# EMS Dubell F.1711 EASF

## ტექნიკური მონაცემების ქართული საინფორმაციო ვერსია

დოკუმენტის სტრუქტურა: თავდაპირველად მოცემულია ძირითადი ტექნიკური ტექსტის ქართული თარგმანი და გამოკვეთილი მონაცემები; შემდეგ უცვლელად ერთვის მწარმოებლის სრული ინგლისური TDS, მათ შორის ყველა საინჟინრო ცხრილი, ფორმულა და ნახაზი.

მნიშვნელოვანი: ეს არ არის მწარმოებლის მიერ დამოწმებული სრული ქართულენოვანი TDS. ინგლისური საინჟინრო ცხრილები არ არის თარგმნილი. რაოდენობრივი ანგარიშისა და მონტაჟისთვის უპირატესობა ენიჭება ოფიციალურ ინგლისურ TDS-სა და ETA-ს.

## პროდუქტის აღწერა

EMS Dubell F.1711 EASF არის ორკომპონენტიანი ეპოქსი-აკრილატის საფუძველზე დამზადებული საინექციო ქიმიური ანკერი. პროდუქტი არ შეიცავს სტიროლსა და ვინილტოლუენს; ხასიათდება დაბალი სუნით და განკუთვნილია შიდა და გარე სამუშაოებისთვის.

გამოიყენება მძიმე დატვირთვის სამაგრების დასამონტაჟებლად ბეტონსა და ქვის/აგურის წყობაში, ასევე არმატურის შემდგომი ჩამაგრებისთვის. მწარმოებელს აქვს სამი ვარიანტი: EASF — სტანდარტული; EASF-A — ცივი კლიმატისთვის (−20°C-მდე); EASF-E — ცხელი კლიმატისთვის, გახანგრძლივებული სამუშაო დროით.

## გამოყენების სფერო

ლითონის საყრდენები და კარკასები, მოაჯირები, ღობეები, აივნის პარაპეტები, საგზაო ნიშნები, მილსადენები, განათება, ფარდულები, უსაფრთხოების ბარიერები, თაროები, დანადგარები, ვენტილაცია და არმატურის შემდგომი ჩამაგრება.

პროდუქტის ცხრილები მოიცავს ანკერულ ღეროებს M8–M30 და არმატურას Ø8–Ø32. დასაშვები დატვირთვები აირჩევა კონკრეტული საფუძვლის, ანკერის ზომის, ჩაღრმავების, კიდის მანძილისა და საპროექტო პირობების მიხედვით.

## ძირითადი მახასიათებლები

შემადგენლობა: ეპოქსი-აკრილატის ფისი; შეუმყარებელი მასა: ნაცრისფერი, მაღალი თიქსოტროპიულობის პასტა.

მწარმოებლის TDS-ის მიხედვით განიხილება მშრალ, ნესტიან და წყლით სავსე ხვრელებში მონტაჟი შესაბამისი ინსტრუქციით; ტემპერატურული მდგრადობა −40°C-დან +80°C-მდე (ხანგრძლივად მაქსიმუმ +50°C); სეისმური შესრულება C1 კატეგორიით; დაბალი VOC, A+.

TDS-ის საწყის აღწერაში ძირითადად მითითებულია დაუბზარავი ბეტონი; მახასიათებლების სექციაში მოცემულია შეფასებები დაბზარული და დაუბზარავი ბეტონისთვის. კონკრეტული დანიშნულების დასაშვებობა გადაამოწმეთ შესაბამის ETA-სა და დატვირთვის ცხრილებთან.

## გამაგრების დრო — სტანდარტული EASF

ქვემოთ მოყვანილია მწარმოებლის ცხრილის დროები; სამუშაო დრო იცვლება საფუძვლის/კარტრიჯის ტემპერატურის მიხედვით.

## მონტაჟის ძირითადი პროცედურა

გაბურღეთ შესაბამისი დიამეტრისა და სიღრმის ხვრელი; გაწმინდეთ ფუნჯითა და შეკუმშული ჰაერით TDS-ის თანახმად. დაამაგრეთ სტატიკური შემრევი; პირველადი არაერთგვაროვანი ნარევი გადააგდეთ. ფისი შეიყვანეთ ხვრელის ძირიდან, მოერიდეთ ჰაერის ჯიბეებს; ჩასვით სუფთა ანკერი ბრუნვით და არ დატვირთოთ განსაზღვრული გამაგრების დროის ამოწურვამდე.

ღრუტანიან წყობაში გამოიყენეთ მწარმოებლის მიერ გათვალისწინებული ბადისებრი საცმი. დეტალური ნაბიჯები, ხვრელის ზომები და დატვირთვის ცხრილები იხილეთ უცვლელ ორიგინალურ TDS-ში.

## შენიშვნა საინჟინრო ცხრილებზე

ინგლისურ დანართში უცვლელადაა შენარჩუნებული ანკერის ჩაღრმავების, კიდის მანძილის, დამაგრების ინტერვალის, დამახასიათებელი/საანგარიშო წინაღობის, რეკომენდებული დატვირთვების და ქიმიური მდგრადობის სრული ცხრილები. ისინი წარმოადგენს აუცილებელ საწყის მონაცემებს ინჟინრისთვის.

## სამუშაო და დატვირთვამდე გამაგრების დრო — შერჩეული მონაკვეთები

მწარმოებლის TDS-იდან ამოღებული მონაცემები; შეადარეთ იმავე ვარიანტისა და ტემპერატურის შესაბამის რიგს ორიგინალურ ცხრილში.

| საფუძვლის ტემპერატურა | სამუშაო დრო | დატვირთვამდე დრო |
|---|---|---|
| +5°C | 18 წთ | 150 წთ |
| +10…+20°C | 6 წთ | 85 წთ |
| +20…+25°C | 5 წთ | 50 წთ |
| +25…+30°C | 4 წთ | 40 წთ |
| +30°C | 3 წთ | 35 წთ |

## დანართი — მწარმოებლის სრული ინგლისური TDS (უცვლელი ცხრილებით)

# EMS Dubell F.1711 Chemical Anchor EASF, EASF-E, EASF-A

## Product description

EASF is two component bonded anchoring system anchoring of wide variety of construction applications. Since it is formulated free of styrene and vinyl toluene(VT), EASF has almost no odour and is ideal for indoor and outdoor applications.
EASF is for heavy-duty applications in non-cracked concrete and masonry and many other base materials like aerated concrete, lightweight solid or hollow concrete blocks or sand lime bricks. EASF chemical anchor can be used for post-installed rebar connections Ø8 to Ø32. EASF has three version for various climate conditions.

- EASF: Normal working and loading time
- EASF-A: Faster working and loading time for arctic(up to -20 °C) climate
- EASF-E: Slower working and loading time for hot climate

| | | |
|---|---|---|
| Main constituent | : | Epoxy acrylate resin |
| Appearance (uncured) | : | Paste |
| Colour | : | Grey |
| Viscosity | : | Thixotropic, high |

Applications:
Masonry support, Handrails, Fences, balcony parapets, road signs, Pipe systems, lighting systems, canopies, safety barriers, racking, machinery, ventilation systems, reinforcement bar systems.

Features:

- Assessed for structural applications in cracked and non-cracked concrete, M8 to M30. Rebar used as stud from Ø8 to Ø32 Working life of 50 and/or 100 years.
- Dry, wet and flooded holes
- Temperature range: from -40°C to +80°C (long term maximum temperature +50°C).
- For high loads
- Styrene free formulation (SF)
- Compatible with several building materials including perforated brick.
- For heavy anchoring - doweling and post-installed rebar connection
- Low odour and VOC content (A+)
- Seismic anchor performance category (C1)

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## Working and loading time

Working time is typical gel time at the highest temperature of the given range.
Loading time is setting time at the lowest temperature of the given range.

Epoxyacrylate Styrene Free (EASF)

| Temperature of base material | +5°C | +5°C to +10°C | +10°C to +20°C | +20°C to +25°C | +25°C to +30°C | +30°C |
|---|---|---|---|---|---|---|
| Temperature of cartridge | +5°C | +5°C to +10°C | +10°C to +20°C | +20°C to +25°C | +25°C to +30°C | +30°C |
| Working time (mins) | 18 | 10 | 6 | 5 | 4 | 3 |
| Loading time (mins) | 150 | 150 | 85 | 50 | 40 | 35 |

Epoxyacrylate Styrene Free Arctic Grade (EASF-A)

| Temperature of base material | -20°C | -20°C to -10°C | -10°C to 0°C | 0°C to +5°C | +5°C to +15°C | +15°C |
|---|---|---|---|---|---|---|
| Temperature of cartridge | -20°C | -20°C to -10°C | -10°C to 0°C | 0°C to +5°C | +5°C to +15°C | +15°C |
| Working time (mins) | 60 | 45 | 20 | 6 | 3 | 2 |
| Loading time (mins) | 24hr | 960 | 360 | 240 | 75 | 45 |

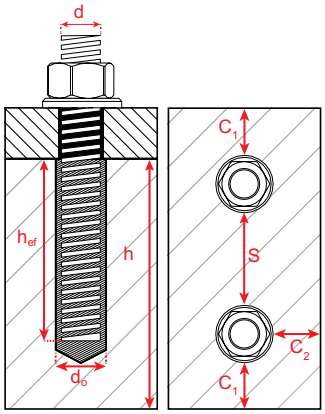
Epoxyacrylate Styrene Free Tropical Grade (EASF-E)

| Temperature of base material | +10°C | +10°C to +20°C | +20°C to +25°C | +25°C to +30°C | +30°C to +35°C | +35°C to +40°C | +40°C to +45°C | +45°C |
|---|---|---|---|---|---|---|---|---|
| Temperature of cartridge | +10°C | +10°C to +20°C | +20°C to +25°C | +25°C to +30°C | +30°C to +35°C | +35°C to +40°C | +40°C to +45°C | +45°C |
| Working time (mins) | 30 | 15 | 10 | 7.5 | 5 | 3.5 | 2.5 | 1.5 |
| Loading time (mins) | 300 | 300 | 150 | 85 | 50 | 40 | 35 | 15 |

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# EMS Dubell F.1711 Chemical Anchor EASF, EASF-E, EASF-A

## Installation Parameters




| Installation parameter - Threaded Rod | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Anchor size | | | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
| d | Diameter of anchor bolt or thread diameter | mm | 8 | 10 | 12 | 16 | 20 | 24 | 27 | 30 |
| $d_0$ | Nominal diameter of drill bit | mm | 10 | 12 | 14 | 18 | 24 | 28 | 32 | 35 |
| $d_f$ | Diameter of clearance hole in the fixture (≤) | mm | 9 | 12 | 14 | 18 | 22 | 26 | 30 | 33 |
| $d_b$ | Diameter of steel brush (≥) | mm | 12 | 14 | 16 | 20 | 26 | 30 | 34 | 37 |
| $h_{ef,min}$ | Minimum effective anchorage depth | mm | 60 | 60 | 70 | 80 | 90 | 96 | 108 | 120 |
| $h_{ef}$ | Standard effective anchorage depth | mm | 80 | 90 | 110 | 125 | 170 | 210 | 250 | 280 |
| $h_{ef,max}$ | Maximum effective anchorage depth (20*d) | mm | 160 | 200 | 240 | 320 | 400 | 480 | 540 | 600 |
| $h_{min}$ | Minimum thickness of the concrete member | mm | $h_{ef}$+30mm ≥100mm | | | $h_{ef}$ + 2$d_0$ | | | | |
| $T_{inst}$ | Nominal torque moment | Nm | 10 | 20 | 40 | 80 | 120 | 160 | 180 | 200 |
| $s_{min}$ | Minimum spacing (5*d) | mm | 40 | 50 | 60 | 80 | 100 | 120 | 135 | 150 |
| $s_{cr,N}$ | Spacing | mm | 184 | 252 | 304 | 376 | 506 | 582 | 624 | 658 |
| $c_{min}$ | Minimum edge distance (5*d) | mm | 40 | 50 | 60 | 80 | 100 | 120 | 135 | 150 |
| $c_{cr,N}$ | Edge distance | mm | 92 | 126 | 152 | 188 | 253 | 291 | 312 | 329 |

| Installation parameter - Reinforcing bar | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Anchor size | | | Ø8 | Ø10 | Ø12 | Ø14 | Ø16 | Ø20 | Ø25 | Ø28 | Ø32 |
| d | Diameter of anchor | mm | 8 | 10 | 12 | 14 | 16 | 20 | 25 | 28 | 32 |
| $d_0$ | Nominal diameter of drill bit | mm | 12 | 14 | 16 | 18 | 20 | 24 | 32 | 35 | 40 |
| $d_b$ | Diameter of steel brush (≥) | mm | 14 | 16 | 18 | 20 | 22 | 26 | 34 | 37 | 41 |
| $h_{ef,min}$ | Minimum effective anchorage depth | mm | 60 | 60 | 70 | 75 | 80 | 90 | 100 | 112 | 128 |
| $h_{ef}$ | Standard effective anchorage depth | mm | 80 | 90 | 110 | 115 | 125 | 170 | 210 | 250 | 280 |
| $h_{ef,max}$ | Maximum effective anchorage depth (20*d) | mm | 160 | 200 | 240 | 280 | 320 | 400 | 500 | 560 | 640 |

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| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $h_{min}$ | Minimum thickness of the concrete member | mm | $h_{ef}$+30mm ≥100mm | | $h_{ef}$ + 2$d_0$ | | | | | | |
| $s_{min}$ | Minimum spacing (5*d) | mm | 40 | 50 | 60 | 70 | 80 | 100 | 125 | 140 | 160 |
| $s_{cr,N}$ | Spacing | mm | 184 | 252 | 304 | 346 | 376 | 506 | 606 | 646 | 682 |
| $c_{min}$ | Minimum edge distance (5*d) | mm | 40 | 50 | 60 | 70 | 80 | 100 | 125 | 140 | 160 |
| $c_{cr,N}$ | Edge distance | mm | 92 | 126 | 152 | 173 | 188 | 253 | 303 | 323 | 341 |

## Load values – Characteristic Resistance – Threaded bar

Characteristic resistances for C20/25 concrete for an isolated anchor (without considering anchor-to-anchor or anchor-to-edge distance effects) and class 5.8,8.8,10.9 studs or A4-70 and A4-80, 1,4529 stainless steel are shown in tables below.

| Characteristic resistance values to tension load – threaded rod | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Steel Failure - Characteristic resistance | | | | | | | | | |
| Size | | | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
| Steel grade 5.8 | $N_{Rk,s}$ | [kN] | 18 | 29 | 42 | 79 | 123 | 177 | 230 | 281 |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,5 | | | | | | | |
| Steel grade 8.8 | $N_{Rk,s}$ | [kN] | 29 | 46 | 67 | 126 | 196 | 282 | 367 | 449 |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,5 | | | | | | | |
| Steel grade 10.9 | $N_{Rk,s}$ | [kN] | 37 | 58 | 84 | 157 | 245 | 353 | 459 | 561 |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,4 | | | | | | | |
| Stainless Steel grade A4-70 | $N_{Rk,s}$ | [kN] | 26 | 41 | 59 | 110 | 172 | 247 | 321 | 393 |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,9 | | | | | | | |
| Stainless Steel grade A4-80 | $N_{Rk,s}$ | [kN] | 29 | 46 | 67 | 126 | 196 | 282 | 367 | 449 |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,6 | | | | | | | |
| Stainless Steel grade 1,4529 | $N_{Rk,s}$ | [kN] | 26 | 41 | 59 | 110 | 172 | 247 | 321 | 393 |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,5 | | | | | | | |

| Characteristic resistance values to shear load – threaded rod | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Steel Failure - Without Lever Arm | | | | | | | | | |
| Size | | | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
| Steel grade 5.8 | $V_{Rk,s}$ | [kN] | 9 | 15 | 21 | 39 | 61 | 88 | 115 | 140 |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,25 | | | | | | | |
| Steel grade 8.8 | $V_{Rk,s}$ | [kN] | 15 | 23 | 34 | 63 | 98 | 141 | 184 | 224 |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,25 | | | | | | | |
| Steel grade 10.9 | $V_{Rk,s}$ | [kN] | 18 | 29 | 42 | 79 | 123 | 177 | 230 | 281 |

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|---|---|---|---|---|---|---|---|---|---|---|
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,5 | | | | | | | |
| Stainless Steel grade A4-70 | $V_{Rk,s}$ | [kN] | 13 | 20 | 30 | 55 | 86 | 124 | 161 | 196 |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,56 | | | | | | | |
| Stainless Steel grade A4-80 | $V_{Rk,s}$ | [kN] | 15 | 23 | 34 | 63 | 98 | 141 | 184 | 224 |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,33 | | | | | | | |
| Stainless Steel grade 1,4529 | $V_{Rk,s}$ | [kN] | 13 | 20 | 30 | 55 | 86 | 124 | 161 | 196 |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,25 | | | | | | | |
| Steel Failure - With Lever Arm | | | | | | | | | | |
| Size | | | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
| Steel grade 5.8 | $M^0_{Rk,s}$ | [kN] | 19 | 37 | 66 | 166 | 325 | 561 | 832 | 1125 |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,25 | | | | | | | |
| Steel grade 8.8 | $M^0_{Rk,s}$ | [kN] | 30 | 60 | 105 | 266 | 519 | 898 | 1332 | 1799 |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,25 | | | | | | | |
| Steel grade 10.9 | $M^0_{Rk,s}$ | [kN] | 37 | 75 | 131 | 333 | 649 | 1123 | 1664 | 2249 |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,5 | | | | | | | |
| Stainless Steel grade A4-70 | $M^0_{Rk,s}$ | [kN] | 26 | 52 | 92 | 233 | 454 | 786 | 1165 | 1574 |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,56 | | | | | | | |
| Stainless Steel grade A4-80 | $M^0_{Rk,s}$ | [kN] | 30 | 60 | 105 | 266 | 519 | 898 | 1332 | 1799 |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,33 | | | | | | | |
| Stainless Steel grade 1,4529 | $M^0_{Rk,s}$ | [kN] | 26 | 52 | 92 | 233 | 454 | 786 | 1165 | 1574 |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,25 | | | | | | | |
| Concrete pry-out failure | | | | | | | | | | |
| Factor for resistance to pry-out failure | $k_3$ | [-] | 2,0 | | | | | | | |
| Installation safety factor | $\gamma_2 = \gamma_{inst}$ | [-] | 1,0 | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Concrete edge failure – threaded bar | | | | | | | | | |
| Size | | | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
| Outside diameter of anchor | $d_{nom}$ | [mm] | 8 | 10 | 12 | 16 | 20 | 24 | 27 | 30 |
| Effective length of anchor | $\ell_f$ | [mm] | min ($h_{ef}$, 8*$d_{nom}$) | | | | | | | |
| Installation safety factor | $\gamma_2 = \gamma_{inst}$ | [-] | 1,00 | | | | | | | |

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| Characteristic resistance to tension load – threaded rod (1) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Characteristic bond resistance in non-cracked concrete C20/25 | | | | | | | | | | | | |
| Concrete Class | Temperature Range(2) | Embedment depth | Size | | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
| NON-CRACKED CONCRETE | 24˚C / 40˚C | $h_{ef,min}$ | $N_{Rk,p}$ | [kN] | 15,1 | 22,6 | 31,7 | 48,3 | 62,2 | 79,6 | 91,6 | 101,8 |
| | | $h_{ef,standard}$ | $N_{Rk,p}$ | [kN] | 20,1 | 33,9 | 49,8 | 75,4 | 117,5 | 174,2 | 212,1 | 237,5 |
| | | $h_{ef,max}$ = 20*d | $N_{Rk,p}$ | [kN] | 40,2 | 75,4 | 108,6 | 193,0 | 276,5 | 398,1 | 458,0 | 508,9 |
| | 50˚C / 80˚C | $h_{ef,min}$ | $N_{Rk,p}$ | [kN] | 11,3 | 16,0 | 22,4 | 34,2 | 48,1 | 61,5 | 64,1 | 73,5 |
| | | $h_{ef,standard}$ | $N_{Rk,p}$ | [kN] | 15,1 | 24,0 | 35,2 | 53,4 | 90,8 | 134,6 | 148,4 | 171,5 |
| | | $h_{ef,max}$ = 20*d | $N_{Rk,p}$ | [kN] | 30,2 | 53,4 | 76,9 | 136,7 | 213,6 | 307,6 | 320,6 | 367,6 |
| CRACKED CONCRETE | 24˚C / 40˚C | $h_{ef,min}$ | $N_{Rk,p}$ | [kN] | 7,8 | 9,8 | 14,0 | 21,3 | 30,0 | 39,8 | 57,7 | 73,5 |
| | | $h_{ef,standard}$ | $N_{Rk,p}$ | [kN] | 10,5 | 14,7 | 22,0 | 33,3 | 56,6 | 87,1 | 133,6 | 171,5 |
| | | $h_{ef,max}$ = 20*d | $N_{Rk,p}$ | [kN] | 20,9 | 32,7 | 48,0 | 85,3 | 133,2 | 199,1 | 288,6 | 367,6 |
| | 50˚C / 80˚C | $h_{ef,min}$ | $N_{Rk,p}$ | [kN] | 5,5 | 6,9 | 9,8 | 14,9 | 21,0 | 27,9 | 40,4 | 51,5 |
| | | $h_{ef,standard}$ | $N_{Rk,p}$ | [kN] | 7,3 | 10,3 | 15,4 | 23,3 | 39,6 | 61,0 | 93,5 | 120,1 |
| | | $h_{ef,max}$ = 20*d | $N_{Rk,p}$ | [kN] | 14,6 | 22,9 | 33,6 | 59,7 | 93,2 | 139,3 | 202,0 | 257,3 |

(1) For more detailed load information, please Declaration of Performance(DOP).

(2) Short term temperature / long term temperature. Long term concrete temperatures are roughly constant over significant periods of time. Short term elevated temperatures are those that occur over brief intervals, e.g. as a result of diurnal cycling.

## Load values – Characteristic Resistance – Rebar

| Characteristic resistance values to tension load - rebar | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Steel Failure - Characteristic resistance | | | | | | | | | | |
| Size | | | Ø8 | Ø10 | Ø12 | Ø14 | Ø16 | Ø20 | Ø25 | Ø28 | Ø32 |
| Rebar Grade BSt 500 S | $V_{Rk,s}$ | [kN] | 28 | 43 | 62 | 85 | 111 | 173 | 270 | 339 | 442 |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,5 | | | | | | | | |

| Characteristic resistance values to shear load - rebar | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Steel Failure - Without Lever Arm | | | | | | | | | |
| Size | Ø8 | Ø10 | Ø12 | Ø14 | Ø16 | Ø20 | Ø25 | Ø28 | Ø32 |

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# EMS Dubell F.1711 Chemical Anchor EASF, EASF-E, EASF-A

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Rebar Grade BSt 500 S | $V_{Rk,s}$ | [kN] | 14 | 22 | 31 | 42 | 55 | 86 | 135 | 169 | 221 |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,5 | | | | | | | | |
| Ductility factor acc. to CEN/TS 1992-4-5 6.3.2.1 | $k_2$ | [-] | 0,8 | | | | | | | | |
| Steel Failure - With Lever Arm | | | | | | | | | | | |
| Size | | | Ø8 | Ø10 | Ø12 | Ø14 | Ø16 | Ø20 | Ø25 | Ø28 | Ø32 |
| Rebar Grade BSt 500 S | $M^0_{Rk,s}$ | [kN] | 33 | 65 | 112 | 178 | 265 | 518 | 1013 | 1422 | 2122 |
| Concrete pry-out failure | | | | | | | | | | | |
| Factor for resistance to pry-out failure | $k_3$ | [-] | 2,0 | | | | | | | | |
| Installation safety factor | $\gamma_2 = \gamma_{inst}$ | [-] | 1,0 | | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Concrete edge failure - rebar** | | | | | | | | | | |
| Size | | | Ø8 | Ø10 | Ø12 | Ø14 | Ø16 | Ø20 | Ø25 | Ø28 | Ø32 |
| Outside diameter of anchor | $d_{nom}$ | [mm] | 8 | 10 | 12 | 14 | 16 | 20 | 25 | 28 | 32 |
| Effective length of anchor | $\ell_f$ | [mm] | min ($h_{ef}$, 8*$d_{nom}$) | | | | | | | | |
| Installation safety factor | $\gamma_2 = \gamma_{inst}$ | [-] | 1,00 | | | | | | | | |

**Characteristic resistance to tension load – rebar (1)**

Characteristic bond resistance in non-cracked concrete C20/25

| Concrete Class | Temperature Range(2) | Embedment depth | Size | | Ø8 | Ø10 | Ø12 | Ø14 | Ø16 | Ø20 | Ø25 | Ø28 | Ø32 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NON-CRACKED CONCRETE | 24˚C / 40˚C | $h_{ef,min}$ | $N_{Rk,p}$ | [kN] | 15,1 | 22,6 | 31,7 | 39,6 | 46,2 | 62,2 | 78,5 | 98,5 | 109,4 |
| | | $h_{ef,standard}$ | $N_{Rk,p}$ | [kN] | 20,1 | 33,9 | 49,8 | 60,7 | 72,3 | 117,5 | 164,9 | 219,9 | 239,3 |
| | | $h_{ef,max}$ = 20*d | $N_{Rk,p}$ | [kN] | 40,2 | 75,4 | 108,6 | 147,8 | 185,0 | 276,5 | 392,7 | 492,6 | 546,9 |
| | 50˚C / 80˚C | $h_{ef,min}$ | $N_{Rk,p}$ | [kN] | 10,9 | 16,3 | 22,8 | 28,5 | 33,3 | 44,8 | 56,5 | 67,0 | 74,4 |
| | | $h_{ef,standard}$ | $N_{Rk,p}$ | [kN] | 14,5 | 24,4 | 35,8 | 43,7 | 52,0 | 84,6 | 118,8 | 149,5 | 162,7 |
| | | $h_{ef,max}$ = 20*d | $N_{Rk,p}$ | [kN] | 29,0 | 54,3 | 78,2 | 106,4 | 133,2 | 199,1 | 282,7 | 335,0 | 371,9 |
| CRACKED CONCRETE | 24˚C / 40˚C | $h_{ef,min}$ | $N_{Rk,p}$ | [kN] | 7,8 | 9,8 | 14,0 | 17,5 | 21,3 | 31,1 | 49,5 | 64,0 | 83,6 |
| | | $h_{ef,standard}$ | $N_{Rk,p}$ | [kN] | 10,5 | 14,7 | 22,0 | 26,8 | 33,3 | 58,7 | 103,9 | 142,9 | 183,0 |
| | | $h_{ef,max}$ = 20*d | $N_{Rk,p}$ | [kN] | 20,9 | 32,7 | 48,0 | 65,3 | 85,3 | 138,2 | 247,4 | 320,2 | 418,2 |
| | 50˚C / 80˚C | $h_{ef,min}$ | $N_{Rk,p}$ | [kN] | 5,5 | 6,9 | 9,8 | 12,2 | 14,9 | 21,8 | 34,6 | 44,8 | 58,5 |
| | | $h_{ef,standard}$ | $N_{Rk,p}$ | [kN] | 7,3 | 10,3 | 15,4 | 18,8 | 23,3 | 41,1 | 72,7 | 100,1 | 128,1 |
| | | $h_{ef,max}$ = 20*d | $N_{Rk,p}$ | [kN] | 14,6 | 22,9 | 33,6 | 45,7 | 59,7 | 96,8 | 173,2 | 224,1 | 292,7 |

(1) For more detailed load information, please Declaration of Performance(DOP).

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(2) Short term temperature / long term temperature. Long term concrete temperatures are roughly constant over significant periods of time. Short term elevated temperatures are those that occur over brief intervals, e.g. as a result of diurnal cycling.

## Load values – Design Resistance – Threaded bar

| Design resistance values to tension load -threaded bar | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Steel Failure - Design resistance | | | | | | | | | |
| Size | | | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
| Steel grade 5.8 | $N_{Rd,s}$ | [kN] | 12 | 19 | 28 | 53 | 82 | 118 | 153 | 187 |
| Steel grade 8.8 | $N_{Rd,s}$ | [kN] | 19 | 31 | 45 | 84 | 131 | 188 | 245 | 299 |
| Steel grade 10.9 | $N_{Rd,s}$ | [kN] | 26 | 41 | 60 | 112 | 175 | 252 | 328 | 401 |
| Stainless Steel grade A4-70 | $N_{Rd,s}$ | [kN] | 14 | 22 | 31 | 58 | 91 | 130 | 169 | 207 |
| Stainless Steel grade A4-80 | $N_{Rd,s}$ | [kN] | 18 | 29 | 42 | 79 | 123 | 176 | 229 | 281 |
| Stainless Steel grade 1,4529 | $N_{Rd,s}$ | [kN] | 17 | 27 | 39 | 73 | 115 | 165 | 214 | 262 |

| Design resistance values to shear load - threaded bar | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Steel Failure - Design resistance | | | | | | | | | |
| Size | | | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
| Steel grade 5.8 | $V_{Rd,s}$ | [kN] | 7 | 12 | 17 | 31 | 49 | 70 | 92 | 112 |
| Steel grade 8.8 | $V_{Rd,s}$ | [kN] | 12 | 18 | 27 | 50 | 78 | 113 | 147 | 179 |
| Steel grade 10.9 | $V_{Rd,s}$ | [kN] | 12 | 19 | 28 | 53 | 82 | 118 | 153 | 187 |
| Stainless Steel grade A4-70 | $V_{Rd,s}$ | [kN] | 8 | 13 | 19 | 35 | 55 | 79 | 103 | 126 |
| Stainless Steel grade A4-80 | $V_{Rd,s}$ | [kN] | 11 | 17 | 26 | 47 | 74 | 106 | 138 | 168 |
| Stainless Steel grade 1,4529 | $V_{Rd,s}$ | [kN] | 10 | 16 | 24 | 44 | 69 | 99 | 129 | 157 |

| Design resistance values to tension load - threaded bar [1] | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Design bond resistance in non-cracked concrete C20/25 | | | | | | | | | | | | |
| Concrete Class | Temperature Range[2] | Embedment depth | Size | | | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
| NON-CRACKED CONCRETE | 24˚C / 40˚C | $h_{ef,min}$ | $N_{Rd,p}$ | [kN] | | 10,1 | 12,6 | 17,6 | 26,8 | 34,6 | 44,2 | 50,9 | 56,5 |
| | | $h_{ef,standard}$ | $N_{Rd,p}$ | [kN] | | 13,4 | 18,8 | 27,6 | 41,9 | 65,3 | 96,8 | 117,8 | 131,9 |
| | | $h_{ef,max}$ = 20*d | $N_{Rd,p}$ | [kN] | | 26,8 | 41,9 | 60,3 | 107,2 | 153,6 | 221,2 | 254,5 | 282,7 |
| | 50˚C / 80˚C | $h_{ef,min}$ | $N_{Rd,p}$ | [kN] | | 7,5 | 8,9 | 12,5 | 19,0 | 26,7 | 34,2 | 35,6 | 40,8 |
| | | $h_{ef,standard}$ | $N_{Rd,p}$ | [kN] | | 10,1 | 13,4 | 19,6 | 29,7 | 50,4 | 74,8 | 82,5 | 95,3 |
| | | $h_{ef,max}$ = 20*d | $N_{Rd,p}$ | [kN] | | 20,1 | 29,7 | 42,7 | 76,0 | 118,7 | 170,9 | 178,1 | 204,2 |

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| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CRACKED CONCRETE | 24˚C / 40˚C | $h_{ef,min}$ | $N_{Rd,p}$ | [kN] | 5,2 | 5,4 | 7,8 | 11,8 | 16,7 | 22,1 | 32,1 | 40,8 |
| | | $h_{ef,standard}$ | $N_{Rd,p}$ | [kN] | 7,0 | 8,2 | 12,2 | 18,5 | 31,5 | 48,4 | 74,2 | 95,3 |
| | | $h_{ef,max}$ = 20*d | $N_{Rd,p}$ | [kN] | 13,9 | 18,2 | 26,6 | 47,4 | 74,0 | 110,6 | 160,3 | 204,2 |
| | 50˚C / 80˚C | $h_{ef,min}$ | $N_{Rd,p}$ | [kN] | 3,7 | 3,8 | 5,4 | 8,3 | 11,7 | 15,5 | 22,4 | 28,6 |
| | | $h_{ef,standard}$ | $N_{Rd,p}$ | [kN] | 4,9 | 5,7 | 8,5 | 13,0 | 22,0 | 33,9 | 52,0 | 66,7 |
| | | $h_{ef,max}$ = 20*d | $N_{Rd,p}$ | [kN] | 9,8 | 12,7 | 18,6 | 33,2 | 51,8 | 77,4 | 112,2 | 142,9 |

(1) For more detailed load information, please Declaration of Performance(DOP).

(2) Short term temperature / long term temperature. Long term concrete temperatures are roughly constant over significant periods of time. Short term elevated temperatures are those that occur over brief intervals, e.g. as a result of diurnal cycling.

## Load values – Design Resistance – Rebar

| Design resistance values to tension load - rebar | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Steel Failure - Design resistance | | | | | | | | | | | |
| Size | | | Ø8 | Ø10 | Ø12 | Ø14 | Ø16 | Ø20 | Ø25 | Ø28 | Ø32 |
| Rebar Grade BSt 500 S | $N_{Rk,s}$ | [kN] | 18 | 29 | 41 | 56 | 74 | 115 | 180 | 226 | 295 |

| Design resistance values to shear load - rebar | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Steel Failure - Design resistance | | | | | | | | | | |
| Size | | | Ø8 | Ø10 | Ø12 | Ø14 | Ø16 | Ø20 | Ø25 | Ø28 | Ø32 |
| Rebar Grade BSt 500 S | $V_{Rk,s}$ | [kN] | 9 | 14 | 21 | 28 | 37 | 58 | 90 | 113 | 147 |

| Design resistance values to tension load - rebar (1) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Design bond resistance in non-cracked concrete C20/25 | | | | | | | | | | | | | |
| Concrete Class | Temperature Range(2) | Embedment depth | Size | | | Ø8 | Ø10 | Ø12 | Ø14 | Ø16 | Ø20 | Ø25 | Ø28 | Ø32 |
| NON-CRACKED CONCRETE | 24˚C / 40˚C | $h_{ef,min}$ | $N_{Rk,p}$ | [kN] | | 10,1 | 12,6 | 17,6 | 22,0 | 25,7 | 34,6 | 43,6 | 54,7 | 60,8 |
| | | $h_{ef,standard}$ | $N_{Rk,p}$ | [kN] | | 13,4 | 18,8 | 27,6 | 33,7 | 40,1 | 65,3 | 91,6 | 122,2 | 132,9 |
| | | $h_{ef,max}$ = 20*d | $N_{Rk,p}$ | [kN] | | 26,8 | 41,9 | 60,3 | 82,1 | 102,8 | 153,6 | 218,2 | 273,7 | 303,8 |
| | 50˚C / 80˚C | $h_{ef,min}$ | $N_{Rk,p}$ | [kN] | | 7,2 | 9,0 | 12,7 | 15,8 | 18,5 | 24,9 | 31,4 | 37,2 | 41,3 |
| | | $h_{ef,standard}$ | $N_{Rk,p}$ | [kN] | | 9,7 | 13,6 | 19,9 | 24,3 | 28,9 | 47,0 | 66,0 | 83,1 | 90,4 |
| | | $h_{ef,max}$ = 20*d | $N_{Rk,p}$ | [kN] | | 19,3 | 30,2 | 43,4 | 59,1 | 74,0 | 110,6 | 157,1 | 186,1 | 206,6 |
| CRACKED CONCRETE | 24˚C / 40˚C | $h_{ef,min}$ | $N_{Rk,p}$ | [kN] | | 5,2 | 5,4 | 7,8 | 9,7 | 11,8 | 17,3 | 27,5 | 35,6 | 46,5 |
| | | $h_{ef,standard}$ | $N_{Rk,p}$ | [kN] | | 7,0 | 8,2 | 12,2 | 14,9 | 18,5 | 32,6 | 57,7 | 79,4 | 101,6 |
| | | $h_{ef,max}$ = 20*d | $N_{Rk,p}$ | [kN] | | 13,9 | 18,2 | 26,6 | 36,3 | 47,4 | 76,8 | 137,4 | 177,9 | 232,3 |

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| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50˚C / 80˚C | $h_{ef,min}$ | $N_{Rk,p}$ | [kN] | 3,7 | 3,8 | 5,4 | 6,8 | 8,3 | 12,1 | 19,2 | 24,9 | 32,5 |
| | $h_{ef,standard}$ | $N_{Rk,p}$ | [kN] | 4,9 | 5,7 | 8,5 | 10,4 | 13,0 | 22,8 | 40,4 | 55,6 | 71,2 |
| | $h_{ef,max}$ = 20*d | $N_{Rk,p}$ | [kN] | 9,8 | 12,7 | 18,6 | 25,4 | 33,2 | 53,8 | 96,2 | 124,5 | 162,6 |

(1) For more detailed load information, please Declaration of Performance(DOP).

(2) Short term temperature / long term temperature. Long term concrete temperatures are roughly constant over significant periods of time. Short term elevated temperatures are those that occur over brief intervals, e.g. as a result of diurnal cycling.

## Load values – Maximum load recommended – Threaded bar

The recommended loads are only valid for single anchor for a roughly design, if the following conditions are valid:

$c \geq c_{cr,N}$ $s \geq s_{cr,N}$ $h \geq 2*h_{ef}$

The safety factors are already included in the recommended loads.

### Maximum loads recommended - Tension load – threaded bar

Steel Failure - Recommended load

| Size | | | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
|---|---|---|---|---|---|---|---|---|---|---|
| Steel grade 5.8 | $N_{Rec,s}$ | [kN] | 9 | 14 | 20 | 38 | 59 | 84 | 110 | 134 |
| Steel grade 8.8 | $N_{Rec,s}$ | [kN] | 14 | 22 | 32 | 60 | 93 | 134 | 175 | 214 |
| Steel grade 10.9 | $N_{Rec,s}$ | [kN] | 19 | 30 | 43 | 80 | 125 | 180 | 234 | 286 |
| Stainless Steel grade A4-70 | $N_{Rec,s}$ | [kN] | 10 | 15 | 22 | 41 | 65 | 93 | 121 | 148 |
| Stainless Steel grade A4-80 | $N_{Rec,s}$ | [kN] | 13 | 21 | 30 | 56 | 88 | 126 | 164 | 200 |
| Stainless Steel grade 1,4529 | $N_{Rec,s}$ | [kN] | 12 | 20 | 28 | 52 | 82 | 118 | 153 | 187 |

### Maximum loads recommended - Shear load – threaded bar

Steel Failure - Recommended load

| Size | | | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
|---|---|---|---|---|---|---|---|---|---|---|
| Steel grade 5.8 | $V_{Rd,s}$ | [kN] | 5 | 9 | 12 | 22 | 35 | 50 | 66 | 80 |
| Steel grade 8.8 | $V_{Rd,s}$ | [kN] | 9 | 13 | 19 | 36 | 56 | 81 | 105 | 128 |
| Steel grade 10.9 | $V_{Rd,s}$ | [kN] | 9 | 14 | 20 | 38 | 59 | 84 | 110 | 134 |
| Stainless Steel grade A4-70 | $V_{Rd,s}$ | [kN] | 6 | 9 | 14 | 25 | 39 | 57 | 74 | 90 |
| Stainless Steel grade A4-80 | $V_{Rd,s}$ | [kN] | 8 | 12 | 18 | 34 | 53 | 76 | 99 | 120 |
| Stainless Steel grade 1,4529 | $V_{Rd,s}$ | [kN] | 7 | 11 | 17 | 31 | 49 | 71 | 92 | 112 |

### Maximum loads recommended - Tension load – threaded bar (1)

Recommended load in non-cracked concrete C20/25

| Concrete Class | Temperature Range(2) | Embedment depth | Size | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
|---|---|---|---|---|---|---|---|---|---|---|---|

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| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NON-CRACKED CONCRETE | 24˚C / 40˚C | $h_{ef,min}$ | $N_{Rec,p,stat}$ | [kN] | 7,2 | 9,0 | 12,6 | 19,1 | 24,7 | 31,6 | 36,4 | 40,4 |
| | | $h_{ef,standard}$ | $N_{Rec,p,stat}$ | [kN] | 9,6 | 13,5 | 19,7 | 29,9 | 46,6 | 69,1 | 84,1 | 94,2 |
| | | $h_{ef,max}$ = 20*d | $N_{Rec,p,stat}$ | [kN] | 19,1 | 29,9 | 43,1 | 76,6 | 109,7 | 158,0 | 181,8 | 202,0 |
| | 50˚C / 80˚C | $h_{ef,min}$ | $N_{Rec,p,stat}$ | [kN] | 5,4 | 6,4 | 8,9 | 13,6 | 19,1 | 24,4 | 25,4 | 29,2 |
| | | $h_{ef,standard}$ | $N_{Rec,p,stat}$ | [kN] | 7,2 | 9,5 | 14,0 | 21,2 | 36,0 | 53,4 | 58,9 | 68,1 |
| | | $h_{ef,max}$ = 20*d | $N_{Rec,p,stat}$ | [kN] | 14,4 | 21,2 | 30,5 | 54,3 | 84,8 | 122,1 | 127,2 | 145,9 |
| CRACKED CONCRETE | 24˚C / 40˚C | $h_{ef,min}$ | $N_{Rec,p,stat}$ | [kN] | 3,7 | 3,9 | 5,6 | 8,5 | 11,9 | 15,8 | 22,9 | 29,2 |
| | | | $N_{Rec,p,seis}$ | [kN] | 2,5 | 2,6 | 3,8 | 5,8 | 8,1 | 10,9 | 15,8 | 20,1 |
| | | $h_{ef,standard}$ | $N_{Rec,p,stat}$ | [kN] | 5,0 | 5,8 | 8,7 | 13,2 | 22,5 | 34,6 | 53,0 | 68,1 |
| | | | $N_{Rec,p,seis}$ | [kN] | 3,4 | 4,0 | 5,9 | 9,0 | 15,3 | 23,8 | 36,6 | 47,0 |
| | | $h_{ef,max}$ = 20*d | $N_{Rec,p,stat}$ | [kN] | 10,0 | 13,0 | 19,0 | 33,8 | 52,9 | 79,0 | 114,5 | 145,9 |
| | | | $N_{Rec,p,seis}$ | [kN] | 6,8 | 8,8 | 12,9 | 23,0 | 35,9 | 54,5 | 79,0 | 100,6 |
| | 50˚C / 80˚C | $h_{ef,min}$ | $N_{Rec,p,stat}$ | [kN] | 2,6 | 2,7 | 3,9 | 5,9 | 8,3 | 11,1 | 16,0 | 20,4 |
| | | | $N_{Rec,p,seis}$ | [kN] | 1,8 | 1,9 | 2,6 | 4,0 | 5,7 | 7,6 | 11,1 | 14,1 |
| | | $h_{ef,standard}$ | $N_{Rec,p,stat}$ | [kN] | 3,5 | 4,1 | 6,1 | 9,3 | 15,7 | 24,2 | 37,1 | 47,6 |
| | | | $N_{Rec,p,seis}$ | [kN] | 2,4 | 2,8 | 4,2 | 6,3 | 10,7 | 16,7 | 25,6 | 32,9 |
| | | $h_{ef,max}$ = 20*d | $N_{Rec,p,stat}$ | [kN] | 7,0 | 9,1 | 13,3 | 23,7 | 37,0 | 55,3 | 80,2 | 102,1 |
| | | | $N_{Rec,p,seis}$ | [kN] | 4,7 | 6,2 | 9,1 | 16,1 | 25,2 | 38,2 | 55,3 | 70,5 |

(1) For more detailed load information, please Declaration of Performance(DOP).

(2) Short term temperature / long term temperature. Long term concrete temperatures are roughly constant over significant periods of time. Short term elevated temperatures are those that occur over brief intervals, e.g. as a result of diurnal cycling.

## Load values – Maximum load recommended – Rebar

The recommended loads are only valid for single anchor for a roughly design, if the following conditions are valid:
$c \geq c_{cr,N}$ $s \geq s_{cr,N}$ $h \geq 2*h_{ef}$
The safety factors are already included in the recommended loads.

| Maximum loads recommended – Tension load | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Steel Failure – Recommended load | | | | | | | | | | |
| Size | | | Ø8 | Ø10 | Ø12 | Ø14 | Ø16 | Ø20 | Ø25 | Ø28 | Ø32 |
| Rebar Grade BSt 500 S | $N_{Rk,s}$ | [kN] | 13 | 21 | 30 | 40 | 53 | 82 | 129 | 161 | 211 |

| Maximum loads recommended – Shear load | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Steel Failure – Recommended load | | | | | | | | | |
| Size | Ø8 | Ø10 | Ø12 | Ø14 | Ø16 | Ø20 | Ø25 | Ø28 | Ø32 |

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# EMS Dubell F.1711 Chemical Anchor EASF, EASF-E, EASF-A

| Rebar Grade BSt 500 S | $V_{Rk,s}$ | [kN] | 7 | 10 | 15 | 20 | 26 | 41 | 64 | 81 | 105 |
|---|---|---|---|---|---|---|---|---|---|---|---|

**Maximum load values to tension load (1)**

Design bond resistance in non-cracked concrete C20/25

| Concrete Class | Temperature Range(2) | Embedment depth | Size | | | Ø8 | Ø10 | Ø12 | Ø14 | Ø16 | Ø20 | Ø25 | Ø28 | Ø32 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NON-CRACKED CONCRETE | 24˚C / 40˚C | $h_{ef,min}$ | $N_{Rec,p,stat}$ | [kN] | | 7,2 | 9,0 | 12,6 | 15,7 | 18,4 | 24,7 | 31,2 | 39,1 | 43,4 |
| | | $h_{ef,standard}$ | $N_{Rec,p,stat}$ | [kN] | | 9,6 | 13,5 | 19,7 | 24,1 | 28,7 | 46,6 | 65,4 | 87,3 | 94,9 |
| | | $h_{ef,max}$ = 20*d | $N_{Rec,p,stat}$ | [kN] | | 19,1 | 29,9 | 43,1 | 58,6 | 73,4 | 109,7 | 155,8 | 195,5 | 217,0 |
| | 50˚C / 80˚C | $h_{ef,min}$ | $N_{Rec,p,stat}$ | [kN] | | 5,2 | 6,5 | 9,0 | 11,3 | 13,2 | 17,8 | 22,4 | 26,6 | 29,5 |
| | | $h_{ef,standard}$ | $N_{Rec,p,stat}$ | [kN] | | 6,9 | 9,7 | 14,2 | 17,3 | 20,6 | 33,6 | 47,1 | 59,3 | 64,6 |
| | | $h_{ef,max}$ = 20*d | $N_{Rec,p,stat}$ | [kN] | | 13,8 | 21,5 | 31,0 | 42,2 | 52,9 | 79,0 | 112,2 | 132,9 | 147,6 |
| CRACKED CONCRETE | 24˚C / 40˚C | $h_{ef,min}$ | $N_{Rec,p,stat}$ | [kN] | | 3,7 | 3,9 | 5,6 | 6,9 | 8,5 | 12,3 | 19,6 | 25,4 | 33,2 |
| | | | $N_{Rec,p,seis}$ | [kN] | | 2,7 | 2,8 | 4,0 | 5,0 | 6,0 | 8,8 | 14,0 | 18,2 | 23,7 |
| | | $h_{ef,standard}$ | $N_{Rec,p,stat}$ | [kN] | | 5,0 | 5,8 | 8,7 | 10,6 | 13,2 | 23,3 | 41,2 | 56,7 | 72,6 |
| | | | $N_{Rec,p,seis}$ | [kN] | | 3,6 | 4,2 | 6,2 | 7,6 | 9,4 | 16,7 | 29,5 | 40,5 | 51,9 |
| | | $h_{ef,max}$ = 20*d | $N_{Rec,p,stat}$ | [kN] | | 10,0 | 13,0 | 19,0 | 25,9 | 33,8 | 54,9 | 98,2 | 127,1 | 166,0 |
| | | | $N_{Rec,p,seis}$ | [kN] | | 7,1 | 9,3 | 13,6 | 18,5 | 24,2 | 39,2 | 70,1 | 90,8 | 118,5 |
| | 50˚C / 80˚C | $h_{ef,min}$ | $N_{Rec,p,stat}$ | [kN] | | 2,6 | 2,7 | 3,9 | 4,9 | 5,9 | 8,6 | 13,7 | 17,8 | 23,2 |
| | | | $N_{Rec,p,seis}$ | [kN] | | 1,8 | 1,9 | 2,6 | 3,3 | 4,0 | 6,0 | 9,5 | 12,3 | 15,8 |
| | | $h_{ef,standard}$ | $N_{Rec,p,stat}$ | [kN] | | 3,5 | 4,1 | 6,1 | 7,4 | 9,3 | 16,3 | 28,9 | 39,7 | 50,8 |
| | | | $N_{Rec,p,seis}$ | [kN] | | 2,4 | 2,8 | 4,2 | 5,1 | 6,3 | 11,3 | 19,9 | 27,4 | 34,6 |
| | | $h_{ef,max}$ = 20*d | $N_{Rec,p,stat}$ | [kN] | | 7,0 | 9,1 | 13,3 | 18,1 | 23,7 | 38,4 | 68,7 | 88,9 | 116,2 |
| | | | $N_{Rec,p,seis}$ | [kN] | | 4,7 | 6,2 | 9,1 | 12,3 | 16,1 | 26,5 | 47,4 | 61,4 | 79,0 |

(1) For more detailed load information, please Declaration of Performance(DOP).

(2) Short term temperature / long term temperature. Long term concrete temperatures are roughly constant over significant periods of time. Short term elevated temperatures are those that occur over brief intervals, e.g. as a result of diurnal cycling.

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# EMS Dubell F.1711 Chemical Anchor EASF, EASF-E, EASF-A

## Chemical resistance of cured anchor

| Chemical environment | Concentration | Result | Chemical environment | Concentration | Result |
|---|---|---|---|---|---|
| Aqueous Solution Acetic Acid | 10% | G | Heptane | 100% | C |
| Acetone | 100% | F | Hexane | 100% | C |
| Aluminium Chloride Aqueous Solution | Saturated | G | Hydrochloric Acid | 10% | G |
| Aluminium Nitrate Aqueous Solution | 10% | G | Hydrochloric Acid | 15% | G |
| Ammonia Aqueous Solution | 5% | F | Hydrochloric Acid | 25% | C |
| Jet Fuel | 100% | F | Hydrogen Sulphide | 100% | G |
| Benzene | 100% | F | Isopropyl Alcohol | 100% | F |
| Benzoic Acid | Saturated | G | Linseed Oil | 100% | G |
| Benzyl Alcohol | 100% | F | Lubricating Oil | 100% | G |
| Sodium Hypochlorite Solution | 15% | G | Mineral Oil | 100% | G |
| Butyl Alcohol | 100% | C | Paraffin / Kerosene | 100% | C |
| Calcium Sulphate Aqueous Solution | Saturated | G | Phenol Aqueous Solution | 1% | F |
| Carbon Monoxide | 100% | G | Phosphoric Acid | 50% | G |
| Carbon Tetrachloride | 100% | C | Potassium Hydroxide | 10% pH13 | C |
| Chlorine Water | Saturated | F | Sea Water | 100% | C |
| Chloro Benzene | 100% | F | Styrene | 100% | F |
| Citric Acid Aqueous Solution | Saturated | G | Sulphur Dioxide Solution | 10% | G |
| Cyclohexanol | 100% | G | Sulphuric Acid | 10% | G |
| Diesel Fuel | 100% | G | Sulphuric Acid | 50% | G |
| Diethylene Glycol | 100% | G | Turpentine | 100% | C |
| Ethanol Aqueous Solution | 95% | F | White Spirit | 100% | G |
| Ethanol Aqueous Solution | 20% | C | Xylene | 100% | F |

| | |
|---|---|
| Resistance up to 75C with minimum 80% retained properties | G |
| Resistance up to 25C with minimum 80% retained properties | C |
| No data | N |

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TDS

# EMS Dubell F.1711 Chemical Anchor EASF, EASF-E, EASF-A

## Physical properties

| | | | |
|---|---|---|---|
| Density (at +20°C) | ASTM D1875 | g/ml | 1.7 |
| Hardness Shore D | | | 90 |
| Tensile Modulus | ASTM D638 | $N/mm^2$ | 13800 |
| Compressive strength | BS 6319 | $N/mm^2$ | 95 |
| Service temperature | - | - | -40°C - +80°C*<br>*maximum long term temperature is 50°C |

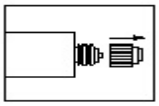
## Consumption table

Consumption of chemical anchor depends on the dimensions of threaded bar and drilled hole. The table given below shows the theoretical consumption of chemical anchor with recommended application parameters.

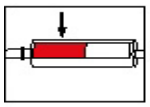
| Threaded bar | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
|---|---|---|---|---|---|---|---|---|
| Diameter of threaded bar (mm) | 8 | 10 | 12 | 16 | 20 | 24 | 27 | 30 |
| Diameter of hole in concrete (mm) | 10 | 12 | 14 | 18 | 24 | 28 | 32 | 35 |
| Anchoring depth (mm) | 80 | 90 | 110 | 125 | 170 | 210 | 250 | 280 |
| Consumption per hole (ml) | 3 | 4 | 6 | 9 | 31 | 45 | 75 | 93 |
| Number of holes with 300ml cartridge | 87 | 63 | 44 | 29 | 8 | 6 | 3 | 2 |
| Number of holes with 345ml cartridge | 100 | 73 | 50 | 34 | 10 | 7 | 4 | 3 |
| Number of holes with 410ml cartridge | 119 | 86 | 60 | 40 | 11 | 8 | 5 | 4 |

## Directions for use

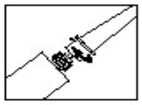
### Cartridge preparation



1) Open the cap at the tip of the cartridge.



2) Place the cartridge into application gun.

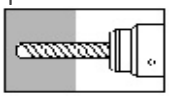


3) Place mixing nozzle to the cartridge (Screw down and tight)

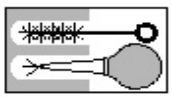


4) Extrude the product by 10cm to ensure homogenous mixing.

### Application of the product



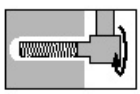
1) Choose the drill bit suitable for the diameter of the anchor showed in consumption table.



2) Clean inside of the hole with air pump or brush.



3) Fill 2/3 of the hole by injecting Chemical Anchor.



4) Place anchoring bar by rotating. Spare resin must overflow out of the hole.

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# EMS Dubell F.1711 Chemical Anchor EASF, EASF-E, EASF-A

## Packaging

| Cartridge | Pieces in a box | Pieces on a wooden pallet |
|---|---|---|
| 300ml | 20 | 1500 |
| 345ml | 12 | 1200 |
| 410ml | 12 | 1200 |

- For each cartridge, there are two static mixers in the box.

## Storage and shelf life

Keep product in its original container at 22°C and avoid contacting with direct sunlight. Storage below 5°C and above 25°C can negatively affect product properties.
Material removed from its original container can be contaminated during usage which affects both adhesive performance and storage life. Therefore, do not return contaminated product to the original container.
Metsan cannot take any responsibility for product which has been contaminated or stored under conditions different than previously indicated.

Shelf life: 18 months at 22°C

## Health and safety

For further information, please consult Safety Data Sheet (SDS) before use.

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