Deutsches Institut für Bautechnik

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Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

Designated according to Article 29 of Regulation (EU) No 305/2011 and member of EOTA (European Organisation for Technical Assessment)

# European Technical Assessment ETA-12/0554 of 16 August 2016

English translation prepared by DIBt - Original version in German language

**General Part**

| | |
|---|---|
| Technical Assessment Body issuing the European Technical Assessment: | Deutsches Institut für Bautechnik |
| Trade name of the construction product | fischer injection system FIS HT for masonry |
| Product family to which the construction product belongs | Injection anchor for use in masonry |
| Manufacturer | fischerwerke GmbH & Co. KG<br>Klaus-Fischer-Straße 1<br>72178 Waldachtal<br>DEUTSCHLAND |
| Manufacturing plant | fischerwerke |
| This European Technical Assessment contains | 23 pages including 3 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 | Guideline for European technical approval of "Metal Injection Anchors for Use in Masonry", ETAG 029, April 2013,<br>used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011. |



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## Specific Part

### 1 Technical description of the product

The fischer injection system FIS HT for masonry is a bonded anchor (injection type) consisting of a mortar cartridge with injection mortar fischer FIS HT High Speed, FIS HT or FIS HT Low Speed, a perforated sieve sleeve and an anchor rod with hexagon nut and washer. The steel elements are made of zinc coated steel, stainless steel or high corrosion resistant steel.

The anchor rod is placed into a drilled hole filled with injection mortar and is anchored via the bond between steel element, injection mortar and masonry and mechanical interlock.

The 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 for tension and shear loads | See Annex C 1 – C 2 |
| Characteristic resistance for bending moments | See Annex C 3 |
| Displacements under shear and tension loads | See Annex C 3 |
| Reduction Factor for job site tests (β-Factor) | See Annex C 3 |
| Edge distances and spacing | See Annex C 4 |

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

| Essential characteristic | Performance |
|---|---|
| Reaction to fire | Anchorages satisfy requirements for Class A1 |
| Resistance to fire | No performance assessed |

#### 3.3 Hygiene, health and the environment (BWR 3)

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

### 3.4 Safety in use (BWR 4)

The essential characteristics regarding Safety in use are included under the Basic Works Requirement Mechanical resistance and stability.

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

In accordance with guideline for European technical approval ETAG 029, April 2013 used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011 the applicable European legal act is: [97/177/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 European Assessment Document

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

Issued in Berlin on 16 August 2016 by Deutsches Institut für Bautechnik

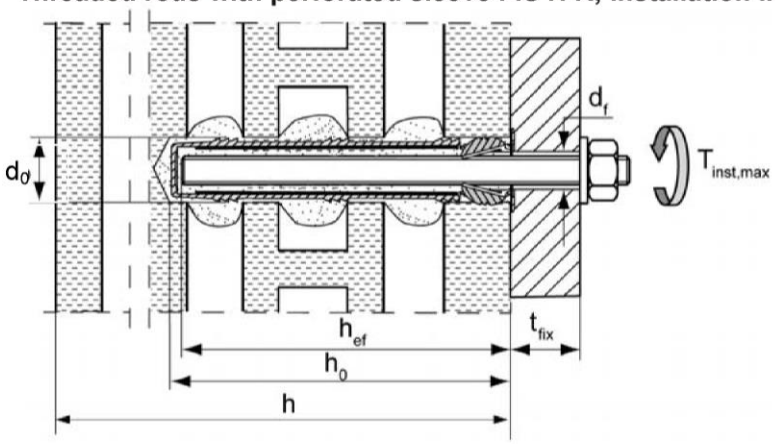
Uwe Bender
Head of Department

*beglaubigt:*
Baderschneider

Deutsches Institut für Bautechnik DIBt

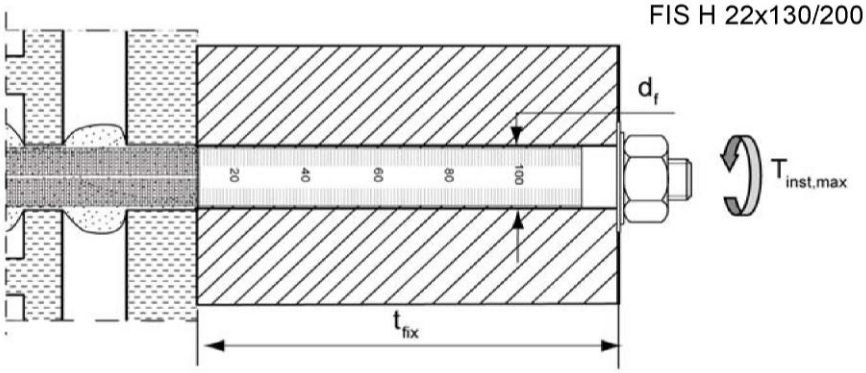
## Installation conditions

**Threaded rods with perforated sleeve FIS H K; installation in perforated and solid brick**



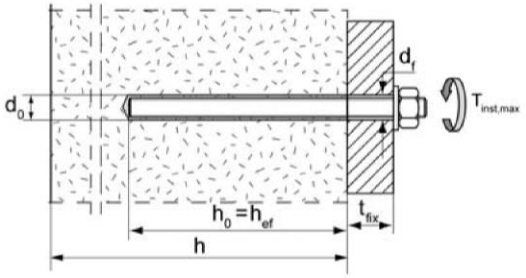

**Pre-positioned anchorage**
FIS H 16x85 K
FIS H 16x130 K
FIS H 20x130 K
FIS H 20x200 K

**Push through anchorage**
FIS H 18x130/200 K
FIS H 22x130/200 K

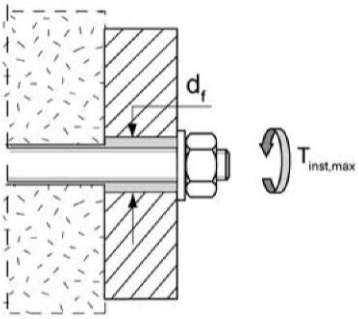



**Threaded rods without perforated sleeve FIS H K; installation in solid brick**

**Pre-positioned anchorage**




**Push-through anchorage**




$d_0$ = nominal drill bit diameter
$d_f$ = diameter of clearance hole in the fixture
$T_{inst,max}$ = maximum torque moment
$h$ = thickness of masonry
$h_{ef}$ = effective anchorage depth
$h_0$ = depth of drill hole
$t_{fix}$ = thickness of fixture

| fischer injection system FIS HT for masonry | Annex A 1 |
|---|---|
| **Product description**<br>Installation conditions | |

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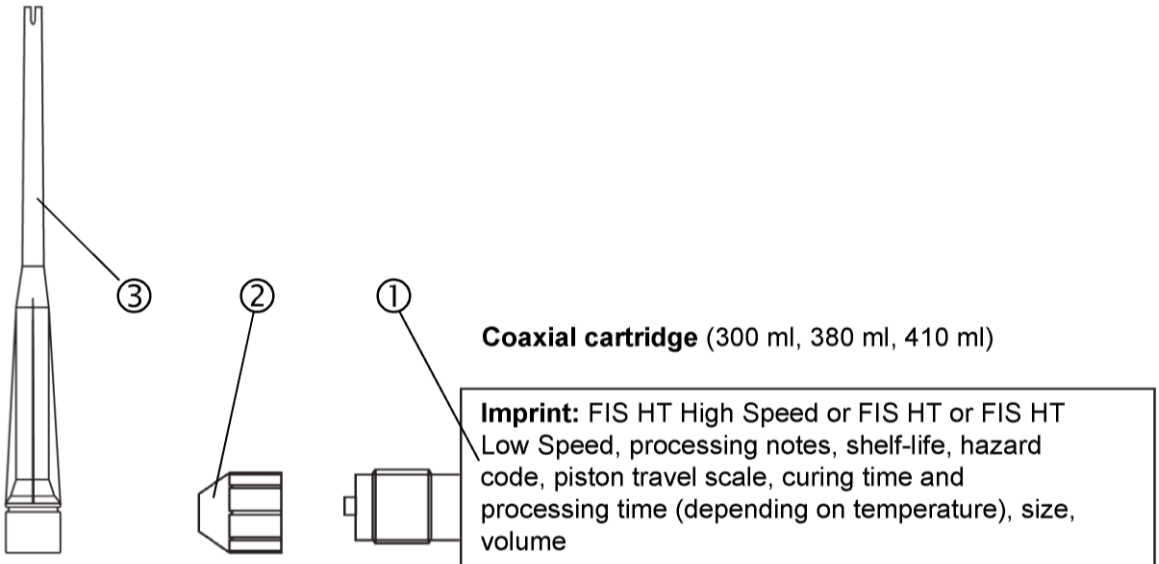
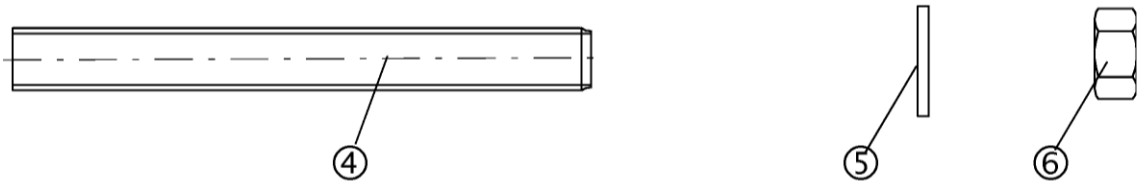
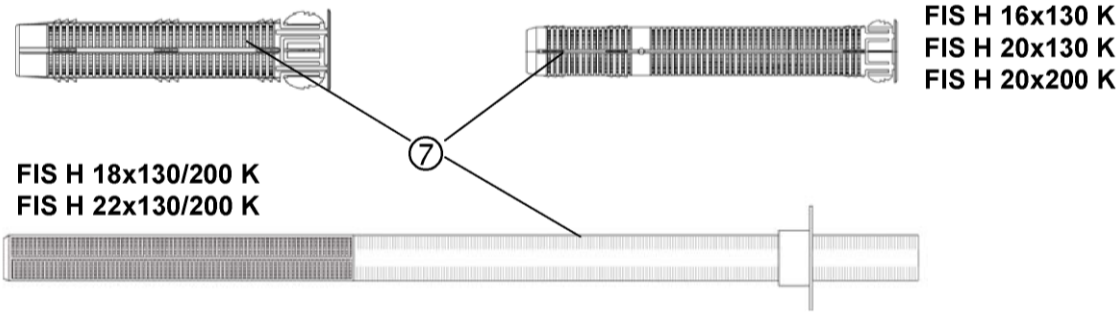



**FIS H 16x85 K**




① Mortar cartridge
② Sealing cap
③ Static mixer
④ Anchor rod
⑤ Washer
⑥ Hexagon nut
⑦ Perforated sleeve

**fischer injection system FIS HT for masonry**

**Annex A 2**

**Product description**
Product

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**Table A1: Materials**

| Part | Designation | Material | | |
|---|---|---|---|---|
| 1 | Mortar cartridge | Mortar, hardener; filler | | |
| | | Steel, zinc plated | Stainless steel A4 | High corrosion-resistant steel C |
| 4 | Anchor rod | Property class 5.8 or 8.8; EN ISO 898-1: 2013 zinc plated ≥ 5µm, EN ISO 4042:1999 A2K or hot-dip galvanised EN ISO 10684:2004 $f_{uk} \leq 1000$ N/mm² $A_5 > 8\%$ fracture elongation | Property class 50, 70 or 80 EN ISO 3506:2009 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; 1.4062, 1.4462, 1.4662 EN 10088-1:2014 $f_{uk} \leq 1000$ N/mm² $A_5 > 8\%$ fracture elongation | Property class 50 or 80 EN ISO 3506:2009 or property class 70 with $f_{yk}$= 560 N/mm² 1.4565; 1.4529 EN 10088-1:2014 $f_{uk} \leq 1000$ N/mm² $A_5 > 8\%$ fracture elongation |
| 5 | Washer ISO 7089:2000 | zinc plated ≥ 5µm, EN ISO 4042:1999 A2K or hot-dip galvanised EN ISO 10684:2004 | 1.4401; 1.4404; 1.4578;1.4571; 1.4439; 1.4362 EN 10088-1:2014 | 1.4565;1.4529 EN 10088-1:2014 |
| 6 | Hexagon nut | Property class 5 or 8; EN ISO 898-2:2013 zinc plated ≥ 5µm, ISO 4042:1999 A2K or hot-dip galvanised ISO 10684:2004 | Property class 50, 70 or 80 EN ISO 3506:2009 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362 EN 10088-1:2014 | Property class 50, 70 or 80 EN ISO 3506:2009 1.4565; 1.4529 EN 10088-1:2014 |
| 7 | Perforated sleeve FIS HK | PP / PE | | |



**fischer injection system FIS HT for masonry**

**Product description**
Materials

**Annex A 3**

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**Specifications of intended use**

**Anchorages subject to:**

- Static and quasi-static loads

**Base materials:**

- Solid brick masonry (Use category b), acc. to Annex B9, B10

  Note: The characteristic resistance is also valid for larger brick sizes and higher compressive strength of the masonry unit.

- Hollow brick masonry (use category c), according to Annex B9, B10
- Mortar strength class of the masonry M2,5 at minimum according to EN 998-2:2010
- For other bricks in solid masonry and in hollow or perforated masonry, the characteristic resistance of the sleeve may be determined by job site tests according to ETAG 029, Annex B under consideration of the β-factor according to Annex C3, Table C4

**Temperature Range:**

- **I**: From - 40°C to +80°C (max. short term temperature +80°C and max. long term temperature +50°C)
- **II**: From -40°C to +120°C (max. short term temperature +120°C and max. long term temperature +72°C)

**Use conditions (Environmental conditions):**

- Dry and wet structure (regarding injection mortar)
- Structures subject to dry internal conditions exists
  (zinc coated steel, stainless steel or high corrosion resistant steel)
- Structures subject to external atmospheric exposure including industrial and marine environment or exposure to permanently damp internal condition, if no particular aggressive conditions exist exist
  (stainless steel or high corrosion resistant steel)
- Structures subject to external atmospheric exposure and to permanently damp internal condition, if other particular aggressive conditions exist (high corrosion resistant steel)

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)

| **fischer injection system FIS HT for masonry** | **Annex B 1** |
|---|---|
| **Intended Use**<br>Specifications | |

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**Specifications of intended use**

**Design:**

The anchorage s have to be designed in accordance with the ETAG 029, Annex C, Design method A under the responsibility of an engineer experienced in anchorages and masonry work

Applies to all bricks, if no other values are specified:

$$N_{Rk} = N_{Rk,s} = N_{Rk,p} = N_{Rk,b} = N_{Rk,pb}$$

$$V_{Rk} = V_{Rk,s} = V_{Rk,b} = V_{Rk,c} = V_{Rk,pb}$$

- Verifiable calculation notes and drawings have to be prepared taking account the relevant masonry in the region of the anchorage , the loads to be transmitted and their transmission to the supports of the structure. The position of the sleeve is indicated on the design drawings

**Installation:**

- Category d/d: -Installation and use in dry structures
- Category w/w: -Installation and use in dry and wet structures
- Hole drilling by hammer drill mode

  In case of aborted hole: The hole shall be filled with mortar
- Bridging of unbearing layer (e.g. plaster) see Annex B 4 (Table B2)
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site
- Minimum curing time see Annex B5. Table B5
- Commercial standard threaded rods, washers and hexagon nuts may also be used if the following requirements are fulfilled:
- Material dimensions and mechanical properties of the metal parts according to the specifications are given in Annex A3, Table A1
- Conformation of material and mechanical properties of the metal parts by inspection certificate 3.1 according to EN 10204:2004, the documents shall be stored
- Marking of the threaded rod with the envisage embedment depth. This may be done by the manufacturer of the rod or by a person on job site

| fischer injection system FIS HT for masonry | Annex B 2 |
|---|---|
| **Intended Use**<br>Specifications | |

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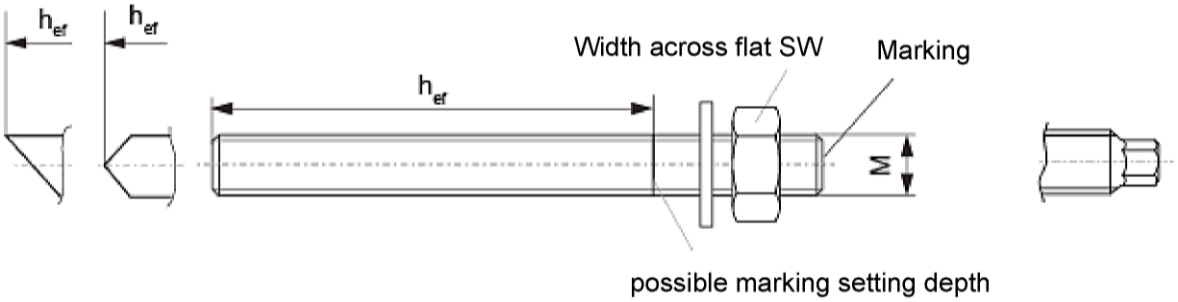
**Anchor rods M8, M10, M12, M16**




**Marking:**
Property class 8.8 or high corrosion resistant steel, property class 80: •
Stainless steel A4, property class 50 and high corrosion resistant steel C, property class 50: ••

**Table B1: Installation parameters for anchor rods in solid bricks without perforated sleeves**

| **Size** | | **M8** | **M10** | **M12** | **M16** |
|---|---|---|---|---|---|
| Nominal drill hole diameter | $d_0$ [mm] | 10 | 12 | 14 | 18 |
| Width across flat | SW [mm] | 13 | 17 | 19 | 24 |
| Effective anchorage depth $h_{ef}$ [1)] | $h_{ef,min}$ [mm] | 50 | 50 | 50 | 64 |
| Depth of drill hole $h_0 = h_{ef}$ | $h_{ef,max}$ [mm] | h-30, ≤200 | | | |
| Diameter of clearance hole in the fixture | pre-position $d_f \leq$ [mm] | 9 | 12 | 14 | 18 |
| | push through $d_f \leq$ [mm] | 11 | 14 | 16 | 20 |
| Diameter of steel brush | $d_b \geq$ [mm] | See Table B4 | | | |
| Maximum installation torque | $T_{inst,max}$ [Nm] | 10 | | | |

[1)] $h_{ef,min} \leq h_{ef} \leq h_{ef,max}$ is possible



| **fischer injection system FIS HT for masonry** | **Annex B 3** |
|---|---|
| **Intended Use**<br>Installation parameters, part 1 | |

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**Perforated sleeves FIS H 16x85; 16x130; 20x130; 20x200 K**

**Marking:**
Size $D_{sleeve,nom}$ x $L_{sleeve}$
(e. g.: 16x85)

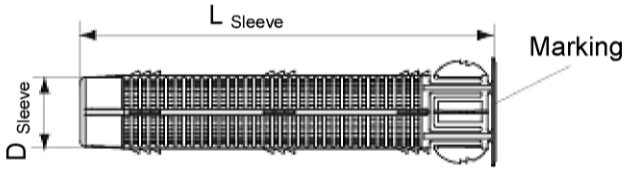



**Table B2: Installation parameters for threaded rods with perforated sleeves (pre-positioned anchorage)**

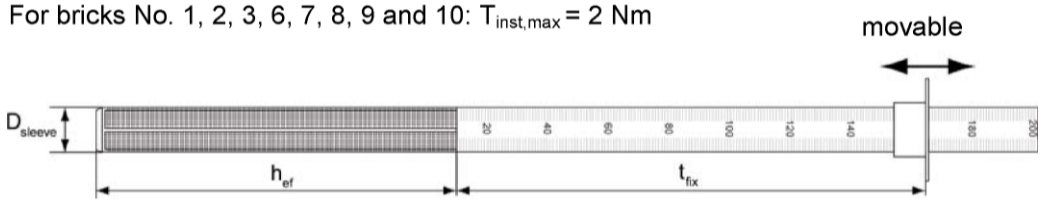
| Size FIS H…K | | | 16x85 | 16x130[3] | 20x130[3] | 20x200[3] |
|---|---|---|---|---|---|---|
| Nominal drill hole diameter $d_0 = D_{sleeve,nom}$ | $d_{nom}=d_0$ | [mm] | 16 | 16 | 20 | 20 |
| Depth of drill hole | $h_0$ | [mm] | 90 | 135 | 135 | 205 |
| Effective anchorage depth | $h_{ef,min}$ | [mm] | 85 | 110 | 110 | 180 |
| | $h_{ef,max}$ | [mm] | 85 | 130 | 130 | 200 |
| Size of threaded rod | | [-] | M8, M10 | | M12, M16 | |
| Maximum installation torque | $T_{inst,max}$ | [Nm] | 4[2] | | | |
| Diameter of steel brush[1] | $d_b$ | [mm] | See Table B4 | | | |

[1] Only for KSL and solid bricks
[2] Valid for bricks No. 4, 5, 11 and 12
For bricks No. 1, 2, 3, 6, 7, 8, 9 and 10: $T_{inst,max}$ = 2 Nm
[3] bridging of unbearing layer (e.g. plaster) is possible

**Table B3: Installation parameters for threaded rods with perforated sleeves (push through anchorage)**

| Size FIS H..K | | 18x130/200 | | 22x130/200 |
|---|---|---|---|---|
| Nominal sleeve diameter | $D_{sleeve,nom}$ [mm] | 16 | | 20 |
| Nominal drill hole diameter | $d_0$ [mm] | 18 | | 22 |
| Depth of drill hole | $h_0$ [mm] | 135 + $t_{fix}$ | | |
| Effective anchorage depth | $h_{ef}$ [mm] | ≥130 | | |
| Diameter of steel brush[1] | $d_b$ ≥ [mm] | See Table B4 | | |
| Size of threaded rod | | M10 | M12 | M16 |
| Maximum installation torque | $T_{inst,max}$ [Nm] | 4[2] | | |
| Thickness of fixture | $t_{fix,max}$ [mm] | 200 | | |

[1] Only for KSL and solid bricks
[2] Valid for bricks No. 4, 5, 11 and 12
For bricks No. 1, 2, 3, 6, 7, 8, 9 and 10: $T_{inst,max}$ = 2 Nm




**Perforated sleeves FIS H 18x130/200 K and FIS H 22x130/200 K**

**fischer injection system FIS HT for masonry**

**Intended Use**
Installation parameters, part 2

**Annex B 4**

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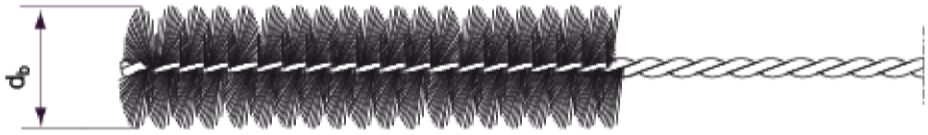
**Steel brush BS**




Only for KSL and solid bricks

**Table B4: Parameters of steel brush**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Drill hole diameter | $d_0$ | [mm] | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| Brush diameter | $d_{b,nom}$ | [mm] | 11 | 14 | 16 | 20 | 20 | 24 | 24 |

**Table B5**: **Maximum processing times and minimum curing times**
(During the curing time of the mortar the masonry temperature may not fall below the listed minimum temperature).

| Temperature at anchoring base [ °C ] | Minimum curing time [1] $t_{cure}$ [minutes] | | |
|---|---|---|---|
| | FIS HT High Speed[3] | FIS HT[2] | FIS HT Low Speed[2] |
| -10 to -5 | 12 hours | --- | --- |
| >-5 to ±0 | 3 hours | 24 hours | --- |
| >±0 to +5 | 90 | 3 hours | 6 hours |
| >+5 to +10 | 45 | 90 | 3 hours |
| >+10 to +20 | 30 | 60 | 2 hours |
| >+20 to +30 | --- | 45 | 60 |
| >+30 to +40 | --- | 35 | 30 |

| System-temperature (mortar) [ °C ] | Maximum processing time $t_{work}$ [minutes] | | |
|---|---|---|---|
| | FIS HT High Speed[3] | FIS HT[2] | FIS HT Low Speed[2] |
| --- | --- | --- | --- |
| ±0 | 5 | --- | --- |
| +5 | 5 | 13 | 20 |
| +10 | 3 | 9 | 20 |
| +20 | 1 | 5 | 10 |
| +30 | --- | 4 | 6 |
| +40 | --- | 2 | 4 |

[1] For wet bricks the curing time must be doubled
[2] Minimum cartridge temperature +5°C
[3] Minimum cartridge temperature ±0°C



| | |
|---|---|
| **fischer injection system FIS HT for masonry** | **Annex B 5** |
| **Intended Use**<br>Steel brush<br>Maximum processing times and minimum curing times | |

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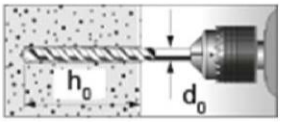
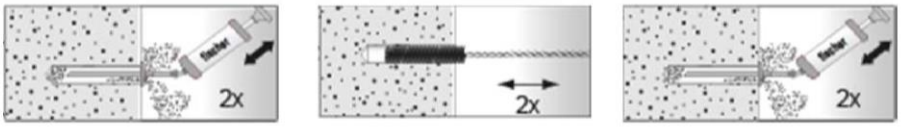
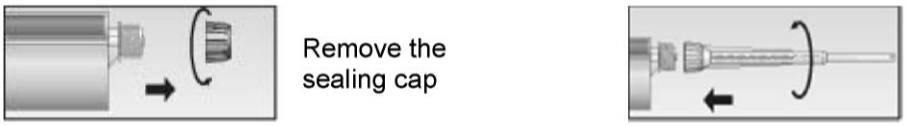
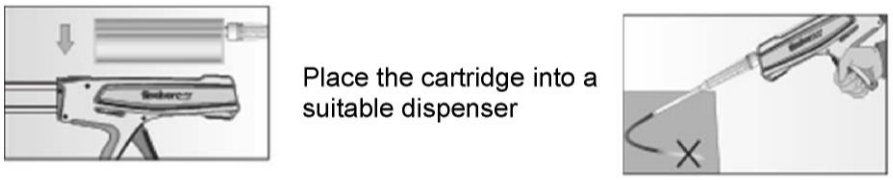
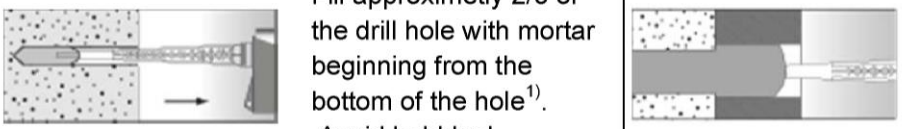
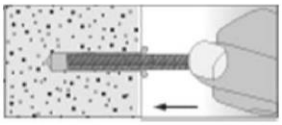
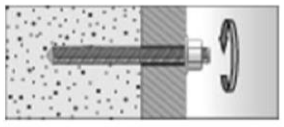
**Installation instruction part 1**

**Installation in solid brick (without perforated sleeve)**

| | | |
|---|---|---|
| 1 |   | Drill the hole in hammer drill function. Depth of drill hole $\mathbf{h_0}$ and drill hole diameter $\mathbf{d_0}$ see **Table B1** |
| 2 |   | Blow out the drill hole two times. Brush two times and blow out two times again. Adequate brushes see **Table B4.** |
| 3 |  | Remove the sealing cap<br>Screw on the static mixer. (the spiral in the static mixer must be clearly visible) |
| 4 |  | Place the cartridge into a suitable dispenser<br>Press out approximately 10 cm of mortar until the resin is permanently grey in colour. Mortar which is not grey in colour will not cure and must be disposed off. |
| 5 |  | Fill approximetly 2/3 of the drill hole with mortar beginning from the bottom of the hole[1)]. Avoid bubbles!<br>For push through anchorage fill the annular clearance with mortar. |
| 6 |  | Only use clean and oil-free sleeve elements. Mark the threaded rod for setting depth. Insert the anchor by hand using light turning motions. When reaching the setting depth marking,excess mortar must emerge from the mouthof the drill hole. |
| 7 |  | Do not touch.<br>Minimum curing time see **Table B5.**<br>  <br>Mounting the fixture.<br>$T_{inst,max}$ see **Table B1** |

[1)] Exact volume of mortar see manufacturer´s specification.

| | |
|---|---|
| **fischer injection system FIS HT for masonry** | **Annex B 6** |
| **Intended Use**<br>Installation instruction (without perforated sleeve) Part 1 | |

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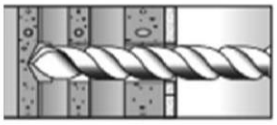
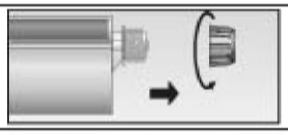
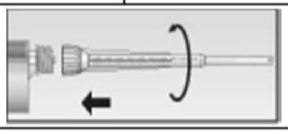
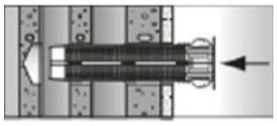
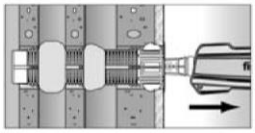
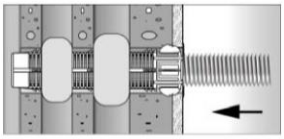
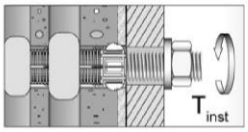
**Installation instruction, part 2**

**Installation in perforated or solid brick with perforated sleeve (pre-positioned anchorage)**

| | | | | |
|---|---|---|---|---|
| 1 |  | Drill the hole (hammer drill). Depth of drill hole $\mathbf{h_0}$ and drill hole diameter $\mathbf{d_0}$ see **Table B2** | When install perforated sleeves in solid bricks or solid areas of hollow bricks, also clean the hole by blowing out and brushing. | |
| 2 |  | Remove the sealing cap. |  | Screw on the static mixer. (the spiral in the static mixer must be clearly visible) |
| 3 |  | Place the cartridge into a suitable dispenser |  | Press out approximately 10 cm of mortar until the resin is permanently grey in colour. Mortar which is not grey in colour will not cure and must be disposed off. |
| 4 |  | Insert the perforated sleeve flush with the surface of the masonry or plaster |  | Fill the perforated sleeve completely with mortar beginning from the bottom of the hole[1)]. |
| 5 |  | Only use clean and oil-free sleeve elements. Mark the threaded rod for setting depth. Insert the threaded rod by hand using light turning motions until reaching the setting depth marking. | | |
| 6 |  | Do not touch. Minimum curing time see **Table B5.** |   | Mounting the fixture. $T_{inst,max}$ see **Table B2** |

[1)] Exact volume of mortar see manufacturer´s specification.



| | |
|---|---|
| **fischer injection system FIS HT for masonry** | **Annex B 7** |
| **Intended Use**<br>Installation instruction (with perforated sleeve) Part 2 | |

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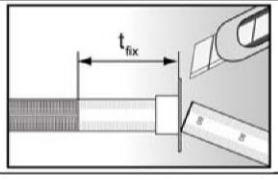
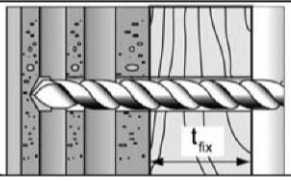
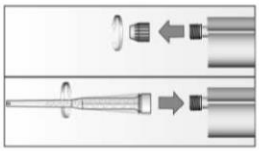
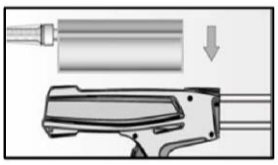
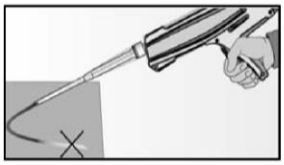
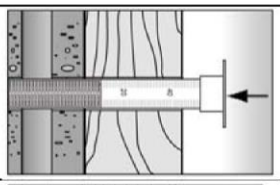
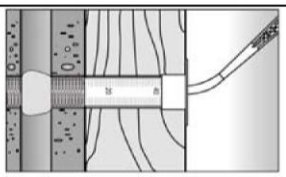
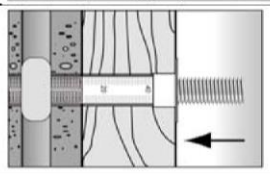
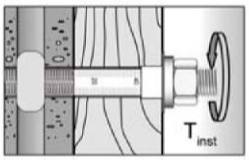
**Installation instruction, part 3**

**Installation in perforated or solid brick with perforated sleeve (push through anchorage)**

| | | | | |
|---|---|---|---|---|
| 1 |  | Push the movable stop up to the correct thickness of fixture and cut the overlap. |  | Drill the hole through the fixture. Depth of drill hole **($h_0$ + $t_{fix}$)** and drill hole diameter see **Table B3.** |
| 2 |  | Remove the sealing cap. Screw on the static mixer. (the spiral in the static mixer must be clearly visible) | | |
| 3 |  | Place the cartridge into a suitable dispenser. |  | Press out approximately 10 cm of mortar until the resin is permanently grey in colour. Mortar which is not grey in colour will not cure and must be disposed off. |
| 4 |  | Insert the perforated sleeve flush with the surface of the fixture into the drill hole. |  | Fill the sleeve with mortar beginning from the bottom of the hole[1]. For deep drill holes use an extension tube. |
| 5 |  | Only use clean and oil-free sleeve elements. Mark the threaded rod for setting depth. Insert the threaded rod by hand using light turning motions until reaching the setting depth marking. | | |
| 6 |  | Do not touch. Minimum curing time see **Table B5.** |  | Mounting the fixture. $T_{inst,max}$ see **Table B3.** |

[1] Exact volume of mortar see manufacturer´s specification.

| | |
|---|---|
| **fischer injection system FIS HT for masonry** | **Annex B 8** |
| **Intended Use**<br>Installation instruction (with perforated sleeve) Part 3 | |

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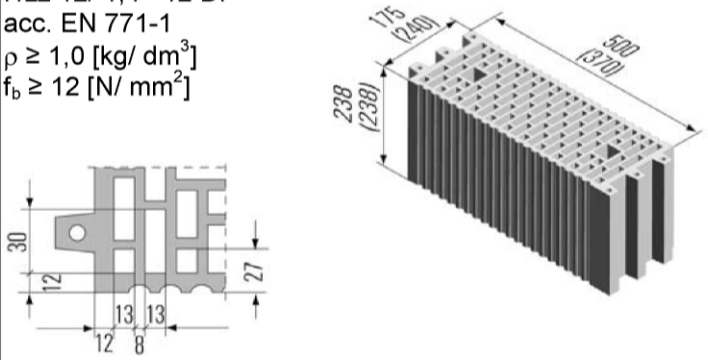
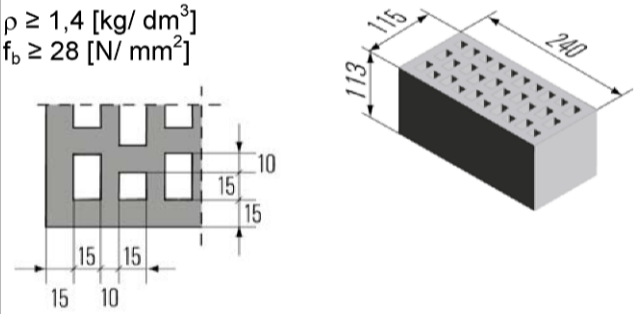
## Types and dimensions of blocks and bricks (part 1)

**Brick No. 1** (alternative dimensions)
Perforated brick
HLz 12/ 1,4 12 DF
acc. EN 771-1
$\rho \geq 1{,}0$ [kg/ dm$^3$]
$f_b \geq 12$ [N/ mm$^2$]



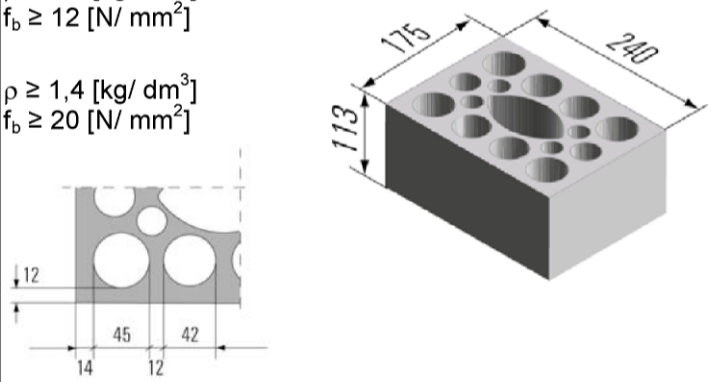

**Brick No. 2** Perforated brick HLz acc. EN 771-1
$\rho \geq 1{,}4$ [kg/ dm$^3$]
$f_b \geq 12$ [N/ mm$^2$]

$\rho \geq 1{,}4$ [kg/ dm$^3$]
$f_b \geq 28$ [N/ mm$^2$]




**Brick No. 3** Sand-lime hollow block
Acc. EN 771-2
e.g. KS Wemding KSL
$\rho \geq 1{,}4$ [kg/ dm$^3$]
$f_b \geq 12$ [N/ mm$^2$]

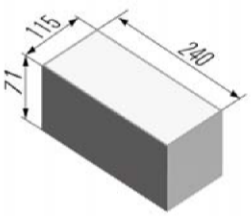
$\rho \geq 1{,}4$ [kg/ dm$^3$]
$f_b \geq 20$ [N/ mm$^2$]




**Brick No. 4** Solid sand-lime brick KS
1,8 NF acc. EN 771-2

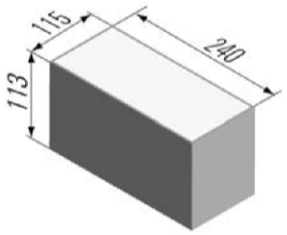
$\rho \geq 1{,}8$ [kg/ dm$^3$]
$f_b \geq 10$ [N/ mm$^2$]

$\rho \geq 1{,}8$ [kg/ dm$^3$]
$f_b \geq 20$ [N/ mm$^2$]



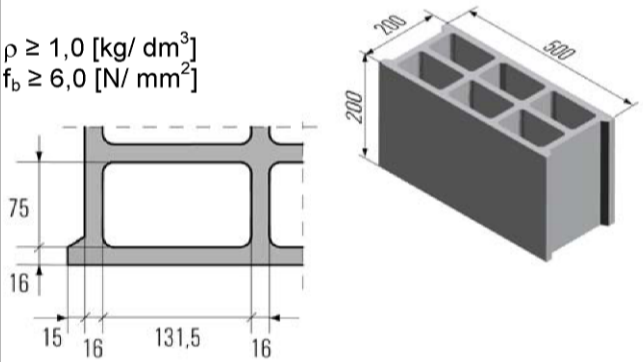

**Brick No. 5** Solid brick 2 DF
Acc. EN 771-1
$\rho \geq 1{,}8$ [kg/ dm$^3$]
$f_b \geq 10$ [N/ mm$^2$]

$\rho \geq 1{,}8$ [kg/ dm$^3$]
$f_b \geq 16$ [N/ mm$^2$]




**Brick No. 6** Light-weight hollow block
Acc. EN 771-3
e.g. NF-P 14-301
Sepa Parpaing

$\rho \geq 1{,}0$ [kg/ dm$^3$]
$f_b \geq 6{,}0$ [N/ mm$^2$]




Bricks and blocks not drawn to scale

**fischer injection system FIS HT for masonry**

**Intended Use**
Types and dimensions of blocks and bricks (part 1)

**Annex B 9**

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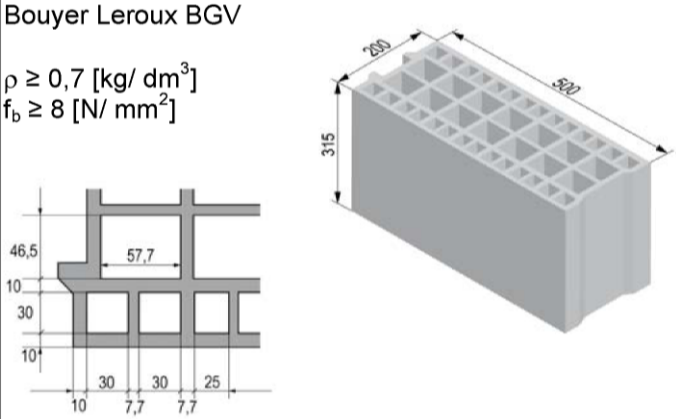
## Types and dimensions of blocks and bricks (part 2)

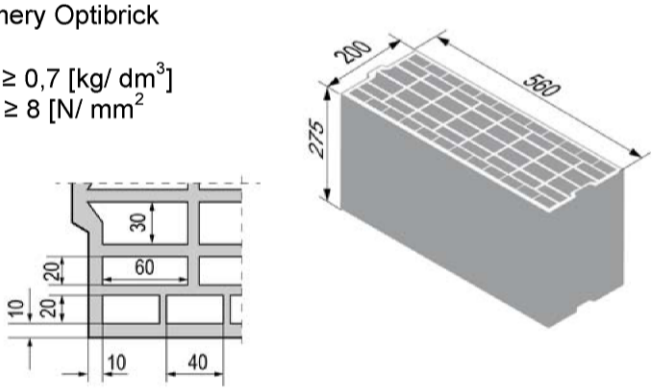
**Brick No. 7** Perforated block form B
acc. EN 771-1
HLz e.g. NF-P 13-301
Bouyer Leroux BGV

$\rho \geq 0{,}7$ [kg/ dm$^3$]
$f_b \geq 8$ [N/ mm$^2$]



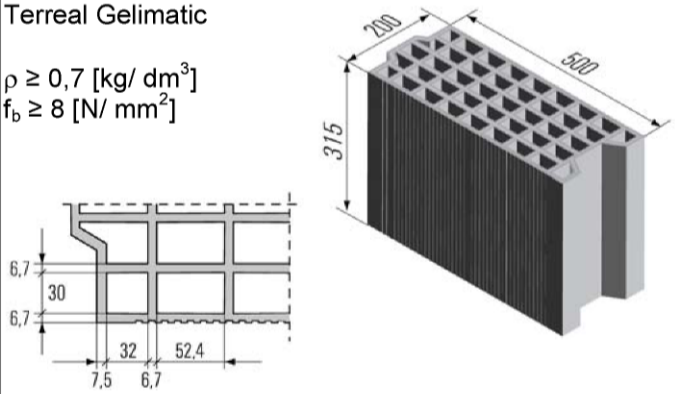

**Brick No. 8** Perforated block form B
acc. EN 771-1
HLz e.g. NF-P 13-301
Imery Optibrick

$\rho \geq 0{,}7$ [kg/ dm$^3$]
$f_b \geq 8$ [N/ mm$^2$



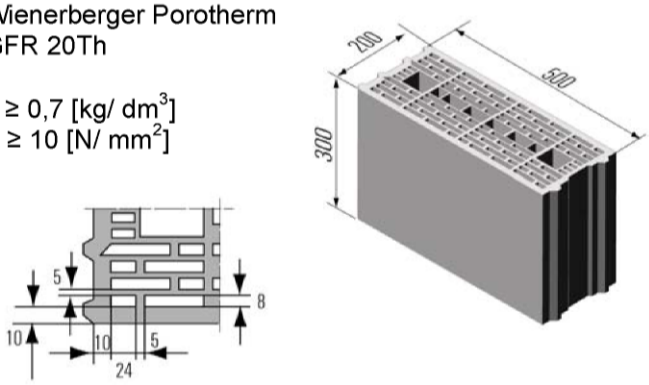

**Brick No. 9** Perforated block form B
acc. EN 771-1
HLz e.g. NF-P 13-301
Terreal Gelimatic

$\rho \geq 0{,}7$ [kg/ dm$^3$]
$f_b \geq 8$ [N/ mm$^2$]



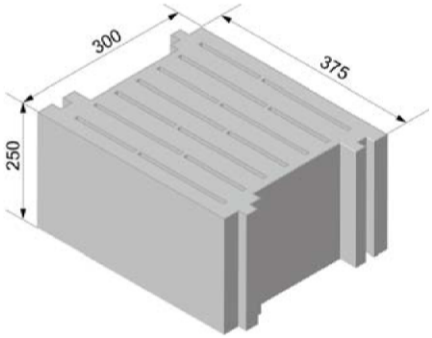

**Brick No. 10** Perforated block form B
acc. EN 771-1
HLz e.g. NF-P 13-301
Wienerberger Porotherm
GFR 20Th

$\rho \geq 0{,}7$ [kg/ dm$^3$]
$f_b \geq 10$ [N/ mm$^2$]




**Brick No. 11** Solid light-weight concrete block
Vbl 2/0,6

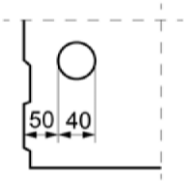
$\rho \geq 0{,}6$ [kg/ dm$^3$]
$f_b \geq 2$ [N/ mm$^2$]

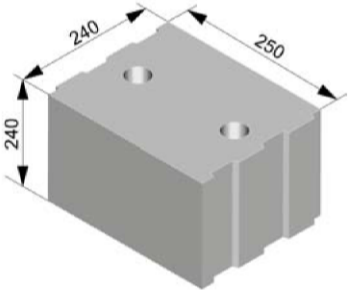



**Brick No. 12** Solid sand-lime block
acc. EN 771-2 8 Df

$\rho \geq 2{,}0$ [kg/ dm$^3$]
$f_b \geq 10$ [N/ mm$^2$]

$\rho \geq 2{,}0$ [kg/ dm$^3$]
$f_b \geq 28$ [N/ mm$^2$]




Bricks and blocks not drawn to scale

**fischer injection system FIS HT for masonry**

**Intended Use**
Types and dimensions of blocks and bricks (part 2)

**Annex B 10**

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**Table B6: Allocation of anchor rods, perforated sleeves and bricks[1)]**

| Brick No. | Perforated sleeve | | | Anchor rod (without perforated sleeve) |
|---|---|---|---|---|
| |  |  |  |  |
| 1 | --- | FIS H 16x130 K (M8/ M10)<br>FIS H 20x130 K (M12/ M16) | FIS H 18x130/200 K (M10/ M12)<br>FIS H 22x130/200 K (M16) | --- |
| 2 | FIS H 16x85 K (M8/ M10) | --- | --- | --- |
| 3 | FIS H 16x85 K (M8/ M10) | FIS H 16x130 K (M8/ M10)<br>FIS H 20x130 K (M12/ M16) | FIS H 18x130/200 K (M10/ M12)<br>FIS H 22x130/200 K (M16) | --- |
| 4 | FIS H 16x85 K (M8/ M10) | --- | --- | M8; M10; M12; M16 |
| 5 | FIS H 16x85 K (M8/ M10) | --- | --- | M8; M10; M12; M16 |
| 6 | --- | FIS H 16x130 K (M8/ M10)<br>FIS H 20x130 K (M12/ M16) | FIS H 18x130/200 K (M10/ M12)<br>FIS H 22x130/200 K (M16) | --- |
| 7 | --- | FIS H 16x130 K (M8/ M10)<br>FIS H 20x130 K (M12/ M16) | FIS H 18x130/200 K (M10/ M12)<br>FIS H 22x130/200 K (M16) | --- |
| 8 | --- | FIS H 16x130 K (M8/ M10)<br>FIS H 20x130 K (M12/ M16) | FIS H 18x130/200 K (M10/ M12)<br>FIS H 22x130/200 K (M16) | --- |
| 9 | --- | FIS H 16x130 K (M8/ M10)<br>FIS H 20x130 K (M12/ M16) | FIS H 18x130/200 K (M10/ M12)<br>FIS H 22x130/200 K (M16) | --- |
| 10 | --- | FIS H 16x130 K (M8/ M10)<br>FIS H 20x130 K (M12/ M16) | FIS H 18x130/200 K (M10/ M12)<br>FIS H 22x130/200 K (M16) | --- |
| 11 | --- | FIS H 16x130 K (M8/ M10)<br>FIS H 20x130 K (M12/ M16)<br>FIS H 20x200 K (M12/ M16) | FIS H 18x130/200 K (M10/ M12)<br>FIS H 22x130/200 K (M16) | --- |
| 12 | FIS H 16x85 K (M8/ M10) | --- | --- | M8; M10; M12; M16 |

[1)] Other combinations can be use after job site tests acc. to ETAG 029, Annex B.
The β-factor for this job site tests are given in **Table C4**



| **fischer injection system FIS HT for masonry** | **Annex B 11** |
|---|---|
| **Intended Use**<br>Allocation of anchor rods, perforated sleeves and bricks | |

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**Table C1.1: Characteristic values to tension load and shear load**

| Brick No. | Density ρ [kg/dm³] -- Com-pressiv strength $f_b$ [N/mm²] | Perforated sleeve FIS H…K | Anchor-size | effective anchorage depth $h_{ef,min}$ [mm] | effective anchorage depth $h_{ef,max}$ [mm] | Charact. resistance $N_{Rk}$ [kN] w/w 50/80 | Charact. resistance $N_{Rk}$ [kN] w/w 72 /120 | Charact. resistance $N_{Rk}$ [kN] d/d 50/80 | Charact. resistance $N_{Rk}$ [kN] d/d 72 /120 | Charact. resistance $V_{Rk}$ [kN] (all categories and temperture ranges) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ρ ≥ 1,4 $f_b$ ≥ 12 | 16x130 | M8/M10 | 110 | 130 | 3,0 | 2,5 | 3,0 | 2,5 | 2,0 |
| | | 18x130/200 | M10/M12 | 130 | --- | | | | | |
| | | 20x130[1)] | M12/M16 | 110 | 130 | 3,5 | 3,0 | 4,0 | 3,5 | |
| | | 22x130/200 | M16 | 130 | --- | | | | | |
| 2 | ρ ≥ 1,4 $f_b$ ≥ 12 | 16x85 | M8/M10 | 85 | --- | 1,2 | 0,9 | 1,2 | 1,2 | 2,5 |
| | ρ ≥ 1,4 $f_b$ ≥ 28 | 16x85 | M8/M10 | 85 | --- | 3,5 | 3,0 | 3,5 | 3,0 | 6,5 (5,5)[2)] |
| 3 | ρ ≥ 1,4 $f_b$ ≥ 12 | 16x85 | M8/M10 | 85 | --- | 2,5 | 2,0 | 2,5 | 2,0 | 4,5 |
| | | 16x130 | M8/M10 | 110 | 130 | 3,0 | 2,5 | 3,5 | 3,0 | |
| | | 18x130/200 | M10/M12 | 130 | --- | | | | | |
| | | 20x130[1)] | M12/M16 | 110 | 130 | | | | | 4,0 |
| | | 22x130/200 | M16 | 130 | --- | | | | | |
| | ρ ≥ 1,4 $f_b$ ≥ 20 | 16x85 | M8/M10 | 85 | --- | 4,5 | 4,0 | 5,0 | 4,0 | 7,5 |
| | | 16x130 | M8/M10 | 110 | 130 | 5,5 | 4,5 | 6,0 | 5,0 | 7,5 |
| | | 18x130/200 | M10/M12 | 130 | --- | | | | | |
| | | 20x130[1)] | M12/M16 | 110 | 130 | | | | | 6,5 |
| | | 22x130/200 | M16 | 130 | --- | | | | | |
| 4 | ρ ≥ 1,8 $f_b$ ≥ 10 | without | M8 | 50 | 100 | 1,5 | 1,2 | 2,5 | 2,0 | 4,0 |
| | | | M10 | 50 | 100 | | | | | |
| | | | M12 | 50 | 100 | | | | | 5,0 |
| | | | M16 | 64 | 100 | | | | | |
| | | 16x85 | M8/M10 | 85 | --- | | | | | 3,0 |
| | ρ ≥ 1,8 $f_b$ ≥ 20 | without | M8 | 50 | 100 | 2,0 | 1,5 | 3,5 | 3,0 | 5,5 |
| | | | M10 | 50 | 100 | | | | | |
| | | | M12 | 50 | 100 | | | | | 7,5 |
| | | | M16 | 64 | 100 | | | | | |
| | | 16x85 | M8/M10 | 85 | --- | | | | | 4,0 |
| 5 | ρ ≥ 1,8 $f_b$ ≥ 10 | without | M8 | 50 | 100 | 1,5 | 1,5 | 3,0 | 2,5 | 3,0 |
| | | | M10 | 50 | 100 | | | | | 3,5 |
| | | | M12 | 50 | 100 | 2,0 | | | | |
| | | | M16 | 50 | 100 | | | | | 3,0 |
| | | 16x85 | M8/M10 | 64 | --- | | | | | |
| | ρ ≥ 1,8 $f_b$ ≥ 16 | without | M8 | 50 | 100 | 2,5 | 2,0 | 4,5 | 4,0 | 5,0 |
| | | | M10 | 50 | 100 | | | | 3,5 | 5,5 |
| | | | M12 | 50 | 100 | 3,5 | | 5,5 | 4,5 | |
| | | | M16 | 50 | 100 | | | | | 5,0 |
| | | 16x85 | M8/M10 | 64 | --- | | | | | |

[1)] Alternative FIS H 20x200 K; ($h_{ef,min}$ = 110 mm)
[2)] Characteristic value of pushing out of one brick $V_{RK,pb}$ = 5,5 kN

**fischer injection system FIS HT for masonry**

**Performances**
Characteristic values to tension load and shear load (part 1)

**Annex C 1**

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**Table C1.2: Characteristic values to tension load and shear load**

| Brick No. | Density ρ [kg/dm³] -- Com-pressiv strength $f_b$ [N/mm²] | Perforated sleeve FIS H…K | Anchor-size | effective anchorage depth $h_{ef,min}$ [mm] | effective anchorage depth $h_{ef,max}$ [mm] | Charact. resistance $N_{Rk}$ [kN] w/w 50/80 | Charact. resistance $N_{Rk}$ [kN] w/w 72 /120 | Charact. resistance $N_{Rk}$ [kN] w/w 50/80 | Charact. resistance $N_{Rk}$ [kN] w/w 72 /120 | Charact. resistance $V_{Rk}$ [kN] (all categories and temperture ranges) |
|---|---|---|---|---|---|---|---|---|---|---|
| 6 | ρ ≥ 1,0 $f_b$ ≥ 6 | 16x130 | M8/M10 | 110 | 130 | 1,2 | 1,2 | 1,5 | 1,2 | 2,5 |
| | | 18x130/200 | M10/M12 | 130 | --- | | | | | |
| | | 20x130[1)] | M12/M16 | 110 | 130 | | | | | |
| | | 22x130/200 | M16 | 130 | --- | | | | | |
| 7 | ρ ≥ 0,7 $f_b$ ≥ 8 | 16x130 | M8/M10 | 110 | 130 | 1,5 | 1,2 | 2,0 | 1,5 | 2,0 |
| | | 18x130/200 | M10/M12 | 130 | --- | | | | | |
| | | 20x130[1)] | M12/M16 | 110 | 130 | 3,5 | 2,5 | 3,5 | 3,0 | |
| | | 22x130/200 | M16 | 130 | --- | | | | | |
| 8 | ρ ≥ 0,6 $f_b$ ≥ 8 | 16x130 | M8/M10 | 110 | 130 | 2,0 | 1,5 | 2,5 | 2,0 | 2,0 |
| | | 18x130/200 | M10/M12 | 130 | --- | | | | | |
| | | 20x130[1)] | M12/M16 | 110 | 130 | 2,5 | 2,0 | 3,0 | 2,5 | |
| | | 22x130/200 | M16 | 130 | --- | | | | | |
| 9 | ρ ≥ 0,7 $f_b$ ≥ 8 | 16x130 | M8/M10 | 110 | 130 | 2,0 | 1,5 | 2,0 | 2,0 | 2,0 |
| | | 18x130/200 | M10/M12 | 130 | --- | | | | | |
| | | 20x130[1)] | M12/M16 | 110 | 130 | | | | | 3,0 |
| | | 22x130/200 | M16 | 130 | --- | | | | | |
| 10 | ρ ≥ 0,6 $f_b$ ≥ 2 | 16x130 | M8/M10 | 110 | 130 | 2,5 | 2,0 | 3,0 | 2,5 | 1,5 |
| | | 18x130/200 | M10/M12 | 130 | --- | | | | | |
| | | 20x130[1)] | M12/M16 | 110 | 130 | 3,5 | 3,0 | 4,0 | 3,0 | |
| | | 22x130/200 | M16 | 130 | --- | | | | | |
| 11 | ρ ≥ 0,6 $f_b$ ≥ 2 | 16x130 | M8/M10 | 110 | 130 | 2,0 | 1,5 | 2,0 | 2,0 | 4,5 |
| | | 18x130/200 | M10/M12 | 130 | --- | | | | | |
| | | 20x130[1)] | M12/M16 | 110 | 130 | 2,5 | 2,5 | 3,0 | 2,5 | |
| | | 22x130/200 | M16 | 130 | --- | | | | | |
| | | 20x200 | M12/M16 | 180 | 200 | 3,0 | 3,0 | 4,0 | 3,0 | 6,5 |
| 12 | ρ ≥ 2,0 $f_b$ ≥ 10 | without | M8 | 50 | 100 | 4,0 | 3,5 | 7,0 | 5,5 | 4,5 |
| | | | M10 | 50 | 100 | 4,5 | 3,5 | 7,0 | 5,5 | |
| | | | M12 | 50 | 100 | | | | | |
| | | | M16 | 64 | 100 | 3,5 | 3,0 | 5,5 | 4,5 | |
| | | 16x85 | M8/M10 | 85 | --- | 4,5 | 3,5 | 8,0 | 6,5 | |
| | ρ ≥ 1,8 $f_b$ ≥ 16 | without | M8 | 50 | 100 | 8,0 | 7,0 | 12,0 (9,0)[2)] | 8,0 | 9,0 |
| | | | M10 | 50 | 100 | 8,5 | 7,0 | 12,0 (9,0)[2)] | 11,5 (9,0)[2)] | |
| | | | M12 | 50 | 100 | | | | | |
| | | | M16 | 64 | 100 | 7,0 | 6,0 | 11,0 (9,0)[2)] | 9,0 | |
| | | 16x85 | M8/M10 | 85 | --- | 8,5 | 7,0 | 12,0 (9,0)[2)] | 12,0 (9,0)[2)] | |

[1)] Alternative FIS H 20x200 K; ($h_{ef,min}$ = 110 mm)
[2)] Characteristic value of pulling out of one brick $N_{RK,pb}$ = 9,0 kN

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**Annex C 2**

**Performances**
Characteristic values to tension load and shear load (part 2)

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### Table C2: Characteristic bending moments

| Size | | | | | M8 | M10 | M12 | M16 |
|---|---|---|---|---|---|---|---|---|
| Charact. bending moment $M_{Rk,s}$ | Steel zinc plated | Property class | 5.8 | [Nm] | 19 | 37 | 65 | 166 |
| | | | 8.8 | [Nm] | 30 | 60 | 105 | 266 |
| | Stainless steel A4 | Property class | 50 | [Nm] | 19 | 37 | 65 | 166 |
| | | | 70 | [Nm] | 26 | 52 | 92 | 232 |
| | High corrosion-resistant steel C | Property class | 50 | [Nm] | 19 | 37 | 65 | 166 |
| | | | 70[1)] | [Nm] | 26 | 52 | 92 | 232 |
| | | | 80 | [Nm] | 30 | 60 | 105 | 266 |

[1)] $f_{uk}$ = 700 N/mm²; $f_{yk}$ = 560 N/mm²

### Table C3: Displacements under tension load and shear load

| | N [kN] | $\delta_{N0}$ [mm] | $\delta_{N\infty}$ [mm] | V [kN] | $\delta_{V0}$ [mm] | $\delta_{V\infty}$ [mm] |
|---|---|---|---|---|---|---|
| Solid bricks[1)] | $\frac{N_{Rk}}{1,4 \bullet \gamma_M}$ | 0,03 | 0,06 | $\frac{V_{Rk}}{1,4 \bullet \gamma_M}$ | 0,59 | 0,88 |
| Hollow bricks[2)] | | | | | 1,71 | 2,56 |
| Brick No.6 | | | | | 6,44 | 9,66 |

[1)] Brick No.: 4, 5, 11, 12
[2)] Brick No.: 1, 2, 3, 7, 8, 9, 10

### Table C4: β- factors for job site tests according to ETAG 029; Annex B

| Use category | | w/w | | d/d | |
|---|---|---|---|---|---|
| Temperature range | | 50/80 | 72/120 | 50/80 | 72/120 |
| Material | Size | | | | |
| Solid Bricks | M8 | 0,57 | 0,51 | 0,96 | 0,80 |
| | M10 | 0,59 | 0,52 | | |
| | M12 | 0,60 | 0,54 | | |
| | M16 | 0,62 | 0,52 | | |
| Hollow bricks | All sizes | 0,86 | 0,72 | 0,96 | 0,80 |

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**Table C5: Edge distance and spacing**

| Direction to bed joint | | | ⊥ | | ∥ | | Group factor | | | | Min. thickness of the masonry members |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Brick No . | $h_{ef}$ [mm] | $c_{cr} = c_{min}$ | $s_{min}$ | $s_{cr}$ | $s_{min}$ | $s_{cr}$ | ⊥ | | ∥ | | |
| | | [mm] | [mm] | [mm] | [mm] | [mm] | $\alpha^g_N$ | $\alpha^g_V$ | $\alpha^g_N$ | $\alpha^g_V$ | [mm] |
| 1 | All sizes | 100 | 100 | 240 | 100 | 375 (500)[2] | 1 | | | | $h_{ef}$ + 30 (≥ 80) |
| 2 | All sizes | 80 | 115 | | 240 | | 2 | | | | |
| 3 | All sizes | 80 | 115 | | 100 | 240 | 2 | | 1,5 | | |
| 4 | 50 | 100 | 75 | | 240 | | 2 | | | | |
| | 80 | 100 | 75 | | 240 | | 2 | | | | |
| | 200 | 150 | 75 | | 240 | | 2 | | | | |
| 5 | 50 | 100 | 75 | | 60[1] | 150 | 2 | | 1,5 | 1,4 | |
| | 80 | 100 | 75 | | 60[1] | 240 | 2 | | 1,5 | 1,4 | |
| | 200 | 150 | 75 | | 240 | | 2 | | | | |
| 6 | All sizes | 100 | 200 | | 500 | | 2 | | | | |
| 7 | All sizes | 120 | 315 | | 120 | 500 | 2 | | 1,3 | 1,7 | |
| 8 | All sizes | 80 | 275 | | 560 | | 2 | | | | |
| 9 | All sizes | 80 | 100 | 315 | 100 | 500 | 1,1 | 1,2 | 1,1 | 1,2 | |
| 10 | All sizes | 80 | 300 | | 100 | 250 | 2 | | 1,4 | 2 | |
| 11 | All sizes | 130 | 250 | | 370 | | 2 | | | | |
| 12 | All sizes | 60 | 80 | 240 | 80 | 250 | 1,5 | 1,2 | 1,5 | 1,2 | |

[1] Only valid for tension loads, for shear loads $s_{min}\| = s_{cr}\|$
[2] Spacing depending on brick dimension, brick dimension see Annex B9, brick No.1



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**Performances**
Edge distance and spacing

**Annex C 4**

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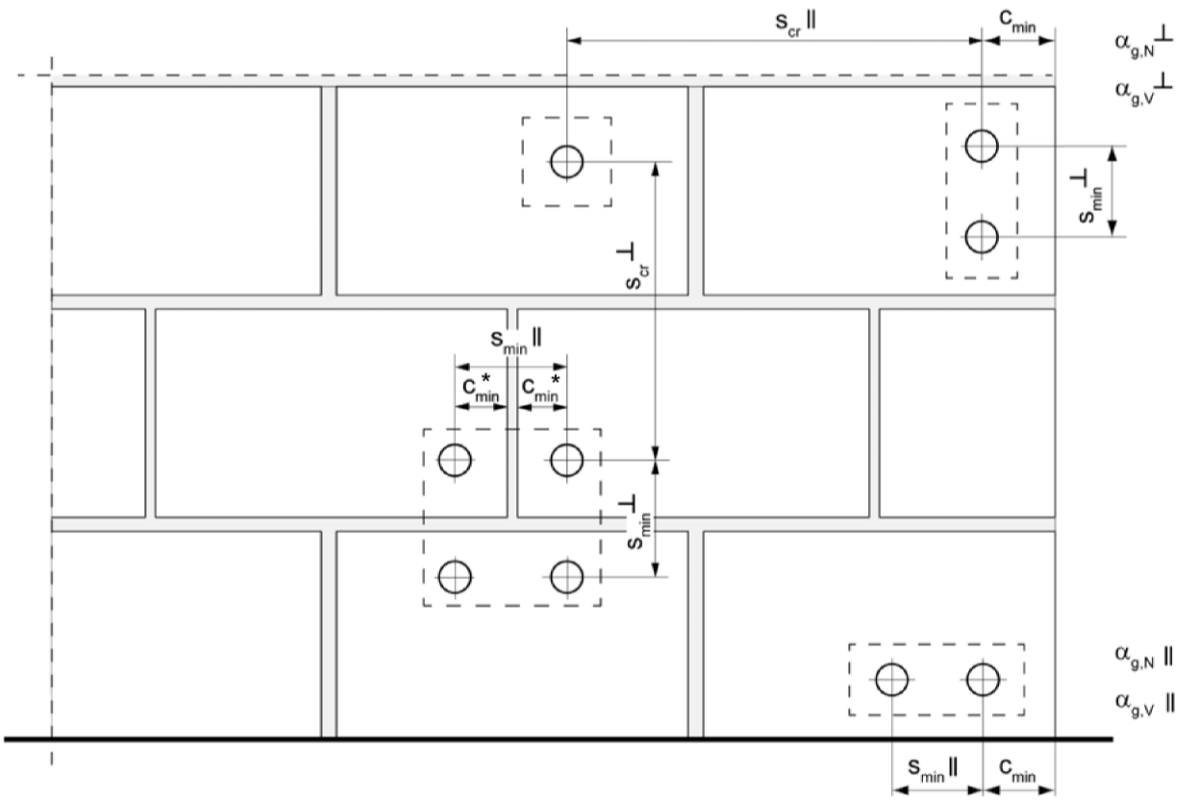


* Only, if joints are visible and vertical joints (butt joints) are not filled with mortar

$s_{min}$ || = Minimum spacing parallel to bed joint
$s_{min}$ ⊥ = Minimum spacing vertical to bed joint
$s_{cr}$ || = Characteristic spacing parallel to bed joint
$s_{cr}$ ⊥ = Characteristic spacing vertical to bed joint
$c_{cr} = c_{min}$ = Edge distance
$\alpha_{g,N}$ || = Group factor for tension load parallel to bed joint
$\alpha_{g,V}$ || = Group factor for shear load parallel to bed joint
$\alpha_{g,N}$ ⊥ = Group factor for tension load vertical to bed joint
$\alpha_{g,V}$ ⊥ = Group factor for shear load vertical to bed joint

For $s > s_{cr}$ $\alpha_g = 2$
For $s_{min} \leq s \leq s_{cr}$ $\alpha_g$ according to Table C5
$N^g_{Rk} = \alpha_{g,N} \bullet N_{Rk}$; $V^g_{Rk} = \alpha_{g,V} \bullet V_{Rk}$ (Group of 2 anchors)
$N^g_{Rk} = \alpha_{g,N}$ || $\bullet$ $\alpha_{g,N}$ ⊥ $\bullet N_{Rk;}$ $V^g_{Rk} = \alpha_{g,V}$ || $\bullet$ $\alpha_{g,V}$ ⊥ $\bullet V_{Rk}$ (Group of 4 anchors)

**fischer injection system FIS HT for masonry**

**Performances**
Definition of minimum edge distance, minimum spacing and group factors

**Annex C 5**