# TOIMIVUSDEKLARATSIOON

## DoP 0417

fischer HybridPower jaoks (plastist tüübel betooni ja müüritise kinnitamiseks) ET

1. Tootetüübi kordumatu identifitseerimiskood: **DoP 0417**

2. Kavandatud kasutusala(d): **Plastikust tüübel mitmekordseks kasutamiseks betoonis ja müüritises mittestruktuursetes rakendustes (aluspinna rühmad a, b, c, d), Vt lisa, eelkõige lisad B1 - B5.**

3. Tootja: **fischerwerke GmbH & Co. KG, Klaus-Fischer-Str. 1, 72178 Waldachtal, Saksamaa**

4. Volitatud esindaja: **–**

5. Toimivuse püsivuse hindamise ja kontrolli süsteem: **2+**

6. Euroopa hindamisdokument: **EAD 330284-00-0604-v01**
   Euroopa tehniline hinnang: **ETA-26/0168; 2026-06-23**
   Tehnilise hindamise asutus: **ETA-Danmark A/S**
   Teavitatud asutus(ed): **2873 TU Darmstadt**

7. Deklareeritud toimivus:
   **Ohutus tulekahju korral (BWR 2)**
   1) Reaktsioon tulele: Klass (A1)
   2) Tulepüsivus (alusmaterjalide rühm A): Lisa C14
   3) Tulepüsivus (alusmaterjalide rühmad B, C ja D): Annex C15

   **Mehaaniline vastupidavus ja stabiilsus (BWR 4)**
   4) Tõmbekoormuse all terase purunemiskindlus: Lisa C1
   5) Vastupidavus terase või polümeeri nihkekoormusel purunemisele: Lisa C1
   6) Tõmbekoormusel väljatõmbamisele, betooni purunemisele või polümeeri purunemisele vastupidavus (aluspinna rühm a): Lisa C1
   7) Vastupidavus igas koormussuunas ilma hoovavarreta (aluspinna rühmad b, c, d): Vt lisa, eelkõige lisad C7 - C13
   8) Servakaugus ja paigutus (aluspinna rühm a): Lisa B2
   9) Servakaugus ja paigutus (aluspinna rühmad b, c, d): Lisa B3, B4
   10) Deformatsioonid lühiajalise ja pikaajalise koormuse korral: Lisa C1

   **Vastupidavus:**
   11) Vastupidavus: Lisa B1

8. Asjakohane tehniline dokumentatsioon ja/või tehniline eridokumentatsioon: **–**

Eespool kirjeldatud toote toimivus vastab deklareeritud toimivusele. Käesolev toimivusdeklaratsioon on välja antud kooskõlas määrusega (EL) nr 305/2011 eespool nimetatud tootja ainuvastutusel.

Tootja poolt ja nimel allkirjastanud:

i.V.

Dr. Christian Weber, Arendusjuht

Dieter Pfaff, Rahvusvahelise tootmisföderatsiooni ja kvaliteedijuhtimise juht

Tumlingen, 2026-08-01

Toimivusdeklaratsioon on koostatud mitmes keeles. Kui tõlked on omavahel vastuolus, tuleb lähtuda ingliskeelsest versioonist.
Lisa sisaldab (keeleneutraalselt määratletud) juriidilisi nõudeid ületavat vabatahtlikku ja täiendavat teavet inglise keeles.

Translation guidance Essential Characteristics and Performance Parameters for Annexes
**Tõlkimisjuhised Lisade olulised omadused ja tulemuslikkuse parameetrid**

| | | |
|---|---|---|
| Safety in case of fire (BWR 2)<br>**Ohutus tulekahju korral (BWR 2)** | | |
| 1 | Reaction to fire:<br>**Reaktsioon tulele:** | - |
| 2 | Resistance to fire (base material group a):<br>**Tulepüsivus (alusmaterjalide rühm A):** | $N_{Rk,s,fi}$ [kN], $N_{Rk,s,fi}$ [kN],<br>$F_{Rk,fi,90}$ [kN]; $F_{Rk,fi}$ (α) [kN];<br>$M_{Rk,s,fi}$ [Nm]; $c_{min,fi}$ , $s_{min,fi}$ [mm] |
| 3 | Resistance to fire (base material group b, c and d):<br>**Tulepüsivus (alusmaterjalide rühm A):** | $F_{Rk,fi\,(\alpha)}$ [kN]; $M_{Rk,s,fi}$ [Nm]; $c_{min,fi}$ [mm]<br>$s_{min,fi}$ [mm] |
| Mechanical resistance and stability (BWR 4)<br>**Mehaaniline vastupidavus ja stabiilsus (BWR 4)** | | |
| 3 | Resistance to steel failure under tension loading:<br>**Tõmbekoormuse all terase purunemiskindlus:** | $N_{Rk,s}$ [kN] |
| 4 | Resistance to steel or polymer failure under shear loading:<br>**Vastupidavus terase või polümeeri nihkekoormusel purunemisele:** | $V_{Rk,s}$ [kN]; $M_{Rk,s}$ [Nm]; $V_{Rk,pol}$ [kN] |
| 5 | Resistance to pull-out or concrete failure or polymer failure under tension loading (base material group a)<br>**Tõmbekoormusel väljatõmbamisele, betooni purunemisele või polümeeri purunemisele vastupidavus (aluspinna rühm a):** | $N_{Rk,p}$ [kN] / $N_{Rk,pol}$ [kN] |
| 6 | Resistance in any load direction without lever arm (base material group b,c,d):<br>**Vastupidavus igas koormussuunas ilma hoovavarreta (aluspinna rühmad b, c, d):** | $F_{Rk}$ [kN] |
| 7 | Edge distance and spacing (base material group a)<br>**Servakaugus ja paigutus (aluspinna rühm a):** | $c_{cr;}$ $s_{cr;}$ $c_{min;}$ $s_{min;}$ $a_{;}$ $h_{min}$ [mm] |
| 8 | Edge distance and spacing (base material group b,c,d):<br>**Servakaugus ja paigutus (aluspinna rühmad b, c, d):** | $c_{min;}$ $s_{min;}$ $h_{min}$ [mm] |
| 9 | Displacements under short-term and long-term loading:<br>**Deformatsioonid lühiajalise ja pikaajalise koormuse korral:** | $\delta_0$; $\delta_\infty$ [mm] |
| Aspects of durability<br>**Vastupidavus:** | | |
| 10 | Durability:<br>**Vastupidavus:** | - |

# II SPECIFIC PART OF THE EUROPEAN TECHNICAL ASSESSMENT

## 1 Technical description of product

The fischer HybridPower is a plastic anchor consisting of a plug sleeve made of polyamide combined with a metal sceleton (power wedge), and a special screw made of either galvanized steel with an additional organic coating or stainless steel according to Annex A3. The anchor is available with two different head types; a hexagon head (type FUS) and a countersunk head (type T).

The anchors are intended for use in several base materials; cracked and uncracked concrete of strength classes ranging from C12/15 to C50/60, masonry units (solid and hollow or perforated) and unreinforced or reinforced auto aerated concrete.

The following service temperature ranges are applied for:
- T1: -20°C/50°C
- T2: -20°C/80°C

The anchor is screwed into a predrilled cylindrical drill hole, and the power wedges interlock with the base material ensuring a secure anchorage.

The product description is given in Annex A and the intended use specifications of the product are detailed in Annex B.

## 2 Specification of the intended use(s) in accordance with the applicable European Assessment Document (hereinafter 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 intended 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 or Assessment Body, 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

| Characteristic | Assessment of characteristic |
|---|---|
| **3.1 Safety in case of fire (BWR2)** | |
| Reaction to fire | Class A1 |
| Resistance to fire (base material group a) | Annex C14 |
| Resistance to fire (base material group b, c and d) | Annex C15 |
| **3.2 Mechanical resistance and stability (BWR4)** | |
| Resistance to steel failure under tension loading | Annex C1 |
| Resistance to steel failure under shear loading | Annex C1 |
| Resistance to pull-out or concrete failure or polymer failure under tension loading (base material group a) | Annex C1 |
| Resistance in any load direction without lever arm (base material group b, c and d) | Annex C7 to C13 |
| Edge distance and spacing (base material group a) | Annex B2 |
| Edge distance and spacing (base material group b, c and d) | Annex B3 and B4 |
| Displacements under short-term and long-term loading | Annex C1 |
| **3.3 Aspects of durability** | |
| Durability | Annex B1 |

See additional information in section 3.4

### 3.4 General aspects related to the performance of the product

The European Technical Assessment is issued for the product on the basis of agreed data/information, deposited with ETA-Danmark, which identifies the product that has been assessed and judged. Changes to the product or production process, which could result in this deposited data/information being incorrect, should be notified to ETA-Danmark before the changes are introduced. ETA-Danmark will decide whether or not such changes affect the ETA and consequently the validity of the CE marking on the basis of the ETA and if so whether further assessment or alterations to the ETA, shall be necessary.

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

## 4.1 AVCP system

According to the decision 1997/463/EC of the European Commission, the system(s) of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No. 305/2011) is **2+**.

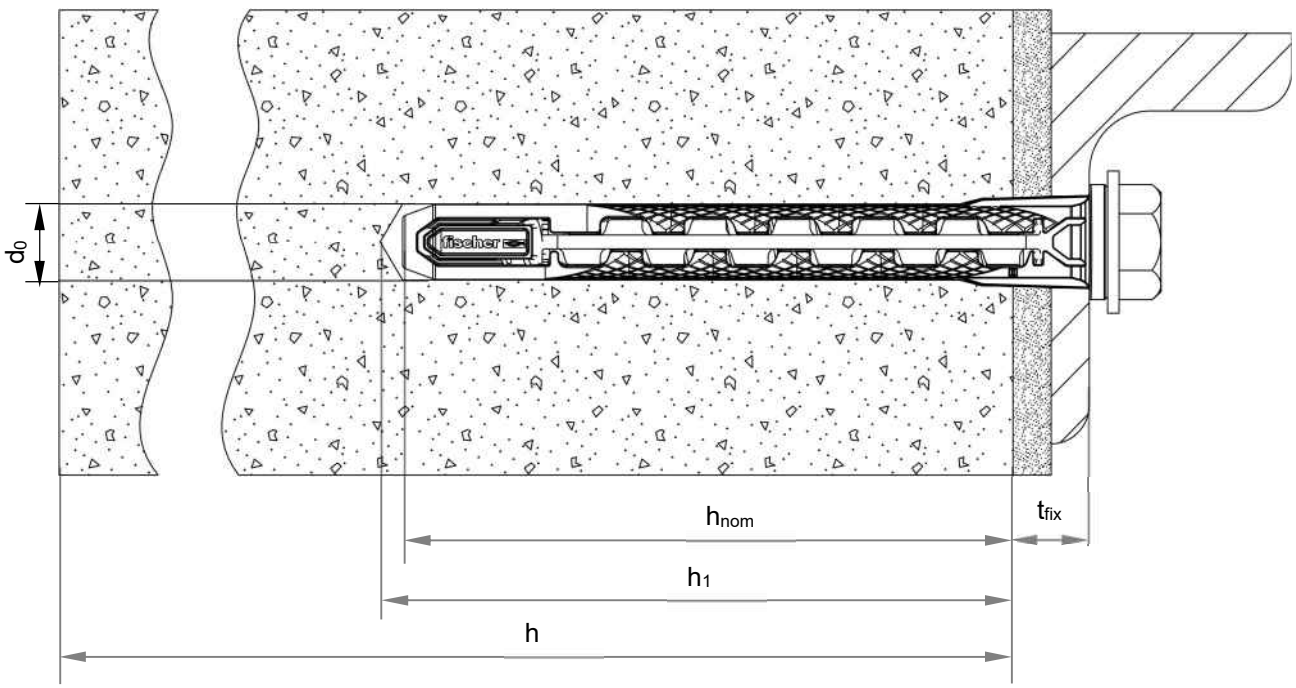
# 5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at ETA-Danmark prior to CE marking.

The following standards and documents are referred to in this European Technical Assesment:

− EOTA European Assessment Document EAD 330284-00-0604-v01: Plastic anchors for redundant non-structural systems for use in concrete and masonry under fire exposure
− EOTA Technical Report TR 051, 2018-04: Recommendations for job site tests of plastic anchors and screws
− EOTA Technical Report TR 064, 2018-05, amended 01/2023: Design of plastic anchors in concrete and masonry
− EN 206:2013+A1:2016: Concrete – Specification, performance, production and conformity
− EN 771-1:2011+A1:2015: Specification for masonry units – Part 1: Clay masonry units
− EN 771-2:2011+A1:2015: Specification for masonry units – Part 2: Calcium silicate
− EN 771-3:2011+A1:2015: Specification for masonry units – Part 3: Aggregate concrete masonry units (dense and lightweight aggregates)
− EN 771-4:2011+A1:2015: Specification for masonry units – Part 4: autoclaved aerated concrete masonry units
− EN 998-2:2010: Specification for mortar for masonry - Part 2: Masonry mortar
− EN 12602:2016: Prefabricated reinforced components of autoclaved aerated concrete
− EN 1993-1-4:2025: Design of steel structures - Part 1-4: General rules -
− EN ISO 4042:2022: Fasteners – Electroplated coating systems

**fischer HybridPower**




**Legend**

$d_0$ = Nominal drill hole diameter

$h_{nom}$ = Overall plastic anchor embedment depth in the base material

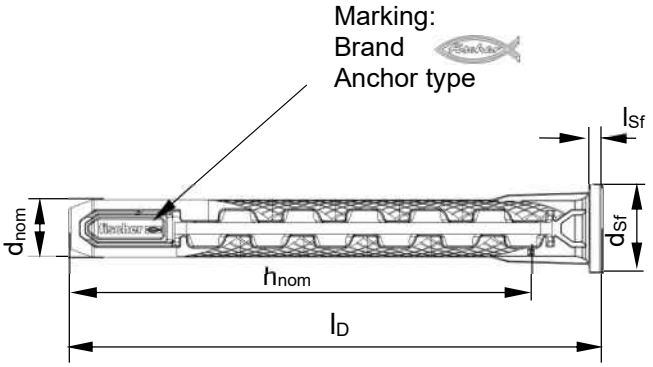
$h_1$ = Depth of drill hole to deepest point

$h$ = Thickness of member (wall)

$t_{fix}$ = Thickness of fixture and / or non-load bearing layer

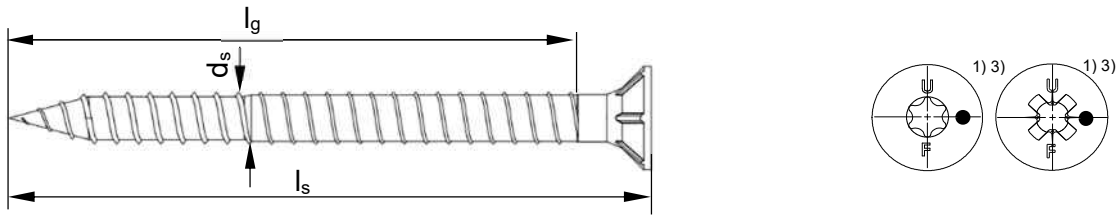
*Figure not to scale*

## Anchor sleeve – HybridPower

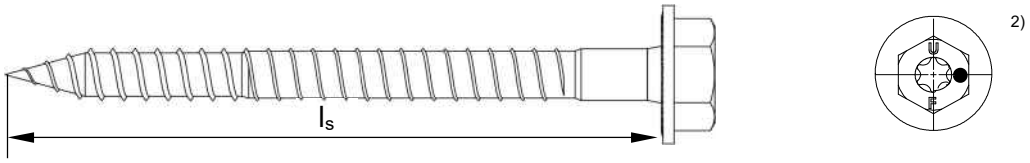



**Special screws**

Countersunk screw




Hexagonal screw with washer




1) Additional marking for the special screw, stainless steel version: e.g. "A4" resp. "R" or "A2".
2) Internal driving feature for Torx bit is optional for hexagonal head.
3) Optional additional version with underhead ribs.

### Table A2.1: Dimensions

| Anchor type | Anchor sleeve | | | | | | Special screw | | |
|---|---|---|---|---|---|---|---|---|---|
| | $h_{nom}$ [mm] | $d_{nom}$ [mm] | $t_{fix}$ [mm] | $l_D$ [mm] | $l_{Sf}$ [mm] | $d_{Sf}$ [mm] | $d_s$ [mm] | $l_G$ [mm] | $l_s$ [mm] |
| HybridPower FUS | 80 | 10 | ≥ 1 | 90-230 | 2,5 | 15 | 7,0 | 77 | $l_D$ |
| HybridPower T | 80 | 10 | ≥ 1 | 90-230 | 2,5 | 15 | 7,0 | 77 | $l_D$ |

**Legend**

$h_{nom}$ = Overall plastic anchor embedment depth in the base material
$d_{nom}$ = Nominal diameter of the anchor sleeve
$t_{fix}$ = Thickness of fixture and / or non-load bearing layer
$l_D$ = Length of the anchor sleeve
$l_{Sf}$ = Thickness of the anchor sleeve collar
$d_{Sf}$ = Diameter of the anchor sleeve collar
$d_S$ = Diameter of the screw
$l_G$ = Thread length of the screw
$l_S$ = Length of the screw

*Figures not to scale*

**fischer HybridPower**

**Product description**
Anchor type, special screws
Marking and dimensions

**Annex A2**
Appendix 6 / 27

**Table A3.1: Materials**

| Name | Material |
|---|---|
| Hybrid anchor sleeve | - Polyamide, PA6, colour: red |
| Sceleton | - Ferritic stainless steel |
| Special screw | - Galvanised steel gvz with Zn5/Ag or Zn5/An in accordance with EN ISO 4042 with additional organic layer (Zn5/Ag/T7 or Zn5/An/T7, resp. total layer thickness ≥ 6 µm)<br>**or**<br>- Stainless steel “A2” of corrosion resistance class CRC II in accordance with EN 1993-1-4<br>**or**<br>- Stainless steel “A4” or “R” of corrosion resistance class CRC III in accordance with EN 1993-1-4 |

## Specifications of intended use

**Anchorages subject to:**

- Static and quasi-static loads.
- Redundant non-structural systems.
- Fire exposure in reinforced or unreinforced compacted normal weight concrete without fibres, strength classes ≥ C20/25 as per EN 206 and solid brick masonry with mean compressive strength ≥ 5 N/mm² as per EN 771, see Annex C14 and Annex C15.

**Base materials:**

- Reinforced or unreinforced compacted normal weight concrete without fibres, strength classes ≥ C12/15 (base material group “a”), in accordance with EN 206-1, see Annex C1 and C2.
- Solid brick masonry (base material group “b”) as per EN 771-1, EN 771-2 or EN 771-3, see Annex C2, C7 and C8.
  Note: The characteristic resistance is also valid for larger brick sizes and higher compressive strength of the masonry unit.
- Hollow or perforated brick masonry (base material group “c”), as per EN 771-1, EN 771-2 or EN 771-3, see Annex C3 – C6 and C8 – C12.
- Unreinforced autoclaved aerated concrete (base material group “d”) as per EN 771-4 and reinforced autoclaved aerated concrete (base material group “d”) as per EN 12602, see Annex C2 and C13.
- Mortar strength class of the masonry ≥ M2,5 in accordance with EN 998-2.
- For other comparable base materials of the base material group “a”, “b”, “c” and “d” the characteristic resistance of the anchor may be determined by job site tests in accordance with TR 051.

**Temperature Range:**

- c: - 20 °C to 50 °C (max. short term temperature + 50 °C and max. long term temperature + 30 °C)
- b: - 20 °C to 80 °C (max. short term temperature + 80 °C and max. long term temperature + 50 °C)

**Use conditions (Environmental conditions):**

- Structures subject to dry internal conditions: Special screw made of zinc coated steel or stainless steel.
- The specific screw made of galvanised steel or galvanised steel with an additional organic layer may also be used in structures subject to external atmospheric exposure, if the area of the head of the screw is protected against moisture and driving rain after mounting of the fixing unit in this way, that intrusion of moisture into the anchor shaft is prevented. Therefore, there shall be an external cladding or a ventilated rainscreen mounted in front of the head of the screw and the head of the screw itself shall be coated with a soft plastic, permanently elastic bitumen-oil-combination coating (e.g. undercoating or body cavity protection for cars).
- Structures subject to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal condition, if no particular aggressive conditions exist: Special screw made of stainless steel of corrosion resistance class CRC III.
  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. in desulphurization plants or road tunnels where de-icing materials are used).

**Design:**

- The anchorages are to be designed in accordance with TR 064 under the responsibility of an engineer experienced in anchorages and masonry work.
- Verifiable calculation notes and drawings shall be prepared taking account of the loads to be anchored, the nature and strength of the base materials and the dimensions of the anchorage members as well as of the relevant tolerances. The position of the anchor is indicated on the design drawings.

**Installation:**

- Hole drilling by the drilling method in accordance with Annex C1 for base material group “a”, and in accordance with Annexes C7 – C13 for base material group “b”, “c” and “d”.
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- Installation temperature: - 20 °C to + 40 °C.
- Exposure to UV due to solar radiation of the anchor not protected by rendering ≤ 6 weeks.
- No ingress of water in the borehole at temperatures < 0 °C.

**Table B2.1: Installation parameters**

| Anchor type | | | | HybridPower, HybridPower A2, HybridPower A4, HybridPower R |
|---|---|---|---|---|
| Nominal drill hole diameter | $d_0$ | = | [mm] | 10 |
| Cutting diameter of drill bit | $d_{cut}$ | ≤ | [mm] | 10,45 |
| Overall plastic anchor embedment depth in the base material | $h_{nom}$ | ≥ | [mm] | 80 |
| Depth of drill hole to deepest point | $h_1$ | ≥ | [mm] | 90 |
| Diameter of clearance hole in the fixture | $d_f$ | ≤ | [mm] | 10,50[1)] |

1) In combination of hexagon screw with washer and anchor sleeve, use in elongated hole under tensile load is allowed.

**Table B2.2: Minimum thickness of member, spacing and edge distances in concrete – base material group "a"**

| Anchor Type [-] | Embed-ment depth $h_{nom}$ [mm] | Strength class [-] | Minimum thickness of member $h_{min}$ [mm] | Charac-teristic edge distance $c_{cr,N}$ [mm] | Charac-teristic spacing $s_{cr,N}$ [mm] | Minimum spacing and edge distances[1)] $s_{min}$, $c_{min}$ [mm] |
|---|---|---|---|---|---|---|
| **HybridPower, HybridPower A2, HybridPower A4, HybridPower R** | 80 | C12/15 | 100 | 70 | 105 | $s_{min}$ = 70 for c ≥ 70<br>$c_{min}$ = 70 for s ≥ 70 |
| | | ≥ C16/20 | | 50 | 75 | $s_{min}$ = 50 for c ≥ 50<br>$c_{min}$ = 50 for s ≥ 50 |

1) Intermediate values by linear interpolation.

Fixing points with spacing a ≤ $s_{cr,N}$ are considered as a group with a maximum characteristic resistance $N_{Rk,p}$ as per Table C1.2. For a spacing a > $s_{cr,N}$ the anchors are considered as single anchors, each with characteristic resistance $N_{Rk,p}$ as per Table C1.2.

**Scheme of spacing and edge distances in concrete, base material group "a"**

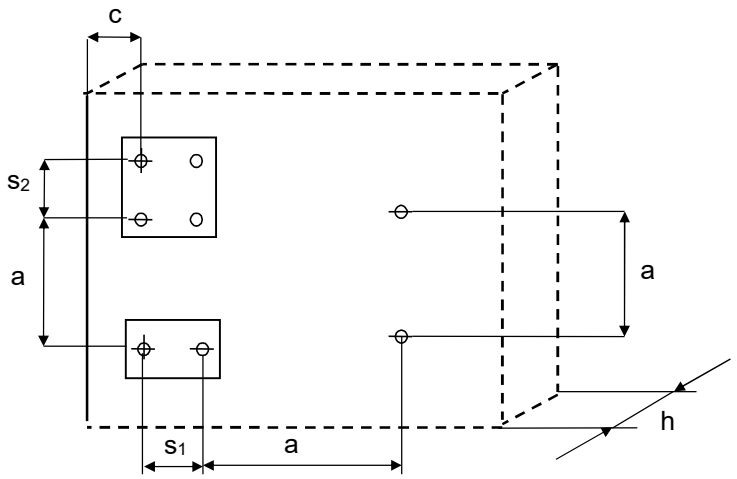



*Figure not to scale*

**Table B3.1: Minimum thickness of member, spacing and edge distances in solid and hollow or perforated masonry – base material group "b" and "c"**

| Anchor Type | | | HybridPower, HybridPower A2, HybridPower A4, HybridPower R |
|---|---|---|---|
| Minimum thickness of member[1)] | $h_{min}$ | [mm] | 115 |
| Minimum spacing between anchor groups and / or single anchors | $a_{min}$ | [mm] | 250 |
| **Single anchor** | | | |
| Minimum edge distance | $c_{min}$ | [mm] | 100 |
| **Anchor group** | | | |
| Minimum spacing perpendicular to free edge | $s_{1,min}$ | [mm] | 100 |
| Minimum spacing parallel to free edge | $s_{2,min}$ | [mm] | 100 |
| Minimum edge distance | $c_{min}$ | [mm] | 100 |

1) Member thickness according to Annex C2 – C6.

**Scheme of spacing and edge distances in solid and hollow or perforated masonry – base material group "b" and "c"**

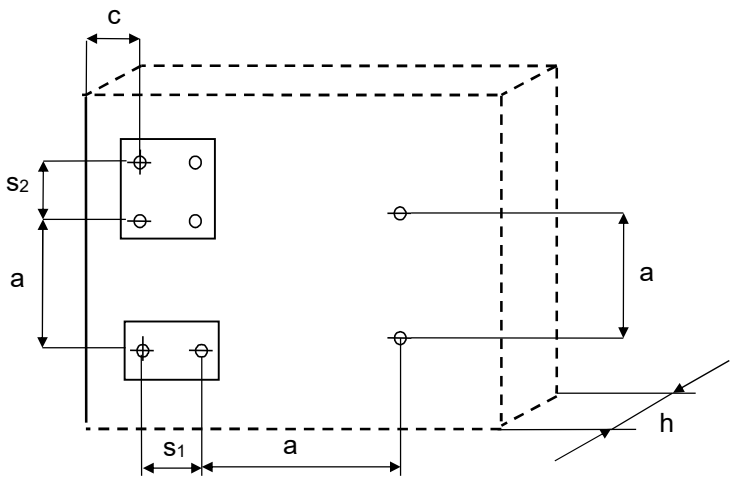



*Figure not to scale*

**fischer HybridPower**

**Intended use**
Minimum thickness of member, spacing and edge distances for use in solid, hollow or perforated masonry

**Annex B3**

**Table B4.1: Minimum thickness of member, spacing and edge distances in unreinforced and reinforced autoclaved aerated concrete – base material group "d"**

| Anchor type | | | HybridPower, HybridPower A2, HybridPower A4, HybridPower R | |
|---|---|---|---|---|
| Compressive strength[1)] | $f_{cm,decl}$ $f_{ck}$ | [N/mm²] | ≥ 2 | > 3 |
| Minimum thickness of member | $h_{min}$ | [mm] | 115 | 175 |
| Minimum spacing between anchor groups and / or single anchors | $a_{min}$ | [mm] | 250 | 250 |
| **Single anchor** | | | | |
| Minimum edge distance | $c_{min}$ | [mm] | 100 | 100 |
| **Anchor group** | | | | |
| Minimum spacing perpendicular to free edge | $s_{1,min}$ | [mm] | 100 | 100 |
| Minimum spacing parallel to free edge | $s_{2,min}$ | [mm] | 100 | 100 |
| Minimum edge distance | $c_{min}$ | [mm] | 100 | 100 |

1) See Table C13.1 and C13.2.

**Scheme of spacing and edge distances in unreinforced and reinforced autoclaved aerated concrete – base material group "d"**

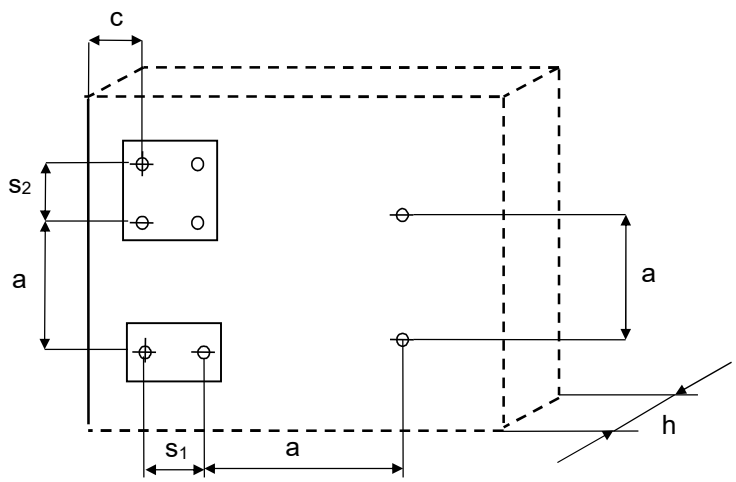



*Figure not to scale*

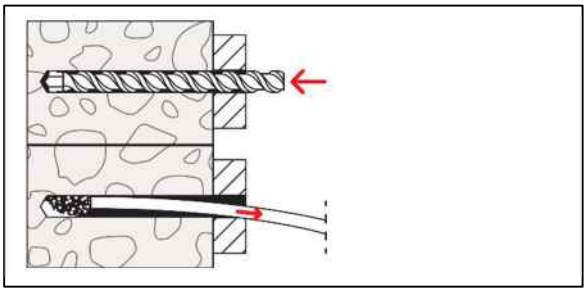
**fischer HybridPower**

**Intended use**
Minimum thickness of member, spacing and edge distances for use in autoclaved aerated concrete

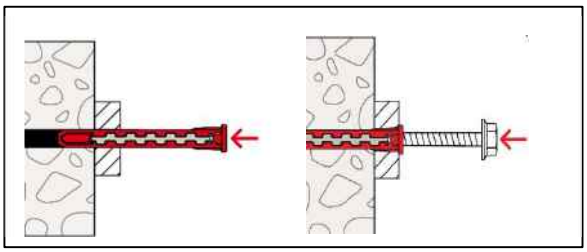
**Annex B4**

## Installation instructions

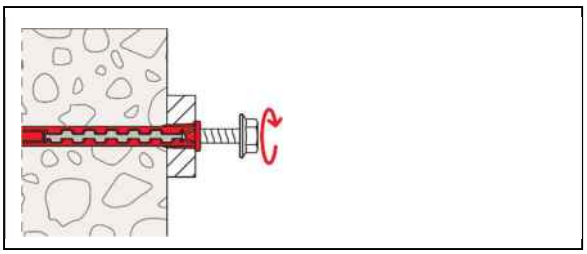
The following pictures show fixing through timber in concrete.
Summary of all kind of masonry bricks see Annex C2 – C6.



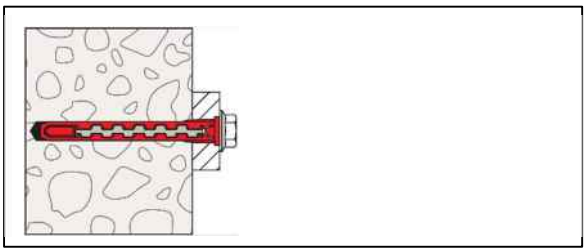
1. Drill the bore hole as per Table B2.1 using the drilling method described in the corresponding Annex C1 and C7 to C13.
2. For use in base material group “a“ (concrete), “b“ (solid bricks), “d” (autoclaved aerated concrete):
   Remove dust from borehole.
   Not necessary for base material group “c”.



3. Insert anchor (screw and sleeve) by using a hammer until the collar of the plastic sleeve is flush with the surface of the fixture.



4. The screw is screwed-in until the head of the screw touches the sleeve. The anchor is correctly installed, if the head of the screw fits tight on the surface and nor the anchor sleeve neither the screw cannot be turned-in any further.



5. Correctly installed anchor, shown in concrete.

*Figures not to scale*

**Table C1.1: Characteristic resistance of the screws**

| Failure of expansion element (special screw) | | | HybridPower, HybridPower A2, HybridPower A4, HybridPower R | |
|---|---|---|---|---|
| | | | galvanised steel | stainless steel |
| Characteristic tension resistance | $N_{Rk,s}$ | [kN] | **21,70** | **21,70** |
| Partial safety factor | $\gamma_{Ms}$ 1) | [-] | **1,55** | **1,55** |
| Characteristic shear resistance | $V_{Rk,s}$ | [kN] | **10,80** | **10,80** |
| Partial safety factor | $\gamma_{Ms}$ 1) | [-] | **1,29** | **1,29** |
| **Characteristic bending resistance of the screw** | | | | |
| Characteristic bending resistance | $M_{Rk,s}$ | [Nm] | **20,60** | **20,60** |
| Partial safety factor | $\gamma_{Ms}$ 1) | [-] | **1,29** | **1,29** |

1) In absence of other national regulations.

**Table C1.2: Characteristic resistance due to pullout-failure for use in cracked and uncracked concrete base material group "a"1)**

| Pull-out failure (plastic sleeve) | | | HybridPower, HybridPower A2, HybridPower A4, HybridPower R |
|---|---|---|---|
| **Embedment depth $h_{nom}$** | ≥ | [mm] | **80** |
| **Concrete ≥ C16/20** | | | |
| Characteristic tension resistance (30/50 °C) | $N_{Rk,p}$ | [kN] | **4,50 / 3,00**2) |
| Characteristic tension resistance (50/80 °C) | $N_{Rk,p}$ | [kN] | **4,00 / 3,00**2) |
| Partial safety factor | $\gamma_{Mc}$ 3) | [-] | **1,80** |

1) Drilling method: hammer drilling.
2) Valid for concrete C12/15.
3) In absence of other national regulations.

**Table C1.3: Displacements1) under tension and shear loading in cracked and uncracked concrete, base material group "a" and in masonry, base material group "b" and "c"**

| Displacements under | | | Tension load2) | | Shear load2) | |
|---|---|---|---|---|---|---|
| **Anchor type** | $h_{nom}$ [mm] | F [kN] | $\delta_{NO}$ [mm] | $\delta_{N\infty}$ [mm] | $\delta_{VO}$ [mm] | $\delta_{V\infty}$ [mm] |
| **HybridPower, HybridPower A2, HybridPower A4, HybridPower R** | 80 | 2,50 | 0,90 | 0,90 | 4,90 | 1,35 |

1) Valid for all ranges of temperatures.
2) Intermediate values by linear interpolation.

**Table C1.4 Displacements1) under tension and shear loading in unreinforced and reinforced autoclaved aerated concrete, base material group "d"**

| Displacements under | | | | Tension load2) | | Shear load2) | |
|---|---|---|---|---|---|---|---|
| **Anchor type** | $f_{cm,decl}$ / $f_{ck}$ [N/mm²] | $h_{nom}$ [mm] | F [kN] | $\delta_{NO}$ [mm] | $\delta_{N\infty}$ [mm] | $\delta_{VO}$ [mm] | $\delta_{V\infty}$ [mm] |
| **HybridPower, HybridPower A2, HybridPower A4, HybridPower R** | **≥ 2** | 80 | 0,14 | 0,20 | 0,39 | 0,29 | 0,43 |
| | **≥ 6** | 80 | 0,57 | 0,11 | 0,21 | 1,14 | 1,71 |

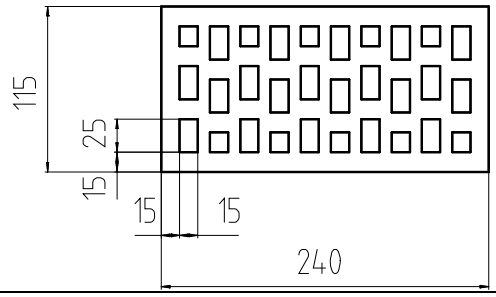
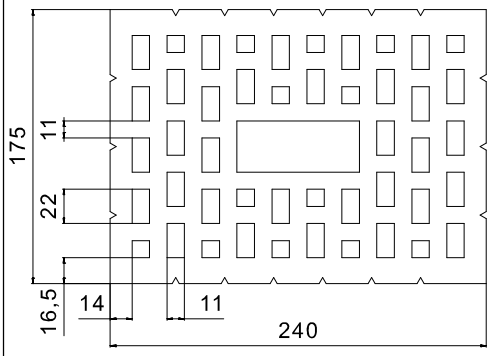
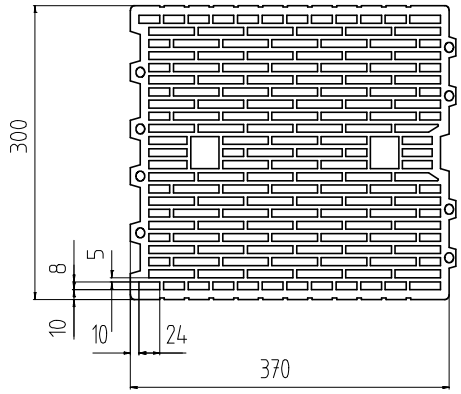
1) Valid for all ranges of temperatures. 2) Intermediate values by linear interpolation.

**Table C2.1: Summary of concrete - base material group "a", solid bricks – base material group "b"[1] and autoclaved aerated concrete – base material group "d"**

| Base material | Format | Dimensions [mm] | Mean compressive strength as per EN 771 [N/mm²] | Bulk density ρ [kg/dm³] | See Annex |
|---|---|---|---|---|---|
| **Concrete** ≥ **C12/15** as per EN 206 | | | | | C1 |
| **Autoclaved aerated concrete, AAC** as per EN 771-4 | | | | | C13 |
| **Reinforced autoclaved aerated concrete, AAC** as per EN 12602 | | | | | C13 |
| **Clay brick Mz**, as per EN 771-1 *e.g. Ziegelwerk Nordhausen, DE* | ≥ NF | ≥ 240x115x71 | ≥ 7,5 | ≥ 2,0 | C7 |
| **Clay brick Mz**, as per EN 771-1 *e.g. Wienerberger DE* | ≥ 2 DF | ≥ 240x115x113 | ≥ 10,0 | ≥ 1,8 | C7 |
| **Calcium silicate solid brick KS,** as per EN 771-2 *e.g. KS Wemding, DE* | ≥ NF | ≥ 240x115x71 | ≥ 7,5 | ≥ 2,0 | C7 |
| **Calcium silicate solid brick KS,** as per EN 771-2 *e.g. Hermann Peter, DE* | ≥ 2 DF | ≥ 240x115x113 | ≥ 7,5 | ≥ 2,0 | C7 |
| **Calcium silicate solid brick KS,** as per EN 771-2 *e.g. Hermann Peter, DE* | ≥ 12 DF | ≥ 498x175x248 | ≥ 7,5 | ≥ 2,0 | C8 |
| **Lightweight solid brick Vbl**, as per EN 771-3 *e.g. KLB, DE* | ≥ 2 DF | ≥ 240x115x113 | ≥ 2,5 | ≥ 1,2 | C8 |

[1] Vertically perforation ≤ 15%; cross section reduced by perforation vertically to the resting area.

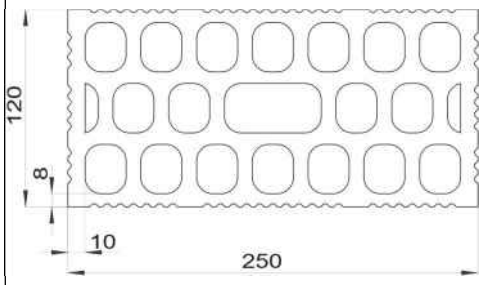
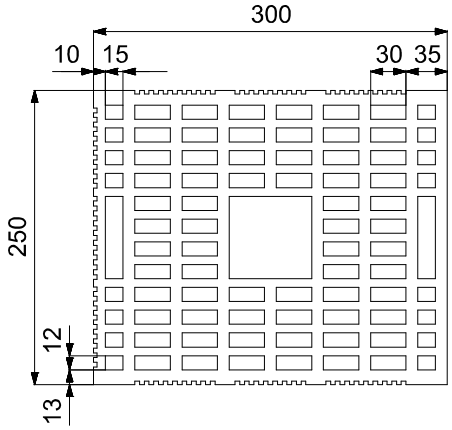
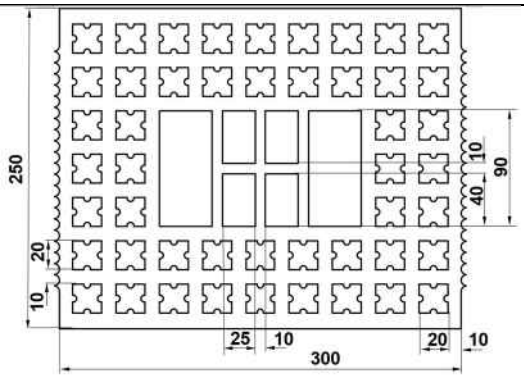
**Table C3.1: Summary of hollow or perforated bricks – base material group "c"[1)]**

| Base material | Format/ Dimensions [mm] | Brick drawing [mm] | Mean compressive strength as per EN 771 [N/mm²] / bulk density ρ [kg/dm³] | See Annex |
|---|---|---|---|---|
| **Perforated clay brick Hlz,** as per EN 771-1 *e.g. Wienerberger, DE* | 2 DF 240x115x113 |   | ≥ 7,5 / ≥ 0,9 | C8 |
| **Perforated clay brick Hlz,** as per EN 771-1 *e.g. Schlagmann, DE* | 3 DF 240x175x113 |   | ≥ 7,5 / ≥ 1,2 | C9 |
| **Perforated clay brick Hlz,** as per EN 771-1 *e.g. Wienerberger Porotherm 30 R, FR* | 370x300x250 |   | ≥ 5,0 / ≥ 0,8 | C9 |

[1)] Vertically perforation > 15% and ≤ 50%; cross section reduced by perforation vertically to the resting area.

*Figures not to scale*

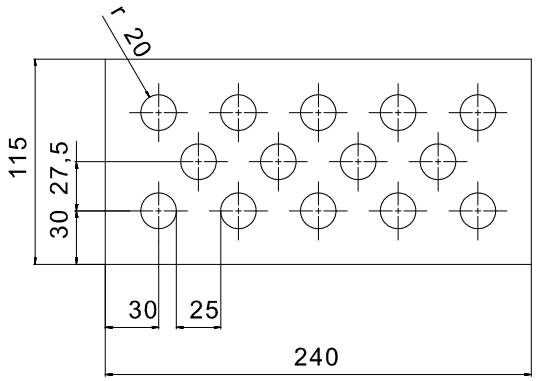
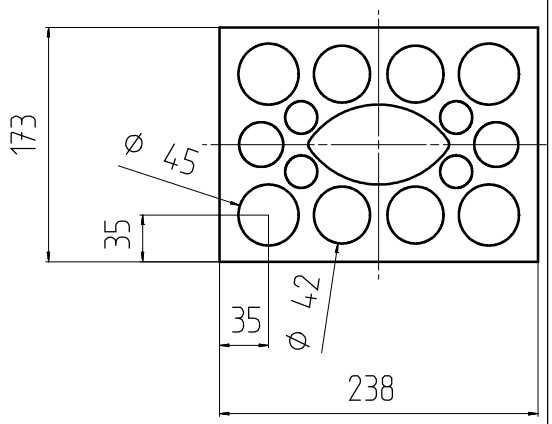
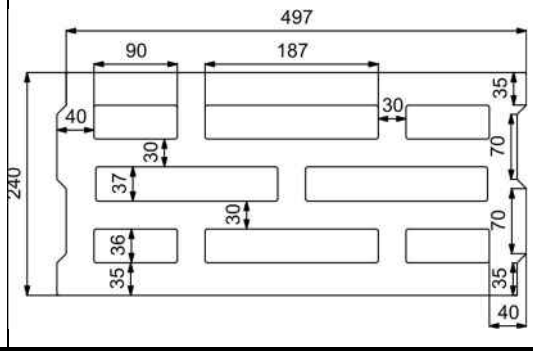
**Table C4.1: Summary of hollow or perforated bricks – base material group "c"[1)]**

| Base material | Format/ Dimensions [mm] | Brick drawing [mm] | Mean compressive strength as per EN 771 [N/mm²] / bulk density ρ [kg/dm³] | See Annex |
|---|---|---|---|---|
| **Perforated clay brick Hlz,** as per EN 771-1 *e.g. Doppio Uni Wienerberger, IT* | 250x120x190 |   | ≥ 7,5 / ≥ 0,8 | C9 |
| **Perforated clay brick Hlz,** as per EN 771-1 *e.g. Wienerberger Pth Bio Modulare, IT* | 300x250x190 |   | ≥ 7,5 / ≥ 1,0 | C10 |
| **Perforated clay brick Hlz,** as per EN 771-1 *e.g. Danesi Poroton P700, IT* | 300x250x190 |   | ≥ 5,0 / ≥ 0,9 | C10 |

[1)] Vertically perforation > 15% and ≤ 50%; cross section reduced by perforation vertically to the resting area.

*Figures not to scale*

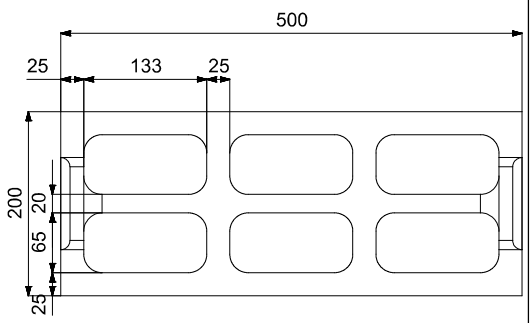
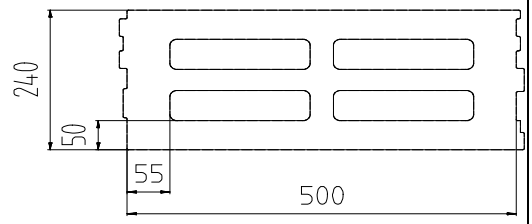
**Table C5.1: Summary of hollow or perforated bricks – base material group "c"[1)]**

| Base material | Format/ Dimensions [mm] | Brick drawing [mm] | Mean compressive strength as per EN 771 [N/mm²] / bulk density ρ [kg/dm³] | See Annex |
|---|---|---|---|---|
| **Calcium silicate hollow brick KSL,** as per EN 771-1 *e.g. Bösel, DE* | 2 DF 240x115x113 |   | ≥ 7,5 / ≥ 1,6 | C11 |
| **Calcium silicate hollow brick KSL,** as per EN 771-1 *e.g. KS Wemding, DE* | 3 DF 240x175x113 |   | ≥ 7,5 / ≥ 1,4 | C11 |
| **Hollow brick lightweight concrete Hbl,** as per EN 771-3 *e.g. Knobel, DE* | 16 DF 495x240x248 |   | ≥ 2,5 / ≥ 0,7 | C12 |

[1)] Vertically perforation > 15% and ≤ 50%; cross section reduced by perforation vertically to the resting area.

*Figures not to scale*

**Table C6.1: Summary of hollow or perforated bricks – base material group "c"[1)]**

| Base material | Format/ Dimensions [mm] | Brick drawing [mm] | Mean compressive strength as per EN 771 [N/mm²] / bulk density ρ [kg/dm³] | See Annex |
|---|---|---|---|---|
| **Hollow brick lightweight concrete Hbl,** as per EN 771-3 *e.g. Indelasa, ES* | 500x200x200 |   | ≥ 2,5 / ≥ 1,0 | C12 |
| **Hollow brick lightweight concrete Hbl,** as per EN 771-3 *e.g. Knobel, DE* | 500x240x240 |   | ≥ 2,5 / ≥ 0,9 | C12 |

[1)] Vertically perforation > 15% and ≤ 50%; cross section reduced by perforation vertically to the resting area.

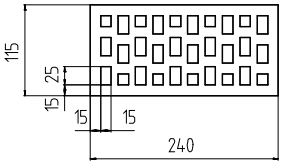
*Figures not to scale*

**Table C7.1: Characteristic resistance $F_{Rk}$ in [kN] for use in solid masonry – base material group "b"**

| **Base material**<br>[*Supplier Title, country*]<br>Geometry, DF or nom. Size<br>(L x W x H) [mm]<br>and drilling method | Mean compressive strength as per EN 771 / Minimum compressive strength single brick[1)]<br>[N/mm²] | Characteristic resistance $F_{Rk}$ [kN] | |
|---|---|---|---|
| | | Temperature range 30/50 °C | Temperature range 50/80 °C |
| | | $h_{nom}$ [mm] ≥ 80 | |
| **Clay brick Mz; ρ ≥ 2,0**<br>as per EN 771-1<br>*e.g. Mz Ziegelwerk Nordhausen, DE*<br>≥ NF (≥ 240x115x71)<br>Hammer drilling | ≥ 7,5 / 6,0 | **1,50** | **1,50** |
| | ≥ 10,0 / 8,0 | **2,00** | **2,00** |
| | ≥ 12,5 / 10,0 | **2,50** | **2,50** |
| | ≥ 15,0 / 12,0 | **3,00** | **3,00** |
| | ≥ 20,0/ 16,0 | **3,50 / 4,00[3)]** | **3,50 / 4,00[3)]** |
| | ≥ 25,0 / 20,0 | **4,00 / 5,00[3)]** | **4,00 / 4,50[3)]** |
| | ≥ 25,3 / - | **4,00 / 5,00[3)]** | **4,00 / 5,00[3)]** |
| **Clay brick Mz; ρ ≥ 1,8**<br>as per EN 771-1<br>*e.g. Mz Wienerberger, DE*<br>≥ 2DF (≥ 240x115x113)<br>Hammer drilling | ≥ 10,0 / 8,0 | **1,50** | **1,50** |
| | ≥ 12,5 / 10,0 | **2,00** | **1,50** |
| | ≥ 15,0 / 12,0 | **2,50** | **2,00** |
| | ≥ 20,0/ 16,0 | **3,00** | **3,00** |
| | ≥ 25,0 / 20,0 | **4,00** | **3,50** |
| | ≥ 35,0 / 28,0 | **4,50 / 5,50[3)]** | **4,50 / 5,00[3)]** |
| **Calcium silicate solid brick KS; ρ ≥ 2,0**<br>as per EN 771-2<br>*e.g. KS Wemding, DE*<br>≥ NF (≥ 240x115x71)<br>Hammer drilling | ≥ 7,5 / 6,0 | **0,40** | **0,40** |
| | ≥ 10,0 / 8,0 | **0,60** | **0,60** |
| | ≥ 12,5 / 10,0 | **0,75** | **0,75** |
| | ≥ 15,0 / 12,0 | **0,90** | **0,90** |
| | ≥ 20,0/ 16,0 | **1,20** | **1,20** |
| | ≥ 25,0 / 20,0 | **1,50** | **1,50** |
| **Calcium silicate solid brick KS; ρ ≥ 2,0**<br>as per EN 771-2<br>*e.g. Hermann Peter, DE*<br>≥ 2 DF (≥ 240x115x113)<br>Hammer drilling | ≥ 7,5 / 6,0 | **2,00** | **1,50** |
| | ≥ 10,0 / 8,0 | **2,50** | **2,00** |
| | ≥ 12,5 / 10,0 | **2,50 / 3,00[3)]** | **2,50 / 3,00[3)]** |
| | ≥ 15,0 / 12,0 | **3,00 / 3,50[3)]** | **3,00 / 3,50[3)]** |
| | ≥ 18,8 / - | **3,50 / 4,00[3)] / 4,50[4)]** | **3,50 / 4,00[3)]** |
| Partial safety factor | $\gamma_{Mm}$[2)] [-] | **2,50** | |

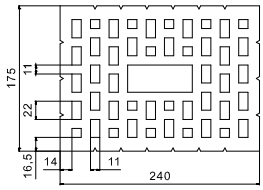
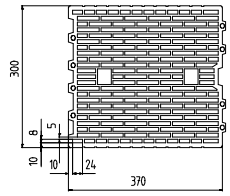
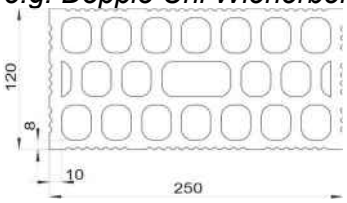
1) The compressive strength of the single brick must not be less than 80% of the mean compressive strength.
2) In absence of other national regulations.
3) Only valid for c ≥ 125 mm.
4) Only valid for c ≥ 150 mm.

**Table C8.1: Characteristic resistance $F_{Rk}$ in [kN] for use in solid and in hollow or perforated masonry – base material group "b" and "c"**

| **Base material**<br>[*Supplier Title, country*]<br>Geometry, DF or nom. Size<br>(L x W x H) [mm]<br>and drilling method | Mean compressive strength as per EN 771 / Minimum compressive strength single brick[1)]<br>[N/mm²] | Characteristic resistance $F_{Rk}$ [kN] | |
|---|---|---|---|
| | | Temperature range 30/50 °C | Temperature range 50/80 °C |
| | | $h_{nom}$ [mm] ≥ 80[3)] | |
| **Calcium silicate solid brick KS; ρ ≥ 2,0**<br>as per EN 771-2<br>*e.g. KS Wemding, DE*<br>≥ 12 DF (≥ 498x175x248)<br>Hammer drilling | ≥ 7,5 / 6,0 | **2,50 / 3,00[4)]** | **2,50** |
| | ≥ 10,0 / 8,0 | **3,00 / 4,00[4)]** | **3,00/ 3,50[4)]** |
| | ≥ 12,5 / 10,0 | **3,00 / 5,00[4)]** | **3,00 / 4,50[4)]** |
| | ≥ 15,0 / 12,0 | **3,50 / 5,50[4)]** | **3,50 / 5,50[4)]** |
| | ≥ 20,0 / 16,0 | **4,00 / 6,50[4)] / 7,50[7)]** | **4,00 / 6,50[4)] / 7,00[7)]** |
| | ≥ 25,0 / 20,0 | **4,50 / 7,50[4)] / 9,50[7)]** | **4,50 / 7,50[4)] / 9,00[7)]** |
| | ≥ 34,6 / - | **5,00 / 8,50[4)] / 11,00[7)] / 12,50[8)]** | **5,00 / 8,50[4)] / 11,00[7)] / 12,00[8)]** |
| **Lightweight solid brick Vbl; ρ ≥ 1,2**<br>as per EN 771-3<br>*e.g. Vbl KLB, DE*<br>≥ 2 DF (≥ 240x115x113)<br>Rotary drilling | ≥ 2,5 / 2,0 | **1,20 / 1,50[4)]** | **1,20** |
| | ≥ 5,0 / 4,0 | **1,50 / 2,50[4)] / 3,00[5)]** | **1,50 / 2,50[4)]** |
| | ≥ 6,0 / - | **2,00 / 2,50[4)] / 3,00[5)] / 3,50[6)]** | **2,00 / 2,50[4)] / 3,00[5)]** |
| **Perforated clay brick Hlz; ρ ≥ 0,9**<br>as per EN 771-1<br>*e.g. Wienerberger, DE*<br>  <br><br>2 DF (240x115x113)<br>Rotary drilling | ≥ 7,5 / 6,0 | **0,30** | **0,30** |
| | ≥ 10,0 / 8,0 | **0,40** | **0,40** |
| | ≥ 12,5 / 10,0 | **0,50** | **0,50** |
| | ≥ 15,0 / 12,0 | **0,60** | **0,60** |
| | ≥ 16,7 / - | **0,75** | **0,75** |
| Partial safety factor | $\gamma_{Mm}$[2)] [-] | **2,50** | |

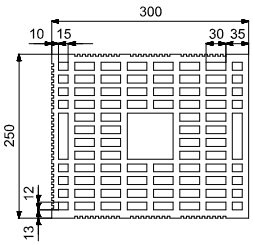
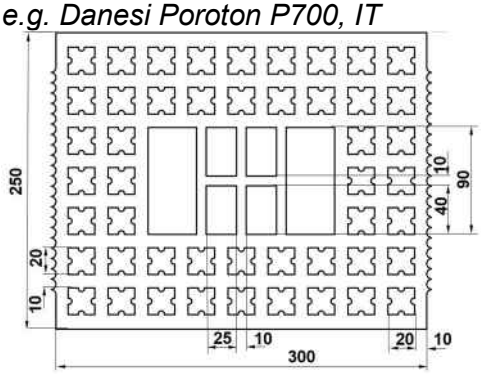
1) The compressive strength of the single brick must not be less than 80% of the mean compressive strength.
2) In absence of other national regulations.
3) Exception "Perforated clay brick Hlz; ρ ≥ 0,9": only valid $h_{nom}$ = 80mm.
4) Only valid for c ≥ 150 mm.
5) Only valid for c ≥ 170 mm.
6) Only valid for c ≥ 175 mm.
7) Only valid for c ≥ 200 mm.
8) Only valid for c ≥ 240 mm.

**Table C9.1: Characteristic resistance $F_{Rk}$ in [kN] for use in hollow or perforated masonry – base material group "c"**

| **Base material**<br>[*Supplier Title, country*]<br>Geometry, DF or nom. Size<br>(L x W x H) [mm]<br>and drilling method | Mean compressive strength as per EN 771 / Minimum compressive strength single brick[1)]<br>[N/mm²] | Characteristic resistance $\mathbf{F_{Rk}}$ [kN] | |
|---|---|---|---|
| | | Temperature range 30/50 °C | Temperature range 50/80 °C |
| | | $h_{nom}$ [mm] = 80 | |
| **Perforated clay brick Hlz; ρ ≥ 1,2**<br>as per EN 771-1<br>*e.g. Schlagmann, DE*<br>  <br>3 DF (240x175x113)<br>Rotary drilling | ≥ 7,5 / 6,0 | **0,50** | **0,50** |
| | ≥ 10,0 / 8,0 | **0,75** | **0,75** |
| | ≥ 12,5 / 10,0 | **0,90** | **0,90** |
| | ≥ 15,0 / 12,0 | **0,90** | **0,90** |
| | ≥ 19,8 / - | **1,20** | **1,20** |
| **Perforated clay brick Hlz; ρ ≥ 0,8**<br>as per EN 771-1<br>*e.g. Wienerberger Porotherm 30 R, FR*<br>  <br>370x300x250<br>Rotary drilling | ≥ 5,0 / 4,0 | **0,40** | **0,40** |
| | ≥ 7,5 / 6,0 | **0,60** | **0,60** |
| | ≥ 10,0 / 8,0 | **0,75** | **0,75** |
| | ≥ 12,5 / 10,0 | **0,90** | **0,90** |
| | ≥ 15,0 / 12,0 | **1,20** | **1,20** |
| **Perforated clay brick Hlz; ρ ≥ 0,8**<br>as per EN 771-1<br>*e.g. Doppio Uni Wienerberger, IT*<br>  <br>250x120x190<br>Rotary drilling | ≥ 7,5 / 6,0 | **0,40** | **0,40** |
| | ≥ 10,0 / 8,0 | **0,60** | **0,50** |
| | ≥ 12,5 / 10,0 | **0,75** | **0,60** |
| | ≥ 15,0 / 12,0 | **0,90** | **0,75** |
| | ≥ 20,0 / 16,0 | **1,20** | **0,90** |
| | ≥ 25,0 / 20,0 | **1,50** | **1,20** |
| | ≥ 26,5 / - | **1,50** | **1,50** |
| Partial safety factor | $\gamma_{Mm}$[2)] [-] | **2,50** | |

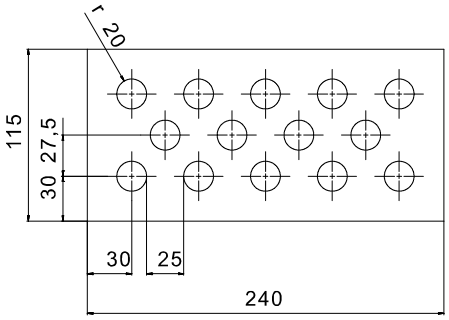
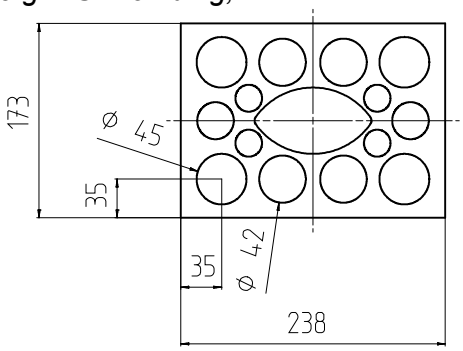
1) The compressive strength of the single brick must not be less than 80% of the mean compressive strength.
2) In absence of other national regulations.

**Table C10.1: Characteristic resistance $F_{Rk}$ in [kN] for use in hollow or perforated masonry – base material group "c"**

| **Base material**<br>[*Supplier Title, country*]<br>Geometry, DF or nom. Size<br>(L x W x H) [mm]<br>and drilling method | Mean compressive strength as per EN 771 / Minimum compressive strength single brick[1)]<br>[N/mm²] | Characteristic resistance $F_{Rk}$ [kN] | |
|---|---|---|---|
| | | Temperature range 30/50 °C | Temperature range 50/80 °C |
| | | $h_{nom}$ [mm] = 80 | |
| **Perforated clay brick Hlz; ρ ≥ 1,0**<br>as per EN 771-1<br>*e.g. Wienerberger Pth Bio Modulare, IT*<br>  <br>300x250x190<br>Rotary drilling | ≥ 7,5 / 6,0 | **0,30** | **-**[3)] |
| | ≥ 10,0 / 8,0 | **0,50** | **0,30** |
| | ≥ 12,5 / 10,0 | **0,60** | **0,40** |
| | ≥ 15,0 / 12,0 | **0,60** | **0,50** |
| | ≥ 20,0 / 16,0 | **0,90** | **0,60** |
| | ≥ 25,0 / 20,0 | **1,20** | **0,90** |
| | ≥ 35,0 / 28,0 | **1,50** | **1,20** |
| **Perforated clay brick Hlz; ρ ≥ 0,9**<br>as per EN 771-1<br>*e.g. Danesi Poroton P700, IT*<br>  <br>300x250x190<br>Rotary drilling | ≥ 5,0 / 4,0 | **0,50** | **0,50** |
| | ≥ 7,5 / 6,0 | **0,75** | **0,75** |
| | ≥ 10,0 / 8,0 | **0,90** | **0,90** |
| | ≥ 12,5 / 10,0 | **1,20** | **1,20** |
| | ≥ 15,0 / 12,0 | **1,50** | **1,50** |
| Partial safety factor | $\gamma_{Mm}$[2)] [-] | **2,50** | |

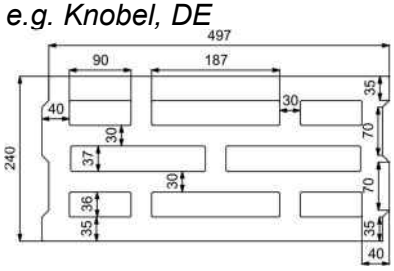
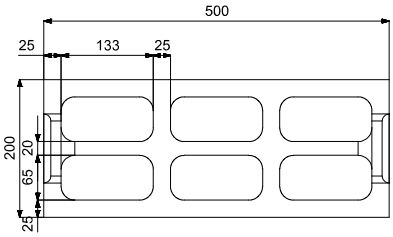
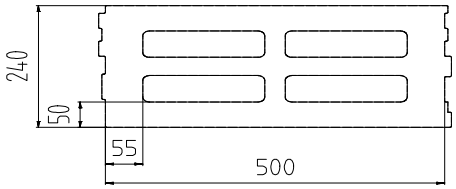
1) The compressive strength of the single brick must not be less than 80% of the mean compressive strength.
2) In absence of other national regulations.
3) No performance assessed.

**Table C11.1: Characteristic resistance $F_{Rk}$ in [kN] for use in hollow or perforated masonry – base material group "c"**

| **Base material**<br>[*Supplier Title, country*]<br>Geometry, DF or nom. Size (L x W x H) [mm]<br>and drilling method | Mean compressive strength as per EN 771 / Minimum compressive strength single brick[1)] [N/mm²] | Characteristic resistance $F_{Rk}$ [kN] | |
|---|---|---|---|
| | | Temperature range 30/50 °C | Temperature range 50/80 °C |
| | | $h_{nom}$ [mm] = 80 | |
| **Calcium silicate hollow brick KSL; ρ ≥ 1,6**<br>as per EN 771-1<br>*e.g. Bösel, DE*<br>  <br><br>2 DF (240x115x113)<br>Hammer drilling | ≥ 7,5 / 6,0 | **0,90** | **0,90** |
| | ≥ 10,0 / 8,0 | **1,20** | **1,20** |
| | ≥ 12,5 / 10,0 | **1,50** | **1,50** |
| | ≥ 15,0 / 12,0 | **2,00** | **2,00** |
| | ≥ 20,0 / 16,0 | **2,50** | **2,50** |
| | ≥ 25,0 / 20,0 | **3,00** | **3,00** |
| **Calcium silicate hollow brick KSL; ρ ≥ 1,4**<br>as per EN 771-1<br>*e.g. KS Wemding, DE*<br>  <br><br>3 DF (240x175x113)<br>Hammer drilling | ≥ 7,5 / 6,0 | **0,40** | **0,40** |
| | ≥ 10,0 / 8,0 | **0,60** | **0,50** |
| | ≥ 12,5 / 10,0 | **0,75** | **0,60** |
| | ≥ 15,0 / 12,0 | **0,90** | **0,75** |
| | ≥ 20,0 / 16,0 | **1,20** | **0,90** |
| | ≥ 20,2 / - | **1,20** | **1,20** |
| Partial safety factor | $\gamma_{Mm}$[2)] [-] | **2,50** | |

1) The compressive strength of the single brick must not be less than 80% of the mean compressive strength.
2) In absence of other national regulations.

**Table C12.1: Characteristic resistance $F_{Rk}$ in [kN] for use in hollow or perforated masonry – base material group "c"**

| **Base material**<br>[*Supplier Title, country*]<br>Geometry, DF or nom. Size<br>(L x W x H) [mm]<br>and drilling method | Mean compressive strength as per EN 771 / Minimum compressive strength single brick[1)]<br>[N/mm²] | Characteristic resistance $F_{Rk}$ [kN] | |
|---|---|---|---|
| | | Temperature range 30/50 °C | Temperature range 50/80 °C |
| | | $h_{nom}$ [mm] = 80 | |
| **Hollow brick lightweight concrete Hbl; ρ ≥ 0,7**<br>as per EN 771-3<br>*e.g. Knobel, DE*<br>  <br>16 DF (495x240x248)<br>Rotary drilling | ≥ 2,5 / 2,0 | **1,20** | **0,90** |
| | ≥ 5,0 / 4,0 | **2,00** | **2,00** |
| | ≥ 5,4 / 2,0 | **2,50** | **2,00** |
| **Hollow brick lightweight concrete Hbl; ρ ≥ 1,0**<br>as per EN 771-3<br>*e.g. Indelasa, ES*<br>  <br>500x200x200<br>Rotary drilling | ≥ 2,5 / 2,0 | **0,30** | **0,30** |
| | ≥ 5,0 / 4,0 | **0,60** | **0,60** |
| **Hollow brick lightweight concrete Hbl; ρ ≥ 0,9**<br>as per EN 771-3<br>*e.g. Knobel, DE*<br>  <br>500x240x240<br>Rotary drilling | ≥ 2,5 / 2,0 | **0,90** | **0,90** |
| | ≥ 5,0 / 4,0 | **2,00** | **1,50** |
| Partial safety factor | $\gamma_{Mm}$[2)] [-] | **2,50** | |

[1)] The compressive strength of the single brick must not be less than 80% of the mean compressive strength.
[2)] In absence of other national regulations.

**fischer HybridPower**

**Performances**
Characteristic resistance for use in hollow or perforated bricks

**Annex C12**
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**Table C13.1: Characteristic resistance $F_{Rk}$ in [kN] for use in unreinforced autoclaved aerated concrete – base material group "d"**

| **Base material** [*Supplier Title, country*] Geometry, DF or nom. Size (L x W x H) [mm] and drilling method | Mean compressive strength as per EN 771-4 $f_{cm,decl}$ / Minimum compressive strength single brick[1] [N/mm²] | Characteristic resistance $F_{Rk}$ [kN] Temperature range 30/50 °C and 50/80 °C |
|---|---|---|
| | | $h_{nom}$ [mm] ≥ 80 |
| **Unreinforced autoclaved aerated concrete, AAC** as per EN 771-4 e.g. (500x120x300)[2] e.g. (500x250x300)[2] Hammer drilling | ≥ 2,90 / 2,32 | **0,50** |
| | ≥ 3,75 / 3,00 | **0,90** |
| | ≥ 4,00 / 3,20 | **0,90** |
| | ≥ 5,00 / 4,0 | **1,20** |
| | ≥ 6,00 / 4,80 | **1,50** |
| | ≥ 7,50 / 6,00 | **2,00** |
| Partial safety factor | $\gamma_{MAAC}$[3] [-] | **2,00** |

1) The compressive strength of the single brick must not be less than 80% of the mean compressive strength.
2) For $f_{cm,decl}$ > 3 N/mm²: $h_{min}$ = 175 mm.
3) In absence of other national regulations.

**Table C13.2: Characteristic resistance $F_{Rk}$ in [kN] for use in reinforced autoclaved aerated concrete – base material group "d"**

| **Base material** [*Supplier Title, country*] minimum member thickness $h_{min}$ and drilling method | Compressive strength $f_{ck}$ (compressive strength class) as per EN 12602 [N/mm²] | Characteristic resistance $F_{Rk}$ [kN] Temperature range 30/50 °C and 50/80 °C |
|---|---|---|
| | | $h_{nom}$ [mm] ≥ 80 |
| **Reinforced autoclaved aerated concrete, AAC** as per EN 12602 $h_{min}$ = 115 mm[1] Hammer drilling | ≥ 2,0 (AAC2) | **0,40** |
| | ≥ 2,5 (AAC2,5) | **0,60** |
| | ≥ 3,0 (AAC3) | **0,75** |
| | ≥ 3,5 (AAC3,5) | **0,90** |
| | ≥ 4,0 (AAC4) | **1,20** |
| | ≥ 4,5 (AAC4,5) | **1,50** |
| | ≥ 5,0 (AAC5) | **1,50** |
| | ≥ 6,0 (AAC6) | **2,00** |
| Partial safety factor | $\gamma_{MAAC}$[2] [-] | **2,00** |

1) For > AAC3: $h_{min}$ = 175 mm.
2) In absence of other national regulations.

**Figure C14.1: Characteristic fire resistance under inclined loading, load direction α, in concrete – base material group "a" and solid brick masonry – base material group "b"**

The characteristic fire resistance for each fire resistance class shall be interpolated for load direction α between 45° and 90° according to following equation:

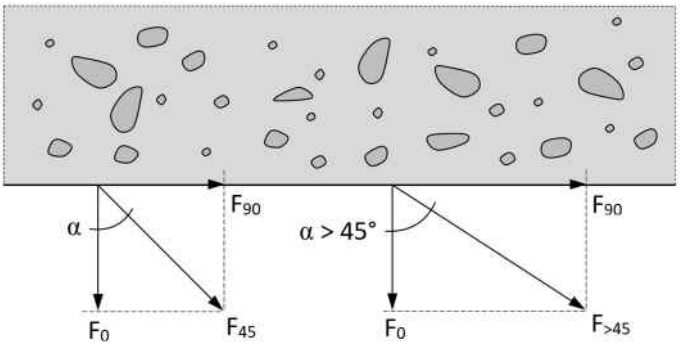


*Figure not to scale*

**Equation C14.1:**

$$F_{Rk,fi}\ (\alpha) = \frac{0{,}71 \cdot F_{Rk,fi(45°)}}{\cos\alpha} \leq F_{Rk,fi(90°)}$$

**Table C14.1: Characteristic fire resistance in concrete – base material group "a"**

| Anchor type | | | HybridPower, HybridPower A2, HybridPower A4, HybridPower R | | | |
|---|---|---|---|---|---|---|
| | | | R30 | R60 | R90 | R120 |
| Embedment depth | $h_{nom}$ ≥ | [mm] | 80 | | | |
| **Characteristic fire resistance under inclined loading for selected load directions α** | | | | | | |
| Characteristic resistance under 45° | $F_{Rk,fi(45°)}$ | [kN] | 1,58 | 1,10 | 0,62 | 0,37 |
| Characteristic resistance under 60° | $F_{Rk,fi(60°)}$ | [kN] | 1,99 | 1,54 | 0,88 | 0,53 |
| Characteristic resistance under 75° | $F_{Rk,fi(75°)}$ | [kN] | 1,99 | 1,54 | 1,02 | 0,76 |
| Partial factor | $\gamma_{Mm,fi}$ [1)] | [-] | 1,00 | | | |
| **Characteristic fire resistance for shear load without lever arm** | | | | | | |
| Characteristic shear resistance | $F_{Rk,fi(90°)}$ | [kN] | 1,99 | 1,54 | 1,02 | 0,76 |
| Partial factor | $\gamma_{Mm,fi}$ [1)] | [-] | 1,00 | | | |
| **Characteristic fire resistance for shear load with lever arm** | | | | | | |
| Characteristic bending resistance | $M_{Rk,s,fi}$ | [Nm] | 0,47 | 0,37 | 0,26 | 0,21 |
| Partial factor | $\gamma_{Mm,fi}$ [1)] | [-] | 1,00 | | | |
| Minimum edge distances under fire exposure | $c_{min,fi}$ | [mm] | 2 x $h_{nom}$ | | | |
| Minimum spacing under fire exposure | $s_{min,fi}$ | [mm] | 4 x $h_{nom}$ | | | |

[1)] In absence of other national regulations.

**Table C14.2: Values under fire exposure in concrete C20/25 to C50/60 in load direction α (no permanent centric tension load, only for shear load without lever arm) Fastening of façade systems**

| Anchor type | Fire resistance class | Load direction α | $F_{Rk,fi,90}$ | $\gamma_{M,fi}$ [1)] |
|---|---|---|---|---|
| **HybridPower, HybridPower A2, HybridPower A4, HybridPower R** | R90 | ≥ 57° | **0,8 kN** | **1,00** |

[1)] In absence of other national regulations.

**Table C15.1: Characteristic fire resistance in solid brick masonry – base material group "b"**

| **Anchor type** | | | | **HybridPower, HybridPower A2, HybridPower A4, HybridPower R** | | | |
|---|---|---|---|---|---|---|---|
| **Base material; bulk density [kg/dm³] / mean compressive strength as per EN 771 [N/mm²]**<br>[*Supplier Title, country*]<br>Geometry, DF or nominal size (L x W x H) [mm] drilling method | | | | **R30** | **R60** | **R90** | **R120** |
| Embedment depth | | $h_{nom}$ ≥ | [mm] | **80** | | | |
| **Characteristic fire resistance under inclined loading for selected load directions α** | | | | | | | |
| **Calcium silicate solid brick KS; ρ ≥ 2,0 / 25**<br>as per EN 771-2<br>*e.g. KS Wemding, DE;*<br>NF (≥ 240x115x71)<br>Hammer drilling | | Characteristic resistance under 45° $F_{Rk,fi(45°)}$ | [kN] | **0,62** | **0,62** | **0,62** | **0,37** |
| | | Characteristic resistance under 60° $F_{Rk,fi(60°)}$ | [kN] | **0,88** | **0,88** | **0,88** | **0,53** |
| | | Characteristic resistance under 75° $F_{Rk,fi(75°)}$ | [kN] | **1,54** | **1,54** | **1,02** | **0,76** |
| | | Characteristic shear load **fire resistance without lever arm** $F_{Rk,fi(90°)}$ | [kN] | **1,54** | **1,54** | **1,02** | **0,76** |
| Partial factor | | $\gamma_{Mm,fi}$ [1)] | [-] | **1,00** | | | |
| **Characteristic fire resistance under inclined loading for selected load directions α** | | | | | | | |
| **Calcium silicate solid brick KS; ρ ≥ 2,0 / 15**<br>as per EN 771-2<br>*e.g. KS Wemding, DE;* 2 DF<br>(≥ 240x115x113)<br>Hammer drilling | **Lightweight solid brick Vbl; ρ ≥ 1,2 / 5**<br>as per EN 771-3<br>*e.g. Vbl KLB, DE;* 2 DF<br>(≥ 240x115x113)<br>Rotary drilling | Characteristic resistance under 45° $F_{Rk,fi(45°)}$ | [kN] | **1,10** | **1,10** | **0,62** | **0,37** |
| | | Characteristic resistance under 60° $F_{Rk,fi(60°)}$ | [kN] | **1,02** | **1,02** | **0,88** | **0,53** |
| | | Characteristic resistance under 75° $F_{Rk,fi(75°)}$ | [kN] | **1,02** | **1,02** | **1,02** | **0,76** |
| | | Characteristic shear load **fire resistance without lever arm** $F_{Rk,fi(90°)}$ | [kN] | **1,02** | **1,02** | **1,02** | **0,76** |
| Partial factor | | $\gamma_{Mm,fi}$ [1)] | [-] | **1,00** | | | |
| **Characteristic fire resistance for shear load with lever arm, valid for all above mentioned base materials** | | | | | | | |
| Characteristic bending resistance | | $M_{Rk,s,fi}$ | [Nm] | **0,47** | **0,37** | **0,26** | **0,21** |
| Partial factor | | $\gamma_{Mm,fi}$ [1)] | [-] | **1,00** | | | |
| Minimum edge distances under fire exposure | | $c_{min,fi}$ | [mm] | **2 x $h_{nom}$** | | | |
| Minimum spacing under fire exposure | | $s_{min,fi}$ | [mm] | **4 x $h_{nom}$** | | | |

[1)] In absence of other national regulations.