... eine starke Verbindung

SUORITUSTASOILMOITUS
**DoP Nro. MKT-122** - fi

1. Tuotetyypin yksilöllinen tunniste: **MKT Tehoankkuri SZ**

2. Tyyppi-, erä- tai sarjanumero tai muu merkintä, jonka ansiosta rakennustuotteet voidaan tunnistaa, kuten 11 artiklan 4 kohdassa edellytetään:

**ETA-02/0030, Annex A2**
**Eränumero: katso pakkau**

3. Valmistajan ennakoima, sovellettavan yhdenmukaistetun teknisen eritelmän mukainen rakennustuotteen aiottu käyttötarkoitus tai -tarkoitukset:

| | |
|---|---|
| **yleinen tyyppi** | Vääntömomentti kontrolloitu laajeneva ankkuri (holkki 4 tyyppi) |
| **käytettäväksi** | Halkeillut ja halkeilematon betoni C20/25 - C50/60 (EN 206) |
| **vaihtoehto** | 1 |
| **kuormitus** | Staattinen tai kvasistaattinen: kaikki koot<br>Seisminen, luokka C1 + C2:<br>- Kattaa koot: SZ-B + SZ-S (12/M8, 15/M10, 18/M12, 24/M16, 24/M16L, 28/M20);<br>SZ-SK (12/M8, 15/M10, 18/M12) |
| **materiaali** | Sinkittyä teräs:<br>Ainoastaan kuivat sisätilat<br>- Kattaa koot: SZ-B (10/M6, 12/M8, 15/M10, 18/M12, 24/M16, 24/M16L, 28/M20)<br>SZ-S (10/M6, 12/M8, 15/M10, 18/M12, 24/M16, 24/M16L, 28/M20)<br>SZ-SK (10/M6, 12/M8,15/M10, 18/M12)<br>Ruostumaton teräs (merkintä A4):<br>Sisäiseen ja ulkoiseen käyttöön ilman erityistä aggressiivista olosuhdetta<br>- Kattaa koot: SZ-B (12/M8, 15/M10, 18/M12, 24/M16)<br>SZ-S (12/M8, 15/M10, 18/M12, 24/M16)<br>SZ-SK (12/M8,15/M10, 18/M12) |
| **lämpötila-alue** (mahdollisesti) | -- |

4. Valmistajan nimi, rekisteröity kauppanimi tai tavaramerkki sekä osoite, josta valmistajaan saa yhteyden, kuten 11 artiklan 5 kohdassa edellytetään:

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

5. Mahdollisen valtuutetun edustajan, jonka toimeksiantoon kuuluvat 12 artiklan 2 kohdassa eritellyt tehtävät, nimi sekä osoite, josta tähän saa yhteyden: --

6. Rakennustuotteen suoritustason pysyvyyden arviointi- ja varmennusjärjestelmä(t) liitteen V mukaisesti:
**Järjestelmä 1**

7. Kun kyse on yhdenmukaistetun standardin piiriin kuuluvan rakennustuotteen suoritustasoilmoituksesta:
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8. Kun kyse on suoritustasoilmoituksesta, joka koskee rakennustuotetta, josta on annettu eurooppalainen tekninen arviointi:

**Deutsches Institut für Bautechnik, Berlin**

antoi:

**ETA-02/0030**

joka perustuu

**EAD 330232-00-0601**

Rekisteröity tuoteasetussertifikaatti 1343-CPR on myönnetty menetelmän 1 mukaisesti:

i) tuotetyypin määritys tuotteen tyyppitestauksen (myös näytteenotto), tyyppilaskennan, taulukoitujen arvojen tai tuotetta kuvailevien asiakirjojen perusteella;
ii) tuotantolaitoksen sekä tuotannon sisäisen laadunvalvonnan alkutarkastus;
iii) tuotannon sisäisen laadunvalvonnan jatkuva valvonta, arviointi ja evaluointi.

ja antoi: sertifikaatin suoritustasojen pysyvyydestä 1343-CPR-M 550-9

9. Erklärte Leistung:

| **Perusominaisuudet** | **Laskentamalli** | **Suoritustaso** | | **Yhdenmukaistetut tekniset eritelmät** |
|---|---|---|---|---|
| | | **Sinkittyä teräs** | **Ruostumaton teräs A4** | |
| ominaisarvo/ jännitys | FprEN 1992-4:2016 und TR 055 | Annex C1, C2 | Annex C1, C3 | EAD 330232-00-0601 |
| ominaisarvo/ leikkaus | FprEN 1992-4:2016 und TR 055 | Annex C4 | Annex C5 | |
| ominaisarvo/ seisminen | FprEN 1992-4:2016 und TR 055 | Annex C6 | Annex C7 | |
| tilavuus asetetuissa raja-arvoissa | FprEN 1992-4:2016 und TR 055 | Annex C9 | Annex C10 | |
| ominaisarvo palo altistus | FprEN 1992-4:2016 und TR 055 | Annex C8 | Annex C8 | |

Vaatimukset, jotka tuote täyttää, kun teknistä erityisasiakirjaa on käytetty 37 ja 38 artiklan nojalla:

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10. Edellä 1 ja 2 kohdassa yksilöidyn tuotteen suoritustasot ovat 9 kohdassa ilmoitettujen suoritustasojen mukaiset.

Tämä suoritustasoilmoitus on annettu 4 kohdassa ilmoitetun valmistajan yksinomaisella vastuulla:

Valmistajan puolesta allekirjoittanut:

**Stefan Weustenhagen**
(General Manager)
**Weilerbach, 22.08.2017**

i.V.
**Dipl.-Ing. Detlef Bigalke**
(Head of product development)

**Table C1:** Characteristic values for **tension load, cracked concrete** under static or quasi-static action**, steel zinc plated**

| **Anchor size** | | | **10/M6** | **12/M8** | **15/M10** | **18/M12** | **24/M16** | **24/M16L** | **28/M20** |
|---|---|---|---|---|---|---|---|---|---|
| Installation safety factor | $\gamma_{inst}$ | [-] | 1,0 | | | | | | |
| **Steel failure** | | | | | | | | | |
| Characteristic resistance | $N_{Rk,s}$ | [kN] | 16 | 29 | 46 | 67 | 126 | 126 | 196 |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,5 | | | | | | |
| **Pull-out failure** | | | | | | | | | |
| Characteristic resistance in cracked concrete C20/25 | $N_{Rk,p}$ | [kN] | 5 | 12 | 16 | 1) | 1) | 1) | 1) |
| Increasing factor for $N_{Rk,p}$ | $\psi_C$ | [-] | $\left(\frac{f_{ck}}{20}\right)^{0,5}$ | | | | | | |
| **Concrete cone failure** | | | | | | | | | |
| Effective anchorage depth | $h_{ef}$ | [mm] | 50 | 60 | 71 | 80 | 100 | 115 | 125 |
| Factor for $k_1$ | $k_{cr,N}$ | [-] | 7,7 | | | | | | |

1) Pull-out is not decisive.

**Table C2:** Characteristic values for **tension load**, **cracked concrete** under static or quasi-static action**, stainless steel A4**

| **Anchor size** | | | **12/M8** | **15/M10** | **18/M12** | **24/M16** |
|---|---|---|---|---|---|---|
| Installation safety factor | $\gamma_{inst}$ | [-] | 1,0 | | | |
| **Steel failure** | | | | | | |
| **SZ-B** | | | | | | |
| Characteristic resistance | $N_{Rk,s}$ | [kN] | 26 | 41 | 60 | 110 |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,5 | | | |
| **SZ-S and SZ-SK** | | | | | | |
| Characteristic resistance | $N_{Rk,s}$ | [kN] | 26 | 41 | 60 | 110 |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,87 | | | |
| **Pull-out failure** | | | | | | |
| Characteristic resistance in cracked concrete C20/25 | $N_{Rk,p}$ | [kN] | 9 | 16 | 1) | 1) |
| Increasing factor for $N_{Rk,p}$ | $\psi_C$ | [-] | $\left(\frac{f_{ck}}{20}\right)^{0,5}$ | | | |
| **Concrete cone failure** | | | | | | |
| Effective anchorage depth | $h_{ef}$ | [mm] | 60 | 71 | 80 | 100 |
| Factor for $k_1$ | $k_{cr,N}$ | [-] | 7,7 | | | |

1) Pull-out is not decisive.

**Highload Anchor SZ**

**Performance**
Characteristic values for **tension load** in **cracked concrete** under static or quasi-static action

**Annex C1**

**Table C3:** Characteristic values for **tension load in uncracked concrete**, under static or quasi-static action, **steel zinc plated**

| **Anchor size** | | | **10/M6** | **12/M8** | **15/M10** | **18/M12** | **24/M16** | **24/M16L** | **28/M20** |
|---|---|---|---|---|---|---|---|---|---|
| Installation safety factor | $\gamma_{inst}$ | [-] | 1,0 | | | | | | |
| **Steel failure** | | | | | | | | | |
| Characteristic resistance | $N_{Rk,s}$ | [kN] | 16 | 29 | 46 | 67 | 126 | 126 | 196 |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,5 | | | | | | |
| **Pull-out failure** | | | | | | | | | |
| Characteristic resistance in uncracked concrete C20/25 | $N_{Rk,p}$ | [kN] | 1) | 20 | 1) | 1) | 1) | 1) | 1) |
| **Splitting failure** (The higher resistance of case 1 and case 2 may be applied.) | | | | | | | | | |
| Case 1 | | | | | | | | | |
| Characteristic resistance in uncracked concrete C20/25 | $N^0_{Rk,sp}$ | [kN] | 12 | 16 | 25 | 30 | 40 | 70 | 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] | 17,4 | 20,0 | 29,4 | 35,2 | 49,2 | 60,7 | 68,8 |
| Edge distance | $c_{cr,sp}$ | [mm] | 2,5 $h_{ef}$ | | | | | 1,5 $h_{ef}$ | 2,5 $h_{ef}$ |
| Increasing factor for $N_{Rk,p}$ and $N^0_{Rk,sp}$ | $\psi_C$ | [-] | $\left(\frac{f_{ck}}{20}\right)^{0,5}$ | | | | | | |
| **Concrete cone failure** | | | | | | | | | |
| Effective Anchorage depth | $h_{ef}$ | [mm] | 50 | 60 | 71 | 80 | 100 | 115 | 125 |
| Edge distance | $c_{cr,N}$ | [mm] | 1,5 $h_{ef}$ | | | | | | |
| Factor for $k_1$ | $k_{ucr,N}$ | [-] | 11,0 | | | | | | |

1) Pull-out is not decisive.

**Table C4:** Characteristic values for **tension load** in **uncracked concrete** under static or quasi-static action, **stainless steel A4**

| **Anchor size** | | | **12/M8** | **15/M10** | **18/M12** | **24/M16** |
|---|---|---|---|---|---|---|
| Installation safety factor | $\gamma_{inst}$ | [-] | 1,0 | | | |
| **Steel failure** | | | | | | |
| **SZ-B** | | | | | | |
| Characteristic resistance | $N_{Rk,s}$ | [kN] | 26 | 41 | 60 | 110 |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,5 | | | |
| **SZ-S and SZ-SK** | | | | | | |
| Characteristic resistance | $N_{Rk,s}$ | [kN] | 26 | 41 | 60 | 110 |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,87 | | | |
| **Pull-out failure** | | | | | | |
| Characteristic resistance in uncracked concrete C20/25 | $N_{Rk,p}$ | [kN] | 16 | 25 | 35 | [1] |
| **Splitting failure** | | | | | | |
| Characteristic resistance in uncracked concrete C20/25 | $N^0_{Rk,sp}$ | [kN] | 16 | 25 | 35 | 49,2 |
| Edge distance | $c_{cr,sp}$ | [mm] | 180 | 235 | 265 | 300 |
| Increasing factor for $N_{Rk,p}$ and $N^0_{Rk,sp}$ | $\psi_C$ | [-] | $\left(\frac{f_{ck}}{20}\right)^{0,5}$ | | | |
| **Concrete cone failure** | | | | | | |
| Effective anchorage depth | $h_{ef}$ | [mm] | 60 | 71 | 80 | 100 |
| Edge distance | $c_{cr,N}$ | [mm] | 1,5 $h_{ef}$ | | | |
| Factor for $k_1$ | $k_{ucr,N}$ | [-] | 11,0 | | | |

[1] Pull-out is not decisive.

**Table C5:** Characteristic values of **shear load** under static or quasi-static action, **steel zinc plated**

| **Anchor size** | | | **10/M6** | **12/M8** | **15/M10** | **18/M12** | **24/M16** | **24/M16L** | **28/M20** |
|---|---|---|---|---|---|---|---|---|---|
| **Steel failure without lever arm** | | | | | | | | | |
| **SZ-B** | | | | | | | | | |
| Characteristic resistance | $V_{Rk,s}$ | [kN] | 16 | 25 | 36 | 63 | 91 | 91 | 122 |
| Factor | $k_7$ | [-] | 1,0 | | | | | | |
| **SZ-S** | | | | | | | | | |
| Characteristic resistance | $V_{Rk,s}$ | [kN] | 18 | 30 | 48 | 73 | 126 | 126 | 150 |
| Factor | $k_7$ | [-] | 1,0 | | | | | | |
| **SZ-SK** | | | | | | | | | |
| Characteristic resistance | $V_{Rk,s}$ | [kN] | 18 | 30 | 48 | 73 | 126 | 126 | 150 |
| Factor | $k_7$ | [-] | 1,0 | | | | | | |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,25 | | | | | | |
| **Steel failure with lever arm** | | | | | | | | | |
| Characteristic resistance | $M^0_{Rk,s}$ | [Nm] | 12 | 30 | 60 | 105 | 266 | 266 | 519 |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,25 | | | | | | |
| **Concrete pry-out failure** | | | | | | | | | |
| Factor | $k_8$ | [-] | 1,8 | 2,0 | | | | | |
| **Concrete edge failure** | | | | | | | | | |
| Effective length of anchor in shear loading | $l_f$ | [mm] | 50 | 60 | 71 | 80 | 100 | 115 | 125 |
| Outside diameter of anchor | $d_{nom}$ | [mm] | 10 | 12 | 15 | 18 | 24 | 24 | 28 |

**Table C6:** Characteristic values for **shear load** under static or quasi-static action, **stainless steel A4**

| **Anchor size** | | | **12/M8** | **15/M10** | **18/M12** | **24/M16** |
|---|---|---|---|---|---|---|
| **Steel failure without lever arm** | | | | | | |
| Characteristic resistance | $V_{Rk,s}$ | [kN] | 24 | 37 | 62 | 92 |
| **SZ-B** | | | | | | |
| Factor | $k_7$ | [-] | 1,0 | | | |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,25 | | | |
| **SZ-S** | | | | | | |
| Factor | $k_7$ | [-] | 1,0 | | | |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,36 | | | |
| **SZ-SK** | | | | | | |
| Factor | $k_7$ | [-] | 0,8 | | | |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,36 | | | |
| **Steel failure with lever arm** | | | | | | |
| Characteristic resistance | $M^0_{Rk,s}$ | [Nm] | 26 | 52 | 92 | 232 |
| **SZ-B** | | | | | | |
| Factor | $k_7$ | [-] | 1,0 | | | |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,25 | | | |
| **SZ-S** | | | | | | |
| Factor | $k_7$ | [-] | 1,0 | | | |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,56 | | | |
| **SZ-SK** | | | | | | |
| Factor | $k_7$ | [-] | 0,8 | | | |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,56 | | | |
| **Concrete pry-out failure** | | | | | | |
| Factor | $k_8$ | [-] | 2,0 | | | |
| **Concrete edge failure** | | | | | | |
| Effective length of anchor in shear loading | $l_f$ | [mm] | 60 | 71 | 80 | 100 |
| Outside diameter of anchor | $d_{nom}$ | [mm] | 12 | 15 | 18 | 24 |

**Table C7:** Characteristic values for **seismic action, Category C1 and C2, steel zinc plated**

| **Anchor size** | | | **12/M8** | **15/M10** | **18/M12** | **24/M16** | **24/M16L** | **28/M20** |
|---|---|---|---|---|---|---|---|---|
| **Tension load** | | | | | | | | |
| Installation safety factor | $\gamma_{inst}$ | [-] | 1,0 | | | | | |
| **Steel failure** | | | | | | | | |
| Characteristic tension resistance category **C1** | $N_{Rk,s,eq,C1}$ | [kN] | 29 | 46 | 67 | 126 | 126 | 196 |
| Characteristic tension resistance category **C2** | $N_{Rk,s,eq,C2}$ | [kN] | 29 | 46 | 67 | 126 | 126 | 196 |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,5 | | | | | |
| **Pull-out failure** | | | | | | | | |
| Characteristic tension resistance category **C1** | $N_{Rk,p,eq,C1}$ | [kN] | 12 | 16 | 25 | 36 | 44,4 | 50,3 |
| Characteristic tension resistance category **C2** | $N_{Rk,p,eq,C2}$ | [kN] | 5,4 | 16,4 | 22,6 | 29,0 | 41,2 | 43,6 |
| **Shear load** | | | | | | | | |
| **Steel failure without lever arm** | | | | | | | | |
| **SZ-B** | | | | | | | | |
| Characteristic shear resistance category **C1** | $V_{Rk,s,eq,C1}$ | [kN] | 18,0 | 27,1 | 43,4 | 51,9 | 51,9 | 96,4 |
| Characteristic shear resistance category **C2** | $V_{Rk,s,eq,C2}$ | [kN] | 12,7 | 20,5 | 31,5 | 50,1 | 50,1 | 67,1 |
| **SZ-S** | | | | | | | | |
| Characteristic shear resistance category **C1** | $V_{Rk,s,eq,C1}$ | [kN] | 18,0 | 27,1 | 43,4 | 51,9 | 51,9 | 96,4 |
| Characteristic shear resistance category **C2** | $V_{Rk,s,eq,C2}$ | [kN] | 12,7 | 20,5 | 31,5 | 69,3 | 69,3 | 67,1 |
| **SZ-SK** | | | | | | | | |
| Characteristic shear resistance category **C1** | $V_{Rk,s,eq,C1}$ | [kN] | 25,2 | 36,5 | 50,4 | - | - | - |
| Characteristic shear resistance category **C2** | $V_{Rk,s,eq,C2}$ | [kN] | 19,2 | 29,3 | 39,4 | - | - | - |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,25 | | | | | |

**Table C8:** Characteristic values for **seismic action, Category C1 and C2, stainless steel A4**

| **Anchor size** | | | **12/M8** | **15/M10** | **18/M12** | **24/M16** |
|---|---|---|---|---|---|---|
| **Tension load** | | | | | | |
| Installation safety factor | $\gamma_{inst}$ | [-] | 1,0 | | | |
| **Steel failure** | | | | | | |
| Characteristic tension resistance, category **C1** | $N_{Rk,s,eq,C1}$ | [kN] | 26 | 41 | 60 | 110 |
| Characteristic tension resistance, category **C2** | $N_{Rk,s,eq,C2}$ | [kN] | 26 | 41 | 60 | 110 |
| Partial safety factor **SZ-B** | $\gamma_{Ms}$ | [-] | 1,5 | | | |
| Partial safety factor **SZ-S and SZ-SK** | $\gamma_{Ms}$ | [-] | 1,87 | | | |
| **Pull-out failure** | | | | | | |
| Characteristic tension resistance, category **C1** | $N_{Rk,p,eq,C1}$ | [kN] | 9 | 16 | 26 | 36 |
| Characteristic tension resistance, category **C2** | $N_{Rk,p,eq,C2}$ | [kN] | 4,8 | 16,5 | 24,8 | 44,5 |
| **Shear load** | | | | | | |
| **Steel failure without lever arm** | | | | | | |
| **SZ-B** | | | | | | |
| Characteristic shear resistance, category **C1** | $V_{Rk,s,eq,C1}$ | [kN] | 9,6 | 13,3 | 25,4 | 75,4 |
| Characteristic shear resistance, category **C2** | $V_{Rk,s,eq,C2}$ | [kN] | 9,7 | 14,0 | 18,0 | 32,2 |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,25 | | | |
| **SZ-S** | | | | | | |
| Characteristic shear resistance, category **C1** | $V_{Rk,s,eq,C1}$ | [kN] | 9,6 | 13,3 | 25,4 | 75,4 |
| Characteristic shear resistance, category **C2** | $V_{Rk,s,eq,C2}$ | [kN] | 9,7 | 14,0 | 18,0 | 32,2 |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,36 | | | |
| **SZ-SK** | | | | | | |
| Characteristic shear resistance, category **C1** | $V_{Rk,s,eq,C1}$ | [kN] | 11,5 | 23,3 | 31,6 | - |
| Characteristic shear resistance, category **C2** | $V_{Rk,s,eq,C2}$ | [kN] | 10,8 | 17,4 | 15,4 | - |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,36 | | | - |

**Table C9:** Characteristic values under **fire exposure** in cracked and uncracked concrete C20/25 to C50/60

| **Anchor size** | | | | **10/M6** | **12/M8** | **15/M10** | **18/M12** | **24/M16** | **24/M16L** | **28/M20** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Tension load** | | | | | | | | | | |
| **Steel failure** | | | | | | | | | | |
| **Steel zinc plated** | | | | | | | | | | |
| Characteristic resistance | R30 | $N_{Rk,s,fi}$ | [kN] | 1,0 | 1,9 | 4,3 | 6,3 | 11,6 | | 18,3 |
| | R60 | | | 0,8 | 1,5 | 3,2 | 4,6 | 8,6 | | 13,5 |
| | R90 | | | 0,6 | 1,0 | 2,1 | 3,0 | 5,0 | | 7,7 |
| | R120 | | | 0,4 | 0,8 | 1,5 | 2,0 | 3,1 | | 4,9 |
| **Stainless steel A4** | | | | | | | | | | |
| Characteristic resistance | R30 | $N_{Rk,s,fi}$ | [kN] | - | 6,1 | 10,2 | 15,7 | 29,2 | - | - |
| | R60 | | | - | 4,4 | 7,3 | 11,1 | 20,6 | - | - |
| | R90 | | | - | 2,6 | 4,3 | 6,4 | 12,0 | - | - |
| | R120 | | | - | 1,8 | 2,8 | 4,1 | 7,7 | - | - |
| **Shear load** | | | | | | | | | | |
| **Steel failure without lever arm** | | | | | | | | | | |
| **Steel zinc plated** | | | | | | | | | | |
| Characteristic resistance | R30 | $V_{Rk,s,fi}$ | [kN] | 1,0 | 1,9 | 4,3 | 6,3 | 11,6 | | 18,3 |
| | R60 | | | 0,8 | 1,5 | 3,2 | 4,6 | 8,6 | | 13,5 |
| | R90 | | | 0,6 | 1,0 | 2,1 | 3,0 | 5,0 | | 7,7 |
| | R120 | | | 0,4 | 0,8 | 1,5 | 2,0 | 3,1 | | 4,9 |
| **Stainless steel A4** | | | | | | | | | | |
| Characteristic resistance | R30 | $V_{Rk,s,fi}$ | [kN] | - | 14,3 | 22,7 | 32,8 | 61,0 | - | - |
| | R60 | | | - | 11,1 | 17,6 | 25,5 | 47,5 | - | - |
| | R90 | | | - | 7,9 | 12,6 | 18,3 | 34,0 | - | - |
| | R120 | | | - | 6,3 | 10,0 | 14,6 | 27,2 | - | - |
| **Steel failure with lever arm** | | | | | | | | | | |
| **Steel zinc plated** | | | | | | | | | | |
| Characteristic resistance | R30 | $M^0_{Rk,s,fi}$ | [Nm] | 0,8 | 2,0 | 5,6 | 9,7 | 24,8 | | 42,4 |
| | R60 | | | 0,6 | 1,5 | 4,1 | 7,2 | 18,3 | | 29,8 |
| | R90 | | | 0,4 | 1,0 | 2,7 | 4,7 | 11,9 | | 17,1 |
| | R120 | | | 0,3 | 0,8 | 1,9 | 3,1 | 6,6 | | 10,7 |
| **Stainless steel A4** | | | | | | | | | | |
| Characteristic resistance | R30 | $M^0_{Rk,s,fi}$ | [Nm] | - | 6,2 | 13,2 | 24,4 | 61,8 | - | - |
| | R60 | | | - | 4,5 | 9,4 | 17,2 | 43,6 | - | - |
| | R90 | | | - | 2,7 | 5,6 | 10,0 | 25,3 | - | - |
| | R120 | | | - | 1,8 | 3,6 | 6,4 | 16,2 | - | - |

If pull-out is not decisive in equation D.4 and D.5, FprEN 1992-4:2016 $N_{Rk,p}$ must be replaced by $N^0_{Rk,c}$.

**Highload Anchor SZ**

**Performance**
Characteristic values under **fire exposure**

**Annex C8**

**Table C10:** Displacements under tension and shear load, **steel zinc plated**

| **Anchor size** | | | **10/M6** | **12/M8** | **15/M10** | **18/M12** | **24/M16** | **24/M16L** | **28/M20** |
|---|---|---|---|---|---|---|---|---|---|
| **Tension load** | | | | | | | | | |
| Tension load in cracked concrete | N | [kN] | 2,4 | 5,7 | 7,6 | 12,3 | 17,1 | 21,1 | 24 |
| Displacement | $\delta_{N0}$ | [mm] | 0,5 | 0,5 | 0,5 | 0,7 | 0,8 | 0,7 | 0,9 |
| | $\delta_{N\infty}$ | [mm] | 2,0 | 2,0 | 1,3 | 1,3 | 1,3 | 1,3 | 1,4 |
| Tension load in uncracked concrete | N | [kN] | 8,5 | 9,5 | 14,3 | 17,2 | 24 | 29,6 | 34 |
| Displacement | $\delta_{N0}$ | [mm] | 0,8 | 1,0 | 1,1 | | | 1,3 | 0,3 |
| | $\delta_{N\infty}$ | [mm] | 3,4 | | 1,7 | | | 2,3 | 1,4 |
| Seismic action C2 | | | | | | | | | |
| Displacement for DLS | $\delta_{N,eq\ (DLS)}$ | [mm] | - | 3,3 | 3,0 | 5,0 | 3,0 | 3,0 | 4,0 |
| Displacement for ULS | $\delta_{N,eq\ (ULS)}$ | [mm] | - | 12,2 | 11,3 | 16,0 | 9,2 | 9,2 | 13,8 |
| **Shear load** | | | | | | | | | |
| **SZ-B** | | | | | | | | | |
| Shear load in cracked and uncracked concrete | V | [kN] | 9,1 | 14 | 20,7 | 35,1 | 52,1 | 52,1 | 77 |
| Displacement | $\delta_{V0}$ | [mm] | 2,5 | 2,1 | 2,7 | 3,0 | 5,1 | 5,1 | 4,3 |
| | $\delta_{V\infty}$ | [mm] | 3,8 | 3,1 | 4,1 | 4,5 | 7,6 | 7,6 | 6,5 |
| Seismic action C2 | | | | | | | | | |
| Displacement for DLS | $\delta_{V,eq\ (DLS)}$ | [mm] | - | 2,3 | 3,1 | 3,0 | 2,6 | 2,6 | 1,6 |
| Displacement for ULS | $\delta_{V,eq\ (ULS)}$ | [mm] | - | 4,8 | 6,4 | 6,1 | 6,6 | 6,6 | 4,8 |
| **SZ-S** | | | | | | | | | |
| Shear load in cracked and uncracked concrete | V | [kN] | 10,1 | 17,1 | 27,5 | 41,5 | 72 | 72 | 77 |
| Displacement | $\delta_{V0}$ | [mm] | 2,9 | 2,5 | 3,6 | 3,5 | 7,0 | 7,0 | 4,3 |
| | $\delta_{V\infty}$ | [mm] | 4,4 | 3,8 | 5,4 | 5,3 | 10,5 | 10,5 | 6,5 |
| Seismic action C2 | | | | | | | | | |
| Displacement for DLS | $\delta_{V,eq\ (DLS)}$ | [mm] | - | 2,3 | 3,1 | 3,0 | 3,3 | 3,3 | 1,6 |
| Displacement for ULS | $\delta_{V,eq\ (ULS)}$ | [mm] | - | 4,8 | 6,4 | 6,1 | 8,2 | 8,2 | 4,8 |
| **SZ-SK** | | | | | | | | | |
| Shear load in cracked and uncracked concrete | V | [kN] | 10,1 | 17,1 | 27,5 | 41,5 | 72 | 72 | 77 |
| Displacement | $\delta_{V0}$ | [mm] | 2,9 | 2,5 | 3,6 | 3,5 | 7,0 | 7,0 | 4,3 |
| | $\delta_{V\infty}$ | [mm] | 4,4 | 3,8 | 5,4 | 5,3 | 10,5 | 10,5 | 6,5 |
| Seismic action C2 | | | | | | | | | |
| Displacement for DLS | $\delta_{V,eq\ (DLS)}$ | [mm] | - | 3,1 | 3,9 | 3,9 | - | - | - |
| Displacement for ULS | $\delta_{V,eq\ (ULS)}$ | [mm] | - | 10,2 | 11,8 | 13,0 | - | - | - |

**Table C11:** Displacements under tension and shear load, **stainless steel A4**

| **Anchor size** | | | **12/M8** | **15/M10** | **18/M12** | **24/M16** |
|---|---|---|---|---|---|---|
| **Tension load** | | | | | | |
| Tension load in cracked concrete | N | [kN] | 4,3 | 7,6 | 12,1 | 17,0 |
| Displacement | $\delta_{N0}$ | [mm] | 0,5 | 0,5 | 1,3 | 0,5 |
| | $\delta_{N\infty}$ | [mm] | 1,2 | 1,6 | 1,8 | 1,6 |
| Tension load in uncracked concrete | N | [kN] | 7,6 | 11,9 | 16,7 | 24,1 |
| Displacement | $\delta_{N0}$ | [mm] | 0,2 | 0,3 | 1,2 | 1,5 |
| | $\delta_{N\infty}$ | [mm] | 1,1 | - | - | - |
| Seismic action C2 | | | | | | |
| Displacement for DLS | $\delta_{N,eq\ (DLS)}$ | [mm] | 4,7 | 4,5 | 4,3 | 4,9 |
| Displacement for ULS | $\delta_{N,eq\ (ULS)}$ | [mm] | 13,3 | 12,7 | 9,7 | 10,1 |
| **Shear load** | | | | | | |
| Shear load in cracked concrete | V | [kN] | 13,9 | 21,1 | 34,7 | 50,8 |
| Displacement | $\delta_{V0}$ | [mm] | 3,4 | 4,9 | 4,8 | 6,7 |
| | $\delta_{V\infty}$ | [mm] | 5,1 | 7,4 | 7,1 | 10,1 |
| Seismic action C2 | | | | | | |
| **SZ-B, SZ-S** | | | | | | |
| Displacement for DLS | $\delta_{V,eq(DLS)}$ | [mm] | 2,8 | 3,1 | 2,6 | 3,3 |
| Displacement for ULS | $\delta_{V,eq\ (ULS)}$ | [mm] | 5,6 | 5,8 | 5,0 | 6,9 |
| **SZ-SK** | | | | | | |
| Displacement for DLS | $\delta_{V,eq(DLS)}$ | [mm] | 2,5 | 2,8 | 2,9 | - |
| Displacement for ULS | $\delta_{V,eq\ (ULS)}$ | [mm] | 5,8 | 5,9 | 6,9 | - |