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Member of EOTA
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# European Technical Assessment

# ETA 23/0707
## of 24/01/2025

**Technical Assessment Body issuing the ETA:** Technical and Test Institute for Construction Prague

| | |
|---|---|
| **Trade name of the construction product** | R-HLX |
| **Product family to which the construction product belongs** | Product area code: 33<br>Concrete screw for use in cracked and uncracked concrete |
| **Manufacturer** | Rawlplug S.A.<br>Ul. Kwidzyńska 6<br>51-416 Wrocław<br>Poland |
| **Manufacturing plant** | Manufacturing Plant No 2 |
| **This European Technical Assessment contains** | 15 pages including 13 Annexes which form an integral part of this assessment |
| **This European Technical Assessment is issued in accordance with regulation (EU) No 305/2011, on the basis of** | EAD 330232-01-0601<br>Mechanical fasteners for use in concrete |
| **This version replaces** | ETA 23/0707 issued on 19/03/2024 |

## 1. Technical description of the product

The R-HLX concrete screw in sizes of 6, 8, 10, 12 and 14 is made of carbon steel with coating.

The anchor is screwed into a drilled cylindrical hole. The special thread of the anchor cuts an internal thread into the member while setting. The anchorage is characterised by mechanical interlock in the special thread.

The installed anchor is shown in Annex A1.

## 2. Specification of the intended use in accordance with the applicable EAD

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 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 producer, but are to be regarded only as a means for choosing the 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 (static and quasi-static loading) | See Annex C 1 and C 2 |
| Displacement | See Annex C 1 and C 2 |
| Characteristic resistance for seismic performance category C1 and C2 | See Annex C 4 |

### 3.2 Safety in case of fire (BWR 2)

| Essential characteristic | Performance |
|---|---|
| Reaction to fire | Class A1 according to EN 13501-1 |
| Resistance to fire | Seen Annex C 3 |

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

According to the Decision 96/582/EC of the European Commission[1], the system 1 of assessment verification of constancy of performance (see Annex V to the Regulation (EU) No 305/2011) apply.

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

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Technical and Test Institute for Construction Prague.

Issued in Prague on 24.01.2025

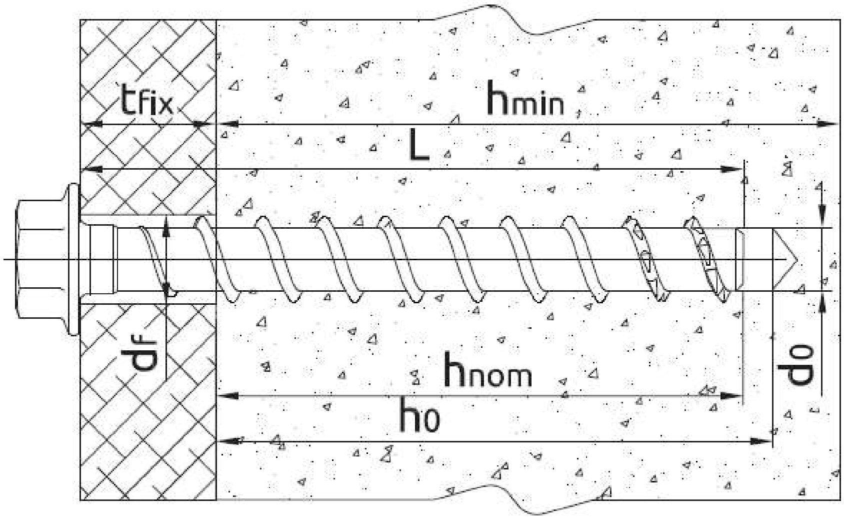
By

**Ing. Jiří Studnička, Ph.D.**
Head of the Technical Assessment Body

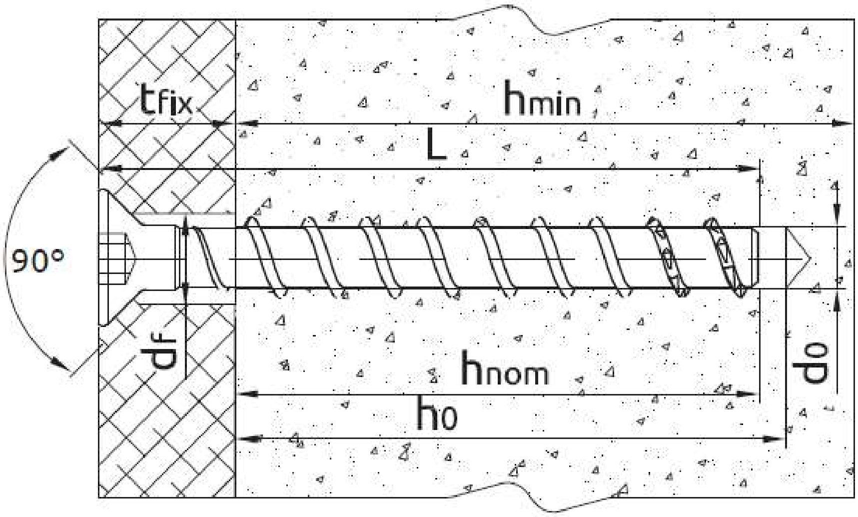
TECHNICKÝ A ZKUŠEBNÍ ÚSTAV STAVEBNÍ PRAHA, s.p. Technical and Test Institute for Construction Prague, SOE ZÚS Czech Republic Technical Assessment Body Subjekt pro technické posuzování

1 Official Journal of the European Communities L 254 08.10.1996

**R-HLX-HF - Installed screw**

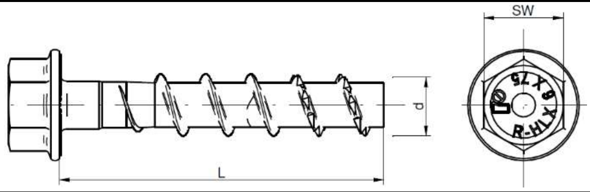
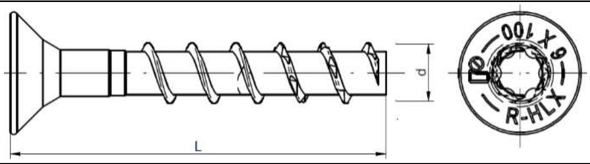
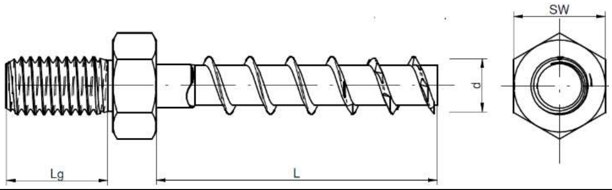
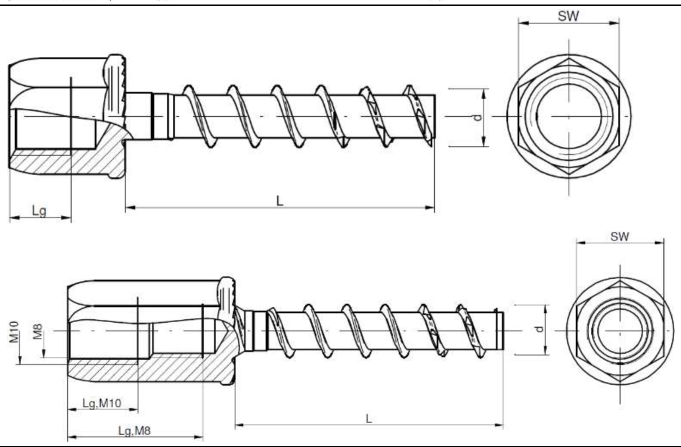
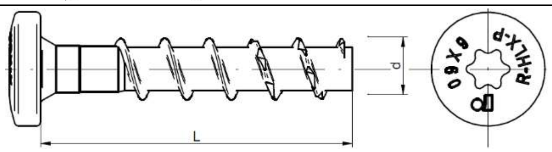
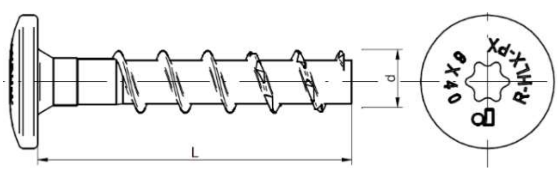
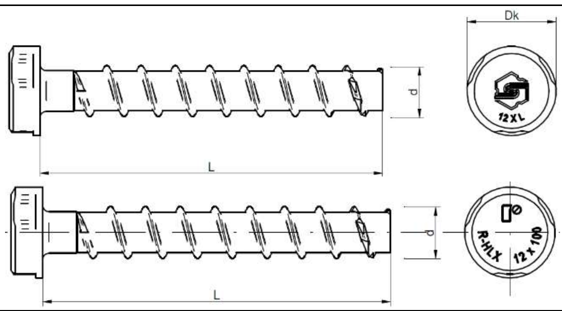



**R-HLX-CS - Installed screw**




| R-HLX | Annex A 1 |
|---|---|
| **Product description**<br>Installed conditions | |

## R-HLX – Types

| Type | Design |
|---|---|
| R-HLX-HF |  |
| R-HLX-CS |  |
| R-HLX-E |  |
| R-HLX-I |  |
| R-HLX-P |  |
| R-HLX-PX |  |
| HLX-SI |  |

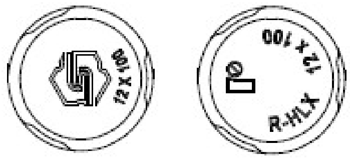
| | |
|---|---|
| **R-HLX** | |
| **Product description**<br>Materials<br>Marking | **Annex A 2** |

**Table A1 - Materials**

| Material |
|---|
| Carbon steel; rupture elongation $A_5 \geq 12\%$<br>Galvanized zinc plating ($\geq 5$ µm), acc  ISO 4042 or<br>Zinc flake ($\geq 5$ µm), acc. ISO 10683 |

**R-HLX and HLX-SI – Marking**

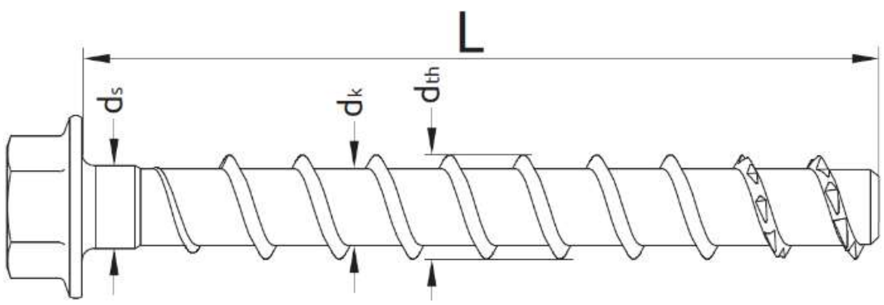

Marking:
R-HLX Identifying mark of the producer
D x L, where:
D – screw size [mm], e. g. 10
L – length of a screw [mm], e. g. 100




HLX-SI head
D x L, where:
D – screw size [mm], e. g. 10
L – length of a screw [mm], e. g. 100

**Table A2 - Dimensions**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Nominal diameter | $d_{nom}$ | [mm] | 6 | 8 | 10 | 12 | 14 |
| Threaded outer diameter | $d_{th}$ | [mm] | 7,9 | 10,4 | 12,7 | 14,9 | 16,9 |
| Core diameter | $d_k$ | [mm] | 5,6 | 7,5 | 9,3 | 11,5 | 13,3 |
| Shaft diameter | $d_s$ | [mm] | 5,85 | 7,85 | 9,8 | 11,95 | 13,85 |
| Head sizes R-HLX-HF | Sw | [-] | 10 | 13 | SW15 | SW17 | SW21 |
| Head sizes CS | T | [-] | T40 | T50 | T50 | T50 | T50 |




**R-HLX**

**Product description**
Dimensions

**Annex A 3**

## Specifications of intended use

**Anchorages subject to:**
- Static and quasi-static loads
- Fire exposure
- Seismic performance category C1
- Seismic performance category C2, only standard embedment depth

**Base materials**
- Cracked or uncracked concrete.
- Reinforced or unreinforced normal weight concrete of strength class C20/25 at minimum and C50/60 at maximum according EN 206:2013+A1:2016.

**Use conditions (Environmental conditions)**
- Structures subject to dry internal conditions.

**Design:**
- The anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- The anchorages are designed in accordance with the EN 1992-4:2018 and Technical Report TR 055, Edition February 2018.
- Anchorages under fire exposure have to be designed in accordance with EN 1992-4, Annex D.
- Anchorages under seismic actions have to be designed in accordance with EN 1992-4, Annex C.
- 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. positions of the fastener relative to reinforcement or to support, etc.).

**Installation:**
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- Use of the anchor only as supplied by the manufacturer without exchanging any components of the anchor.
- Anchor installation in accordance with the manufacturer’s specifications and drawings using the appropriate tools.
- Effective anchoring depth, edge distance and spacing not less than the specified values without minus tolerance.
- In case of aborted drill 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 load it is not in the direction of load application.

| R-HLX | Annex B 1 |
|---|---|
| **Intended use**<br>Specifications | |

**Table B1 - Installation parameters for standard embedment depth**

| Type | Drill hole diameter $d_0$ [mm] | Maximum cutting diameter $d_{cut,max}$ [mm] | Nominal embedment depth $h_{nom}$ [mm] | Min. hole depth $h_0$ [mm] | Max. hole diameter in fixture $d_f$ [mm] | Maximum installation torque $T_{imp,max}$ [Nm] | Minimum thickness of concrete member $h_{min}$ [mm] | Minimum spacing $s_{min}$ [mm] | Minimum edge distance $c_{min}$ [mm] |
|---|---|---|---|---|---|---|---|---|---|
| R-HLX-6 | 6 | 6,4 | 55 | 65 | 9 | 250 | 80 | 35 | 35 |
| R-HLX-8 | 8 | 8,45 | 70 | 85 | 12 | 350 | 110 | 35 | 35 |
| R-HLX 10 | 10 | 10,45 | 85 | 95 | 14 | 650 | 130 | 60 | 60 |
| R-HLX 12 | 12 | 12,45 | 100 | 110 | 16 | 1000 | 155 | 80 | 80 |
| R-HLX 14 | 14 | 14,45 | 115 | 125 | 18 | 1000 | 190 | 100 | 100 |

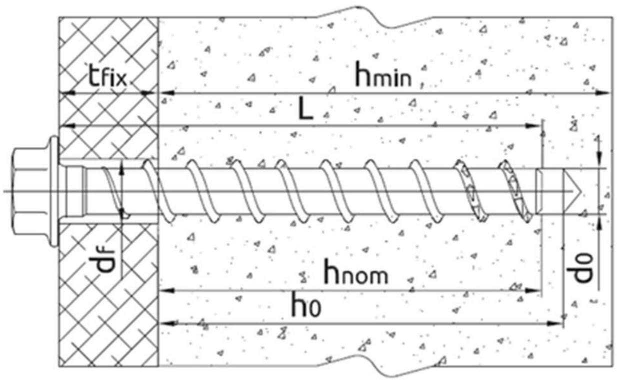
**Table B2 - Installation parameters for medium embedment depth**

| Type | Drill hole diameter $d_0$ [mm] | Maximum cutting diameter $d_{cut,max}$ [mm] | Nominal embedment depth $h_{nom}$ [mm] | Min. hole depth $h_0$ [mm] | Max. hole diameter in fixture $d_f$ [mm] | Maximum installation torque $T_{imp,max}$ [Nm] | Minimum thickness of concrete member $h_{min}$ [mm] | Minimum spacing $s_{min}$ [mm] | Minimum edge distance $c_{min}$ [mm] |
|---|---|---|---|---|---|---|---|---|---|
| R-HLX-6 | 6 | 6,4 | 40 | 50 | 9 | 250 | 80 | 35 | 35 |
| R-HLX-8 | 8 | 8,45 | 60 | 70 | 12 | 350 | 110 | 35 | 35 |
| R-HLX 10 | 10 | 10,45 | 75 | 85 | 14 | 650 | 120 | 60 | 60 |
| R-HLX 12 | 12 | 12,45 | 80 | 90 | 16 | 1000 | 130 | 80 | 80 |
| R-HLX 14 | 14 | 14,45 | 85 | 95 | 18 | 1000 | 130 | 100 | 100 |

**Table B3 – Installation parameters for reduced embedment depth**

| Type | Drill hole diameter $d_0$ [mm] | Maximum cutting diameter $d_{cut,max}$ [mm] | Nominal embedment depth $h_{nom}$ [mm] | Min. hole depth $h_0$ [mm] | Max. hole diameter in fixture $d_f$ [mm] | Maximum installation torque $T_{imp,max}$ [Nm] | Minimum thickness of concrete member $h_{min}$ [mm] | Minimum spacing $s_{min}$ [mm] | Minimum edge distance $c_{min}$ [mm] |
|---|---|---|---|---|---|---|---|---|---|
| R-HLX-6 | 6 | 6,4 | 35[1)] | 45 | 9 | 250 | 80 | 35 | 35 |
| R-HLX-8 | 8 | 8,45 | 50 | 60 | 12 | 350 | 110 | 35 | 35 |
| R-HLX 10 | 10 | 10,45 | 55 | 65 | 14 | 650 | 100 | 60 | 60 |
| R-HLX 12 | 12 | 12,45 | 60 | 70 | 16 | 1000 | 110 | 80 | 80 |
| R-HLX 14 | 14 | 14,45 | 65 | 75 | 18 | 1000 | 110 | 100 | 100 |

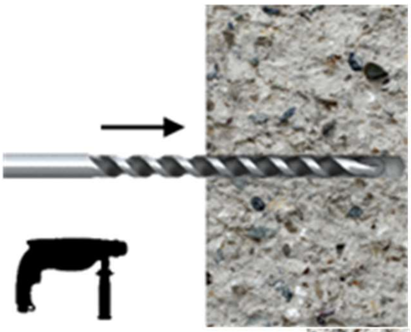
1) Use restricted to anchoring statically indeterminate structural components




| | |
|---|---|
| **R-HLX** | **Annex B 2** |
| **Intended use**<br>Installation parameters | |

**Installation instructions I – with cleaning (see Table C1 - $\gamma_{inst}$)**

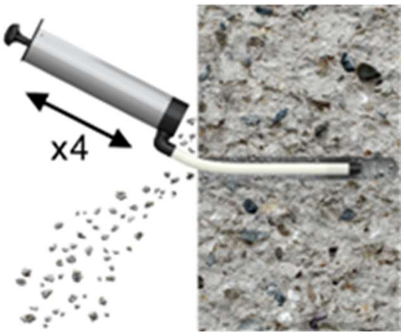
1a



1b

1. Drill the hole with a hammer drill (1a) or a dust-free drill (1b) to the required depth.
   Drill hole depth: $h_1 \geq L - t_{fix} + 10$ mm

2.




2. Clean the hole (blow dust at least 4 times with the hand pump). When using a dust-free drill bit (1b), it is not necessary to clean the hole by pump.

3.


3. Screw the concrete screw into the hole with an impact wrench and a suitable impact socket. Tighten until the fixture is clamped to the substrate.
   Installation with any tangential impact wrench.

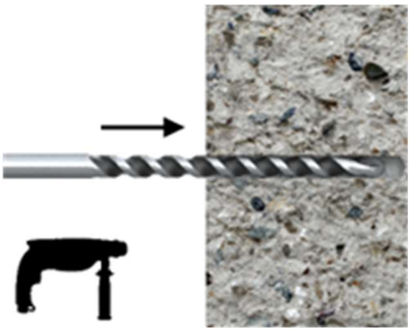
4.

4. Finish screwing when the screw head presses the fastened element/substrate. The screw head must not be damaged.

| | |
|---|---|
| **R-HLX** | **Annex B 3** |
| **Intended use**<br>Installation instructions I | |

**Installation instructions II – without cleaning (see Table C1 - $\gamma_{inst}$)**

1



1. Drill the hole with a hammer drill to the required depth and 3x ventilation after drilling is executed (moving the drill bit in and out drill hole 3 times after the recommended drilling depth is achieved).
   Drill hole depth: $h_1 \geq L - t_{fix} + 25$ mm

2.


2. Screw the concrete screw into the hole with an impact wrench and a suitable impact socket. Tighten until the fixture is clamped to the substrate.
   Installation with any tangential impact wrench.

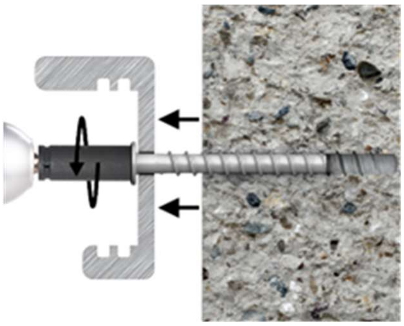
3.

3. Finish screwing when the screw head presses the fastened element/substrate. The screw head must not be damaged.

| R-HLX | Annex B 4 |
|---|---|
| **Intended use**<br>Installation instructions II | |

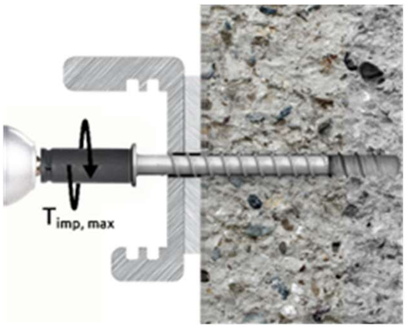
**Installation instructions III – adjustment (see Table C1)**

4.



4. Possibility to unscrew the fixed anchor to a maximum height of 10mm.
   In the adjustment process, the permissible thickness of the fastened elements ($T_{fix}$) must be observed.

5.




5. Adjust the element and tighten until the fixture is clamped to the substrate.
   Installation with any impact wrench with tangential impact.

6.

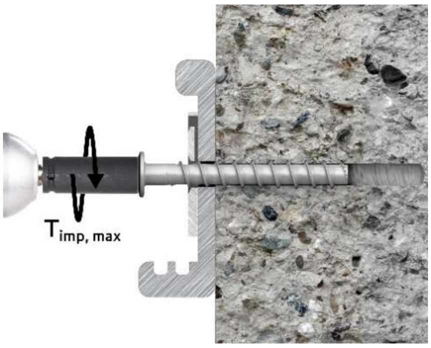
6. Finish screwing when the screw head presses the fastened element (substrate).
   The adjustment operation can be performed twice.

**Adjustment not allowed for anchorage subjected to seismic actions.**

| | |
|---|---|
| **R-HLX** | **Annex B 5** |
| **Intended use**<br>Installation instructions III | |

**Installation instructions IV: filling of the annular gap (see Tables C7 and C8 - $\alpha_{gap}$)**

1.




1. Place the sealing ring on the fixture. Screw the concrete screw into the hole using an impact wrench and an appropriate impact socket. Tighten until the element is pressed to the surface. Installation using any impact wrench with a tangential impact.

2.

2. Finish screwing in when the screw head and the ring presses with the fastened element/substrate. The screw head must not be damaged.

3.

3. Place the dispensing nozzle in the opening of the sealing ring. Fill the annular gap with resin.

4.

4. Correctly installed screw with a sealing ring filled with resin.

| | |
|---|---|
| **R-HLX** | **Annex B 6** |
| **Intended use**<br>Installation instructions IV | |

## Table C1 – Characteristic resistance under tension load

| **Size** | | | 6 | | | 8 | | | 10 | | | 12 | | | 14 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Nominal embedment depth** | | $h_{nom}$ [mm] | 35[2)] | 40 | 55 | 50 | 60 | 70 | 55 | 75 | 85 | 60 | 80 | 100 | 65 | 85 | 115 |
| **Adjustment** | | | | | | | | | | | | | | | | | |
| Max. thickness of adjustment layers | | $t_{adj}$ [mm] | - | - | 10 | 10 | 10 | 10 | - | - | 10 | - | - | 10 | - | - | 10 |
| Max. number of adjustments | | $n_a$ [-] | - | - | 2 | 2 | 2 | 2 | - | - | 2 | - | - | 2 | - | - | 2 |
| **Steel failure** | | | | | | | | | | | | | | | | | |
| Characteristic resistance | | $N_{Rk,s}$ [kN] | 19,4 | | | 35,4 | | | 54,3 | | | 83,1 | | | 111,1 | | |
| Partial safety factor | | $\gamma_{Ms}$ [-] | 1,5 | | | | | | | | | | | | | | |
| **Pull-out failure** | | | | | | | | | | | | | | | | | |
| Characteristic resistance in uncracked concrete C20/25 | | $N_{Rk,p,ucr}$ [kN] | 4,5 | 8,0[1)] | 13,8[1)] | 11,9[1)] | 16,3[1)] | 20,6[1)] | 13,4[1)] | 22,3[1)] | 27,6[1)] | 15,4[1)] | 24,6[1)] | 35,2[1)] | 16,9[1)] | 26,4[1)] | 43,4[1)] |
| Characteristic resistance in cracked concrete C20/25 | | $N_{Rk,p,cr}$ [kN] | 2,0 | 2,0 | 3,5 | 8,0 | 9,0 | 11,0 | 9,4[1)] | 15,6[1)] | 19,3[1)] | 10,7[1)] | 17,2[1)] | 24,6[1)] | 11,8[1)] | 18,5[1)] | 30,4[1)] |
| Increasing factor for concrete | C25/30 | $\psi_c$ [-] | 1,08 | | | | | | 1,10 | | | | | | | | |
| | C30/37 | | 1,17 | | | | | | 1,22 | | | | | | | | |
| | C35/45 | | 1,27 | | | | | | 1,34 | | | | | | | | |
| | C40/50 | | 1,32 | | | | | | 1,41 | | | | | | | | |
| | C45/55 | | 1,37 | | | | | | 1,48 | | | | | | | | |
| | C50/60 | | 1,42 | | | | | | 1,55 | | | | | | | | |
| **Concrete cone and splitting failure** | | | | | | | | | | | | | | | | | |
| Effective embedment depth | | $h_{ef}$ [mm] | 26 | 30 | 43 | 39 | 43 | 56 | 42 | 59 | 68 | 46 | 63 | 80 | 49 | 66 | 92 |
| Factor for concrete cone failure for uncracked concrete | | $k_{ucr,N}$ [-] | 11,0 | | | | | | | | | | | | | | |
| Factor for concrete cone failure for cracked concrete | | $k_{cr,N}$ [-] | 7,7 | | | | | | | | | | | | | | |
| Robustness | with cleaning | $\gamma_{inst}$ [-] | 1,0[3)] | 1,0[3)] | 1,0 | 1,0 | 1,0 | 1,0 | 1,0 | 1,0 | 1,0 | 1,0 | 1,0 | 1,0 | 1,0 | 1,0 | 1,0 |
| | without cleaning | | 1,2[4)] | 1,2[4)] | 1,0 | 1,0 | 1,0 | 1,0 | 1,0 | 1,0 | 1,0 | 1,0 | 1,0 | 1,0 | 1,0 | 1,0 | 1,0 |
| Spacing | concrete cone failure | $s_{cr,N}$ [mm] | $3 \cdot h_{ef}$ | | | | | | | | | | | | | | |
| | splitting failure | $s_{cr,sp}$ [mm] | 80 | 90 | 130 | 120 | 150 | 170 | 120 | 180 | 200 | 140 | 200 | 240 | 150 | 200 | 280 |
| Edge distance | concrete cone failure | $c_{cr,N}$ [mm] | $1,5 \cdot h_{ef}$ | | | | | | | | | | | | | | |
| | splitting failure | $c_{cr,sp}$ [mm] | 40 | 45 | 65 | 60 | 75 | 85 | 60 | 90 | 100 | 70 | 100 | 120 | 75 | 100 | 140 |

1) limited to $N^0_{Rk,c}$
2) Use restricted to anchoring statically indeterminate structural components
3) See Annex B 3
3) See Annex B 4

## Table C2 – Displacement under tension load

| **Size** | | | 6 | | | 8 | | | 10 | | | 12 | | | 14 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Nominal embedment depth** | $h_{nom}$ | [mm] | 35 | 40 | 55 | 50 | 60 | 70 | 55 | 75 | 85 | 60 | 80 | 100 | 65 | 85 | 115 |
| Tension load in uncracked concrete | N | [kN] | 2,1 | 3,8 | 6,6 | 5,7 | 7,8 | 9,8 | 7,03 | 15,03 | 19,28 | 8,02 | 17,92 | 30,52 | 10,41 | 21,63 | 38,86 |
| Displacement | $\delta_{N0}$ | [mm] | 0,9 | 1,0 | 1,3 | 0,8 | 1,1 | 1,3 | 0,4 | 0,4 | 0,6 | 0,4 | 0,4 | 0,6 | 0,4 | 0,6 | 0,7 |
| | $\delta_{N\infty}$ | [mm] | 2,0 | 2,0 | 2,0 | 2,0 | 2,0 | 2,0 | 1,2 | 1,1 | 1,2 | 1,2 | 1,1 | 1,2 | 1,3 | 1,2 | 1,4 |
| Tension load in cracked concrete | N | [kN] | 1,0 | 1,0 | 1,7 | 3,8 | 4,3 | 5,2 | 4,55 | 9,05 | 13,62 | 6,60 | 10,25 | 22,56 | 7,60 | 14,30 | 28,41 |
| Displacement | $\delta_{N0}$ | [mm] | 0,4 | 0,5 | 0,5 | 1,1 | 1,4 | 1,7 | 0,4 | 0,4 | 0,5 | 0,5 | 0,5 | 0,7 | 0,6 | 0,7 | 0,7 |
| | $\delta_{N\infty}$ | [mm] | 2,0 | 2,0 | 2,0 | 2,0 | 2,0 | 2,0 | 2,0 | 2,0 | 2,0 | 2,0 | 2,0 | 2,0 | 2,0 | 2,0 | 2,0 |

### Table C3 – Characteristic resistance under shear load

| Size | | | 6 | | | 8 | | | 10 | | | 12 | | | 14 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Nominal embedment depth** | $h_{nom}$ | [mm] | 35[1)] | 40 | 55 | 50 | 60 | 70 | 55 | 75 | 85 | 60 | 80 | 100 | 65 | 85 | 115 |
| **Steel failure without lever arm** | | | | | | | | | | | | | | | | | |
| Characteristic resistance | $V^0_{Rk,s}$ | [kN] | 9,7 | | | 17,7 | | | 27,2 | | | 41,6 | | | 55,6 | | |
| Ductility factor | $k_7$ | [-] | 1,0 | | | | | | | | | | | | | | |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,25 | | | | | | | | | | | | | | |
| **Steel failure without lever arm** | | | | | | | | | | | | | | | | | |
| Characteristic resistance | $M^0_{Rk,s}$ | [Nm] | 16,1 | | | 39,8 | | | 75,8 | | | 143,4 | | | 221,7 | | |
| Partial safety factor | $\gamma_{Ms}$ | [-] | 1,25 | | | | | | | | | | | | | | |
| **Concrete cone pry-out failure** | | | | | | | | | | | | | | | | | |
| Pry-out factor | $k_8$ | [-] | 1,0 | 1,0 | 1,0 | 1,0 | 2,0 | 2,0 | 1,0 | 2,0 | 2,0 | 2,0 | 2,0 | 2,0 | 2,0 | 2,0 | 2,0 |
| Installation safety factor | $\gamma_{inst}$ | [-] | 1,0 | | | | | | | | | | | | | | |
| **Concrete edge failure** | | | | | | | | | | | | | | | | | |
| Effective length of anchor | $l_f$ | [mm] | 35 | 40 | 55 | 50 | 60 | 70 | 55 | 75 | 85 | 60 | 80 | 100 | 65 | 85 | 115 |
| Anchor diameter | $d_{nom}$ | [mm] | 6 | | | 8 | | | 10 | | | 12 | | | 14 | | |
| Installation safety factor | $\gamma_{inst}$ | [-] | 1,0 | | | | | | | | | | | | | | |

[1)] Use restricted to anchoring statically indeterminate structural components

### Table C4 – Displacement under shear load

| Size | | | 6 | 8 | 10 | 12 | 14 |
|---|---|---|---|---|---|---|---|
| Shear load in cracked and uncracked concrete | $V$ | [kN] | 5,5 | 10,1 | 14,3 | 20,8 | 27,8 |
| Displacement | $\delta_{V0}$ | [mm] | 6,0 | 3,0 | 1,1 | 1,4 | 1,7 |
| | $\delta_{V\infty}$ | [mm] | 9,0 | 4,5 | 1,7 | 2,1 | 2,6 |

## Table C5 – Characteristic values for fire resistance under tension load[1)]

| Size | | | 6 | | | 8 | | | 10 | | | 12 | | | 14 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Nominal embedment depth** | $h_{nom}$ | [mm] | 35[2)] | 40 | 55 | 50 | 60 | 70 | 55 | 75 | 85 | 60 | 80 | 100 | 65 | 85 | 115 |
| **Fire resistance duration at 30 minutes** | | | | | | | | | | | | | | | | | |
| Steel failure | $N_{Rk,s,fi(30)}$ | [kN] | 1,8 | | | 3,8 | | | 6,6 | | | 11,4 | | | 15,2 | | |
| Pull-out failure | $N_{Rk,p,fi(30)}$ | [kN] | 0,5 | 0,5 | 0,8 | 2,0 | 2,2 | 2,7 | 2,3 | 3,9 | 4,8 | 2,6 | 4,3 | 6,1 | 2,9 | 4,6 | 7,6 |
| **Fire resistance duration at 60 minutes** | | | | | | | | | | | | | | | | | |
| Steel failure | $N_{Rk,s,fi(60)}$ | [kN] | 1,4 | | | 2,9 | | | 5,0 | | | 8,5 | | | 11,4 | | |
| Pull-out failure | $N_{Rk,p,fi(60)}$ | [kN] | 0,5 | 0,5 | 0,8 | 2,0 | 2,2 | 2,7 | 2,3 | 3,9 | 4,8 | 2,6 | 4,3 | 6,1 | 2,9 | 4,6 | 7,6 |
| **Fire resistance duration at 90 minutes** | | | | | | | | | | | | | | | | | |
| Steel failure | $N_{Rk,s,fi(90)}$ | [kN] | 1,0 | | | 2,0 | | | 3,4 | | | 5,7 | | | 7,6 | | |
| Pull-out failure | $N_{Rk,p,fi(90)}$ | [kN] | 0,5 | 0,5 | 0,8 | 2,0 | 2,2 | 2,7 | 2,3 | 3,9 | 4,8 | 2,6 | 4,3 | 6,1 | 2,9 | 4,6 | 7,6 |
| **Fire resistance duration at 120 minutes** | | | | | | | | | | | | | | | | | |
| Steel failure | $N_{Rk,s,fi(120)}$ | [kN] | 0,8 | | | 1,6 | | | 2,6 | | | 4,3 | | | 5,7 | | |
| Pull-out failure | $N_{Rk,p,fi(120)}$ | [kN] | 0,4 | 0,4 | 0,7 | 1,6 | 1,8 | 2,2 | 1,8 | 3,1 | 3,8 | 2,1 | 3,4 | 4,9 | 2,3 | 3,6 | 6,0 |
| Spacing | $s_{cr,N}$ | [mm] | 4 $h_{ef}$ | | | | | | | | | | | | | | |
| Edge distance | $c_{cr,N}$ | [mm] | 2 $h_{ef}$ | | | | | | | | | | | | | | |
| In case of fire attack from more than one side, the edge distance of the anchor has to be ≥ 300 mm and ≥ 2 $h_{ef}$ | | | | | | | | | | | | | | | | | |

1) In absence of other national regulations, the partial safety factor for resistance under fire exposure is recommended $\gamma_{M,fi}$ = 1,0 for steel failure and concrete related failure modes under shear loading.
For concrete related failure under tension $\gamma_{M,fi}$ = 1,0 • $\gamma_{inst}$

2) Use restricted to anchoring statically indeterminate structural components

## Table C6 – Characteristic values for fire resistance under shear load[1)]

| Size | | | 6 | | | 8 | | | 10 | | | 12 | | | 14 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Nominal embedment depth** | $h_{nom}$ | [mm] | 35[2)] | 40 | 55 | 50 | 60 | 70 | 55 | 75 | 85 | 60 | 80 | 100 | 65 | 85 | 115 |
| **Fire resistance duration at 30 minutes** | | | | | | | | | | | | | | | | | |
| Characteristic resistance | $V_{Rk,s,fi(30)}$ | [kN] | 1,8 | | | 3,8 | | | 6,6 | | | 11,4 | | | 15,2 | | |
| Characteristic bending resistance | $M^0_{Rk,s,fi(30)}$ | [Nm] | 1,5 | | | 4,3 | | | 9,3 | | | 19,7 | | | 30,4 | | |
| **Fire resistance duration at 60 minutes** | | | | | | | | | | | | | | | | | |
| Characteristic resistance | $V_{Rk,s,fi(60)}$ | [kN] | 1,4 | | | 2,9 | | | 5,0 | | | 8,5 | | | 11,4 | | |
| Characteristic bending resistance | $M^0_{Rk,s,fi(60)}$ | [Nm] | 1,2 | | | 3,3 | | | 7,0 | | | 14,8 | | | 22,9 | | |
| **Fire resistance duration at 90 minutes** | | | | | | | | | | | | | | | | | |
| Characteristic resistance | $V_{Rk,s,fi(90)}$ | [kN] | 1,0 | | | 2,0 | | | 3,4 | | | 5,7 | | | 7,6 | | |
| Characteristic bending resistance | $M^0_{Rk,s,fi(90)}$ | [Nm] | 0,8 | | | 2,3 | | | 4,8 | | | 9,9 | | | 15,3 | | |
| **Fire resistance duration at 120 minutes** | | | | | | | | | | | | | | | | | |
| Characteristic resistance | $V_{Rk,s,fi(120)}$ | [kN] | 0,8 | | | 1,6 | | | 2,6 | | | 4,3 | | | 5,7 | | |
| Characteristic bending resistance | $M^0_{Rk,s,fi(120)}$ | [Nm] | 0,7 | | | 1,8 | | | 3,7 | | | 7,4 | | | 11,5 | | |

1) In absence of other national regulations, the partial safety factor for resistance under fire exposure is recommended $\gamma_{M,fi}$ = 1,0 for steel failure and concrete related failure modes under shear loading.
For concrete related failure under tension $\gamma_{M,fi}$ = 1,0 • $\gamma_{inst}$

2) Use restricted to anchoring statically indeterminate structural components

### Table C7 – Characteristic resistance under seismic action category C1

| Size | | | 6 | | 8 | | | 10 | | | 12 | | | 14 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Nominal embedment depth** | $h_{nom}$ | [mm] | 40 | 55 | 50 | 60 | 70 | 55 | 75 | 85 | 60 | 80 | 100 | 65 | 85 | 115 |
| **Tension load** | | | | | | | | | | | | | | | | |
| Steel failure | $N_{Rk,s,C1}$ | [kN] | 19,4 | | 35,4 | | | 54,3 | | | 83,1 | | | 111,1 | | |
| Pull-out failure | $N_{Rk,p,C1}$ | [kN] | 2,0 | 3,5 | 7,6 | 8,6 | 10,5 | 8,6 | 14,4 | 17,8 | 7,6 | 12,2 | 17,5 | 8,4 | 13,1 | 21,6 |
| **Shear load** | | | | | | | | | | | | | | | | |
| Steel failure | $V_{Rk,s,C1}$ | [kN] | 4,7 | | 10,6 | | | 18,7 | | | 28,7 | | | 38,3 | | |
| Reduction factor according to EN 1992-4:2018 without gap filling | $\alpha_{gap}$ | [-] | 0,5 | | | | | | | | | | | | | |
| Reduction factor according to EN 1992-4:2018 with gap filling (see Annex B 4) | $\alpha_{gap}$ | [-] | 1,0 | | | | | | | | | | | | | |

### Table C8 – Characteristic resistance under seismic action category C2

| Size | | | 8 | 10 | 12 | 14 |
|---|---|---|---|---|---|---|
| **Nominal embedment depth** | $h_{nom}$ | [mm] | 70 | 85 | 100 | 115 |
| **Tension load** | | | | | | |
| Steel failure | $N_{Rk,s,C2}$ | [kN] | 35,4 | 54,3 | 83,1 | 111,1 |
| Pull-out failure | $N_{Rk,p,C2}$ | [kN] | 2,0 | 8,5 | 13,3 | 19,3 |
| **Shear load** | | | | | | |
| Steel failure | $V_{Rk,s,C2}$ | [kN] | 3,6 | 8,0 | 22,3 | 21,6 |
| Reduction factor according to EN 1992-4:2018 without gap filling | $\alpha_{gap}$ | [-] | 0,5 | | | |
| Reduction factor according to EN 1992-4:2018 with gap filling (see Annex B 4) | $\alpha_{gap}$ | [-] | 1,0 | | | |

### Table C9 – Displacement under tension and shear load - seismic action category C2

| Size | | | 8 | 10 | 12 | 14 |
|---|---|---|---|---|---|---|
| **Nominal embedment depth** | $h_{nom}$ | [mm] | 70 | 85 | 100 | 115 |
| $\delta_{N,C2(DLS)}$ | | [mm] | 0,50 | 0,36 | 0,44 | 0,57 |
| $\delta_{N,C2(ULS)}$ | | [mm] | 1,19 | 1,29 | 1,65 | 2,55 |
| $\delta_{V,C2(DLS)}$ | | [mm] | 1,98 | 5,59 | 5,00 | 6,66 |
| $\delta_{V,C2(ULS)}$ | | [mm] | 6,24 | 7,10 | 7,90 | 9,24 |

**Note: Adjustment (see Annex B 5) not allowed.**