 | $N_{Rk,p}$ | [kN] | 7,5 | 9 | 18 | 26,7 | -[1)] | -[1)] | -[1)] |
| **Splitting** | | | | | | | | | |
| **Standard anchorage depth** | | | | | | | | | |
| Splitting for **standard thickness of concrete member** (The higher resistance of case 1 and case 2 may be applied; $c_{cr,sp}$ may be linearly interpolated for the member thickness $h_{min,2} < h < h_{min,1}$ (Case 2); $\psi_{h,sp}$= 1,0)) | | | | | | | | | |
| Standard thickness of concrete | $h_{min,1} \geq$ | [mm] | 100 | 120 | 140 | 170 | 200 | 230 | 250 |
| **Case 1** | | | | | | | | | |
| Characteristic resistance in uncracked concrete C20/25 | $N^0_{Rk,sp}$ | [kN] | 9 | 12 | 20 | 30 | 40 | 62,3 | 50 |
| Edge distance | $c_{cr,sp}$ | [mm] | 1,5 $h_{ef}$ | | | | | | |
| **Case 2** | | | | | | | | | |
| Characteristic resistance in uncracked concrete C20/25 | $N^0_{Rk,sp}$ | [kN] | 12 | 16 | 25 | 35 | 50,5 | 62,3 | 70,6 |
| Edge distance | $c_{cr,sp}$ | [mm] | $2h_{ef}$ | | | | 2,2 $h_{ef}$ | 1,5 $h_{ef}$ | 2,5 $h_{ef}$ |
| Splitting for **minimum thickness of concrete member** | | | | | | | | | |
| Minimum thickness of concrete | $h_{min,2} \geq$ | [mm] | 80 | 100 | 120 | 140 | -[1)] | -[1)] | -[1)] |
| Characteristic resistance in uncracked concrete C20/25 | $N^0_{Rk,sp}$ | [kN] | 12 | 16 | 25 | 35 | | | |
| Edge distance | $c_{cr,sp}$ | [mm] | $2,5h_{ef}$ | | | | | | |
| **Reduced anchorage depth** | | | | | | | | | |
| Minimum thickness of concrete | $h_{min,3} \geq$ | [mm] | 80 | 80 | 100 | 140 | -[1)] | -[1)] | -[1)] |
| Characteristic resistance in uncracked concrete C20/25 | $N^0_{Rk,sp}$ | [kN] | 7,5 | 9 | 17,9 | 26,5 | | | |
| Edge distance | $c_{cr,sp}$ | [mm] | 100 | 100 | 125 | 150 | | | |
| Increasing factor for $N_{Rk,p} = \Psi_c \cdot N_{Rk,p}$ (C20/25) $N^0_{Rk,sp} = \Psi_c \cdot N^0_{Rk,sp}$ (C20/25) | $\Psi_c$ | [-] | $\left(\frac{f_{ck}}{20}\right)^{0,5}$ | | | | | | |
| **Concrete cone failure** | | | | | | | | | |
| Effective anchorage depth | $h_{ef}$ | [mm] | 46 | 60 | 70 | 85 | 100 | 115 | 125 |
| Reduced anchorage depth | $h_{ef,red}$ | [mm] | 35 [2)] | 40 | 50 | 65 | -[1)] | -[1)] | -[1)] |
| Factor for uncracked concrete | $k_{ucr,N}$ | [-] | 11,0 | | | | | | |

1) No performance assessed.
2) Restricted to the use of statically indeterminate structural components, subject to dry internal exposure conditions only
3) In absence of other national regulations

**Würth Fixanchor W-FAZ PRO**

**Performance**
Characteristic values for tension loads, uncracked concrete, **W-FAZ PRO-SH**

**Annex C18**

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**Table C25:** Characteristic values for **shear loads**, **W-FAZ PRO-SH**, **cracked** and **uncracked concrete,** static or quasi static action

| **Fastener size** | | | | **M8** | **M10** | **M12** | **M16** | **M20** | **M24** | **M27** |
|---|---|---|---|---|---|---|---|---|---|---|
| Installation factor | | $\gamma_{inst}$ | [-] | 1,0 | | | | | | |
| **Steel failure <u>without</u> lever arm** | | | | | | | | | | |
| Characteristic resistance | | $V^0_{Rk,s}$ | [kN] | 12,2 | 20,1 | 30 | 55 | 69 | 114 | 169,4 |
| Ductility factor | | $k_7$ | [-] | 1,0 | | | | | | |
| Partial factor[3] | | $\gamma_{Ms}$ | [-] | 1,25 | | | | 1,33 | 1,25 | 1,25 |
| **Steel failure <u>with</u> lever arm** | | | | | | | | | | |
| Characteristic bending resistance | | $M^0_{Rk,s}$ | [Nm] | 23 | 47 | 82 | 216 | 363 | 898 | 1331,5 |
| Partial factor[3] | | $\gamma_{Ms}$ | [-] | 1,25 | | | | 1,33 | 1,25 | 1,25 |
| **Concrete pry-out failure** | | | | | | | | | | |
| Pry-out factor | | $k_8$ | [-] | 2,4 | | | | 2,8 | | |
| **Concrete edge failure** | | | | | | | | | | |
| Effective length of fastener in shear loading | with $\mathbf{h_{ef}}$ | $l_f$ | [mm] | 46 | 60 | 70 | 85 | 100 | 115 | 125 |
| | with $\mathbf{h_{ef,red}}$ | $l_{f,red}$ | [mm] | 35 [2] | 40 | 50 | 65 | -[1] | -[1] | -[1] |
| Outside diameter of fastener | | $d_{nom}$ | [mm] | 8 | 10 | 12 | 16 | 20 | 24 | 27 |

1) No performance assessed.
2) Restricted to the use of statically indeterminate structural components, subject to dry internal exposure conditions only.
3) In absence of other national regulations

**Table C26:** Characteristic resistance for **seismic loading**, **W-FAZ PRO-SH, standard anchorage depth** [1], performance category **C1** and **C2**

| **Fastener size** | | | **M8** | **M10** | **M12** | **M16** | **M20** |
|---|---|---|---|---|---|---|---|
| **Tension loads** | | | | | | | |
| Installation factor | $\gamma_{inst}$ | [-] | 1,0 | | | | |
| **Steel failure** | | | | | | | |
| Characteristic resistance **C1** | $N_{Rk,s,C1}$ | [kN] | 16 | 27 | 40 | 60 | 86 |
| Characteristic resistance **C2** | $N_{Rk,s,C2}$ | [kN] | 16 | 27 | 40 | 60 | 86 |
| Partial factor[2] | $\gamma_{Ms}$ | [-] | 1,53 | | 1,5 | | 1,6 |
| **Pull-out** | | | | | | | |
| Characteristic resistance **C1** | $N_{Rk,p,C1}$ | [kN] | 5 | 9 | 16 | 25 | 36 |
| Characteristic resistance **C2** | $N_{Rk,p,C2}$ | [kN] | 2,3 | 3,6 | 10,2 | 13,8 | 24,4 |
| **Shear loads** | | | | | | | |
| **Steel failure without lever arm** | | | | | | | |
| Characteristic resistance **C1** | $V_{Rk,s,C1}$ | [kN] | 9,3 | 20 | 27 | 44 | 69 |
| Characteristic resistance **C2** | $V_{Rk,s,C2}$ | [kN] | 6,7 | 14 | 16,2 | 35,7 | 55,2 |
| Partial factor[2] | $\gamma_{Ms}$ | [-] | 1,25 | | | | 1,33 |
| Factor for annular gap **without** filling of annular gap | $\alpha_{gap}$ | [-] | 0,5 | | | | |
| Factor for annular gap **with** filling of annular gap | $\alpha_{gap}$ | [-] | 1,0 | | | | |

[1] Only for fastener length L≤ 200 mm
[2] In absence of other national regulations

**Table C27:** Characteristic values for **tension** and **shear load** under **fire exposure**, **W-FAZ PRO-SH,** cracked and uncracked concrete C20/25 to C50/60

| **Fastener size** | | | | **M8** | **M10** | **M12** | **M16** | **M20** | **M24** | **M27** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Tension load** | | | | | | | | | | |
| **Steel failure** | | | | | | | | | | |
| **Standard anchorage depth** | | | | | | | | | | |
| Characteristic resistance | R30 | $N_{Rk,s,fi}$ | [kN] | 1,5 | 2,6 | 4,1 | 7,7 | 9,4 | 13,6 | 17,6 |
| | R60 | | | 1,1 | 1,9 | 3,0 | 5,6 | 8,2 | 11,8 | 15,3 |
| | R90 | | | 0,8 | 1,4 | 2,4 | 4,4 | 6,9 | 10,0 | 13,0 |
| | R120 | | | 0,7 | 1,2 | 2,2 | 4,0 | 6,3 | 9,1 | 11,8 |
| **Reduced anchorage depth** | | | | | | | | | | |
| Characteristic resistance | R30 | $N_{Rk,s,fi}$ | [kN] | 1,5 | 2,6 | 4,1 | 7,7 | -[1] | -[1] | -[1] |
| | R60 | | | 1,1 | 1,9 | 3,0 | 5,6 | | | |
| | R90 | | | 0,8 | 1,3 | 1,9 | 3,5 | | | |
| | R120 | | | 0,6 | 1,0 | 1,3 | 2,5 | | | |
| **Shear load** | | | | | | | | | | |
| **Steel failure <u>without</u> lever arm** | | | | | | | | | | |
| **Standard anchorage depth** | | | | | | | | | | |
| Characteristic resistance | R30 | $V_{Rk,s,fi}$ | [kN] | 1,6 | 2,6 | 4,1 | 7,7 | 11 | 16 | 20,6 |
| | R60 | | | 1,5 | 2,5 | 3,6 | 6,8 | 11 | 15 | 19,8 |
| | R90 | | | 1,2 | 2,1 | 3,5 | 6,5 | 10 | 15 | 19,0 |
| | R120 | | | 1,0 | 2,0 | 3,4 | 6,4 | 10 | 14 | 18,6 |
| **Reduced anchorage depth** | | | | | | | | | | |
| Characteristic resistance | R30 | $V_{Rk,s,fi}$ | [kN] | 1,5 | 2,6 | 4,1 | 7,7 | -[1] | -[1] | -[1] |
| | R60 | | | 1,1 | 1,9 | 3,0 | 5,6 | | | |
| | R90 | | | 0,8 | 1,3 | 1,9 | 3,5 | | | |
| | R120 | | | 0,6 | 1,0 | 1,3 | 2,5 | | | |
| **Steel failure <u>with</u> lever arm** | | | | | | | | | | |
| **Standard anchorage depth** | | | | | | | | | | |
| Characteristic resistance | R30 | $M^0_{Rk,s,fi}$ | [Nm] | 1,7 | 3,3 | 6,4 | 16,3 | 29 | 50 | 75 |
| | R60 | | | 1,6 | 3,2 | 5,6 | 14 | 28 | 48 | 72 |
| | R90 | | | 1,2 | 2,7 | 5,4 | 14 | 27 | 47 | 69 |
| | R120 | | | 1,1 | 2,5 | 5,3 | 13 | 26 | 46 | 68 |
| **Reduced anchorage depth** | | | | | | | | | | |
| Characteristic resistance | R30 | $M^0_{Rk,s,fi}$ | [Nm] | 1,5 | 3,3 | 6,4 | 16,3 | -[1] | -[1] | -[1] |
| | R60 | | | 1,2 | 2,5 | 4,7 | 11,9 | | | |
| | R90 | | | 0,8 | 1,7 | 3,0 | 7,5 | | | |
| | R120 | | | 0,6 | 1,2 | 2,1 | 5,3 | | | |

[1] No performance assessed

## Table C28: Displacements W-FAZ PRO-SH

| **Fastener size** | | | **M8** | **M10** | **M12** | **M16** | **M20** | **M24** | **M27** |
|---|---|---|---|---|---|---|---|---|---|
| **Tension load** | | | | | | | | | |
| **Standard anchorage depth** | | | | | | | | | |
| Tension load in cracked concrete | N | [kN] | 2,4 | 4,3 | 7,6 | 11,9 | 17,1 | 21,1 | 24 |
| Displacement | $\delta_{N0}$ | [mm] | 0,6 | 1,0 | 0,4 | 1,0 | 0,9 | 0,7 | 0,9 |
| | $\delta_{N\infty}$ | [mm] | 1,4 | 1,2 | 1,4 | 1,3 | 1,0 | 1,2 | 1,4 |
| Tension load in uncracked concrete | N | [kN] | 5,7 | 7,6 | 11,9 | 16,7 | 23,8 | 29,6 | 34 |
| Displacement | $\delta_{N0}$ | [mm] | 0,4 | 0,5 | 0,7 | 0,3 | 0,4 | 0,5 | 0,3 |
| | $\delta_{N\infty}$ | [mm] | 0,8 | | 1,4 | 0,8 | | | 1,4 |
| Displacements under seismic tension loads **C2** | | | | | | | | | |
| Displacements for DLS | $\delta_{N,C2(0,5)}$ | [mm] | 2,3 | 4,1 | 4,9 | 3,6 | 5,1 | -[1] | -[1] |
| Displacements for ULS | $\delta_{N,C2(0,8)}$ | [mm] | 8,2 | 13,8 | 15,7 | 9,5 | 15,2 | | |
| **Reduced anchorage depth** | | | | | | | | | |
| Tension load in cracked concrete | N | [kN] | 2,4 | 3,6 | 6,1 | 9,0 | -[1] | -[1] | -[1] |
| Displacement | $\delta_{N0}$ | [mm] | 0,8 | 0,7 | 0,5 | 1,0 | | | |
| | $\delta_{N\infty}$ | [mm] | 1,2 | 1,0 | 0,8 | 1,1 | | | |
| Tension load in uncracked concrete | N | [kN] | 3,7 | 4,3 | 8,5 | 12,6 | -[1] | -[1] | -[1] |
| Displacement | $\delta_{N0}$ | [mm] | 0,1 | 0,2 | 0,2 | 0,2 | | | |
| | $\delta_{N\infty}$ | [mm] | 0,7 | 0,7 | 0,7 | 0,7 | | | |
| **Shear load** | | | | | | | | | |
| **Standard anchorage depth** | | | | | | | | | |
| Shear load in cracked and uncracked concrete | V | [kN] | 6,9 | 11,4 | 17,1 | 31,4 | 36,8 | 64,9 | 96,8 |
| Displacement | $\delta_{V0}$ | [mm] | 2,0 | 3,2 | 3,6 | 3,5 | 1,8 | 3,5 | 3,6 |
| | $\delta_{V\infty}$ | [mm] | 3,0 | 4,7 | 5,5 | 5,3 | 2,7 | 5,3 | 5,4 |
| Displacements under seismic shear loads **C2** | | | | | | | | | |
| Displacements for DLS | $\delta_{V,C2(0,5)}$ | [mm] | 3,0 | 2,7 | 3,5 | 4,3 | 4,7 | -[1] | -[1] |
| Displacements for ULS | $\delta_{V,C2(0,8)}$ | [mm] | 5,9 | 5,3 | 9,5 | 9,6 | 10,1 | | |
| **Reduced anchorage depth** | | | | | | | | | |
| Shear load in cracked and uncracked concrete | V | [kN] | 6,9 | 11,4 | 17,1 | 31,4 | -[1] | -[1] | -[1] |
| Displacement | $\delta_{V0}$ | [mm] | 2,0 | 3,2 | 3,6 | 3,5 | | | |
| | $\delta_{V\infty}$ | [mm] | 3,0 | 4,7 | 5,5 | 5,3 | | | |

[1] No performance assessed

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**Table C29:** Characteristic values for **tension loads**, **W-FAZ PRO-IG**, **cracked concrete,** static and quasi-static action

| **Fastener size** | | | M6 | M8 | M10 | M12 |
|---|---|---|---|---|---|---|
| Installation factor | $\gamma_{inst}$ | [-] | 1,2 | | | |
| **Steel failure** | | | | | | |
| Characteristic resistance, **steel zinc plated** | $N_{Rk,s}$ | [kN] | 16,1 | 22,6 | 26,0 | 56,6 |
| Partial factor[1)] | $\gamma_{Ms}$ | [-] | 1,5 | | | |
| Characteristic resistance, **stainless steel R3 / R5** | $N_{Rk,s}$ | [kN] | 14,1 | 25,6 | 35,8 | 59,0 |
| Partial factor[1)] | $\gamma_{Ms}$ | [-] | 1,87 | | | |
| **Pull-out failure** | | | | | | |
| Characteristic resistance in cracked concrete C20/25 | $N_{Rk,p}$ | [kN] | 5 | 9 | 12 | 20 |
| Increasing factor for $N_{Rk,p} = \Psi_c \cdot N_{Rk,p}$ (C20/25) | $\Psi_c$ | [-] | $\left(\frac{f_{ck}}{20}\right)^{0,5}$ | | | |
| **Concrete cone failure** | | | | | | |
| Effective anchorage depth | $h_{ef}$ | [mm] | 45 | 58 | 65 | 80 |
| Factor for cracked concrete | $k_{cr,N}$ | [-] | 7,7 | | | |

1) In absence of other national regulations

**Table C30:** Characteristic values for **tension loads**, **W-FAZ PRO-IG**, **uncracked concrete,** static and quasi-static action

| **Fastener size** | | | M6 | M8 | M10 | M12 |
|---|---|---|---|---|---|---|
| Installation factor | $\gamma_{inst}$ | [-] | 1,2 | | | |
| **Steel failure** | | | | | | |
| Characteristic resistance, **W-FAZ PRO-IG/S** | $N_{Rk,s}$ | [kN] | 16,1 | 22,6 | 26,0 | 56,6 |
| Partial factor[1)] | $\gamma_{Ms}$ | [-] | 1,5 | | | |
| Characteristic resistance, **W-FAZ PRO-IG/R3** **W-FAZ PRO-IG/R5** | $N_{Rk,s}$ | [kN] | 14,1 | 25,6 | 35,8 | 59,0 |
| Partial factor[1)] | $\gamma_{Ms}$ | [-] | 1,87 | | | |
| **Pull-out** | | | | | | |
| Characteristic resistance in uncracked concrete C20/25 | $N_{Rk,p}$ | [kN] | 12 | 16 | 20 | 30 |
| **Splitting** (the higher resistance of Case 1 and Case 2 may be applied) | | | | | | |
| Minimum thickness of concrete member | $h_{min}$ | [mm] | 100 | 120 | 130 | 160 |
| **Case 1** | | | | | | |
| Characteristic resistance in uncracked concrete C20/25 | $N^0_{Rk,sp}$ | [kN] | 9 | 12 | 16 | 25 |
| Edge distance | $c_{cr,sp}$ | [mm] | 1,5 $h_{ef}$ | | | |
| **Case 2** | | | | | | |
| Characteristic resistance in uncracked concrete C20/25 | $N^0_{Rk,sp}$ | [kN] | 12 | 16 | 20 | 30 |
| Edge distance | $c_{cr,sp}$ | [mm] | 2,5 $h_{ef}$ | | | |
| Increasing factor for $N_{Rk,p} = \Psi_c \cdot N_{Rk,p}$ (C20/25) $N^0_{Rk,sp} = \Psi_c \cdot N^0_{Rk,sp}$ (C20/25) | $\Psi_c$ | [-] | $\left(\frac{f_{ck}}{20}\right)^{0,5}$ | | | |
| **Concrete cone failure** | | | | | | |
| Effective anchorage depth | $h_{ef}$ | [mm] | 45 | 58 | 65 | 80 |
| Factor for uncracked concrete | $k_{ucr,N}$ | [-] | 11,0 | | | |

1) In absence of other national regulations

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**Table C31:** Characteristic values for **shear loads**, **W-FAZ PRO-IG cracked and uncracked concrete,** static and quasi-static action

| **Fastener size** | | | **M6** | **M8** | **M10** | **M12** |
|---|---|---|---|---|---|---|
| Installation factor | $\gamma_{inst}$ | [-] | 1,0 | | | |
| **Steel zinc plated** | | | | | | |
| **Steel failure <u>without</u> lever arm, pre-setting installation** | | | | | | |
| Characteristic resistance | $V^0_{Rk,s}$ | [kN] | 5,8 | 6,9 | 10,4 | 25,8 |
| **Steel failure <u>without</u> lever arm, through-setting installation** | | | | | | |
| Characteristic resistance | $V^0_{Rk,s}$ | [kN] | 5,1 | 7,6 | 10,8 | 24,3 |
| **Steel failure <u>with</u> lever arm, pre-setting installation** | | | | | | |
| Characteristic bending resistance | $M^0_{Rk,s}$ | [Nm] | 12,2 | 30,0 | 59,8 | 104,6 |
| **Steel failure <u>with</u> lever arm, through-setting installation** | | | | | | |
| Characteristic bending resistance | $M^0_{Rk,s}$ | [Nm] | 36,0 | 53,2 | 76,0 | 207 |
| Partial factor[1] for $V_{Rk,s}$ and $M^0_{Rk,s}$ | $\gamma_{Ms}$ | [-] | 1,25 | | | |
| Ductility factor | $k_7$ | [-] | 1,0 | | | |
| **Stainless steel R3 / R5** | | | | | | |
| **Steel failure <u>without</u> lever arm, pre-setting installation** | | | | | | |
| Characteristic resistance | $V^0_{Rk,s}$ | [kN] | 5,7 | 9,2 | 10,6 | 23,6 |
| Partial factor[1] | $\gamma_{Ms}$ | [-] | 1,25 | | | |
| **Steel failure <u>without</u> lever arm, through-setting installation** | | | | | | |
| Characteristic resistance | $V^0_{Rk,s}$ | [kN] | 7,3 | 7,6 | 9,7 | 29,6 |
| Partial factor[1] | $\gamma_{Ms}$ | [-] | 1,25 | | | |
| **Steel failure <u>with</u> lever arm, pre-setting installation** | | | | | | |
| Characteristic bending resistance | $M^0_{Rk,s}$ | [Nm] | 10,7 | 26,2 | 52,3 | 91,6 |
| Partial factor[1] | $\gamma_{Ms}$ | [-] | 1,56 | | | |
| **Steel failure <u>with</u> lever arm, through-setting installation** | | | | | | |
| Characteristic bending resistance | $M^0_{Rk,s}$ | [Nm] | 28,2 | 44,3 | 69,9 | 191,2 |
| Partial factor[1] | $\gamma_{Ms}$ | [-] | 1,25 | | | |
| Ductility factor | $k_7$ | [-] | 1,0 | | | |
| **Concrete pry-out failure** | | | | | | |
| Pry-out factor | $k_8$ | [-] | 1,5 | 1,5 | 2,0 | 2,0 |
| **Concrete edge failure** | | | | | | |
| Effective length of fastener in shear loading | $l_f$ | [mm] | 45 | 58 | 65 | 80 |
| Effective diameter of fastener | $d_{nom}$ | [mm] | 8 | 10 | 12 | 16 |

[1] In absence of other national regulations

**Würth Fixanchor W-FAZ PRO**

**Performance**
Characteristic values for shear loads, **W-FAZ PRO-IG**

**Annex C25**

**Table C32:** Characteristic values for **tension** and **shear load** under **fire exposure, W-FAZ PRO-IG,** cracked and uncracked concrete C20/25 to C50/60

| **Fastener size** | | | | **M6** | **M8** | **M10** | **M12** |
|---|---|---|---|---|---|---|---|
| **Tension load** | | | | | | | |
| **Steel failure** | | | | | | | |
| **Steel zinc plated** | | | | | | | |
| Characteristic resistance | R30 | $N_{Rk,s,fi}$ | [kN] | 0,7 | 1,4 | 2,5 | 3,7 |
| | R60 | | | 0,6 | 1,2 | 2,0 | 2,9 |
| | R90 | | | 0,5 | 0,9 | 1,5 | 2,2 |
| | R120 | | | 0,4 | 0,8 | 1,3 | 1,8 |
| **Stainless steel R3 / R5** | | | | | | | |
| Characteristic resistance | R30 | $N_{Rk,s,fi}$ | [kN] | 2,9 | 5,4 | 8,7 | 12,6 |
| | R60 | | | 1,9 | 3,8 | 6,3 | 9,2 |
| | R90 | | | 1,0 | 2,1 | 3,9 | 5,7 |
| | R120 | | | 0,5 | 1,3 | 2,7 | 4,0 |
| **Shear load** | | | | | | | |
| **Steel failure without lever arm** | | | | | | | |
| **Steel zinc plated** | | | | | | | |
| Characteristic resistance | R30 | $V_{Rk,s,fi}$ | [kN] | 0,7 | 1,4 | 2,5 | 3,7 |
| | R60 | | | 0,6 | 1,2 | 2,0 | 2,9 |
| | R90 | | | 0,5 | 0,9 | 1,5 | 2,2 |
| | R120 | | | 0,4 | 0,8 | 1,3 | 1,8 |
| **Stainless steel R3 / R5** | | | | | | | |
| Characteristic resistance | R30 | $V_{Rk,s,fi}$ | [kN] | 2,9 | 5,4 | 8,7 | 12,6 |
| | R60 | | | 1,9 | 3,8 | 6,3 | 9,2 |
| | R90 | | | 1,0 | 2,1 | 3,9 | 5,7 |
| | R120 | | | 0,5 | 1,3 | 2,7 | 4,0 |
| **Steel failure with lever arm** | | | | | | | |
| **Steel zinc plated** | | | | | | | |
| Characteristic resistance | R30 | $M^0_{Rk,s,fi}$ | [Nm] | 0,5 | 1,4 | 3,3 | 5,7 |
| | R60 | | | 0,4 | 1,2 | 2,6 | 4,6 |
| | R90 | | | 0,4 | 0,9 | 2,0 | 3,4 |
| | R120 | | | 0,3 | 0,8 | 1,6 | 2,8 |
| **Stainless steel R3 / R5** | | | | | | | |
| Characteristic resistance | R30 | $M^0_{Rk,s,fi}$ | [Nm] | 2,2 | 5,5 | 11,2 | 19,6 |
| | R60 | | | 1,5 | 3,9 | 8,1 | 14,3 |
| | R90 | | | 0,7 | 2,2 | 5,1 | 8,9 |
| | R120 | | | 0,4 | 1,3 | 3,5 | 6,2 |

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## Table C33: Displacements under tension load, W-FAZ PRO-IG

| **Fastener size** | | | **M6** | **M8** | **M10** | **M12** |
|---|---|---|---|---|---|---|
| Tension load in cracked concrete | N | [kN] | 2,0 | 3,6 | 4,8 | 8,0 |
| Displacements | $\delta_{N0}$ | [mm] | 0,6 | 0,6 | 0,8 | 1,0 |
| | $\delta_{N\infty}$ | [mm] | 0,8 | 0,8 | 1,2 | 1,4 |
| Tension load in uncracked concrete | N | [kN] | 4,8 | 6,4 | 8,0 | 12,0 |
| Displacements | $\delta_{N0}$ | [mm] | 0,4 | 0,5 | 0,7 | 0,8 |
| | $\delta_{N\infty}$ | [mm] | 0,8 | 0,8 | 1,2 | 1,4 |

## Table C34: Displacements under shear load, W-FAZ PRO-IG

| **Fastener size** | | | **M6** | **M8** | **M10** | **M12** |
|---|---|---|---|---|---|---|
| Shear load in cracked and uncracked concrete | V | [kN] | 4,2 | 5,3 | 6,2 | 16,9 |
| Displacements | $\delta_{V0}$ | [mm] | 2,8 | 2,9 | 2,5 | 3,6 |
| | $\delta_{V\infty}$ | [mm] | 4,2 | 4,4 | 3,8 | 5,3 |