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European Technical Assessment

ETA-18/0971
of 16. 02. 2023

English version prepared by ZAG

General Part

**Technical Assessment Body issuing the
European Technical Assessment**

ZAG Ljubljana

**Trade name of the construction
product**

**Sormat through bolts
S-KA/ S-KAK/ S-KAH**

**Product family to which the construction
product belongs**

**33: Torque controlled expansion
anchor of size M6 and M8 for
multiple use for non-structural
applications in concrete**

Manufacturer

**EJOT SORMAT OY
Vähäkorventie 10
21250 Masku
Finland
www.ejot.fi**

Manufacturing plant(s)

EJOT production plants

**This European Technical Assessment
contains**

14 pages including 11 annexes, which
form an integral part of the document

**This European Technical Assessment is
issued in accordance with Regulation (EU) No
305/2011, on the basis of**

EAD 330747-00-0601: Fasteners for
use in concrete for redundant non-
structural systems, edition May 2018

This version replaces

ETA-18/0971 issued on 21. 08. 2019

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Specific parts

1 Technical description of the product

Sormat through bolts S-KA/ S-KAK/ S-KAH are made of zinc plated carbon steel (S-KA), hot dip galvanised carbon steel (S-KAK) or stainless steel (S-KAH). It consists of a bolt, expansion sleeve, hexagonal nut and washer.

Anchors are made in sizes M6 and M8. Anchor is placed into a drilled hole and anchored by torque-controlled expansion.

For the installed anchor see Figure given in Annex A1.

2 Specification of the intended use(s) in accordance with the applicable European Assessment Document (hereinafter EAD)

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

The provisions made in this European Technical Assessment are based on an assumed working life of the anchor of 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the manufacturer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

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

3.1 Mechanical resistance and stability (BWR 1)

The basic work requirements for mechanical resistance and stability are listed in Annexes C1 and C2.

3.2 Safety in case of fire (BWR 2)

The basic work requirements for safety in case of fire are listed in Annexes C3 and C4.

3.3 Hygiene, health and environment (BWR 3)

Regarding dangerous substances contained in this European Technical Assessment, there may be requirements applicable to the products falling within its scope (e.g. transported European legislation and national laws, regulations and administrative provisions). In order to meet provisions of the regulation (EU) No 305/2011, these requirements need also to be complied with, when they apply.

3.4 Safety in use (BWR 4)

For basic work requirement safety in use the same criteria are valid as for basic work requirement mechanical resistance and stability.

3.5 Protection against noise (BWR 5)

Not relevant.

3.6 Energy economy and heat retention (BWR 6)

Not relevant.

3.7 Sustainable use of natural resources (BWR 7)

No performance assessed.

3.8 General aspects relating to fitness for use

Durability and serviceability are only ensured if specifications of intended use according to Annex B1 are kept.

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

According to the decision 96/582/EC of the European Commission¹ the system of assessment and verification of constancy of performance (see Annex V to regulation (EU) No 305/2011) 2+ apply.

5 Technical details necessary for the implementation of the AVCP system, as provided for on the applicable EAD

Technical details necessary for the implementation of the AVCP system are laid down in Chapter 3 of EAD 330747-00-0601.

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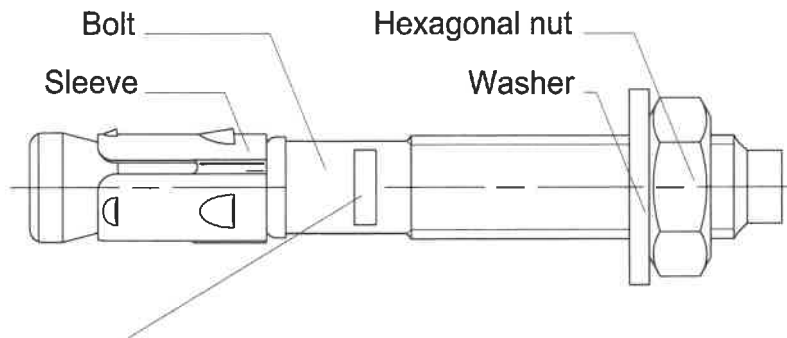
Signed by:

Franc Capuder, M.Sc.

Head of Service of TAB

¹ Official Journal of the European Communities L 254 of 8.10.1996
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SORMAT through bolt



Marking (Optional):

| | | |
|---------------|---------------------------------|----------------------|
| S-KA: | S-KA M.../t _{fix,max} | - zinc plated |
| S-KA: | S-KA M... × length | - zinc plated |
| S-KAK: | S-KAK M.../t _{fix,max} | - hot dip galvanized |
| S-KAK: | S-KAK M... × length | - hot dip galvanized |
| S-KAH: | S-KAH M.../t _{fix,max} | - stainless steel A4 |
| S-KAH: | S-KAH M... × length | - stainless steel A4 |

Examples:

| | |
|------------|----------------------|
| S-KA 6/15 | - zinc plated |
| S-KAK 6/15 | - hot dip galvanized |
| S-KAH 6/15 | - stainless steel |

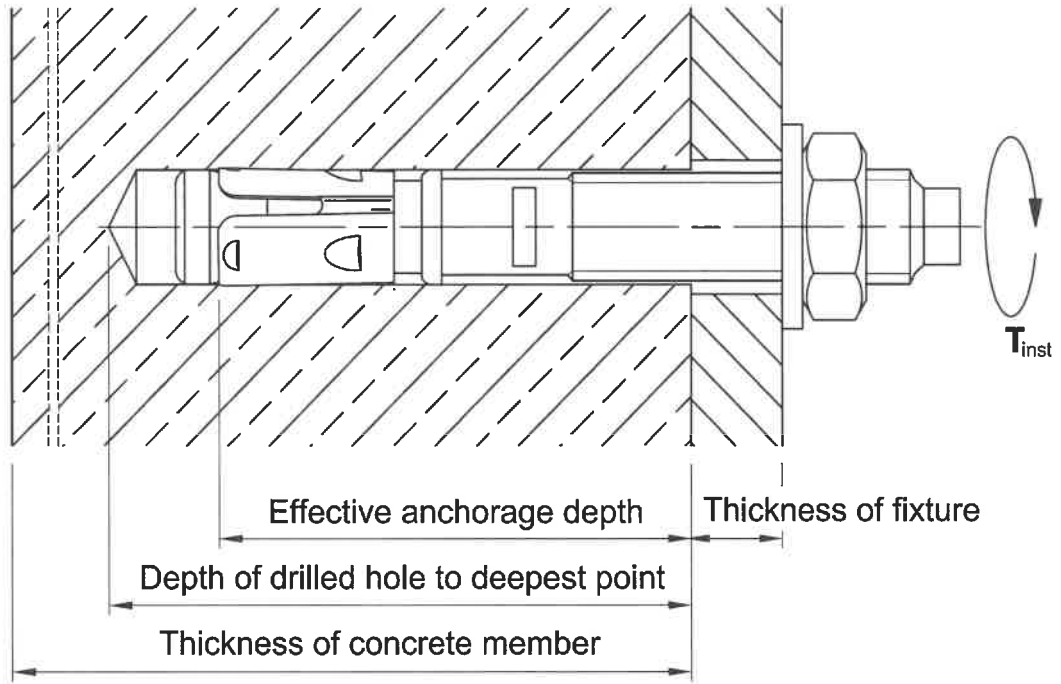
Sormat through bolts S-KA/S-KAK/S-KAH

Product description

Product

Annex A1

SORMAT through bolt after installation



Sormat through bolts S-KA/S-KAK/S-KAH

Product description
Installation condition

Annex A2

SORMAT through bolt

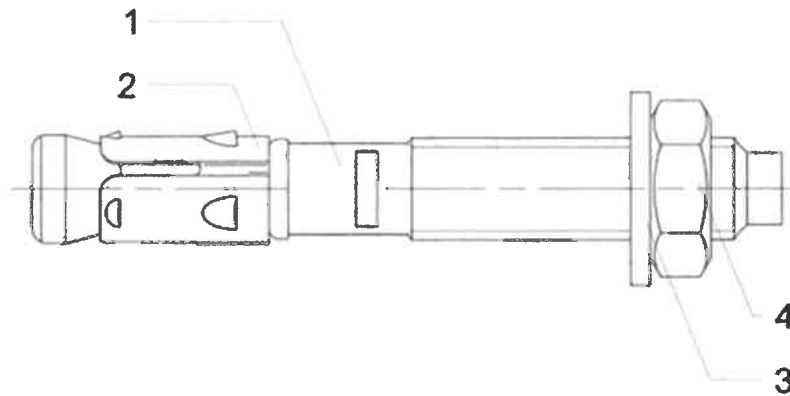


Table A1: Materials for S-KA and S-KAK

| Part | Designation | Material ^{1) 2)} |
|------|---------------|---|
| 1 | Bolt | Cold forged steel |
| 2 | Sleeve | Cold rolled galvanized steel strip, EN 10346 |
| 3 | Washer | Steel, DIN 125 (EN ISO 7089), DIN 440 (EN ISO 7094), DIN 9021 (EN ISO 7093) |
| 4 | Hexagonal nut | Steel, property class 8, DIN 934 (EN ISO 4032) |

¹⁾ **S-KA:** Parts 1,3 and 4 are zinc electroplated according to EN ISO 4042 $\geq 5\mu\text{m}$ and bright passivated

²⁾ **S-KAK:** Parts 1,3 and 4 are hot dip galvanized according to EN ISO 10684, EN ISO 1461

Table A2: Materials for S-KAH

| Part | Designation | Material |
|------|---------------|---|
| 1 | Bolt | Stainless steel, EN 10088-3 |
| 2 | Sleeve | Stainless steel strip, EN 10088-2 |
| 3 | Washer | Stainless steel, DIN 125 (EN ISO 7089), DIN 440 (EN ISO 7094), DIN 9021 (EN ISO 7093) |
| 4 | Hexagonal nut | Stainless steel, property class 80, DIN 934 (EN ISO 4032) |

Sormat through bolts S-KA/S-KAK/S-KAH

Product description
Materials

Annex A3

Specifications of intended use

Anchorage subjected to:

- Static, quasi static load.
- Use only for multiple use for non-structural applications according to EAD 330747-00-0601
- Fire exposure.

Base materials:

- Cracked and non-cracked concrete.
- Reinforced and unreinforced normal weight concrete of strength class C20/25 at minimum and C50/60 at maximum according to EN 206:2013A1:2016.

Use conditions (Environmental conditions):

- The S-KA and S-KAK and S-KAH M6-1 anchors may be used in concrete subject to dry internal conditions.
- The S-KAH M6-2 and S-KAH M8 anchors may be used in concrete subject to dry internal conditions and also in concrete subject to external atmospheric exposure (including industrial and marine environment), or exposure in permanently damp internal conditions, if no particular aggressive conditions exist.

Note: Particular aggressive conditions are e.g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with extreme chemical pollution (e.g. desulphurization plants or road tunnels where de-icing materials are used).

Design:

- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- Anchorages under static and quasi-static actions are designed in accordance with EOTA TR 055, Edition December 2016, Amended February 2018 or EN 1992-4:2018.
- For application with resistance under fire exposure the anchorages are designed in accordance with the method given in EOTA TR 020, Edition May 2004.
- Verifiable calculation notes and drawings are prepared taking into account of the load to be anchored. The position of the anchor is indicated on the design drawings (e.g. position of the anchor relative to reinforcement or to supports, etc.).

Installation:

- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters on the site.
- Use of the anchor only as supplied by the manufacturer without exchanging the components of an anchor.
- Anchor installation in accordance with the manufacturer's specifications and drawings using the appropriate tools.
- Checks before placing the anchor to ensure that the strength class of the concrete in which the anchor is to be placed is in the range given and is not lower than that of the concrete to which the characteristic loads apply for.
- Check of concrete being well compacted, e.g. without significant voids.
- Cleaning of the hole of drilling dust.
- Anchor installation ensuring the specified embedment depth.
- Keeping of the edge distance and spacing to the specified values without minus tolerances.
- In case of aborted hole, drilling of new hole at a minimum distance of twice the depth of the aborted hole, or smaller distance provided the aborted drill hole is filled with high strength non-shrinkage mortar. No shear or oblique tension loads are allowed in the direction of a not filled aborted hole.
- Application of the torque moment given in Annex B3 using a calibrated torque wrench.

Sormat through bolts S-KA/S-KAK/S-KAH

**Intended use
Specifications**

Annex B1

SORMAT through bolt

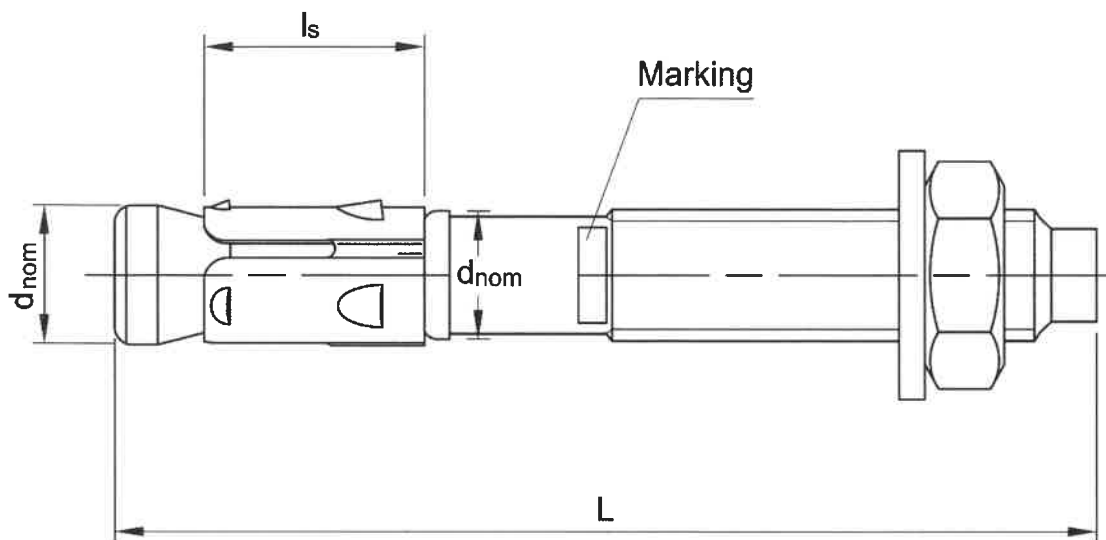


Table B1: Dimension of an anchor

| Size | Nominal diameter d_{nom} [mm] | Sleeve length l_s [mm] | Total length L [mm] |
|------|---------------------------------|--------------------------|-----------------------|
| M6 | 6 | 14,5 | 38 ... 420 |
| M8 | 8 | 15,9 | 50 ... 420 |

Sormat through bolts S-KA/S-KAK/S-KAH

Intended use
Anchor dimensions

Annex B2

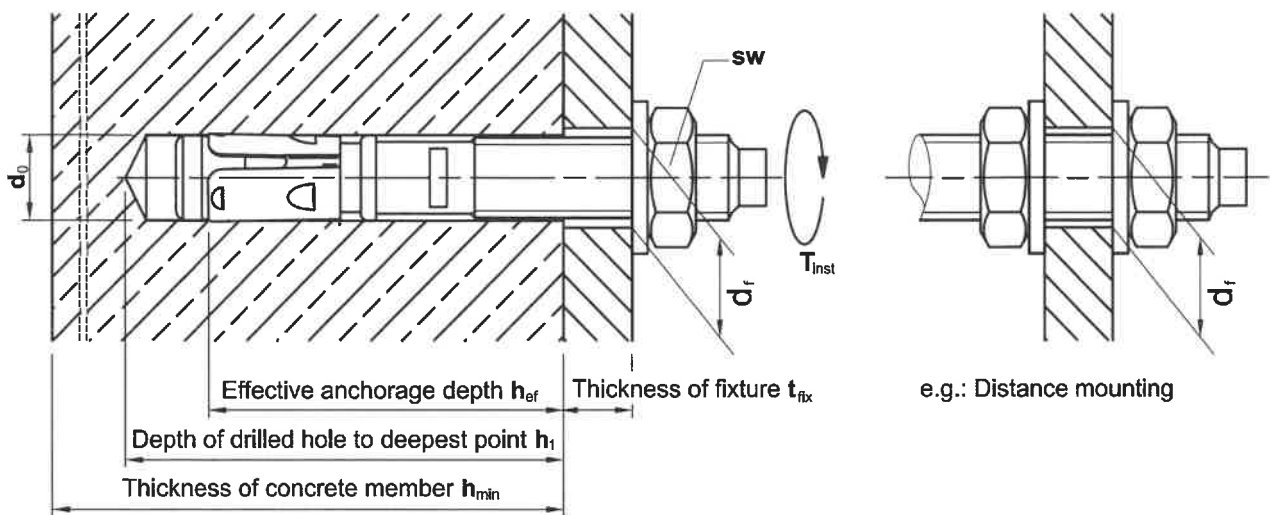


Table B2: Installation data

| Sormat through bolts S-KA/S-KAK/S-KAH | | Anchor size | | | |
|--|-------------------------|-----------------|------|------|----|
| | | M6-1 | M6-2 | M8 | |
| Drill hole diameter | d_0 [mm] | 6 | 6 | 8 | |
| Cutting diameter at the upper tolerance limit (maximum diameter bit) | $d_{cut,max} \leq$ [mm] | 6,40 | 6,40 | 8,45 | |
| Depth of drilled hole to deepest point | $h_1 \geq$ [mm] | 35 | 45 | 45 | |
| Effective anchorage depth | h_{ef} [mm] | 25 | 35 | 35 | |
| Diameter of clearance hole in the fixture | $d_f \leq$ [mm] | 7 | 7 | 9 | |
| Thickness of the fixture | $t_{fix,max}$ [mm] | 380 | 370 | 370 | |
| Width across flats | SW [mm] | 10 | 10 | 13 | |
| Required torque | S-KA | T_{inst} [Nm] | 4 | 7 | 11 |
| | S-KAK | | 4 | 7 | 15 |
| | S-KAH | | 5 | 8 | 15 |

Sormat through bolts S-KA/S-KAK/S-KAH

Intended use
Installation data

Annex B3

Table B3: Minimum thickness of concrete member, spacing and edge distance

| Sormat through bolts S-KA/S-KAK/S-KAH | | Anchor size | | |
|---------------------------------------|----------------|-------------|------|----|
| | | M6-1 | M6-2 | M8 |
| Minimum thickness of concrete member | h_{min} [mm] | 80 | 80 | 80 |
| Minimum spacing | s_{min} [mm] | 50 | 40 | 60 |
| Minimum edge distance | c_{min} [mm] | 50 | 40 | 60 |

Sormat through bolts S-KA/S-KAK/S-KAH

Intended use
Installation data

Annex B4

Table C1: Characteristic resistances under tension loads in case of static and quasi-static loading for design according EOTA TR 055 or EN 1992-4:2018

| Sormat through bolts S-KA/S-KAK/S-KAH | | | | Anchor size | | |
|--|------------|----------------------|--------|-------------------|------|------|
| | | | | M6-1 | M6-2 | M8 |
| Steel failure | | | | | | |
| Characteristic resistance | S-KA/S-KAK | $N_{Rk,s}$ | [kN] | 8,6 | | 14,8 |
| | S-KAH | | | 9,9 | | 15,8 |
| Partial safety factor | | $\gamma_{Ms}^{2)}$ | [-] | 1,4 | | |
| Pull-out failure | | | | | | |
| Characteristic resistance in cracked and non-cracked concrete C20/25 | S-KA/S-KAK | $N_{Rk,p}$ | [kN] | 2,0 | 3,5 | 7,0 |
| | S-KAH | | | 3,0 | 5,0 | 7,0 |
| Increasing factor for $N_{Rk,p}$ | | ψ_c | C25/30 | 1,12 | 1,12 | 1,08 |
| | | | C30/37 | 1,22 | 1,22 | 1,15 |
| | | | C35/45 | 1,32 | 1,32 | 1,20 |
| | | | C40/50 | 1,41 | 1,41 | 1,26 |
| | | | C45/55 | 1,50 | 1,50 | 1,32 |
| | | | C50/60 | 1,58 | 1,58 | 1,44 |
| Partial safety factor | | $\gamma_{inst}^{2)}$ | [-] | 1,0 | | |
| | | $\gamma_{Mp}^{3)}$ | [-] | 1,5 ³⁾ | | |
| Concrete cone and splitting failure | | | | | | |
| Effective anchorage depth | | h_{ef} | [mm] | 25 | 35 | 35 |
| Factor for cracked concrete | | k_{cr} | [-] | 7,7 | | |
| Factor for non-cracked concrete | | k_{ucr} | [-] | 11,0 | | |
| Spacing | | $s_{cr,N}$ | [mm] | 75 | 105 | 105 |
| Edge distance | | $c_{cr,N}$ | [mm] | 37,5 | 52,5 | 52,5 |
| Spacing (splitting) | | $s_{cr,sp}$ | [mm] | 140 | 120 | 120 |
| Edge distance (splitting) | | $c_{cr,sp}$ | [mm] | 70 | 60 | 60 |
| Partial safety factor | | $\gamma_{Msp}^{2)}$ | [-] | 1,5 | | |

1) Pull-out failure is not decisive

2) In absence of other national regulations

3) The installation safety factor of $\gamma_2 = 1,0$ is included

Sormat through bolts S-KA/S-KAK/S-KAH

Performance

Characteristic resistance under tension loads

Annex C1

Table C2: Characteristic resistances under shear loads in case of static and quasi-static loading for design according to EOTA TR 055 or EN 1992-4:2018

| Sormat through bolts S-KA/S-KAK/S-KAH | | | | Anchor size | | |
|---|------------|--------------------|------|-------------|------|------|
| | | | | M6-1 | M6-2 | M8 |
| Steel failure without lever arm | | | | | | |
| Characteristic resistance | S-KA/S-KAK | $V_{Rk,s}$ | [kN] | / | 4,3 | 10,0 |
| | S-KAH | | | / | 12 | 13,4 |
| Partial safety factor | | $\gamma_{Ms}^{1)}$ | [-] | 1,25 | | |
| Factor for considering ductility | | k_7 | [-] | 1 | | |
| Steel failure with lever arm | | | | | | |
| Characteristic resistance | S-KA/S-KAK | $M_{Rk,s}^0$ | [Nm] | 7 | | 20 |
| | S-KAH | | | 9 | | 22 |
| Partial safety factor | | $\gamma_{Ms}^{1)}$ | [-] | 1,25 | | |
| Concrete pryout failure | | | | | | |
| k-factor | | k_8 | [-] | 1 | 1 | 1 |
| Partial safety factor | | $\gamma_{Mc}^{1)}$ | [-] | 1,5 | | |
| Concrete edge failure | | | | | | |
| Effective length of anchor under shear load | | l_f | [mm] | 25 | 35 | 35 |
| Outside diameter of anchor | | d_{nom} | [mm] | 6 | 6 | 8 |
| Uncracked and cracked concrete without any edge reinforcement | | $\Psi_{re,V}$ | [-] | 1,0 | | |
| Cracked concrete with straight edge reinforcement > Ø12 mm | | | | 1,2 | | |
| Uncracked or cracked concrete with edge reinforcement and closely spaced stirrups ($a \leq 100\text{mm}$ and $a \leq 2c_1$) | | | | 1,4 | | |
| Partial safety factor | | $\gamma_{Mc}^{1)}$ | [-] | 1,5 | | |

¹⁾ In absence of other national regulations

Sormat through bolts S-KA/S-KAK/S-KAH

Performance

Characteristic resistance under shear loads

Annex C2

Table C3: Characteristic resistances under tension loads in case of fire exposure for design according to EOTA TR 020 or EN 1992-4:2018

| Sormat through bolts S-KA/S-KAK/S-KAH | | | | Anchor size | | |
|--|---------------|------|--|-------------|------|------|
| | | | | M6-1 | M6-2 | M8 |
| Steel failure | | | | | | |
| Characteristic resistance $N_{Rk,s,fi}$ | S-KA/S-KAK | R30 | [kN] | / | 0,16 | 0,26 |
| | | R60 | [kN] | / | 0,14 | 0,24 |
| | | R90 | [kN] | / | 0,11 | 0,18 |
| | | R120 | [kN] | / | 0,08 | 0,13 |
| | S-KAH | R30 | [kN] | / | 0,16 | 0,53 |
| | | R60 | [kN] | / | 0,14 | 0,42 |
| | | R90 | [kN] | / | 0,11 | 0,32 |
| | | R120 | [kN] | / | 0,08 | 0,26 |
| Pull-out failure | | | | | | |
| Characteristic resistance $N_{Rk,p,fi}$ | S-KA/S-KAK | R30 | [kN] | 0,50 | 0,50 | 1,75 |
| | | R60 | [kN] | 0,50 | 0,50 | 1,75 |
| | | R90 | [kN] | 0,50 | 0,50 | 1,75 |
| | | R120 | [kN] | 0,40 | 0,40 | 1,40 |
| | S-KAH | R30 | [kN] | 0,75 | 0,75 | 1,63 |
| | | R60 | [kN] | 0,75 | 0,75 | 1,63 |
| | | R90 | [kN] | 0,75 | 0,75 | 1,63 |
| | | R120 | [kN] | 0,60 | 0,60 | 1,30 |
| Concrete cone and splitting failure ¹⁾ | | | | | | |
| Characteristic resistance $N_{Rk,c,fi}^0$ | R30 | [kN] | 0,56 | 1,30 | 1,30 | |
| | R60 | [kN] | 0,56 | 1,30 | 1,30 | |
| | R90 | [kN] | 0,56 | 1,30 | 1,30 | |
| | R120 | [kN] | 0,45 | 1,04 | 1,04 | |
| Spacing | $s_{cr,N,fi}$ | [mm] | 4 x h_{ef} | | | |
| | s_{min} | [mm] | 50 | 40 | 60 | |
| Edge distance | $c_{cr,N,fi}$ | [mm] | 2 x h_{ef} | | | |
| | c_{min} | [mm] | Fire attack from one side: $c_{min} = 2 \times h_{ef}$ Fire attack from more than one side: $c_{min} \geq 300 \text{ mm}$ and $\geq 2 \times h_{ef}$ | | | |

¹⁾ As a rule, splitting failure can be neglected when cracked concrete and reinforcement is assumed. Design under fire exposure is performed according to the design method given in EOTA TR 020.

Under fire exposure usually cracked concrete is assumed. The design equations are given in EOTA TR 020 § 2.2.1.

In the absence of other national regulations the partial safety factor for resistance under fire exposure $\gamma_{M,fi} = 1,0$ is recommended.

Sormat through bolts S-KA/S-KAK/S-KAH

Performance

Characteristic tension resistance under fire exposure

Annex C3

Table C4: Characteristic resistances under shear loads in case of fire exposure for design according to EOTA TR 020 or EN 1992-4:2018

| Sormat through bolts S-KA/S-KAK/S-KAH | | | | Anchor size | | |
|--|------------|------|------|-------------|------|------|
| | | | | M6-1 | M6-2 | M8 |
| Steel failure without lever arm | | | | | | |
| Characteristic resistance $V_{Rk,s,fi}$ | S-KA/S-KAK | R30 | [kN] | / | 0,16 | 0,26 |
| | | R60 | [kN] | / | 0,14 | 0,24 |
| | | R90 | [kN] | / | 0,11 | 0,18 |
| | | R120 | [kN] | / | 0,08 | 0,13 |
| | S-KAH | R30 | [kN] | / | 0,16 | 0,53 |
| | | R60 | [kN] | / | 0,14 | 0,42 |
| | | R90 | [kN] | / | 0,11 | 0,32 |
| | | R120 | [kN] | / | 0,08 | 0,26 |
| Steel failure with lever arm | | | | | | |
| Characteristic resistance $M_{Rk,s,fi}^0$ | S-KA/S-KAK | R30 | [kN] | / | 0,15 | 0,37 |
| | | R60 | [kN] | / | 0,14 | 0,34 |
| | | R90 | [kN] | / | 0,11 | 0,26 |
| | | R120 | [kN] | / | 0,08 | 0,19 |
| | S-KAH | R30 | [kN] | / | 0,15 | 0,75 |
| | | R60 | [kN] | / | 0,14 | 0,60 |
| | | R90 | [kN] | / | 0,11 | 0,40 |
| | | R120 | [kN] | / | 0,08 | 0,37 |
| Concrete pryout failure | | | | | | |
| k-factor | k_g | [-] | 1 | 1 | 1 | |
| Characteristic resistance $V_{Rk,cp,fi}$ | R30 | [kN] | 0,56 | 1,30 | 1,30 | |
| | R60 | [kN] | 0,56 | 1,30 | 1,30 | |
| | R90 | [kN] | 0,56 | 1,30 | 1,30 | |
| | R120 | [kN] | 0,45 | 1,04 | 1,04 | |
| Concrete edge failure | | | | | | |
| The initial value $V_{Rk,c,fi}^0$ of the characteristic resistance in concrete C20/25 to C50/60 under fire exposure may be determined by: | | | | | | |
| $V_{Rk,c,fi}^0 = 0,25 \times V_{Rk,c}^0 \quad (\leq R90) \qquad V_{Rk,c,fi}^0 = 0,20 \times V_{Rk,c}^0 \quad (R120)$ with $V_{Rk,c}^0$ initial value of the characteristic resistance in cracked concrete C20/25 under normal temperature. | | | | | | |

Design under fire exposure is performed according to the design method given in EOTA TR 020.

Under fire exposure usually cracked concrete is assumed. The design equations are given in EOTA TR 020 § 2.2.1.

EOTA TR 020 covers design for fire exposure from one side. For fire attack from more than one side the edge distance must be increased to $c_{min} \geq 300$ mm and $\geq 2 \times h_{ef}$.

In the absence of other national regulations the partial safety factor for resistance under fire exposure $\gamma_{M,fi} = 1,0$ is recommended.

Sormat through bolts S-KA/S-KAK/S-KAH

Performance

Characteristic shear resistance under fire exposure

Annex C4