



# DECLARACIÓN DE PRESTACIONES



no 0075 – ES

1. Código de identificación única del producto tipo: **Upat Sistema de inyección UPM 44 para anclaje en mampostería**

2. Usos previstos:

| producto                                                      | Uso/s previsto/s                                                                                                                                                                                                                                                                                                         |
|---------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| anclaje de inyección para aplicaciones en fábrica de ladrillo | Anclajes para los cuales se cumplen los requisitos de resistencia mecánica y estabilidad y seguridad durante el uso. Están destinados a la fijación y/o el soporte de elementos estructurales (que contribuyen a la estabilidad de las obras) o unidades pesadas, Véase el apéndice, especialmente los anexos B 1 - B 12 |

3. Fabricante: **fischerwerke GmbH & Co. KG, Otto-Hahn-Straße 15, 79211 Denzlingen, Germany**

4. Representante autorizado: --

5. Sistemas de evaluación y verificación de la constancia de las prestaciones (EVCP): **1**

6a. Norma armonizada: ---

Organismos notificados: ---

6b. Documento de evaluación europeo: **ETAG 029; 2013-04**

Evaluación técnica europea: **ETA-15/0555; 2015-09-11**

Organismo de evaluación técnica: **DIBt**

Organismos notificados: **1343 – MPA Darmstadt**

7. Prestaciones declaradas:

## Resistencia mecánica y estabilidad (BWR 1)

| indicación esencial                                                         | Prestaciones                              |
|-----------------------------------------------------------------------------|-------------------------------------------|
| valores característicos para solicitaciones a tracción y a cortante         | Ver anexo, especialmente anexo C 1 - C 75 |
| momentos flectores característicos                                          | Ver anexo, especialmente anexo C 76       |
| desplazamientos bajo solicitaciones a tracción y a cortante                 | Ver anexo, especialmente anexo C 78       |
| coeficiente de reducción para ensayos a pie de obra ( $\beta$ -coeficiente) | Ver anexo, especialmente anexo C 78       |
| distancias al borde y entre ejes                                            | Ver anexo, especialmente anexo C 1 - C 75 |

## protección contra incendios (BWR 2)

| indicación esencial  | Prestaciones                                         |
|----------------------|------------------------------------------------------|
| Reacción al fuego    | el anclaje cumple con las exigencias de la clase A1. |
| resistencia al fuego | resistencia no calculada                             |

8. Documentación técnica adecuada o documentación técnica específica: ---

Las prestaciones del producto identificado anteriormente son conformes con el conjunto de prestaciones declaradas. La presente declaración de prestaciones se emite, de conformidad con el Reglamento (UE) no 305/2011, bajo la sola responsabilidad del fabricante arriba identificado.

Firmado por y en nombre del fabricante por:

Andreas Bucher, Dipl.-Ing.

Wolfgang Hengesbach, Dipl.-Ing., Dipl.-Wirtsch.-Ing.

*i.V. A. Bucher*

*i.V. W. Hengesbach*

Tumlingen, 2015-09-24

- Este DoP ha sido redactado en varios idiomas. En caso de disputa acerca de la interpretación siempre prevalecerá la versión en inglés.

- el anexo contiene información voluntaria y complementaria en inglés, que va más allá de las exigencias legales.

## Specific Part

### 1 Technical description of the product

The Upat injection system UPM 44 for masonry is a bonded anchor (injection type) consisting of a mortar cartridge with Upat injection mortar UPM 44, UPM 44 Express and UPM 44 Relax, a perforated sieve sleeve and an anchor rod with hexagon nut and washer or an internal threaded rod in the range of M6 to M16. 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 75 |
| Characteristic resistance for bending moments          | See Annex C 76       |
| Displacements under shear and tension loads            | See Annex C 78       |
| Reduction Factor for job site tests ( $\beta$ -Factor) | See Annex C 78       |
| Edge distances and spacing                             | See Annex C 1 – C 75 |

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

| Essential characteristic | Performance                                 |
|--------------------------|---------------------------------------------|
| Reaction to fire         | Anchorage 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.

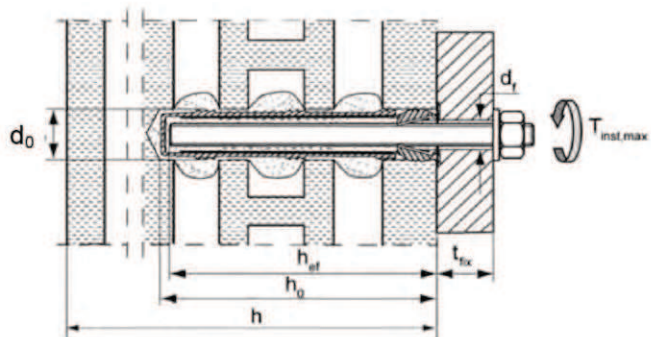
**4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base**

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

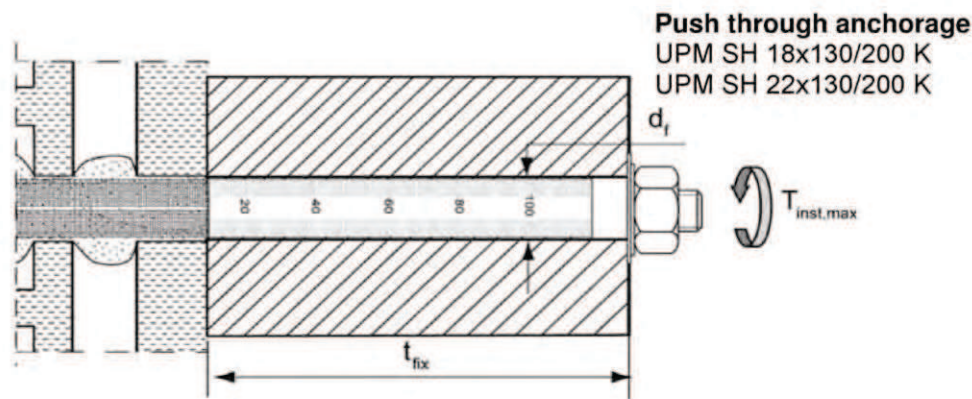
Installation conditions part 1

Threaded rods with perforated sleeve UPM SH K; Installation in perforated and solid brick masonry



Pre-positioned anchorage

- UPM SH 12x50 K
- UPM SH 12x85 K
- UPM SH 16x85 K
- UPM SH 16x130 K
- UPM SH 20x85 K
- UPM SH 20x130 K
- UPM SH 20x200 K

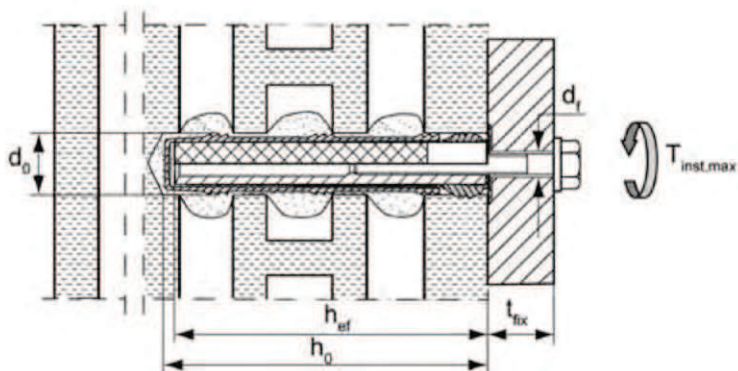


Push through anchorage

- UPM SH 18x130/200 K
- UPM SH 22x130/200 K

Internal threaded anchor UPM-I with perforated sleeve UPM SH K; Installation in perforated and solid brick masonry

Pre-positioned anchorage



- $d_0$  = nominal drill bit diameter
- $d_f$  = diameter of clearance hole in the fixture
- $T_{nst,max}$  = maximum torque moment
- $h$  = thickness of masonry

- $h_{ef}$  = effective anchorage depth
- $h_0$  = depth of drill hole
- $t_{fix}$  = thickness of fixture

Upat injection system UPM 44 masonry

Annex A 1

Product description

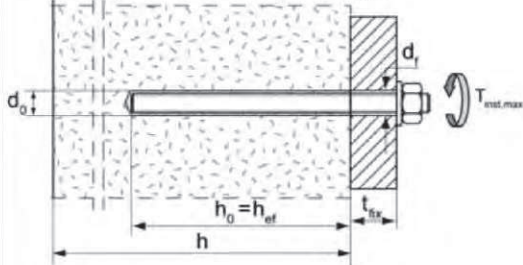
Installation conditions part 1, in perforated brick



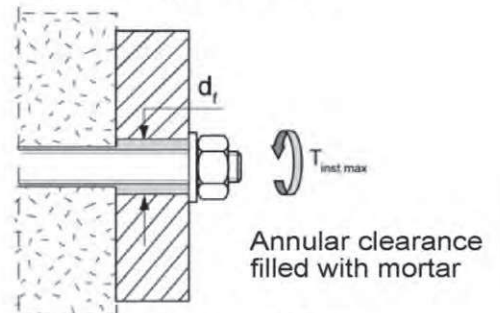
## Installation conditions part 2

**Threaded rods without perforated sleeve UPM SH K; installation in solid brick masonry and autoclaved aerated concrete**

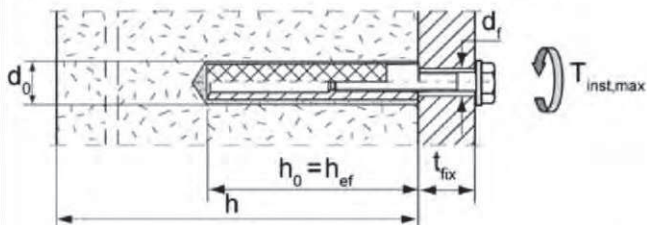
### Pre-positioned anchorage



### Push-through anchorage



**Internal threaded anchors UPM-I without perforated sleeve UPM SH K; installation in solid brick masonry and autoclaved aerated concrete**

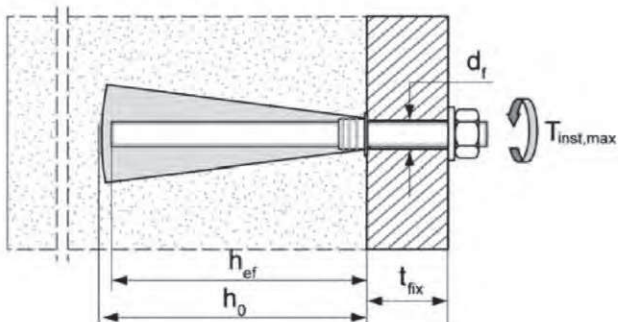


**Threaded rods and internal threaded anchors UPM-I without perforated sleeve UPM SH K; installation in autoclaved aerated concrete (installation with special conic drill bit PBB)**

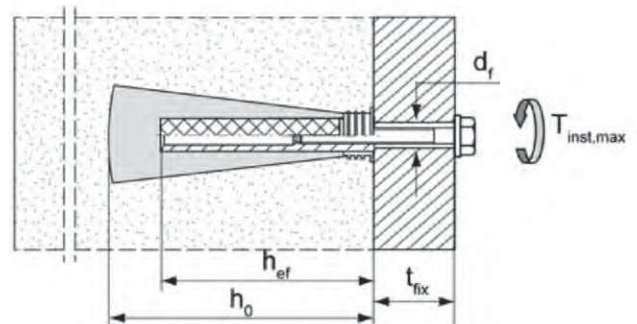
Threaded rods M8, M10, M12

Internal threaded anchor UPM-I M6 and UPM-I M8

### Pre-positioned anchorage



### Pre-positioned 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

Upat injection system UPM 44 masonry

### Product description

Installation conditions part 2, in solid bricks

**Annex A 2**

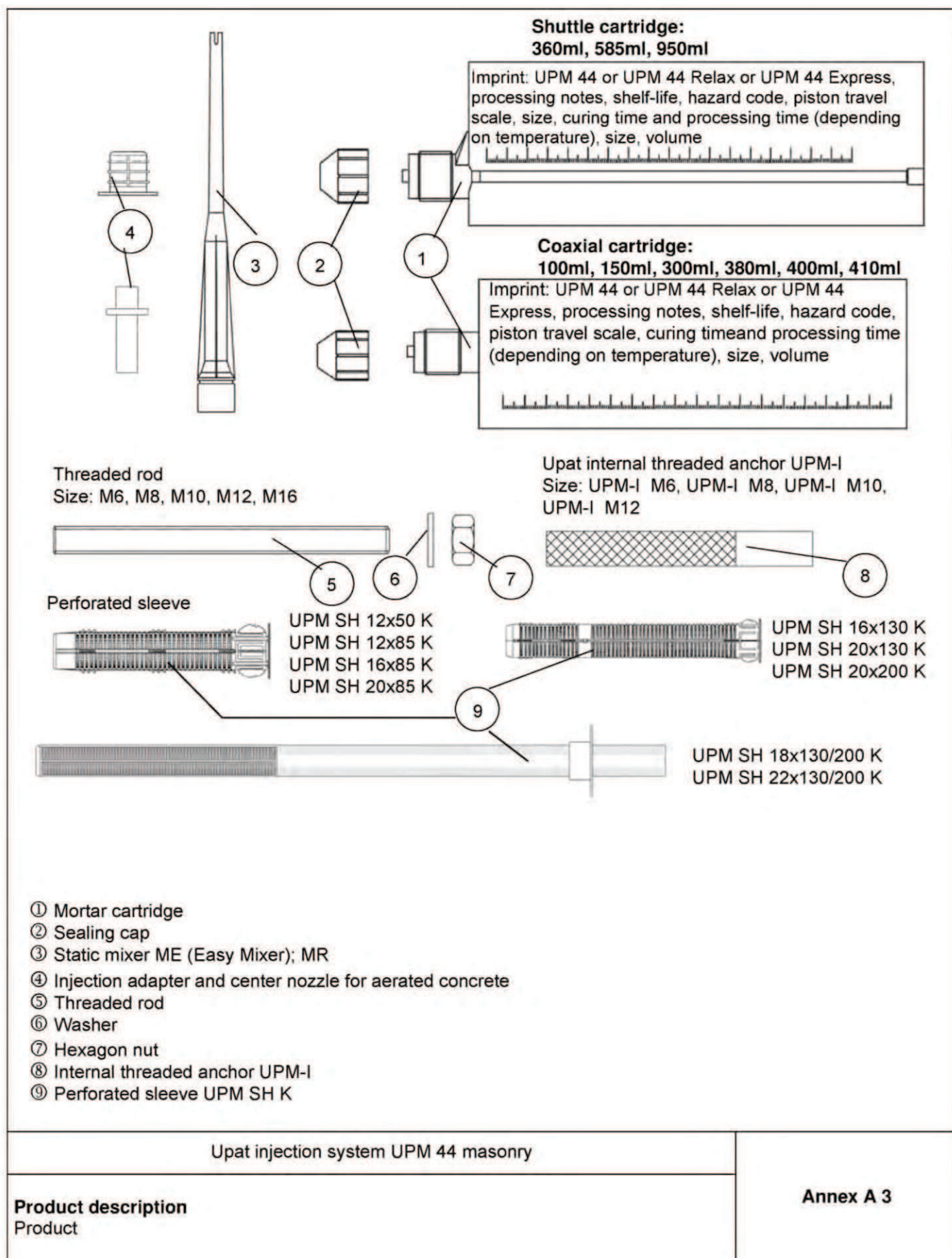




Table A1: Materials

| Part                                 | Designation                                                    | Material                                                                                                                                                                                                                               |                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                    |
|--------------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1                                    | Mortar cartridge                                               | Mortar, hardener; filler                                                                                                                                                                                                               |                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                    |
|                                      |                                                                | Steel, zinc plated                                                                                                                                                                                                                     | Stainless steel A4                                                                                                                                                                                                                 | High corrosion-resistant steel C                                                                                                                                                                                                                   |
| 5                                    | Threaded rod                                                   | Property class 5.8 or 8.8;<br>EN ISO 898-1: 2013<br>zinc plated ≥ 5µm,<br>EN ISO 4042:1999 A2K<br>or hot-dip galvanised<br>EN ISO 10684:2004<br>f <sub>uk</sub> ≤ 1000 N/mm <sup>2</sup><br>A <sub>5</sub> > 8% fracture<br>elongation | Property class 50, 70<br>or 80<br>EN ISO 3506:2009<br>1.4401; 1.4404;<br>1.4578; 1.4571;<br>1.4439; 1.4362;<br>1.4062<br>EN 10088-1:2014<br>f <sub>uk</sub> ≤ 1000 N/mm <sup>2</sup><br>A <sub>5</sub> > 8% fracture<br>elongation | Property class 50 or 80<br>EN ISO 3506:2009<br>or property class 70<br>with f <sub>yk</sub> = 560 N/mm <sup>2</sup><br>1.4565; 1.4529<br>EN 10088-1:2014<br>f <sub>uk</sub> ≤ 1000 N/mm <sup>2</sup><br>A <sub>5</sub> > 8% fracture<br>elongation |
| 6                                    | Washer<br>ISO 7089:2000                                        | zinc plated ≥ 5µm,<br>EN ISO 4042:1999 A2K<br>or hot-dip galvanised<br>EN ISO 10684:2004                                                                                                                                               | 1.4401; 1.4404;<br>1.4578;1.4571;<br>1.4439; 1.4362<br>EN 10088-1:2014                                                                                                                                                             | 1.4565;1.4529<br>EN 10088-1:2014                                                                                                                                                                                                                   |
| 7                                    | Hexagon nut                                                    | Property class 5 or 8;<br>EN ISO 898-2:2013<br>zinc plated ≥ 5µm,<br>ISO 4042:1999 A2K<br>or hot-dip galvanised<br>ISO 10684:2004                                                                                                      | Property class 50, 70<br>or 80<br>EN ISO 3506:2009<br>1.4401; 1.4404;<br>1.4578; 1.4571;<br>1.4439; 1.4362<br>EN 10088-1:2014                                                                                                      | Property class 50, 70 or<br>80<br>EN ISO 3506:2009<br>1.4565; 1.4529<br>EN 10088-1:2014                                                                                                                                                            |
| 8                                    | Internal threaded anchor<br>UPM-I                              | Property class 5.8;<br>EN 10277-1:2008-06<br>zinc plated ≥ 5µm,<br>ISO 4042:1999 A2K                                                                                                                                                   | Property class 70<br>EN ISO 3506:2009<br>1.4401; 1.4404;<br>1.4578; 1.4571;<br>1.4439; 1.4362<br>EN 10088-1:2014                                                                                                                   | Property class 70<br>EN ISO 3506-1:2009<br>1.4565; 1.4529<br>EN 10088-1:2014                                                                                                                                                                       |
|                                      | Screw or threaded rod for<br>internal threaded anchor<br>UPM-I | Property class 5.8 or 8.8;<br>EN ISO 898-1:2013<br>zinc plated ≥ 5µm,<br>ISO 4042:1999 A2K                                                                                                                                             | Property class 70<br>EN ISO 3506:2009<br>1.4401; 1.4404;<br>1.4578; 1.4571;<br>1.4439; 1.4362<br>EN 10088-1:2014                                                                                                                   | Property class 70<br>EN ISO 3506-1:2009<br>1.4565; 1.4529<br>EN 10088-1:2014                                                                                                                                                                       |
| 9                                    | Perforated sleeve                                              | PP / PE                                                                                                                                                                                                                                |                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                    |
| Upat injection system UPM 44 masonry |                                                                |                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                    |
| Product description<br>Materials     |                                                                |                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                    | Annex A 4                                                                                                                                                                                                                                          |

**Specifications of intended use**

**Anchorage subject to:**

- Static and quasi-static loads

**Base materials:**

- Solid brick masonry (Use category b) and autoclaved aerated concrete (Use category d), acc. to Annex B10, B11, B12

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 B10, B11
- 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 and autoclaved aerated concrete, the characteristic resistance of the anchor may be determined by job site tests according to ETAG 029, Annex B under consideration of the  $\beta$ -factor according to Annex C78, Table C121

**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)

|                                       |                  |
|---------------------------------------|------------------|
| Upat injection system UPM 44 masonry  | <b>Annex B 1</b> |
| <b>Intended Use</b><br>Specifications |                  |

### Specifications of intended use

#### Design:

- The anchorages 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 anchor 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 B3)
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site
- Fastening screws or threaded rods (including nut and washer) must comply with the appropriate material and property class of the Upat internal threaded anchor UPM-I
- minimum curing time see Annex B5. Table B6
- 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 A4, 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

Upat injection system UPM 44 masonry

**Intended Use**  
Specifications

**Annex B 2**



**Table B1: Installation parameters for threaded rods in solid bricks and autoclaved aerated concrete without perforated sleeves**

| Size                                                               |                              | M6                      | M8 | M10 | M12 | M16 |
|--------------------------------------------------------------------|------------------------------|-------------------------|----|-----|-----|-----|
| Nominal drill hole diameter                                        | $d_0$ [mm]                   | 8                       | 10 | 12  | 14  | 18  |
| Effective anchorage depth AAC cylindrical drill hole $h_{ef}^{1)}$ | $h_{ef,min}$ [mm]            | 100                     |    |     |     |     |
| Effective anchorage depth AAC                                      | $h_{0,min}$ [mm]             | -                       | 80 |     |     | -   |
| Conical drill hole $h_{ef}^{1)}$                                   | $h_{ef,min}$ [mm]            | -                       | 75 |     |     | -   |
| Effective anchorage depth $h_{ef}^{1)}$                            | $h_{ef,min}$ [mm]            | 50                      |    |     |     |     |
| Depth of drill hole $h_0 = h_{ef}$                                 | $h_{ef,max}$ [mm]            | $h-30, \leq 200$        |    |     |     |     |
| Diameter of clearance                                              | pre-position $d_f \leq$ [mm] | 7                       | 9  | 12  | 14  | 18  |
| hole in the fixture                                                | push through $d_f \leq$ [mm] | 9                       | 11 | 14  | 16  | 20  |
| Diameter of steel brush                                            | $d_b \geq$ [mm]              | See Table B5            |    |     |     |     |
| Maximum installation torque                                        | $T_{inst,max}$ [Nm]          | see parameters of brick |    |     |     |     |

<sup>1)</sup>  $h_{ef,min} \leq h_{ef} \leq h_{ef,max}$  is possible.

#### Upat threaded rods M6, M8, M10, M12, M16



#### Marking:

Property class 8.8 or high corrosion resistant steel, property class 80: •

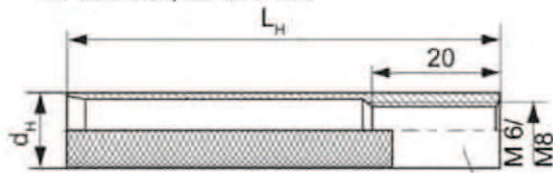
Stainless steel A4, property class 50 and high corrosion resistant steel C, property class 50: ••

**Table B2: Installation parameters for internal threaded anchors UPM-I in solid bricks and autoclaved aerated concrete without perforated sleeves**

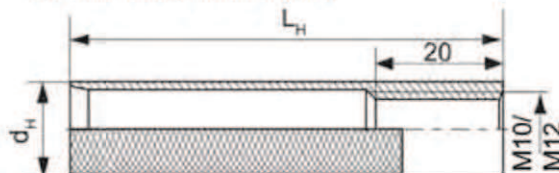
| Size UPM-I...                             |                     | M6                      | M8 | M10 | M12 |
|-------------------------------------------|---------------------|-------------------------|----|-----|-----|
| Diameter of anchor                        | $d_H$ [mm]          | 11                      |    | 15  |     |
| Nominal drill bit diameter                | $d_0$ [mm]          | 14                      |    | 18  |     |
| Length of anchor                          | $L_H$ [mm]          | 85                      |    |     |     |
| Drill hole depth                          | $h_0 = h_{ef}$ [mm] | 85                      |    |     |     |
| Effective anchorage depth                 | $h_{ef}$ [mm]       | 85                      |    |     |     |
| Effective anchorage depth AAC             | $h_0$ [mm]          | 100                     | -  |     |     |
| Conical drill hole $h_{ef}^{1)}$          | $h_{ef}$ [mm]       | 85                      |    |     |     |
| Diameter of steel brush                   | $d_b \geq$ [mm]     | See Table B5            |    |     |     |
| Maximum installation torque               | $T_{inst,max}$ [Nm] | see parameters of brick |    |     |     |
| Diameter of clearance hole in the fixture | $d_f$ [mm]          | 7                       | 9  | 12  | 14  |
| Screw-in depth                            | $l_{E,min}$ [mm]    | 6                       | 8  | 10  | 12  |
|                                           | $l_{E,max}$ [mm]    | 60                      |    |     |     |

#### Upat Internal threaded anchor UPM-I

UPM-I M6, UPM-I M8



UPM-I M10, UPM-I M12



Marking: Size, e.g. **M8**, Stainless steel: A4, e.g. **M8 A4** High corrosion resistant steel: C, e.g. **M8 C**

Upat injection system UPM 44 masonry

#### Intended Use

Installation parameters threaded rods and internal threaded anchors UPM-I without perforated sleeves

**Annex B 3**



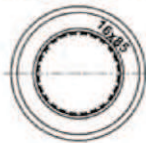
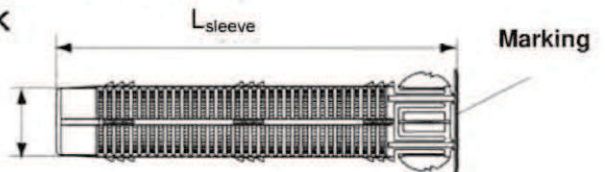
**Table B3: Installation parameters for threaded rods and internal threaded anchors UPM-I with perforated sleeves (pre-positioned anchorage)**

| Size UPM SH K                                                 | 12x50                     | 12x85 | 16x85     | 16x130 <sup>2)</sup> | 20x85      | 20x130 <sup>2)</sup> | 20x200 <sup>2)</sup> |
|---------------------------------------------------------------|---------------------------|-------|-----------|----------------------|------------|----------------------|----------------------|
| Nominal drill hole diameter<br>$d_0 = D_{\text{sleeve, nom}}$ | 12                        |       | 16        |                      | 20         |                      |                      |
| Depth of drill hole<br>$h_0$ [mm]                             | 55                        | 90    | 90        | 135                  | 90         | 135                  | 205                  |
| Effective anchorage depth                                     | $h_{\text{ef, min}}$ [mm] | 50    | 85        | 85                   | 110        | 85                   | 110                  |
|                                                               | $h_{\text{ef, max}}$ [mm] | 50    | 85        | 85                   | 130        | 85                   | 130                  |
| Size of threaded rod [-]                                      | M6 or M8                  |       | M8 or M10 |                      | M12 or M16 |                      |                      |
| Size of internal threaded anchor UPM-I                        | ---                       | ---   | M6/M8     | ---                  | M10/M12    | ---                  | ---                  |
| Diameter of steel brush <sup>1)</sup><br>$d_b \geq$ [mm]      | See Table B5              |       |           |                      |            |                      |                      |
| Maximum installation<br>$T_{\text{inst, max}}$ [Nm]           | see parameters of brick   |       |           |                      |            |                      |                      |

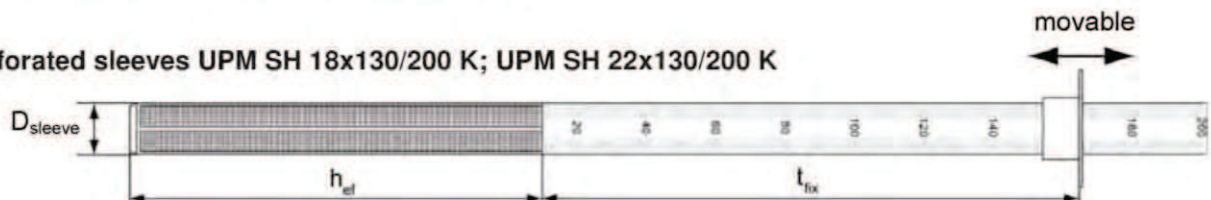
<sup>1)</sup> Only for solid areas in hollow bricks and solid bricks<sup>2)</sup> Bridging of unbearing layer (e.g. plaster) possible**Perforated sleeves**

UPM SH 12x50 K; UPM SH 12x85 K; UPM SH 16x85 K; UPM SH 16x130 K;

UPM SH 20x85 K; UPM SH 20x130 K; UPM SH 20x200 K

**Marking:**Size  $D_{\text{sleeve, nom}} \times L_{\text{sleeve}}$   
(e. g.: 16x85) $D_{\text{sleeve, nom}}$ **Table B4: Installation parameters for threaded rods with perforated sleeves (push through anchorage)**

| Size UPM SH K                         |                               | 18x130/200              |     | 22x130/200 |
|---------------------------------------|-------------------------------|-------------------------|-----|------------|
| Nominal sleeve diameter               | $D_{\text{sleeve, nom}}$ [mm] | 16                      |     | 20         |
| Nominal drill hole diameter           | $d_0$ [mm]                    | 18                      |     | 22         |
| Depth of drill hole                   | $h_0$ [mm]                    | $135 + t_{\text{fix}}$  |     |            |
| Effective anchorage depth             | $h_{\text{ef}}$ [mm]          | $\geq 130$              |     |            |
| Diameter of steel brush <sup>1)</sup> | $d_b \geq$ [mm]               | See Table B5            |     |            |
| Size of threaded rod                  | [-]                           | M10                     | M12 | M16        |
| Maximum installation torque           | $T_{\text{inst, max}}$ [Nm]   | see parameters of brick |     |            |
| Thickness of fixture                  | $t_{\text{fix, max}}$ [mm]    | 200                     |     |            |

<sup>1)</sup> Only for solid areas in hollow bricks and solid bricks**Perforated sleeves UPM SH 18x130/200 K; UPM SH 22x130/200 K**

Upat injection system UPM 44 masonry

**Intended Use**

Installation parameters threaded rods and internal threaded anchors UPM-I with perforated sleeves

**Annex B4**

**Steel brush**

Only for solid bricks and autoclaved aerated concrete

**Table B5:** Parameters of steel brush

|                     |             |      |   |    |    |    |    |    |    |    |
|---------------------|-------------|------|---|----|----|----|----|----|----|----|
| Drill hole diameter | $d_0$       | [mm] | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| Brush diameter      | $d_{b,nom}$ | [mm] | 9 | 11 | 14 | 16 | 20 | 20 | 25 | 25 |

**Table B6:** 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<br>[ °C ] | Minimum curing time <sup>1)</sup> $t_{cure}$<br>[minutes] |                      |                            | System-temperature<br>(mortar)<br>[ °C ] | Maximum processing time $t_{work}$<br>[minutes] |                      |                            |
|-----------------------------------------|-----------------------------------------------------------|----------------------|----------------------------|------------------------------------------|-------------------------------------------------|----------------------|----------------------------|
|                                         | UPM 44 Express <sup>3)</sup>                              | UPM 44 <sup>2)</sup> | UPM 44 Relax <sup>2)</sup> |                                          | UPM 44 Express <sup>3)</sup>                    | UPM 44 <sup>2)</sup> | UPM 44 Relax <sup>2)</sup> |
| -10 to -5                               | 12 hours                                                  |                      |                            |                                          |                                                 |                      |                            |
| >-5 to ±0                               | 3 hours                                                   | 24 hours             |                            | ±0                                       | 5                                               |                      |                            |
| >±0 to +5                               | 90                                                        | 3 hours              | 6 hours                    | +5                                       | 5                                               | 13                   | 20                         |
| >+5 to +10                              | 45                                                        | 90                   | 3 hours                    | +10                                      | 3                                               | 9                    | 20                         |
| >+10 to +20                             | 30                                                        | 60                   | 2 hours                    | +20                                      | 1                                               | 5                    | 10                         |
| >+20 to +30                             |                                                           | 45                   | 60                         | +30                                      |                                                 | 4                    | 6                          |
| >+30 to +40                             |                                                           | 35                   | 30                         | +40                                      |                                                 | 2                    | 4                          |

<sup>1)</sup> For wet bricks the curing time must be doubled

<sup>2)</sup> Minimum cartridge temperature +5°C

<sup>3)</sup> Minimum cartridge temperature ±0°C

Upat injection system UPM 44 masonry

**Intended Use**

Steel brush

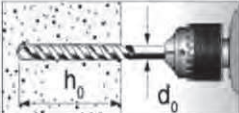
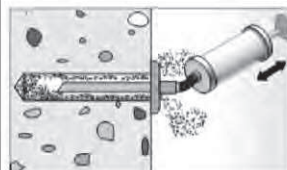
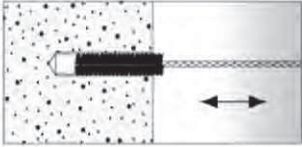
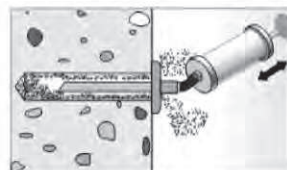
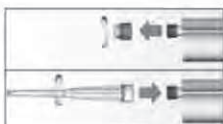
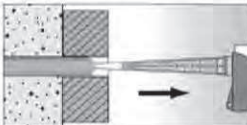
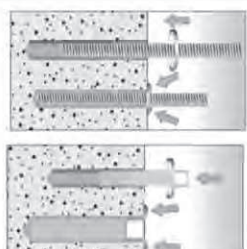
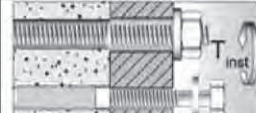
Maximum processing times and minimum curing times

**Annex B 5**



# Installation instruction part 1

## Installation in solid brick and autoclaved aerated concrete (without perforated sleeve)

|   |                                                                                     |                                                                                                                                                                                                                                                                                     |                                                                                      |                                                                                                                                                                  |
|---|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 |    | Drill the hole in hammer drill function. Depth of drill hole $h_0$ and drill hole diameter $d_0$ see <b>Table B1; B2</b>                                                                                                                                                            |                                                                                      |                                                                                                                                                                  |
| 2 |    |                                                                                                                                                                                                    |    | Blow out the drill hole twice. Brush twice and blow out twice again.                                                                                             |
| 3 |    | Remove the sealing cap. Screw on the static mixer. (the spiral in the static mixer must be clearly visible)                                                                                                                                                                         |                                                                                      |                                                                                                                                                                  |
| 4 |  | 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 of. |
| 5 |  | Fill approximately 2/3 of the drill hole with mortar beginning from the bottom of the hole <sup>1)</sup> . Avoid bubbles!                                                                                                                                                           |  | For push through anchorage fill the annular clearance with mortar.                                                                                               |
| 6 |  | Only use clean and oil-free anchor elements. Mark the threaded rod for setting depth. Insert the anchor or internal threaded anchor UPM-I by hand using light turning motions. When reaching the setting depth marking, excess mortar must emerge from the mouth of the drill hole. |                                                                                      |                                                                                                                                                                  |
| 7 |  | Do not touch. Minimum curing time see <b>Table B6</b> .                                                                                                                                                                                                                             |  | Mounting the fixture. $T_{inst,max}$ see parameter of brick.                                                                                                     |

<sup>1)</sup> Exact volume of mortar see manufacturer's specification.

Upat injection system UPM 44 masonry

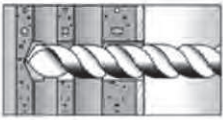
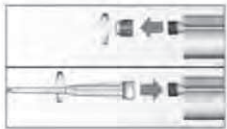
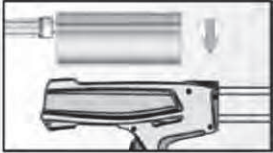
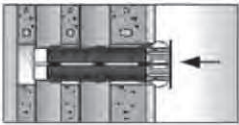
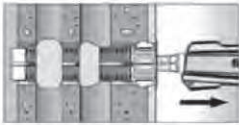
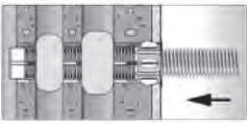
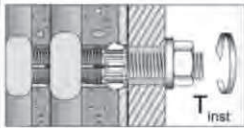
### Intended Use

Installation instruction (without perforated sleeve) Part 1

**Annex B 6**

## Installation instruction, part 2

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

|   |                                                                                     |                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                         |
|---|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 |    | Drill the hole (hammer drill).<br>Depth of drill hole $h_0$<br>and drill hole diameter $d_0$<br>see Table B3                                                                                                                                                                                          | 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                                                                                                                                                                                                                                                         | <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 of. |
| 4 |  | Insert the perforated sleeve flush with the surface of the masonry or plaster                                                                                                                                                                                                                         | <br>Fill the perforated sleeve completely with mortar beginning from the bottom of the hole <sup>1)</sup> .                                                         |
| 5 |  | Only use clean and oil-free anchor elements. Mark the threaded rod for setting depth. Insert the threaded rod or the internal threaded anchor UPM-I by hand using light turning motions until reaching the setting depth marking (threaded rod) or flush with the surface (internal threaded anchor). |                                                                                                                                                                                                                                                         |
| 6 |  | Do not touch.<br>Minimum curing time<br>see Table B6.                                                                                                                                                                                                                                                 | <br>Mounting the fixture.<br>$T_{inst, max}$ see parameter of brick.                                                                                                |

<sup>1)</sup>Exact volume of mortar see manufacturer's specification.

Upat injection system UPM 44 masonry

#### Intended Use

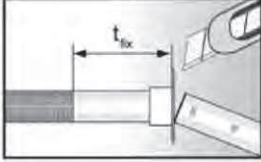
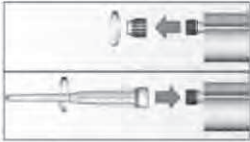
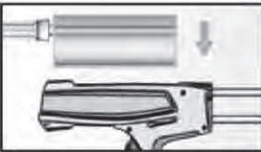
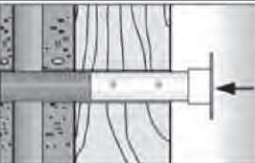
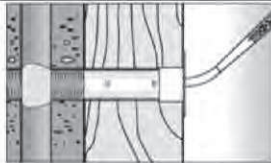
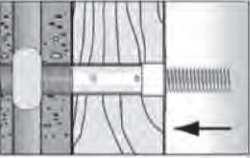
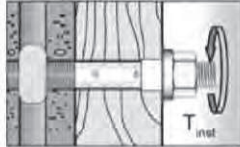
Installation instruction (with perforated sleeve) Part 2

Annex B 7



### 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 <b>Table B4</b> .                                        |
| 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 of. |
| 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. <sup>1)</sup> For deep drill holes use an extension tube.                                     |
| 5 |  | Only use clean and oil-free anchor 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 <b>Table B6</b> .                                                                                                                                     |  | Mounting the fixture. $T_{inst, max}$ see parameter of brick.                                                                                                    |

<sup>1)</sup> Exact volume of mortar see manufacturer's specification.

Upat injection system UPM 44 masonry

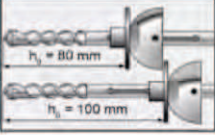
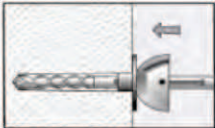
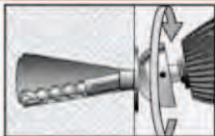
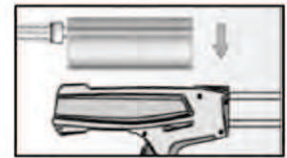
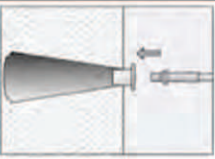
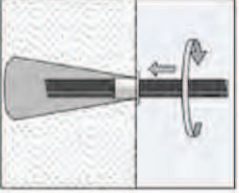
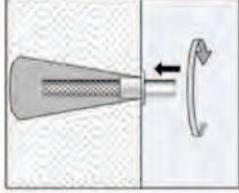
#### Intended Use

Installation instruction (with perforated sleeve) Part 3

**Annex B 8**



**Installation instruction, part 4****Installation in autoclaved aerated concrete with special conic drill bit PBB (pre-positioned anchorage)**

|   |                                                                                     |                                                                                                                                                         |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                  |
|---|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 |    | Position the movable drill bit arrester on the used drill hole depth. For this, unlock the clamp screw and slide the arrester. Now fix the clamp screw. |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                  |
| 2 |    | Drill the cylindrical hole with rotating drill until the arrester contact the material surface.                                                         |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                  |
| 3 |    | Deviate the working power drill circulate to generate an conic undercut in the material.                                                                |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                  |
| 4 |    | Blow out the drill hole four times.                                                                                                                     |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                  |
| 5 |  | Remove the sealing cap. Screw on the static mixer. (the spiral in the static mixer must be clearly visible)                                             |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                  |
| 6 |  | 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 of. |
| 7 |  | Put the center sleeve into the drill hole and adapt the injection adapter onto the static mixer                                                         |                                                                                                                                                                                                 | Fill the drill hole with injection mortar.                                                                                                                       |
| 8 |  |                                                                      | Only use clean and oil-free anchor elements. Mark the threaded rod for setting depth. Insert the anchor or internal threaded anchor UPM-I by hand using light turning motions. When reaching the setting depth marking, excess mortar must emerge from the mouth of the drill hole. |                                                                                                                                                                  |
| 9 |  | Do not touch. Minimum curing time see <b>Table B6</b> .                                                                                                 |                                                                                                                                                                                                 | Mounting the fixture.<br>$T_{inst, max}$ see parameter of brick.                                                                                                 |

Upat injection system UPM 44 masonry

**Intended Use**

Installation instruction (without perforated sleeve special conic drill bit PBB) Part 4

**Annex B 9**

Table B7.1: Summary of German bricks and blocks

| Kind of masonry                                      | Brick format [mm]     | Compressive strength [N/mm <sup>2</sup> ] | Density [kg/dm <sup>3</sup> ] | Annex       |
|------------------------------------------------------|-----------------------|-------------------------------------------|-------------------------------|-------------|
| <b>Solid bricks</b>                                  |                       |                                           |                               |             |
| Solid brick <b>Mz</b><br>EN 771-1                    | ≥ 240x115x113         | 10 / 16                                   | ≥1,8                          | C1/C2       |
| Solid brick <b>Mz</b><br>EN 771-1                    | ≥ 240x115x71          | 10 / 20                                   | ≥1,8                          | C3/C4       |
| Solid sand- lime brick<br><b>KS</b><br>EN 771-2      | ≥ 250x240x240         | 10 / 20 / 28                              | ≥2,0                          | C5/C6/C7    |
| Solid light-weight<br>concrete block <b>Vbl</b>      | ≥ 372x300x254         | 2                                         | ≥0,6                          | C8/C9       |
| Solid light-weight<br>concrete block <b>Vbl</b>      | ≥ 250x240x239         | 4 / 6 / 8                                 | ≥1,6                          | C10/C11/C12 |
| <b>Perforated bricks and hollow blocks</b>           |                       |                                           |                               |             |
| Perforated brick <b>HLz</b><br>EN 771-1 e.g. Poroton | 500(370)x175(240)x237 | 4 / 6 / 8 / 10 / 12                       | ≥1,0                          | C13/C14/C15 |
| Perforated brick <b>HLz</b><br>EN 771-1              | 240x115x113           | 6 / 10 / 16 / 20 / 28                     | ≥1,4                          | C16/C17/C18 |
| Sand- lime hollow block<br><b>KSL</b>                | 240x175x113           | 8 / 10 / 12 / 16 / 20                     | ≥1,4                          | C19/C20/C21 |
| Light-weight concrete<br>hollow block <b>Hbl</b>     | 362x240x240           | 2 / 4                                     | ≥1,0                          | C22/C23/C24 |

Table B7.2: Summary of French bricks and blocks

| Kind of masonry                                  | Brick format [mm] | Compressive strength [N/mm <sup>2</sup> ] | Density [kg/dm <sup>3</sup> ] | Annex       |
|--------------------------------------------------|-------------------|-------------------------------------------|-------------------------------|-------------|
| <b>Perforated bricks and hollow blocks</b>       |                   |                                           |                               |             |
| Perforated brick <b>HLz</b><br>EN 771-1          | 500x200x315       | 4 / 6 / 8                                 | ≥0,6                          | C25/C26/C27 |
| Perforated brick <b>HLz</b><br>EN 771-1          | 500x200x300       | 4 / 6 / 8 / 10                            | ≥0,7                          | C28/C29/C30 |
| Perforated brick <b>HLz</b><br>EN 771-1          | 500x200x315       | 2 / 4 / 6 / 8                             | ≥0,7                          | C31/C32/C33 |
| Perforated brick <b>HLz</b><br>EN 771-1          | 520x200x275       | 4 / 6 / 8                                 | ≥0,7                          | C34/C35     |
| Light-weight concrete<br>hollow block <b>Hbl</b> | 500x200x200       | 2 / 4 / 6                                 | ≥1,0                          | C36/C37     |

Upat injection system UPM 44 masonry

Annex B 10

**Intended Use**

Summary of especially German and French bricks and blocks



Table B7.3: Summary of Italian bricks

| Kind of masonry                         | Brick format [mm] | Compressive strength [N/mm <sup>2</sup> ] | Density [kg/dm <sup>3</sup> ] | Annex       |
|-----------------------------------------|-------------------|-------------------------------------------|-------------------------------|-------------|
| <b>Solid bricks</b>                     |                   |                                           |                               |             |
| Solid brick <b>Mz</b><br>EN 771-1       | ≥ 245x118x54      | 10 / 20                                   | ≥1,8                          | C38/C39     |
| <b>Perforated bricks</b>                |                   |                                           |                               |             |
| Perforated brick <b>HLz</b><br>EN 771-1 | 255x120x118       | 2 / 4 / 6 / 8 / 10 / 12                   | ≥1,0                          | C40/C41/C42 |
| Perforated brick <b>LLz</b><br>EN 771-1 | 248x78x250        | 2 / 4 / 6                                 | ≥0,7                          | C43/C44     |

Table B7.4: Summary of Spanish and Portuguese bricks

| Kind of masonry                         | Brick format [mm] | Compressive strength [N/mm <sup>2</sup> ] | Density [kg/dm <sup>3</sup> ] | Annex       |
|-----------------------------------------|-------------------|-------------------------------------------|-------------------------------|-------------|
| <b>Perforated bricks</b>                |                   |                                           |                               |             |
| Perforated brick <b>HLz</b><br>EN 771-1 | 275x130x94        | 6 / 8 / 12 / 16 / 20                      | ≥0,8                          | C45/C46/C47 |
| <b>Perforated bricks</b>                |                   |                                           |                               |             |
| Perforated brick <b>LLz</b><br>EN 771-1 | 128x88x275        | 2                                         | ≥0,8                          | C48/C49     |
| Perforated brick <b>HLz</b><br>EN 771-1 | 190x290x220       | 6 / 8 / 10                                | ≥0,7                          | C50/C51/C52 |

Table B7.5: Summary of Austrian bricks

| Kind of masonry                         | Brick format [mm] | Compressive strength [N/mm <sup>2</sup> ] | Density [kg/dm <sup>3</sup> ] | Annex       |
|-----------------------------------------|-------------------|-------------------------------------------|-------------------------------|-------------|
| <b>Perforated bricks</b>                |                   |                                           |                               |             |
| Perforated brick <b>HLz</b><br>EN 771-1 | 253x300x240       | 2 / 4 / 6                                 | ≥0,8                          | C53/C54/C55 |

Table B 7.6: Summary of Irish and English bricks

| Kind of masonry                               | Brick format [mm] | Compressive strength [N/mm <sup>2</sup> ] | Density [kg/dm <sup>3</sup> ] | Annex       |
|-----------------------------------------------|-------------------|-------------------------------------------|-------------------------------|-------------|
| <b>Solid blocks</b>                           |                   |                                           |                               |             |
| Solid light-weight concrete brick <b>Vbl</b>  | ≥ 440x100x215     | 4 / 6 / 8 / 10                            | ≥2,0                          | C56/C57     |
| Solid light-weight concrete brick <b>Vbl</b>  | ≥ 440x95x215      | 6 / 8 / 10 / 12                           | ≥2,0                          | C58/C59     |
| <b>Perforated blocks</b>                      |                   |                                           |                               |             |
| Light-weight concrete hollow block <b>Hbl</b> | 440x215x215       | 4 / 6 / 8 / 10                            | ≥1,2                          | C60/C61/C62 |

Upat injection system UPM 44 masonry

**Intended Use**

Summary of especially Italian, Spanish, Portuguese, Austrian, Irish and English bricks and blocks

**Annex B 11**



**Table B7.7: Summary of Dutch and Danish bricks and blocks**

| Kind of masonry                             | Brick format [mm] | Compressive strength [N/mm <sup>2</sup> ] | Density [kg/dm <sup>3</sup> ] | Annex       |
|---------------------------------------------|-------------------|-------------------------------------------|-------------------------------|-------------|
| <b>Solid bricks</b>                         |                   |                                           |                               |             |
| Solid brick <b>Mz</b><br>EN 771-1           | ≥ 230x108x55      | 10 / 20                                   | ≥1,8                          | C63/C64     |
| Solid sand-lime brick <b>KS</b><br>EN 771-2 | ≥ 997x214x538     | 10 / 20 / 36                              | ≥1,8                          | C65/C66/C67 |
| <b>Perforated bricks</b>                    |                   |                                           |                               |             |
| Perforated brick <b>HLz</b><br>EN 771-1     | 230x108x55        | 2 / 4 / 6 / 8                             | ≥1,4                          | C68/C69/C70 |

**Table B7.8: Summary of autoclaved aerated concrete blocks**

| <b>Autoclaved aerated concrete</b> |                                            |                               |             |
|------------------------------------|--------------------------------------------|-------------------------------|-------------|
| Property class                     |                                            | Density [kg/dm <sup>3</sup> ] | Annex       |
| <b>2 / 4 / 6</b>                   | Cylindrical drill hole                     | 350, 500, 650                 | C71/C72/C73 |
|                                    | Conical drill hole (special drill bit PBB) | 350, 500, 650                 | C74/C75     |

Upat injection system UPM 44 masonry

**Intended Use**

Summary of especially Danish and Dutch bricks and blocks  
 Summary of autoclaved aerated concrete

**Annex B 12**

Kind of masonry: Solid brick Mz, 2 DF

Table C1: Parameters of brick

|                              |                              |                                  |
|------------------------------|------------------------------|----------------------------------|
| Species of brick             |                              | Solid brick Mz, 2DF              |
| Density                      | $\rho \geq [\text{kg/dm}^3]$ | 1.8                              |
| Compressive strength         | $f_b \geq [\text{N/mm}^2]$   | 10 or 16                         |
| Standard or approval         |                              | EN 771-1                         |
| Producer                     |                              | e.g. Wienerberger                |
| Size, dimensions             | [mm]                         | $\geq 240 \times 115 \times 113$ |
| Minimum thickness of masonry | $h_{\min}$ [mm]              | 115                              |

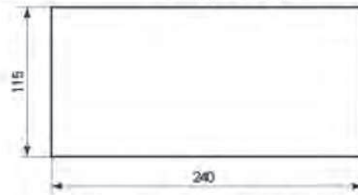


Table C2: Installation parameters for threaded rod and internal threaded anchor without perforated sleeve

| Size of threaded rod                                | M6  |     | M8 |     | M10 |     | M12 |     | M16 |     | UPM-I <sup>1)</sup><br>M6/M8 | UPM-I<br>M10/M12 |
|-----------------------------------------------------|-----|-----|----|-----|-----|-----|-----|-----|-----|-----|------------------------------|------------------|
| Effective anchorage depth $h_{\text{ef}}$ [mm]      | 50  | 100 | 50 | 100 | 50  | 100 | 50  | 100 | 50  | 100 | 85                           | 85               |
| Edge distance $c_{\min}$ [mm]                       | 60  |     |    |     |     |     |     |     |     |     |                              |                  |
| $s_{\min}$    [mm]                                  | 120 |     |    |     |     |     |     |     |     |     |                              |                  |
| Spacing $s_{\text{cr}}$    [mm]                     | 240 |     |    |     |     |     |     |     |     |     |                              |                  |
| $s_{\text{cr}} \perp = s_{\min} \perp$ [mm]         | 115 |     |    |     |     |     |     |     |     |     |                              |                  |
| $\alpha_{g,N}$    [-]                               | 1,5 |     |    |     |     |     |     |     |     |     |                              |                  |
| $\alpha_{g,V}$    [-]                               | 1,4 |     |    |     |     |     |     |     |     |     |                              |                  |
| $\alpha_{g,N} \perp$ [-]                            | 2,0 |     |    |     |     |     |     |     |     |     |                              |                  |
| $\alpha_{g,V} \perp$ [-]                            |     |     |    |     |     |     |     |     |     |     |                              |                  |
| Max. installation torque $T_{\text{inst,max}}$ [Nm] | 4   |     | 10 |     |     |     |     |     |     |     |                              |                  |

<sup>1)</sup> For UPM-I with screw M6:  $T_{\text{inst,max}} = 4 \text{ Nm}$ 

Table C3: Installation parameters for threaded rod and internal threaded anchor UPM-I with perforated sleeve

| Size of perforated sleeve                           | 16x85 |     |    |    |
|-----------------------------------------------------|-------|-----|----|----|
| Size of threaded rod                                | M8    | M10 | M6 | M8 |
| Size of internal threaded anchor UPM-I              | UPM-I |     |    |    |
| Edge distance $c_{\min}$ [mm]                       | 60    |     |    |    |
| $s_{\min}$    [mm]                                  | 120   |     |    |    |
| Spacing $s_{\text{cr}}$    [mm]                     | 240   |     |    |    |
| $s_{\text{cr}} \perp = s_{\min} \perp$ [mm]         | 115   |     |    |    |
| $\alpha_{g,N}$    [-]                               | 1,5   |     |    |    |
| $\alpha_{g,V}$    [-]                               | 1,4   |     |    |    |
| $\alpha_{g,N} \perp$ [-]                            | 2     |     |    |    |
| $\alpha_{g,V} \perp$ [-]                            |       |     |    |    |
| Max. installation torque $T_{\text{inst,max}}$ [Nm] | 10    |     | 4  | 10 |

Upat injection system UPM 44 masonry

**Performances**

Solid brick Mz, 2DF

Species of brick, installation parameters

**Annex C 1**



Kind of masonry: Solid brick Mz 2 DF

Table C4: Characteristic values of resistance; tension load ( $N_{Rk}$ )

| Use category                                                    |                           | w/w                                              |       | d/d    |       |        |
|-----------------------------------------------------------------|---------------------------|--------------------------------------------------|-------|--------|-------|--------|
| Temperature range                                               |                           | [°C]                                             | 50/80 | 72/120 | 50/80 | 72/120 |
| Effective anchorage depth                                       | Anchor size               | characteristic values <b>N<sub>Rk</sub></b> [kN] |       |        |       |        |
| Compressive strength <b>f<sub>b</sub> = 10 N/mm<sup>2</sup></b> |                           |                                                  |       |        |       |        |
| 50                                                              | M6, M8, M10               | 1,50                                             | 1,50  | 3,00   | 2,50  |        |
|                                                                 | M12, M16                  | 2,00                                             |       |        |       |        |
| 85                                                              | UPM-IM6/M8, UPM-I M10/M12 |                                                  |       |        |       |        |
| 100                                                             | M10                       | 3,00                                             | 2,50  | 4,50   | 4,00  |        |
|                                                                 | M12, M16                  | 3,50                                             |       | 5,50   | 4,50  |        |
| Perforated sleeve 16x85                                         | UPM-I M6/M8, M8, M10      | 1,50                                             | 1,20  | 3,00   | 2,50  |        |
| Compressive strength <b>f<sub>b</sub> = 16 N/mm<sup>2</sup></b> |                           |                                                  |       |        |       |        |
| 50                                                              | M6, M8                    | 2,50                                             | 2,00  | 4,50   | 4,00  |        |
|                                                                 | M10                       |                                                  |       |        | 3,50  |        |
|                                                                 | M12, M16                  | 3,50                                             | 2,00  | 5,50   | 4,50  |        |
| 85                                                              | UPM-I M6/M8,UPM-I M10/M12 |                                                  |       |        |       |        |
| 100                                                             | M6, M8                    | 4,00                                             | 3,00  | 7,00   | 5,50  |        |
|                                                                 | M10                       | 4,50                                             | 4,00  | 7,50   | 6,50  |        |
|                                                                 | M12, M16                  | 5,50                                             | 4,50  | 8,00   | 7,00  |        |
| Perforated sleeve 16x85                                         | UPM-I M6/M8, M8, M10      | 2,50                                             | 2,00  | 4,50   | 4,00  |        |

Calculation of pulling out of one brick (tension load):  $N_{Rk,pb}$  see ETAG 029, Annex CTable C5: Characteristic values of resistance; shear load ( $V_{Rk}$ )

| Use category                                   |                         | w/w                                 |        | d/d   |        |
|------------------------------------------------|-------------------------|-------------------------------------|--------|-------|--------|
| Temperature range                              |                         | 50/80                               | 72/120 | 50/80 | 72/120 |
| Effective anchorage depth                      | Anchor size             | characteristic values $V_{Rk}$ [kN] |        |       |        |
| Compressive strength $f_b = 10 \text{ N/mm}^2$ |                         |                                     |        |       |        |
| $\geq 50$                                      | M6                      | 2,50                                |        |       |        |
| 85                                             | UPM-I M6                |                                     |        |       |        |
| $\geq 50$                                      | M8                      | 3,00                                |        |       |        |
| 85                                             | UPM-I M8                |                                     |        |       |        |
| $\geq 50$                                      | M10, M12                | 3,50                                |        |       |        |
| 85                                             | UPM-I M10/M12, M12, M16 |                                     |        |       |        |
| Compressive strength $f_b = 16 \text{ N/mm}^2$ |                         |                                     |        |       |        |
| $\geq 50$                                      | M6                      | 4,00                                |        |       |        |
| 85                                             | UPM-I M6                |                                     |        |       |        |
| $\geq 50$                                      | M8                      | 5,00                                |        |       |        |
| 85                                             | UPM-I M8                |                                     |        |       |        |
| $\geq 50$                                      | M10                     | 5,50                                |        |       |        |
| $\geq 50$                                      | M12                     |                                     |        |       |        |
| 85                                             | UPM I M10/M12, M12, M16 | 5,00                                |        |       |        |

Calculation of pushing out of one brick (shear load):  $V_{Rk,pb}$  see ETAG 029, Annex C

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

**Performances**Solid brick Mz, 2DF  
Characteristic values**Annex C 2**

Kind of masonry: Solid brick Mz, NF

Table C6: Parameters of brick

| Species of brick             |                              | Solid brick Mz, NF              |
|------------------------------|------------------------------|---------------------------------|
| Density                      | $\rho \geq [\text{kg/dm}^3]$ | 1.8                             |
| Compressive strength         | $f_b \geq [\text{N/mm}^2]$   | 10 or 20                        |
| Standard or approval         |                              | EN 771-1                        |
| Producer                     |                              | e.g. Wienerberger               |
| Size, dimensions             | [mm]                         | $\geq 240 \times 115 \times 71$ |
| Minimum thickness of masonry | $h_{\min}$ [mm]              | 115                             |

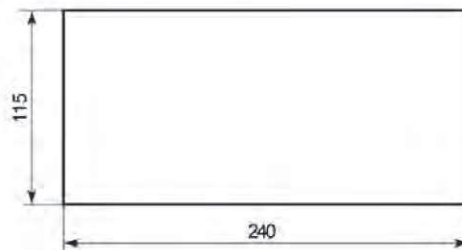


Table C7: Installation parameters (threaded rod and internal threaded anchor without perforated sleeve)

| Size of threaded rod                          |                                                  | M6  |    | M8 |    |     | M10 |    |     | M12 |    |     | UPM-I <sup>1)</sup><br>M6/M8 |
|-----------------------------------------------|--------------------------------------------------|-----|----|----|----|-----|-----|----|-----|-----|----|-----|------------------------------|
| Effective anchorage depth                     | $h_{\text{ef}}$ [mm]                             | 50  | 80 | 50 | 80 | 200 | 50  | 80 | 200 | 50  | 80 | 200 | 85                           |
| Edge distance                                 | $c_{\min}$ [mm]                                  | 100 |    |    |    |     |     |    |     |     |    |     |                              |
| Edge distance<br>$h_{\text{ef}}=200\text{mm}$ | $c_{\min}$ [mm]                                  | 150 |    |    |    |     |     |    |     |     |    |     |                              |
| Spacing                                       | $s_{\min \parallel, N}$ [mm]                     | 60  |    |    |    |     |     |    |     |     |    |     |                              |
|                                               | $h_{\text{ef}}=200$ $s_{\min \parallel, N}$ [mm] | 240 |    |    |    |     |     |    |     |     |    |     |                              |
|                                               | $s_{\min \parallel, V}$ [mm]                     | 240 |    |    |    |     |     |    |     |     |    |     |                              |
|                                               | $s_{\text{cr} \parallel}$ [mm]                   | 240 |    |    |    |     |     |    |     |     |    |     |                              |
|                                               | $s_{\text{cr} \perp} = s_{\min \perp}$ [mm]      | 75  |    |    |    |     |     |    |     |     |    |     |                              |
| Group-factor                                  | $\alpha_{g, N \parallel}$ [-]                    | 1,5 |    |    |    |     |     |    |     |     |    |     |                              |
|                                               | $\alpha_{g, V \parallel}$ [-]                    | 2,0 |    |    |    |     |     |    |     |     |    |     |                              |
|                                               | $\alpha_{g, N \perp}$ [-]                        | 2   |    |    |    |     |     |    |     |     |    |     |                              |
|                                               | $\alpha_{g, V \perp}$ [-]                        |     |    |    |    |     |     |    |     |     |    |     |                              |
| Max. installation torque                      | $T_{\text{inst, max}}$ [Nm]                      | 4   |    | 10 |    |     |     |    |     |     |    |     |                              |

<sup>1)</sup> For UPM-I with screw M6:  $T_{\text{inst, max}} = 4 \text{ Nm}$

|                                           |  |           |
|-------------------------------------------|--|-----------|
| Upat injection system UPM 44 masonry      |  | Annex C 3 |
| <b>Performances</b>                       |  |           |
| Solid brick Mz, NF                        |  |           |
| Species of brick, installation parameters |  |           |

Kind of masonry: Solid brick Mz, NF

Table C8: Characteristic values of resistance; tension load ( $N_{Rk}$ )

| Use category                                   |             | w/w                                 |      | d/d   |        |
|------------------------------------------------|-------------|-------------------------------------|------|-------|--------|
| Temperature range                              |             | [°C]                                |      | 50/80 | 72/120 |
| Effective anchorage depth                      | Anchor size | characteristic values $N_{Rk}$ [kN] |      |       |        |
| Compressive strength $f_b = 10 \text{ N/mm}^2$ |             |                                     |      |       |        |
| 50                                             | M6          | 2,50                                | 2,00 | 4,00  | 3,50   |
|                                                | M8          | 2,50                                | 2,00 | 4,00  | 3,00   |
|                                                | M10         | 2,00                                | 1,50 | 3,50  | 3,00   |
| 80                                             | M10         | 3,00                                | 2,50 | 5,00  | 4,00   |
| 200                                            | M10         | 7,50                                | 6,50 | 12,00 | 10,50  |
| 50                                             | M12         | 2,00                                | 1,50 | 3,00  | 2,50   |
| 80                                             | M12         | 3,50                                | 3,00 | 5,50  | 4,50   |
| 200                                            | M12         | 5,00                                | 4,00 | 8,00  | 6,50   |
| 85                                             | UPM-I M6/M8 | 3,50                                | 3,00 | 5,50  | 4,50   |
| Compressive strength $f_b = 20 \text{ N/mm}^2$ |             |                                     |      |       |        |
| 50                                             | M6          | 3,50                                | 2,50 | 5,50  | 5,00   |
|                                                | M8          | 3,50                                | 2,50 | 5,50  | 4,50   |
|                                                | M10         | 3,00                                | 2,50 | 5,00  | 4,00   |
| 80                                             | M10         | 4,50                                | 3,50 | 7,00  | 6,00   |
| 200                                            | M10         | 11,00                               | 9,00 | 12,00 | 12,00  |
| 50                                             | M12         | 3,00                                | 2,50 | 4,50  | 4,00   |
| 80                                             | M12         | 5,00                                | 4,00 | 8,00  | 6,50   |
| 200                                            | M12         | 7,00                                | 6,00 | 11,50 | 9,50   |
| 85                                             | UPM-I M6/M8 | 5,00                                | 4,00 | 8,00  | 6,50   |

Calculation of pulling out of one brick (tension load):  $N_{Rk,pb}$  see ETAG 029, Annex CTable C9: Characteristic values of resistance; shear load ( $V_{Rk}$ )

| Use category                                   |             | w/w                                 |  | d/d   |        |
|------------------------------------------------|-------------|-------------------------------------|--|-------|--------|
| Temperature range                              |             | [°C]                                |  | 50/80 | 72/120 |
| Effective anchorage depth                      | Anchor size | characteristic values $V_{Rk}$ [kN] |  |       |        |
| Compressive strength $f_b = 10 \text{ N/mm}^2$ |             |                                     |  |       |        |
| ≥ 50                                           | M6, M8      | 2,50                                |  |       |        |
| 85                                             | UPM-I M6/M8 |                                     |  |       |        |
| ≥ 50 - 80                                      | M10         | 4,00                                |  |       |        |
| 200                                            | M10         | 8,50                                |  |       |        |
| ≥ 50                                           | M12         | 4,00                                |  |       |        |
| 200                                            | M12         | 11,50                               |  |       |        |
| Compressive strength $f_b = 20 \text{ N/mm}^2$ |             |                                     |  |       |        |
| ≥ 50                                           | M6, M8      | 4,00                                |  |       |        |
| 85                                             | UPM-I M6/M8 |                                     |  |       |        |
| ≥ 50 - 80                                      | M10         | 6,00                                |  |       |        |
| 200                                            | M10         | 12,00                               |  |       |        |
| ≥ 50                                           | M12         | 5,50                                |  |       |        |
| 200                                            | M12         | 12,00                               |  |       |        |

Calculation of pushing out of one brick (shear load):  $V_{Rk,pb}$  see ETAG 029, Annex C

Factor for job site tests and displacements see Annex C78.

|                                                                    |           |
|--------------------------------------------------------------------|-----------|
| Upat injection system UPM 44 masonry                               | Annex C 4 |
| <b>Performances</b><br>Solid brick Mz, NF<br>Characteristic values |           |



## Kind of masonry: Solid sand-lime block

Table C10: Parameters of brick

|                           |                              |                                  |
|---------------------------|------------------------------|----------------------------------|
| Species of brick          |                              | Solid sand-lime block            |
| Density                   | $\rho \geq [\text{kg/dm}^3]$ | 2.0                              |
| Compressive strength      | $f_b \geq [\text{N/mm}^2]$   | 10, 20 or 28                     |
| Standard or approval      |                              | EN 771-1                         |
| Producer                  |                              |                                  |
| Size, dimensions          | [mm]                         | $\geq 250 \times 240 \times 240$ |
| Minimum thickness of wall | $h_{\min}$ [mm]              | 240                              |

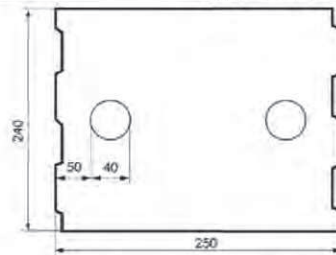


Table C11: Installation parameters for threaded rod and internal threaded anchor without perforated sleeve

| Size of threaded rod                                   | M6                       |     | M8 |     | M10 |     | M12 |     | M16 |     | UPM-I <sup>1)</sup><br>M6/M8 | UPM-I<br>M10/M12 |
|--------------------------------------------------------|--------------------------|-----|----|-----|-----|-----|-----|-----|-----|-----|------------------------------|------------------|
| Effective anchorage depth<br>h <sub>ef</sub> [mm]      | 50                       | 100 | 50 | 100 | 50  | 100 | 50  | 100 | 50  | 100 | 85                           | 85               |
| Edge distance<br>c <sub>min</sub> [mm]                 | 60                       |     |    |     |     |     |     |     |     |     |                              |                  |
| Spacing                                                | s <sub>min</sub>    [mm] |     |    |     |     |     |     |     |     |     |                              | 80               |
|                                                        | s <sub>cr</sub>    [mm]  |     |    |     |     |     |     |     |     |     |                              | 250              |
|                                                        | s <sub>min</sub> ⊥ [mm]  |     |    |     |     |     |     |     |     |     |                              | 80               |
|                                                        | s <sub>cr</sub> ⊥ [mm]   |     |    |     |     |     |     |     |     |     |                              | 240              |
|                                                        |                          |     |    |     |     |     |     |     |     |     |                              |                  |
| Group-factor                                           | α <sub>g,N</sub>    [-]  |     |    |     |     |     |     |     |     |     |                              | 1,5              |
|                                                        | α <sub>g,V</sub>    [-]  |     |    |     |     |     |     |     |     |     |                              | 1,2              |
|                                                        | α <sub>g,N</sub> ⊥ [-]   |     |    |     |     |     |     |     |     |     |                              | 1,5              |
|                                                        | α <sub>g,V</sub> ⊥ [-]   |     |    |     |     |     |     |     |     |     |                              | 1,2              |
| Max. installation torque<br>T <sub>inst,max</sub> [Nm] | 4                        |     | 10 |     |     |     |     |     |     |     |                              |                  |

<sup>1)</sup> For UPM-I with screw M6:  $T_{\text{inst,max}} = 4 \text{ Nm}$

Upat injection system UPM 44 masonry

## Performances

Solid sand-lime block

Species of brick, installation parameters

Annex C 5

Kind of masonry: Solid sand-lime block

Table C12: Installation parameters for threaded rod and internal threaded anchor with perforated sleeve

|                                        |                              |       |     |    |    |
|----------------------------------------|------------------------------|-------|-----|----|----|
| Size of perforated sleeve              |                              | 16x85 |     |    |    |
| Size of threaded rod                   |                              | M8    | M10 | M6 | M8 |
| Size of internal threaded anchor UPM-I |                              | UPM-I |     |    |    |
| Edge distance $c_{min}$ [mm]           |                              | 60    |     |    |    |
| Spacing                                | $s_{min} \parallel$ [mm]     | 80    |     |    |    |
|                                        | $s_{cr} \parallel$ [mm]      | 250   |     |    |    |
|                                        | $s_{min} \perp$ [mm]         | 80    |     |    |    |
|                                        | $s_{cr} \perp$ [mm]          | 240   |     |    |    |
|                                        | $\alpha_{g,N} \parallel$ [-] | 1,5   |     |    |    |
| Group-factor                           | $\alpha_{g,V} \parallel$ [-] | 1,2   |     |    |    |
|                                        | $\alpha_{g,N} \perp$ [-]     | 1,5   |     |    |    |
|                                        | $\alpha_{g,V} \perp$ [-]     | 1,2   |     |    |    |
| Max. installation torque               | $T_{inst,max}$ [Nm]          | 10    | 4   | 10 |    |

Upat injection system UPM 44 masonry

**Performances**

Solid sand-lime block

Species of brick, installation parameters

**Annex C 6**

| Kind of masonry: Solid sand-lime block                                          |                             |                                            |        |                          |                          |
|---------------------------------------------------------------------------------|-----------------------------|--------------------------------------------|--------|--------------------------|--------------------------|
| Table C13: Characteristic values of resistance; tension load (N <sub>Rk</sub> ) |                             |                                            |        |                          |                          |
| Use category                                                                    |                             | w/w                                        |        | d/d                      |                          |
| Temperature range [°C]                                                          |                             | 50/80                                      | 72/120 | 50/80                    | 72/120                   |
| Effective anchorage depth                                                       | Anchor size                 | characteristic values N <sub>Rk</sub> [kN] |        |                          |                          |
| Compressive strength f <sub>b</sub> = 10 N/mm <sup>2</sup>                      |                             |                                            |        |                          |                          |
| ≥50                                                                             | M6                          | 3,00                                       | 2,50   | 5,00                     | 4,50                     |
| 85                                                                              | UPM-I M6                    |                                            |        |                          |                          |
| ≥50                                                                             | M8                          | 4,00                                       | 3,50   | 7,00                     | 5,50                     |
|                                                                                 | M10 / M12                   | 4,50                                       | 3,50   | 7,00                     | 5,50                     |
|                                                                                 | M16                         | 3,50                                       | 3,00   | 5,50                     | 4,50                     |
| 85                                                                              | UPM-I M8<br>UPM-I M10 / M12 |                                            |        |                          |                          |
| Perforated sleeve 16x85                                                         | UPM-I M6                    | 3,00                                       | 2,50   | 5,00                     | 4,50                     |
|                                                                                 | M8 / M10 / UPM-I M8         | 4,50                                       | 3,50   | 8,00                     | 6,50                     |
| Compressive strength f <sub>b</sub> = 20 N/mm <sup>2</sup>                      |                             |                                            |        |                          |                          |
| ≥50                                                                             | M6                          | 4,50                                       | 3,50   | 7,50                     | 6,50                     |
| 85                                                                              | UPM-I M6                    |                                            |        |                          |                          |
| ≥50                                                                             | M8                          | 6,00                                       | 5,00   | 10,00 (9,0) <sup>1</sup> | 8,00                     |
|                                                                                 | M10 / M12                   | 6,00                                       | 5,00   | 10,00 (9,0) <sup>1</sup> | 8,00                     |
|                                                                                 | M16                         | 5,00                                       | 4,00   | 7,50                     | 6,50                     |
| 85                                                                              | UPM-I M8<br>UPM-I M10 / M12 |                                            |        |                          |                          |
| Perforated sleeve 16x85                                                         | UPM-I M6                    | 4,50                                       | 3,50   | 7,50                     | 6,50                     |
|                                                                                 | M8 / M10 / UPM-I M8         | 6,50                                       | 5,00   | 11,00 (9,0) <sup>1</sup> | 9,00                     |
| Compressive strength f <sub>b</sub> = 28 N/mm <sup>2</sup>                      |                             |                                            |        |                          |                          |
| ≥50                                                                             | M6                          | 5,00                                       | 4,00   | 8,50                     | 8,50                     |
| 85                                                                              | UPM-I M6                    |                                            |        |                          |                          |
| ≥50                                                                             | M8                          | 8,00                                       | 7,00   | 12,00 (9,0) <sup>1</sup> | 8,00                     |
|                                                                                 | M10 / M12                   | 8,50                                       | 7,00   | 12,00 (9,0) <sup>1</sup> | 11,50 (9,0)              |
|                                                                                 | M16                         | 7,00                                       | 6,00   | 11,00 (9,0) <sup>1</sup> | 9,00                     |
| 85                                                                              | UPM-I M8<br>UPM-I M10 / M12 |                                            |        |                          |                          |
| Perforated sleeve 16x85                                                         | UPM-I M6                    | 5,00                                       | 4,00   | 8,50                     | 8,50                     |
|                                                                                 | M8 / M10 / UPM-I M8         | 8,50                                       | 7,00   | 12,00 (9,0) <sup>1</sup> | 12,00 (9,0) <sup>1</sup> |

<sup>1)</sup> Characteristic value of pulling out of one brick  $N_{Rk,pb} = 9,0 \text{ kN}$

Table C14: Characteristic values of resistance; shear load ( $V_{Rk}$ )

| Compressive strength [ $\text{N/mm}^2$ ] |                       | 10                                  | 20  | 28  |
|------------------------------------------|-----------------------|-------------------------------------|-----|-----|
| Effective anchorage depth                | Anchor size           | characteristic values $V_{Rk}$ [kN] |     |     |
| ≥ 50                                     | M6                    | 2,5                                 | 4,0 | 5,0 |
| 85                                       | UPM-I M6              |                                     |     |     |
| ≥ 50                                     | M8 / M10 / M12 / M16, | 4,5                                 | 6,5 | 9,0 |
| 85                                       | UPM-I M8              |                                     |     |     |
|                                          | UPM-I M10 / M12       |                                     |     |     |
| Perforated sleeve 16x85                  | UPM-I M6              | 2,5                                 | 4,0 | 5,0 |
|                                          | M8 / M10 / UPM-I M8   | 4,5                                 | 6,5 | 9,0 |

Factor for job site tests and displacements see Annex C78.

|                                      |  |           |
|--------------------------------------|--|-----------|
| Upat injection system UPM 44 masonry |  | Annex C 7 |
| <b>Performances</b>                  |  |           |
| Solid sand-lime block                |  |           |
| Characteristic values                |  |           |



Kind of masonry: Light-weight concrete block Vbl

Table C15: Parameters of brick

|                            |                              |                                  |
|----------------------------|------------------------------|----------------------------------|
| Species of brick           |                              | Light-weight concrete block Vbl  |
| Density                    | $\rho \geq [\text{kg/dm}^3]$ | 0,6                              |
| Compressive strength       | $f_b \geq [\text{N/mm}^2]$   | 2                                |
| Standard or approval       |                              | EN 771-3                         |
| Producer                   |                              | e.g. Sepa                        |
| Size, dimensions           | [mm]                         | $\geq 372 \times 300 \times 254$ |
| Minimum thickness of brick | $h_{\min}$ [mm]              | 300                              |

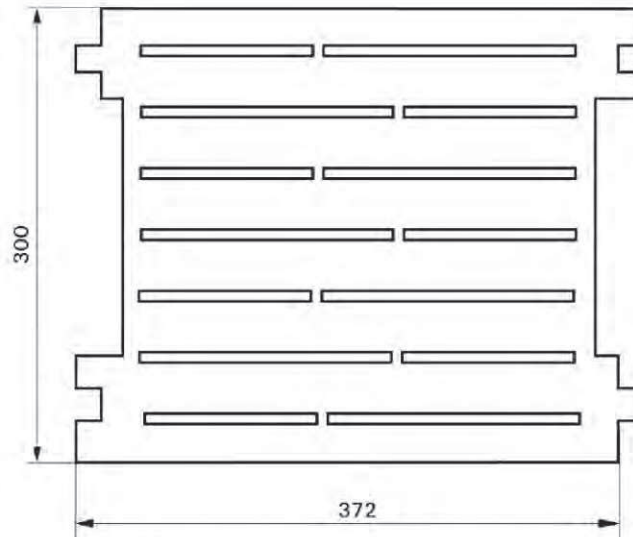


Table C16: Installation parameters for threaded rod with perforated sleeve

| Size of perforated sleeve |                                              | 16x130 |     | 18x130/200 |     | 20x130 |     | 22x130/200 |  | 20x200 |     |
|---------------------------|----------------------------------------------|--------|-----|------------|-----|--------|-----|------------|--|--------|-----|
| Size of threaded rod      |                                              | M8     | M10 | M10        | M12 | M12    | M16 | M16        |  | M12    | M16 |
| Edge distance             | $c_{\min}$ [mm]                              | 130    |     |            |     |        |     |            |  |        |     |
| Spacing                   | $s_{cr \parallel} = s_{\min \parallel}$ [mm] | 370    |     |            |     |        |     |            |  |        |     |
|                           | $s_{cr \perp} = s_{\min \perp}$ [mm]         | 250    |     |            |     |        |     |            |  |        |     |
| Group-factor              | $\alpha_{g,N \parallel}$ [-]                 | 2,0    |     |            |     |        |     |            |  |        |     |
|                           | $\alpha_{g,V \parallel}$ [-]                 |        |     |            |     |        |     |            |  |        |     |
|                           | $\alpha_{g,N \perp}$ [-]                     |        |     |            |     |        |     |            |  |        |     |
|                           | $\alpha_{g,V \perp}$ [-]                     |        |     |            |     |        |     |            |  |        |     |
| Max. installation torque  | $T_{\text{inst,max}}$ [Nm]                   | 4      |     |            |     |        |     |            |  |        |     |

Upat injection system UPM 44 masonry

#### Performances

Solid light-weight concrete block Vbl  
Species of brick, installation parameters

Annex C 8

Kind of masonry: Solid light-weight concrete block Vbl

**Table C17: Characteristic values of resistance; tension load ( $N_{Rk}$ )**

| Use category                                                   |                            | w/w                                              |        | d/d   |        |
|----------------------------------------------------------------|----------------------------|--------------------------------------------------|--------|-------|--------|
| Temperature range [°C]                                         |                            | 50/80                                            | 72/120 | 50/80 | 72/120 |
| Sleeve/anchor combinations                                     | Sleeve/anchor combinations | characteristic values <b>N<sub>Rk</sub></b> [kN] |        |       |        |
| Compressive strength <b>f<sub>b</sub> = 2 N/mm<sup>2</sup></b> |                            |                                                  |        |       |        |
| 16x130 / M8 / M10                                              | 18x130/200 / M10 / M12     | 2,00                                             | 1,50   | 2,00  | 2,00   |
| 20x130 / M12 / M16                                             | 22x130/200 / M16           | 2,50                                             | 2,50   | 3,00  | 2,50   |
| 20x200 / M12 / M16                                             |                            | 3,50                                             | 3,00   | 4,00  | 3,00   |

**Table C18: Characteristic values of resistance; shear load ( $V_{Rk}$ )**

| Use category                                  |                            | w/w                                 |        | d/d   |        |
|-----------------------------------------------|----------------------------|-------------------------------------|--------|-------|--------|
| Temperature range [°C]                        |                            | 50/80                               | 72/120 | 50/80 | 72/120 |
| Sleeve/anchor combinations                    | Sleeve/anchor combinations | characteristic values $V_{Rk}$ [kN] |        |       |        |
| Compressive strength $f_b = 2 \text{ N/mm}^2$ |                            |                                     |        |       |        |
| 16x130 / M8 / M10                             | 18x130/200 / M10 / M12     | 4,50                                |        |       |        |
| 20x130 / M12 / M16                            |                            |                                     |        |       |        |
| 20x200 / M12 / M16                            | 22x130/200 / M16           | 6,50                                |        |       |        |

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

**Performances**

Solid light-weight concrete block Vbl  
Characteristic values

**Annex C 9**

Kind of masonry: Solid light-weight concrete block Vbl

Table C19: Parameters of brick

|                            |                              |                                       |
|----------------------------|------------------------------|---------------------------------------|
| Species of brick           |                              | Solid light-weight concrete block Vbl |
| Density                    | $\rho \geq [\text{kg/dm}^3]$ | 1,6                                   |
| Compressive strength       | $f_b \geq [\text{N/mm}^2]$   | 4, 6 or 8                             |
| Standard or approval       |                              | EN 771-3                              |
| Producer                   |                              | KLB                                   |
| Size, dimensions           | [mm]                         | $\geq 250 \times 240 \times 239$      |
| Minimum thickness of brick | $h_{\min}$ [mm]              | 240                                   |

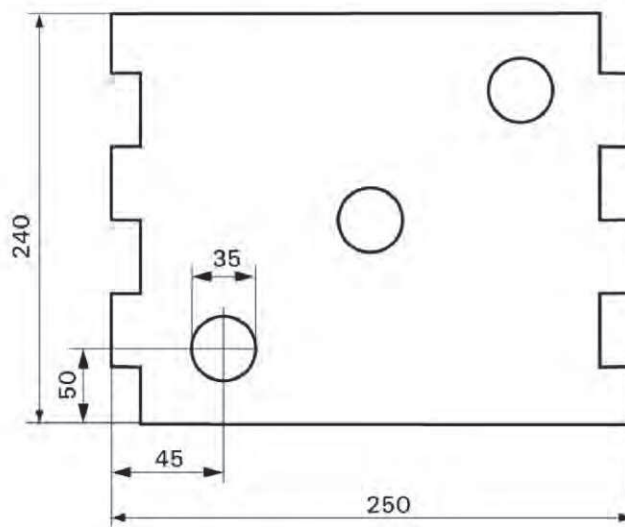


Table C20: Installation parameters for threaded rod with perforated sleeve and internal threaded anchor UPM-I with perforated sleeve

|                                        |                                         |       |       |        |            |       |        |            |         |     |     |     |     |     |     |     |
|----------------------------------------|-----------------------------------------|-------|-------|--------|------------|-------|--------|------------|---------|-----|-----|-----|-----|-----|-----|-----|
| Size of perforated sleeve              | 12x50                                   | 12x85 | 16x85 | 16x130 | 18x130/200 | 20x85 | 20x130 | 22x130/200 | 20x200  |     |     |     |     |     |     |     |
| Size of threaded rod                   | M6                                      | M8    | M6    | M8     | M10        | M8    | M10    | M10        | M12     | M12 | M16 | M12 | M16 | M16 | M12 | M16 |
| Size of internal threaded anchor UPM-I |                                         |       |       | M6/M8  |            |       |        |            | M10/M12 |     |     |     |     |     |     |     |
| Edge distance                          | $c_{\min}$ [mm]                         |       | 130   |        |            |       |        |            |         |     |     |     |     |     |     |     |
| Spacing                                | $s_{cr} \parallel = s_{\min} \parallel$ |       | 250   |        |            |       |        |            |         |     |     |     |     |     |     |     |
|                                        | $s_{cr} \perp = s_{\min} \perp$         |       | 250   |        |            |       |        |            |         |     |     |     |     |     |     |     |
| Group-factor                           | $\alpha_{g,N} \parallel [-]$            |       | 2,0   |        |            |       |        |            |         |     |     |     |     |     |     |     |
|                                        | $\alpha_{g,V} \parallel [-]$            |       |       |        |            |       |        |            |         |     |     |     |     |     |     |     |
|                                        | $\alpha_{g,N} \perp [-]$                |       |       |        |            |       |        |            |         |     |     |     |     |     |     |     |
|                                        | $\alpha_{g,V} \perp [-]$                |       |       |        |            |       |        |            |         |     |     |     |     |     |     |     |
| Max. installation torque               | $T_{\text{inst,max}}$ [Nm]              |       | 4     |        |            |       |        |            |         |     |     |     |     |     |     |     |

Upat injection system UPM 44 masonry

#### Performances

Solid light-weight concrete block Vbl  
Species of brick, installation parameters

Annex C 10



**Kind of masonry: Solid light-weight concrete block Vbl**

**Table C21: Characteristic values of resistance; tension load ( $N_{Rk}$ )**

| Use category                                                   |                                                        | w/w                                              |        | d/d   |        |
|----------------------------------------------------------------|--------------------------------------------------------|--------------------------------------------------|--------|-------|--------|
| Temperature range [°C]                                         |                                                        | 50/80                                            | 72/120 | 50/80 | 72/120 |
| Sleeve/anchor combinations                                     | Sleeve/anchor combinations                             | characteristic values <b>N<sub>Rk</sub></b> [kN] |        |       |        |
| Compressive strength <b>f<sub>b</sub> = 4 N/mm<sup>2</sup></b> |                                                        |                                                  |        |       |        |
| 12x50 M6 / M8                                                  |                                                        | 1,20                                             | 0,90   | 2,00  | 1,50   |
| 12x85 M6 / M8                                                  |                                                        | 2,00                                             | 1,50   | 3,50  | 3,00   |
| 16x85 M8 / M10<br>16x85 UPM-I M6 / M8                          | 16x130 M8 / M10<br>18x130/200 M10 / M12                | 2,50                                             | 2,00   | 4,00  | 3,50   |
| 20x85 M12 / M16<br>20x85 UPM-I M10 / M12                       | 20x130 M12 / M16<br>20x200 M12 / M16<br>22x130/200 M16 | 3,00                                             | 2,50   | 5,00  | 4,50   |
| Compressive strength <b>f<sub>b</sub> = 6 N/mm<sup>2</sup></b> |                                                        |                                                  |        |       |        |
| 12x50 M6 / M8                                                  |                                                        | 1,50                                             | 1,50   | 3,00  | 2,50   |
| 12x85 M6 / M8                                                  |                                                        | 3,00                                             | 2,50   | 5,00  | 4,00   |
| 16x85 M8 / M10<br>16x85 UPM-I M6 / M8                          | 16x130 M8 / M10<br>18x130/200 M10 / M12                | 4,00                                             | 3,00   | 6,50  | 5,50   |
| 20x85 M12 / M16<br>20x85 UPM-I M10 / M12                       | 20x130 M12 / M16<br>20x200 M12 / M16<br>22x130/200 M16 | 5,00                                             | 4,00   | 7,50  | 6,50   |
| Compressive strength <b>f<sub>b</sub> = 8 N/mm<sup>2</sup></b> |                                                        |                                                  |        |       |        |
| 12x50 M6 / M8                                                  |                                                        | 2,00                                             | 2,00   | 4,00  | 3,00   |
| 12x85 M6 / M8                                                  |                                                        | 4,00                                             | 3,00   | 7,00  | 5,50   |
| 16x85 M8 / M10<br>16x85 UPM-I M6 / M8                          | 16x130 M8 / M10<br>18x130/200 M10 / M12                | 5,00                                             | 4,00   | 8,50  | 7,00   |
| 20x85 M12 / M16<br>20x85 UPM-I M10 / M12                       | 20x130 M12 / M16<br>20x200 M12 / M16<br>22x130/200 M16 | 6,50                                             | 5,50   | 9,00  | 8,50   |

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

**Performances**

Solid light-weight concrete block Vbl  
Characteristic values tension load

**Annex C 11**

Kind of masonry: Solid light-weight concrete block Vbl

Table C22: Characteristic values of resistance; shear load ( $V_{Rk}$ )

| Use category                                  |                                                        | w/w                                 |  | d/d   |        |
|-----------------------------------------------|--------------------------------------------------------|-------------------------------------|--|-------|--------|
| Temperature range                             |                                                        | [°C]                                |  | 50/80 | 72/120 |
| Sleeve/anchor combinations                    |                                                        | characteristic values $V_{Rk}$ [kN] |  |       |        |
| Compressive strength $f_b = 4 \text{ N/mm}^2$ |                                                        |                                     |  |       |        |
| 12x50 M6<br>12x85 M6                          | 16x85 / UPM-I M6                                       | 2,00                                |  |       |        |
| 12x50 M8                                      | 12x85 M8                                               | 3,00                                |  |       |        |
| 16x85 M8 / M10<br>UPM-I M8                    | 16x130 M8 / M10<br>18x130/200 M10 / M12                | 3,50                                |  |       |        |
| 20x85 M12 / M16<br>UPM-I M10 / M12            | 20x130 M12 / M16<br>20x200 M12 / M16<br>22x130/200 M16 | 4,50                                |  |       |        |
| Compressive strength $f_b = 6 \text{ N/mm}^2$ |                                                        |                                     |  |       |        |
| 12x50 M6<br>12x85 M6                          | 16x85 / UPM-I M6                                       | 3,00                                |  |       |        |
| 12x50 M8                                      | 12x85 M8                                               | 4,50                                |  |       |        |
| 16x85 M8 / M10<br>UPM-I M8                    | 16x130 M8 / M10<br>18x130/200 M10 / M12                | 5,50                                |  |       |        |
| 20x85 M12 / M16<br>UPM-I M10 / M12            | 20x130 M12 / M16<br>20x200 M12 / M16<br>22x130/200 M16 | 6,50                                |  |       |        |
| Compressive strength $f_b = 8 \text{ N/mm}^2$ |                                                        |                                     |  |       |        |
| 12x50 M6<br>12x85 M6                          | 16x85 / UPM-I M6                                       | 4,00                                |  |       |        |
| 12x50 M8                                      | 12x85 M8                                               | 6,00                                |  |       |        |
| 16x85 M8 / M10<br>UPM-I M8                    | 16x130 M8 / M10<br>18x130/200 M10 / M12                | 7,00                                |  |       |        |
| 20x85 M12 / M16<br>UPM-I M10 / M12            | 20x130 M12 / M16<br>20x200 M12 / M16<br>22x130/200 M16 | 8,50                                |  |       |        |

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

**Performances**Solid light-weight concrete block Vbl  
Characteristic values shear load**Annex C 12**

## Kind of masonry: Perforated block form B, HLz

Table C23: Parameters of brick

|                            |                              |                              |
|----------------------------|------------------------------|------------------------------|
| Species of brick           |                              | Perforated block form B, HLz |
| Density                    | $\rho \geq [\text{kg/dm}^3]$ | 1,0                          |
| Compressive strength       | $f_b \geq [\text{N/mm}^2]$   | 4, 6, 8, 10 or 12            |
| Standard or approval       |                              | EN 771-1                     |
| Producer                   |                              | e.g. Wienerberger, Poroton   |
| Size, dimensions           | [mm]                         | 500(370)x175(240)x237        |
| Minimum thickness of brick | $h_{\min}$ [mm]              | 175(240)                     |

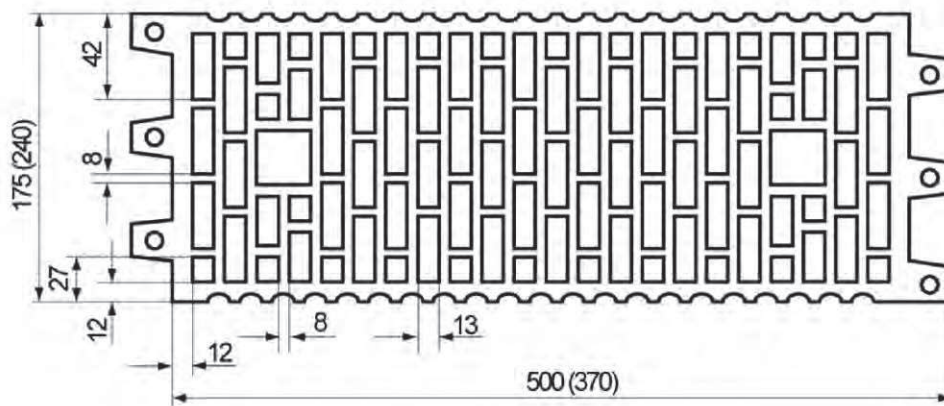


Table C24: Installation parameters for threaded rod with perforated sleeve and internal threaded anchor UPM-I with perforated sleeve

| Size of perforated sleeve              |  | 12x50                             |    | 12x85     |    | 16x85 |     | 16x130 |     | 20x85   |     | 20x130 |     |
|----------------------------------------|--|-----------------------------------|----|-----------|----|-------|-----|--------|-----|---------|-----|--------|-----|
| Size of threaded rod                   |  | M6                                | M8 | M6        | M8 | M8    | M10 | M8     | M10 | M12     | M16 | M12    | M16 |
| Size of internal threaded anchor UPM-I |  |                                   |    |           |    | M6/M8 |     |        |     | M10/M12 |     |        |     |
| Edge distance                          |  | $c_{\min}$ [mm]                   |    | 100       |    |       |     |        |     |         |     |        |     |
| Spacing                                |  | $s_{\min}$ II [mm]                |    | 100       |    |       |     |        |     |         |     |        |     |
|                                        |  | $s_{\text{cr}}$ II [mm]           |    | 500 (370) |    |       |     |        |     |         |     |        |     |
|                                        |  | $s_{\min}^{\perp}$ [mm]           |    | 100       |    |       |     |        |     |         |     |        |     |
|                                        |  | $s_{\text{cr}}^{\perp}$ [mm]      |    | 240       |    |       |     |        |     |         |     |        |     |
| Group-factor                           |  | $\alpha_{\text{g,N}}$ II [-]      |    | 1         |    |       |     |        |     |         |     |        |     |
|                                        |  | $\alpha_{\text{g,V}}$ II [-]      |    |           |    |       |     |        |     |         |     |        |     |
|                                        |  | $\alpha_{\text{g,N}}^{\perp}$ [-] |    |           |    |       |     |        |     |         |     |        |     |
|                                        |  | $\alpha_{\text{g,V}}^{\perp}$ [-] |    |           |    |       |     |        |     |         |     |        |     |
| Max. installation torque               |  | $T_{\text{inst,max}}$ [Nm]        |    | 2         |    |       |     |        |     |         |     |        |     |

Upat injection system UPM 44 masonry

## Performances

Perforated block form B, HLz  
Species of brick, installation parameters

Annex C 13



Kind of masonry: Perforated block form B, HLz

**Table C25: Characteristic values of resistance; tension load ( $N_{Rk}$ )**

| Use category                                   |                            | w/w                                 |        | d/d   |        |
|------------------------------------------------|----------------------------|-------------------------------------|--------|-------|--------|
| Temperature range                              |                            | 50/80                               | 72/120 | 50/80 | 72/120 |
| Sleeve/anchor combinations                     | Sleeve/anchor combinations | characteristic values $N_{Rk}$ [kN] |        |       |        |
| Compressive strength $f_b = 4 \text{ N/mm}^2$  |                            |                                     |        |       |        |
| 12x50 M6/M8                                    | 12x85 M6/M8                | 0,30                                | -      | 0,40  | 0,30   |
| 16x85 M8 / M10                                 | 20x85 M12 / M16            | 0,90                                | 0,75   | 0,90  | 0,90   |
| 16x85 UPM-I M6 / M8                            | 20x 85 UPM-I M10 / M12     |                                     |        |       |        |
| 16x130 M8/ M10                                 |                            |                                     |        |       |        |
| 20x130 M12/M16                                 |                            | 1,20                                | 0,90   | 1,20  | 1,20   |
| Compressive strength $f_b = 6 \text{ N/mm}^2$  |                            |                                     |        |       |        |
| 12x50 M6/M8                                    | 12x85 M6/M8                | 0,50                                | 0,40   | 0,60  | 0,50   |
| 16x85 M8 / M10                                 | 20x85 M12 / M16            | 1,50                                | 1,20   | 1,50  | 1,20   |
| 16x85 UPM-I M6 / M8                            | 20x 85 UPM-I M10 / M12     |                                     |        |       |        |
| 16x130 M8/ M10                                 |                            |                                     |        |       |        |
| 20x130 M12/M16                                 |                            | 2,0                                 | 1,5    | 2,0   | 1,5    |
| Compressive strength $f_b = 8 \text{ N/mm}^2$  |                            |                                     |        |       |        |
| 12x50 M6/M8                                    | 12x85 M6/M8                | 0,75                                | 0,60   | 0,75  | 0,60   |
| 16x85 M8 / M10                                 | 20x85 M12 / M16            | 2,00                                | 1,50   | 2,00  | 1,50   |
| 16x85 UPM-I M6 / M8                            | 20x 85 UPM-I M10 / M12     |                                     |        |       |        |
| 16x130 M8/ M10                                 |                            |                                     |        |       |        |
| 20x130 M12/M16                                 |                            | 2,50                                | 2,00   | 2,50  | 2,00   |
| Compressive strength $f_b = 10 \text{ N/mm}^2$ |                            |                                     |        |       |        |
| 12x50 M6/M8                                    | 12x85 M6/M8                | 0,90                                | 0,75   | 0,90  | 0,75   |
| 16x85 M8 / M10                                 | 20x85 M12 / M16            | 2,50                                | 2,00   | 2,50  | 2,00   |
| 16x85 UPM-I M6 / M8                            | 20x 85 UPM-I M10 / M12     |                                     |        |       |        |
| 16x130 M8/ M10                                 |                            |                                     |        |       |        |
| 20x130 M12/M16                                 |                            | 3,00                                | 2,50   | 3,50  | 3,00   |
| Compressive strength $f_b = 12 \text{ N/mm}^2$ |                            |                                     |        |       |        |
| 12x50 M6/M8                                    | 12x85 M6/M8                | 0,90                                | 0,90   | 1,20  | 0,90   |
| 16x85 M8 / M10                                 | 20x85 M12 / M16            | 3,00                                | 2,50   | 3,00  | 2,50   |
| 16x85 UPM-I M6 / M8                            | 20x 85 UPM-I M10 / M12     |                                     |        |       |        |
| 16x130 M8/ M10                                 |                            |                                     |        |       |        |
| 20x130 M12/M16                                 |                            | 3,50                                | 3,00   | 4,00  | 3,50   |

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

**Performances**

Perforated block form B, HLz  
Characteristic values tension load

**Annex C 14**

Kind of masonry: Perforated block form B, HLz

Table C26: Characteristic values of resistance; shear load ( $V_{Rk}$ )

| Use category                                   |                        | w/w                        |  | d/d                                 |        |
|------------------------------------------------|------------------------|----------------------------|--|-------------------------------------|--------|
| Temperature range                              |                        | [°C]                       |  | 50/80                               | 72/120 |
| Sleeve/anchor combinations                     |                        | Sleeve/anchor combinations |  | characteristic values $N_{Rk}$ [kN] |        |
| Compressive strength $f_b = 4 \text{ N/mm}^2$  |                        |                            |  |                                     |        |
| 12x50 M6/M8                                    | 12x85 M6 / M8          | 0,50                       |  |                                     |        |
| 16x85 M8 / M10                                 | 20x85 M12 / M16        |                            |  |                                     |        |
| 16x85 UPM-I M6 / M8                            | 20x 85 UPM-I M10 / M12 |                            |  |                                     |        |
| 16x130 M8/M10                                  | 20x130 M12/M16         | 0,60                       |  |                                     |        |
| Compressive strength $f_b = 6 \text{ N/mm}^2$  |                        |                            |  |                                     |        |
| 12x50 M6/M8                                    | 12x85 M6 / M8          | 0,75                       |  |                                     |        |
| 16x85 M8 / M10                                 | 20x85 M12 / M16        |                            |  |                                     |        |
| 16x85 UPM-I M6 / M8                            | 20x 85 UPM-I M10 / M12 |                            |  |                                     |        |
| 16x130 M8/M10                                  | 20x130 M12/M16         | 0,90                       |  |                                     |        |
| Compressive strength $f_b = 8 \text{ N/mm}^2$  |                        |                            |  |                                     |        |
| 12x50 M6/M8                                    | 12x85 M6 / M8          | 0,90                       |  |                                     |        |
| 16x85 M8 / M10                                 | 20x85 M12 / M16        |                            |  |                                     |        |
| 16x85 UPM-I M6 / M8                            | 20x 85 UPM-I M10 / M12 |                            |  |                                     |        |
| 16x130 M8/M10                                  | 20x130 M12/M16         | 1,20                       |  |                                     |        |
| Compressive strength $f_b = 10 \text{ N/mm}^2$ |                        |                            |  |                                     |        |
| 12x50 M6/M8                                    | 12x85 M6 / M8          | 1,20                       |  |                                     |        |
| 16x85 M8 / M10                                 | 20x85 M12 / M16        |                            |  |                                     |        |
| 16x85 UPM-I M6 / M8                            | 20x 85 UPM-I M10 / M12 |                            |  |                                     |        |
| 16x130 M8/M10                                  | 20x130 M12/M16         | 1,50                       |  |                                     |        |
| Compressive strength $f_b = 12 \text{ N/mm}^2$ |                        |                            |  |                                     |        |
| 12x50 M6/M8                                    | 12x85 M6 / M8          | 1,5                        |  |                                     |        |
| 16x85 M8 / M10                                 | 20x85 M12 / M16        |                            |  |                                     |        |
| 16x85 UPM-I M6 / M8                            | 20x 85 UPM-I M10 / M12 |                            |  |                                     |        |
| 16x130 M8/M10                                  | 20x130 M12/M16         | 2,00                       |  |                                     |        |

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

**Performances**

Perforated block form B, HLz  
Characteristic values shear load

**Annex C 15**



Kind of masonry: Perforated brick HLz, 2DF

Table C27: Parameters of brick

|                            |                              |                      |
|----------------------------|------------------------------|----------------------|
| Species of brick           |                              | Perforated brick HLz |
| Density                    | $\rho \geq [\text{kg/dm}^3]$ | 1,4                  |
| Compressive strength       | $f_b \geq [\text{N/mm}^2]$   | 6, 10, 16, 20 or 28  |
| Standard or approval       |                              | EN 771-1             |
| Producer                   |                              | e.g. Wienerberger    |
| Size, dimensions           | [mm]                         | 240x115x113          |
| Minimum thickness of brick | $h_{\min}$ [mm]              | 115                  |

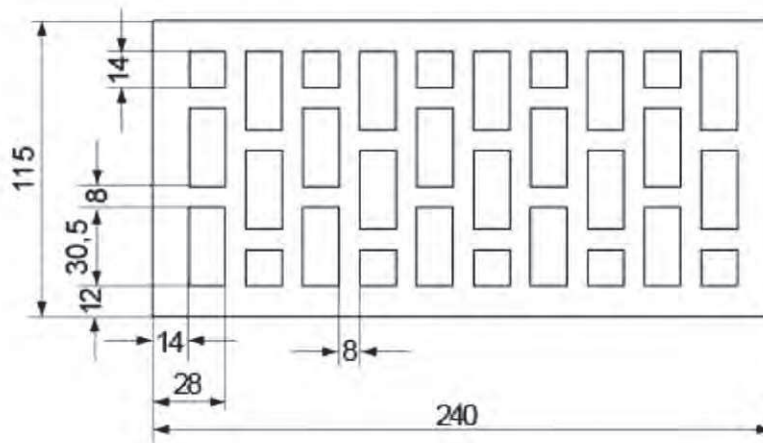


Table C28: Installation parameters for threaded rod with perforated sleeves  
and internal threaded anchor UPM-I with perforated sleeve

| Size of perforated sleeve              |                                               | 12x50                      |     | 12x85 |    | 16x85 |     | 20x85   |     |
|----------------------------------------|-----------------------------------------------|----------------------------|-----|-------|----|-------|-----|---------|-----|
| Size of threaded rod                   |                                               | M6                         | M8  | M6    | M8 | M8    | M10 | M12     | M16 |
| Size of internal threaded anchor UPM-I |                                               |                            |     |       |    | M6/M8 |     | M10/M12 |     |
| Edge distance                          |                                               | c <sub>min</sub> [mm]      |     | 80    |    |       |     |         |     |
| Spacing                                | s <sub>cr</sub>    = s <sub>min</sub>    [mm] |                            | 240 |       |    |       |     |         |     |
|                                        | s <sub>cr</sub> ⊥ = s <sub>min</sub> ⊥ [mm]   |                            | 115 |       |    |       |     |         |     |
| Group-factor                           | α <sub>g,N</sub>    [-]                       |                            | 2,0 |       |    |       |     |         |     |
|                                        | α <sub>g,V</sub>    [-]                       |                            |     |       |    |       |     |         |     |
|                                        | α <sub>g,N</sub> ⊥ [-]                        |                            |     |       |    |       |     |         |     |
|                                        | α <sub>g,V</sub> ⊥ [-]                        |                            |     |       |    |       |     |         |     |
| Max. installation torque               |                                               | T <sub>inst,max</sub> [Nm] |     | 2     |    |       |     |         |     |

Upat injection system UPM 44 masonry

#### Performances

Perforated brick HLz, 2DF

Species of brick, installation parameters

Annex C 16



Kind of masonry: Perforated brick HLz, 2DF

Table C29: Characteristic values of resistance; tension load ( $N_{Rk}$ )

| Use category                                   |                            | w/w                                 |        | d/d   |        |
|------------------------------------------------|----------------------------|-------------------------------------|--------|-------|--------|
| Temperature range [°C]                         |                            | 50/80                               | 72/120 | 50/80 | 72/120 |
| Sleeve/anchor combinations                     | Sleeve/anchor combinations | characteristic values $N_{Rk}$ [kN] |        |       |        |
| Compressive strength $f_b = 6 \text{ N/mm}^2$  |                            |                                     |        |       |        |
| 12x50 M6 / M8                                  |                            | 0,75                                | 0,60   | 0,75  | 0,60   |
| 12x85 M6 / M8                                  |                            | 0,90                                | 0,90   | 1,20  | 0,90   |
| 16x85 M8 / M10                                 | 16x85 UPM-I M6 / M8        | 0,75                                | 0,60   | 0,75  | 0,60   |
| 20x85 M12 / M16                                | 20x85 UPM-I M10 / M12      | 0,90                                | 0,75   | 0,90  | 0,75   |
| Compressive strength $f_b = 10 \text{ N/mm}^2$ |                            |                                     |        |       |        |
| 12x50 M6 / M8                                  |                            | 1,20                                | 0,90   | 1,20  | 0,90   |
| 12x85 M6 / M8                                  |                            | 1,50                                | 1,50   | 2,00  | 1,50   |
| 16x85 M8 / M10                                 | 16x85 UPM-I M6 / M8        | 1,20                                | 0,90   | 1,20  | 1,20   |
| 20x85 M12 / M16                                | 20x85 UPM-I M10 / M12      | 1,50                                | 1,20   | 1,50  | 1,20   |
| Compressive strength $f_b = 16 \text{ N/mm}^2$ |                            |                                     |        |       |        |
| 12x50 M6 / M8                                  |                            | 2,00                                | 1,50   | 2,00  | 1,50   |
| 12x85 M6 / M8                                  |                            | 2,50                                | 2,00   | 3,00  | 2,50   |
| 16x85 M8 / M10                                 | 16x85 UPM-I M6 / M8        | 2,00                                | 1,50   | 2,00  | 1,50   |
| 20x85 M12 / M16                                | 20x85 UPM-I M10 / M12      | 2,00                                | 2,00   | 2,50  | 2,00   |
| Compressive strength $f_b = 20 \text{ N/mm}^2$ |                            |                                     |        |       |        |
| 12x50 M6 / M8                                  |                            | 2,50                                | 2,00   | 2,50  | 2,00   |
| 12x85 M6 / M8                                  |                            | 3,50                                | 3,00   | 4,00  | 3,00   |
| 16x85 M8 / M10                                 | 16x85 UPM-I M6 / M8        | 2,50                                | 2,00   | 2,50  | 2,00   |
| 20x85 M12 / M16                                | 20x85 UPM-I M10 / M12      | 3,00                                | 2,50   | 3,00  | 2,50   |
| Compressive strength $f_b = 28 \text{ N/mm}^2$ |                            |                                     |        |       |        |
| 12x50 M6 / M8                                  |                            | 3,00                                | 2,50   | 3,50  | 3,00   |
| 12x85 M6 / M8                                  |                            | 5,00                                | 4,00   | 5,50  | 4,50   |
| 16x85 M8 / M10                                 | 16x85 UPM-I M6 / M8        | 3,50                                | 3,00   | 3,50  | 3,00   |
| 20x85 M12 / M16                                | 20x85 UPM-I M10 / M12      | 4,00                                | 3,50   | 4,50  | 3,50   |

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

**Performances**

Perforated brick HLz

Characteristic values tension load

**Annex C 17**

Kind of masonry: Perforated brick, HLz, 2DF

Table C30: Characteristic values of resistance; shear load ( $V_{Rk}$ )

| Use category                                   |                       | w/w                        |  | d/d                                 |        |
|------------------------------------------------|-----------------------|----------------------------|--|-------------------------------------|--------|
| Temperature range                              |                       | [°C]                       |  | 50/80                               | 72/120 |
| Sleeve/anchor combinations                     |                       | Sleeve/anchor combinations |  | characteristic values $V_{Rk}$ [kN] |        |
| Compressive strength $f_b = 6 \text{ N/mm}^2$  |                       |                            |  |                                     |        |
| 12x50 M6<br>12x85 M6                           | 16x85 UPM-I M6        | 1,2                        |  |                                     |        |
| 12x85 M8                                       |                       | 2,0                        |  |                                     |        |
| 16x85 M8 / M10<br>12x50 M8                     | 16x85 UPM-I M8        | 1,5                        |  |                                     |        |
| 20x85 M12 / M16                                | 20x85 UPM-I M10 / M12 | 2,5                        |  |                                     |        |
| Compressive strength $f_b = 10 \text{ N/mm}^2$ |                       |                            |  |                                     |        |
| 12x50 M6<br>12x85 M6                           | 16x85 UPM-I M6        | 2,0                        |  |                                     |        |
| 12x85 M8                                       |                       | 4,0                        |  |                                     |        |
| 16x85 M8 / M10<br>12x50 M8                     | 16x85 UPM-I M8        | 2,5                        |  |                                     |        |
| 20x85 M12 / M16                                | 20x85 UPM-I M10 / M12 | 4,5                        |  |                                     |        |
| Compressive strength $f_b = 16 \text{ N/mm}^2$ |                       |                            |  |                                     |        |
| 12x50 M6<br>12x85 M6                           | 16x85 UPM-I M6        | 3,0                        |  |                                     |        |
| 12x85 M8                                       |                       | 6,0 (5,5) <sup>1)</sup>    |  |                                     |        |
| 16x85 M8 / M10<br>12x50 M8                     | 16x85 UPM-I M8        | 3,5                        |  |                                     |        |
| 20x85 M12 / M16                                | 20x85 UPM-I M10 / M12 | 7,0 (5,5) <sup>1)</sup>    |  |                                     |        |
| Compressive strength $f_b = 20 \text{ N/mm}^2$ |                       |                            |  |                                     |        |
| 12x50 M6<br>12x85 M6                           | 16x85 UPM-I M6        | 4,0                        |  |                                     |        |
| 12x85 M8                                       |                       | 7,5 (5,5) <sup>1)</sup>    |  |                                     |        |
| 16x85 M8 / M10<br>12x50 M8                     | 16x85 UPM-I M8        | 4,5                        |  |                                     |        |
| 20x85 M12 / M16                                | 20x85 UPM-I M10 / M12 | 8,5 (5,5) <sup>1)</sup>    |  |                                     |        |
| Compressive strength $f_b = 28 \text{ N/mm}^2$ |                       |                            |  |                                     |        |
| 12x50 M6<br>12x85 M6                           | 16x85 UPM-I M6        | 5,0                        |  |                                     |        |
| 12x85 M8                                       |                       | 9,5 (5,5) <sup>1)</sup>    |  |                                     |        |
| 16x85 M8 / M10<br>12x50 M8                     | 16x85 UPM-I M8        | 6,5 (5,5) <sup>1)</sup>    |  |                                     |        |
| 20x85 M12 / M16                                | 20x85 UPM-I M10 / M12 | 12,0 (5,5) <sup>1)</sup>   |  |                                     |        |

<sup>1)</sup> Characteristic value of pushing out of one brick  $V_{Rk,pb} = 5,5 \text{ kN}$

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

#### Performances

Perforated brick HLz

Characteristic values shear load

Annex C 18



Kind of masonry: Sand-lime hollow brick KSL

Table C31: Parameters of brick

|                            |                              |                            |
|----------------------------|------------------------------|----------------------------|
| Species of brick           |                              | Sand-lime hollow brick KSL |
| Density                    | $\rho \geq [\text{kg/dm}^3]$ | 1,4                        |
| Compressive strength       | $f_b \geq [\text{N/mm}^2]$   | 8, 10, 12, 16 or 20        |
| Standard or approval       |                              | EN 771-2                   |
| Producer                   |                              | e.g. KS Wemding            |
| Size, dimensions           | [mm]                         | 240x175x113                |
| Minimum thickness of brick | $h_{\min}$ [mm]              | 175                        |

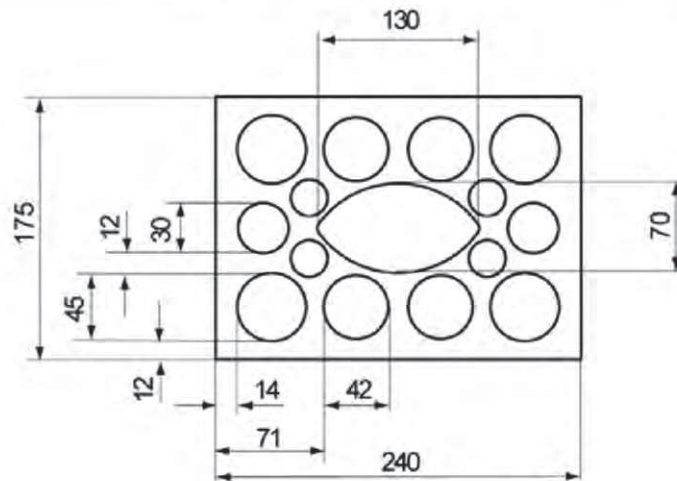


Table C32: Installation parameters for threaded rod with perforated sleeve and internal threaded anchor UPM-I with perforated sleeve

|                                        |                                      |       |        |        |            |         |         |            |
|----------------------------------------|--------------------------------------|-------|--------|--------|------------|---------|---------|------------|
| Size of perforated sleeve              | 12x50                                | 12x85 | 16x85  | 16x130 | 18x130/200 | 20x85   | 20x130  | 22x130/200 |
| Size of threaded rod                   | M6/M8                                | M6/M8 | M8/M10 | M8/M10 | M10/M12    | M12/M16 | M12/M16 | M16        |
| Size of internal threaded anchor UPM-I |                                      |       | M6/M8  |        |            | M10/M12 |         |            |
| Edge distance                          | $c_{\min}$ [mm]                      | 60    |        |        |            | 80      |         |            |
| Spacing                                | $s_{\min \parallel}$ [mm]            |       |        |        | 100        |         |         |            |
|                                        | $s_{cr \parallel}$ [mm]              |       |        |        | 240        |         |         |            |
|                                        | $s_{cr \perp} = s_{\min \perp}$ [mm] |       |        |        | 115        |         |         |            |
| Group-factor                           | $\alpha_{g,N \parallel}$ [-]         |       |        |        | 1,5        |         |         |            |
|                                        | $\alpha_{g,V \parallel}$ [-]         |       |        |        |            |         |         |            |
|                                        | $\alpha_{g,N \perp}$ [-]             |       |        |        | 2,0        |         |         |            |
|                                        | $\alpha_{g,V \perp}$ [-]             |       |        |        |            |         |         |            |
| Max. installation torque               | $T_{\text{inst,max}}$ [Nm]           |       |        |        | 2          |         |         |            |

Upat injection system UPM 44 masonry

**Performances**

Sand-lime hollow brick KSL  
Species of brick, installation parameters

**Annex C 19**



Kind of masonry: Sand-lime hollow brick KSL

Table C33: Characteristic values of resistance; tension load ( $N_{Rk}$ )

| Use category                                                       |                                    | w/w                                 |        | d/d   |        |
|--------------------------------------------------------------------|------------------------------------|-------------------------------------|--------|-------|--------|
| Temperature range                                                  |                                    | 50/80                               | 72/120 | 50/80 | 72/120 |
| Sleeve/anchor combinations                                         | Sleeve/anchor combinations         | characteristic values $N_{Rk}$ [kN] |        |       |        |
| Compressive strength $f_b = 8 \text{ N/mm}^2$                      |                                    |                                     |        |       |        |
| 12x50 M6 / M8                                                      | 12x85 M6 / M8                      | 1,50                                | 1,20   | 1,50  | 1,50   |
| 16x85 M8 / M10                                                     | UPM-I M6 / M8                      | 2,00                                | 1,50   | 2,00  | 1,50   |
| 16x130 M8 / M10<br>18x 130 /200 M10 / M12<br>20x85 UPM-I M10 / M12 | 20x130 M12 / M16<br>22x130/200 M16 | 2,00                                | 1,50   | 2,50  | 2,00   |
| Compressive strength $f_b = 10 \text{ N/mm}^2$                     |                                    |                                     |        |       |        |
| 12x50 M6 / M8                                                      | 12x85 M6 / M8                      | 2,00                                | 1,50   | 2,00  | 2,00   |
| 16x85 M8 / M10                                                     | UPM-I M6 / M8                      | 2,00                                | 2,00   | 2,50  | 2,50   |
| 16x130 M8 / M10<br>18x 130 /200 M10 / M12<br>20x85 UPM-I M10 / M12 | 20x130 M12 / M16<br>22x130/200 M16 | 2,50                                | 2,00   | 3,00  | 2,50   |
| Compressive strength $f_b = 12 \text{ N/mm}^2$                     |                                    |                                     |        |       |        |
| 12x50 M6 / M8                                                      | 12x85 M6 / M8                      | 2,50                                | 2,00   | 2,50  | 2,00   |
| 16x85 M8 / M10                                                     | UPM-I M6 / M8                      | 2,50                                | 2,00   | 3,00  | 2,50   |
| 16x130 M8 / M10<br>18x 130 /200 M10 / M12<br>20x85 UPM-I M10 / M12 | 20x130 M12 / M16<br>22x130/200 M16 | 3,00                                | 2,50   | 3,50  | 3,00   |
| Compressive strength $f_b = 16 \text{ N/mm}^2$                     |                                    |                                     |        |       |        |
| 12x50 M6 / M8                                                      | 12x85 M6 / M8                      | 3,00                                | 2,50   | 3,50  | 3,00   |
| 16x85 M8 / M10                                                     | UPM-I M6 / M8                      | 3,50                                | 3,00   | 4,00  | 3,50   |
| 16x130 M8 / M10<br>18x 130 /200 M10 / M12<br>20x85 UPM-I M10 / M12 | 20x130 M12 / M16<br>22x130/200 M16 | 4,50                                | 3,50   | 4,50  | 4,00   |
| Compressive strength $f_b = 20 \text{ N/mm}^2$                     |                                    |                                     |        |       |        |
| 12x50 M6 / M8                                                      | 12x85 M6 / M8                      | 4,00                                | 3,50   | 4,50  | 3,50   |
| 16x85 M8 / M10                                                     | UPM-I M6 / M8                      | 4,50                                | 4,00   | 5,00  | 4,00   |
| 16x130 M8 / M10<br>18x 130 /200 M10 / M12<br>20x85 UPM-I M10 / M12 | 20x130 M12 / M16<br>22x130/200 M16 | 5,50                                | 4,50   | 6,00  | 5,00   |

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

**Performances**

Sand-lime hollow brick KSL  
Characteristic values tension load

**Annex C 20**

Kind of masonry: Sand-lime hollow brick KSL

Table C34: Characteristic values of resistance; shear load ( $V_{Rk}$ )

| Use category                                         |                                                                          | w/w                        |  | d/d                                 |        |
|------------------------------------------------------|--------------------------------------------------------------------------|----------------------------|--|-------------------------------------|--------|
| Temperature range                                    |                                                                          | [°C]                       |  | 50/80                               | 72/120 |
| Sleeve/anchor combinations                           |                                                                          | Sleeve/anchor combinations |  | characteristic values $V_{Rk}$ [kN] |        |
| Compressive strength $f_b = 8 \text{ N/mm}^2$        |                                                                          |                            |  |                                     |        |
| 12x50 M6 / 12x85 M6                                  | 16x85 UPM-I M6                                                           | 1,50                       |  |                                     |        |
| 12x50 M8 / 12x85 M8                                  |                                                                          | 1,50                       |  |                                     |        |
| 16x85 M8 / M10<br>16x85 UPM-I M8<br>16x130 M10 / M12 | 18x130/200 M10 / M12<br>20x85 M12<br>20x85 UPM-I M10 / M12<br>20x130 M12 | 3,00                       |  |                                     |        |
| 20x85 M16<br>20x130 M16                              | 22x130/200 M16                                                           | 2,50                       |  |                                     |        |
| Compressive strength $f_b = 10 \text{ N/mm}^2$       |                                                                          |                            |  |                                     |        |
| 12x50 M6 / 12x85 M6                                  | 16x85 UPM-I M6                                                           | 2,00                       |  |                                     |        |
| 12x50 M8 / 12x85 M8                                  |                                                                          | 2,00                       |  |                                     |        |
| 16x85 M8 / M10<br>16x85 UPM-I M8<br>16x130 M10 / M12 | 18x130/200 M10 / M12<br>20x85 M12<br>20x85 UPM-I M10 / M12<br>20x130 M12 | 3,50                       |  |                                     |        |
| 20x85 M16<br>20x130 M16                              | 22x130/200 M16                                                           | 3,50                       |  |                                     |        |
| Compressive strength $f_b = 12 \text{ N/mm}^2$       |                                                                          |                            |  |                                     |        |
| 12x50 M6 / 12x85 M6                                  | 16x85 UPM-I M6                                                           | 2,50                       |  |                                     |        |
| 12x50 M8 / 12x85 M8                                  |                                                                          | 2,50                       |  |                                     |        |
| 16x85 M8 / M10<br>16x85 UPM-I M8<br>16x130 M10 / M12 | 18x130/200 M10 / M12<br>20x85 M12<br>20x85 UPM-I M10 / M12<br>20x130 M12 | 4,50                       |  |                                     |        |
| 20x85 M16<br>20x130 M16                              | 22x130/200 M16                                                           | 4,00                       |  |                                     |        |
| Compressive strength $f_b = 16 \text{ N/mm}^2$       |                                                                          |                            |  |                                     |        |
| 12x50 M6 / 12x85 M6                                  | 16x85 UPM-I M6                                                           | 3,00                       |  |                                     |        |
| 12x50 M8 / 12x85 M8                                  |                                                                          | 3,50                       |  |                                     |        |
| 16x85 M8 / M10<br>16x85 UPM-I M8<br>16x130 M10 / M12 | 18x130/200 M10 / M12<br>20x85 M12<br>20x85 UPM-I M10 / M12<br>20x130 M12 | 6,00                       |  |                                     |        |
| 20x85 M16<br>20x130 M16                              | 22x130/200 M16                                                           | 5,50                       |  |                                     |        |
| Compressive strength $f_b = 20 \text{ N/mm}^2$       |                                                                          |                            |  |                                     |        |
| 12x50 M6 / 12x85 M6                                  | 16x85 UPM-I M6                                                           | 4,00                       |  |                                     |        |
| 12x50 M8 / 12x85 M8                                  |                                                                          | 4,50                       |  |                                     |        |
| 16x85 M8 / M10<br>16x85 UPM-I M8<br>16x130 M10 / M12 | 18x130/200 M10 / M12<br>20x85 M12<br>20x85 UPM-I M10 / M12<br>20x130 M12 | 7,50                       |  |                                     |        |
| 20x85 M16<br>20x130 M16                              | 22x130/200 M16                                                           | 6,50                       |  |                                     |        |

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

**Performances**Sand-lime hollow brick KSL  
Characteristic values shear load**Annex C 21**

Kind of masonry: Light-weight concrete hollow block Hbl

Table C35: Parameters of brick

|                            |                              |                                        |
|----------------------------|------------------------------|----------------------------------------|
| Species of brick           |                              | Light-weight concrete hollow block Hbl |
| Density                    | $\rho \geq [\text{kg/dm}^3]$ | 1,0                                    |
| Compressive strength       | $f_b \geq [\text{N/mm}^2]$   | 2 or 4                                 |
| Standard or approval       |                              | EN 771-3                               |
| Producer                   |                              |                                        |
| Size, dimensions           | [mm]                         | 362x240x240                            |
| Minimum thickness of brick | $h_{\min}$ [mm]              | 240                                    |

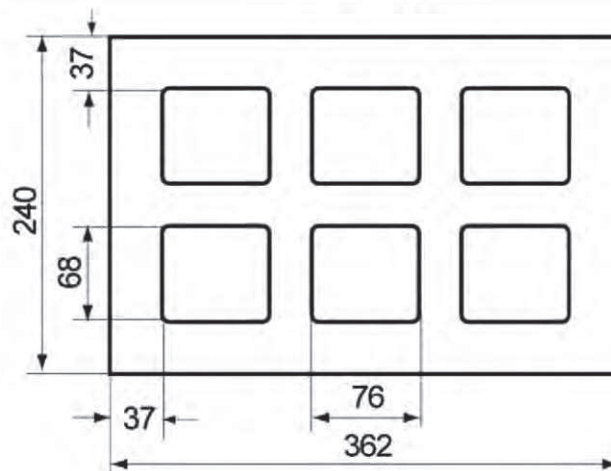


Table C36: Installation parameters for threaded rod with perforated sleeve and internal threaded anchor UPM-I with perforated sleeve

|                                        |                                      |       |       |        |            |       |        |            |         |     |     |     |     |     |     |
|----------------------------------------|--------------------------------------|-------|-------|--------|------------|-------|--------|------------|---------|-----|-----|-----|-----|-----|-----|
| Size of perforated sleeve              | 12x50                                | 12x85 | 16x85 | 16x130 | 18x130/200 | 20x85 | 20x130 | 22x130/200 | 20x200  |     |     |     |     |     |     |
| Size of threaded rod                   | M6                                   | M8    | M6    | M8     | M8         | M10   | M8     | M10        | M10     | M12 | M12 | M16 | M12 | M16 | M16 |
| Size of internal threaded anchor UPM-I |                                      |       |       | M6/M8  |            |       |        |            | M10/M12 |     |     |     |     |     |     |
| Edge distance                          | $c_{\min}$ [mm]                      | 60    |       |        |            |       |        |            |         |     |     |     |     |     |     |
| Spacing                                | $s_{\min}$ II [mm]                   | 100   |       |        |            |       |        |            |         |     |     |     |     |     |     |
|                                        | $s_{cr}$ II [mm]                     | 362   |       |        |            |       |        |            |         |     |     |     |     |     |     |
|                                        | $s_{cr} \perp = s_{\min} \perp$ [mm] | 240   |       |        |            |       |        |            |         |     |     |     |     |     |     |
| Group-factor                           | $\alpha_{g,N}$ II [-]                | 1,2   |       |        |            |       |        |            |         |     |     |     |     |     |     |
|                                        | $\alpha_{g,V}$ II [-]                | 1,1   |       |        |            |       |        |            |         |     |     |     |     |     |     |
|                                        | $\alpha_{g,N} \perp$ [-]             | 2,0   |       |        |            |       |        |            |         |     |     |     |     |     |     |
|                                        | $\alpha_{g,V} \perp$ [-]             |       |       |        |            |       |        |            |         |     |     |     |     |     |     |
| Max. installation torque               | $T_{\text{inst,max}}$ [Nm]           | 2     |       |        |            |       |        |            |         |     |     |     |     |     |     |

Upat injection system UPM 44 masonry

#### Performances

Light-weight concrete hollow block Hbl  
Species of brick, installation parameters

Annex C 22



Kind of masonry: Light-weight concrete hollow block Hbl

Table C37: Characteristic values of resistance; tension load ( $N_{Rk}$ )

| Use category                                  |                                                                                  | w/w                                 |        | d/d   |        |
|-----------------------------------------------|----------------------------------------------------------------------------------|-------------------------------------|--------|-------|--------|
| Temperature range [°C]                        |                                                                                  | 50/80                               | 72/120 | 50/80 | 72/120 |
| Sleeve/anchor combinations                    | Sleeve/anchor combinations                                                       | characteristic values $N_{RK}$ [kN] |        |       |        |
| Compressive strength $f_b = 2 \text{ N/mm}^2$ |                                                                                  |                                     |        |       |        |
| 12x50 M6 / M8                                 |                                                                                  | 1,20                                | 0,90   | 1,20  | 0,90   |
| 12x85 M6<br>16x130 M8 / M10                   | 18x130/200 M10 / M12                                                             | 1,50                                | 1,20   | 1,50  | 1,20   |
| 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8       | 20x85 M12 / M16<br>20x85 / UPM-I M10 / M12<br>20x130 M12 / M16<br>22x130/200 M16 | 1,50                                | 1,20   | 1,50  | 1,20   |
| 20x200 M12 / M16                              |                                                                                  | 2,50                                | 2,00   | 2,50  | 2,00   |
| Compressive strength $f_b = 4 \text{ N/mm}^2$ |                                                                                  |                                     |        |       |        |
| 12x50 M6 / M8                                 |                                                                                  | 2,00                                | 2,00   | 2,50  | 2,00   |
| 12x85 M6<br>16x130 M8 / M10                   | 18x130/200 M10 / M12                                                             | 3,00                                | 2,50   | 3,00  | 2,50   |
| 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8       | 20x85 M12 / M16<br>20x85 / UPM-I M10 / M12<br>20x130 M12 / M16<br>22x130/200 M16 | 3,00                                | 2,50   | 3,00  | 2,50   |
| 20x200 M12 / M16                              |                                                                                  | 5,00                                | 4,00   | 5,50  | 4,50   |

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

#### Performances

Light-weight concrete hollow block Hbl  
Characteristic values tension load

Annex C 23

Kind of masonry: Light-weight concrete hollow block Hbl

**Table C38: Characteristic values of resistance; shear load ( $V_{Rk}$ )**

| Use category                                  |                            | w/w                                 |        | d/d   |        |
|-----------------------------------------------|----------------------------|-------------------------------------|--------|-------|--------|
| Temperature range [°C]                        |                            | 50/80                               | 72/120 | 50/80 | 72/120 |
| Sleeve/anchor combinations                    | Sleeve/anchor combinations | characteristic values $V_{Rk}$ [kN] |        |       |        |
| Compressive strength $f_b = 2 \text{ N/mm}^2$ |                            |                                     |        |       |        |
| All sizes                                     |                            | 0,90                                |        |       |        |
| Compressive strength $f_b = 4 \text{ N/mm}^2$ |                            |                                     |        |       |        |
| All sizes                                     |                            | 2,00                                |        |       |        |

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

**Performances**

Light-weight concrete hollow block Hbl  
Characteristic values shear load

**Annex C 24**

Kind of masonry: Perforated block form B, HLz

Table C39: Parameters of brick

|                            |                              |                              |
|----------------------------|------------------------------|------------------------------|
| Species of brick           |                              | Perforated block form B, HLz |
| Density                    | $\rho \geq [\text{kg/dm}^3]$ | 0,6                          |
| Compressive strength       | $f_b \geq [\text{N/mm}^2]$   | 4, 6, 8                      |
| Standard or approval       |                              | EN 771-1                     |
| Producer                   |                              | e.g. Bouyer Leroux           |
| Size, dimensions           | [mm]                         | 500x200x315                  |
| Minimum thickness of brick | $h_{\min}$ [mm]              | 200                          |

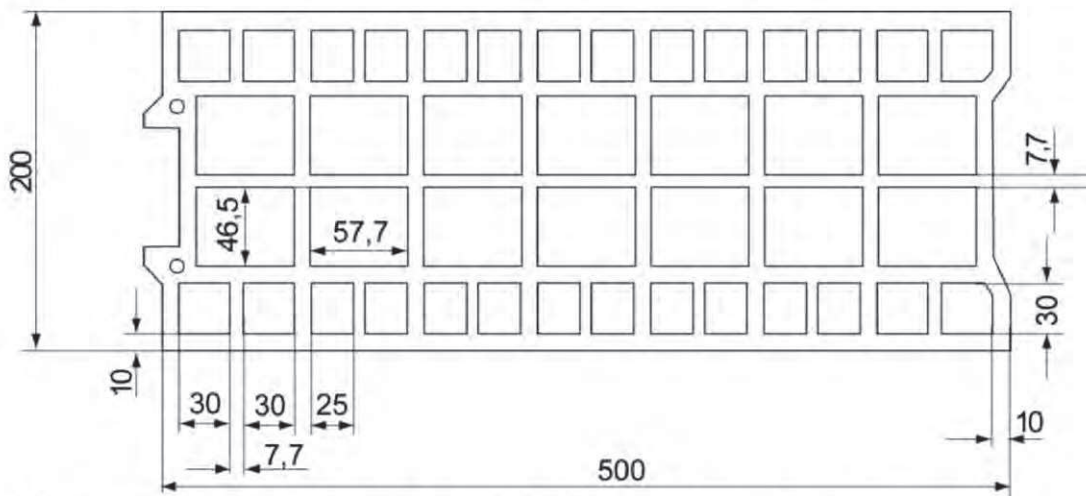


Table C40: Installation parameters for threaded rod with perforated sleeve and internal threaded anchor UPM-I with perforated sleeve

| Size of perforated sleeve                           | 12x50 | 12x85 | 16x85  | 16x130 | 18x130/200 | 20x85   | 20x130  | 22x130/200 |
|-----------------------------------------------------|-------|-------|--------|--------|------------|---------|---------|------------|
| Size of threaded rod                                | M6 M8 | M6 M8 | M8 M10 | M8 M10 | M10 M12    | M12 M16 | M12 M16 | M16        |
| Size of internal threaded anchor UPM-I              |       |       | M6/M8  |        |            | M10/M12 |         |            |
| Edge distance $c_{\min}$ [mm]                       | 120   |       |        |        |            |         |         |            |
| Spacing $s_{\min}$ II [mm]                          | 120   |       |        |        |            |         |         |            |
| Spacing $s_{cr}$ II [mm]                            | 500   |       |        |        |            |         |         |            |
| Spacing $s_{cr} \perp = s_{\min} \perp$ [mm]        | 315   |       |        |        |            |         |         |            |
| Group-factor $\alpha_{g,N}$ II [-]                  | 1,3   |       |        |        |            |         |         |            |
| Group-factor $\alpha_{g,V}$ II [-]                  | 1,7   |       |        |        |            |         |         |            |
| Group-factor $\alpha_{g,N} \perp$ [-]               | 2,0   |       |        |        |            |         |         |            |
| Group-factor $\alpha_{g,V} \perp$ [-]               | 2,0   |       |        |        |            |         |         |            |
| Max. installation torque $T_{\text{inst,max}}$ [Nm] | 2     |       |        |        |            |         |         |            |

Upat injection system UPM 44 masonry

#### Performances

Perforated block form B, HLz  
Species of brick, installation parameters

Annex C 25



Kind of masonry: Perforated block form B, HLz

Table C41: Characteristic values of resistance; tension load ( $N_{Rk}$ )

| Use category                                             |                                            | w/w                                 |        | d/d   |        |
|----------------------------------------------------------|--------------------------------------------|-------------------------------------|--------|-------|--------|
| Temperature range                                        |                                            | 50/80                               | 72/120 | 50/80 | 72/120 |
| Sleeve/anchor combinations                               | Sleeve/anchor combinations                 | characteristic values $N_{Rk}$ [kN] |        |       |        |
| Compressive strength $f_b = 4 \text{ N/mm}^2$            |                                            |                                     |        |       |        |
| 12x50 M6 / M8                                            |                                            | 0,50                                | 0,40   | 0,60  | 0,50   |
| 12x85 M6 / M8<br>16x85 M8 / M10<br>16x85 / UPM-I M6 / M8 | 20x85 M12 / M16<br>20x85 / UPM-I M10 / M12 | 1,50                                | 1,20   | 1,50  | 1,20   |
| 16x130 M8 / M10<br>18x130/200 M8 / M10                   |                                            | 0,75                                | 0,60   | 0,90  | 0,75   |
| 20x130 M16<br>22x130/200 M16                             |                                            | 1,50                                | 1,20   | 2,00  | 1,50   |
| Compressive strength $f_b = 6 \text{ N/mm}^2$            |                                            |                                     |        |       |        |
| 12x50 M6 / M8                                            |                                            | 0,75                                | 0,60   | 0,90  | 0,75   |
| 12x85 M6 / M8<br>16x85 M8 / M10<br>16x85 / UPM-I M6 / M8 | 20x85 M12 / M16<br>20x85 / UPM-I M10 / M12 | 2,00                                | 2,00   | 2,50  | 2,00   |
| 16x130 M8 / M10<br>18x130/200 M8 / M10                   |                                            | 1,20                                | 0,90   | 1,20  | 1,20   |
| 20x130 M12 / M16<br>22x130/200 M16                       |                                            | 2,50                                | 2,00   | 2,50  | 2,00   |
| Compressive strength $f_b = 8 \text{ N/mm}^2$            |                                            |                                     |        |       |        |
| 12x50 M6 / M8                                            |                                            | 0,90                                | 0,90   | 1,20  | 0,90   |
| 12x85 M6 / M8<br>16x85 M8 / M10<br>16x85 / UPM-I M6 / M8 | 20x85 M12 / M16<br>20x85 / UPM-I M10 / M12 | 3,00                                | 2,50   | 3,00  | 2,50   |
| 16x130 M8 / M10<br>18x130/200 M8 / M10                   |                                            | 1,50                                | 1,20   | 2,00  | 1,50   |
| 20x130 M12 / M16<br>22x130/200 M16                       |                                            | 3,50                                | 2,50   | 3,50  | 3,00   |

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

**Performances**

Perforated block form B, HLz  
Characteristic values tension load

**Annex C 26**

Kind of masonry: Perforated block form B, HLz

Table C42: Characteristic values of resistance; shear load ( $V_{Rk}$ )

| Use category                                     |                                                             | w/w                                 |        | d/d   |        |
|--------------------------------------------------|-------------------------------------------------------------|-------------------------------------|--------|-------|--------|
| Temperature range                                |                                                             | 50/80                               | 72/120 | 50/80 | 72/120 |
| Sleeve/anchor combinations                       | Sleeve/anchor combinations                                  | characteristic values $V_{Rk}$ [kN] |        |       |        |
| Compressive strength $f_b = 4 \text{ N/mm}^2$    |                                                             |                                     |        |       |        |
| 12x50 M6 / M8<br>12x85 M6 / M8<br>16x85 M8 / M10 | 16x85 / UPM-I M6 / M8<br>20x85 / UPM-I M10/M12<br>20x85 M12 | 1,50                                |        |       |        |
| 20x85 M16                                        |                                                             | 2,50                                |        |       |        |
| 16x130 M8 / M10<br>20x130 M12 / M16              | 18x130/200 M10 / M12<br>22x130/200 M16                      | 0,90                                |        |       |        |
| Compressive strength $f_b = 6 \text{ N/mm}^2$    |                                                             |                                     |        |       |        |
| 12x50 M6 / M8<br>12x85 M6 / M8<br>16x85 M8 / M10 | 16x85 / UPM-I M6 / M8<br>20x85 / UPM-I M10/M12<br>20x85 M12 | 2,50                                |        |       |        |
| 20x85 M16                                        |                                                             | 3,50                                |        |       |        |
| 16x130 M8 / M10<br>20x130 M12 / M16              | 18x130/200 M10 / M12<br>22x130/200 M16                      | 1,50                                |        |       |        |
| Compressive strength $f_b = 8 \text{ N/mm}^2$    |                                                             |                                     |        |       |        |
| 12x50 M6 / M8<br>12x85 M6 / M8<br>16x85 M8 / M10 | 16x85 / UPM-I M6 / M8<br>20x85 / UPM-I M10/M12<br>20x85 M12 | 3,50                                |        |       |        |
| 20x85 M16                                        |                                                             | 4,50                                |        |       |        |
| 16x130 M8 / M10<br>20x130 M12 / M16              | 18x130/200 M10 / M12<br>22x130/200 M16                      | 2,00                                |        |       |        |

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

**Performances**

Perforated block form B, HLz  
Characteristic values shear load

**Annex C27**

Kind of masonry: Perforated block form B, HLz

Table C43: Parameters of brick

|                            |                              |                              |
|----------------------------|------------------------------|------------------------------|
| Species of brick           |                              | Perforated block form B, HLz |
| Density                    | $\rho \geq [\text{kg/dm}^3]$ | 0,7                          |
| Compressive strength       | $f_b \geq [\text{N/mm}^2]$   | 4, 6, 8 or 10                |
| Standard or approval       |                              | EN 771-1                     |
| Producer                   |                              | e.g. Wienerberger            |
| Size, dimensions           | [mm]                         | 500x200x300                  |
| Minimum thickness of brick | $h_{\min}$ [mm]              | 200                          |

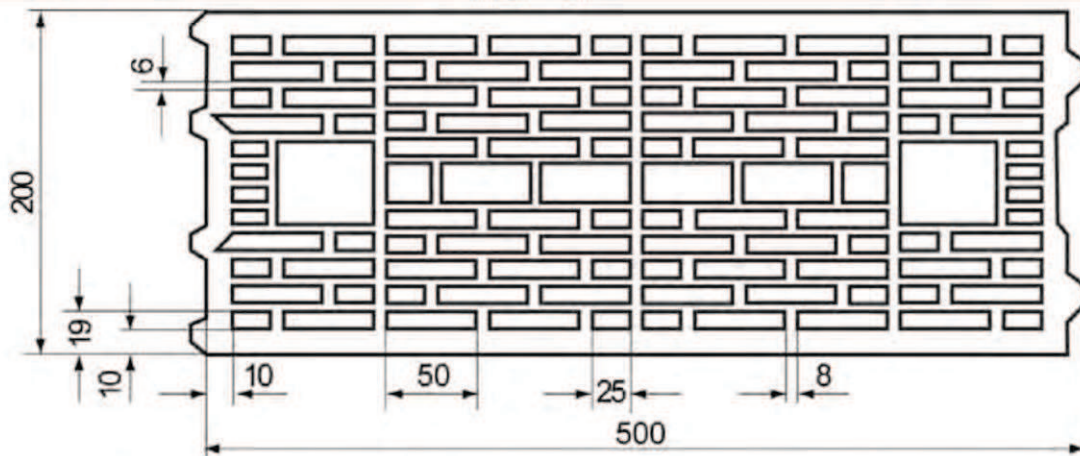


Table C44: Installation parameters for threaded rod with perforated sleeve and internal threaded anchor UPM-I with perforated sleeve

|                                              |                                         |    |       |    |       |     |        |     |            |     |         |     |        |     |            |  |  |
|----------------------------------------------|-----------------------------------------|----|-------|----|-------|-----|--------|-----|------------|-----|---------|-----|--------|-----|------------|--|--|
| Size of perforated sleeve                    | 12x50                                   |    | 12x85 |    | 16x85 |     | 16x130 |     | 18x130/200 |     | 20x85   |     | 20x130 |     | 22x130/200 |  |  |
| Size of threaded rod                         | M6                                      | M8 | M6    | M8 | M8    | M10 | M8     | M10 | M10        | M12 | M12     | M16 | M12    | M16 | M16        |  |  |
| Size of internal threaded anchor UPM-I       |                                         |    |       |    | M6/M8 |     |        |     |            |     | M10/M12 |     |        |     |            |  |  |
| Edge distance $c_{min}$ [mm]                 | 50                                      |    |       |    |       |     | 80     |     |            |     | 50      | 80  |        |     |            |  |  |
| Spacing                                      | $s_{min}$ II [mm]                       |    | 100   |    |       |     |        |     |            |     |         |     |        |     |            |  |  |
|                                              | $s_{cr}$ II [mm]                        |    | 500   |    |       |     |        |     |            |     |         |     |        |     |            |  |  |
|                                              | $s_{cr}^{\perp} = s_{min}^{\perp}$ [mm] |    | 300   |    |       |     |        |     |            |     |         |     |        |     |            |  |  |
| Group-factor                                 | $\alpha_{g,N}$ II [-]                   |    | 1,4   |    |       |     |        |     |            |     |         |     |        |     |            |  |  |
|                                              | $\alpha_{g,V}$ II [-]                   |    | 2,0   |    |       |     |        |     |            |     |         |     |        |     |            |  |  |
|                                              | $\alpha_{g,N}^{\perp}$ [-]              |    |       |    |       |     |        |     |            |     |         |     |        |     |            |  |  |
|                                              | $\alpha_{g,V}^{\perp}$ [-]              |    |       |    |       |     |        |     |            |     |         |     |        |     |            |  |  |
| Max. installation torque $T_{inst,max}$ [Nm] | 2                                       |    |       |    |       |     |        |     |            |     |         |     |        |     |            |  |  |

Upat injection system UPM 44 masonry

**Performances**  
Perforated block form B,HLz  
Species of brick, installation parameters

**Annex C 28**



Kind of masonry: Perforated block form B, HLz

Table C45: Characteristic values of resistance; tension load ( $N_{Rk}$ )

| Use category                                   |                            | w/w                                 |        | d/d   |        |
|------------------------------------------------|----------------------------|-------------------------------------|--------|-------|--------|
| Temperature range [°C]                         |                            | 50/80                               | 72/120 | 50/80 | 72/120 |
| Sleeve/anchor combinations                     | Sleeve/anchor combinations | characteristic values $N_{RK}$ [kN] |        |       |        |
| Compressive strength $f_b = 4 \text{ N/mm}^2$  |                            |                                     |        |       |        |
| 12x50 M6 / M8                                  | 12x85 M6 / M8              | 0,50                                | 0,40   | 0,60  | 0,50   |
| 16x85 M8 / M10                                 | 16x85 / UPM-I M6 / M8      | 0,60                                | 0,50   | 0,75  | 0,60   |
| 20x85 M12 / M16                                | 20x85 / UPM-I M10 / M12    | 0,75                                | 0,60   | 0,90  | 0,75   |
| 16x130 M8 / M10                                | 18x130/200 M10 / M12       | 1,20                                | 0,90   | 1,20  | 0,90   |
| 20x130 M12 / M16                               | 22x130/200 M16             | 1,50                                | 1,20   | 1,50  | 1,20   |
| Compressive strength $f_b = 6 \text{ N/mm}^2$  |                            |                                     |        |       |        |
| 12x50 M6 / M8                                  | 12x85 M6 / M8              | 0,75                                | 0,60   | 0,90  | 0,75   |
| 16x85 M8 / M10                                 | 16x85 / UPM-I M6 / M8      | 0,90                                | 0,75   | 1,20  | 0,90   |
| 20x85 M12 / M16                                | 20x85 / UPM-I M10 / M12    | 1,20                                | 0,90   | 1,20  | 1,20   |
| 16x130 M8 / M10                                | 18x130/200 M10 / M12       | 1,50                                | 1,20   | 2,00  | 1,50   |
| 20x130 M12 / M16                               | 22x130/200 M16             | 2,00                                | 1,50   | 2,50  | 2,00   |
| Compressive strength $f_b = 8 \text{ N/mm}^2$  |                            |                                     |        |       |        |
| 12x50 M6 / M8                                  | 12x85 M6 / M8              | 0,90                                | 0,90   | 1,20  | 0,90   |
| 16x85 M8 / M10                                 | 16x85 / UPM-I M6 / M8      | 1,20                                | 1,20   | 1,50  | 1,20   |
| 20x85 M12 / M16                                | 20x85 / UPM-I M10 / M12    | 1,50                                | 1,20   | 1,50  | 1,50   |
| 16x130 M8 / M10                                | 18x130/200 M10 / M12       | 2,00                                | 2,00   | 2,50  | 2,00   |
| 20x130 M12 / M16                               | 22x130/200 M16             | 2,50                                | 2,50   | 3,00  | 2,50   |
| Compressive strength $f_b = 10 \text{ N/mm}^2$ |                            |                                     |        |       |        |
| 12x50 M6 / M8                                  | 12x85 M6 / M8              | 1,20                                | 0,90   | 1,50  | 1,2    |
| 16x85 M8 / M10                                 | 16x85 / UPM-I M6 / M8      | 1,50                                | 1,20   | 2,00  | 1,50   |
| 20x85 M12 / M16                                | 20x85 / UPM-I M10 / M12    | 2,00                                | 1,50   | 2,00  | 2,00   |
| 16x130 M8 / M10                                | 18x130/200 M10 / M12       | 2,50                                | 2,00   | 3,00  | 2,50   |
| 20x130 M12 / M16                               | 22x130/200 M16             | 3,50                                | 3,00   | 4,00  | 3,00   |

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

**Performances**Perforated block form B, HLz  
Characteristic values tension load**Annex C 29**

Kind of masonry: Perforated block form B, HLz

Table C46: Characteristic values of resistance; shear load ( $V_{Rk}$ )

| Use category                                   |                            | w/w                                 |        | d/d   |        |
|------------------------------------------------|----------------------------|-------------------------------------|--------|-------|--------|
| Temperature range [°C]                         |                            | 50/80                               | 72/120 | 50/80 | 72/120 |
| Sleeve/anchor combinations                     | Sleeve/anchor combinations | characteristic values $V_{Rk}$ [kN] |        |       |        |
| Compressive strength $f_b = 4 \text{ N/mm}^2$  |                            |                                     |        |       |        |
| 12x50 M6                                       | 16x85 / UPM-I M6           | 0,90                                |        |       |        |
| 12x50 M8                                       | 16x85 / UPM-I M8           | 1,20                                |        |       |        |
| 12x85 M6 / M8                                  |                            |                                     |        |       |        |
| 20x85 M12 / M16                                | 20x85 /UPM-I M10 / M12     | 2,00                                |        |       |        |
| 16x130 M8 / M10                                | 20x130 M12 / M16           | 0,60                                |        |       |        |
| 18x130/200 M10 / M12                           | 22x130/200 M16             |                                     |        |       |        |
| Compressive strength $f_b = 6 \text{ N/mm}^2$  |                            |                                     |        |       |        |
| 12x50 M6                                       | 16x85 / UPM-I M6           | 1,20                                |        |       |        |
| 12x50 M8                                       | 16x85 / UPM-I M8           | 1,50                                |        |       |        |
| 12x85 M6 / M8                                  |                            |                                     |        |       |        |
| 20x85 M12 / M16                                | 20x85 /UPM-I M10 / M12     | 3,00                                |        |       |        |
| 16x130 M8 / M10                                | 20x130 M12 / M16           | 0,90                                |        |       |        |
| 18x130/200 M10 / M12                           | 22x130/200 M16             |                                     |        |       |        |
| Compressive strength $f_b = 8 \text{ N/mm}^2$  |                            |                                     |        |       |        |
| 12x50 M6                                       | 16x85 / UPM-I M6           | 1,50                                |        |       |        |
| 12x50 M8                                       | 16x85 / UPM-I M8           | 2,00                                |        |       |        |
| 12x85 M6 / M8                                  |                            |                                     |        |       |        |
| 20x85 M12 / M16                                | 20x85 /UPM-I M10 / M12     | 4,00                                |        |       |        |
| 16x130 M8 / M10                                | 20x130 M12 / M16           | 1,20                                |        |       |        |
| 18x130/200 M10 / M12                           | 22x130/200 M16             |                                     |        |       |        |
| Compressive strength $f_b = 10 \text{ N/mm}^2$ |                            |                                     |        |       |        |
| 12x50 M6                                       | 16x85 / UPM-I M6           | 2,00                                |        |       |        |
| 12x50 M8                                       | 16x85 / UPM-I M8           | 3,00                                |        |       |        |
| 12x85 M6 / M8                                  |                            |                                     |        |       |        |
| 20x85 M12 / M16                                | 20x85 /UPM-I M10 / M12     | 5,00                                |        |       |        |
| 16x130 M8 / M10                                | 20x130 M12 / M16           | 1,50                                |        |       |        |
| 18x130/200 M10 / M12                           | 22x130/200 M16             |                                     |        |       |        |

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

**Performances**Perforated block form B, HLz  
Characteristic values shear load**Annex C 30**



Kind of masonry: Perforated block form B, HLz

Table C47: Parameters of brick

|                            |                              |                              |
|----------------------------|------------------------------|------------------------------|
| Species of brick           |                              | Perforated block form B, HLz |
| Density                    | $\rho \geq [\text{kg/dm}^3]$ | 0,7                          |
| Compressive strength       | $f_b \geq [\text{N/mm}^2]$   | 2, 4, 6 or 8                 |
| Standard or approval       |                              | EN 771-1                     |
| Producer                   |                              | e.g. Terreal                 |
| Size, dimensions           | [mm]                         | 500x200x315                  |
| Minimum thickness of brick | $h_{\min}$ [mm]              | 200                          |

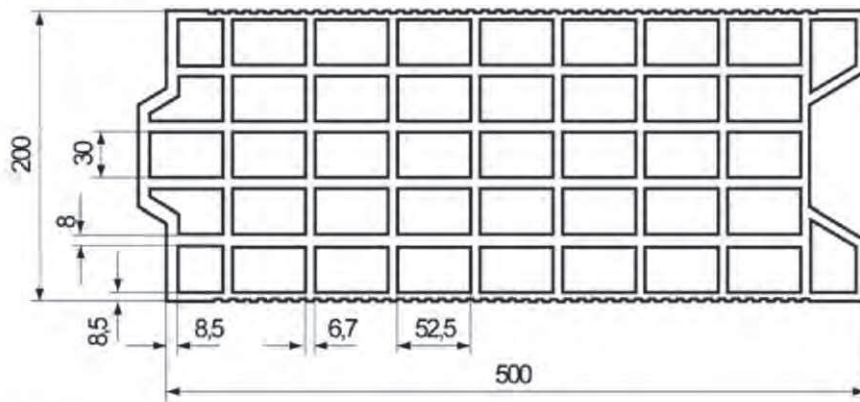


Table C48: Installation parameters for threaded rod with perforated sleeve and internal threaded anchor UPM-I with perforated sleeve

| Size of perforated sleeve              |                            | 12x50           |    | 12x85 |    | 16x85 |     | 16x130 |     | 18x130/200 |     | 20x85   |     | 20x130 |     | 22x130/200 |  |
|----------------------------------------|----------------------------|-----------------|----|-------|----|-------|-----|--------|-----|------------|-----|---------|-----|--------|-----|------------|--|
| Size of threaded rod                   |                            | M6              | M8 | M6    | M8 | M8    | M10 | M8     | M10 | M10        | M12 | M12     | M16 | M12    | M16 | M16        |  |
| Size of internal threaded anchor UPM-I |                            |                 |    |       |    | M6/M8 |     |        |     |            |     | M10/M12 |     |        |     |            |  |
| Edge distance                          |                            | $c_{\min}$ [mm] |    | 50    |    |       |     | 80     |     |            |     | 50      |     | 80     |     |            |  |
| Spacing                                | $s_{\min}$    [mm]         | 100             |    |       |    |       |     |        |     |            |     |         |     |        |     |            |  |
|                                        | $s_{cr}$    [mm]           | 500             |    |       |    |       |     |        |     |            |     |         |     |        |     |            |  |
|                                        | $s_{\min}$ $\perp$ [mm]    | 100             |    |       |    |       |     |        |     |            |     |         |     |        |     |            |  |
|                                        | $s_{cr}$ $\perp$ [mm]      | 315             |    |       |    |       |     |        |     |            |     |         |     |        |     |            |  |
| Group-factor                           | $\alpha_{g,N}$    [-]      | 1,1             |    |       |    |       |     |        |     |            |     |         |     |        |     |            |  |
|                                        | $\alpha_{g,V}$    [-]      | 1,2             |    |       |    |       |     |        |     |            |     |         |     |        |     |            |  |
|                                        | $\alpha_{g,N}$ $\perp$ [-] | 1,1             |    |       |    |       |     |        |     |            |     |         |     |        |     |            |  |
|                                        | $\alpha_{g,V}$ $\perp$ [-] | 1,2             |    |       |    |       |     |        |     |            |     |         |     |        |     |            |  |
| Max. installation torque               | $T_{\text{inst,max}}$ [Nm] | 2               |    |       |    |       |     |        |     |            |     |         |     |        |     |            |  |

Upat injection system UPM 44 masonry

#### Performances

Perforated block form B, HLz  
Species of brick, installation parameters

Annex C 31



Kind of masonry: Perforated block form B, HLz

Table C49: Characteristic values of resistance; tension load ( $N_{Rk}$ )

| Use category                                  |                                                                                         | w/w                                 |        | d/d   |        |
|-----------------------------------------------|-----------------------------------------------------------------------------------------|-------------------------------------|--------|-------|--------|
| Temperature range                             |                                                                                         | 50/80                               | 72/120 | 50/80 | 72/120 |
| Sleeve/anchor combinations                    | Sleeve/anchor combinations                                                              | characteristic values $N_{RK}$ [kN] |        |       |        |
| Compressive strength $f_b = 2 \text{ N/mm}^2$ |                                                                                         |                                     |        |       |        |
| 12x50 M6 / M8                                 |                                                                                         | 0,50                                | 0,40   | 0,50  | 0,40   |
| 12x85 M6 / M8                                 | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8<br>20x85 M12 / M16<br>20x85 /UPM-I M10 / M12    | 0,50                                | 0,40   | 0,50  | 0,40   |
| 20x130 M12 / M16<br>22x130/200 M16            | 16x130 M8 / M10<br>18x130/200 M10 / M12                                                 | 0,50                                | 0,40   | 0,60  | 0,50   |
| Compressive strength $f_b = 4 \text{ N/mm}^2$ |                                                                                         |                                     |        |       |        |
| 12x50 M6 / M8                                 |                                                                                         | 0,90                                | 0,75   | 0,90  | 0,90   |
| 12x85 M6 / M8                                 | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8<br>20x85 M12 / M16<br>20x85 /UPM-I M10 / M12    | 0,90                                | 0,75   | 1,20  | 0,90   |
| 20x130 M12 / M16<br>22x130/200 M16            | 16x130 M8 / M10<br>18x130/200 M10 / M12                                                 | 0,90                                | 0,90   | 1,20  | 0,90   |
| Compressive strength $f_b = 6 \text{ N/mm}^2$ |                                                                                         |                                     |        |       |        |
| 12x50 M6 / M8                                 |                                                                                         | 1,50                                | 1,20   | 1,50  | 1,20   |
| 12x85 M6 / M8                                 | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8<br>20x85 M12 / M16<br>20x85 /UPM-I M10 / M12    | 1,50                                | 1,20   | 1,50  | 1,20   |
| 20x130 M12 / M16<br>22x130/200 M16            | 16x130 M8 / M10<br>18x130/200 M10 / M12                                                 | 1,50                                | 1,20   | 1,50  | 1,50   |
| Compressive strength $f_b = 8 \text{ N/mm}^2$ |                                                                                         |                                     |        |       |        |
| 12x50 M6 / M8                                 |                                                                                         | 2,00                                | 1,50   | 2,00  | 1,50   |
| 12x85 M6 / M8                                 | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8<br>20x85 M12 / M16<br>20x85 /UPM-I M10 / M12M12 | 2,00                                | 1,50   | 2,00  | 2,00   |
| 20x130 M12 / M16<br>22x130/200 M16            | 16x130 M8 / M10<br>18x130/200 M10 / M12                                                 | 2,00                                | 1,50   | 2,00  | 2,00   |

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

**Performances**Perforated block form B, HLz  
Characteristic values tension load**Annex C 32**

**Kind of masonry: Perforated block form B, HLz****Table C50: Characteristic values of resistance; shear load ( $V_{Rk}$ )**

| Use category                                  |                         | w/w                        |  | d/d                                 |        |
|-----------------------------------------------|-------------------------|----------------------------|--|-------------------------------------|--------|
| Temperature range                             |                         | [°C]                       |  | 50/80                               | 72/120 |
| Sleeve/anchor combinations                    |                         | Sleeve/anchor combinations |  | characteristic values $V_{Rk}$ [kN] |        |
| Compressive strength $f_b = 2 \text{ N/mm}^2$ |                         |                            |  |                                     |        |
| 12x50 M6                                      | 16x85 / UPM-I M6        | 0,30                       |  |                                     |        |
| 12x50 M8                                      | 16x85 M8                | 0,60                       |  |                                     |        |
| 12x85 M6 / M8                                 | 16x85 / UPM-I M8        |                            |  |                                     |        |
| 20x85 M12 / M16                               | 20x85 / UPM-I M10 / M12 | 0,90                       |  |                                     |        |
| 16x130 M8 / M10                               | 18x130/200 M10 / M12    | 0,60                       |  |                                     |        |
| 20x130 M12 / M16                              | 22x130/200 M16          | 0,75                       |  |                                     |        |
| Compressive strength $f_b = 4 \text{ N/mm}^2$ |                         |                            |  |                                     |        |
| 12x50 M6                                      | 16x85 / UPM-I M6        | 0,75                       |  |                                     |        |
| 12x50 M8                                      | 16x85 M8                | 1,20                       |  |                                     |        |
| 12x85 M6 / M8                                 | 16x85 / UPM-I M8        |                            |  |                                     |        |
| 20x85 M12 / M16                               | 20x85 / UPM-I M10 / M12 | 2,00                       |  |                                     |        |
| 16x130 M8 / M10                               | 18x130/200 M10 / M12    | 1,20                       |  |                                     |        |
| 20x130 M12 / M16                              | 22x130/200 M16          | 1,50                       |  |                                     |        |
| Compressive strength $f_b = 6 \text{ N/mm}^2$ |                         |                            |  |                                     |        |
| 12x50 M6                                      | 16x85 / UPM-I M6        | 0,90                       |  |                                     |        |
| 12x50 M8                                      | 16x85 M8                | 2,00                       |  |                                     |        |
| 12x85 M6 / M8                                 | 16x85 / UPM-I M8        |                            |  |                                     |        |
| 20x85 M12 / M16                               | 20x85 / UPM-I M10 / M12 | 3,00                       |  |                                     |        |
| 16x130 M8 / M10                               | 18x130/200 M10 / M12    | 1,50                       |  |                                     |        |
| 20x130 M12 / M16                              | 22x130/200 M16          | 2,00                       |  |                                     |        |
| Compressive strength $f_b = 8 \text{ N/mm}^2$ |                         |                            |  |                                     |        |
| 12x50 M6                                      | 16x85 / UPM-I M6        | 1,50                       |  |                                     |        |
| 12x50 M8                                      | 16x85 M8                | 2,50                       |  |                                     |        |
| 12x85 M6 / M8                                 | 16x85 / UPM-I M8        |                            |  |                                     |        |
| 20x85 M12 / M16                               | 20x85 / UPM-I M10 / M12 | 4,00                       |  |                                     |        |
| 16x130 M8 / M10                               | 18x130/200 M10 / M12    | 2,00                       |  |                                     |        |
| 20x130 M12 / M16                              | 22x130/200 M16          | 3,00                       |  |                                     |        |

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

**Performances**

Perforated block form B, HLz  
Characteristic values shear load

**Annex C 33**

Kind of masonry: Perforated block form B, HLz

Table C51: Parameters of brick

|                            |                              |                              |
|----------------------------|------------------------------|------------------------------|
| Species of brick           |                              | Perforated block form B, HLz |
| Density                    | $\rho \geq [\text{kg/dm}^3]$ | 0,7                          |
| Compressive strength       | $f_b \geq [\text{N/mm}^2]$   | 4, 6 or 8                    |
| Standard or approval       |                              | EN 771-1                     |
| Producer                   |                              | e.g. Imery                   |
| Size, dimensions           | [mm]                         | 500x200x275                  |
| Minimum thickness of brick | $h_{\min}$ [mm]              | 200                          |

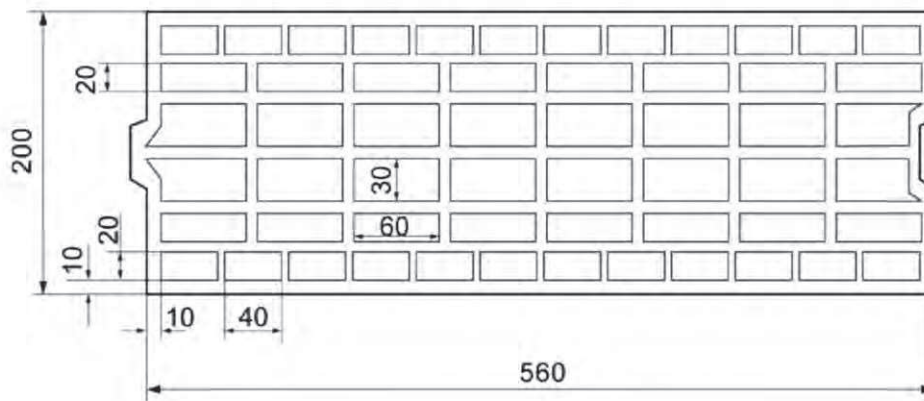


Table C52: Installation parameters for threaded rod with perforated sleeve

|                           |                                            |     |            |     |        |     |            |
|---------------------------|--------------------------------------------|-----|------------|-----|--------|-----|------------|
| Size of perforated sleeve | 16x130                                     |     | 18x130/200 |     | 20x130 |     | 22x130/200 |
| Size of threaded rod      | M8                                         | M10 | M10        | M12 | M12    | M16 | M16        |
| Edge distance             | $c_{\min}$ [mm]                            |     | 80         |     |        |     |            |
| Spacing                   | $s_{cr \parallel} = s_{\min}^{\perp}$ [mm] |     | 560        |     |        |     |            |
|                           | $s_{cr}^{\perp} = s_{\min}^{\perp}$ [mm]   |     | 275        |     |        |     |            |
| Group-factor              | $\alpha_{g,N \parallel}$ [-]               |     | 2,0        |     |        |     |            |
|                           | $\alpha_{g,V \parallel}$ [-]               |     |            |     |        |     |            |
|                           | $\alpha_{g,N}^{\perp}$ [-]                 |     |            |     |        |     |            |
|                           | $\alpha_{g,V}^{\perp}$ [-]                 |     |            |     |        |     |            |
| Max. installation torque  | $T_{\text{inst,max}}$ [Nm]                 |     | 2          |     |        |     |            |

Upat injection system UPM 44 masonry

#### Performances

Perforated block form B, HLz

Species of brick, installation parameters

Annex C 34



Kind of masonry: Perforated block form B, HLz

**Table C53: Characteristic values of resistance; tension load ( $N_{Rk}$ )**

| Use category                                  |                            | w/w                                 |        | d/d   |        |
|-----------------------------------------------|----------------------------|-------------------------------------|--------|-------|--------|
| Temperature range [°C]                        |                            | 50/80                               | 72/120 | 50/80 | 72/120 |
| Sleeve/anchor combinations                    | Sleeve/anchor combinations | characteristic values $N_{RK}$ [kN] |        |       |        |
| Compressive strength $f_b = 4 \text{ N/mm}^2$ |                            |                                     |        |       |        |
| 16x130 M8 / M10                               | 18x130/200 M10 / M12       | 0,90                                | 0,90   | 1,20  | 0,90   |
| 20x130 M12 / M16                              | 22x130/200 M16             | 1,20                                | 1,20   | 1,50  | 1,20   |
| Compressive strength $f_b = 6 \text{ N/mm}^2$ |                            |                                     |        |       |        |
| 16x130 M8 / M10                               | 18x130/200 M10 / M12       | 1,50                                | 1,20   | 1,50  | 1,50   |
| 20x130 M12 / M16                              | 22x130/200 M16             | 2,00                                | 1,50   | 2,00  | 2,00   |
| Compressive strength $f_b = 8 \text{ N/mm}^2$ |                            |                                     |        |       |        |
| 16x130 M8 / M10                               | 18x130/200 M10 / M12       | 2,00                                | 1,50   | 2,50  | 2,00   |
| 20x130 M12 / M16                              | 22x130/200 M16             | 2,50                                | 2,00   | 3,00  | 2,50   |

**Table C54: Characteristic values of resistance; shear load ( $V_{Rk}$ )**

| Use category                                  |                                    | w/w                                 |  | d/d   |        |
|-----------------------------------------------|------------------------------------|-------------------------------------|--|-------|--------|
| Temperature range                             |                                    | [°C]                                |  | 50/80 | 72/120 |
| Sleeve/anchor combinations                    | Sleeve/anchor combinations         | characteristic values $V_{Rk}$ [kN] |  |       |        |
| Compressive strength $f_b = 4 \text{ N/mm}^2$ |                                    |                                     |  |       |        |
| 16x130 M8 / M10<br>18x130/200 M10 / M12       | 20x130 M12 / M16<br>22x130/200 M16 | 0,90                                |  |       |        |
| Compressive strength $f_b = 6 \text{ N/mm}^2$ |                                    |                                     |  |       |        |
| 16x130 M8 / M10<br>18x130/200 M10 / M12       | 20x130 M12 / M16<br>22x130/200 M16 | 1,50                                |  |       |        |
| Compressive strength $f_b = 8 \text{ N/mm}^2$ |                                    |                                     |  |       |        |
| 16x130 M8 / M10<br>18x130/200 M10 / M12       | 20x130 M12 / M16<br>22x130/200 M16 | 2,00                                |  |       |        |

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

**Performances**

Perforated block form B,HLz  
Characteristic values

**Annex C 35**

Kind of masonry: Light-weight concrete hollow block Hbl

Table C55: Parameters of brick

|                            |                              |                                        |
|----------------------------|------------------------------|----------------------------------------|
| Species of brick           |                              | Light-weight concrete hollow block Hbl |
| Density                    | $\rho \geq [\text{kg/dm}^3]$ | 1,0                                    |
| Compressive strength       | $f_b \geq [\text{N/mm}^2]$   | 2, 4 or 6                              |
| Standard or approval       |                              | EN 771-1                               |
| Producer                   |                              | e.g. Sepa                              |
| Size, dimensions           | [mm]                         | 500x200x200                            |
| Minimum thickness of brick | $h_{\min}$ [mm]              | 200                                    |

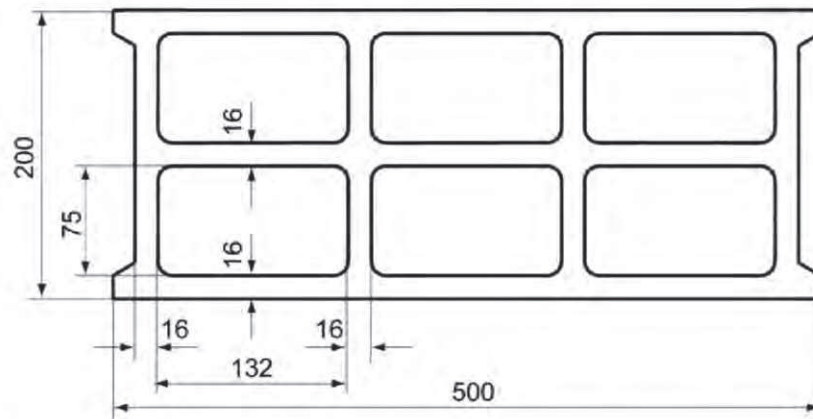


Table C56: Installation parameters for threaded rod with perforated sleeve

|                                        |                                              |    |       |    |       |     |        |     |            |     |         |     |
|----------------------------------------|----------------------------------------------|----|-------|----|-------|-----|--------|-----|------------|-----|---------|-----|
| Size of perforated sleeve              | 12x50                                        |    | 12x85 |    | 16x85 |     | 16x130 |     | 18x130/200 |     | 20x85   |     |
| Size of threaded rod                   | M6                                           | M8 | M6    | M8 | M8    | M10 | M8     | M10 | M10        | M12 | M12     | M16 |
| Size of internal threaded anchor UPM-I |                                              |    |       |    | M6/M8 |     |        |     |            |     | M10/M12 |     |
| Edge distance                          | $c_{\min}$ [mm]                              |    | 100   |    |       |     |        |     |            |     |         |     |
| Spacing                                | $s_{cr \parallel} = s_{\min \parallel}$ [mm] |    | 500   |    |       |     |        |     |            |     |         |     |
|                                        | $s_{cr \perp} = s_{\min \perp}$ [mm]         |    | 200   |    |       |     |        |     |            |     |         |     |
| Group-factor                           | $\alpha_{g,N \parallel}$ [-]                 |    | 2,0   |    |       |     |        |     |            |     |         |     |
|                                        | $\alpha_{g,V \parallel}$ [-]                 |    |       |    |       |     |        |     |            |     |         |     |
|                                        | $\alpha_{g,N \perp}$ [-]                     |    |       |    |       |     |        |     |            |     |         |     |
|                                        | $\alpha_{g,V \perp}$ [-]                     |    |       |    |       |     |        |     |            |     |         |     |
| Max. installation torque               | $T_{\text{inst,max}}$ [Nm]                   |    | 1     |    | 2     |     |        |     |            |     |         |     |

Upat injection system UPM 44 masonry

#### Performances

Light-weight concrete hollow block  
Species of brick, installation parameters

Annex C 36

Kind of masonry: Light-weight concrete hollow block Hbl

**Table C57: Characteristic values of resistance; tension load ( $N_{Rk}$ )**

| Use category                                  | w/w                                 |        | d/d   |        |
|-----------------------------------------------|-------------------------------------|--------|-------|--------|
| Temperature range [°C]                        | 50/80                               | 72/120 | 50/80 | 72/120 |
| Sleeve/anchor combinations                    | characteristic values $N_{Rk}$ [kN] |        |       |        |
| Compressive strength $f_b = 2 \text{ N/mm}^2$ |                                     |        |       |        |
| All sizes                                     | 0,40                                | 0,40   | 0,50  | 0,40   |
| Compressive strength $f_b = 4 \text{ N/mm}^2$ |                                     |        |       |        |
| All sizes                                     | 0,90                                | 0,75   | 0,90  | 0,75   |
| Compressive strength $f_b = 6 \text{ N/mm}^2$ |                                     |        |       |        |
| All sizes                                     | 1,20                                | 1,20   | 1,50  | 1,20   |

**Table C58: Characteristic values of resistance; shear load ( $V_{Rk}$ )**

| Use category                                  | w/w                                 |        | d/d   |        |
|-----------------------------------------------|-------------------------------------|--------|-------|--------|
| Temperature range [°C]                        | 50/80                               | 72/120 | 50/80 | 72/120 |
| Sleeve/anchor combinations                    | characteristic values $V_{Rk}$ [kN] |        |       |        |
| Compressive strength $f_b = 2 \text{ N/mm}^2$ |                                     |        |       |        |
| All sizes                                     | 0,90                                |        |       |        |
| Compressive strength $f_b = 4 \text{ N/mm}^2$ |                                     |        |       |        |
| All sizes                                     | 1,50                                |        |       |        |
| Compressive strength $f_b = 6 \text{ N/mm}^2$ |                                     |        |       |        |
| All sizes                                     | 2,50                                |        |       |        |

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

**Performances**

Light-weight concrete hollow block Hbl  
Characteristic values

**Annex C 37**



Kind of masonry: Solid brick Mz

Table C59: Parameters of brick

|                            |                              |                                 |
|----------------------------|------------------------------|---------------------------------|
| Species of brick           |                              | Solid brick Mz                  |
| Density                    | $\rho \geq [\text{kg/dm}^3]$ | 1,8                             |
| Compressive strength       | $f_b \geq [\text{N/mm}^2]$   | 10 or 20                        |
| Standard or approval       |                              | EN 771-1                        |
| Producer                   |                              | e.g. Nigra                      |
| Size, dimensions           | [mm]                         | $\geq 245 \times 118 \times 54$ |
| Minimum thickness of brick | $h_{\min}$ [mm]              | 118                             |

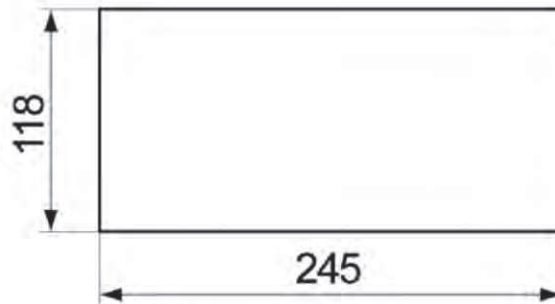


Table C60: Installation parameters for threaded rod and internal threaded anchor without perforated sleeve

| Size of threaded rod                                | M6                                           |     | M8 |     | M10 |     | M12 |     | M16 |     | UPM-I <sup>1)</sup><br>M6/M8 | UPM-I<br>M10/M12 |
|-----------------------------------------------------|----------------------------------------------|-----|----|-----|-----|-----|-----|-----|-----|-----|------------------------------|------------------|
| Effective anchorage depth $h_{ef}$ [mm]             | 50                                           | 100 | 50 | 100 | 50  | 100 | 50  | 100 | 50  | 100 | 85                           | 85               |
| Edge distance $c_{\min}$ [mm]                       | 60                                           |     |    |     |     |     |     |     |     |     |                              |                  |
| Spacing                                             | $s_{cr \parallel} = s_{\min \parallel}$ [mm] |     |    |     |     |     |     |     |     |     |                              |                  |
|                                                     | 245                                          |     |    |     |     |     |     |     |     |     |                              |                  |
| Group-factor                                        | $s_{cr \perp} = s_{\min \perp}$ [mm]         |     |    |     |     |     |     |     |     |     |                              |                  |
|                                                     | 60                                           |     |    |     |     |     |     |     |     |     |                              |                  |
|                                                     | $\alpha_{g,N \parallel}$ [-]                 |     |    |     |     |     |     |     |     |     |                              |                  |
|                                                     | $\alpha_{g,V \parallel}$ [-]                 |     |    |     |     |     |     |     |     |     |                              |                  |
| Max. installation torque $T_{\text{inst,max}}$ [Nm] | $\alpha_{g,N \perp}$ [-]                     |     |    |     |     |     |     |     |     |     |                              |                  |
|                                                     | $\alpha_{g,V \perp}$ [-]                     |     |    |     |     |     |     |     |     |     |                              |                  |
|                                                     |                                              | 4   | 10 |     |     |     |     |     |     |     |                              |                  |

<sup>1)</sup> For UPM-I with screw M6:  $T_{\text{inst,max}} = 4 \text{ Nm}$

Upat injection system UPM 44 masonry

**Performances**

Solid brick Mz

Species of brick, installation parameters

**Annex C 38**

Kind of masonry: Solid brick Mz

Table C61: Characteristic values of resistance; tension load ( $N_{Rk}$ )

| Use category                                   |                 | w/w                                 |        | d/d   |        |
|------------------------------------------------|-----------------|-------------------------------------|--------|-------|--------|
| Temperature range [°C]                         |                 | 50/80                               | 72/120 | 50/80 | 72/120 |
| Effective anchorage depth                      | Anchor size     | characteristic values $N_{RK}$ [kN] |        |       |        |
| Compressive strength $f_b = 10 \text{ N/mm}^2$ |                 |                                     |        |       |        |
| ≥ 50                                           | M6              | 0,60                                | 0,50   | 1,20  | 0,9    |
| 85                                             | UPM-I M6        |                                     |        |       |        |
| ≥ 50                                           | M8              | 0,90                                | 0,90   | 1,50  | 1,50   |
| 85                                             | UPM-I M8        | 0,75                                | 0,60   | 1,20  | 1,20   |
| ≥ 50                                           | M10 / M12 / M16 |                                     |        |       |        |
| 85                                             | UPM-I M10 / M12 |                                     |        |       |        |
| Compressive strength $f_b = 20 \text{ N/mm}^2$ |                 |                                     |        |       |        |
| ≥ 50                                           | M6              | 0,90                                | 0,75   | 1,50  | 1,20   |
| 85                                             | UPM-I M6        |                                     |        |       |        |
| ≥ 50                                           | M8              | 1,50                                | 1,20   | 2,50  | 2,00   |
| 85                                             | UPM-I M8        | 1,20                                | 0,90   | 2,00  | 1,50   |
| ≥ 50                                           | M10 / M12 / M16 |                                     |        |       |        |
| 85                                             | UPM-I M10 / M12 |                                     |        |       |        |

Table C62: Characteristic values of resistance; shear load ( $V_{Rk}$ )

| Use category                                   |             | w/w                                 |  | d/d   |        |
|------------------------------------------------|-------------|-------------------------------------|--|-------|--------|
| Temperature range                              |             | [°C]                                |  | 50/80 | 72/120 |
| Effective anchorage depth                      | Anchor size | characteristic values $V_{Rk}$ [kN] |  |       |        |
| Compressive strength $f_b = 10 \text{ N/mm}^2$ |             |                                     |  |       |        |
| ≥ 50                                           | M6          | 2,00                                |  |       |        |
| 85                                             | UPM-I M6    |                                     |  |       |        |
| ≥ 50                                           | M8          | 3,00                                |  |       |        |
| 85                                             | UPM-I M8    |                                     |  |       |        |
| ≥ 50                                           | M10         | 4,00                                |  |       |        |
| 85                                             | UPM-I M10   |                                     |  |       |        |
| ≥ 50                                           | M12         | 4,50                                |  |       |        |
| 85                                             | UPM-I M12   |                                     |  |       |        |
| ≥ 50                                           | M16         | 5,50                                |  |       |        |
| Compressive strength $f_b = 20 \text{ N/mm}^2$ |             |                                     |  |       |        |
| ≥ 50                                           | M6          | 2,50                                |  |       |        |
| 85                                             | UPM-I M6    |                                     |  |       |        |
| ≥ 50                                           | M8          | 4,00                                |  |       |        |
| 85                                             | UPM-I M8    |                                     |  |       |        |
| ≥ 50                                           | M10         | 5,50                                |  |       |        |
| 85                                             | UPM-I M10   |                                     |  |       |        |
| ≥ 50                                           | M12         | 6,00 (5,50) <sup>1</sup>            |  |       |        |
| 85                                             | UPM-I M12   |                                     |  |       |        |
| ≥ 50                                           | M16         | 8,00 (5,50) <sup>1</sup>            |  |       |        |

<sup>1)</sup> Characteristic value pushing out of one brick  $V_{Rk,pb} = 5,50 \text{ kN}$   
Factor for job site tests and displacements see Annex C78

Upat injection system UPM 44 masonry

**Performances**

Solid brick Mz  
Characteristic values

**Annex C 39**

## Kind of masonry: Perforated brick HLz

Table C63: Parameters of brick

| Species of brick           |                              | Perforated brick HLz |
|----------------------------|------------------------------|----------------------|
| Density                    | $\rho \geq [\text{kg/dm}^3]$ | 1,0                  |
| Compressive strength       | $f_b \geq [\text{N/mm}^2]$   | 2, 4, 6, 8, 10 or 12 |
| Standard or approval       |                              | EN 771-1             |
| Producer                   |                              | e.g. Wienerberger    |
| Size, dimensions           | [mm]                         | 255x120x118          |
| Minimum thickness of brick | $h_{\min}$ [mm]              | 120                  |

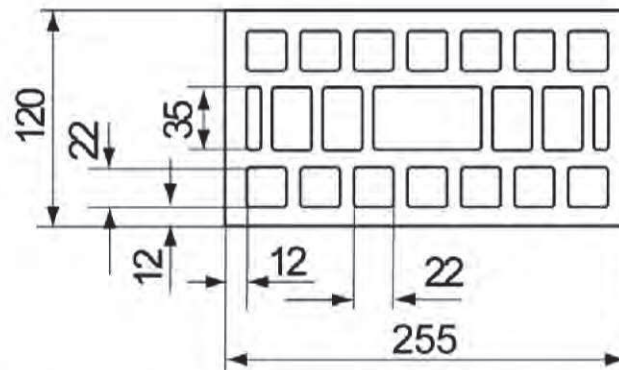


Table C64: Installation parameters for threaded rod with perforated sleeve and internal threaded anchor UPM-I with perforated sleeve

| Size of perforated sleeve              | 12x50                                       |    | 12x85 |    | 16x85 |     | 20x85   |     |
|----------------------------------------|---------------------------------------------|----|-------|----|-------|-----|---------|-----|
| Size of threaded rod                   | M6                                          | M8 | M6    | M8 | M8    | M10 | M12     | M16 |
| Size of internal threaded anchor UPM-I |                                             |    |       |    | M6/M8 |     | M10/M12 |     |
| Edge distance                          | $c_{min}$ [mm]                              |    | 60    |    |       |     |         |     |
| Spacing                                | $s_{cr \parallel} = s_{min \parallel}$ [mm] |    | 255   |    |       |     |         |     |
|                                        | $s_{cr \perp} = s_{min \perp}$ [mm]         |    | 120   |    |       |     |         |     |
| Group-factor                           | $\alpha_{g,N \parallel}$ [-]                |    | 2,0   |    |       |     |         |     |
|                                        | $\alpha_{g,V \parallel}$ [-]                |    |       |    |       |     |         |     |
|                                        | $\alpha_{g,N \perp}$ [-]                    |    |       |    |       |     |         |     |
|                                        | $\alpha_{g,V \perp}$ [-]                    |    |       |    |       |     |         |     |
| Max. installation torque               | $T_{inst,max}$ [Nm]                         |    | 2     |    |       |     |         |     |

Upat injection system UPM 44 masonry

## Performances

Perforated brick HLz

Species of brick, installation parameters

Annex C 40



| Kind of masonry: Perforated brick HLz                                     |                                         |                                     |        |            |        |
|---------------------------------------------------------------------------|-----------------------------------------|-------------------------------------|--------|------------|--------|
| Table C65: Characteristic values of resistance; tension load ( $N_{Rk}$ ) |                                         |                                     |        |            |        |
| Use category                                                              |                                         | w/w                                 |        | d/d        |        |
| Temperature range [°C]                                                    |                                         | 50/80                               | 72/120 | 50/80      | 72/120 |
| Sleeve/anchor combinations                                                | Sleeve/anchor combinations              | characteristic values $N_{Rk}$ [kN] |        |            |        |
| Compressive strength $f_b = 2 \text{ N/mm}^2$                             |                                         |                                     |        |            |        |
| 12x50 M6 / M8                                                             |                                         | 0,40                                | 0,30   | 0,50       | 0,40   |
| 12x85 M6 / M8                                                             | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8 | 0,50                                | 0,40   | 0,50       | 0,50   |
| 20x85 M12 / M16                                                           | 20x85 / UPM-I M10 / M12                 | --                                  | --     | --         | --     |
| Compressive strength $f_b = 4 \text{ N/mm}^2$                             |                                         |                                     |        |            |        |
| 12x50 M6 / M8                                                             |                                         | 0,90                                | 0,75   | 0,90       | 0,75   |
| 12x85 M6 / M8                                                             | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8 | 0,90                                | 0,90   | 1,20       | 0,90   |
| 20x85 M12 / M16                                                           | 20x85 / UPM-I M10 / M12                 | 0,50                                | 0,40   | 0,50       | 0,40   |
| Compressive strength $f_b = 6 \text{ N/mm}^2$                             |                                         |                                     |        |            |        |
| 12x50 M6 / M8                                                             |                                         | 1,20                                | 0,90   | 1,50       | 1,20   |
| 12x85 M6 / M8                                                             | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8 | 1,50                                | 1,20   | 1,50       | 1,50   |
| 20x85 M12 / M16                                                           | 20x85 / UPM-I M10 / M12                 | 0,75                                | 0,60   | 0,75       | 0,60   |
| Compressive strength $f_b = 8 \text{ N/mm}^2$                             |                                         |                                     |        |            |        |
| 12x50 M6 / M8                                                             |                                         | 1,50                                | 1,50   | 2,00       | 1,50   |
| 12x85 M6 / M8                                                             | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8 | 2,00                                | 1,50   | 2,00       | 2,00   |
| 20x85 M12 / M16                                                           | 20x85 / UPM-I M10 / M12                 | 0,90                                | 0,75   | 0,90       | 0,90   |
| Compressive strength $f_b = 10 \text{ N/mm}^2$                            |                                         |                                     |        |            |        |
| 12x50 M6 / M8                                                             |                                         | 2,00                                | 1,50   | 2,50       | 2,00   |
| 12x85 M6 / M8                                                             | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8 | 2,50                                | 2,00   | 2,50       | 2,50   |
| 20x85 M12 / M16                                                           | 20x85 / UPM-I M10 / M12                 | 1,20                                | 0,90   | 1,20       | 1,20   |
| Compressive strength $f_b = 12 \text{ N/mm}^2$                            |                                         |                                     |        |            |        |
| 12x50 M6 / M8                                                             |                                         | 2,50                                | 2,00   | 3,00       | 2,50   |
| 12x85 M6 / M8                                                             | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8 | 3,00                                | 2,50   | 3,50       | 2,50   |
| 20x85 M12 / M16                                                           | 20x85 / UPM-I M10 / M12                 | 1,50                                | 1,20   | 1,50       | 1,20   |
| Factor for job site tests and displacements see Annex C78.                |                                         |                                     |        |            |        |
| Upat injection system UPM 44 masonry                                      |                                         |                                     |        | Annex C 41 |        |
| Performances                                                              |                                         |                                     |        |            |        |
| Perforated brick HLz                                                      |                                         |                                     |        |            |        |
| Characteristic values tension load                                        |                                         |                                     |        |            |        |

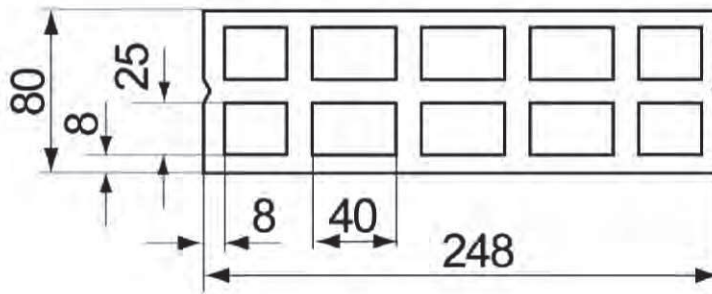
| Kind of masonry: Perforated brick HLz                                   |                                         |                                     |        |              |
|-------------------------------------------------------------------------|-----------------------------------------|-------------------------------------|--------|--------------|
| Table C66: Characteristic values of resistance; shear load ( $V_{Rk}$ ) |                                         |                                     |        |              |
| Use category                                                            |                                         | w/w                                 |        | d/d          |
| Temperature range [°C]                                                  |                                         | 50/80                               | 72/120 | 50/80 72/120 |
| Sleeve/anchor combinations                                              | Sleeve/anchor combinations              | characteristic values $V_{Rk}$ [kN] |        |              |
| Compressive strength $f_b = 2 \text{ N/mm}^2$                           |                                         |                                     |        |              |
| 12x50 M6                                                                | 12x85 M6                                | 0,60                                |        |              |
| 12x50 M8                                                                | 12x85 M8                                | 0,75                                |        |              |
| 20x85 M12 / M16<br>20x85 / UPM-I M10 / M12                              | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8 | 0,90                                |        |              |
| Compressive strength $f_b = 4 \text{ N/mm}^2$                           |                                         |                                     |        |              |
| 12x50 M6                                                                | 12x85 M6                                | 1,20                                |        |              |
| 12x50 M8                                                                | 12x85 M8                                | 1,50                                |        |              |
| 20x85 M12 / M16<br>20x85 / UPM-I M10 / M12                              | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8 | 2,00                                |        |              |
| Compressive strength $f_b = 6 \text{ N/mm}^2$                           |                                         |                                     |        |              |
| 12x50 M6                                                                | 12x85 M6                                | 2,00                                |        |              |
| 12x50 M8                                                                | 12x85 M8                                | 2,00                                |        |              |
| 20x85 M12 / M16<br>20x85 / UPM-I M10 / M12                              | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8 | 2,50                                |        |              |
| Compressive strength $f_b = 8 \text{ N/mm}^2$                           |                                         |                                     |        |              |
| 12x50 M6                                                                | 12x85 M6                                | 2,50                                |        |              |
| 12x50 M8                                                                | 12x85 M8                                | 3,00                                |        |              |
| 20x85 M12 / M16<br>20x85 / UPM-I M10 / M12                              | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8 | 3,50                                |        |              |
| Compressive strength $f_b = 10 \text{ N/mm}^2$                          |                                         |                                     |        |              |
| 12x50 M6                                                                | 12x85 M6                                | 3,00                                |        |              |
| 12x50 M8                                                                | 12x85 M8                                | 3,50                                |        |              |
| 20x85 M12 / M16<br>20x85 / UPM-I M10 / M12                              | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8 | 4,50                                |        |              |
| Compressive strength $f_b = 12 \text{ N/mm}^2$                          |                                         |                                     |        |              |
| 12x50 M6                                                                | 12x85 M6                                | 4,00                                |        |              |
| 12x50 M8                                                                | 12x85 M8                                | 4,50                                |        |              |
| 20x85 M12 / M16<br>20x85 / UPM-I M10 / M12                              | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8 | 5,50                                |        |              |
| Factor for job site tests and displacements see Annex C78.              |                                         |                                     |        |              |
| Upat injection system UPM 44 masonry                                    |                                         |                                     |        | Annex C 42   |
| Performances                                                            |                                         |                                     |        |              |
| Perforated brick HLz<br>Characteristic values shear load                |                                         |                                     |        |              |



**Kind of masonry: Perforated brick LLz**

**Table C67: Parameters of brick**

| Species of brick           |                              | Perforated brick LLz |
|----------------------------|------------------------------|----------------------|
| Density                    | $\rho \geq [\text{kg/dm}^3]$ | 0,7                  |
| Compressive strength       | $f_b \geq [\text{N/mm}^2]$   | 2, 4 or 6            |
| Standard or approval       |                              | EN 771-1             |
| Producer                   |                              |                      |
| Size, dimensions           | [mm]                         | 248x78x248           |
| Minimum thickness of brick | $h_{\min}$ [mm]              | 80                   |



**Table C68: Installation parameters for threaded rod with perforated sleeve**

|                           |                                      |         |
|---------------------------|--------------------------------------|---------|
| Size of perforated sleeve |                                      | 12x50   |
| Size of threaded rod      |                                      | M6   M8 |
| Edge distance             | $c_{\min}$ [mm]                      | 100     |
| Spacing                   | $s_{\min \parallel}$ [mm]            | 75      |
|                           | $s_{cr \parallel}$ [mm]              | 250     |
|                           | $s_{cr \perp} = s_{\min \perp}$ [mm] | 250     |
| Group-factor              | $\alpha_{g,N \parallel}$ [-]         | 1,6     |
|                           | $\alpha_{g,V \parallel}$ [-]         | 1,1     |
|                           | $\alpha_{g,N \perp}$ [-]             | 2,0     |
|                           | $\alpha_{g,V \perp}$ [-]             |         |
| Max. installation torque  | $T_{\text{inst,max}}$ [Nm]           | 2       |

Upat injection system UPM 44 masonry

**Performances**

Perforated brick LLz

Species of brick, installation parameters

**Annex C 43**



Kind of masonry: Perforated brick LLz

**Table C69: Characteristic values of resistance; tension load ( $N_{Rk}$ )**

| Use category                                  |                            | w/w                                 |        | d/d   |        |
|-----------------------------------------------|----------------------------|-------------------------------------|--------|-------|--------|
| Temperature range [°C]                        |                            | 50/80                               | 72/120 | 50/80 | 72/120 |
| Sleeve/anchor combinations                    | Sleeve/anchor combinations | characteristic values $N_{Rk}$ [kN] |        |       |        |
| Compressive strength $f_b = 2 \text{ N/mm}^2$ |                            |                                     |        |       |        |
| 12x50 M6 / M8                                 |                            | 0,50                                | 0,40   | 0,60  | 0,50   |
| Compressive strength $f_b = 4 \text{ N/mm}^2$ |                            |                                     |        |       |        |
| 12x50 M6 / M8                                 |                            | 0,90                                | 0,90   | 1,20  | 0,90   |
| Compressive strength $f_b = 6 \text{ N/mm}^2$ |                            |                                     |        |       |        |
| 12x50 M6 / M8                                 |                            | 1,50                                | 1,20   | 1,50  | 1,50   |

**Table C70: Characteristic values of resistance; shear load ( $V_{Rk}$ )**

| Use category                                  |                            | w/w                                 |        | d/d   |        |
|-----------------------------------------------|----------------------------|-------------------------------------|--------|-------|--------|
| Temperature range [°C]                        |                            | 50/80                               | 72/120 | 50/80 | 72/120 |
| Sleeve/anchor combinations                    | Sleeve/anchor combinations | characteristic values $V_{Rk}$ [kN] |        |       |        |
| Compressive strength $f_b = 2 \text{ N/mm}^2$ |                            |                                     |        |       |        |
| 12x50 M6 / M8                                 |                            | 0,50                                |        |       |        |
| Compressive strength $f_b = 4 \text{ N/mm}^2$ |                            |                                     |        |       |        |
| 12x50 M6 / M8                                 |                            | 0,90                                |        |       |        |
| Compressive strength $f_b = 6 \text{ N/mm}^2$ |                            |                                     |        |       |        |
| 12x50 M6 / M8                                 |                            | 1,50                                |        |       |        |

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

**Performances**  
Perforated brick LLz  
Characteristic values

**Annex C 44**

Kind of masonry: Perforated brick HLz

Table C71: Parameters of brick

|                            |                              |                             |
|----------------------------|------------------------------|-----------------------------|
| Species of brick           |                              | Perforated brick HLz        |
| Density                    | $\rho \geq [\text{kg/dm}^3]$ | 0,8                         |
| Compressive strength       | $f_b \geq [\text{N/mm}^2]$   | 6, 8, 12, 16 or 20          |
| Standard or approval       |                              | EN 771-1                    |
| Producer                   |                              | e.g. Cermanica Farreny S.A. |
| Size, dimensions           | [mm]                         | 275x130x94                  |
| Minimum thickness of brick | $h_{\min}$ [mm]              | 130                         |

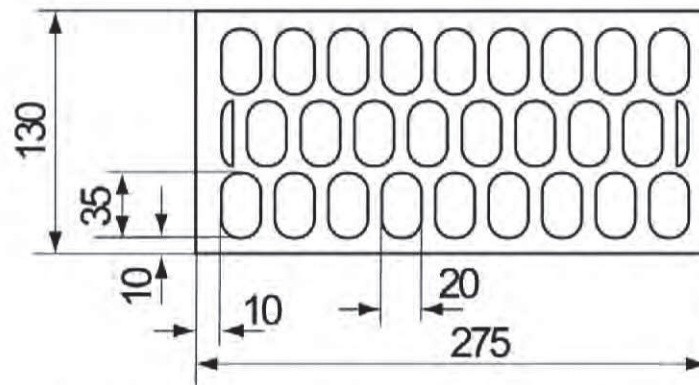


Table C72: Installation parameters for threaded rod with perforated sleeve and internal threaded anchor UPM-I with perforated sleeve

|                                        |                                             |  |       |    |       |    |       |     |         |     |
|----------------------------------------|---------------------------------------------|--|-------|----|-------|----|-------|-----|---------|-----|
| Size of perforated sleeve              |                                             |  | 12x50 |    | 12x85 |    | 16x85 |     | 20x85   |     |
| Size of threaded rod                   |                                             |  | M6    | M8 | M6    | M8 | M8    | M10 | M12     | M16 |
| Size of internal threaded anchor UPM-I |                                             |  |       |    |       |    | M6/M8 |     | M10/M12 |     |
| Edge distance                          | $c_{min}$ [mm]                              |  | 100   |    |       |    |       |     | 120     |     |
| Spacing                                | $s_{cr \parallel} = s_{min \parallel}$ [mm] |  | 275   |    |       |    |       |     |         |     |
|                                        | $s_{cr \perp} = s_{min \perp}$ [mm]         |  | 95    |    |       |    |       |     |         |     |
| Group-factor                           | $\alpha_{g,N \parallel}$ [-]                |  | 2,0   |    |       |    |       |     |         |     |
|                                        | $\alpha_{g,V \parallel}$ [-]                |  |       |    |       |    |       |     |         |     |
|                                        | $\alpha_{g,N \perp}$ [-]                    |  |       |    |       |    |       |     |         |     |
|                                        | $\alpha_{g,V \perp}$ [-]                    |  |       |    |       |    |       |     |         |     |
| Max. installation torque               | $T_{inst,max}$ [Nm]                         |  | 2     |    |       |    |       |     |         |     |

Upat injection system UPM 44 masonry

**Performances**

Perforated brick HLz

Species of brick, installation parameters

**Annex C 45**

Kind of masonry: Perforated brick HLz

Table C73: Characteristic values of resistance; tension load ( $N_{Rk}$ )

| Use category                                   |                                                                                       | w/w                                 |      | d/d   |        |
|------------------------------------------------|---------------------------------------------------------------------------------------|-------------------------------------|------|-------|--------|
| Temperature range                              |                                                                                       | [°C]                                |      | 50/80 | 72/120 |
| Sleeve/anchor combinations                     | Sleeve/anchor combinations                                                            | characteristic values $N_{Rk}$ [kN] |      |       |        |
| Compressive strength $f_b = 6 \text{ N/mm}^2$  |                                                                                       |                                     |      |       |        |
| 12x50 M6 / M8                                  |                                                                                       | 0,40                                | 0,30 | 0,40  | 0,40   |
| 12x85 M6 / M8                                  | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8<br>20x85 M12 / M16<br>20x85 / UPM-I M10 / M12 | 0,90                                | 0,75 | 0,90  | 0,75   |
| Compressive strength $f_b = 8 \text{ N/mm}^2$  |                                                                                       |                                     |      |       |        |
| 12x50 M6 / M8                                  |                                                                                       | 0,50                                | 0,40 | 0,60  | 0,50   |
| 12x85 M6 / M8                                  | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8<br>20x85 M12 / M16<br>20x85 / UPM-I M10 / M12 | 1,20                                | 0,90 | 1,20  | 0,90   |
| Compressive strength $f_b = 12 \text{ N/mm}^2$ |                                                                                       |                                     |      |       |        |
| 12x50 M6 / M8                                  |                                                                                       | 0,75                                | 0,60 | 0,90  | 0,75   |
| 12x85 M6 / M8                                  | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8<br>20x85 M12 / M16<br>20x85 / UPM-I M10 / M12 | 1,50                                | 1,50 | 2,00  | 1,50   |
| Compressive strength $f_b = 16 \text{ N/mm}^2$ |                                                                                       |                                     |      |       |        |
| 12x50 M6 / M8                                  |                                                                                       | 0,90                                | 0,90 | 1,20  | 0,90   |
| 12x85 M6 / M8                                  | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8<br>20x85 M12 / M16<br>20x85 / UPM-I M10 / M12 | 2,00                                | 2,00 | 2,50  | 2,00   |
| Compressive strength $f_b = 20 \text{ N/mm}^2$ |                                                                                       |                                     |      |       |        |
| 12x50 M6 / M8                                  |                                                                                       | 1,20                                | 1,20 | 1,50  | 1,20   |
| 12x85 M6 / M8                                  | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8<br>20x85 M12 / M16<br>20x85 / UPM-I M10 / M12 | 3,00                                | 2,50 | 3,00  | 2,50   |

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

**Performances**

Perforated brick HLz

Characteristic values tension load

**Annex C 46**



Kind of masonry: Perforated brick HLz

Table C74: Characteristic values of resistance; shear load ( $V_{Rk}$ )

| Use category                                   |                                                                                       | w/w                                 |  | d/d   |        |
|------------------------------------------------|---------------------------------------------------------------------------------------|-------------------------------------|--|-------|--------|
| Temperature range                              |                                                                                       | [°C]                                |  | 50/80 | 72/120 |
| Sleeve/anchor combinations                     | Sleeve/anchor combinations                                                            | characteristic values $V_{Rk}$ [kN] |  |       |        |
| Compressive strength $f_b = 6 \text{ N/mm}^2$  |                                                                                       |                                     |  |       |        |
| 12x50 M6 / M8                                  |                                                                                       | 1,2                                 |  |       |        |
| 12x85 M6 / M8                                  | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8<br>20x85 M12 / M16<br>20x85 / UPM-I M10 / M12 | 1,2                                 |  |       |        |
| Compressive strength $f_b = 8 \text{ N/mm}^2$  |                                                                                       |                                     |  |       |        |
| 12x50 M6 / M8                                  |                                                                                       | 1,5                                 |  |       |        |
| 12x85 M6 / M8                                  | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8<br>20x85 M12 / M16<br>20x85 / UPM-I M10 / M12 | 1,5                                 |  |       |        |
| Compressive strength $f_b = 12 \text{ N/mm}^2$ |                                                                                       |                                     |  |       |        |
| 12x50 M6 / M8                                  |                                                                                       | 2,0                                 |  |       |        |
| 12x85 M6 / M8                                  | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8<br>20x85 M12 / M16<br>20x85 / UPM-I M10 / M12 | 2,5                                 |  |       |        |
| Compressive strength $f_b = 16 \text{ N/mm}^2$ |                                                                                       |                                     |  |       |        |
| 12x50 M6 / M8                                  |                                                                                       | 3,0                                 |  |       |        |
| 12x85 M6 / M8                                  | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8<br>20x85 M12 / M16<br>20x85 / UPM-I M10 / M12 | 3,0                                 |  |       |        |
| Compressive strength $f_b = 20 \text{ N/mm}^2$ |                                                                                       |                                     |  |       |        |
| 12x50 M6 / M8                                  |                                                                                       | 4,0                                 |  |       |        |
| 12x85 M6 / M8                                  | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8<br>20x85 M12 / M16<br>20x85 / UPM-I M10 / M12 | 4,0                                 |  |       |        |

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

**Performances**  
 Perforated brick HLz  
 Characteristic values shear load

**Annex C 47**

Kind of masonry: Perforated brick LLz

Table C75: Parameters of brick

| Species of brick           |                              | Perforated brick LLz        |
|----------------------------|------------------------------|-----------------------------|
| Density                    | $\rho \geq [\text{kg/dm}^3]$ | 0,8                         |
| Compressive strength       | $f_b \geq [\text{N/mm}^2]$   | 2                           |
| Standard or approval       |                              | EN 771-1                    |
| Producer                   |                              | e.g. Cermanica Farreny S.A. |
| Size, dimensions           | [mm]                         | 128x88x275                  |
| Minimum thickness of brick | $h_{\min}$ [mm]              | 88                          |

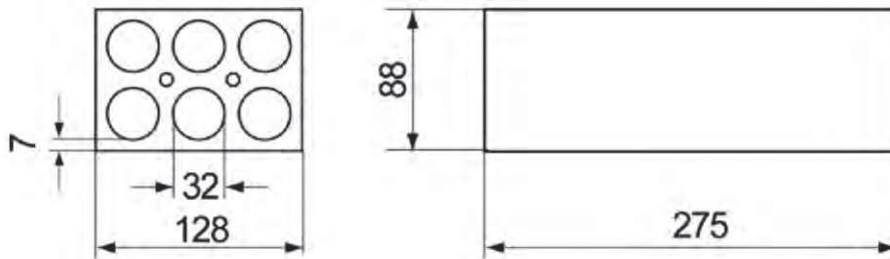


Table C76: Installation parameters for threaded rod with perforated sleeve

| Size of perforated sleeve |                            | 12x50 |    |
|---------------------------|----------------------------|-------|----|
| Size of threaded rod      |                            | M6    | M8 |
| Edge distance             | $c_{\min}$ [mm]            | 60    |    |
| Spacing                   | $s_{\min}$    [mm]         | 75    |    |
|                           | $s_{cr}$    [mm]           | 275   |    |
|                           | $s_{\min}$ $\perp$ [mm]    | 75    |    |
|                           | $s_{cr}$ $\perp$ [mm]      | 130   |    |
| Group-factor              | $\alpha_{g,N}$    [-]      | 1,3   |    |
|                           | $\alpha_{g,V}$    [-]      | 1,5   |    |
|                           | $\alpha_{g,N}$ $\perp$ [-] | 1,3   |    |
|                           | $\alpha_{g,V}$ $\perp$ [-] | 1,5   |    |
| Max. installation torque  | $T_{\text{inst,max}}$ [Nm] | 2     |    |

Upat injection system UPM 44 masonry

**Performances**  
 Perforated brick LLz  
 Species of brick, installation parameters

**Annex C 48**

Kind of masonry: Perforated brick LLz

**Table C77: Characteristic values of resistance; tension load ( $N_{Rk}$ )**

| Use category                                                   |                            | w/w                                              |        | d/d   |        |
|----------------------------------------------------------------|----------------------------|--------------------------------------------------|--------|-------|--------|
| Temperature range [°C]                                         |                            | 50/80                                            | 72/120 | 50/80 | 72/120 |
| Sleeve/anchor combinations                                     | Sleeve/anchor combinations | characteristic values <b>N<sub>Rk</sub></b> [kN] |        |       |        |
| Compressive strength <b>f<sub>b</sub> = 2 N/mm<sup>2</sup></b> |                            |                                                  |        |       |        |
| 12x50 M6 / M8                                                  |                            | 1,50                                             | 1,20   | 1,50  | 1,20   |

**Table C78: Characteristic values of resistance; shear load ( $V_{Rk}$ )**

| Use category                                  |                            | w/w                                 |        | d/d   |        |
|-----------------------------------------------|----------------------------|-------------------------------------|--------|-------|--------|
| Temperature range [°C]                        |                            | 50/80                               | 72/120 | 50/80 | 72/120 |
| Sleeve/anchor combinations                    | Sleeve/anchor combinations | characteristic values $V_{RK}$ [kN] |        |       |        |
| Compressive strength $f_b = 2 \text{ N/mm}^2$ |                            |                                     |        |       |        |
| 12x50 M6 / M8                                 |                            | 1.20                                |        |       |        |

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

**Performances**  
Perforated brick LLz  
Characteristic values

**Annex C 49**



Kind of masonry: Perforated brick HLz

Table C79: Parameters of brick

|                            |                              |                      |
|----------------------------|------------------------------|----------------------|
| Species of brick           |                              | Perforated brick HLz |
| Density                    | $\rho \geq [\text{kg/dm}^3]$ | 0,7                  |
| Compressive strength       | $f_b \geq [\text{N/mm}^2]$   | 6, 8 or 10           |
| Standard or approval       |                              | EN 771-1             |
| Producer                   |                              | e.g. Perceram        |
| Size, dimensions           | [mm]                         | 220x190x290          |
| Minimum thickness of brick | $h_{\min}$ [mm]              | 190                  |

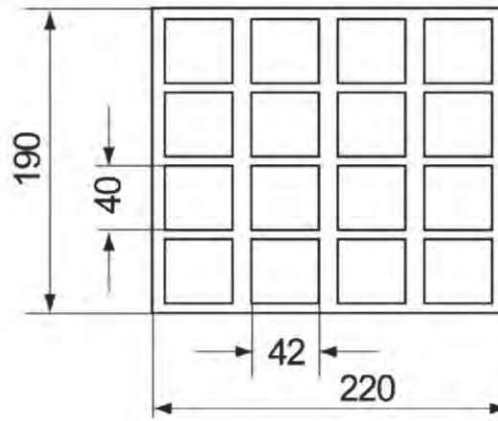


Table C80: Installation parameters for threaded rod with perforated sleeve and internal threaded anchor UPM-I with perforated sleeve

|                                              |                                             |         |          |          |            |           |           |            |
|----------------------------------------------|---------------------------------------------|---------|----------|----------|------------|-----------|-----------|------------|
| Size of perforated sleeve                    | 12x50                                       | 12x85   | 16x85    | 16x130   | 18x130/200 | 20x85     | 20x130    | 22x130/200 |
| Size of threaded rod                         | M6   M8                                     | M6   M8 | M8   M10 | M8   M10 | M10   M12  | M12   M16 | M12   M16 | M16        |
| Size of internal threaded anchor UPM-I       |                                             |         | M6/M8    |          |            | M10/M12   |           |            |
| Edge distance $c_{min}$ [mm]                 | 110                                         |         |          |          |            |           |           |            |
| Spacing                                      | $s_{cr \parallel} = s_{min \parallel}$ [mm] |         | 220      |          |            |           |           |            |
|                                              | $s_{cr \perp} = s_{min \perp}$ [mm]         |         | 290      |          |            |           |           |            |
| Group-factor                                 | $\alpha_{g,N \parallel}$ [-]                |         | 2,0      |          |            |           |           |            |
|                                              | $\alpha_{g,V \parallel}$ [-]                |         |          |          |            |           |           |            |
|                                              | $\alpha_{g,N \perp}$ [-]                    |         |          |          |            |           |           |            |
|                                              | $\alpha_{g,V \perp}$ [-]                    |         |          |          |            |           |           |            |
| Max. installation torque $T_{inst,max}$ [Nm] | 2                                           |         |          |          |            |           |           |            |

Upat injection system UPM 44 masonry

**Performances**

Perforated brick HLz

Species of brick, installation parameters

**Annex C 50**

Kind of masonry: Perforated brick HLz

Table C81: Characteristic values of resistance; tension load ( $N_{Rk}$ )

| Use category                                   |                                                                                       | w/w                                 |        | d/d   |        |
|------------------------------------------------|---------------------------------------------------------------------------------------|-------------------------------------|--------|-------|--------|
| Temperature range [°C]                         |                                                                                       | 50/80                               | 72/120 | 50/80 | 72/120 |
| Sleeve/anchor combinations                     | Sleeve/anchor combinations                                                            | characteristic values $N_{Rk}$ [kN] |        |       |        |
| Compressive strength $f_b = 6 \text{ N/mm}^2$  |                                                                                       |                                     |        |       |        |
| 12x50 M6 / M8                                  |                                                                                       | 0,30                                | --     | 0,40  | 0,30   |
| 12x85 M6 / M8                                  | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8<br>20x85 M12 / M16<br>20x85 / UPM-I M10 / M12 | 1,20                                | 1,20   | 1,50  | 1,20   |
| 20x130 M12 / M16<br>22x130/200 M16             | 16x130 M8 / M10<br>18x130/200 M10 / M12                                               | 1,50                                | 1,20   | 1,50  | 1,50   |
| Compressive strength $f_b = 8 \text{ N/mm}^2$  |                                                                                       |                                     |        |       |        |
| 12x50 M6 / M8                                  |                                                                                       | 0,50                                | 0,40   | 0,50  | 0,40   |
| 12x85 M6 / M8                                  | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8<br>20x85 M12 / M16<br>20x85 / UPM-I M10 / M12 | 1,50                                | 1,50   | 2,00  | 1,50   |
| 20x130 M12 / M16<br>22x130/200 M16             | 16x130 M8 / M10<br>18x130/200 M10 / M12                                               | 2,00                                | 1,50   | 2,50  | 2,00   |
| Compressive strength $f_b = 10 \text{ N/mm}^2$ |                                                                                       |                                     |        |       |        |
| 12x50 M6 / M8                                  |                                                                                       | 0,60                                | 0,50   | 0,60  | 0,50   |
| 12x85 M6 / M8                                  | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8<br>20x85 M12 / M16<br>20x85 / UPM-I M10 / M12 | 2,00                                | 2,00   | 2,50  | 2,00   |
| 20x130 M12 / M16<br>22x130/200 M16             | 16x130 M8 / M10<br>18x130/200 M10 / M12                                               | 2,50                                | 2,00   | 3,00  | 2,00   |

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

**Performances**

Perforated brick HLz

Characteristic values tension load

**Annex C 51**

Kind of masonry: Perforated brick HLz

Table C82: Characteristic values of resistance; shear load ( $V_{Rk}$ )

| Use category                                   |                                                                                       | w/w                                 |        | d/d   |        |
|------------------------------------------------|---------------------------------------------------------------------------------------|-------------------------------------|--------|-------|--------|
| Temperature range                              |                                                                                       | [°C]                                |        |       |        |
| Sleeve/anchor combinations                     | Sleeve/anchor combinations                                                            | 50/80                               | 72/120 | 50/80 | 72/120 |
| Compressive strength $f_b = 6 \text{ N/mm}^2$  |                                                                                       | characteristic values $V_{Rk}$ [kN] |        |       |        |
| 12x50 M6 / M8                                  |                                                                                       |                                     | 1,50   |       |        |
| 12x85 M6 / M8                                  | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8<br>20x85 M12 / M16<br>20x85 / UPM-I M10 / M12 |                                     | 1,50   |       |        |
| 16x130 M8 / M10                                |                                                                                       |                                     | 2,50   |       |        |
| 20x130 M12 / M16                               | 22x130/200 M16<br>18x130/200 M10 / M12                                                |                                     | 2,00   |       |        |
| Compressive strength $f_b = 8 \text{ N/mm}^2$  |                                                                                       |                                     |        |       |        |
| 12x50 M6 / M8                                  |                                                                                       |                                     | 2,00   |       |        |
| 12x85 M6 / M8                                  | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8<br>20x85 M12 / M16<br>20x85 / UPM-I M10 / M12 |                                     | 2,00   |       |        |
| 16x130 M8 / M10                                |                                                                                       |                                     | 3,50   |       |        |
| 20x130 M12 / M16                               | 22x130/200 M16<br>18x130/200 M10 / M12                                                |                                     | 3,00   |       |        |
| Compressive strength $f_b = 10 \text{ N/mm}^2$ |                                                                                       |                                     |        |       |        |
| 12x50 M6 / M8                                  |                                                                                       |                                     | 2,50   |       |        |
| 12x85 M6 / M8                                  | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8<br>20x85 M12 / M16<br>20x85 / UPM-I M10 / M12 |                                     | 3,00   |       |        |
| 16x130 M8 / M10                                |                                                                                       |                                     | 4,50   |       |        |
| 20x130 M12 / M16                               | 22x130/200 M16<br>18x130/200 M10 / M12                                                |                                     | 3,50   |       |        |

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

**Performances**  
Perforated brick HLz  
Characteristic values shear load

**Annex C 52**



Kind of masonry: Perforated brick HLz

Table C83: Parameters of brick

|                            |                              |                        |
|----------------------------|------------------------------|------------------------|
| pecies of brick            |                              | Perforated brick HLz   |
| Density                    | $\rho \geq [\text{kg/dm}^3]$ | 0,8                    |
| Compressive strength       | $f_b \geq [\text{N/mm}^2]$   | 2, 4 or 6              |
| Standard or approval       |                              | EN 771-1               |
| Producer                   |                              | e.g. Ziegelwerk Brenna |
| Size, dimensions           | [mm]                         | 253x300x240            |
| Minimum thickness of brick | $h_{\min}$ [mm]              | 300                    |

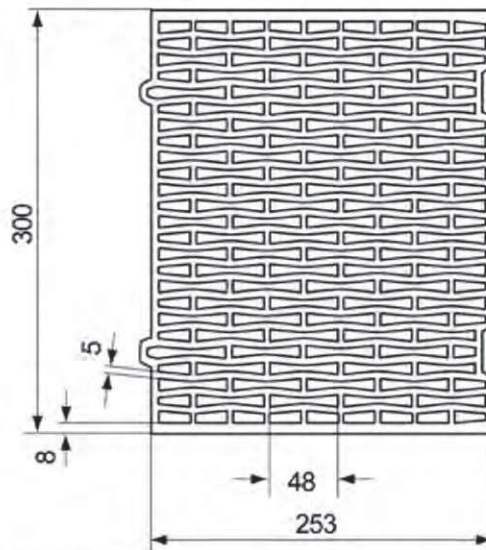


Table C84: Installation parameters for threaded rod with perforated sleeve and internal threaded anchor UPM-I with perforated sleeve

|                                                      |         |         |          |          |            |           |           |            |
|------------------------------------------------------|---------|---------|----------|----------|------------|-----------|-----------|------------|
| Size of perforated sleeve                            | 12x50   | 12x85   | 16x85    | 16x130   | 18x130/200 | 20x85     | 20x130    | 22x130/200 |
| Size of threaded rod                                 | M6   M8 | M6   M8 | M8   M10 | M8   M10 | M10   M12  | M12   M16 | M12   M16 | M16        |
| Size of internal threaded anchor UPM-I               |         |         | M6/M8    |          |            | M10/M12   |           |            |
| Edge distance $c_{\min}$ [mm]                        | 60      |         |          |          |            |           |           |            |
| Spacing $s_{cr \parallel} = s_{\min \parallel}$ [mm] | 255     |         |          |          |            |           |           |            |
| $s_{cr \perp} = s_{\min \perp}$ [mm]                 | 240     |         |          |          |            |           |           |            |
| Group-factor $\alpha_{g,N \parallel}$ [-]            | 2,0     |         |          |          |            |           |           |            |
| $\alpha_{g,V \parallel}$ [-]                         |         |         |          |          |            |           |           |            |
| $\alpha_{g,N \perp}$ [-]                             |         |         |          |          |            |           |           |            |
| $\alpha_{g,V \perp}$ [-]                             |         |         |          |          |            |           |           |            |
| Max. installation torque $T_{\text{inst,max}}$ [Nm]  | 2       |         |          |          |            |           |           |            |

Upat injection system UPM 44 masonry

**Performances**

Perforated brick HLz

Species of brick, installation parameters

**Annex C 53**

Kind of masonry: Perforated brick HLz

Table C85: Characteristic values of resistance; tension load ( $N_{Rk}$ )

| Use category                                  |                                                                                       | w/w                                 |        | d/d   |        |
|-----------------------------------------------|---------------------------------------------------------------------------------------|-------------------------------------|--------|-------|--------|
| Temperature range [°C]                        |                                                                                       | 50/80                               | 72/120 | 50/80 | 72/120 |
| Sleeve/anchor combinations                    | Sleeve/anchor combinations                                                            | characteristic values $N_{Rk}$ [kN] |        |       |        |
| Compressive strength $f_b = 2 \text{ N/mm}^2$ |                                                                                       |                                     |        |       |        |
| 12x50 M6 / M8                                 |                                                                                       | --                                  | --     | 0,30  | --     |
| 12x85 M6 / M8                                 | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8<br>20x85 M12 / M16<br>20x85 / UPM-I M10 / M12 | 0,50                                | 0,40   | 0,50  | 0,40   |
| 20x130 M12 / M16<br>22x130/200 / M16          | 16x130 M8 / M10<br>18x130/200 M10 / M12                                               | 0,40                                | 0,30   | 0,50  | 0,40   |
| Compressive strength $f_b = 4 \text{ N/mm}^2$ |                                                                                       |                                     |        |       |        |
| 12x50 M6 / M8                                 |                                                                                       | 0,50                                | 0,40   | 0,60  | 0,50   |
| 12x85 M6 / M8                                 | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8<br>20x85 M12 / M16<br>20x85 / UPM-I M10 / M12 | 0,90                                | 0,75   | 0,90  | 0,90   |
| 20x130 M12 / M16<br>22x130/200 / M16          | 16x130 M8 / M10<br>18x130/200 M10 / M12                                               | 0,90                                | 0,75   | 0,90  | 0,75   |
| Compressive strength $f_b = 6 \text{ N/mm}^2$ |                                                                                       |                                     |        |       |        |
| 12x50 M6 / M8                                 |                                                                                       | 0,75                                | 0,60   | 0,90  | 0,75   |
| 12x85 M6 / M8                                 | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8<br>20x85 M12 / M16<br>20x85 / UPM-I M10 / M12 | 1,50                                | 1,20   | 1,50  | 1,20   |
| 20x130 M12 / M16<br>22x130/200 / M16          | 16x130 M8 / M10<br>18x130/200 M10 / M12                                               | 1,20                                | 0,90   | 1,50  | 1,20   |

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

**Performances**  
Perforated brick HLz  
Characteristic values tension load

**Annex C 54**

**Kind of masonry: Perforated brick HLz**

**Table C86: Characteristic values of resistance; shear load ( $V_{Rk}$ )**

| Use category                                  |  | w/w                                                                                   |  | d/d                                 |        |       |        |
|-----------------------------------------------|--|---------------------------------------------------------------------------------------|--|-------------------------------------|--------|-------|--------|
| Temperature range                             |  | [°C]                                                                                  |  | 50/80                               | 72/120 | 50/80 | 72/120 |
| Sleeve/anchor combinations                    |  | Sleeve/anchor combinations                                                            |  | characteristic values $V_{Rk}$ [kN] |        |       |        |
| Compressive strength $f_b = 2 \text{ N/mm}^2$ |  |                                                                                       |  |                                     |        |       |        |
| 12x50 M6 / M8                                 |  |                                                                                       |  | 0,50                                |        |       |        |
| 12x85 M6 / M8<br>16x130 M8 / M10              |  | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8<br>18x130/200 M10 / M 12<br>20x85 / UPM-I M10 |  | 0,50                                |        |       |        |
| 20x130 M12 / M16<br>22x130/200 M16            |  | 20x85 M12 / M16<br>20 x 85, UPM-I M12                                                 |  | 0,60                                |        |       |        |
| Compressive strength $f_b = 4 \text{ N/mm}^2$ |  |                                                                                       |  |                                     |        |       |        |
| 12x50 M6 / M8                                 |  |                                                                                       |  | 0,90                                |        |       |        |
| 12x85 M6 / M8<br>16x130 M8 / M10              |  | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8<br>18x130/200 M10 / M 12<br>20x85 / UPM-I M10 |  | 0,90                                |        |       |        |
| 20x130 M12 / M16<br>22x130/200 M16            |  | 20x85 M12 / M16<br>20 x 85, UPM-I M12                                                 |  | 1,20                                |        |       |        |
| Compressive strength $f_b = 6 \text{ N/mm}^2$ |  |                                                                                       |  |                                     |        |       |        |
| 12x50 M6 / M8                                 |  |                                                                                       |  | 1,50                                |        |       |        |
| 12x85 M6 / M8<br>16x130 M8 / M10              |  | 16x85 M8 / M10<br>16x85 / UPM-I M6 / M8<br>18x130/200 M10 / M 12<br>20x85 / UPM-I M10 |  | 1,50                                |        |       |        |
| 20x130 M12 / M16<br>22x130/200 M16            |  | 20x85 M12 / M16<br>20x85, UPM-I M12                                                   |  | 1,50                                |        |       |        |

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

**Performances**

Perforated brick HLz

Characteristic values shear load

**Annex C 55**



Kind of masonry: Solid light-weight concrete block Vbl

Table C87: Parameters of brick

|                            |                              |                                       |
|----------------------------|------------------------------|---------------------------------------|
| Species of brick           |                              | Solid light-weight concrete block Vbl |
| Density                    | $\rho \geq [\text{kg/dm}^3]$ | 2,0                                   |
| Compressive strength       | $f_b \geq [\text{N/mm}^2]$   | 4, 6, 8 or 10                         |
| Standard or approval       |                              |                                       |
| Producer                   |                              | e.g. Roadstone wood                   |
| Size, dimensions           | [mm]                         | $\geq 440 \times 100 \times 215$      |
| Minimum thickness of brick | $h_{\min}$ [mm]              | 100                                   |

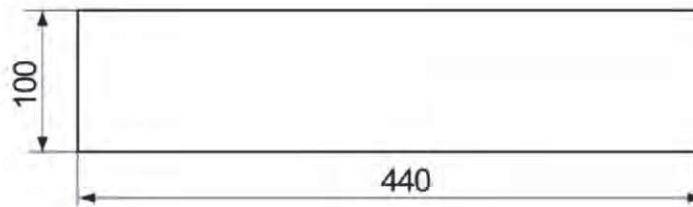


Table C88: Installation parameters for threaded rod (without perforated sleeve)

| Size of threaded rod                                |                                     | M6  |    | M8 |    | M10 |    | M12 |    | M16 |    |
|-----------------------------------------------------|-------------------------------------|-----|----|----|----|-----|----|-----|----|-----|----|
| Effective anchorage depth                           | $h_{\text{ef}}$ [mm]                | 50  | 70 | 50 | 70 | 50  | 70 | 50  | 70 | 50  | 70 |
| Edge distance                                       | $c_{\text{min}}$ [mm]               | 100 |    |    |    |     |    |     |    |     |    |
| Spacing                                             | $s_{\text{min}} \parallel$ [mm]     | 75  |    |    |    |     |    |     |    |     |    |
|                                                     | $s_{\text{cr}} \parallel$ [mm]      | 440 |    |    |    |     |    |     |    |     |    |
|                                                     | $s_{\text{min}} \perp$ [mm]         | 75  |    |    |    |     |    |     |    |     |    |
|                                                     | $s_{\text{cr}} \perp$ [mm]          | 215 |    |    |    |     |    |     |    |     |    |
| Group-factor                                        | $\alpha_{\text{g,N}} \parallel$ [-] | 1,6 |    |    |    |     |    |     |    |     |    |
|                                                     | $\alpha_{\text{g,V}} \parallel$ [-] | 1,3 |    |    |    |     |    |     |    |     |    |
|                                                     | $\alpha_{\text{g,N}} \perp$ [-]     | 1,4 |    |    |    |     |    |     |    |     |    |
|                                                     | $\alpha_{\text{g,V}} \perp$ [-]     | 1,3 |    |    |    |     |    |     |    |     |    |
| Max. installation torque $T_{\text{inst,max}}$ [Nm] |                                     | 4   |    | 10 |    |     |    |     |    |     |    |

Upat injection system UPM 44 masonry

**Performances**

Solid light-weight concrete block Vbl  
Species of brick, installation parameters

**Annex C 56**

Kind of masonry: Solid light-weight concrete block Vbl

Table C89: Characteristic values of resistance; tension load ( $N_{Rk}$ )

| Use category                                   |                      | w/w                                 |        | d/d   |        |
|------------------------------------------------|----------------------|-------------------------------------|--------|-------|--------|
| Temperature range [°C]                         |                      | 50/80                               | 72/120 | 50/80 | 72/120 |
| Effective anchorage depth                      | Anchor size          | characteristic values $N_{RK}$ [kN] |        |       |        |
| Compressive strength $f_b = 4 \text{ N/mm}^2$  |                      |                                     |        |       |        |
| $\geq 50$                                      | M6                   | 1,20                                | 0,90   | 2,00  | 1,50   |
|                                                | M8 / M10 / M12 / M16 | 1,20                                | 1,20   | 2,00  | 2,00   |
| Compressive strength $f_b = 6 \text{ N/mm}^2$  |                      |                                     |        |       |        |
| $\geq 50$                                      | M6                   | 1,50                                | 1,50   | 3,00  | 2,50   |
|                                                | M8 / M10 / M12 / M16 | 2,00                                | 1,50   | 3,50  | 2,50   |
| Compressive strength $f_b = 8 \text{ N/mm}^2$  |                      |                                     |        |       |        |
| $\geq 50$                                      | M6                   | 2,00                                | 2,00   | 4,00  | 3,00   |
|                                                | M8 / M10 / M12 / M16 | 2,50                                | 2,00   | 4,50  | 3,50   |
| Compressive strength $f_b = 10 \text{ N/mm}^2$ |                      |                                     |        |       |        |
| $\geq 50$                                      | M6                   | 3,00                                | 2,50   | 5,00  | 4,00   |
|                                                | M8 / M10 / M12 / M16 | 3,50                                | 2,50   | 5,50  | 4,50   |

Table C90: Characteristic values of resistance; shear load ( $V_{Rk}$ )

| Use category                                   |             | w/w                                 |  | d/d   |        |
|------------------------------------------------|-------------|-------------------------------------|--|-------|--------|
| Temperature range                              |             | [°C]                                |  | 50/80 | 72/120 |
| Effective anchorage depth                      | Anchor size | characteristic values $V_{Rk}$ [kN] |  |       |        |
| Compressive strength $f_b = 4 \text{ N/mm}^2$  |             |                                     |  |       |        |
| $\geq 50$                                      | M6          | 1,20                                |  |       |        |
|                                                | M8          | 1,50                                |  |       |        |
|                                                | M10 / M12   | 1,50                                |  |       |        |
|                                                | M16         | 1,50                                |  |       |        |
| Compressive strength $f_b = 6 \text{ N/mm}^2$  |             |                                     |  |       |        |
| $\geq 50$                                      | M6          | 2,00                                |  |       |        |
|                                                | M8          | 2,00                                |  |       |        |
|                                                | M10 / M12   | 2,50                                |  |       |        |
|                                                | M16         | 2,50                                |  |       |        |
| Compressive strength $f_b = 8 \text{ N/mm}^2$  |             |                                     |  |       |        |
| $\geq 50$                                      | M6          | 2,50                                |  |       |        |
|                                                | M8          | 2,50                                |  |       |        |
|                                                | M10 / M12   | 3,00                                |  |       |        |
|                                                | M16         | 3,50                                |  |       |        |
| Compressive strength $f_b = 10 \text{ N/mm}^2$ |             |                                     |  |       |        |
| $\geq 50$                                      | M6          | 3,00                                |  |       |        |
|                                                | M8          | 3,50                                |  |       |        |
|                                                | M10 / M12   | 4,00                                |  |       |        |
|                                                | M16         | 4,50                                |  |       |        |

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

**Performances**Solid light-weight concrete block Vbl  
Characteristic values**Annex C 57**

Kind of masonry: Solid light-weight concrete block Vbl

Table C91: Parameters of brick

|                            |                              |                                       |
|----------------------------|------------------------------|---------------------------------------|
| Species of brick           |                              | Solid light-weight concrete block Vbl |
| Density                    | $\rho \geq [\text{kg/dm}^3]$ | 2,0                                   |
| Compressive strength       | $f_b \geq [\text{N/mm}^2]$   | 6, 8, 10 or 12                        |
| Standard or approval       |                              |                                       |
| Producer                   |                              | e.g. Tramac                           |
| Size, dimensions           | [mm]                         | $\geq 440 \times 95 \times 215$       |
| Minimum thickness of brick | $h_{\min}$ [mm]              | 95                                    |

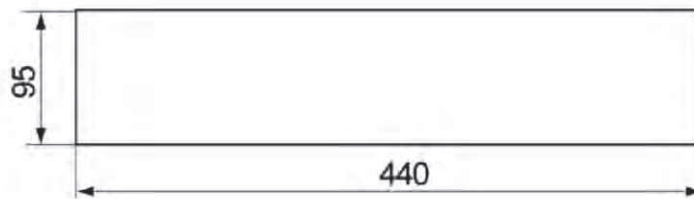


Table C92: Installation parameters for threaded rod without perforated sleeve

| Size of threaded rod      |                              | M6  |    | M8 |    | M10 |    | M12 |    | M16 |    |
|---------------------------|------------------------------|-----|----|----|----|-----|----|-----|----|-----|----|
| Effective anchorage depth | $h_{ef}$ [mm]                | 50  | 70 | 50 | 70 | 50  | 70 | 50  | 70 | 50  | 70 |
| Edge distance             | $c_{\min}$ [mm]              | 60  |    |    |    |     |    |     |    |     |    |
| Spacing                   | $s_{\min \parallel}$ [mm]    | 75  |    |    |    |     |    |     |    |     |    |
|                           | $s_{cr \parallel}$ [mm]      | 440 |    |    |    |     |    |     |    |     |    |
|                           | $s_{\min \perp}$ [mm]        | 75  |    |    |    |     |    |     |    |     |    |
|                           | $s_{cr \perp}$ [mm]          | 215 |    |    |    |     |    |     |    |     |    |
|                           | $\alpha_{g,N \parallel}$ [-] | 1,9 |    |    |    |     |    |     |    |     |    |
| Group-factor              | $\alpha_{g,V \parallel}$ [-] | 1,4 |    |    |    |     |    |     |    |     |    |
|                           | $\alpha_{g,N \perp}$ [-]     | 1,9 |    |    |    |     |    |     |    |     |    |
|                           | $\alpha_{g,V \perp}$ [-]     | 1,4 |    |    |    |     |    |     |    |     |    |
| Max. installation torque  | $T_{\text{inst,max}}$ [Nm]   | 4   |    | 10 |    |     |    |     |    |     |    |

Upat injection system UPM 44 masonry

#### Performances

Solid light-weight concrete block Vbl  
Species of brick, installation parameters

Annex C 58



Kind of masonry: Solid light-weight concrete block Vbl

Table C93: Characteristic values of resistance; tension load ( $N_{Rk}$ )

| Use category                                   |                           | w/w                                 |        | d/d   |        |
|------------------------------------------------|---------------------------|-------------------------------------|--------|-------|--------|
| Temperature range [°C]                         |                           | 50/80                               | 72/120 | 50/80 | 72/120 |
| Effective anchorage depth                      | Anchor size               | characteristic values $N_{Rk}$ [kN] |        |       |        |
| Compressive strength $f_b = 6 \text{ N/mm}^2$  |                           |                                     |        |       |        |
| 50                                             | M6 / M8 / M10 / M12 / M16 | 1,50                                | 1,20   | 2,50  | 2,00   |
| 70                                             | M6 / M8                   | 2,00                                | 1,50   | 3,50  | 3,00   |
|                                                | M10 / M12 / M16           | 2,00                                | 2,00   | 3,50  | 3,00   |
| Compressive strength $f_b = 8 \text{ N/mm}^2$  |                           |                                     |        |       |        |
| 50                                             | M6 / M8 / M10 / M12 / M16 | 2,00                                | 1,50   | 3,50  | 3,00   |
| 70                                             | M6 / M8                   | 2,50                                | 2,00   | 4,50  | 4,00   |
|                                                | M10 / M12 / M16           | 3,00                                | 2,50   | 5,00  | 4,00   |
| Compressive strength $f_b = 10 \text{ N/mm}^2$ |                           |                                     |        |       |        |
| 50                                             | M6 / M8 / M10 / M12 / M16 | 2,50                                | 2,00   | 4,50  | 3,50   |
| 70                                             | M6 / M8                   | 3,50                                | 3,00   | 6,00  | 5,00   |
|                                                | M10 / M12 / M16           | 3,50                                | 3,00   | 6,00  | 5,00   |
| Compressive strength $f_b = 12 \text{ N/mm}^2$ |                           |                                     |        |       |        |
| 50                                             | M6 / M8 / M10 / M12 / M16 | 3,00                                | 2,50   | 5,00  | 4,50   |
| 70                                             | M6 / M8                   | 4,00                                | 3,50   | 7,00  | 6,00   |
|                                                | M10 / M12 / M16           | 4,50                                | 3,50   | 7,50  | 6,00   |

Table C94: Characteristic values of resistance; shear load ( $V_{Rk}$ )

| Use category                                   |             | w/w                                 |  | d/d   |        |
|------------------------------------------------|-------------|-------------------------------------|--|-------|--------|
| Temperature range                              |             | [°C]                                |  | 50/80 | 72/120 |
| Effective anchorage depth                      | Anchor size | characteristic values $V_{Rk}$ [kN] |  |       |        |
| Compressive strength $f_b = 6 \text{ N/mm}^2$  |             |                                     |  |       |        |
| ≥ 50                                           | M6 / M8     | 2,00                                |  |       |        |
|                                                | M10         | 2,00                                |  |       |        |
|                                                | M12 / M16   | 1,50                                |  |       |        |
| Compressive strength $f_b = 8 \text{ N/mm}^2$  |             |                                     |  |       |        |
| ≥ 50                                           | M6 / M8     | 2,50                                |  |       |        |
|                                                | M10         | 3,00                                |  |       |        |
|                                                | M12 / M16   | 2,50                                |  |       |        |
| Compressive strength $f_b = 10 \text{ N/mm}^2$ |             |                                     |  |       |        |
| ≥ 50                                           | M6 / M8     | 3,50                                |  |       |        |
|                                                | M10         | 4,00                                |  |       |        |
|                                                | M12 / M16   | 3,00                                |  |       |        |
| Compressive strength $f_b = 12 \text{ N/mm}^2$ |             |                                     |  |       |        |
| ≥ 50                                           | M6 / M8     | 4,00                                |  |       |        |
|                                                | M10         | 4,50                                |  |       |        |
|                                                | M12 / M16   | 3,50                                |  |       |        |

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

**Performances**Solid light-weight concrete block Vbl  
Characteristic values**Annex C 59**

Kind of masonry: Light-weight concrete hollow block Hbl

Table C95: Parameters of brick

|                            |                              |                                        |
|----------------------------|------------------------------|----------------------------------------|
| Species of brick           |                              | Light-weight concrete hollow block Hbl |
| Density                    | $\rho \geq [\text{kg/dm}^3]$ | 1,2                                    |
| Compressive strength       | $f_b \geq [\text{N/mm}^2]$   | 4, 6, 8 or 10                          |
| Standard or approval       |                              | EN771-3                                |
| Producer                   |                              | e.g. Roadstone wood                    |
| Size, dimensions           | [mm]                         | $\geq 440 \times 215 \times 215$       |
| Minimum thickness of brick | $h_{\min}$ [mm]              | 215                                    |

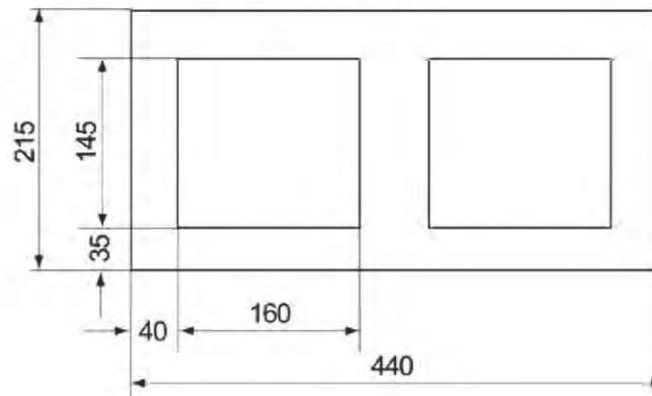


Table C96: Installation parameters for threaded rod and internal threaded anchor UPM-I with perforated sleeve

| Size of perforated sleeve              |                              | 12x50 |    | 12x85 |    | 16x85 |     | 16x130 |     | 18x130/200 |     | 20x85   |     | 20x130 |     | 22x130/200 |  |
|----------------------------------------|------------------------------|-------|----|-------|----|-------|-----|--------|-----|------------|-----|---------|-----|--------|-----|------------|--|
| Size of threaded rod                   |                              | M6    | M8 | M6    | M8 | M8    | M10 | M8     | M10 | M10        | M12 | M12     | M16 | M12    | M16 | M16        |  |
| Size of internal threaded anchor UPM-I |                              |       |    |       |    | M6/M8 |     |        |     |            |     | M10/M12 |     |        |     |            |  |
| Edge distance                          | $c_{\min}$ [mm]              | 110   |    |       |    |       |     |        |     |            |     |         |     |        |     |            |  |
| Spacing                                | $s_{\min \parallel}$ [mm]    | 100   |    |       |    |       |     |        |     |            |     |         |     |        |     |            |  |
|                                        | $s_{cr \parallel}$ [mm]      | 440   |    |       |    |       |     |        |     |            |     |         |     |        |     |            |  |
|                                        | $s_{\min \perp}$ [mm]        | 100   |    |       |    |       |     |        |     |            |     |         |     |        |     |            |  |
|                                        | $s_{cr \perp}$ [mm]          | 215   |    |       |    |       |     |        |     |            |     |         |     |        |     |            |  |
|                                        | $\alpha_{g,N \parallel}$ [-] | 1,4   |    |       |    |       |     |        |     |            |     |         |     |        |     |            |  |
| Group-factor                           | $\alpha_{g,V \parallel}$ [-] | 2,0   |    |       |    |       |     |        |     |            |     |         |     |        |     |            |  |
|                                        | $\alpha_{g,N \perp}$ [-]     | 1,4   |    |       |    |       |     |        |     |            |     |         |     |        |     |            |  |
|                                        | $\alpha_{g,V \perp}$ [-]     | 1,2   |    |       |    |       |     |        |     |            |     |         |     |        |     |            |  |
| Max. installation torque               | $T_{\text{inst,max}}$ [Nm]   | 2     |    |       |    |       |     |        |     |            |     |         |     |        |     |            |  |

Upat injection system UPM 44 masonry

**Performances**

Light-weight concrete hollow block Hbl  
Species of brick, installation parameters

**Annex C 60**



Kind of masonry: Light-weight concrete hollow block Hbl

Table C97: Characteristic values of resistance; tension load ( $N_{Rk}$ )

| Use category                                   |                            | w/w                                 |      | d/d   |        |
|------------------------------------------------|----------------------------|-------------------------------------|------|-------|--------|
| Temperature range                              |                            | [°C]                                |      | 50/80 | 72/120 |
| Sleeve/anchor combinations                     | Sleeve/anchor combinations | characteristic values $N_{Rk}$ [kN] |      |       |        |
| Compressive strength $f_b = 4 \text{ N/mm}^2$  |                            |                                     |      |       |        |
| 12x50 M6 / M8                                  | 12x85 M6 / M8              | 0,90                                | 0,90 | 1,20  | 0,90   |
| 16x85 M8 / M10                                 | 16x130 M8 / M10            | 1,20                                | 0,90 | 1,50  | 1,20   |
| 16x85 / UPM-I M6 / M8                          | 18x130/200 M10 / M12       |                                     |      |       |        |
| 20x85 M12 / M16                                | 22x130/200 M16             | 2,00                                | 1,50 | 2,00  | 1,50   |
| 20x130 M12 / M16                               | 20x85 UPM-I M10 / M 12     |                                     |      |       |        |
| Compressive strength $f_b = 6 \text{ N/mm}^2$  |                            |                                     |      |       |        |
| 12x50 M6 / M8                                  | 12x85 M6 / M8              | 1,50                                | 1,20 | 1,50  | 1,50   |
| 16x85 M8 / M10                                 | 16x130 M8 / M10            | 2,00                                | 1,50 | 2,00  | 1,50   |
| 16x85 / UPM-I M6 / M8                          | 18x130/200 M10 / M12       |                                     |      |       |        |
| 20x85 M12 / M16                                | 22x130/200 M16             | 3,00                                | 2,50 | 3,00  | 2,50   |
| 20x130 M12 / M16                               | 20x85 UPM-I M10 / M 12     |                                     |      |       |        |
| Compressive strength $f_b = 8 \text{ N/mm}^2$  |                            |                                     |      |       |        |
| 12x50 M6 / M8                                  | 12x85 M6 / M8              | 2,00                                | 1,50 | 2,00  | 2,00   |
| 16x85 M8 / M10                                 | 16x130 M8 / M10            | 2,50                                | 2,00 | 3,00  | 2,50   |
| 16x85 / UPM-I M6 / M8                          | 18x130/200 M10 / M12       |                                     |      |       |        |
| 20x85 M12 / M16                                | 22x130/200 M16             | 3,50                                | 3,00 | 4,00  | 3,50   |
| 20x130 M12 / M16                               | 20x85 UPM-I M10 / M 12     |                                     |      |       |        |
| Compressive strength $f_b = 10 \text{ N/mm}^2$ |                            |                                     |      |       |        |
| 12x50 M6 / M8                                  | 12x85 M6 / M8              | 2,50                                | 2,00 | 3,00  | 2,50   |
| 16x85 M8 / M10                                 | 16x130 M8 / M10            | 3,00                                | 2,50 | 3,50  | 3,00   |
| 16x85 / UPM-I M6 / M8                          | 18x130/200 M10 / M12       |                                     |      |       |        |
| 20x85 M12 / M16                                | 22x130/200 M16             | 4,50                                | 4,00 | 5,00  | 4,50   |
| 20x130 M12 / M16                               | 20x85 UPM-I M10 / M 12     |                                     |      |       |        |

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

#### Performances

Light-weight concrete hollow block Hbl  
Characteristic values tension load

**Annex C 61**



Kind of masonry: Light-weight concrete hollow block Hbl

Table C98: Characteristic values of resistance; shear load ( $V_{Rk}$ )

| Use category                                                                  |                                                                                                  | w/w                        |  | d/d                                 |        |
|-------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|----------------------------|--|-------------------------------------|--------|
| Temperature range                                                             |                                                                                                  | [°C]                       |  | 50/80                               | 72/120 |
| Sleeve/anchor combinations                                                    |                                                                                                  | Sleeve/anchor combinations |  | characteristic values $V_{Rk}$ [kN] |        |
| Compressive strength $f_b = 4 \text{ N/mm}^2$                                 |                                                                                                  |                            |  |                                     |        |
| 12x50 M6<br>12x85 M6                                                          | 16x85 / UPM-I M6                                                                                 | 0,75                       |  |                                     |        |
| 12x50 M8<br>12x85 M8<br>16x85 M8 / M10<br>16x85 / UPM-I M8<br>16x130 M8 / M10 | 20x85 M12 / M16<br>20x85 UPM-I M10 / M12<br>20x130 M12 / M16<br>18x130/200 M12<br>22x130/200 M16 | 1,20                       |  |                                     |        |
| Compressive strength $f_b = 6 \text{ N/mm}^2$                                 |                                                                                                  |                            |  |                                     |        |
| 12x50 M6<br>12x85 M6                                                          | 16x85 / UPM-I M6                                                                                 | 1,20                       |  |                                     |        |
| 12x50 M8<br>12x85 M8<br>16x85 M8 / M10<br>16x85 / UPM-I M8<br>16x130 M8 / M10 | 20x85 M12 / M16<br>20x85 UPM-I M10 / M12<br>20x130 M12 / M16<br>18x130/200 M12<br>22x130/200 M16 | 2,00                       |  |                                     |        |
| Compressive strength $f_b = 8 \text{ N/mm}^2$                                 |                                                                                                  |                            |  |                                     |        |
| 12x50 M6<br>12x85 M6                                                          | 16x85 / UPM-I M6                                                                                 | 1,50                       |  |                                     |        |
| 12x50 M8<br>12x85 M8<br>16x85 M8 / M10<br>16x85 / UPM-I M8<br>16x130 M8 / M10 | 20x85 M12 / M16<br>20x85 UPM-I M10 / M12<br>20x130 M12 / M16<br>18x130/200 M12<br>22x130/200 M16 | 2,50                       |  |                                     |        |
| Compressive strength $f_b = 10 \text{ N/mm}^2$                                |                                                                                                  |                            |  |                                     |        |
| 12x50 M6<br>12x85 M6                                                          | 16x85 / UPM-I M6                                                                                 | 2,00                       |  |                                     |        |
| 12x50 M8<br>12x85 M8<br>16x85 M8 / M10<br>16x85 / UPM-I M8<br>16x130 M8 / M10 | 20x85 M12 / M16<br>20x85 UPM-I M10 / M12<br>20x130 M12 / M16<br>18x130/200 M12<br>22x130/200 M16 | 3,00                       |  |                                     |        |

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

**Performances**

Light-weight concrete hollow block Hbl  
Characteristic values shear load

**Annex C 62**

Kind of masonry: Solid brick Mz

### Table C99: Parameters of brick

|                            |                              |                                 |
|----------------------------|------------------------------|---------------------------------|
| Species of brick           |                              | Solid brick Mz                  |
| Density                    | $\rho \geq [\text{kg/dm}^3]$ | 1,8                             |
| Compressive strength       | $f_b \geq [\text{N/mm}^2]$   | 10 or 20                        |
| Standard or approval       |                              | EN 771-2                        |
| Producer                   |                              | e.g. Wienerberger               |
| Size, dimensions           | [mm]                         | $\geq 228 \times 108 \times 54$ |
| Minimum thickness of brick | $h_{\min}$ [mm]              | 108                             |



**Table C100: Installation parameters for threaded rod and internal threaded anchor without perforated sleeve**

| Size of threaded rod                                | M6  |    | M8 |    | M10 |    | M12 |    | M16 |    | UPM-I <sup>1)</sup><br>M6/M8 | UPM-I<br>M10/M12 |
|-----------------------------------------------------|-----|----|----|----|-----|----|-----|----|-----|----|------------------------------|------------------|
| Effective anchorage depth $h_{ef}$ [mm]             | 50  | 90 | 50 | 90 | 50  | 90 | 50  | 90 | 50  | 90 | 85                           | 85               |
| Edge distance $c_{min}$ [mm]                        | 60  |    |    |    |     |    |     |    |     |    |                              |                  |
| Spacing $s_{cr \parallel} = s_{min \parallel}$ [mm] | 230 |    |    |    |     |    |     |    |     |    |                              |                  |
| $s_{cr \perp} = s_{min \perp}$ [mm]                 | 60  |    |    |    |     |    |     |    |     |    |                              |                  |
| Group-factor $\alpha_{g,N \parallel}$ [-]           | 2,0 |    |    |    |     |    |     |    |     |    |                              |                  |
| $\alpha_{g,V \parallel}$ [-]                        |     |    |    |    |     |    |     |    |     |    |                              |                  |
| $\alpha_{g,N \perp}$ [-]                            |     |    |    |    |     |    |     |    |     |    |                              |                  |
| $\alpha_{g,V \perp}$ [-]                            |     |    |    |    |     |    |     |    |     |    |                              |                  |
| Max. installation torque $T_{inst,max}$ [Nm]        | 4   |    | 10 |    |     |    |     |    |     |    |                              |                  |

<sup>1)</sup> For UPM-I with screw M6:  $T_{\text{inst,max}} = 4 \text{ Nm}$

|                                                                |                   |
|----------------------------------------------------------------|-------------------|
| Upat injection system UPM 44 masonry                           | <b>Annex C 63</b> |
| <b>Performances</b><br>Solid brick Mz<br>Characteristic values |                   |

Kind of masonry: Solid brick Mz

Table C101: Characteristic values of resistance; tension load ( $N_{Rk}$ )

| Use category                                   |                                  | w/w                                 |        | d/d   |        |
|------------------------------------------------|----------------------------------|-------------------------------------|--------|-------|--------|
| Temperature range [°C]                         |                                  | 50/80                               | 72/120 | 50/80 | 72/120 |
| Effective anchorage depth                      | Anchor size                      | characteristic values $N_{RK}$ [kN] |        |       |        |
| Compressive strength $f_b = 10 \text{ N/mm}^2$ |                                  |                                     |        |       |        |
| ≥ 50                                           | M6                               | 0,60                                | 0,50   | 1,20  | 0,90   |
| ≥ 50                                           | M8                               | 0,90                                | 0,90   | 1,50  | 1,50   |
| ≥ 50                                           | M10 / M12 / M16                  | 0,75                                | 0,60   | 1,20  | 1,20   |
| 85                                             | UPM-I M6 / M8<br>UPM-I M10 / M12 |                                     |        |       |        |
| Compressive strength $f_b = 20 \text{ N/mm}^2$ |                                  |                                     |        |       |        |
| ≥ 50                                           | M6                               | 0,90                                | 0,75   | 1,50  | 1,20   |
| ≥ 50                                           | M8                               | 1,50                                | 1,20   | 2,50  | 2,00   |
| ≥ 50                                           | M10 / M12 / M16                  | 1,20                                | 0,90   | 2,00  | 1,50   |
| 85                                             | UPM-I M6 / M8<br>UPM-I M10 / M12 |                                     |        |       |        |

Table C102: Characteristic values of resistance; shear load ( $V_{Rk}$ )

| Use category                                   |             | w/w                                 |        | d/d   |        |
|------------------------------------------------|-------------|-------------------------------------|--------|-------|--------|
| Temperature range [°C]                         |             | 50/80                               | 72/120 | 50/80 | 72/120 |
| Effective anchorage depth                      | Anchor size | characteristic values $V_{Rk}$ [kN] |        |       |        |
| Compressive strength $f_b = 10 \text{ N/mm}^2$ |             |                                     |        |       |        |
| ≥ 50                                           | M6          | 2,00                                |        |       |        |
| 85                                             | UPM-I M6    |                                     |        |       |        |
| ≥ 50                                           | M8          | 3,00                                |        |       |        |
| 85                                             | UPM-I M8    |                                     |        |       |        |
| ≥ 50                                           | M10         | 4,00                                |        |       |        |
| 85                                             | UPM-I M10   |                                     |        |       |        |
| ≥ 50                                           | M12         | 4,50                                |        |       |        |
| 85                                             | UPM-I M12   |                                     |        |       |        |
| ≥ 50                                           | M16         | 5,50                                |        |       |        |
| Compressive strength $f_b = 20 \text{ N/mm}^2$ |             |                                     |        |       |        |
| ≥ 50                                           | M6          | 2,50                                |        |       |        |
| 85                                             | UPM-I M6    |                                     |        |       |        |
| ≥ 50                                           | M8          | 4,00                                |        |       |        |
| 85                                             | UPM-I M8    |                                     |        |       |        |
| ≥ 50                                           | M10         | 5,50                                |        |       |        |
| 85                                             | UPM-I M10   |                                     |        |       |        |
| ≥ 50                                           | M12         | 6,00 (5,5) <sup>1</sup>             |        |       |        |
| 85                                             | UPM-I M12   |                                     |        |       |        |
| ≥ 50                                           | M16         | 8,00 (5,5) <sup>1</sup>             |        |       |        |

<sup>1)</sup> Characteristic value pushing out of one brick  $V_{Rk,pb} = 5,50 \text{ kN}$ 

Factor for job site tests and displacements see Annex C78

Upat injection system UPM 44 masonry

**Performances**  
Solid brick Mz  
Characteristic values

**Annex C 64**



Kind of masonry: Solid sand-lime block KS

Table C103: Parameters of brick

| Species of brick           |                              | Solid sand-lime block KS         |     |
|----------------------------|------------------------------|----------------------------------|-----|
| Density                    | $\rho \geq [\text{kg/dm}^3]$ | 1,8                              | 2,2 |
| Compressive strength       | $f_b \geq [\text{N/mm}^2]$   | 10, 20                           | 36  |
| Standard or approval       |                              | EN 771-2                         |     |
| Producer                   |                              | e.g. Calduran                    |     |
| Size, dimensions           | [mm]                         | $\geq 997 \times 214 \times 538$ |     |
| Minimum thickness of brick | $h_{\min}$ [mm]              | 214                              |     |

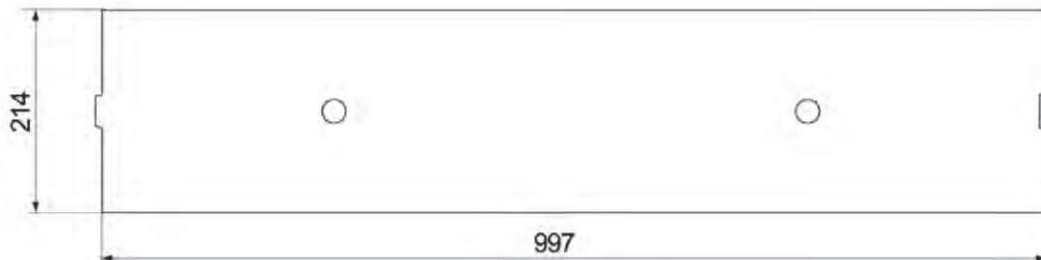


Table C104: Installation parameters for threaded rod and internal threaded anchor without perforated sleeve

| Size of threaded rod                                   | M6                                             |     | M8  |     | M10 |     | M12 |     | M16 |     | UPM-I <sup>1)</sup><br>M6/M8 | UPM-I<br>M10/M12 |
|--------------------------------------------------------|------------------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------------------------------|------------------|
| Effective anchorage depth<br>h <sub>ef</sub> [mm]      | 50                                             | 100 | 50  | 100 | 50  | 100 | 50  | 100 | 50  | 100 | 85                           | 85               |
| Edge distance<br>c <sub>min</sub> [mm]                 | 75                                             |     |     |     |     |     |     |     |     |     |                              |                  |
| Spacing                                                | s <sub>min</sub>    = s <sub>min</sub>    [mm] |     | 300 |     |     |     |     |     |     |     |                              |                  |
|                                                        | s <sub>min</sub> ⊥ = s <sub>min</sub> ⊥ [mm]   |     | 300 |     |     |     |     |     |     |     |                              |                  |
| Group-factor                                           | α <sub>g,N</sub>    [-]                        |     | 2,0 |     |     |     |     |     |     |     |                              |                  |
|                                                        | α <sub>g,V</sub>    [-]                        |     |     |     |     |     |     |     |     |     |                              |                  |
|                                                        | α <sub>g,N</sub> ⊥ [-]                         |     |     |     |     |     |     |     |     |     |                              |                  |
|                                                        | α <sub>g,V</sub> ⊥ [-]                         |     |     |     |     |     |     |     |     |     |                              |                  |
| Max. installation torque<br>T <sub>inst,max</sub> [Nm] | 4                                              |     | 10  |     |     |     |     |     |     |     |                              |                  |

<sup>1)</sup> FOR UPM-I with screw M6:  $T_{\text{inst,max}} = 4 \text{ Nm}$ 

Upat injection system UPM 44 masonry

**Performances**

Solid sand-lime block KS

Species of brick, installation parameters

**Annex C 65**

Kind of masonry: Solid sand-lime block KS

Table C105: Characteristic values of resistance; tension load ( $N_{Rk}$ )

| Use category                                   |                           | w/w                                 |        | d/d   |        |
|------------------------------------------------|---------------------------|-------------------------------------|--------|-------|--------|
| Temperature range [°C]                         |                           | 50/80                               | 72/120 | 50/80 | 72/120 |
| Effective anchorage depth                      | Anchor size               | characteristic values $N_{RK}$ [kN] |        |       |        |
| Compressive strength $f_b = 10 \text{ N/mm}^2$ |                           |                                     |        |       |        |
| 50, 100                                        | M6                        | 4,00                                | 3,00   | 7,00  | 5,50   |
| 50                                             | M8                        | 4,00                                | 3,50   | 7,00  | 6,00   |
| 100                                            | M8                        | 7,00                                | 6,00   | 12,00 | 10,00  |
| 50                                             | M10                       | 5,00                                | 4,00   | 8,00  | 7,00   |
| 100                                            | M10                       | 6,00                                | 5,00   | 9,50  | 8,00   |
| 50                                             | M12                       | 5,00                                | 4,00   | 8,00  | 6,50   |
| 100                                            | M12                       | 6,00                                | 5,00   | 10,00 | 8,00   |
| ≥50                                            | M16                       | 5,50                                | 4,50   | 9,00  | 7,50   |
| 85                                             | UPM-I M6/M8,UPM-I M10/M12 |                                     |        |       |        |
| 100                                            | M16                       | 7,50                                | 6,00   | 11,50 | 9,50   |
| Compressive strength $f_b = 20 \text{ N/mm}^2$ |                           |                                     |        |       |        |
| 50, 100                                        | M6                        | 5,50                                | 4,50   | 8,50  | 8,00   |
| 50                                             | M8                        | 6,00                                | 5,00   | 10,50 | 8,50   |
| 100                                            | M8                        | 10,00                               | 8,50   | 12,00 | 12,00  |
| 50                                             | M10                       | 7,00                                | 6,00   | 11,50 | 10,00  |
| 100                                            | M10                       | 8,5                                 | 7,00   | 12,00 | 10,00  |
| 50                                             | M12                       | 7,00                                | 6,00   | 11,00 | 9,50   |
| 100                                            | M12                       | 9,00                                | 7,50   | 12,00 | 12,00  |
| ≥50                                            | M16                       | 8,00                                | 7,00   | 12,00 | 10,50  |
| 85                                             | UPM-I M6/M8,UPM-I M10/M12 |                                     |        |       |        |
| 100                                            | M16                       | 11,00                               | 9,00   | 12,00 | 12,00  |
| Compressive strength $f_b = 36 \text{ N/mm}^2$ |                           |                                     |        |       |        |
| 50, 100                                        | M6                        | 4,50                                | 3,50   | 8,00  | 6,50   |
| 50                                             | M8                        | 8,00                                | 6,50   | 12,00 | 11,00  |
| 100                                            | M8                        | 12,00                               | 12,00  | 12,00 | 12,00  |
| 50                                             | M10                       | 11,50                               | 9,50   | 12,00 | 12,00  |
| 100                                            | M10                       | 12,00                               | 12,00  | 12,00 | 12,00  |
| 50                                             | M12                       | 12,00                               | 11,50  | 12,00 | 12,00  |
| 100                                            | M12                       | 12,00                               | 12,00  | 12,00 | 12,00  |
| ≥50                                            | M16                       | 12,00                               | 12,00  | 12,00 | 12,00  |
| 85                                             | UPM-I M6/M8,UPM-I M10/M12 |                                     |        |       |        |
| 100                                            | M16                       | 12,00                               | 12,00  | 12,00 | 12,00  |

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

**Performances**Solid sand-lime block KS  
Characteristic values tension load**Annex C 66**

## Kind of masonry: Solid sand-lime block KS

Table C106: Characteristic values of resistance; shear load ( $V_{Rk}$ )

| Use category                                   |             | w/w                                 |  | d/d   |        |
|------------------------------------------------|-------------|-------------------------------------|--|-------|--------|
| Temperature range                              |             | [°C]                                |  | 50/80 | 72/120 |
| Effective anchorage depth                      | Anchor size | characteristic values $V_{Rk}$ [kN] |  |       |        |
| Compressive strength $f_b = 10 \text{ N/mm}^2$ |             |                                     |  |       |        |
| ≥50                                            | M6          | 3,00                                |  |       |        |
| 85                                             | UPM-I M6    |                                     |  |       |        |
| ≥50                                            | M8          | 5,00                                |  |       |        |
| 85                                             | UPM-I M8    |                                     |  |       |        |
| ≥50                                            | M10         | 5,50                                |  |       |        |
| 85                                             | UPM-I M10   |                                     |  |       |        |
| ≥50                                            | M12 / M16   | 4,00                                |  |       |        |
| 85                                             | UPM-I M12   |                                     |  |       |        |
| Compressive strength $f_b = 20 \text{ N/mm}^2$ |             |                                     |  |       |        |
| ≥50                                            | M6          | 4,50                                |  |       |        |
| 85                                             | UPM-I M6    |                                     |  |       |        |
| ≥50                                            | M8          | 7,00                                |  |       |        |
| 85                                             | UPM-I M8    |                                     |  |       |        |
| ≥50                                            | M10         | 7,50                                |  |       |        |
| 85                                             | UPM-I M10   |                                     |  |       |        |
| ≥50                                            | M12 / M16   | 6,00                                |  |       |        |
| 85                                             | UPM-I M12   |                                     |  |       |        |
| Compressive strength $f_b = 36 \text{ N/mm}^2$ |             |                                     |  |       |        |
| ≥50                                            | M6          | 4,50                                |  |       |        |
| 85                                             | UPM-I M6    |                                     |  |       |        |
| ≥50                                            | M8          | 9,00                                |  |       |        |
| 85                                             | UPM-I M8    |                                     |  |       |        |
| ≥50                                            | M10         | 11,00                               |  |       |        |
| 85                                             | UPM-I M10   |                                     |  |       |        |
| ≥50                                            | M12 / M16   | 12,00                               |  |       |        |
| 85                                             | UPM-I M12   |                                     |  |       |        |

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

## Performances

Solid sand-lime block KS  
Characteristic values shear load

Annex C 67



Kind of masonry: Perforated brick HLz

Table C107: Parameters of brick

|                            |                              |                      |
|----------------------------|------------------------------|----------------------|
| Species of brick           |                              | Perforated brick HLz |
| Density                    | $\rho \geq [\text{kg/dm}^3]$ | $\geq 1,4$           |
| Compressive strength       | $f_b \geq [\text{N/mm}^2]$   | 2, 4, 6 or 8         |
| Standard or approval       |                              | EN 771-1             |
| Producer                   |                              | e.g. Wienerberger    |
| Size, dimensions           | [mm]                         | 230x108x55           |
| Minimum thickness of brick | $h_{\min}$ [mm]              | 108                  |

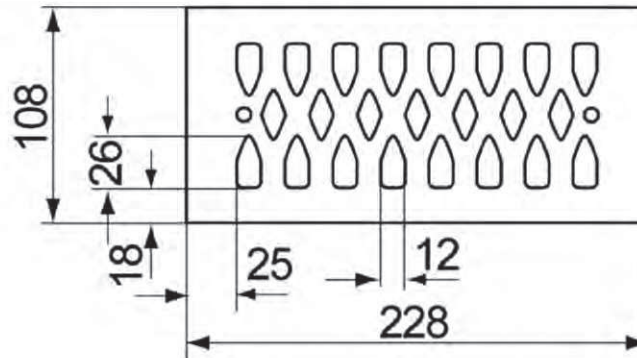


Table C108: Installation parameters for threaded rod with perforated sleeve and internal threaded anchor UPM-I with perforated sleeve

| Size of perforated sleeve              |                              | 12x50 |    | 12x85 |    | 16x85 |     | 20x85   |     |
|----------------------------------------|------------------------------|-------|----|-------|----|-------|-----|---------|-----|
| Size of threaded rod                   |                              | M6    | M8 | M6    | M8 | M8    | M10 | M12     | M16 |
| Size of internal threaded anchor UPM-I |                              |       |    |       |    | M6/M8 |     | M10/M12 |     |
| Edge distance                          | $c_{\min}$ [mm]              | 60    |    |       |    |       |     |         |     |
| Spacing                                | $s_{\min \parallel}$ [mm]    | 80    |    |       |    |       |     |         |     |
|                                        | $s_{cr \parallel}$ [mm]      | 230   |    |       |    |       |     |         |     |
|                                        | $s_{\min \perp}$ [mm]        | 60    |    |       |    |       |     |         |     |
|                                        |                              |       |    |       |    |       |     |         |     |
| Group-factor                           | $\alpha_{g,N \parallel}$ [-] | 2,0   |    |       |    |       |     |         |     |
|                                        | $\alpha_{g,V \parallel}$ [-] |       |    |       |    |       |     |         |     |
|                                        | $\alpha_{g,N \perp}$ [-]     |       |    |       |    |       |     |         |     |
|                                        | $\alpha_{g,V \perp}$ [-]     |       |    |       |    |       |     |         |     |
| Max. installation torque               | $T_{\text{inst,max}}$ [Nm]   | 2     |    |       |    |       |     |         |     |

Upat injection system UPM 44 masonry

**Performances**  
 Perforated brick HLz  
 Species of brick, installation parameters

Annex C 68

**Kind of masonry: Perforated brick HLz**

**Table C109: Characteristic values of resistance; tension load ( $N_{Rk}$ )<sup>1)</sup>**

| Use category                                  |                            | w/w                                 |        | d/d   |        |
|-----------------------------------------------|----------------------------|-------------------------------------|--------|-------|--------|
| Temperature range [°C]                        |                            | 50/80                               | 72/120 | 50/80 | 72/120 |
| Sleeve/anchor combinations                    | Sleeve/anchor combinations | characteristic values $N_{Rk}$ [kN] |        |       |        |
| Compressive strength $f_b = 2 \text{ N/mm}^2$ |                            |                                     |        |       |        |
| 12x50 M6 / M8                                 |                            | 0,30                                | --     | 0,30  | 0,30   |
| 12x85 M6 / M8                                 |                            | 0,90                                | 0,75   | 0,90  | 0,75   |
| 16x85 M8 / M10                                | 16x85 / UPM-I M6 / M8      | 0,75                                | 0,60   | 0,90  | 0,75   |
| 20x85 M12 / M16                               | 20x85 / UPM-I M10 / M12    | 0,50                                | 0,40   | 0,60  | 0,50   |
| Compressive strength $f_b = 4 \text{ N/mm}^2$ |                            |                                     |        |       |        |
| 12x50 M6 / M8                                 |                            | 0,60                                | 0,50   | 0,75  | 0,60   |
| 12x85 M6 / M8                                 |                            | 1,50                                | 1,50   | 2,00  | 1,50   |
| 16x85 M8 / M10                                | 16x85 / UPM-I M6 / M8      | 1,50                                | 1,20   | 1,50  | 1,50   |
| 20x85 M12 / M16                               | 20x85 / UPM-I M10 / M12    | 0,90                                | 0,90   | 1,20  | 0,90   |
| Compressive strength $f_b = 6 \text{ N/mm}^2$ |                            |                                     |        |       |        |
| 12x50 M6 / M8                                 |                            | 0,90                                | 0,75   | 0,90  | 0,90   |
| 12x85 M6 / M8                                 |                            | 2,50                                | 2,00   | 3,00  | 2,50   |
| 16x85 M8 / M10                                | 16x85 / UPM-I M6 / M8      | 2,50                                | 2,00   | 2,50  | 2,00   |
| 20x85 M12 / M16                               | 20x85 / UPM-I M10 / M12    | 1,50                                | 1,20   | 1,50  | 1,50   |
| Compressive strength $f_b = 8 \text{ N/mm}^2$ |                            |                                     |        |       |        |
| 12x50 M6 / M8                                 |                            | 1,20                                | 0,90   | 1,50  | 1,20   |
| 12x85 M6 / M8                                 |                            | 3,50                                | 3,00   | 4,00  | 3,00   |
| 16x85 M8 / M10                                | 16x85 / UPM-I M6 / M8      | 3,00                                | 2,50   | 3,50  | 3,00   |
| 20x85 M12 / M16                               | 20x85 / UPM-I M10 / M12    | 2,00                                | 1,50   | 2,50  | 2,00   |

<sup>1)</sup> If the fixing is in a solid area, for w/w, the characteristic values shall be reduced with the factor 0,64.

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

**Performances**  
Perforated brick HLz  
Characteristic values tension load

**Annex C 69**

Kind of masonry: Perforated brick HLz

Table C110: Characteristic values of resistance; shear load ( $V_{Rk}$ )

| Use category                                  |                            | w/w                                 |        | d/d   |        |
|-----------------------------------------------|----------------------------|-------------------------------------|--------|-------|--------|
| Temperature range                             |                            | 50/80                               | 72/120 | 50/80 | 72/120 |
| Sleeve/anchor combinations                    | Sleeve/anchor combinations | characteristic values $V_{Rk}$ [kN] |        |       |        |
| Compressive strength $f_b = 2 \text{ N/mm}^2$ |                            |                                     |        |       |        |
| 12x50 M6 / M8                                 | 16x85 M8 / M10             | 0,6                                 |        |       |        |
| 12x85 M6 / M8                                 | 16x85 UPM-I M6 / M8        |                                     |        |       |        |
| 20x85 M12 / M16                               | 20x85 / UPM-I M10 / M12    | 0,4                                 |        |       |        |
| Compressive strength $f_b = 4 \text{ N/mm}^2$ |                            |                                     |        |       |        |
| 12x50 M6 / M8                                 | 16x85 M8 / M10             | 1,2                                 |        |       |        |
| 12x85 M6 / M8                                 | 16x85 UPM-I M6 / M8        |                                     |        |       |        |
| 20x85 M12 / M16                               | 20x85 / UPM-I M10 / M12    | 0,9                                 |        |       |        |
| Compressive strength $f_b = 6 \text{ N/mm}^2$ |                            |                                     |        |       |        |
| 12x50 M6 / M8                                 | 16x85 M8 / M10             | 1,5                                 |        |       |        |
| 12x85 M6 / M8                                 | 16x85 UPM-I M6 / M8        |                                     |        |       |        |
| 20x85 M12 / M16                               | 20x85 / UPM-I M10 / M12    | 1,2                                 |        |       |        |
| Compressive strength $f_b = 8 \text{ N/mm}^2$ |                            |                                     |        |       |        |
| 12x50 M6 / M8                                 | 16x85 M8 / M10             | 2,5                                 |        |       |        |
| 12x85 M6 / M8                                 | 16x85 UPM-I M6 / M8        |                                     |        |       |        |
| 20x85 M12 / M16                               | 20x85 / UPM-I M10 / M12    | 1,5                                 |        |       |        |

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

**Performances**  
Perforated brick HLz  
Characteristic values shear load

**Annex C 70**



Kind of masonry: Autoclaved aerated concrete

Cylindrical drill hole

**Table C111: Parameters of brick**

| Species of brick     |                              | Autoclaved aerated concrete |     |     |
|----------------------|------------------------------|-----------------------------|-----|-----|
| Density              | $\rho \geq [\text{kg/dm}^3]$ | 350                         | 500 | 650 |
| Compressive strength | $f_b \geq [\text{N/mm}^2]$   | 2                           | 4   | 6   |
| Standard             |                              | EN 771-4                    |     |     |
| Producer             |                              | e.g. Ytong                  |     |     |

**Table C112: Installation parameters for threaded rod and internal threaded anchor without perforated sleeve**

| Size of threaded rod                            | M6                                          | M8 | M10 | M12 | M16 | UPM-I<br>M6 / M8 | UPM-I<br>M10/ M12 |
|-------------------------------------------------|---------------------------------------------|----|-----|-----|-----|------------------|-------------------|
| Effective anchorage depth<br>$h_{ef}$ [mm]      | 100                                         |    |     |     |     | 85               |                   |
| Edge distance<br>$c_{min}$ [mm]                 | 100                                         |    |     |     |     |                  |                   |
| Spacing                                         | $s_{cr \parallel} = s_{min \parallel}$ [mm] |    |     | 250 |     |                  |                   |
|                                                 | $s_{cr \perp} = s_{min \perp}$ [mm]         |    |     | 250 |     |                  |                   |
| Group-factor                                    | $\alpha_{g,N \parallel}$ [-]                |    |     | 2,0 |     |                  |                   |
|                                                 | $\alpha_{g,V \parallel}$ [-]                |    |     |     |     |                  |                   |
|                                                 | $\alpha_{g,N \perp}$ [-]                    |    |     |     |     |                  |                   |
|                                                 | $\alpha_{g,V \perp}$ [-]                    |    |     |     |     |                  |                   |
| Max. installation torque<br>$T_{inst,max}$ [Nm] | 1                                           |    | 2   |     |     | 1                | 2                 |

Upat injection system UPM 44 masonry

**Performances**

Autoclaved aerated concrete  
Cylindrical drill hole  
Installation parameters

**Annex C 71**

Kind of masonry: Autoclaved aerated concrete (cylindrical drill hole)

Table C113: Characteristic values of resistance; tension load ( $N_{Rk}$ )

| Use category                                  |                  | w/w                                 |        | d/d   |        |
|-----------------------------------------------|------------------|-------------------------------------|--------|-------|--------|
| Temperature range [°C]                        |                  | 50/80                               | 72/120 | 50/80 | 72/120 |
| Effective anchorage depth                     | Anchor size      | characteristic values $N_{Rk}$ [kN] |        |       |        |
| Compressive strength $f_b = 2 \text{ N/mm}^2$ |                  |                                     |        |       |        |
| 100                                           | M6               | 1,20                                |        | 1,50  |        |
|                                               | M8               | 1,50                                |        | 1,50  |        |
|                                               | M10              | 1,50                                |        | 1,50  |        |
|                                               | M12              | 1,50                                |        | 2,00  |        |
|                                               | M16              | 2,00                                |        | 2,00  |        |
| 85                                            | UPM-I M6 / M 8   | 1,50                                |        | 1,50  |        |
|                                               | UPM-I M10 / M 12 | 1,50                                |        | 1,50  |        |
| Compressive strength $f_b = 4 \text{ N/mm}^2$ |                  |                                     |        |       |        |
| 100                                           | M6               | 1,20                                |        | 1,50  |        |
|                                               | M8               | 2,00                                |        | 2,00  |        |
|                                               | M10              | 2,50                                |        | 3,00  |        |
|                                               | M12              | 2,50                                |        | 2,50  |        |
|                                               | M16              | 2,00                                |        | 2,00  |        |
| 85                                            | UPM-I M6 / M 8   | 2,00                                |        | 2,00  |        |
|                                               | UPM-I M10 / M 12 | 1,50                                |        | 1,50  |        |
| Compressive strength $f_b = 6 \text{ N/mm}^2$ |                  |                                     |        |       |        |
| 100                                           | M6               | 1,50                                |        | 1,50  |        |
|                                               | M8               | 3,00                                |        | 3,50  |        |
|                                               | M10              | 4,50                                |        | 5,00  |        |
|                                               | M12              | 4,50                                |        | 5,00  |        |
|                                               | M16              | 3,00                                |        | 3,00  |        |
| 85                                            | UPM-I M6 / M 8   | 3,50                                |        | 3,50  |        |
|                                               | UPM-I M10 / M 12 | 2,50                                |        | 2,50  |        |

Calculation of pulling out of one brick (tension load):  $N_{Rk,pb}$  see ETAG 029, Annex C

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

**Performances**

Autoclaved aerated concrete  
Cylindrical drill hole  
Characteristic values tension load

**Annex C 72**

Kind of masonry: Autoclaved aerated concrete (cylindrical drill hole)

Table C114: Characteristic values of resistance; shear load ( $V_{Rk}$ )

| Use category                                  |                  | w/w                                 |        | d/d   |        |
|-----------------------------------------------|------------------|-------------------------------------|--------|-------|--------|
| Temperature range [°C]                        |                  | 50/80                               | 72/120 | 50/80 | 72/120 |
| Effective anchorage depth                     | Anchor size      | characteristic values $V_{Rk}$ [kN] |        |       |        |
| Compressive strength $f_b = 2 \text{ N/mm}^2$ |                  |                                     |        |       |        |
| 85                                            | UPM-I M6         | 1,20                                |        |       |        |
|                                               | UPM-I M8         |                                     |        |       |        |
|                                               | UPM-I M10        |                                     |        |       |        |
|                                               | UPM-I M12        |                                     |        |       |        |
| 100                                           | M12              | 1,50                                |        |       |        |
| 100                                           | M6, M8, M10, M16 | 1,20                                |        |       |        |
| Compressive strength $f_b = 4 \text{ N/mm}^2$ |                  |                                     |        |       |        |
| 85                                            | UPM-I M6         | 2,00                                |        |       |        |
|                                               | UPM-I M8         |                                     |        |       |        |
|                                               | UPM-I M10        |                                     |        |       |        |
|                                               | UPM-I M12        |                                     |        |       |        |
| 100                                           | M8, M12          | 2,50                                |        |       |        |
| 100                                           | M6, M10, M16     | 2,00                                |        |       |        |
| Compressive strength $f_b = 6 \text{ N/mm}^2$ |                  |                                     |        |       |        |
| 85                                            | UPM-I M6         | 2,50                                |        |       |        |
|                                               | UPM-I M8         |                                     |        |       |        |
|                                               | UPM-I M10        |                                     |        |       |        |
|                                               | UPM-I M12        |                                     |        |       |        |
| 100                                           | M6               | 2,5                                 |        |       |        |
| 100                                           | M8, M10          | 3,0                                 |        |       |        |
| 100                                           | M12              | 3,50                                |        |       |        |
| 100                                           | M16              | 4,50                                |        |       |        |

Calculation of pushing out of one brick (shear load):  $V_{Rk,pb}$  see ETAG 029, Annex C

Factor for job site tests and displacements see Annex C78.

Upat injection system UPM 44 masonry

**Performances**

Autoclaved aerated concrete  
Cylindrical drill hole  
Characteristic values shear load

**Annex C 73**



Kind of masonry: Autoclaved aerated concrete

Conical drill hole (with special drill bit PBB)

**Table C115: Parameters of brick**

| Species of brick     |                              | Autoclaved aerated concrete |     |     |
|----------------------|------------------------------|-----------------------------|-----|-----|
| Density              | $\rho \geq [\text{kg/dm}^3]$ | 350                         | 500 | 650 |
| Compressive strength | $f_b \geq [\text{N/mm}^2]$   | 2                           | 4   | 6   |
| Standard or approval |                              | EN 771-4                    |     |     |
| Producer             |                              | e.g. Ytong                  |     |     |

**Table C116: Installation parameters for threaded rod and internal threaded anchor without perforated sleeve**

| Size of threaded rod                         | M8                                          | M10 | M12 | M8  | M10 | M12 | UPM-I<br>M6/M8 |
|----------------------------------------------|---------------------------------------------|-----|-----|-----|-----|-----|----------------|
| Effective anchorage depth $h_{ef}$ [mm]      | 75                                          |     |     | 95  |     |     | 85             |
| Edge distance $c_{min}$ [mm]                 | 120                                         |     |     | 150 |     |     |                |
| Spacing                                      | $s_{cr \parallel} = s_{min \parallel}$ [mm] |     |     | 300 |     |     |                |
|                                              | $s_{cr \perp} = s_{min \perp}$ [mm]         |     |     | 250 |     |     |                |
| Group-factor                                 | $\alpha_{g,N \parallel}$ [-]                |     |     | 2,0 |     |     |                |
|                                              | $\alpha_{g,V \parallel}$ [-]                |     |     |     |     |     |                |
|                                              | $\alpha_{g,N \perp}$ [-]                    |     |     |     |     |     |                |
|                                              | $\alpha_{g,V \perp}$ [-]                    |     |     |     |     |     |                |
| Max. installation torque $T_{inst,max}$ [Nm] | 2                                           |     |     |     |     |     |                |

Upat injection system UPM 44 masonry

**Performances**

Autoclaved aerated concrete  
Conical drill hole with drill bit PBB  
Installation parameters

**Annex C 74**

Kind of masonry: Autoclaved aerated concrete

Conical drill hole (with special drill bit PBB)

**Table C117: Characteristic values of resistance; tension load ( $N_{Rk}$ )**

| Use category                                  |                | w/w                                 |        | d/d   |        |
|-----------------------------------------------|----------------|-------------------------------------|--------|-------|--------|
| Temperature range [°C]                        |                | 50/80                               | 72/120 | 50/80 | 72/120 |
| Effective anchorage depth                     | Anchor size    | characteristic values $N_{Rk}$ [kN] |        |       |        |
| Compressive strength $f_b = 2 \text{ N/mm}^2$ |                |                                     |        |       |        |
| 75                                            | M8 / M10 / M12 | 2,00                                | 1,50   | 2,00  | 2,00   |
| 95                                            | M8 / M10 / M12 | 2,50                                | 2,00   | 2,50  | 2,50   |
| 85                                            | UPM-I M6 / M8  | 2,00                                | 1,50   | 2,00  | 2,00   |
| Compressive strength $f_b = 4 \text{ N/mm}^2$ |                |                                     |        |       |        |
| 75                                            | M8 / M10 / M12 | 3,00                                | 1,50   | 3,00  | 2,50   |
| 95                                            | M8 / M10 / M12 | 3,50                                | 3,00   | 3,50  | 3,00   |
| 85                                            | UPM-I M6 / M8  | 3,00                                | 2,50   | 3,00  | 2,50   |
| Compressive strength $f_b = 6 \text{ N/mm}^2$ |                |                                     |        |       |        |
| 75                                            | M8 / M10 / M12 | 3,50                                | 3,00   | 4,00  | 3,50   |
| 95                                            | M8 / M10 / M12 | 4,00                                | 4,00   | 4,50  | 4,00   |
| 85                                            | UPM-I M6 / M8  | 3,50                                | 3,00   | 4,00  | 3,50   |

Calculation of pulling out of one brick (tension load):  $N_{Rk,pb}$  see ETAG 029, Annex C

**Table C118: Characteristic values of resistance; shear load ( $V_{Rk}$ )**

| Use category                                  |             | w/w                                 |        | d/d   |        |
|-----------------------------------------------|-------------|-------------------------------------|--------|-------|--------|
| Temperature range [°C]                        |             | 50/80                               | 72/120 | 50/80 | 72/120 |
| Effective anchorage depth                     | Anchor size | characteristic values $V_{Rk}$ [kN] |        |       |        |
| Compressive strength $f_b = 2 \text{ N/mm}^2$ |             |                                     |        |       |        |
| 75,<br>95,<br>85                              | all sizes   | 2,50                                |        |       |        |
| Compressive strength $f_b = 4 \text{ N/mm}^2$ |             |                                     |        |       |        |
| 75,<br>95,<br>85                              | all sizes   | 4,50                                |        |       |        |
| Compressive strength $f_b = 6 \text{ N/mm}^2$ |             |                                     |        |       |        |
| 75,<br>95,<br>85                              | all sizes   | 6,00                                |        |       |        |

Calculation of pushing out of one brick (shear load):  $V_{Rk,pb}$  see ETAG 029, Annex C

Factor for job site tests and displacements see Annex C78

Upat injection system UPM 44 masonry

**Performances**

Autoclaved aerated concrete  
Conical drill hole with drill bit PBB  
Characteristic values

**Annex C 75**

**Table C119: Characteristic bending moments for threaded rods**

| Size                                         |                                  |                |                       | M6 | M8 | M10 | M12 | M16 |
|----------------------------------------------|----------------------------------|----------------|-----------------------|----|----|-----|-----|-----|
| Characteristic bending moments<br>$M_{Rk,s}$ | zinc plated steel                | Property class | 5.8 [Nm]              | 8  | 19 | 37  | 65  | 166 |
|                                              |                                  |                | 8.8 [Nm]              | 12 | 30 | 60  | 105 | 266 |
|                                              | stainless steel A4               | Property class | 50 [Nm]               | 8  | 19 | 37  | 65  | 166 |
|                                              |                                  |                | 70 [Nm]               | 11 | 26 | 52  | 92  | 232 |
|                                              |                                  |                | 80 [Nm]               | 12 | 30 | 60  | 105 | 266 |
|                                              | high corrosion resistant steel C | Property class | 50 [Nm]               | 8  | 19 | 37  | 65  | 166 |
|                                              |                                  |                | 70 <sup>1)</sup> [Nm] | 11 | 26 | 52  | 92  | 232 |
|                                              |                                  |                | 80 [Nm]               | 12 | 30 | 60  | 105 | 266 |

<sup>1)</sup>  $f_{uk} = 700 \text{ N/mm}^2$ ;  $f_{yk} = 560 \text{ N/mm}^2$

**Table C120: Characteristic bending moments for internal threaded anchors UPM-I**

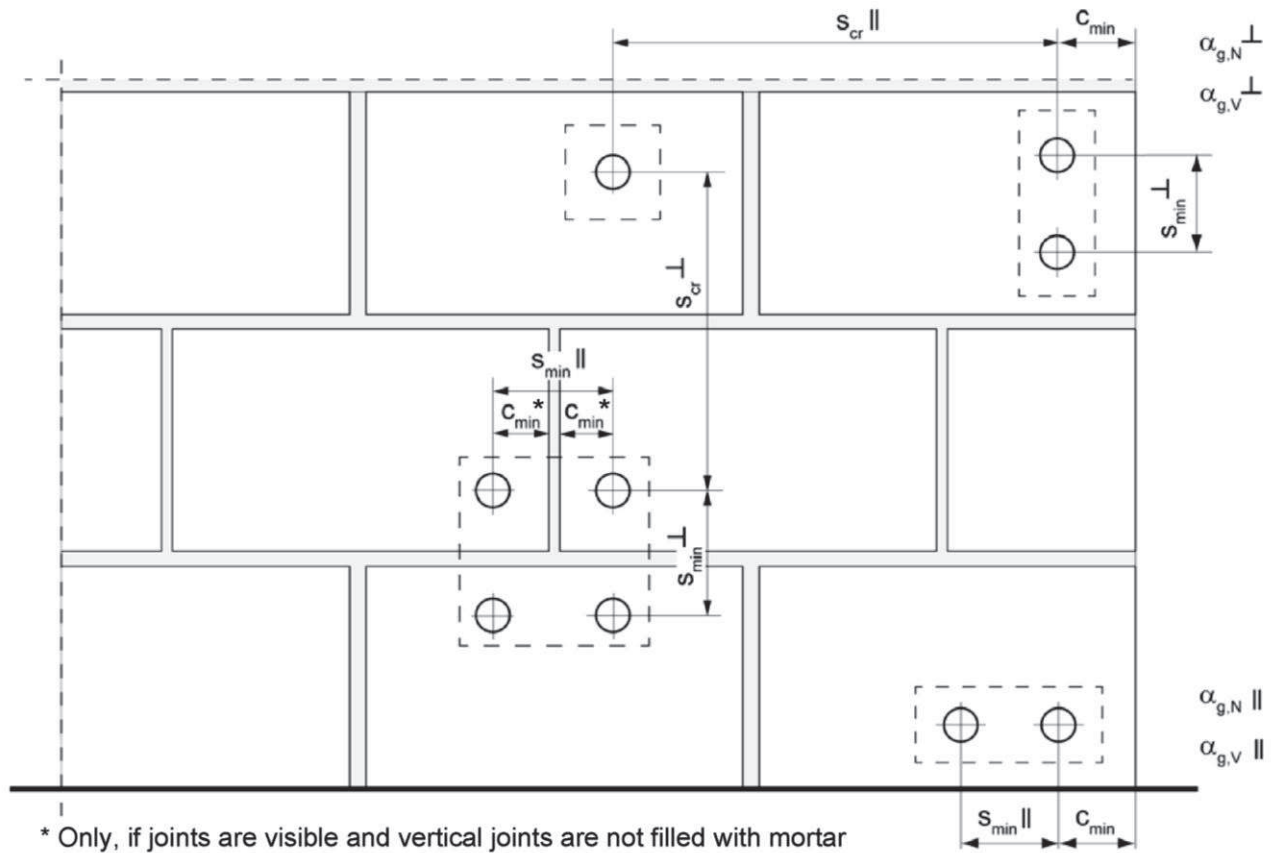
| Size UPM-I                                |                                  |                         |          | M6 | M8 | M10 | M12 |
|-------------------------------------------|----------------------------------|-------------------------|----------|----|----|-----|-----|
| Characteristic bending moments $M_{Rk,s}$ | zinc plated steel,               | Property class of screw | 5.8 [Nm] | 8  | 19 | 37  | 65  |
|                                           |                                  |                         | 8.8 [Nm] | 12 | 30 | 60  | 105 |
|                                           | stainless steel A4               | Property class of screw | 70 [Nm]  | 11 | 26 | 52  | 92  |
|                                           | high corrosion resistant steel C | Property class of screw | 70 [Nm]  | 11 | 26 | 52  | 92  |

Upat injection system UPM 44 masonry

**Performances**  
Characteristic bending moments

**Annex C 76**





- $s_{min ||}$  = Minimum spacing parallel to bed joint  
 $s_{min \perp}$  = Minimum spacing vertical to bed joint  
 $s_{cr ||}$  = Characteristic spacing parallel to bed joint  
 $s_{cr \perp}$  = 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  
 $\alpha_{g,N \perp}$  = Group factor for tension load vertical to bed joint  
 $\alpha_{g,V \perp}$  = 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 installation parameters of brick

$$N_{Rk}^g = \alpha_{g,N} \cdot N_{Rk}; \quad V_{Rk}^g = \alpha_{g,V} \cdot V_{Rk} \quad (\text{Group of 2 anchors})$$

$$N_{Rk}^g = \alpha_{g,N ||} \cdot \alpha_{g,N \perp} \cdot N_{Rk}; \quad V_{Rk}^g = \alpha_{g,V ||} \cdot \alpha_{g,V \perp} \cdot V_{Rk} \quad (\text{Group of 4 anchors})$$

Upat injection system UPM 44 masonry

#### Performances

Definition of minimum edge distance, minimum spacing and group factors

Annex C 77

**Table C121:  $\beta$ - factors for job site tests**

Tension load

| Use category                                        |                       | w/w   |        | d/d   |        |
|-----------------------------------------------------|-----------------------|-------|--------|-------|--------|
| Temperature range                                   |                       | 50/80 | 72/120 | 50/80 | 72/120 |
| Material                                            | Size                  |       |        |       |        |
| solid units                                         | M6                    | 0,55  | 0,46   | 0,96  | 0,80   |
|                                                     | M8                    | 0,57  | 0,51   |       |        |
|                                                     | M10                   | 0,59  | 0,52   |       |        |
|                                                     | M12<br>UPM-I M6, M8   | 0,60  | 0,54   |       |        |
|                                                     | M16<br>UPM-I M10, M12 | 0,62  | 0,52   |       |        |
|                                                     | 16x85                 | 0,55  | 0,46   |       |        |
| hollow units                                        | all size              | 0,86  | 0,72   | 0,96  | 0,80   |
| Autoclaved aerated concrete, cylindrical drill hole | all size              | 0,73  | 0,73   | 0,81  | 0,81   |
| Autoclaved aerated concrete, conical drill hole     | all size              | 0,66  | 0,59   | 0,73  | 0,66   |

**Table C122: Displacements**

| Material                                    | N<br>[kN]                       | $\delta N_0$<br>[mm] | $\delta N_\infty$<br>[mm] | V<br>[kN]                       | $\delta V_0$<br>[mm] | $\delta V_\infty$<br>[mm] |
|---------------------------------------------|---------------------------------|----------------------|---------------------------|---------------------------------|----------------------|---------------------------|
| Solid units and autoclaved aerated concrete | $\frac{N_{Rk}}{1,4 * \gamma_M}$ | 0,03                 | 0,06                      | $\frac{V_{Rk}}{1,4 * \gamma_M}$ | 0,59                 | 0,88                      |
| hollow units                                | $\frac{N_{Rk}}{1,4 * \gamma_M}$ | 0,03                 | 0,06                      | $\frac{V_{Rk}}{1,4 * \gamma_M}$ | 1,71                 | 2,56                      |
| brick Annex C36/C37                         | $\frac{N_{Rk}}{1,4 * \gamma_M}$ | 0,03                 | 0,06                      | $\frac{V_{Rk}}{1,4 * \gamma_M}$ | 6,44                 | 9,66                      |

Upat injection system UPM 44 masonry

**Performances**

$\beta$ - factors for job site tests,  
Displacements

**Annex C 78**