



...eine starke Verbindung

YDEEVNEDEKLARATION
DoP Nr. MKT-111 - dk

1. Varetypens unikke identifikationskode: **MKT Bolzenanker BZ plus og BZ-IG**
2. Type-, parti- eller serienummer eller en anden form for angivelse, ved hjælp af hvilken byggevaren kan identificeres som krævet i henhold til artikel 11, stk. 4:

ETA-99/0010, Annex A3, A5
Batch nummer: se pakning

3. Byggevarens tilsigtede anvendelse eller anvendelser i overensstemmelse med den gældende harmoniserede tekniske specifikation som påtænkt af fabrikanten:

| | |
|-------------------------------------|--|
| Produkttype | Tilspændingsmoment kontrolleret ekspansionsanker (Bolt type (med indvendig gevind)) |
| For anvendelse i | Revnet og ikke revnet beton C20/25 - C50/60 (EN 206) |
| Option | 1 |
| Belastning | Statisk, kvasi-statisk, seismiske, Kategori C1+C2 (Størrelse BZ plus M10, M12, M16, M20) |
| Materiale | <u>Stål galvaniseret:</u> Kun i tørre indeområder Størrelse: BZ plus: M8, M10, M12, M16, M20, M24, M27 BZ-IG: M6, M8, M10, M12 <u>Rustfri Stål (stemplet A4):</u> Til inde- og udeområder uden særlige aggressive påvirkninger Størrelse: BZ plus: M8, M10, M12, M16, M20, M24 BZ-IG: M6, M8, M10, M12 <u>Højkorrosionsbestandig Stål (stemplet HCR):</u> Til inde- og udeområder med særlige aggressive påvirkninger Størrelse: BZ plus: M8, M10, M12, M16, M20, M24 BZ-IG: M6, M8, M10, M12 |
| Temperaturområde (eventuelt) | -- |

4. Fabrikantens navn, registrerede firmabetegnelse eller registrerede varemærke og kontaktadresse som krævet i henhold til artikel 11, stk. 5:

MKT Metall-Kunststoff-Technik GmbH & Co. KG
Auf dem Immel 2
D - 67685 Weilerbach

5. I givet fald navn og kontaktadresse på den bemyndigede repræsentant, hvis mandat omfatter opgaverne i artikel 12, stk. 2: --
6. Systemet eller systemerne til vurdering og kontrol af konstansen af byggevarens ydeevne, jf. bilag V:
System 1
7. Hvis ydeevnedeklarationen vedrører en byggevare, der er omfattet af en harmoniseret standard:
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8. Hvis ydeevnedeklarationen vedrører en byggevare, for hvilken der er udstedt en europæisk teknisk vurdering:

Deutsches Institut für Bautechnik, Berlin

og udstedte:

ETA-99/0010

på grundlag af

ETAG 001-2

Det notificerede produktcertificeringsorgan 1343-CPR udførte kontrollen efter system 1:

- i) bestemmelse af varetypen på grundlag af typeprøvning (herunder stikprøveudtagning), typeberegning, tabelværdier eller deskriptiv dokumentation for byggevaren
- ii) indledende inspektion af fabriksanlæg og fabrikkens egen produktionskontrol
- iii) kontinuerlig overvågning, vurdering og evaluering af fabrikkens egen produktionskontrol

og udstedte: Overensstemmelsesattest 1343-CPR-M 550-1

9. Deklareret ydeevne :

| Karakteristiske kendetegn | Beregningsmetode | Ydeevne | | Harmoniserede tekniske specifikationer |
|---|------------------------------------|-----------------------------|-------------------------------|--|
| | | BZ plus | BZ-IG | |
| Karakteristisk modstand ved trækbelastning | ETAG 001, Annex C CEN/TS 1992-4 | ETA-99/0010, Annex C1-C4 | ETA-99/0010, Annex C10-C11 | ETAG 001 |
| Karakteristisk modstand ved tværbelastning | ETAG 001, Annex C CEN/TS 1992-4 | ETA-99/0010, Annex C5 | ETA-99/0010, Annex C12 | |
| Karakteristisk modstand ved seismiske loading | TR 045 | ETA-99/0010, Annex C6 | NPD | |
| Skift i brug | ETAG 001, Annex C CEN/TS 1992-4 | ETA-99/0010, Annex C8-C9 | ETA-99/0010, Annex C14 | |
| Karakteristisk modstand under brandpåvirkninger | TR 020 CEN/TS 1992-4 | ETA-99/0010, Annex C7 | ETA-99/0010, Annex C13 | |

Hvis der er anvendt specifik teknisk dokumentation i medfør af artikel 37 eller 38, de krav varen opfylder:

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10. Ydeevnen for den byggevare, der er anført i punkt 1 og 2, er i overensstemmelse med den deklarerede ydeevne i punkt 9.

Denne ydeevnedeklaration udstedes på eneansvar af den fabrikant, der er anført i punkt 4.

Underskrevet for fabrikanten og på dennes vegne af:


Lore Weustenhagen
CEO
Weilerbach, 09.01.2015

i.V. 
Dipl.-Ing. Detlef Bigalke
Chef for Produktudvikling



Table C1: Characteristic values for tension loads, BZ plus zinc plated, cracked concrete, static and quasi-static action, design method A according to ETAG 001, Annex C or CEN/TS 1992-4

| Anchor size | | | M8 | M10 | M12 | M16 | M20 | M24 | M27 |
|---|----------------------------|------|---|-----|-----|-----|-----|-----|-----|
| Installation safety factor | $\gamma_2 = \gamma_{inst}$ | [-] | 1,0 | | | | | | |
| Steel failure | | | | | | | | | |
| Characteristic tension resistance | $N_{Rk,s}$ | [kN] | 16 | 27 | 40 | 60 | 86 | 126 | 196 |
| Partial safety factor | γ_{Ms} | [-] | 1,53 | | 1,5 | | 1,6 | 1,5 | |
| Pull-out | | | | | | | | | |
| Standard anchorage depth | | | | | | | | | |
| Characteristic resistance in concrete C20/25 | $N_{Rk,p}$ | [kN] | 5 | 9 | 16 | 25 | 1) | 1) | 1) |
| Reduced anchorage depth | | | | | | | | | |
| Characteristic resistance in concrete C20/25 | $N_{Rk,p,red}$ | [kN] | 5 | 7,5 | 1) | 1) | | | |
| Increasing factor for $N_{Rk,p}$ and $N_{Rk,p,red}$ | ψ_c | [-] | $\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$ | | | | | | |
| 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 | | | |
| Factor for cracked concrete | k_{cr} | [-] | 7,2 | | | | | | |

1) Pull-out is not decisive.

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

Wedge Anchor BZ plus

Performance

Characteristic values for **tension loads, BZ plus zinc plated cracked concrete**, static and quasi-static action, design method A according to ETAG 001, Annex C or CEN/TS 1992-4

Annex C1

Table C2: Characteristic values for **tension loads**, BZ plus **A4 / HCR**, **cracked concrete**, static and quasi-static action, design method A according to ETAG 001, Annex C or CEN/TS 1992-4

| Anchor size | | | M8 | M10 | M12 | M16 | M20 | M24 |
|---|----------------------------|------|---|-----|-----|-----|------|-----|
| Installation safety factor | $\gamma_2 = \gamma_{inst}$ | [-] | 1,0 | | | | | |
| Steel failure | | | | | | | | |
| Characteristic tension resistance | $N_{Rk,s}$ | [kN] | 16 | 27 | 40 | 64 | 108 | 110 |
| Partial safety factor | γ_{Ms} | [-] | 1,5 | | | | 1,68 | 1,5 |
| Pull-out | | | | | | | | |
| Standard anchorage depth | | | | | | | | |
| Characteristic resistance in concrete C20/25 | $N_{Rk,p}$ | [kN] | 5 | 9 | 16 | 25 | 1) | 40 |
| Reduced anchorage depth | | | | | | | | |
| Characteristic resistance in concrete C20/25 | $N_{Rk,p,red}$ | [kN] | 5 | 7,5 | 1) | 1) | | |
| Increasing factor for $N_{Rk,p}$ and $N_{Rk,p,red}$ | ψ_c | [-] | $\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$ | | | | | |
| Concrete cone failure | | | | | | | | |
| Effective anchorage depth | h_{ef} | [mm] | 46 | 60 | 70 | 85 | 100 | 125 |
| Reduced anchorage depth | $h_{ef,red}$ | [mm] | 35 ²⁾ | 40 | 50 | 65 | | |
| Factor for cracked concrete | k_{cr} | [-] | 7,2 | | | | | |

1) Pull-out is not decisive.

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

Wedge Anchor BZ plus

Performance

Characteristic values for **tension loads**, BZ plus **A4 / HCR**, **cracked concrete**, static and quasi-static action, design method A according to ETAG 001, Annex C or CEN/TS 1992-4

Annex C2

Table C3: Characteristic values for tension loads, BZ plus zinc plated, non-cracked concrete, static and quasi-static action, design method A according to ETAG 001, Annex C or CEN/TS 1992-4

| Anchor size | | | M8 | M10 | M12 | M16 | M20 | M24 | M27 |
|---|-----------------------------|------|---|-----|-----|-----|--------------|------------|------------|
| Installation safety factor | $\gamma_2 = \gamma_{inst}$ | [-] | 1,0 | | | | | | |
| Steel failure | | | | | | | | | |
| Characteristic tension resistance | $N_{Rk,s}$ | [kN] | 16 | 27 | 40 | 60 | 86 | 126 | 196 |
| Partial safety factor | γ_{Ms} | [-] | 1,53 | | 1,5 | | 1,6 | 1,5 | |
| Pull-out | | | | | | | | | |
| Standard anchorage depth | | | | | | | | | |
| Characteristic resistance in non-cracked concrete C20/25 | $N_{Rk,p}$ | [kN] | 12 | 16 | 25 | 35 | 1) | 1) | 1) |
| Reduced anchorage depth | | | | | | | | | |
| Characteristic resistance in non-cracked concrete C20/25 | $N_{Rk,p,red}$ | [kN] | 7,5 | 9 | 1) | 1) | | | |
| Splitting For the proof against splitting failure $N^0_{Rk,c}$ has to be replaced by $N^0_{Rk,sp}$ with consideration of the member thickness | | | | | | | | | |
| Standard anchorage depth | | | | | | | | | |
| Splitting for standard thickness of concrete member (The higher resistance of case 1 and case 2 may be applied; the values $s_{cr,sp}$ and $c_{cr,sp}$ may be linearly interpolated for the member thickness $h_{min} < h < h_{std}$ (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 non-cracked concrete C20/25 | $N^0_{Rk,sp}$ | [kN] | 9 | 12 | 20 | 30 | 40 | 1) | 50 |
| Spacing (edge distance) | $s_{cr,sp} (= 2 c_{cr,sp})$ | [mm] | 3 h_{ef} | | | | | | |
| Case 2 | | | | | | | | | |
| Characteristic resistance in non-cracked concrete C20/25 | $N^0_{Rk,sp}$ | [kN] | 12 | 16 | 25 | 35 | 1) | 1) | 1) |
| Spacing (edge distance) | $s_{cr,sp} (= 2 c_{cr,sp})$ | [mm] | 4 h_{ef} | | | | 4,4 h_{ef} | 3 h_{ef} | 5 h_{ef} |
| Splitting for minimum thickness of concrete member | | | | | | | | | |
| Minimum thickness of concrete | $h_{min,2} \geq$ | [mm] | 80 | 100 | 120 | 140 | | | |
| Characteristic resistance in non-cracked concrete C20/25 | $N^0_{Rk,sp}$ | [kN] | 12 | 16 | 25 | 35 | | | |
| Spacing (edge distance) | $s_{cr,sp} (= 2 c_{cr,sp})$ | [mm] | 5 h_{ef} | | | | | | |
| Reduced anchorage depth | | | | | | | | | |
| Minimum thickness of concrete | $h_{min,3} \geq$ | [mm] | 80 | 80 | 100 | 140 | | | |
| Characteristic resistance in non-cracked concrete C20/25 | $N^0_{Rk,sp}$ | [kN] | 7,5 | 9 | 1) | 1) | | | |
| Spacing (edge distance) | $s_{cr,sp} (= 2 c_{cr,sp})$ | [mm] | 200 | 200 | 250 | 300 | | | |
| Increasing factor for $N_{Rk,p(red)}$ and $N^0_{Rk,sp}$ | ψ_c | [-] | $\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$ | | | | | | |
| 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 | | | |
| Factor for non-cracked concrete | k_{Ucr} | [-] | 10,1 | | | | | | |

¹⁾ Pull-out is not decisive.

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

Wedge Anchor BZ plus

Performance

Characteristic values for **tension loads, BZ plus zinc plated, non-cracked concrete**, static and quasi-static action, design method A according to ETAG 001, Annex C or CEN/TS 1992-4

Annex C3

Table C4: Characteristic values for tension loads, BZ plus A4 / HCR, non-cracked concrete, static and quasi-static action, design method A according to ETAG 001, Annex C or CEN/TS 1992-4

| Anchor size | | | M8 | M10 | M12 | M16 | M20 | M24 |
|---|-----------------------------|------|---|-----|-----|-----|------|-----|
| Installation safety factor | $\gamma_2 = \gamma_{inst}$ | [-] | 1,0 | | | | | |
| Steel failure | | | | | | | | |
| Characteristic tension resistance | $N_{Rk,s}$ | [kN] | 16 | 27 | 40 | 64 | 108 | 110 |
| Partial safety factor | γ_{Ms} | [-] | 1,5 | | | | 1,68 | 1,5 |
| Pull-out | | | | | | | | |
| Standard anchorage depth | | | | | | | | |
| Characteristic resistance in non-cracked concrete C20/25 | $N_{Rk,p}$ | [kN] | 12 | 16 | 25 | 35 | 1) | 1) |
| Reduced anchorage depth | | | | | | | | |
| Characteristic resistance in non-cracked concrete C20/25 | $N_{Rk,p,red}$ | [kN] | 7,5 | 9 | 1) | 1) | / | / |
| Splitting For the proof against splitting failure $N^0_{Rk,c}$ has to be replaced by $N^0_{Rk,sp}$ with consideration of the member thickness | | | | | | | | |
| Standard anchorage depth | | | | | | | | |
| Splitting for standard thickness of concrete member (The higher resistance of case 1 and case 2 may be applied; the values $s_{cr,sp}$ and $c_{cr,sp}$ may be linearly interpolated for the member thickness $h_{min} < h < h_{std}$ (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 non-cracked concrete C20/25 | $N^0_{Rk,sp}$ | [kN] | 9 | 12 | 20 | 30 | 40 | / |
| Spacing (edge distance) | $s_{cr,sp} (= 2 c_{cr,sp})$ | [mm] | 3 h_{ef} | | | | | |
| Case 2 | | | | | | | | |
| Characteristic resistance in non-cracked concrete C20/25 | $N^0_{Rk,sp}$ | [kN] | 12 | 16 | 25 | 35 | 1) | 1) |
| Spacing (edge distance) | $s_{cr,sp} (= 2 c_{cr,sp})$ | [mm] | 230 | 250 | 280 | 400 | 440 | 500 |
| Splitting for minimum thickness of concrete member | | | | | | | | |
| Minimum thickness of concrete | $h_{min,2} \geq$ | [mm] | 80 | 100 | 120 | 140 | / | / |
| Characteristic resistance in non-cracked concrete C20/25 | $N^0_{Rk,sp}$ | [kN] | 12 | 16 | 25 | 35 | / | / |
| Spacing (edge distance) | $s_{cr,sp} (= 2 c_{cr,sp})$ | [mm] | 5 h_{ef} | | | | / | / |
| Reduced anchorage depth | | | | | | | | |
| Minimum thickness of concrete | $h_{min,3} \geq$ | [mm] | 80 | 80 | 100 | 140 | / | / |
| Characteristic resistance in non-cracked concrete C20/25 | $N^0_{Rk,sp}$ | [kN] | 7,5 | 9 | 1) | 1) | / | / |
| Spacing (edge distance) | $s_{cr,sp} (= 2 c_{cr,sp})$ | [mm] | 200 | 200 | 250 | 300 | / | / |
| Increasing factor for $N_{Rk,p(red)}$ and $N^0_{Rk,sp}$ | ψ_c | [-] | $\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$ | | | | | |
| Concrete cone failure | | | | | | | | |
| Effective anchorage depth | h_{ef} | [mm] | 46 | 60 | 70 | 85 | 100 | 125 |
| Reduced anchorage depth | $h_{ef,red}$ | [mm] | 35 ²⁾ | 40 | 50 | 65 | / | / |
| Factor for non-cracked concrete | k_{ucr} | [-] | 10,1 | | | | | |

¹⁾ Pull-out is not decisive.

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

Wedge Anchor BZ plus

Performance

Characteristic values for **tension loads, BZ plus A4 / HCR, non-cracked concrete**, static and quasi-static action, design method A according to ETAG 001, Annex C or CEN/TS 1992-4

Annex C4

Table C5: Characteristic values for **shear loads**, BZ plus, **cracked and non-cracked concrete**, static or quasi static action, design method A according to ETAG 001, Annex C or CEN/TS 1992-4

| Anchor size | | M8 | M10 | M12 | M16 | M20 | M24 | M27 | |
|---|--------------------------------|------------------|------|-----|------|-----|-------|--------|-----|
| Installation safety factor | $\gamma_2 = \gamma_{inst}$ [-] | 1,0 | | | | | | | |
| Steel failure without lever arm, Steel zinc plated | | | | | | | | | |
| Characteristic shear resistance | $V_{Rk,s}$ [kN] | 12,2 | 20,1 | 30 | 55 | 69 | 114 | 169,4 | |
| Factor for ductility | k_2 [-] | 1,0 | | | | | | | |
| Partial safety factor | γ_{Ms} [-] | 1,25 | | | 1,33 | | 1,25 | 1,25 | |
| Steel failure without lever arm, Stainless steel A4, HCR | | | | | | | | | |
| Characteristic shear resistance | $V_{Rk,s}$ [kN] | 13 | 20 | 30 | 55 | 86 | 123,6 | / | |
| Factor for ductility | k_2 [-] | 1,0 | | | | | | | |
| Partial safety factor | γ_{Ms} [-] | 1,25 | | | 1,4 | | 1,25 | | |
| Steel failure with lever arm, Steel zinc plated | | | | | | | | | |
| Characteristic bending resistance | $M^0_{Rk,s}$ [Nm] | 23 | 47 | 82 | 216 | 363 | 898 | 1331,5 | |
| Partial safety factor | γ_{Ms} [-] | 1,25 | | | 1,33 | | 1,25 | 1,25 | |
| Steel failure with lever arm, Stainless steel A4, HCR | | | | | | | | | |
| Characteristic bending resistance | $M^0_{Rk,s}$ [Nm] | 26 | 52 | 92 | 200 | 454 | 785,4 | / | |
| Partial safety factor | γ_{Ms} [-] | 1,25 | | | 1,4 | | 1,25 | | |
| Concrete pry-out failure | | | | | | | | | |
| k factor | $k_{(3)}$ [-] | 2,4 | | | 2,8 | | | | |
| Concrete edge failure | | | | | | | | | |
| Effective length of anchor in shear loading with h_{ef} | Steel zinc plated | l_f [mm] | 46 | 60 | 70 | 85 | 100 | 115 | 125 |
| | Stainless steel A4, HCR | l_f [mm] | 46 | 60 | 70 | 85 | 100 | 125 | / |
| Effective length of anchor in shear loading with $h_{ef,red}$ | Steel zinc plated | $l_{f,red}$ [mm] | 35 | 40 | 50 | 65 | / | / | |
| | Stainless steel A4, HCR | $l_{f,red}$ [mm] | 35 | 40 | 50 | 65 | | | |
| Outside diameter of anchor | d_{nom} [mm] | 8 | 10 | 12 | 16 | 20 | 24 | 27 | |

Wedge Anchor BZ plus

Performance

Characteristic values for **shear loads**, BZ plus, **cracked and non-cracked concrete**, static or quasi static action, design method A according to ETAG 001, Annex C or CEN/TS 1992-4

Annex C5

Table C6: Characteristic resistance for **seismic loading**, BZ plus, **standard anchorage depth**, performance category **C1** and **C2**, design according to TR045

| Tension loads | | | | | | |
|---|----------------------------|------|------------|------------|------------|------------|
| Anchor size | | | M10 | M12 | M16 | M20 |
| Installation safety factor | $\gamma_2 = \gamma_{inst}$ | [-] | 1,0 | | | |
| Steel failure, steel zinc plated | | | | | | |
| Characteristic resistance C1 | $N_{Rk,s,seis,C1}$ | [kN] | 27 | 40 | 60 | 86 |
| Characteristic resistance C2 | $N_{Rk,s,seis,C2}$ | [kN] | 27 | 40 | 60 | 86 |
| Partial safety factor | $\gamma_{Ms,seis}$ | [-] | 1,53 | 1,5 | | 1,6 |
| Steel failure, stainless steel A4, HCR | | | | | | |
| Characteristic resistance C1 | $N_{Rk,s,seis,C1}$ | [kN] | 27 | 40 | 64 | 108 |
| Characteristic resistance C2 | $N_{Rk,s,seis,C2}$ | [kN] | 27 | 40 | 64 | 108 |
| Partial safety factor | $\gamma_{Ms,seis}$ | [-] | 1,5 | | | 1,68 |
| Pull-out | | | | | | |
| Characteristic resistance C1 | $N_{Rk,p,seis,C1}$ | [kN] | 9 | 16 | 25 | 36 |
| Characteristic resistance C2 | $N_{Rk,p,seis,C2}$ | [kN] | 3,6 | 10,2 | 13,8 | 22,4 |

| Shear loads | | | | | | |
|---|--------------------|------|------|------|------|------|
| Steel failure without lever arm, Steel zinc plated | | | | | | |
| Characteristic resistance C1 | $V_{Rk,s,seis,C1}$ | [kN] | 20 | 27 | 44 | 69 |
| Characteristic resistance C2 | $V_{Rk,s,seis,C2}$ | [kN] | 14 | 16,2 | 35,7 | 55,2 |
| Partial safety factor | $\gamma_{Ms,seis}$ | [-] | 1,25 | | | 1,33 |
| Steel failure without lever arm, Stainless steel A4, HCR | | | | | | |
| Characteristic resistance C1 | $V_{Rk,s,seis,C1}$ | [kN] | 20 | 27 | 44 | 69 |
| Characteristic resistance C2 | $V_{Rk,s,seis,C2}$ | [kN] | 14 | 16,2 | 35,7 | 55,2 |
| Partial safety factor | $\gamma_{Ms,seis}$ | [-] | 1,25 | | | 1,4 |

Wedge Anchor BZ plus

Performance

Characteristic resistance for **seismic loading**, BZ plus, **standard anchorage depth**, performance category **C1** and **C2**, design according to TR045

Annex C6

Table C7: Characteristic values for tension and shear load under fire exposure, BZ plus, standard anchorage depth, cracked and non-cracked concrete C20/25 to C50/60, design acc. to TR 020 or CEN/TS 1992-4, Annex D

| Anchor size | | M8 | M10 | M12 | M16 | M20 | M24 | M27 | | |
|--|------|-----------------|------|-----|-----|------|------|------|-------|------|
| Tension load | | | | | | | | | | |
| Steel failure | | | | | | | | | | |
| Steel zinc plated | | | | | | | | | | |
| Characteristic resistance | R30 | $N_{Rk,s,fi}$ | [kN] | 1,4 | 2,2 | 3,2 | 6,0 | 9,4 | 13,6 | 17,6 |
| | R60 | | | 1,1 | 1,8 | 2,8 | 5,2 | 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 A4, HCR | | | | | | | | | | |
| Characteristic resistance | R30 | $N_{Rk,s,fi}$ | [kN] | 3,8 | 6,9 | 11,5 | 21,5 | 33,5 | 48,2 | / |
| | R60 | | | 2,9 | 5,2 | 8,6 | 16 | 25,0 | 35,9 | |
| | R90 | | | 2,0 | 3,5 | 5,6 | 10,5 | 16,4 | 23,6 | |
| | R120 | | | 1,6 | 2,7 | 4,2 | 7,8 | 12,1 | 17,4 | |
| Shear load | | | | | | | | | | |
| Steel failure without lever arm | | | | | | | | | | |
| Steel zinc plated | | | | | | | | | | |
| Characteristic resistance | R30 | $V_{Rk,s,fi}$ | [kN] | 1,6 | 2,6 | 3,8 | 7,0 | 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 A4, HCR | | | | | | | | | | |
| Characteristic resistance | R30 | $V_{Rk,s,fi}$ | [kN] | 3,8 | 6,9 | 11,5 | 21,5 | 33,5 | 48,2 | / |
| | R60 | | | 2,9 | 5,2 | 8,6 | 16 | 25,0 | 35,9 | |
| | R90 | | | 2,0 | 3,5 | 5,6 | 10,5 | 16,4 | 23,6 | |
| | R120 | | | 1,6 | 2,7 | 4,2 | 7,8 | 12,1 | 17,4 | |
| Steel failure with lever arm | | | | | | | | | | |
| Steel zinc plated | | | | | | | | | | |
| Characteristic resistance | R30 | $M^0_{Rk,s,fi}$ | [Nm] | 1,7 | 3,3 | 5,9 | 15 | 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 A4, HCR | | | | | | | | | | |
| Characteristic resistance | R30 | $M^0_{Rk,s,fi}$ | [Nm] | 3,8 | 9,0 | 17,9 | 45,5 | 88,8 | 153,5 | / |
| | R60 | | | 2,9 | 6,8 | 13,3 | 33,9 | 66,1 | 114,3 | |
| | R90 | | | 2,1 | 4,5 | 8,8 | 22,2 | 43,4 | 75,1 | |
| | R120 | | | 1,6 | 3,4 | 6,5 | 16,4 | 32,1 | 55,5 | |

The characteristic resistance for pull-out failure, concrete cone failure, concrete pry-out and concrete edge failure can be calculated according to TR020 / CEN/TS 1992-4. If pull-out is not decisive $N_{Rk,p}$ in Eq. 2.4 and Eq. 2.5, TR 020 must be replaced by $N^0_{Rk,c}$.

Wedge Anchor BZ plus

Performance

Characteristic values for tension and shear load under fire exposure, BZ plus, standard anchorage depth, cracked and non-cracked concrete C20/25 to C50/60, design acc. to TR 020 or CEN/TS 1992-4, Annex D

Annex C7

Table C8: Displacements under tension load, BZ plus

| Anchor size | | | M8 | M10 | M12 | M16 | M20 | M24 | M27 |
|---|---------------------------|------|-----|------|------|------|------|------|-----|
| Standard anchorage depth | | | | | | | | | |
| Steel zinc plated | | | | | | | | | |
| Tension load in cracked concrete | N | [kN] | 2,4 | 4,3 | 7,6 | 11,9 | 17,1 | 21,1 | 24 |
| Displacement | δ_{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 non-cracked concrete | N | [kN] | 5,7 | 7,6 | 11,9 | 16,7 | 23,8 | 29,6 | 34 |
| Displacement | δ_{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 | $\delta_{N,seis,C2(DLS)}$ | [mm] | / | 4,1 | 4,9 | 3,6 | 5,1 | / | / |
| Displacements for ULS | $\delta_{N,seis,C2(ULS)}$ | [mm] | | 13,8 | 15,7 | 9,5 | 15,2 | | |
| Stainless steel A4, HCR | | | | | | | | | |
| Tension load in cracked concrete | N | [kN] | 2,4 | 4,3 | 7,6 | 11,9 | 17,1 | 19,0 | / |
| Displacement | δ_{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 non-cracked concrete | N | [kN] | 5,8 | 7,6 | 11,9 | 16,7 | 23,8 | 33,5 | / |
| Displacement | δ_{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 | |
| Displacements under seismic tension loads C2 | | | | | | | | | |
| Displacements for DLS | $\delta_{N,seis,C2(DLS)}$ | [mm] | / | 4,1 | 4,9 | 3,6 | 5,1 | / | / |
| Displacements for ULS | $\delta_{N,seis,C2(ULS)}$ | [mm] | | 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 | / | / | / |
| Displacement | δ_{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 non-cracked concrete | N | [kN] | 3,7 | 4,3 | 8,5 | 12,6 | / | / | / |
| Displacement | δ_{N0} | [mm] | 0,1 | 0,2 | 0,2 | 0,2 | | | |
| | $\delta_{N\infty}$ | [mm] | 0,7 | 0,7 | 0,7 | 0,7 | | | |

Wedge Anchor BZ plus

Performance
Displacements under tension load

Annex C8

Table C9: Displacements under shear load, BZ plus

| Anchor size | | | M8 | M10 | M12 | M16 | M20 | M24 | M27 |
|---|---------------------------|------|-----|------|------|------|------|------|------|
| Standard anchorage depth | | | | | | | | | |
| Steel zinc plated | | | | | | | | | |
| Shear load in cracked and non-cracked concrete | V | [kN] | 6,9 | 11,4 | 17,1 | 31,4 | 36,8 | 64,9 | 96,8 |
| Displacement | δ_{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 | $\delta_{V,seis,C2(DLS)}$ | [mm] | / | 2,7 | 3,5 | 4,3 | 4,7 | / | / |
| Displacements for ULS | $\delta_{V,seis,C2(ULS)}$ | [mm] | | 5,3 | 9,5 | 9,6 | 10,1 | | |
| Stainless steel A4, HCR | | | | | | | | | |
| Shear load in cracked and non-cracked concrete | V | [kN] | 7,3 | 11,4 | 17,1 | 31,4 | 43,8 | 70,6 | / |
| Displacement | δ_{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 | |
| Displacements under seismic shear loads C2 | | | | | | | | | |
| Displacements for DLS | $\delta_{V,seis,C2(DLS)}$ | [mm] | / | 2,7 | 3,5 | 4,3 | 4,7 | / | / |
| Displacements for ULS | $\delta_{V,seis,C2(ULS)}$ | [mm] | | 5,3 | 9,5 | 9,6 | 10,1 | | |
| Reduced anchorage depth | | | | | | | | | |
| Steel zinc plated | | | | | | | | | |
| Shear load in cracked and non-cracked concrete | V | [kN] | 6,9 | 11,4 | 17,1 | 31,4 | / | / | / |
| Displacement | δ_{V0} | [mm] | 2,0 | 3,2 | 3,6 | 3,5 | | | |
| | $\delta_{V\infty}$ | [mm] | 3,0 | 4,7 | 5,5 | 5,3 | | | |
| Stainless steel A4, HCR | | | | | | | | | |
| Shear load in cracked and non-cracked concrete | V | [kN] | 7,3 | 11,4 | 17,1 | 31,4 | / | / | / |
| Displacement | δ_{V0} | [mm] | 1,9 | 2,4 | 4,0 | 4,3 | | | |
| | $\delta_{V\infty}$ | [mm] | 2,9 | 3,6 | 5,9 | 6,4 | | | |

Wedge Anchor BZ plus

Performance
Displacements under shear load

Annex C9

Table C10: Characteristic values for **tension loads, BZ-IG, cracked concrete**, static and quasi-static action, design method A according to ETAG 001, Annex C or CEN/TS 1992-4

| Anchor size | | | M6 | M8 | M10 | M12 |
|--|----------------------------|------|---|------|------|------|
| Installation safety factor | $\gamma_2 = \gamma_{inst}$ | [-] | 1,2 | | | |
| Steel failure | | | | | | |
| Characteristic tension resistance, steel zinc plated | $N_{Rk,s}$ | [kN] | 16,1 | 22,6 | 26,0 | 56,6 |
| Partial safety factor | γ_{Ms} | [-] | 1,5 | | | |
| Characteristic tension resistance, stainless steel A4, HCR | $N_{Rk,s}$ | [kN] | 14,1 | 25,6 | 35,8 | 59,0 |
| Partial safety factor | γ_{Ms} | [-] | 1,87 | | | |
| Pull-out failure | | | | | | |
| Characteristic resistance in cracked concrete C20/25 | $N_{Rk,p}$ | [kN] | 5 | 9 | 12 | 20 |
| Increasing factor | ψ_c | [-] | $\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$ | | | |
| Concrete cone failure | | | | | | |
| Effective anchorage depth | h_{ef} | [mm] | 45 | 58 | 65 | 80 |
| Factor for cracked concrete | k_{cr} | [-] | 7,2 | | | |

Wedge Anchor BZ-IG

Performance

Characteristic values for **tension loads, BZ-IG, cracked concrete**, static and quasi-static action, design method A according to ETAG 001, Annex C or CEN/TS 1992-4

Annex C10

Table C11: Characteristic values for tension loads, **BZ-IG, non-cracked concrete, static and quasi-static action, design method A according to ETAG 001, Annex C or CEN/TS 1992-4**

| Anchor size | | | M6 | M8 | M10 | M12 |
|---|-----------------------------|------|---|------|------|------|
| Installation safety factor | $\gamma_2 = \gamma_{inst}$ | [-] | 1,2 | | | |
| Steel failure | | | | | | |
| Characteristic tension resistance, steel zinc plated | $N_{Rk,s}$ | [kN] | 16,1 | 22,6 | 26,0 | 56,6 |
| Partial safety factor | γ_{Ms} | [-] | 1,5 | | | |
| Characteristic tension resistance, stainless steel A4, HCR | $N_{Rk,s}$ | [kN] | 14,1 | 25,6 | 35,8 | 59,0 |
| Partial safety factor | γ_{Ms} | [-] | 1,87 | | | |
| Pull-out | | | | | | |
| Characteristic resistance in non-cracked concrete C20/25 | $N_{Rk,p}$ | [kN] | 12 | 16 | 20 | 30 |
| Splitting ($N^0_{Rk,c}$ has to be replaced by $N^0_{Rk,sp}$. 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 non-cracked concrete C20/25 | $N^0_{Rk,sp}$ | [kN] | 9 | 12 | 16 | 25 |
| Spacing (edge distance) | $s_{cr,sp} (= 2 c_{cr,sp})$ | [mm] | 3 h_{ef} | | | |
| Case 2 | | | | | | |
| Characteristic resistance in non-cracked concrete C20/25 | $N^0_{Rk,sp}$ | [kN] | 12 | 16 | 20 | 30 |
| Spacing (edge distance) | $s_{cr,sp} (= 2 c_{cr,sp})$ | [mm] | 5 h_{ef} | | | |
| Increasing factor for $N_{Rk,p}$ and $N^0_{Rk,sp}$ | ψ_c | [-] | $\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$ | | | |
| Concrete cone failure | | | | | | |
| Effective anchorage depth | h_{ef} | [mm] | 45 | 58 | 65 | 80 |
| Factor for non-cracked concrete | k_{ucr} | [-] | 10,1 | | | |

Wedge Anchor BZ-IG

Performance

Characteristic values for tension loads, **BZ-IG**, non-cracked concrete, static and quasi-static action, design method A according to ETAG 001, Annex C or CEN/TS 1992-4

Annex C11

Table C12: Characteristic values for **shear loads, BZ-IG, cracked and non-cracked concrete**, static and quasi-static action, design method A according to ETAG 001, Annex C or CEN/TS 1992-4

| Anchor size | | | M6 | M8 | M10 | M12 |
|---|----------------------------|------|------|------|------|-------|
| Installation safety factor | $\gamma_2 = \gamma_{inst}$ | [-] | 1,0 | | | |
| BZ-IG, steel zinc plated | | | | | | |
| Steel failure without lever arm, Installation type V | | | | | | |
| Characteristic shear resistance | $V_{Rk,s}$ | [kN] | 5,8 | 6,9 | 10,4 | 25,8 |
| Steel failure without lever arm, Installation type D | | | | | | |
| Characteristic shear resistance | $V_{Rk,s}$ | [kN] | 5,1 | 7,6 | 10,8 | 24,3 |
| Steel failure with lever arm, Installation type V | | | | | | |
| Characteristic bending resistance | $M^0_{Rk,s}$ | [Nm] | 12,2 | 30,0 | 59,8 | 104,6 |
| Steel failure with lever arm, Installation type D | | | | | | |
| Characteristic bending resistance | $M^0_{Rk,s}$ | [Nm] | 36,0 | 53,2 | 76,0 | 207 |
| Partial safety factor for $V_{Rk,s}$ and $M^0_{Rk,s}$ | γ_{Ms} | [-] | 1,25 | | | |
| Factor of ductility | k_2 | [-] | 1,0 | | | |
| BZ-IG, stainless steel A4, HCR | | | | | | |
| Steel failure without lever arm, Installation type V | | | | | | |
| Characteristic shear resistance | $V_{Rk,s}$ | [kN] | 5,7 | 9,2 | 10,6 | 23,6 |
| Partial safety factor | γ_{Ms} | [-] | 1,25 | | | |
| Steel failure without lever arm, Installation type D | | | | | | |
| Characteristic shear resistance | $V_{Rk,s}$ | [kN] | 7,3 | 7,6 | 9,7 | 29,6 |
| Partial safety factor | γ_{Ms} | [-] | 1,25 | | | |
| Steel failure with lever arm, Installation type V | | | | | | |
| Characteristic bending resistance | $M^0_{Rk,s}$ | [Nm] | 10,7 | 26,2 | 52,3 | 91,6 |
| Partial safety factor | γ_{Ms} | [-] | 1,56 | | | |
| Steel failure with lever arm, Installation type D | | | | | | |
| Characteristic bending resistance | $M^0_{Rk,s}$ | [Nm] | 28,2 | 44,3 | 69,9 | 191,2 |
| Partial safety factor | γ_{Ms} | [-] | 1,25 | | | |
| Factor of ductility | k_2 | [-] | 1,0 | | | |
| Concrete pry-out failure | | | | | | |
| k factor | $k_{(3)}$ | [-] | 1,5 | 1,5 | 2,0 | 2,0 |
| Concrete edge failure | | | | | | |
| Effective length of anchor in shear loading | l_f | [mm] | 45 | 58 | 65 | 80 |
| Effective diameter of anchor | d_{nom} | [mm] | 8 | 10 | 12 | 16 |

Wedge Anchor BZ-IG

Performance

Characteristic values for **shear loads, BZ-IG, cracked and non-cracked concrete**, static and quasi-static action, design method A according to ETAG 001, Annex C or CEN/TS 1992-4

Annex C12

Table C13: Characteristic values for **tension** and **shear load** under **fire exposure**, **BZ-IG** cracked and non-cracked concrete C20/25 to C50/60, design acc. to TR 020 or CEN/TS 1992-4, Annex D

| Anchor 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 A4, HCR | | | | | | | |
| 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 A4, HCR | | | | | | | |
| 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 A4, HCR | | | | | | | |
| 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 |

The characteristic resistance for pull-out failure, concrete cone failure, concrete pry-out failure and concrete edge failure can be designed according to TR020 / CEN/TS 1992-4.

Wedge Anchor BZ-IG

Performance

Characteristic values for **tension** and **shear loads** under **fire exposure**, **BZ-IG** cracked and non-cracked concrete C20/25 to C50/60, design acc. to TR 020 or CEN/TS 1992-4, Annex D

Annex C13

Table C14: Displacements under tension load, BZ-IG

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

Table C15: Displacements under shear load, BZ-IG

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

Wedge Anchor BZ-IG

Performance
Displacements under tension load and under shear load

Annex C14