

Bolt FBN

The heavyweight.

OVERVIEW



Bolt FBN II,
zinc-plated steel



Bolt FBN A4,
stainless steel A4



Bolt FBN-GS
(with large washer),
zinc-plated steel

Approved for:

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



European Technical Approval-
Option 7 for non-cracked concrete

Also suitable for:

- Concrete C12/15
- Natural stone with dense structure



Fire resistance
classification
R 120

Anchor types
see test report

For fixing of:

- Steel constructions
- Railings
- Consoles
- Ladders
- Cable trays
- Machines
- Staircases
- Gates
- Facades
- Window elements
- Wood constructions

DESCRIPTION

- Anchor bolt for push-through and pre-positioned installation.
- When the hexagon nut is tightened, the tapered bolt is pulled into the expansion clip and expands it against the drill hole wall.
- A4 stainless steel version for outdoor use and in damp conditions.
- GS version with large washer for wood constructions in accordance with DIN 440.

Advantages/benefits

- FBN II gvz offers maximum load-bearing capacity in non-cracked concrete – anchoring base can not bear higher loads – is totally utilised.
- Reduced anchorage depth reduces drill time – this saves time and reduces reinforcement hits during drilling.
- Long thread allows stand-off installations and variable usable lengths.
- 8 to 16 mm diameter also for reduced anchorage depths, e.g. for small loads or if reinforcement is hit.
- Embossed letter on the head for subsequent control of the installation as it indicates the setting depth.

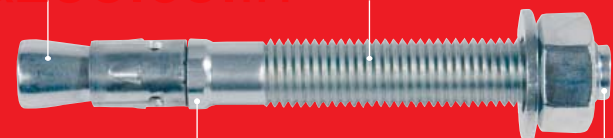


FBN II - ADVANTAGES AT A GLANCE



Twice as good. Every size of anchor can be installed to the standard anchorage depth or with a second reduced anchorage depth.

The long thread is suitable for stand-off installations and provides the best adjustment.



The identification feature of the new FBN II is the faceted collar.

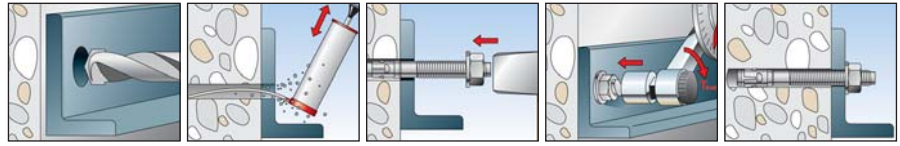
The drive-in pin avoids the damage of the thread. It is stamped to indicate the anchorage depth.

- High loads: The standard anchorage depth utilises the maximum performance of the anchor and the concrete.
- Optimum flexibility: The anchor allows a reduced anchorage depth. This is ideal when larger useable lengths are required or the drilling depth is limited (e.g. with existing reinforcement).
- European Technical Approval (Option 7) for non-cracked concrete. European Technical Approval (Option 7) for non-cracked concrete.
- Fire resistance class R 120.
- Ease of installation: The anchor is installed with only a few hammer blows. A small displacement of the anchor while tightening conveys a sense of reliability while setting the anchor.
- More possible applications: Smaller axial spacings and edge distances allow installation close to the edge and the fastening of smaller anchor plates.

INSTALLATION

Type of installation

- Pusch-trough and pre-positioned installation



Installation tips

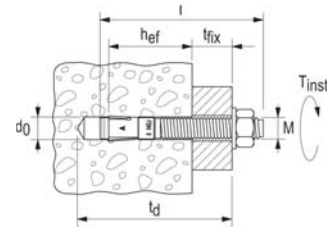
- For series installation we recommend the Anchor bolt setting tool FABS (see page 119) to reduce installation time.
- Before driving in, the hexagon nut should be brought into the optimal installation position (the bolt projects by 2 to 3 mm).

TECHNICAL DATA



Bolt FBN II, zinc-plated steel

| Type | Art.-No. | ID | approval | imprint on head | drill diameter | max. usable length | anchoring depth | min. drill-hole depth for through fixings | total length | thread | Washer (outer diameter x thickness) | Qty. per box |
|------------------------|----------|----|----------|-----------------|----------------|-----------------------------|-----------------|---|--------------|------------------------------------|-------------------------------------|--------------|
| | | | ETA | | d_0 | $h_{ef, stand}/h_{ef, red}$ | h_{ef} | t_d | l | $[\emptyset \times \text{length}]$ | $[\text{mm}]$ | pcs. |
| FBN 6/5 | 45130 | 4 | | - | 6 | 5/- | 20/- | 45 | 40 | M 6 x 16 | 12 x 1,6 | 100 |
| FBN 6/10 | 45136 | 6 | | - | 6 | 10/- | 20/- | 50 | 55 | M 6 x 30 | 12 x 1,6 | 100 |
| FBN 6/30 | 45137 | 3 | | - | 6 | 30/- | 20/- | 70 | 75 | M 6 x 30 | 12 x 1,6 | 100 |
| FBN II 8/5 (8x66) | 40662 | 5 | ■ | A | 8 | 5/15 | 40/30 | 61 | 66 | M 8 x 34 | 16 x 1,6 | 50 |
| FBN II 8/10 (8x71) | 40664 | 9 | ■ | B | 8 | 10/20 | 40/30 | 66 | 71 | M 8 x 39 | 16 x 1,6 | 50 |
| FBN II 8/20 (8x81) | 40669 | 4 | ■ | D | 8 | 20/30 | 40/30 | 76 | 81 | M 8 x 49 | 16 x 1,6 | 50 |
| FBN II 8/30 (8x91) | 40700 | 4 | ■ | F | 8 | 30/40 | 40/30 | 86 | 91 | M 8 x 59 | 16 x 1,6 | 50 |
| FBN II 8/50 (8x111) | 40771 | 4 | ■ | K | 8 | 50/60 | 40/30 | 106 | 111 | M 8 x 79 | 16 x 1,6 | 50 |
| FBN II 8/70 (8x131) | 40777 | 6 | ■ | M | 8 | 70/80 | 40/30 | 126 | 131 | M 8 x 99 | 16 x 1,6 | 20 |
| FBN II 8/100 (8x161) | 40783 | 7 | ■ | P | 8 | 100/110 | 40/30 | 156 | 161 | M 8 x 100 | 16 x 1,6 | 20 |
| FBN II 10/10 (10x86) | 40827 | 8 | ■ | B | 10 | 10/20 | 50/40 | 78 | 86 | M 10 x 46 | 20 x 2 | 50 |
| FBN II 10/20 (10x96) | 40851 | 3 | ■ | D | 10 | 20/30 | 50/40 | 88 | 96 | M 10 x 56 | 20 x 2 | 50 |
| FBN II 10/30 (10x106) | 40854 | 4 | ■ | F | 10 | 30/40 | 50/40 | 98 | 106 | M 10 x 66 | 20 x 2 | 50 |
| FBN II 10/50 (10x126) | 40855 | 1 | ■ | K | 10 | 50/60 | 50/40 | 118 | 126 | M 10 x 86 | 20 x 2 | 20 |
| FBN II 10/70 (10x146) | 40931 | 2 | ■ | M | 10 | 70/80 | 50/40 | 138 | 146 | M 10 x 100 | 20 x 2 | 20 |
| FBN II 10/140 (10x216) | 40944 | 2 | ■ | S | 10 | 140/150 | 50/40 | 208 | 216 | M 10 x 100 | 20 x 2 | 20 |
| FBN II 10/160 (10x236) | 40945 | 9 | ■ | T | 10 | 160/170 | 50/40 | 228 | 236 | M 10 x 100 | 20 x 2 | 20 |
| FBN II 12/10 (12x106) | 40950 | 3 | ■ | B | 12 | 10/25 | 65/50 | 95 | 106 | M 12 x 59 | 24 x 2,5 | 20 |
| FBN II 12/20 (12x116) | 44558 | 7 | ■ | D | 12 | 20/35 | 65/50 | 105 | 116 | M 12 x 69 | 24 x 2,5 | 20 |
| FBN II 12/30 (12x126) | 45263 | 9 | ■ | F | 12 | 30/45 | 65/50 | 115 | 126 | M 12 x 79 | 24 x 2,5 | 20 |
| FBN II 12/50 (12x146) | 45264 | 6 | ■ | K | 12 | 50/65 | 65/50 | 135 | 146 | M 12 x 99 | 24 x 2,5 | 20 |
| FBN II 12/80 (12x176) | 45265 | 3 | ■ | N | 12 | 80/95 | 65/50 | 165 | 176 | M 12 x 129 | 24 x 2,5 | 20 |
| FBN II 12/100 (12x196) | 45266 | 0 | ■ | P | 12 | 100/115 | 65/50 | 185 | 196 | M 12 x 149 | 24 x 2,5 | 20 |
| FBN II 12/120 (12x216) | 45267 | 7 | ■ | R | 12 | 120/135 | 65/50 | 205 | 216 | M 12 x 169 | 24 x 2,5 | 20 |
| FBN II 12/140 (12x236) | 45268 | 4 | ■ | S | 12 | 140/155 | 65/50 | 225 | 236 | M 12 x 189 | 24 x 2,5 | 20 |
| FBN II 12/160 (12x256) | 45269 | 1 | ■ | T | 12 | 160/175 | 65/50 | 245 | 256 | M 12 x 100 | 24 x 2,5 | 20 |
| FBN II 16/25 (16x145) | 45564 | 7 | ■ | E | 16 | 25/40 | 80/65 | 129 | 145 | M 16 x 89 | 30 x 3 | 10 |
| FBN II 16/50 (16x170) | 45565 | 4 | ■ | K | 16 | 50/65 | 80/65 | 154 | 170 | M 16 x 114 | 30 x 3 | 10 |
| FBN II 16/80 (16x200) | 45566 | 1 | ■ | N | 16 | 80/95 | 80/65 | 184 | 200 | M 16 x 144 | 30 x 3 | 10 |
| FBN II 16/100 (16x220) | 45567 | 8 | ■ | P | 16 | 100/115 | 80/65 | 204 | 220 | M 16 x 164 | 30 x 3 | 10 |
| FBN II 16/140 (16x260) | 45568 | 5 | ■ | S | 16 | 140/155 | 80/65 | 244 | 260 | M 16 x 100 | 30 x 3 | 10 |
| FBN II 16/160 (16x280) | 45569 | 2 | ■ | T | 16 | 160/175 | 80/65 | 264 | 280 | M 16 x 100 | 30 x 3 | 10 |
| FBN II 16/200 (16x320) | 45570 | 8 | ■ | V | 16 | 200/215 | 80/65 | 304 | 320 | M 16 x 100 | 30 x 3 | 10 |
| FBN II 20/30 (20x184) | 45573 | 9 | ■ | F | 20 | 30/55 | 105/80 | 165 | 184 | M 20 x 50 | 37 x 3 | 10 |
| FBN II 20/60 (20x214) | 45574 | 6 | ■ | L | 20 | 60/85 | 105/80 | 195 | 214 | M 20 x 90 | 37 x 3 | 10 |
| FBN II 20/80 (20x234) | 45575 | 3 | ■ | M | 20 | 80/105 | 105/80 | 215 | 234 | M 20 x 90 | 37 x 3 | 10 |
| FBN II 20/120 (20x274) | 45576 | 0 | ■ | R | 20 | 120/145 | 105/80 | 255 | 274 | M 20 x 90 | 37 x 3 | 10 |



FIRE PREVENTION

Red hot: You will find fire prevention information on page 31.

CORROSION

Rust prevention tips: Everything you need to know about corrosion and how to prevent it is on page 32.

Bolt FBN

TECHNICAL DATA

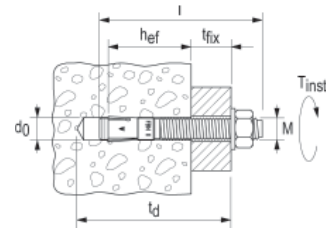


Bolt **FBN II**, zinc-plated steel



Bolt **FBN II-GS** (with large washer), zinc-plated steel

| Type | Art.-No. | ID | approval | imprint on head | drill diameter | max. usable length | anchoring depth | min. drill-hole depth for through fixings | total length | thread | Washer (outer diameter x thickness) | Qty. per box |
|---------------------------|----------|----|----------|-----------------|----------------|-----------------------------|-----------------------------|---|--------------|--|-------------------------------------|--------------|
| | | | ETA | | d_0 | $h_{ef, stand/h_{ef, red}}$ | $h_{ef, stand/h_{ef, red}}$ | t_d | l | $\{ \emptyset \times \text{length} \}$ | $\{ \text{mm} \}$ | pcs. |
| | | | | | [mm] | [mm] | [mm] | [mm] | [mm] | | [mm] | |
| FBN II 8/5 K (8x56) | 1) 40806 | 3 | ■ | -A- | 8 | -/5 | -/30 | 51 | 56 | M 8 x 24 | 16 x 1,6 | 50 |
| FBN II 8/10 K (8x61) | 1) 40807 | 0 | ■ | -B- | 8 | -/10 | -/30 | 56 | 61 | M 8 x 29 | 16 x 1,6 | 50 |
| FBN II 8/30 K (8x81) | 1) 40826 | 1 | ■ | -F- | 8 | -/30 | -/30 | 76 | 81 | M 8 x 49 | 16 x 1,6 | 50 |
| FBN II 10/5 K (10x71) | 1) 40946 | 6 | ■ | -A- | 10 | -/5 | -/40 | 63 | 71 | M 10 x 31 | 20 x 2 | 50 |
| FBN II 10/10 K (10x76) | 1) 40947 | 3 | ■ | -B- | 10 | -/10 | -/40 | 68 | 76 | M 10 x 36 | 20 x 2 | 50 |
| FBN II 10/30 K (10x96) | 1) 40948 | 0 | ■ | -F- | 10 | -/30 | -/40 | 88 | 96 | M 10 x 56 | 20 x 2 | 50 |
| FBN II 12/5 K (12x86) | 1) 45272 | 1 | ■ | -A- | 12 | -/5 | -/50 | 75 | 86 | M 12 x 39 | 24 x 2,5 | 20 |
| FBN II 12/10 K (12x91) | 1) 45273 | 8 | ■ | -B- | 12 | -/10 | -/50 | 80 | 91 | M 12 x 44 | 24 x 2,5 | 20 |
| FBN II 12/30 K (12x111) | 1) 45274 | 5 | ■ | -F- | 12 | -/30 | -/50 | 100 | 111 | M 12 x 64 | 24 x 2,5 | 20 |
| FBN II 16/15 K (16x120) | 1) 45571 | 5 | ■ | -C- | 16 | -/15 | -/65 | 104 | 120 | M 16 x 64 | 30 x 3 | 10 |
| FBN II 16/25 K (16x130) | 1) 45572 | 2 | ■ | -E- | 16 | -/25 | -/65 | 114 | 130 | M 16 x 74 | 30 x 3 | 10 |
| FBN II 20/10 K (20x139) | 1) 45577 | 7 | ■ | -B- | 20 | -/10 | -/80 | 120 | 139 | M 20 x 50 | 37 x 3 | 10 |
| FBN II 12/80 GS (12x176) | 2) 45578 | 4 | ■ | N | 12 | 80/95 | 65/50 | 165 | 176 | M 12 x 129 | 44 x 2,5 | 20 |
| FBN II 12/100 GS (12x196) | 2) 45579 | 1 | ■ | P | 12 | 100/115 | 65/50 | 185 | 196 | M 12 x 149 | 44 x 2,5 | 20 |
| FBN II 12/120 GS (12x216) | 2) 45580 | 7 | ■ | R | 12 | 120/135 | 65/50 | 205 | 216 | M 12 x 169 | 44 x 2,5 | 20 |
| FBN II 12/140 GS (12x236) | 2) 45581 | 4 | ■ | S | 12 | 140/155 | 65/50 | 225 | 236 | M 12 x 189 | 44 x 2,5 | 10 |
| FBN II 12/160 GS (12x256) | 2) 45583 | 8 | ■ | T | 12 | 160/175 | 65/50 | 245 | 256 | M 12 x 100 | 44 x 2,5 | 10 |
| FBN II 12/180 GS (12x276) | 2) 45584 | 5 | ■ | U | 12 | 180/195 | 65/50 | 265 | 276 | M 12 x 100 | 44 x 2,5 | 10 |
| FBN II 12/200 GS (12x296) | 2) 45585 | 2 | ■ | V | 12 | 200/215 | 65/50 | 285 | 296 | M 12 x 100 | 44 x 2,5 | 10 |
| FBN II 12/250 GS (12x346) | 2) 45586 | 9 | ■ | W | 12 | 250/265 | 65/50 | 335 | 346 | M 12 x 100 | 44 x 2,5 | 10 |
| FBN II 16/80 GS (16x200) | 2) 45587 | 6 | ■ | N | 16 | 80/95 | 80/65 | 184 | 200 | M 16 x 144 | 56 x 3 | 10 |
| FBN II 16/100 GS (16x220) | 2) 45588 | 3 | ■ | P | 16 | 100/115 | 80/65 | 204 | 220 | M 16 x 164 | 56 x 3 | 10 |
| FBN II 16/120 GS (16x240) | 2) 45589 | 0 | ■ | R | 16 | 120/135 | 80/65 | 224 | 240 | M 16 x 184 | 56 x 3 | 10 |
| FBN II 16/140 GS (16x160) | 2) 45590 | 6 | ■ | S | 16 | 140/155 | 80/65 | 244 | 260 | M 16 x 100 | 56 x 3 | 10 |
| FBN II 16/160 GS (16x280) | 2) 45591 | 3 | ■ | T | 16 | 160/175 | 80/65 | 264 | 280 | M 16 x 100 | 56 x 3 | 10 |
| FBN II 16/180 GS (16x300) | 2) 45592 | 0 | ■ | U | 16 | 180/195 | 80/65 | 284 | 300 | M 16 x 100 | 56 x 3 | 10 |
| FBN II 16/200 GS (16x320) | 2) 45593 | 7 | ■ | V | 16 | 200/215 | 80/65 | 304 | 320 | M 16 x 100 | 56 x 3 | 10 |
| FBN II 16/250 GS (16x370) | 2) 52192 | 2 | ■ | W | 16 | 250/265 | 80/65 | 354 | 370 | M 16 x 100 | 56 x 3 | 10 |
| FBN II 16/300 GS (16x420) | 2) 52204 | 2 | ■ | X | 16 | 300/315 | 80/65 | 404 | 420 | M 16 x 100 | 56 x 3 | 10 |



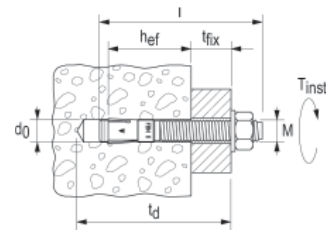
1) Bolt FBN II K (for reduced anchorage depth only)

2) GS = large washer



Bolt **FBN A4**, stainless steel A4

| Type | Art.-No. | ID | approval | imprint on head | drill | usable length | effect. anchoring depth | min. drill-hole depth for through fixings | total length | thread | Washer (outer diameter x thickness) | Qty. per box |
|---------------------|----------|----|----------|-----------------|-------|---------------|-------------------------|---|--------------|--|-------------------------------------|--------------|
| | | | ETA | | d_0 | d_a | h_{ef} | t_d | l | $\{ \emptyset \times \text{length} \}$ | $\{ \text{mm} \}$ | pcs. |
| | | | | | [mm] | [mm] | [mm] | [mm] | [mm] | | [mm] | |
| FBN 6/10 A4 | 69087 | 1 | ■ | - | 6 | 10 | 40 | 65 | 68 | M 6 x 25 | 12 x 1,6 | 100 |
| FBN 6/30 A4 | 69088 | 8 | ■ | - | 6 | 30 | 40 | 85 | 88 | M 6 x 30 | 12 x 1,6 | 100 |
| FBN 8/10 + 23 A4 | 1) 69089 | 5 | ■ | B | 8 | 10/23 | 48/35 | 73 | 76 | M 8 x 41 | 16 x 1,6 | 50 |
| FBN 8/30 + 43 A4 | 1) 69090 | 1 | ■ | F | 8 | 30/43 | 48/35 | 93 | 96 | M 8 x 59 | 16 x 1,6 | 50 |
| FBN 8/50 + 63 A4 | 1) 69091 | 8 | ■ | K | 8 | 50/63 | 48/35 | 113 | 116 | M 8 x 81 | 16 x 1,6 | 50 |
| FBN 10/15 + 23 A4 | 1) 69092 | 5 | ■ | C | 10 | 15/23 | 50/42 | 83 | 89 | M 10 x 51 | 20 x 2 | 50 |
| FBN 10/50 + 58 A4 | 1) 69093 | 2 | ■ | K | 10 | 50/58 | 50/42 | 118 | 125 | M 10 x 87 | 20 x 2 | 20 |
| FBN 10/100 + 108 A4 | 1) 69094 | 9 | ■ | P | 10 | 100/108 | 50/42 | 168 | 174 | M 10 x 134 | 20 x 2 | 20 |
| FBN 12/15 + 35 A4 | 1) 69095 | 6 | ■ | C | 12 | 15/35 | 70/50 | 105 | 113 | M 12 x 71 | 24 x 2,5 | 20 |
| FBN 12/45 + 65 A4 | 1) 69096 | 3 | ■ | I | 12 | 45/65 | 70/50 | 135 | 143 | M 12 x 103 | 24 x 2,5 | 20 |
| FBN 12/100 + 120 A4 | 1) 69097 | 0 | ■ | P | 12 | 100/120 | 70/50 | 190 | 202 | M 12 x 157 | 24 x 2,5 | 20 |
| FBN 16/10 A4 | 69098 | 7 | ■ | - | 16 | 10 | 64 | 98 | 109 | M 16 x 54 | 30 x 3 | 10 |
| FBN 16/25 + 45 A4 | 1) 69099 | 4 | ■ | E | 16 | 25/45 | 84/64 | 133 | 144 | M 16 x 89 | 30 x 3 | 10 |
| FBN 16/50 + 70 A4 | 1) 69100 | 7 | ■ | K | 16 | 50/70 | 84/64 | 158 | 169 | M 16 x 114 | 30 x 3 | 10 |



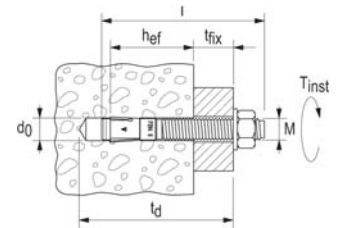
1) Different usable lengths for the corresponding dimensions are possible. The values for max. usable length and anchoring depth before (resp. after) the slash belong together.

TECHNICAL DATA



Bolt **FBN fvz**,
hot-dip galvanised steel

| Type | Art.-No. | ID | drill diameter | | effect. anchoring depth | min. drill-hole depth for through fixings | total length | thread | Washer (outer diameter x thickness) | Qty. per box |
|----------------|--------------|----|----------------|------------|-------------------------|---|--------------|------------|-------------------------------------|--------------|
| | | | d_0 [mm] | d_a [mm] | | | | | | |
| FBN 8/5 FVZ | 57525 | 3 | 8 | 5 | 35 | 55 | 58 | M 8 x 23 | 16 x 1,6 | 100 |
| FBN 8/10 FVZ | 57526 | 0 | 8 | 10 | 48 | 73 | 76 | M 8 x 41 | 16 x 1,6 | 50 |
| FBN 8/50 FVZ | 57527 | 7 | 8 | 50 | 48 | 113 | 116 | M 8 x 81 | 16 x 1,6 | 50 |
| FBN 8/100 FVZ | 57528 | 4 | 8 | 100 | 48 | 163 | 166 | M 8 x 130 | 16 x 1,6 | 25 |
| FBN 10/5 FVZ | 57529 | 1 | 10 | 5 | 42 | 65 | 69 | M 10 x 31 | 20 x 2 | 50 |
| FBN 10/15 FVZ | 57530 | 7 | 10 | 15 | 50 | 83 | 89 | M 10 x 51 | 20 x 2 | 50 |
| FBN 10/50 FVZ | 57531 | 4 | 10 | 50 | 50 | 118 | 124 | M 10 x 87 | 20 x 2 | 20 |
| FBN 10/100 FVZ | 57532 | 1 | 10 | 100 | 50 | 168 | 174 | M 10 x 134 | 20 x 2 | 20 |
| FBN 10/140 FVZ | 57533 | 8 | 10 | 140 | 50 | 208 | 214 | M 10 x 174 | 20 x 2 | 20 |
| FBN 12/5 FVZ | 57534 | 5 | 12 | 5 | 50 | 75 | 83 | M 12 x 41 | 24 x 2,5 | 20 |
| FBN 12/15 FVZ | 57535 | 2 | 12 | 15 | 70 | 105 | 113 | M 12 x 71 | 24 x 2,5 | 20 |
| FBN 12/30 FVZ | 57536 | 9 | 12 | 30 | 70 | 120 | 128 | M 12 x 86 | 24 x 2,5 | 20 |
| FBN 12/45 FVZ | 57537 | 6 | 12 | 45 | 70 | 135 | 143 | M 12 x 103 | 24 x 2,5 | 20 |
| FBN 12/100 FVZ | 57538 | 3 | 12 | 100 | 70 | 190 | 202 | M 12 x 137 | 24 x 2,5 | 20 |
| FBN 16/10 FVZ | 57539 | 0 | 16 | 10 | 64 | 98 | 109 | M 16 x 54 | 30 x 3 | 10 |
| FBN 16/25 FVZ | 57540 | 6 | 16 | 25 | 84 | 133 | 144 | M 16 x 89 | 30 x 3 | 10 |
| FBN 16/50 FVZ | 57541 | 3 | 16 | 50 | 84 | 158 | 169 | M 16 x 114 | 30 x 3 | 10 |
| FBN 16/100 FVZ | 57542 | 0 | 16 | 100 | 84 | 208 | 221 | M 16 x 166 | 30 x 3 | 10 |

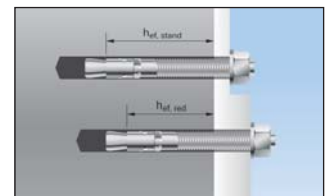


High performance
steel anchors

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EXAMPLE FBN II 12/30

- Highest Load: standard anchorage depth $h_{ef, stand} = 65$ mm.
Possible useable length up to 30 mm at a permissible tensile load of 12,6 kN.
- Reduced anchorage depth $h_{ef, red} = 50$ mm.
Longer useable fixing length up to 45 mm at a reduced tensile load of 8,5 kN.



Bolt FBN

LOADS

Mean ultimate loads, design resistant and recommended loads for single anchors of fischer Bolt FBN and FBN II with large axial spacing and edge distance

| | | | | Non-cracked concrete | | | | | | | | | | | |
|--|----------------------|-----------|--------|----------------------|--------------------|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| Anchor size | | | | M 6 | | M 8 | | M 10 | | M 12 | | M 16 | | M 20 | |
| Effective anchorage depth of FBN II | $h_{ef, FBN II}$ | [mm] | gvz | - | 30 ²⁾ | 40 | 40 | 50 | 50 | 65 | 65 | 80 | 80 | 105 | |
| Effective anchorage depth of FBN | $h_{ef, FBN}$ | [mm] | fvz/A4 | 40 | 35 ²⁾ | 48 | 42 | 50 | 50 | 70 | 64 | 84 | - | - | |
| Drill hole depth of FBN II | $h_{1, FBN II} \geq$ | [mm] | gvz | - | 46 ²⁾ | 56 | 58 | 68 | 70 | 85 | 89 | 104 | 110 | 135 | |
| Drill hole depth of FBN | $h_{1, FBN} \geq$ | [mm] | fvz/A4 | 55 | 50 | 63 | 60 | 68 | 70 | 90 | 88 | 108 | - | - | |
| Drill hole diameter | d_0 | [mm] | | 6 | 8 | 10 | 12 | 16 | 20 | | | | | | |
| Mean ultimate loads N_u and V_u [kN] | | | | | | | | | | | | | | | |
| Tensile | 0° | N_u | [kN] | gvz | - | 9.6 | 16.1 | 15.8 | 22.9 | 23.5 | 35.7 | 37.8 | 46.3 | 57.3 | 75.2 |
| | | | | fvz | - | 12.5 | 15.2* | 17.2 | 19.1 | 23.9 | 32.8 | 32.0 | 43.6 | - | - |
| | | | | A4 | 10.6* | 14.0 | 17.5* | 18.4 | 23.9 | 23.9 | 39.5 | 33.1 | 44.3 | - | - |
| Shear | 90° | V_u | [kN] | gvz | - | 11.0* | 17.0* | 17.0* | 21.0* | 21.0* | 40.0* | 40.0* | 67.0* | - | - |
| | | | | fvz | - | 11.3* | 17.0* | 17.0* | 27.6* | 27.6* | 44.6* | 44.6* | - | - | |
| | | | | A4 | 9.0* | 15.1* | 24.0* | 24.0* | 31.6* | 31.6* | 56.5* | 56.5* | - | - | |
| Design resistant loads N_{Rd} and V_{Rd} [kN] | | | | | | | | | | | | | | | |
| Tensile | 0° | N_{Rd} | [kN] | gvz | - | 4.0 ²⁾ | 8.5 | 8.5 | 11.9 | 11.9 | 17.6 | 17.6 | 24.0 | 24.0 | 36.2 |
| | | | | fvz | - | 4.7 ²⁾ | 6.7 | 7.3 | 9.3 | 10.0 | 15.3 | 14.0 | 17.8 | - | - |
| | | | | A4 | 5.0 | 4.5 ²⁾ | 6.7 | 7.2 | 9.1 | 11.9 | 16.7 | 14.1 | 20.4 | - | - |
| Shear | 90° | V_{Rd} | [kN] | gvz | - | 5.5 ²⁾ | 8.5 | 8.5 | 11.9 | 11.9 | 16.6 | 31.6 | 48.1 | 53.5 | |
| | | | | fvz | - | 7.0 ²⁾ | 7.3 | 9.1 | 11.3 | 11.9 | 18.0 | 31.7 | - | - | |
| | | | | A4 | 5.0 | 7.0 ²⁾ | 8.4 | 9.1 | 11.9 | 11.9 | 17.5 | 31.4 | - | - | |
| Recommended loads N_{rec} and V_{rec} [kN] | | | | | | | | | | | | | | | |
| Tensile | 0° | N_{rec} | [kN] | gvz | - | 2.9 ²⁾ | 6.1 | 6.1 | 8.5 | 8.5 | 12.6 | 12.6 | 17.2 | 17.2 | 25.8 |
| | | | | fvz | - | 3.3 ²⁾ | 4.8 | 5.2 | 6.7 | 7.1 | 11.0 | 10.0 | 12.7 | - | - |
| | | | | A4 | 3.6 | 3.2 ²⁾ | 4.8 | 5.1 | 6.5 | 8.5 | 11.9 | 10.0 | 14.6 | - | - |
| Shear | 90° | V_{rec} | [kN] | gvz | - | 3.9 ²⁾ | 6.1 | 6.1 | 8.5 | 8.5 | 11.8 | 22.6 | 34.3 | 38.2 | |
| | | | | fvz | - | 5.0 ²⁾ | 5.2 | 6.5 | 8.1 | 8.5 | 12.9 | 22.7 | - | - | |
| | | | | A4 | 3.6 | 5.0 ²⁾ | 6.0 | 6.5 | 8.5 | 8.5 | 12.5 | 22.4 | - | - | |
| Recommended bending moment M_{rec} [Nm] | | | | | | | | | | | | | | | |
| | M_{rec} | [Nm] | gvz | - | 11.0 ²⁾ | 12.9 | 25.2 | 25.6 | 44.9 | 44.9 | 114.3 | 114.3 | 199.4 | 241.1 | |
| | | | fvz | - | 10.5 | 10.5 | 12.4 | 12.4 | 40.5 | 40.5 | 99.8 | 99.8 | - | - | |
| | | | A4 | 5.2 | 12.4 | 12.4 | 24.8 | 24.8 | 39.0 | 39.0 | 95.2 | 95.2 | - | - | |
| Component dimensions, minimum spacings and edge distances | | | | | | | | | | | | | | | |
| Characteristic spacing | $s_{cr, N}$ | [mm] | | | | | | | | | | | | | |
| Characteristic edge spacing | $c_{cr, N}$ | [mm] | | | | | | | | | | | | | |
| Minimum spacing | s_{min} | [mm] | gvz | - | 40 ²⁾ | 40 | 50 | 50 | 70 | 70 | 90 | 90 | 120 | 120 | |
| | | [mm] | fvz | - | 35 ²⁾ | 50 | 45 | 55 | 100 | 75 | 140 | 90 | - | - | |
| | | [mm] | A4 | 40 | 50 ²⁾ | 50 | 50 | 60 | 65 | 80 | 90 | 90 | - | - | |
| Minimum edge distance ¹⁾ | c_{min} | [mm] | gvz | - | 40 ²⁾ | 40 | 80 | 50 | 100 | 70 | 120 | 90 | 120 | 120 | |
| | | [mm] | fvz | - | 35 ²⁾ | 50 | 55 | 65 | 100 | 90 | 100 | 105 | - | - | |
| | | [mm] | A4 | 35 | 45 ²⁾ | 35 | 60 | 55 | 70 | 75 | 80 | 80 | - | - | |
| Minimum structural component thickness of FBN II | $h_{min, FBN II}$ | [mm] | gvz | - | 100 ²⁾ | 100 | 100 | 100 | 100 | 120 | 120 | 160 | 160 | 200 | |
| Minimum structural component thickness of FBN | $h_{min, FBN}$ | [mm] | fvz/A4 | 100 | 100 | 100 | 100 | 100 | 100 | 140 | 130 | 170 | - | - | |
| Clearance-hole in fixture to be attached | $d_f \leq$ | [mm] | | 9 | 9 | 12 | 12 | 14 | 14 | 18 | 18 | 22 | 22 | 22 | |
| Required torque | T_{inst} | [Nm] | | 15 | 15 | 30 | 30 | 50 | 50 | 100 | 100 | 200 | 200 | 200 | |

* steel failure decisive

¹⁾ For minimum spacing and minimum edge distance the above described loads have to be reduced!

²⁾ Use restricted to anchoring of structural components which are statically indeterminate.

All load values apply for non-cracked concrete C20/25 without edge or spacing influences.

Design resistant loads: material safety factor γ_M is included. Material safety factor γ_M depends on type of anchor.

Recommended loads: material safety factor γ_M and safety factor for load $\gamma_L = 1.4$ are included.