

Approval body for construction products
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and
Laender Governments



European Technical Assessment

ETA-06/0108
of 17 October 2018

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the
European Technical Assessment:

Trade name of the construction product

Product family
to which the construction product belongs

Manufacturer

Manufacturing plant

This European Technical Assessment
contains

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

Deutsches Institut für Bautechnik

Liebig® Safety Bolt™

Mechanical fasteners for use in concrete

EJOT Baubefestigungen GmbH
In der Stockwiese 35
57334 Bad Laasphe
DEUTSCHLAND

EJOT Plant 14

12 pages including 3 annexes which form an integral part
of this assessment

EAD 330232-00-0601

The European Technical Assessment is issued by the Technical Assessment Body in its official language. Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document and shall be identified as such.

Communication of this European Technical Assessment, including transmission by electronic means, shall be in full. However, partial reproduction may only be made with the written consent of the issuing Technical Assessment Body. Any partial reproduction shall be identified as such.

This European Technical Assessment may be withdrawn by the issuing Technical Assessment Body, in particular pursuant to information by the Commission in accordance with Article 25(3) of Regulation (EU) No 305/2011.

Specific Part

1 Technical description of the product

The Liebig® Safety Bolt™ of sizes M6, M8, M10, M12 and M16 is an anchor made of galvanised steel which is placed in an drilled hole and anchored by torque-controlled expansion. Product and product description is given in Annex A.

2 Specification of the intended use in accordance with the applicable European Assessment Document

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

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the anchor of at least 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, 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)

| Essential characteristic | Performance |
|--|-------------------------|
| Characteristic resistance to tension load (static and quasi-static loading) | See Annex C 1 |
| Characteristic resistance to shear load (static and quasi-static loading) | See Annex C 2 |
| Displacements (static and quasi-static loading) | See Annex C 1 und C 2 |
| Characteristic resistance and displacements for seismic performance categories C1 and C2 | No performance assessed |

3.2 Safety in case of fire (BWR 2)

| Essential characteristic | Performance |
|--------------------------|---------------|
| Reaction to fire | Class A1 |
| Resistance to fire | See Annex C 3 |

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

In accordance with the European Assessment Document EAD No. 330232-00-0601 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

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

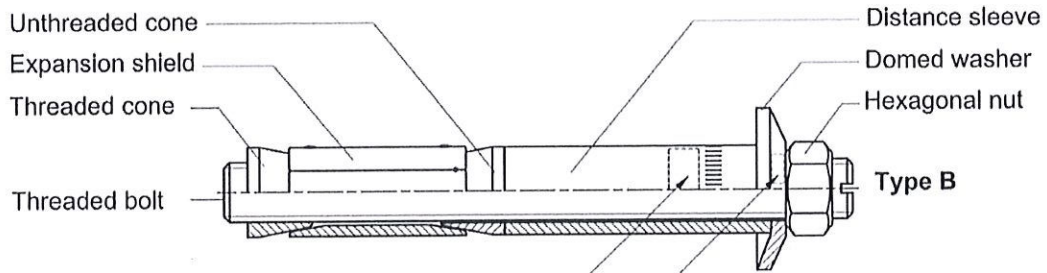
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

Issued in Berlin on 17 October 2018 by Deutsches Institut für Bautechnik

Dr.-Ing. Lars Eckfeldt
p. p. Head of Department

beglaubigt:
Tempel

Liebig Safety Bolt™



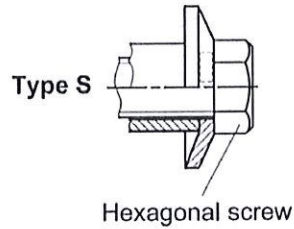
Marking:

Identifying mark: \otimes
Thread size: M ..
Max. fixture thickness: t_{fix}
Setting depth marking: knurl or groove

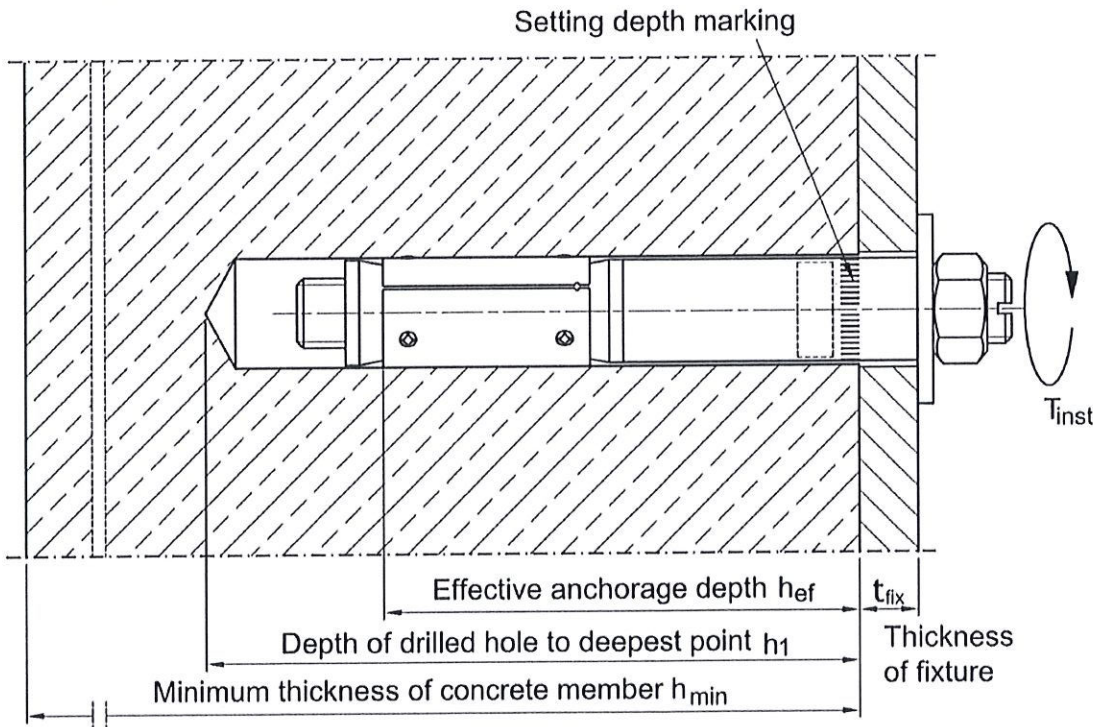
For example: \otimes M10/40

Marking:

Trade name: S (Safety Bolt)



Liebig Safety Bolt™ after installation



Liebig® Safety Bolt™

Annex A1

Product description
Product and installation situation

Liebig Safety Bolt™

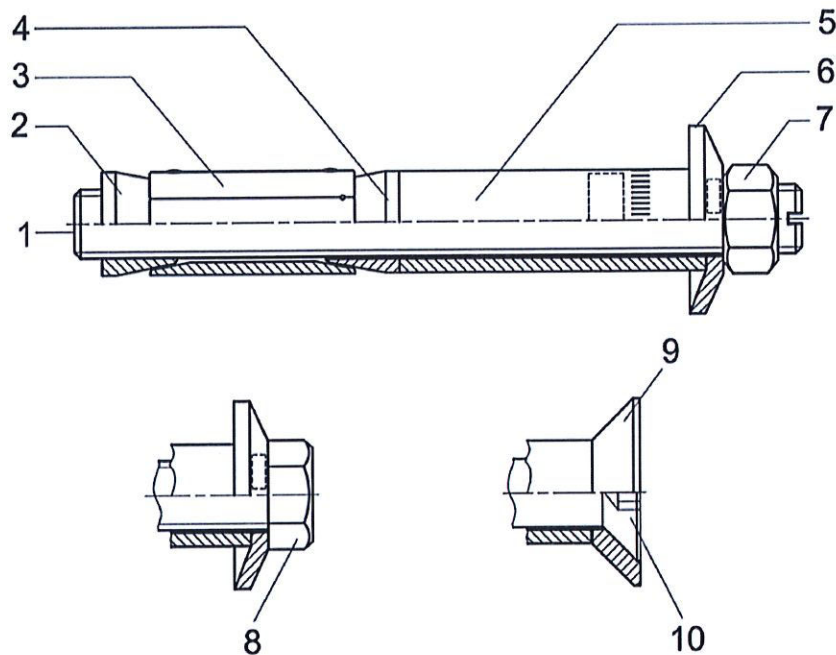


Table 1: Materials

| Part | Designation | Material ^{1) 2)} |
|------|--------------------|-------------------------------------|
| 1 | Threaded bolt | EN ISO 898-1: grade 8.8 |
| 2 | Threaded cone | EN10263: 1.0214 / EN 10087: 1.0718 |
| 3 | Expansion shield | EN 10025: 1.0037 / EN 10139: 1.0330 |
| 4 | Unthreaded cone | EN10263: 1.0214 / EN 10087: 1.0718 |
| 5 | Distance sleeve | EN 10025: 1.0037 / EN 10139: 1.0330 |
| 6 | Domed washer | EN 10139: 1.0330 |
| 7 | Hexagonal nut | EN 20898-2: grade 8 |
| 8 | Hexagonal screw | EN ISO 898-1: grade 8.8 |
| 9 | Countersunk washer | EN 10025: 1.0037 / EN 10087: 1.0718 |
| 10 | Countersunk screw | EN ISO 898-1: grade 8.8 |

¹⁾ Parts 1 - 10 zinc electroplated according to EN ISO 4042 $\geq 5 \mu\text{m}$, passivated.

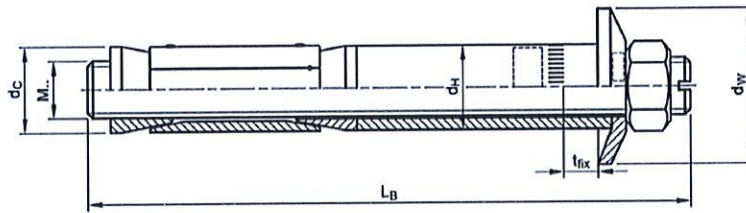
²⁾ Parts 2, 6, 7 and 9 with lubrication.

Liebig® Safety Bolt™

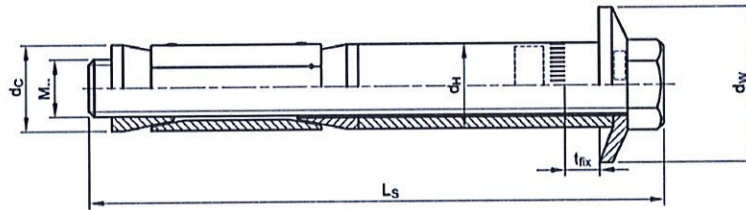
Product description
Materials

Annex A2

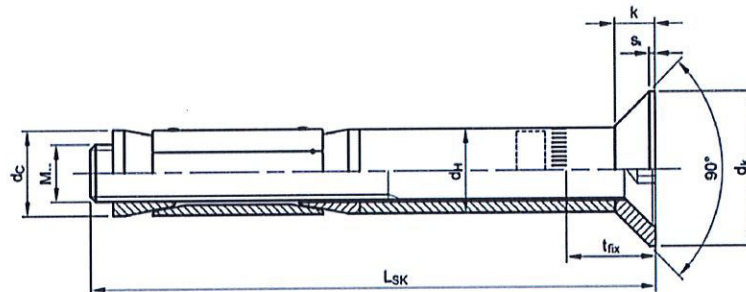
Liebig Safety Bolt™



Type B



Type S



Type SK

Table 2: Dimensions of the anchors

| Anchor size | | | M6-10/45/.. | M8-12/55/.. | M10-15/70/.. | M12-20/80/.. | M16-25/100/.. |
|----------------|----------------|------|-------------|-------------|--------------|--------------|---------------|
| Type B | $t_{fix}^{1)}$ | [mm] | 0 - 200 | 0 - 200 | 0 - 200 | 0 - 200 | 0 - 200 |
| | L_B | [mm] | 65 - 265 | 80 - 280 | 95 - 295 | 115 - 315 | 145 - 345 |
| Type S | $t_{fix}^{1)}$ | [mm] | 1 - 200 | 1 - 200 | 2 - 200 | 5 - 200 | 5 - 200 |
| | L_S | [mm] | 65 - 265 | 76 - 275 | 93 - 291 | 113 - 308 | 145 - 340 |
| Type SK | $t_{fix}^{1)}$ | [mm] | 6 - 200 | 8 - 200 | 8 - 200 | 10 - 200 | 15 - 200 |
| | L_{SK} | [mm] | 60 - 250 | 75 - 265 | 90 - 280 | 105 - 295 | 135 - 320 |
| | s_k | [mm] | 0,5 | 0,5 | 1 | 1 | 1 |
| | k | [mm] | 5,5 | 6,5 | 7 | 8 | 14 |
| | d_k | [mm] | 20 | 24 | 27 | 33 | 50 |
| d_c | [mm] | 10 | 12 | 15 | 19,7 | 24,7 | |
| d_H | [mm] | 9,5 | 11,7 | 14,7 | 19 | 24 | |
| d_w | [mm] | 15 | 20 | 25 | 30 | 40 | |

¹⁾ t_{fix} = Thickness of fixture

Liebig® Safety Bolt™

Annex A3

Product description
Dimensions of the anchor

Specifications of intended use

Anchorage subject to:

- Static and quasi-static loads
- Fire exposure

Base materials:

- Cracked and uncracked concrete
- Reinforced or unreinforced normal weight concrete without fibres, strength class C20/25 to C50/60 according to EN 206:2013

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions

Design:

- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work,
- Verifiable calculation notes and drawings are prepared taking account of the loads 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.),
- Anchorages are designed in accordance with FprEN 1992-4:2017 and EOTA Technical Report TR 055, design method A.

Installation:

- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- Anchor installation in accordance with the manufacturer's specifications and drawings and using the appropriate tools.
- Hole drilling by hammer drill only.
- Cleaning of the hole of drilling dust.
- Application of specified torque moment using a calibrated torque tool.
- In case of aborted hole: new drilling at a minimum distance away of twice the depth of the aborted hole, or smaller distance if the aborted drill hole is filled with high strength mortar and if under shear or oblique tension loads it is not in the direction of load application.

Liebig® Safety Bolt™

Intended use
Specifications

Annex B1

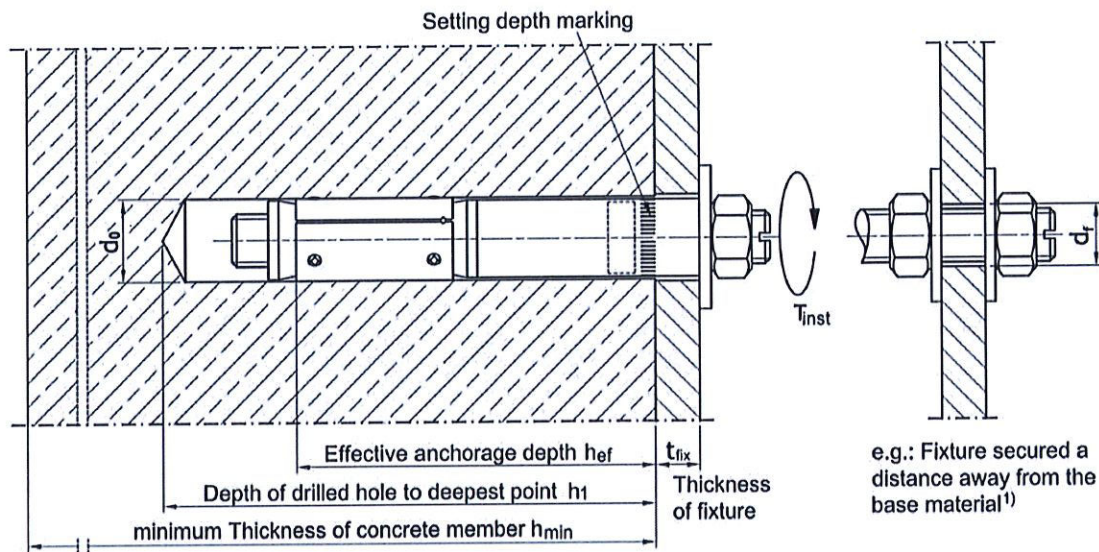


Table 3: Installation data

| Liebig® Safety Bolt™ | | | Anchor size | | | | |
|---|------------------|------|----------------|----------------|-----------------|-----------------|------------------|
| | | | M6 10/45/.. | M8 12/55/.. | M10 15/70/.. | M12 20/80/.. | M16 25/100/.. |
| Nominal diameter of drill bit | d_o | [mm] | 10 | 12 | 15 | 20 | 25 |
| Cutting diameter of drill bit | $d_{cut} \leq$ | [mm] | 10,45 | 12,5 | 15,5 | 20,55 | 25,55 |
| Depth of drilled hole to deepest point | $h_1 \geq$ | [mm] | 60 | 70 | 85 | 100 | 125 |
| Diameter of clearance hole in the fixture | $d_f \leq$ | [mm] | 12 | 14 | 17 | 21 | 26 |
| | $d_f^{(1)} \leq$ | [mm] | 7 | 9 | 12 | 14 | 18 |
| Maximum thickness of fixture | $t_{fix} \leq$ | [mm] | 200 | 200 | 200 | 200 | 200 |
| Width across flats type B + S | SW | [mm] | 10 | 13 | 17 | 19 | 24 |
| Width across flats type SK | S | [mm] | 4 | 5 | 6 | 8 | 10 |
| Torque moment type B | T_{inst} | [Nm] | 8 | 15 | 40 | 70 | 115 |
| Torque moment type S | | | 8 | 20 | 60 | 90 | 170 |
| Torque moment type SK | | | 12 | 20 | 60 | 90 | 190 |

¹⁾ Mounting on the threaded bolt (only type B)

Table 4: Minimum thickness of concrete member, spacing and edge distance

| Liebig® Safety Bolt™ | | | Anchor size | | | | |
|--------------------------------------|--------------|------|----------------|----------------|-----------------|-----------------|------------------|
| | | | M6 10/45/.. | M8 12/55/.. | M10 15/70/.. | M12 20/80/.. | M16 25/100/.. |
| Minimum thickness of concrete member | h_{min} | [mm] | 100 | 110 | 140 | 160 | 200 |
| Minimum spacing | s_{min} | [mm] | 60 | 100 | 150 | 200 | 250 |
| | for $c \geq$ | [mm] | 130 | 200 | 300 | 500 | 600 |
| Minimum edge distance | c_{min} | [mm] | 80 | 100 | 150 | 200 | 250 |
| | for $s \geq$ | [mm] | 140 | 200 | 250 | 380 | 440 |

Intervals may be interpolated linearly.

Liebig® Safety Bolt™

Intended use
Installation data,
Minimum thickness of concrete member, spacing and edge distance

Annex B2

Table 5: Design method A
Characteristic values for tension loads

| Liebig® Safety Bolt™ | | | Anchor size | | | | |
|--|-----------------|--------|----------------|----------------|-----------------|-----------------|------------------|
| | | | M6 10/45/.. | M8 12/55/.. | M10 15/70/.. | M12 20/80/.. | M16 25/100/.. |
| Steel failure | | | | | | | |
| Characteristic resistance | $N_{Rk,s}$ | [kN] | 16,1 | 29,3 | 46,4 | 67,4 | 125,3 |
| Partial safety factor | γ_{Ms} | [-] | 1,5 | | | | |
| Pull-out failure | | | | | | | |
| Characteristic resistance in cracked concrete C20/25 | $N_{Rk,p}$ | [kN] | 6 | 9 | 16 | – 1) | – 1) |
| Characteristic resistance in uncracked concrete C20/25 | $N_{Rk,p}$ | [kN] | 7,5 | 12 | 20 | – 1) | – 1) |
| Increasing factors for $N_{Rk,p}$ | Ψ_C | C25/30 | 1,12 | | | | |
| | | C30/37 | 1,22 | | | | |
| | | C35/45 | 1,32 | | | | |
| | | C40/50 | 1,41 | | | | |
| | | C45/55 | 1,50 | | | | |
| C50/60 | 1,58 | | | | | | |
| Installation safety factor | γ_{Inst} | [-] | 1,2 | 1,2 | 1,0 | 1,0 | 1,0 |
| Concrete cone failure | | | | | | | |
| Effective anchorage depth | h_{ef} | [mm] | 45 | 55 | 70 | 80 | 100 |
| Factor k_1 | $k_{cr,N}$ | | 7,7 | | | | |
| | $k_{ucr,N}$ | | 11,0 | | | | |
| Spacing | $s_{cr,N}$ | [mm] | 3 x h_{ef} | | | | |
| Edge distance | $c_{cr,N}$ | [mm] | 1,5 x h_{ef} | | | | |
| Installation safety factor | γ_{Inst} | [-] | 1,2 | 1,2 | 1,0 | 1,0 | 1,0 |
| Concrete splitting failure | | | | | | | |
| Spacing (splitting) | $s_{cr,sp}$ | [mm] | 5 x h_{ef} | | | | |
| Edge distance (splitting) | $c_{cr,sp}$ | [mm] | 2,5 x h_{ef} | | | | |
| Installation safety factor | γ_{Inst} | [-] | 1,2 | 1,2 | 1,0 | 1,0 | 1,0 |

1) Pull-out failure not decisive.

Table 6: Displacements under tension loads

| Liebig® Safety Bolt™ | | | Anchor size | | | | |
|---------------------------|---------------|------|----------------|----------------|-----------------|-----------------|------------------|
| | | | M6 10/45/.. | M8 12/55/.. | M10 15/70/.. | M12 20/80/.. | M16 25/100/.. |
| Cracked concrete C20/25 | N | [kN] | 2,4 | 3,6 | 7,6 | 12,3 | 17,2 |
| | d_{N0} | [mm] | 0,2 | 0,4 | 0,4 | 0,6 | 0,6 |
| | $d_{N\infty}$ | [mm] | 0,8 | 0,8 | 0,8 | 0,8 | 0,8 |
| Uncracked concrete C20/25 | N | [kN] | 3,0 | 4,8 | 9,5 | 17,2 | 24,0 |
| | d_{N0} | [mm] | 0,2 | 0,3 | 0,3 | 0,4 | 0,4 |
| | $d_{N\infty}$ | [mm] | 0,8 | 0,8 | 0,8 | 0,8 | 0,8 |

Liebig® Safety Bolt™

Annex C1

Performances
Design method A: Characteristic values for tension loads,
Displacements under tension loads

Table 7: Design method A
Characteristic values for shear loads

| Liebig® Safety Bolt™ | | | Anchor size | | | | |
|---|---------------------|--|----------------|----------------|-----------------|-----------------|------------------|
| | | | M6 10/45/.. | M8 12/55/.. | M10 15/70/.. | M12 20/80/.. | M16 25/100/.. |
| Steel failure for shear load without lever arm | | | | | | | |
| Characteristic resistance | $V_{Rk,s}$ [kN] | | 15 | 25 | 39 | 60 | 96 |
| Partial safety factor | γ_{Ms} [-] | | 1,25 | | | | |
| Steel failure for shear load with lever arm | | | | | | | |
| Characteristic bending moment | $M^0_{Rk,s}$ [Nm] | | 12 | 30 | 60 | 105 | 266 |
| Partial safety factor | γ_{Ms} [-] | | 1,25 | | | | |
| Concrete pry-out failure | | | | | | | |
| Factor | k_g [-] | | 1 | | 2 | | |
| Installation safety factor | γ_{Inst} [-] | | 1,0 | | | | |
| Concrete edge failure | | | | | | | |
| Effective length of anchor under shear load | ℓ_f [mm] | | 45 | 55 | 70 | 80 | 100 |
| Outside diameter of anchor | d_{nom} [mm] | | 10 | 12 | 15 | 20 | 25 |
| Installation safety factor | γ_{Inst} [-] | | 1,0 | | | | |

Table 8: Displacements under shear loads

| Liebig® Safety Bolt™ | | | Anchor size | | | | |
|---|--------------------|--|----------------|----------------|-----------------|-----------------|------------------|
| | | | M6 10/45/.. | M8 12/55/.. | M10 15/70/.. | M12 20/80/.. | M16 25/100/.. |
| Cracked and uncracked concrete C20/25 - C50/60 | V [kN] | | 8,6 | 14,3 | 22,3 | 34,3 | 54,9 |
| | d_{v0} [mm] | | 2,5 | 2,9 | 3,2 | 4,1 | 5,0 |
| | $d_{v\infty}$ [mm] | | 3,8 | 4,4 | 4,5 | 6,2 | 7,5 |

Liebig® Safety Bolt™

Performances
Design method A: Characteristic values for shear loads,
Displacements under shear loads

Annex C2

Table 9: Design method A

**Characteristic resistances in cracked and uncracked concrete
C20/25 to C50/60 under fire exposure**

| Liebig® Safety Bolt™ | | | | Anchor size | | | | |
|--|------|---------------|------|---|----------------|-----------------|-----------------|------------------|
| | | | | M6 10/45/.. | M8 12/55/.. | M10 15/70/.. | M12 20/80/.. | M16 25/100/.. |
| Tension resistance <small>Fire resistance class</small> | | | | | | | | |
| Characteristic resistance | R30 | $N_{Rk,s,fi}$ | [kN] | 0,2 | 0,4 | 0,9 | 1,7 | 3,1 |
| | R60 | $N_{Rk,s,fi}$ | [kN] | 0,2 | 0,3 | 0,8 | 1,3 | 2,4 |
| | R90 | $N_{Rk,s,fi}$ | [kN] | 0,1 | 0,3 | 0,6 | 1,1 | 2,0 |
| | R120 | $N_{Rk,s,fi}$ | [kN] | 0,1 | 0,2 | 0,5 | 0,8 | 1,6 |
| Spacing | | $s_{cr,fi}$ | [mm] | 4 x h_{ef} | | | | |
| Edge distance | | $c_{cr,fi}$ | [mm] | 2 x h_{ef} | | | | |
| | | c_{min} | [mm] | In fire attack from more than one side: ≥ 300 mm | | | | |

| | | | | | | | | |
|--|------|-----------------|------|-----|-----|-----|-----|-----|
| Shear resistance without lever arm <small>Fire resistance class</small> | | | | | | | | |
| Characteristic resistance | R30 | $V_{Rk,s,fi}$ | [kN] | 0,2 | 0,4 | 0,9 | 1,7 | 3,1 |
| | R60 | $V_{Rk,s,fi}$ | [kN] | 0,2 | 0,3 | 0,8 | 1,3 | 2,4 |
| | R90 | $V_{Rk,s,fi}$ | [kN] | 0,1 | 0,3 | 0,6 | 1,1 | 2,0 |
| | R120 | $V_{Rk,s,fi}$ | [kN] | 0,1 | 0,2 | 0,5 | 0,8 | 1,6 |
| Shear resistance with lever arm | | | | | | | | |
| Characteristic resistance | R30 | $M^0_{Rk,s,fi}$ | [Nm] | 0,2 | 0,4 | 1,1 | 2,6 | 6,6 |
| | R60 | $M^0_{Rk,s,fi}$ | [Nm] | 0,1 | 0,3 | 1,0 | 2,0 | 5,0 |
| | R90 | $M^0_{Rk,s,fi}$ | [Nm] | 0,1 | 0,3 | 0,7 | 1,7 | 4,3 |
| | R120 | $M^0_{Rk,s,fi}$ | [Nm] | 0,1 | 0,2 | 0,6 | 1,3 | 3,3 |

| | | |
|--|--|----------|
| Liebig® Safety Bolt™ | | Annex C3 |
| Performances Design method A: Characteristic values of resistances under fire exposure | | |