

Approval body for construction products
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and
Laender Governments



European Technical Assessment

ETA-15/0555
of 4 November 2025

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the
European Technical Assessment:

Deutsches Institut für Bautechnik

Trade name of the construction product

Upat injection system UPM 44 for masonry

Product family
to which the construction product belongs

Metal Injection anchors for use in masonry

Manufacturer

Upat Vertriebs GmbH
Bebelstraße 11
79108 Freiburg im Breisgau
DEUTSCHLAND

Manufacturing plant

Upat

This European Technical Assessment
contains

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

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

EAD 330076-01-0604, Edition 10/2022

This version replaces

ETA-15/0555 issued on 11 September 2015

European Technical Assessment

ETA-15/0555

English translation prepared by DIBt

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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 injection mortar Upat UPM 44, UPM 44 Relax and UPM 44 Express, a perforated sieve sleeve and an anchor rod with hexagon nut and washer or an internal threaded rod. 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 fastener 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 fastener 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 static and quasi-static loading	See Annexes B4 to B7, B21, B22, C1 to C123
Characteristic resistance and displacements for seismic loading	No performance assessed

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire under tension and shear loading with and without lever arm. Minimum edge distances and spacing	See Annex C124

3.3 Hygiene, health and the environment (BWR 3)

Essential characteristic	Performance
Content, emission and/or release of dangerous substances	No performance assessed

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

In accordance with the European Assessment Document EAD 330076-01-0604 the applicable European legal act is: [97/177/EC].

The system to be applied is: 1

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document

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

Issued in Berlin on 4 November 2025 by Deutsches Institut für Bautechnik

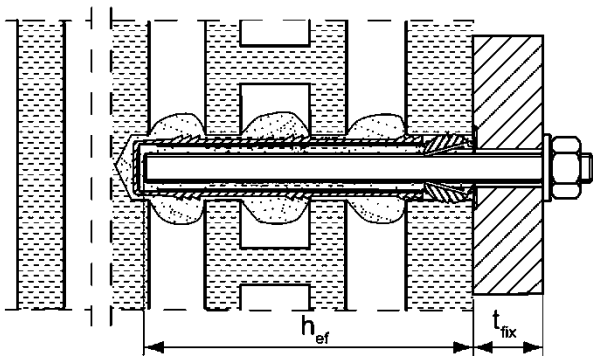
Dipl.-Ing. Beatrix Wittstock
Head of Section

beglaubigt:
Baderschneider

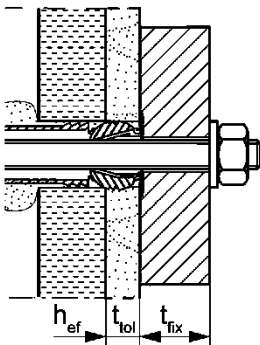
Installation conditions part 1

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

Pre-positioned installation:

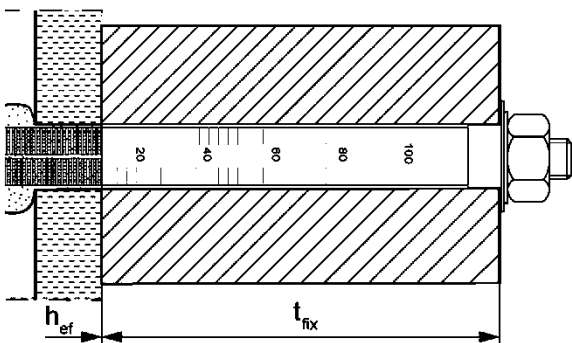


Installation with render bridge

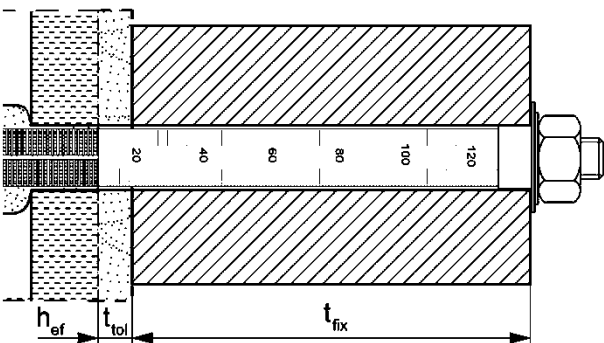


Size of the perforated sleeve: UPM SH 12x50 K UPM SH 16x85 K UPM SH 20x85 K UPM SH 20x200 K
UPM SH 12x85 K UPM SH 16x130 K UPM SH 20x130 K

Push through installation:



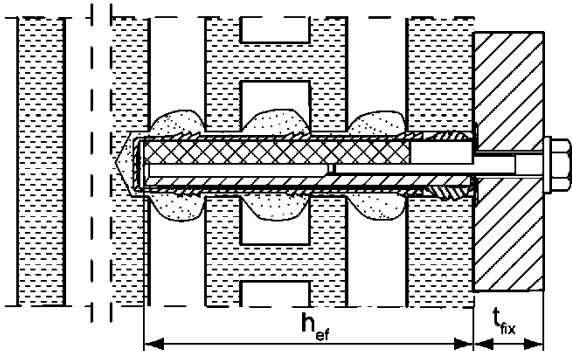
Installation with render bridge



Size of the perforated sleeve: 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 installation:



Figures not to scale

h_{ef} = effective anchorage depth

t_{tol} = thickness of unbearing layer (e.g. plaster)

t_{fix} = thickness of fixture

Upat injection system UPM 44 for masonry

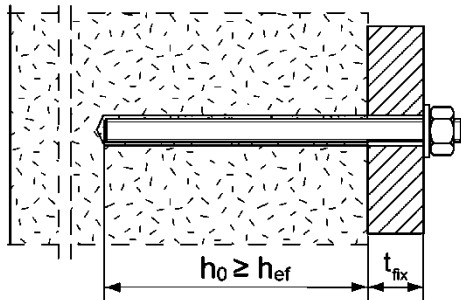
Product description
Installation conditions part 1,
Anchor rods and internal threaded anchor with perforated sleeve

Annex A1

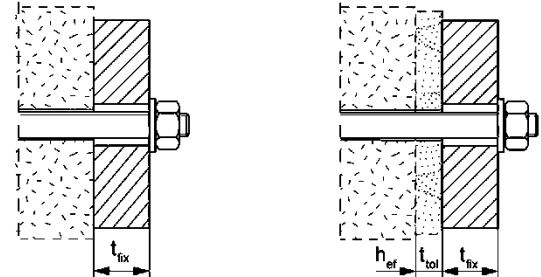
Installation conditions part 2

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

Pre-positioned installation:



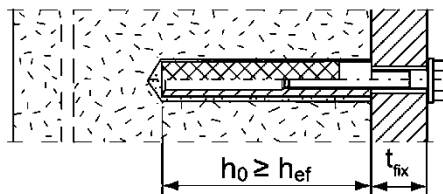
Push through installation: Annular gap filled with mortar



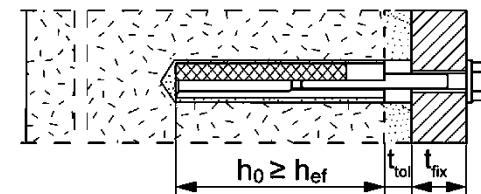
Installation with
render bridge

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

Pre-positioned installation:



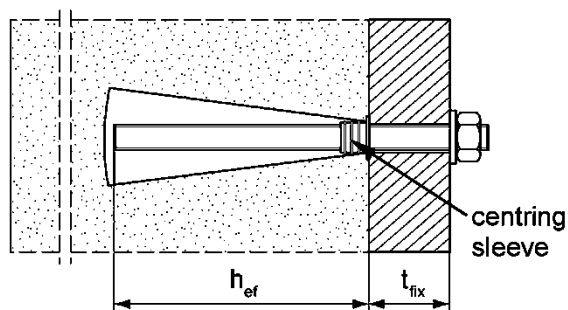
Installation with render bridge



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

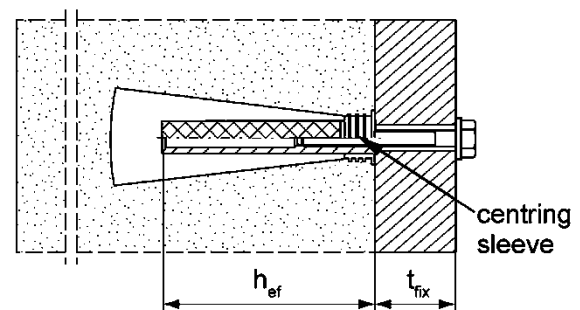
Pre-positioned installation:

anchor rods M8, M10, M12



Pre-positioned installation:

Internal threaded anchor UPM-I 11x85 M6 / M8



Figures not to scale

h_0 = depth of drill hole

h_{ef} = effective anchorage depth

t_{tol} = thickness of unbearing layer (e.g. plaster)

t_{fix} = thickness of fixture

Upat injection system UPM 44 for masonry

Product description

Installation conditions part 2, Anchor rods and internal threaded anchor without
perforated sleeve / with centring sleeve

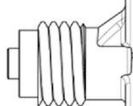
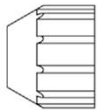
Annex A2

Overview system components part 1

Mortar cartridge (shuttle cartridge) with sealing cap

①

Size: 360 ml, 825 ml



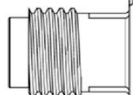
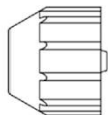
Imprint: Upat UPM 44 or UPM 44 Relax or UPM 44 Express, processing notes, shelf-life, hazard code, piston travel scale (optional), curing time and processing time (depending on temperature), size, volume



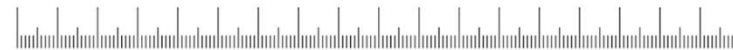
Mortar cartridge (coaxial cartridge) with sealing cap

①

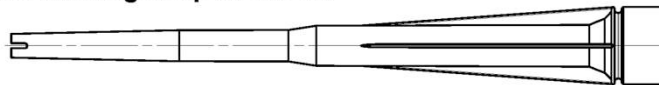
Size: 100 ml, 150 ml, 300 ml, 380 ml, 400 ml, 410 ml



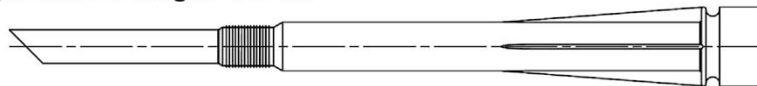
Imprint: Upat UPM 44 or UPM 44 Relax or UPM 44 Express, processing notes, shelf-life, hazard code, piston travel scale (optional), curing time and processing time (depending on temperature), size, volume



Static mixer Upat MR Plus for injection cartridges up to 410 ml



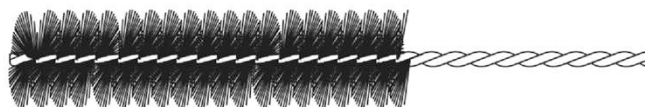
Static mixer Upat JMR for injection cartridges 825 ml



Extension tube Ø 9 for static mixer Upat MR Plus; Extension tube Ø 9 or Ø 15 for static mixer Upat JMR



Cleaning brush UP BS



Blow-out pump UPM AB



compressed-air cleaning tool



Figures not to scale

Upat injection system UPM 44 for masonry

Product description

Overview system components part 1: cartridge / static mixer / cleaning tools

Annex A3

Overview system components part 2

Upat anchor rod

②



Size: M6, M8, M10, M12, M16

Internal threaded anchor UPM-I

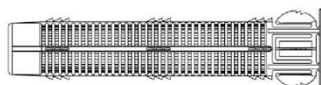
⑤



Size: 11x85 M6 / M8
15x85 M10 / M12

Perforated sleeve UPM SH K

⑦



Size: UPM SH 12x50 K
UPM SH 12x85 K
UPM SH 16x85 K
UPM SH 20x85 K

⑦



Size: UPM SH 16x130 K
UPM SH 20x130 K
UPM SH 20x200 K

Perforated sleeve UPM SH K (push through installation)

⑦



Size: UPM SH 18x130/200 K
UPM SH 22x130/200 K

Washer

③



Hexagon nut

④



Injection adapter

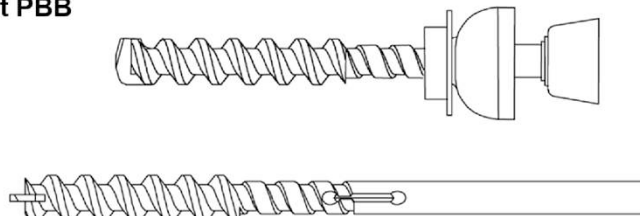


centring sleeve PBZ

⑦



Special conic drill bit PBB



Figures not to scale

Upat injection system UPM 44 for masonry

Product description

Overview system components part 2: steel parts / perforated sleeve / conical drill bit / Injection adapter / centring sleeve

Annex A4

Table A5.1: Materials

Part	Designation	Material		
1	Mortar cartridge	Mortar, hardener; filler		
		Steel	Stainless steel R	High corrosion resistant steel HCR
		zinc plated	acc. to EN 10088-1:2023 Corrosion resistance class CRC III acc. to EN 1993-1-4:2006+A1:2015	acc. to EN 10088-1:2023 Corrosion resistance class CRC V acc. to EN 1993-1-4:2006+A1:2015
2	Anchor rod	Property class 4.6; 4.8; 5.8 or 8.8; EN ISO 898-1: 2013 zinc plated ≥ 5µm, ISO 4042:2022 or hot-dip galvanised EN ISO 10684:2004+AC:2009 f _{uk} ≤ 1000 N/mm ² A ₅ > 8% fracture elongation	Property class 50, 70 or 80 EN ISO 3506-1:2020 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; 1.4062; 1.4662; 1.4462; EN 10088-1:2023 f _{uk} ≤ 1000 N/mm ² A ₅ > 8% fracture elongation	Property class 50 or 80 EN ISO 3506-1:2020 or property class 70 with f _{yk} = 560 N/mm ² 1.4565; 1.4529 EN 10088-1:2023 f _{uk} ≤ 1000 N/mm ² A ₅ > 8% fracture elongation
3	Washer ISO 7089:2000	zinc plated ≥ 5µm, ISO 4042:2022 or hot-dip galvanised EN ISO 10684:2004+AC:2009	1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2023	1.4565;1.4529 EN 10088-1:2023
4	Hexagon nut	Property class 5 or 8; EN ISO 898-2:2022 zinc plated ≥ 5µm, ISO 4042:2022 or hot-dip galvanised EN ISO 10684:2004+AC:2009	Property class 50, 70 or 80 EN ISO 3506-2:2020 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2023	Property class 50, 70 or 80 EN ISO 3506-2:2020 1.4565; 1.4529 EN 10088-1:2023
5	Internal threaded anchor UPM-I	Property class 5.8; EN ISO 898-1:2013 zinc plated ≥ 5µm, ISO 4042:2022	Property class 70 EN ISO 3506-1:2020 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2023	Property class 70 EN ISO 3506-1:2020 1.4565; 1.4529 EN 10088-1:2023
6	Commercial standard screw or threaded rod for internal threaded anchor UPM-I	Property class 4.6, 5.8 or 8.8; EN ISO 898-1:2013 zinc plated ≥ 5µm, ISO 4042:2022	Property class 70 EN ISO 3506-1:2020 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2023	Property class 70 EN ISO 3506-1:2020 1.4565; 1.4529 EN 10088-1:2023
7	Perforated sleeve and centring sleeve	PP / PE		
Upat injection system UPM 44 for masonry				Annex A5
Product description Materials				

Specifications of intended use part 1

Table B1.1: Overview use and performance categories

Anchorages subject to		Upat injection system UPM 44 for masonry	
Hole drilling with hammer drill mode 		all bricks; without C32 to C51, C80 to C83	
Hole drilling with rotary drill mode 		all bricks	
Hole drilling with special conic drill bit		Only C118 to C122	
Static and quasi static load, in masonry		all bricks	
Exposure to fire under tension and shear loading		C124 to C127 (Applies only to the conditions of dry masonry)	
Installation	Pre-positioned installation	Anchor rod or internal threaded anchor (in solid brick masonry and autoclaved aerated concrete)	Perforated sleeve with anchor rod or internal threaded anchor (in perforated and solid brick masonry) Size: 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 installation	Anchor rod; use only in cylindrical drill hole (in solid brick masonry and autoclaved aerated concrete)	Perforated sleeve with anchor rod (in perforated and solid brick masonry) Size: UPM SH 18x130/200 K UPM SH 22x130/200 K
Installation and use conditions	conditions d/d (dry/dry)	all bricks	
	conditions w/d (wet/dry)		
	conditions w/w (wet/wet)		
Installation direction		D3 (downward and horizontal installation)	
Installation temperature		T _{i,min} = -5 °C to T _{i,max} = +40 °C	
In-service temperature	Temperature range Tb	-40 °C to +80 °C	(max. short term temperature +80 °C max. long term temperature +50 °C)
	Temperature range Tc	-40 °C to +120 °C	(max. short term temperature +120 °C; max. long term temperature +72 °C)
Upat injection system UPM 44 for masonry			Annex B1
Intended Use Specifications part 1			

Specifications of intended use part 2

Anchorage subject to:

- Static and quasi-static loads
- Exposure to fire

Base materials:

- Solid brick masonry (base material group b) and autoclaved aerated concrete (base material group d), acc. to Annex B13 / B14.
- Hollow brick masonry (base material group c), according to Annex B13 / B14.
- For minimum thickness of masonry member is $h_{ef} + 30\text{mm}$.
- Mortar strength class of the masonry M2,5 at minimum according to EN 998-2:2016.
- For other bricks in solid masonry, hollow or perforated masonry and autoclaved aerated concrete, the characteristic resistance of the anchor may be determined by job site tests (not for bricks under fire exposure) according to EOTA Technical Report TR 053:2022-07 under consideration of the β -factor according to Annex C123, Table C123.1.

Note (only applies to solid bricks and autoclaved aerated concrete):

The characteristic resistance is also valid for larger brick sizes, higher compressive strength and higher raw density of the masonry unit.

Temperature Range:

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

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions (zinc plated steel, stainless steel or high corrosion resistant steel)
- For all other conditions according to EN 1993-1-4:2006+A1:2015 corresponding to corrosion resistance classes to Annex A5, Table A5.1.

Upat injection system UPM 44 for masonry

Intended Use
Specifications part 2

Annex B2

Specifications of intended use part 3 continued

Design:

- The anchorages have to be designed in accordance with EOTA Technical Report TR 054:2023-12 (included the dimensioning for fire exposure), Design method A under the responsibility of a designer experienced in anchorages and masonry work.

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

$$N_{Rk} = N_{Rk,b} = N_{Rk,p} = N_{Rk,b,c} = N_{Rk,p,c}$$

$$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,I}$$

For the calculation of pulling out a brick under tension loading $N_{Rk,pb}$ or

pushing out a brick under shear loading $V_{Rk,pb}$ see EOTA Technical Report TR 054:2023-12.

$N_{Rk,s}$, $V_{Rk,s}$ and $M^0_{Rk,s}$ see annexes C1-C3.

Factors for job site tests and displacements see annex C123.

- Verifiable calculation notes and drawings have to be prepared taking into 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 to be indicated on the design drawings.

Installation:

- Conditions d/d: - Installation and use in dry structures.
- Conditions w/w: - Installation and use in dry and wet structures.
- Conditions w/d: - Installation in wet structures and use in dry structures.
- Hole drilling see Annex C (drilling method).
- In case of aborted hole: The hole shall be filled with injection mortar UPM 44.
- Bridging of unbearing layer (e.g., plaster) is permitted for masonry with solid bricks and cylindrical drill hole. At perforated brick masonry see Annex B6, Table B6.1.
- 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 anchor rods (including nut and washer) must comply with the appropriate material and property class of the Upat internal threaded anchor UPM-I mentioned in Annex A5, Table A5.1.
- Minimum curing time see Annex B8, Table B8.2.
- 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 A5, Table A5.1

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 anchor 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 for masonry

Intended Use
Specifications part 3 continued

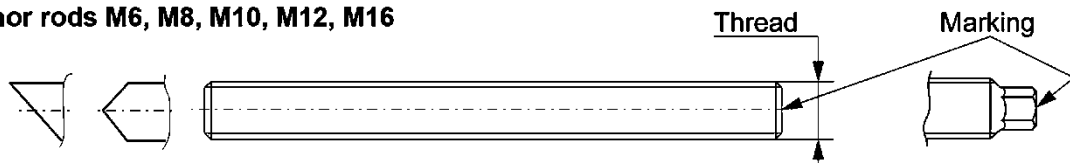
Annex B3

Table B4.1: Installation parameters for anchor rods in solid bricks and autoclaved aerated concrete without perforated sleeves

Anchor rod	Thread	M6	M8	M10	M12	M16
Nominal drill hole diameter	d ₀ [mm]	8	10	12	14	18
Effective anchorage depth h _{ef} ¹⁾	h _{0,min} ≥ h _{ef,min} [mm]	100				
in AAC cylindrical drill hole	h _{0,max} ≥ h _{ef,max} [mm]	h-30, ≤200				
Effective anchorage depth h _{ef} in AAC conical drill hole	h _o [mm]	-	h _{ef} + 5			-
	h _{ef,1} [mm]		75			
	h _{ef,2} [mm]		95			
Effective anchorage depth h _{ef} ¹⁾	h _{ef,min} [mm]	50				
in solid brick (depth of drill hole h ₀ ≥ h _{ef})	h _{ef,max} [mm]	h-30, ≤200				
Diameter of clearance hole in the fixture	pre-positioning d _r ≤ [mm]	7	9	12	14	18
	push through d _r ≤ [mm]	9	11	14	16	20
Diameter of cleaning brush	d _b ≥ [mm]	see Table B8.1				
Maximum installation torque	T _{inst} [Nm]	see parameters of brick				

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

Upat anchor rods M6, M8, M10, M12, M16



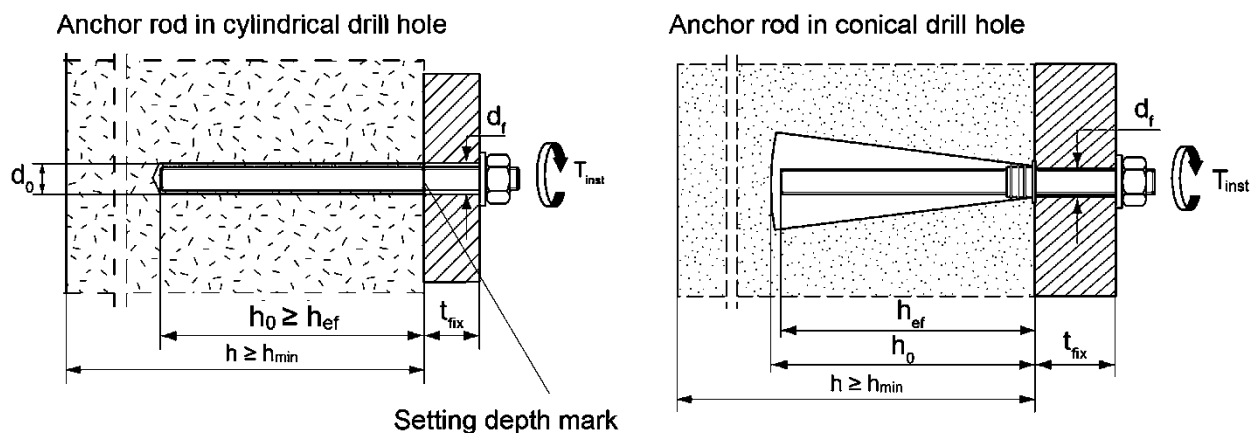
Marking (on random place) Upat anchor rod:

Steel zinc plated PC ¹⁾ 8.8	• or +	Steel hot-dip galvanised PC ¹⁾ 8.8	•
High corrosion resistant steel HCR PC ¹⁾ 50	•	High corrosion resistant steel HCR PC ¹⁾ 70	—
High corrosion resistant steel HCR PC ¹⁾ 80	(	Stainless steel R property class 50	~
Stainless steel R property class 80	*		

Alternatively: Colour coding according to DIN 976-1: 2016;
property class 4.6 marking according to EN ISO 898-1:2013

¹⁾ PC = property class

Installation conditions:



Figures not to scale

Upat injection system UPM 44 for masonry

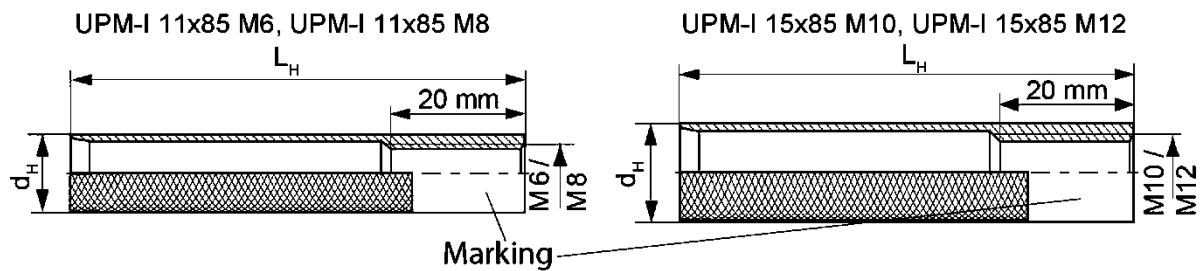
Intended Use
Installation parameters for anchor rods without perforated sleeve

Annex B4

Table B5.1: Installation parameters for internal threaded anchors UPM-I in solid bricks and autoclaved aerated concrete without perforated sleeves

Internal threaded anchor UPM-I		11x85 M6	11x85 M8	15x85 M10	15x85 M12
Diameter of anchor	d _H [mm]	11		15	
Nominal drill hole diameter	d ₀ [mm]	14		18	
Length of anchor	L _H [mm]	85			
Effective anchorage depth	h ₀ ≥ h _{ef} [mm]	85			
Effective anchorage depth h _{ef} in AAC (conical drill hole)	h ₀ [mm]	100		-	
	h _{ef} [mm]	85			
Diameter of cleaning brush	d _b ≥ [mm]	see Table B8.1			
Maximum installation torque	T _{inst} [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

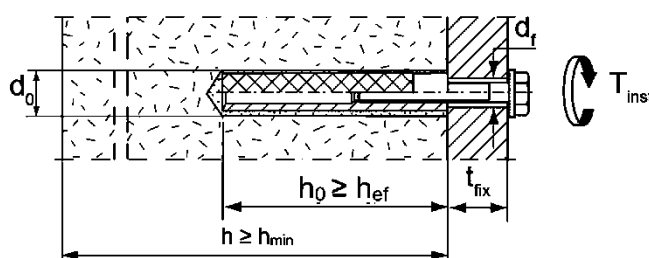


Marking:

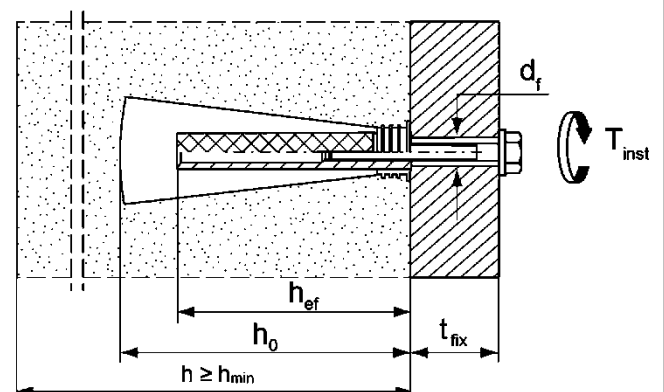
Size, e.g. **M8**, Stainless steel: R, e.g. **M8 R**, High corrosion resistant steel: HCR, e.g. **M8 HCR**

Installation conditions:

Internal threaded anchor in cylindrical drill hole



Internal threaded anchor in conical drill hole



Figures not to scale

Upat injection system UPM 44 for masonry

Intended Use

Installation parameters for internal threaded rods UPM-I without perforated sleeve

Annex B5

Table B6.1: Installation parameters for anchor rods and internal threaded anchors UPM-I with perforated sleeves (pre-positioned installation)

perforated sleeve UPM SH K	12x50	12x85 ²⁾	16x85	16x130 ²⁾	20x85	20x130 ²⁾	20x200 ²⁾
Nominal drill hole diameter $d_0 = D_{\text{sleeve, nom}}$	12		16		20		
Depth of drill hole h_0 [mm]	55	90	90	135	90	135	205
Effective anchorage depth	$h_{\text{ef, min}}$ [mm]	50	65	85	110	85	110
	$h_{\text{ef, max}}$ [mm]	50	85	85	130	85	130
Size of threaded rod [-]	M6 and M8		M8 and M10		M12 and M16		
Size of internal threaded anchor UPM-I	-	-	11x85	-	15x85	-	-
Diameter of cleaning brush ¹⁾ $d_b \geq$ [mm]	see Table B8.1						
Maximum installation torque T_{inst} [Nm]	see parameters of brick						

¹⁾ Only for solid areas in hollow bricks and solid bricks.

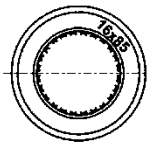
²⁾ Bridging of unbearing layer (e.g. plaster) is possible. When reducing the effective anchorage depth $h_{\text{ef, min}}$, the values of the next shorter perforated sleeve of the same diameter must be used. The smaller value of characteristic resistance must be taken.

Perforated sleeve

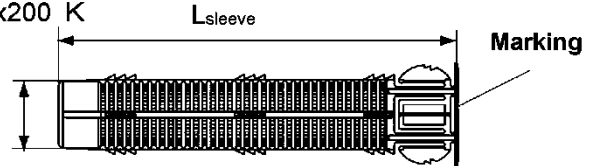
UPM SH 12x50 K; UPM SH 12x85 K; UPM SH 16x85 K; UPM SH 16x130 K;
UPM SH 20x85 K; UPM SH 20x130 K; UPM SH 20x200 K

Marking:

Size $D_{\text{sleeve, nom}} \times L_{\text{sleeve}}$
(e.g.: 16x85)



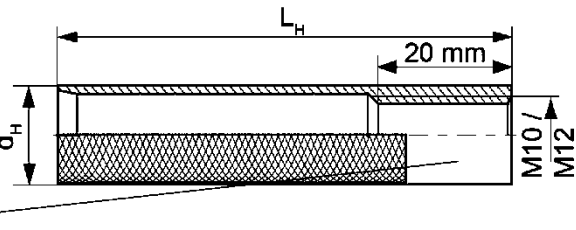
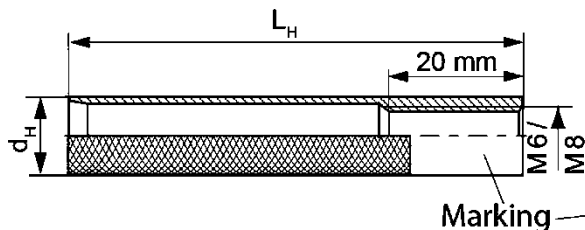
$D_{\text{sleeve, nom}}$



Upat Internal threaded anchor UPM-I

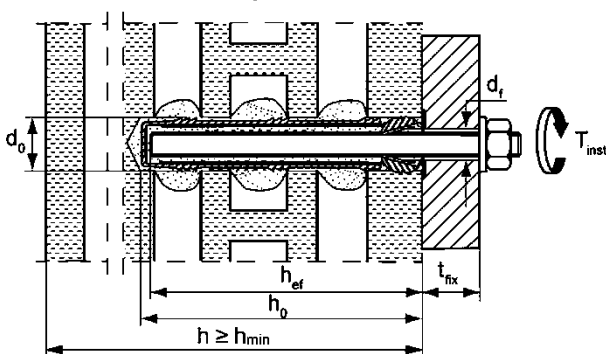
UPM-I 11x85 M6, UPM-I 11x85 M8

UPM-I 15x85 M10, UPM-I 15x85 M12

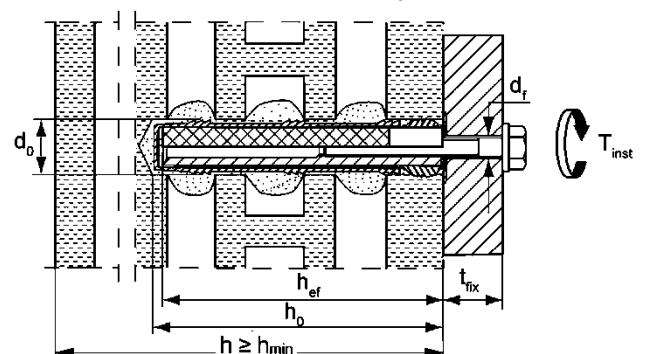


Installation conditions:

Anchor rod with perforated sleeve



Internal threaded anchor with perforated sleeve



Figures not to scale

Upat injection system UPM 44 for masonry

Intended Use

Installation parameters for anchor rods and internal threaded anchors UPM-I with perforated sleeve (pre-positioned installation)

Annex B6

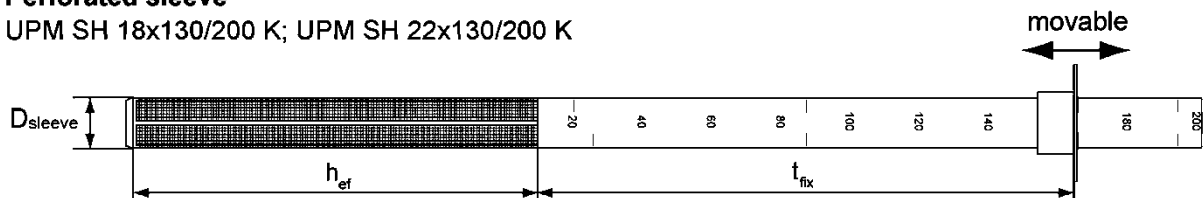
Table B7.1: Installation parameters for anchor rods with perforated sleeves
(push through installation)

Perforated sleeve UPM SH K		18x130/200		22x130/200
Nominal sleeve diameter	D _{sleeve,nom} [mm]	16		20
Nominal drill hole diameter	d ₀ [mm]	18		22
Depth of drill hole	h ₀ [mm]	135		
Effective anchorage depth	h _{ef} [mm]	≥130		
Diameter of cleaning brush ¹⁾	d _b ≥ [mm]	see Table B8.1		
Size of threaded rod	[-]	M10	M12	M16
Maximum installation torque	T _{inst} [Nm]	see parameters of brick		
Thickness of fixture	t _{fix,max} [mm]	200		

¹⁾ Only for solid areas in hollow bricks and solid bricks.

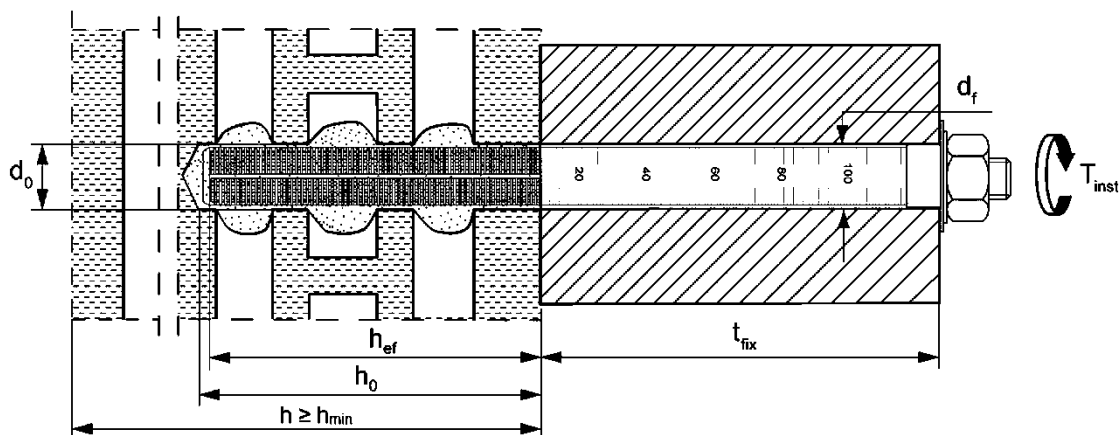
Perforated sleeve

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



Installation conditions:

Anchor rod with perforated sleeve



Figures not to scale

Upat injection system UPM 44 for masonry

Intended Use

Installation parameters for anchor rods with perforated sleeves
(push through installation)

Annex B7

Table B8.1: Parameters of the cleaning brush UP BS (steel brush with steel bristles)

The size of the cleaning brush refers to the drill hole diameter

Drill hole diameter	d_0 [mm]	8	10	12	14	16	18	20	22
Brush diameter	d_b [mm]	9	11	14	16	20	20	25	25



Only for solid bricks and autoclaved aerated concrete or solid areas of perforated bricks and hollow blocks

Table B8.2: Maximum processing times and minimum curing times
(During the curing time of the mortar the masonry temperature may not fall below the listed minimum temperature)

Temperature at anchoring base [°C]	Maximum processing time ²⁾ t_{work}			Minimum curing time ^{1), 2)} t_{cure}		
	UPM 44 Express	UPM 44	UPM 44 Relax	UPM 44 Express	UPM 44	UPM 44 Relax
> -5 to 0	5 min	> 13 min	-	3 h	24 h	-
> 0 to 5	5 min	13 min	> 20 min	3 h	3 h	6 h
> 5 to 10	3 min	9 min	20 min	50 min	90 min	3 h
> 10 to 20	1 min	5 min	10 min	30 min	60 min	2 h
> 20 to 30	-	4 min	6 min	-	45 min	60 min
> 30 to 40	-	2 min	4 min	-	35 min	30 min

¹⁾ For wet bricks the curing time must be doubled.

²⁾ Minimum cartridge temperature +5°C.

Figures not to scale

Upat injection system UPM 44 for masonry

Intended Use

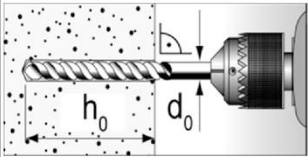
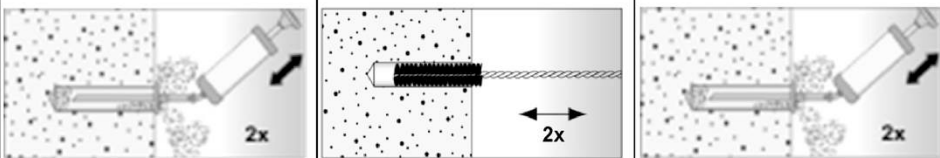
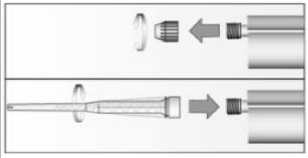
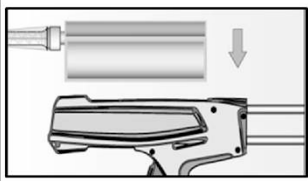
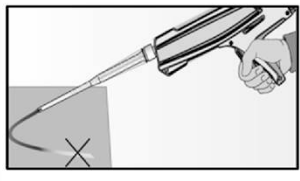
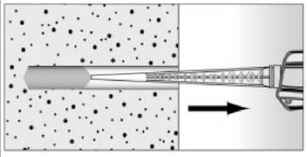
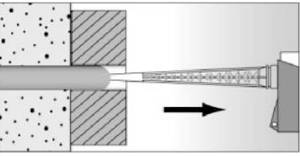
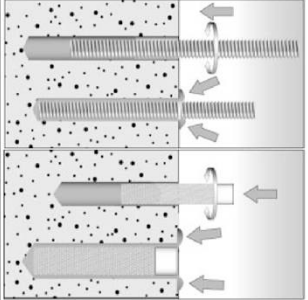
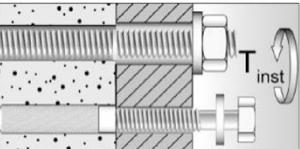
Cleaning brush (steel brush)

Maximum processing times and minimum curing times

Annex B8

Installation instruction part 1

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

1		Drill the hole (drilling method see Annex C of the respective brick) depth of drill hole h_0 and drill hole diameter d_0 see Table B4.1; B5.1 .		
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 ¹⁾ . Avoid bubbles!		For push through installation fill the annular clearance with mortar.
6		Only use clean and oil-free metal parts. Mark the anchor rod for setting depth. Insert the anchor rod 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 Table B8.2 .		Mounting the fixture. max T_{inst} see parameter of brick in Annex C .

¹⁾ Exact volume of mortar see manufacturer's specification.

Upat injection system UPM 44 for masonry

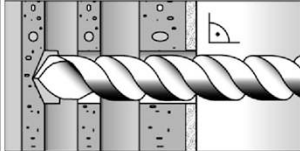
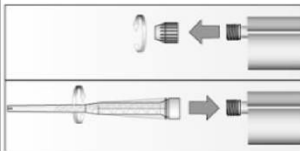
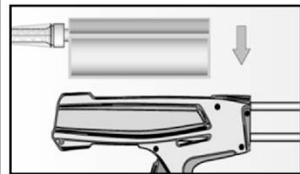
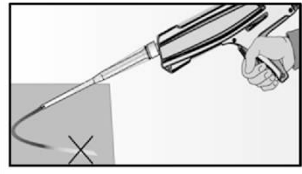
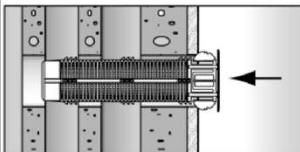
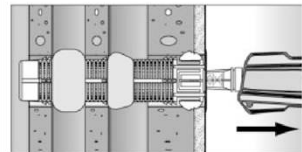
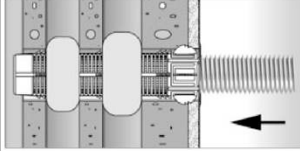
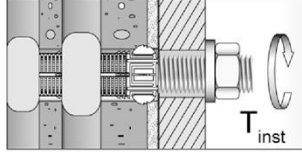
Intended Use

Installation instruction (without perforated sleeve) part 1

Annex B9

Installation instruction part 2

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

1		Drill the hole (drilling method see Annex C of the respective brick). depth of drill hole h_0 and drill hole diameter d_0 see Table B6.1	When install perforated sleeves in solid bricks or solid areas of hollow bricks, also clean the hole by blowing out and brushing.	
2		Remove the sealing cap. Screw on the static mixer. (the spiral in the static mixer must be clearly visible).		
3		Place the cartridge into a suitable dispenser.		Press out approximately 10 cm of mortar until the resin is permanently grey in colour. Mortar which is not grey in colour will not cure and must be disposed of.
4		Insert the perforated sleeve flush with the surface of the masonry or plaster.		Fill the perforated sleeve completely with mortar beginning from the bottom of the hole ¹⁾ .
5		Only use clean and oil-free metal parts. Mark the anchor rod for setting depth. Insert the anchor rod or the internal threaded anchor UPM-I by hand using light turning motions until reaching the setting depth marking (anchor rod) or flush with the surface (internal threaded anchor).		
6		Do not touch. Minimum curing time see Table B8.2		Mounting the fixture. max T_{inst} see parameter of brick in Annex C .

¹⁾ Exact volume of mortar see manufacturer's specification.

Upat injection system UPM 44 for masonry

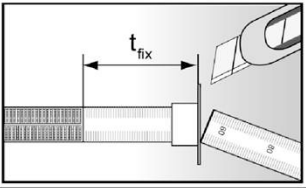
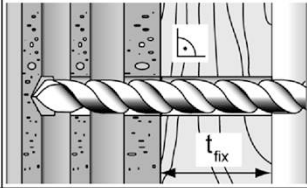
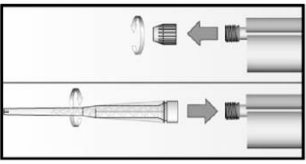
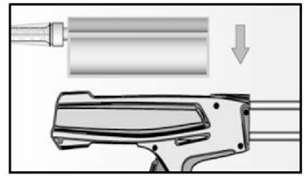
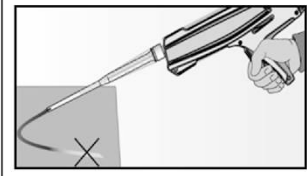
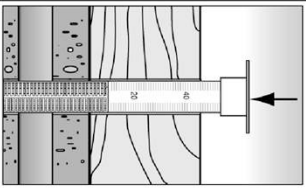
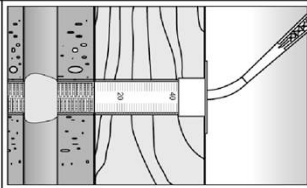
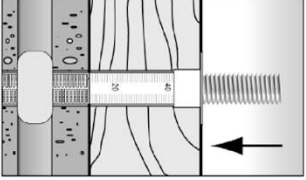
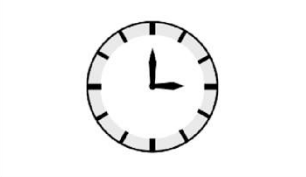
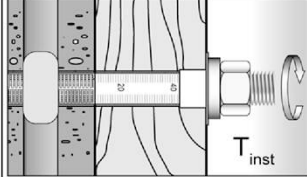
Intended Use

Installation instruction (with perforated sleeve) part 2

Annex B10

Installation instruction part 3

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

1		Push the movable stop up to the correct thickness of fixture and cut the overlap.		Drill the hole through the fixture. Depth of drill hole ($h_0 + t_{fix}$) and drill hole diameter see Table B7.1 .
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. ¹⁾ For deep drill holes use an extension tube.
5		Only use clean and oil-free metal parts. Mark the anchor rod for setting depth. Insert the anchor rod or the internal threaded anchor UPM-I by hand using light turning motions until reaching the setting depth marking (anchor rod) or flush with the surface (internal threaded anchor).		
6		Do not touch. Minimum curing time see Table B8.2 .		Mounting the fixture. max T_{inst} see parameter of brick in Annex C .

¹⁾ Exact volume of mortar see manufacturer's specification.

Upat injection system UPM 44 for masonry

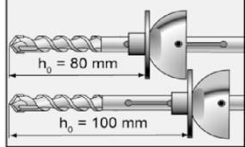
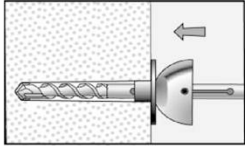
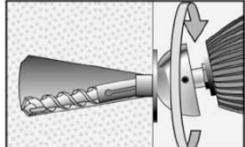
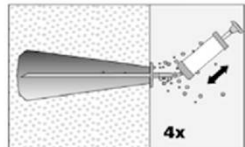
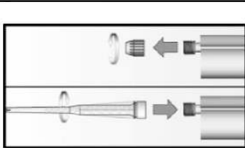
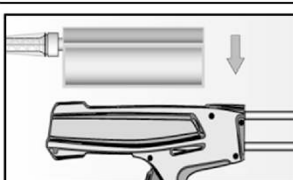
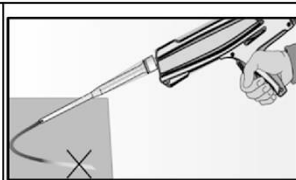
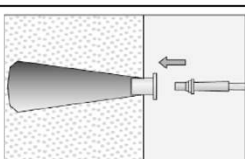
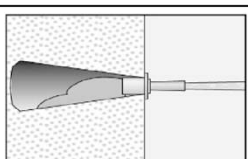
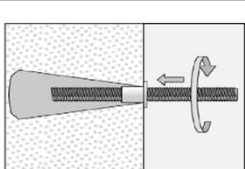
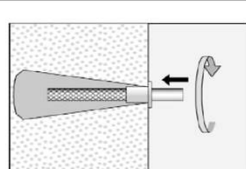
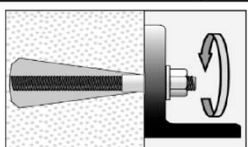
Intended Use

Installation instruction (with perforated sleeve) part 3

Annex B11

Installation instruction part 4

Installation in autoclaved aerated concrete with special conic drill bit PBB (pre-positioned installation)

1		Position the movable drill bit arrester on the used drill hole depth (see Table B4.1). 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 (drilling method see Annex C of the respective brick).		
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 metal parts. Mark the anchor rod for setting depth. Insert the anchor rod 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 Table B8.2 .		Mounting the fixture. max T_{inst} see parameter of brick in Annex C .

Upat injection system UPM 44 for masonry

Intended Use

Installation instruction for autoclaved aerated concrete with special conic drill bit PBB
(pre-positioned installation) part 4

Annex B12

Table B13.1: Overview of assessed bricks part 1

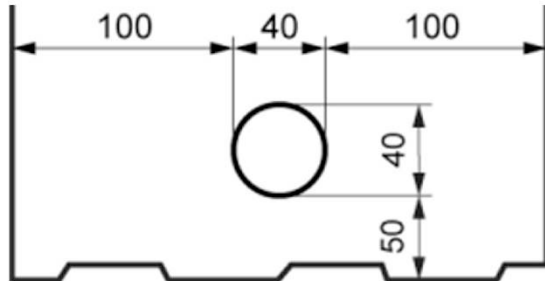
Kind of masonry	Brick format [mm]	Mean compressive strength [N/mm²]	Main country of origin	Mean gross density ρ [kg/dm³]	Annex
Solid brick Mz					
Solid brick Mz	NF ≥240x115x71	15 / 25 / 35	Germany	≥1,8	C4 – C7
	2DF ≥240x115x113	12,5 / 20	Germany	≥1,8	C8 / C9
	≥ 245x118x54	12,5 / 25	Italy	≥1,8	C10 / C11
	≥ 230x108x55	12,5 / 25	Denmark	≥1,8	C12 / C13
Solid calcium silicate (sand- lime) brick KS / perforated calcium silicate (sand- lime) brick KSL					
Solid calcium silicate brick KS	NF ≥240x115x71	15 / 25 / 35	Germany	≥2,0	C14 / C15
	8DF ≥ 250x240x240	12,5 / 25 / 35	Germany	≥2,0	C16 / C17
	≥ 997x214x538	12,5 / 25 & 45	Netherlands	≥1,8 & ≥2,2	C18 / C19
	≥ 240x115x113	12,5 / 25	Germany	≥1,8	C20 – C23
Perforated calcium silicate brick KSL	3DF 240x175x113	10 / 12,5 / 15 / 20 / 25	Germany	≥1,4	C24 – C27
Vertical perforated brick HLz					
Vertical perforated brick HLz	370x240x237	5 / 7,5 / 10 / 12,5 / 15	Germany	≥1,0	C28 / C29
	500x175x237	5 / 7,5 / 10 / 12,5 / 15	Germany	≥1,0	C28 / C29
	2DF 240x115x113	7,5 / 12,5 / 20 / 25 / 35	Germany	≥1,4	C30 / C31
	248x365x248	5 / 7,5 / 10	Germany	≥0,6	C32 – C35
	248x365x249	10 / 12,5 / 15	Germany	≥0,7	C36 – C39
	248x365x249	5 / 8	Germany	≥0,5	C40 – C43
	248x425x248	5 / 8 / 10	Germany	≥0,8	C44 – C47
	248x425x248	5 / 7,5 / 10	Germany	≥0,8	C48 – C51
	500x200x315	5 / 7,5 / 10	Germany	≥0,6	C52 – C55
	500x200x300	5 / 7,5 / 10 / 12,5	France	≥0,7	C56 – C59
	500x200x315	2,5 / 5 / 7,5 / 10	France	≥0,7	C60 – C63
	560x200x275	5 / 8 / 10	France	≥0,7	C64 / C65
	255x120x118	2,5 / 5 / 8 / 10 / 12,5 / 15	Italy	≥1,0	C66 - C68
	275x130x94	7,5 / 10 / 15 / 20 / 25	Spain	≥0,8	C69 / C71
	220x190x290	7,5 / 10 / 12,5	Portugal	≥0,7	C72 – C75
	253x300x240	2,5 / 5 / 8	Austria	≥0,8	C76 – C79
	250x440x250	8 / 10 / 12,5	Austria	≥0,7	C80 – C83
	230x108x55	2,5 / 5 / 8 / 10	Denmark	≥1,4	C84 / C85
	365x248x245	10	Austria	≥0,6	C86 / C89
	240x175x113	12,5	Germany	≥0,9	C90 / C93
Upat injection system UPM 44 for masonry				Annex B13	
Intended Use Overview of assessed bricks part 1					

Table B14.1: Overview of assessed bricks part 2

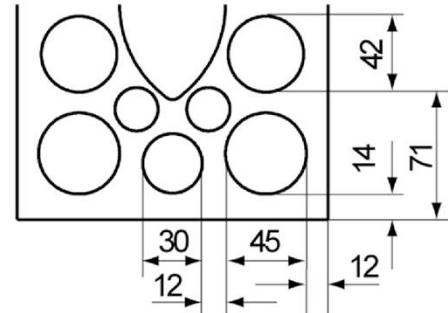
Kind of masonry	Brick format [mm]	Mean compressive strength [N/mm ²]	Main country of origin	Mean gross density ρ [kg/dm ³]	Annex
Horizontal perforated brick LLz					
Horizontal perforated brick LLz	248x78x250	2,5 / 5 / 8	Italy	≥0,7	C94 / C95
	128x88x275	2,5	Spain	≥0,8	C96 / C97
Light-weight concrete hollow block Hbl					
Light-weight concrete hollow block Hbl	362x240x240	2,5 / 5	Germany	≥1,0	C98 – C101
	500x200x200	2,5 / 5 / 8	France	≥1,0	C102 / C103
	440x215x215	5 / 8 / 10 / 12,5	Ireland	≥1,2	C104 – C107
Light-weight concrete solid block Vbl					
Light-weight concrete solid block Vbl	≥ 372x300x254	2,5	Germany	≥0,6	C108 / C109
	≥ 250x240x239	5 / 8 / 10	Germany	≥1,6	C110 – C113
	≥ 440x100x215	5 / 8 / 10 / 12,5	Ireland	≥2,0	C114 / C115
	≥ 440x95x215	7,5 / 10 / 12,5 / 15	England	≥2,0	C116 / C117
Autoclaved aerated concrete (AAC)					
PP2 / AAC	-	2,5	Germany	0,35	C118 – C122
PP4 / AAC	-	5	Germany	0,5	C118 – C122
PP6 / AAC	-	8	Germany	0,65	C118 – C122
Upat injection system UPM 44 for masonry					Annex B14
Intended Use Overview of assessed bricks part 2					

Table B15.1: Overview dimensions of perforated and hollow bricks part 1

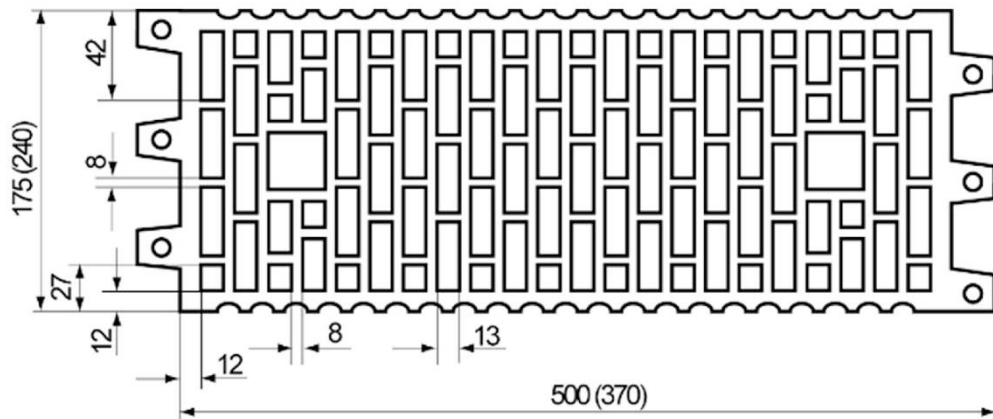
Solid calcium silicate brick KS, 8DF,
EN 771-2:2011+A1:2015 according to Annex C16



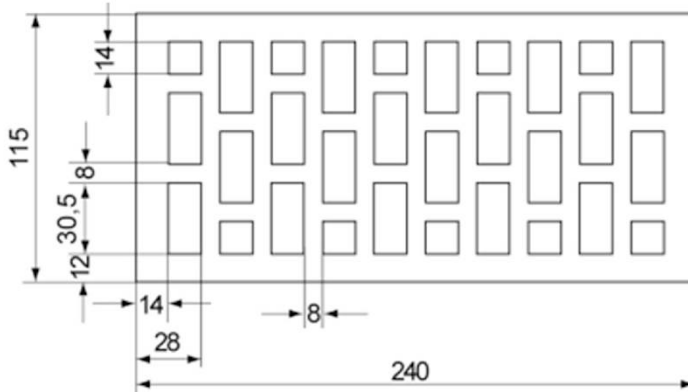
Perforated calcium silicate brick KSL, 3DF,
EN 771-2:2011+A1:2015; e.g. KS Wending
according to Annex C24



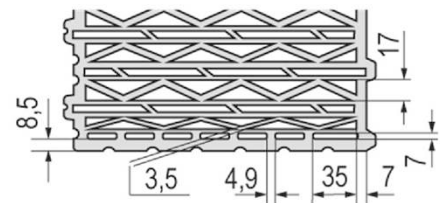
Vertical perforated brick HLz, EN 771-1:2011+A1:2015: e.g. Wienerberger, Poroton according to Annex C28



Vertical perforated brick HLz, 2DF,
EN 771-1:2011+A1:2015; e.g. Wienerberger
according to Annex C30



Vertical perforated brick HLz, U8,
EN 771-1:2011+A1:2015; according to Annex C32



Measures in [mm]
Figures not to scale

Upat injection system UPM 44 for masonry

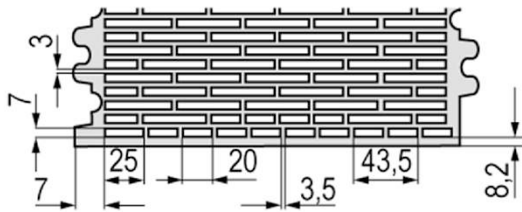
Intended Use

Overview dimensions of perforated and hollow bricks part 1

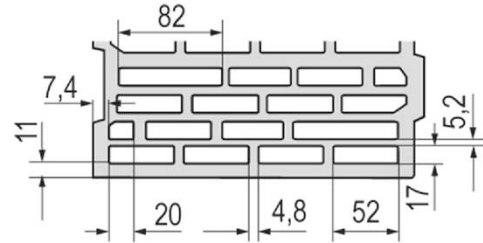
Annex B15

Table B16.1: Overview dimensions of perforated and hollow bricks part 2

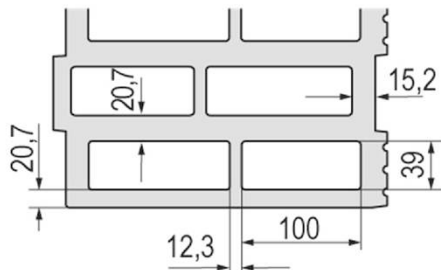
Vertical perforated brick HLz, T10, T11,
EN 771-1:2011+A1:2015; according to Annex C36



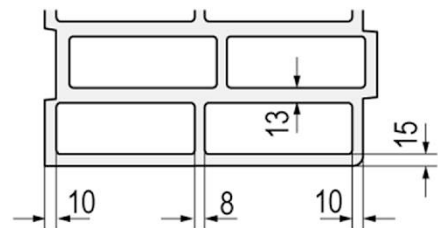
Vertical perforated brick HLz, T7 PF, filled with perlite,
EN 771-1:2011+A1:2015; according to Annex C40



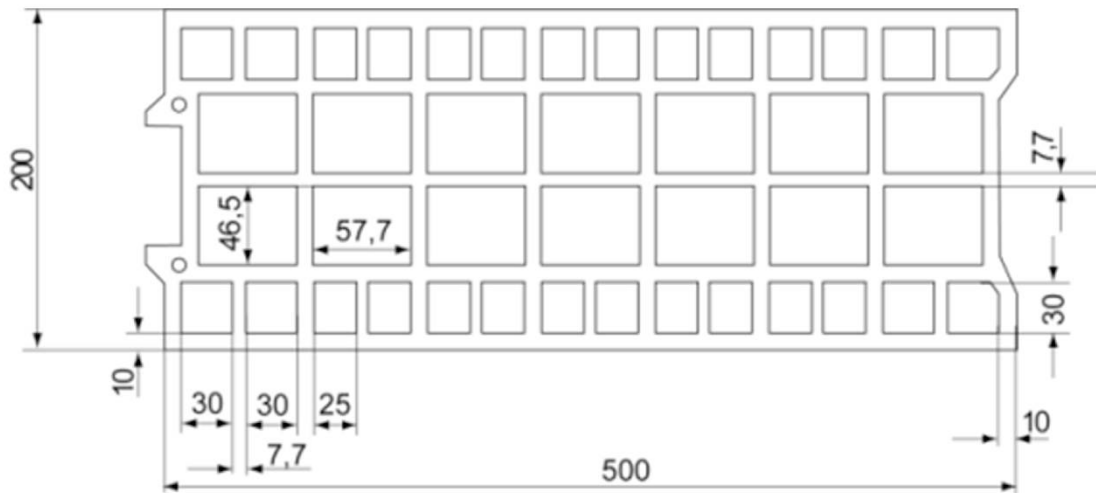
Vertical perforated brick HLz, T9 MW, filled with
mineral wool, EN 771-1:2011+A1:2015; according to
Annex C44



Vertical perforated brick HLz, FZ 7, filled with mineral
wool, EN 771-1:2015; according to Annex C48



Vertical perforated brick HLz, EN 771-1:2011+A1:2015; e.g. Bouyer Leroux; According to Annex C52



Measures in [mm]
Figures not to scale

Upat injection system UPM 44 for masonry

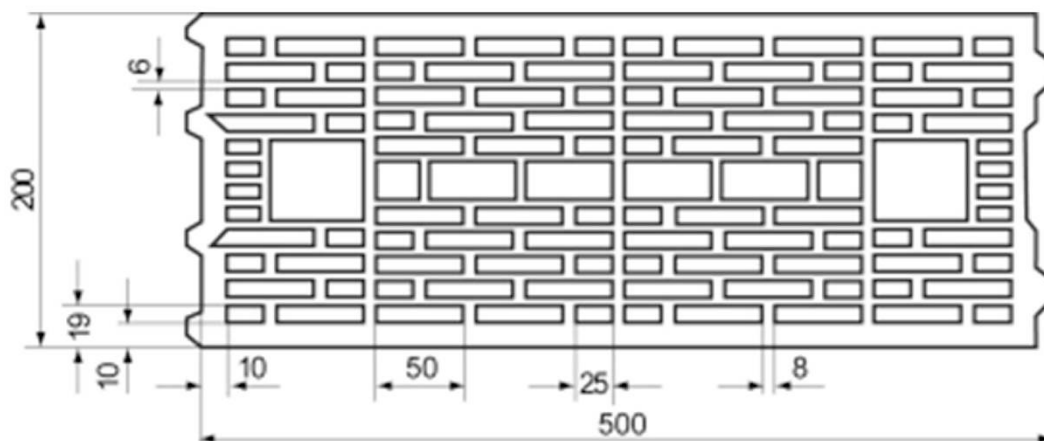
Intended Use

Overview dimensions of perforated and hollow bricks part 2

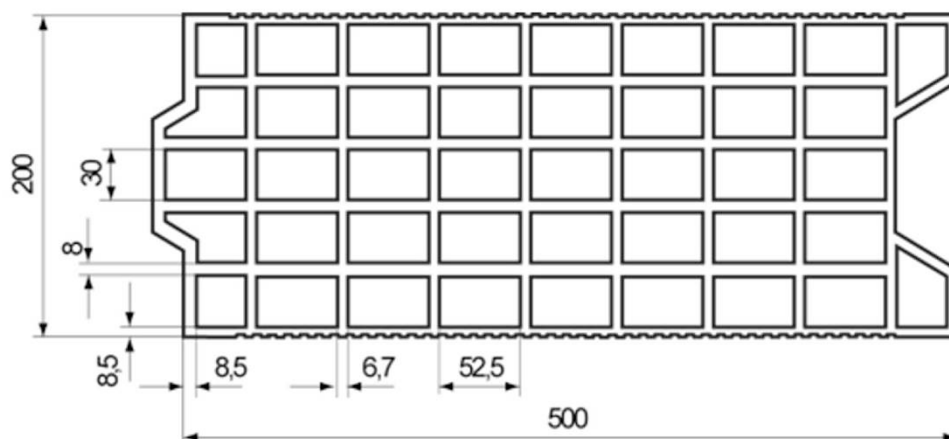
Annex B16

Table B17.1: Overview dimensions of perforated and hollow bricks part 3

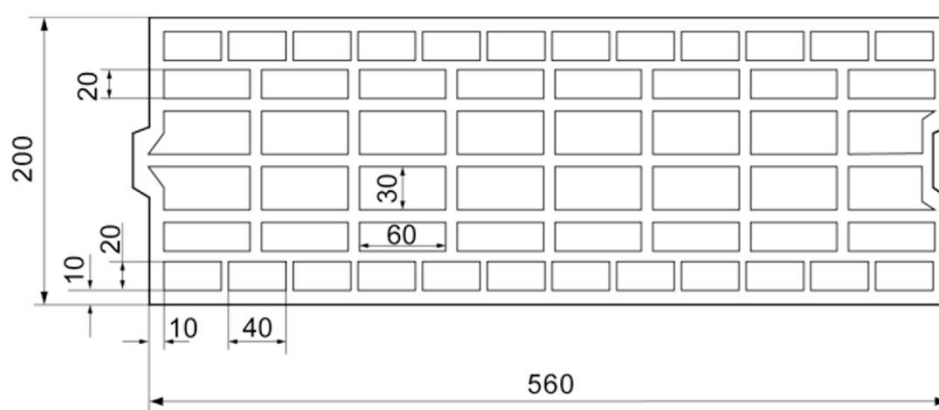
Vertical perforated brick HLz, EN 771-1:2011+A1:2015; e.g. Wienerberger according to Annex C56



Vertical perforated brick HLz, EN 771-1:2011+A1:2015; e.g. Terreal according to Annex C60



Vertical perforated brick HLz, EN 771-1:2011+A1:2015; e.g. Imery according to Annex C64



Measures in [mm]
Figures not to scale

Upat injection system UPM 44 for masonry

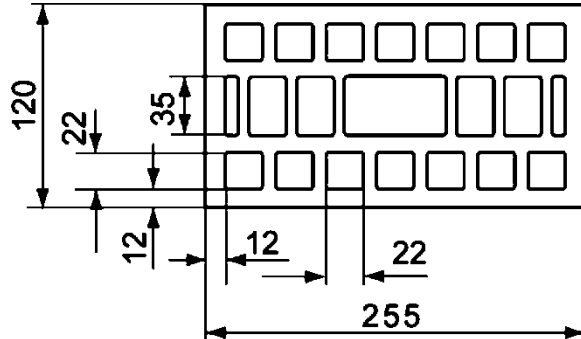
Intended Use

Overview dimensions of perforated and hollow bricks part 3

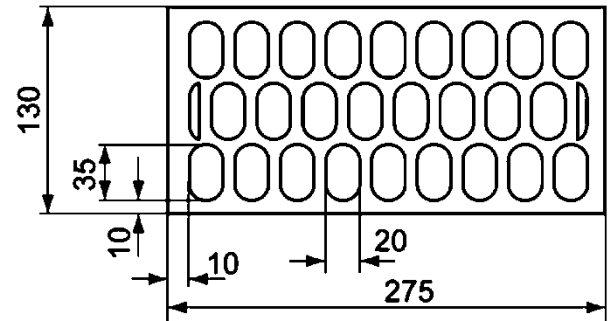
Annex B17

Table B18.1: Overview dimensions of perforated and hollow bricks part 4

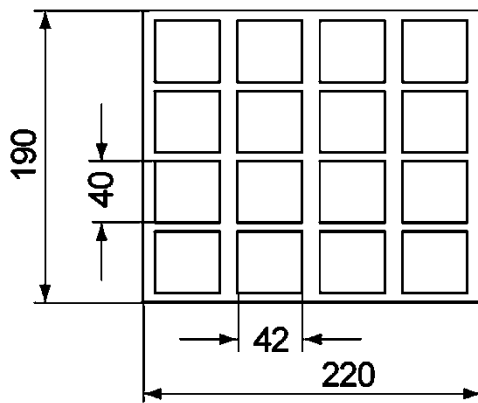
Vertical perforated brick HLz,
EN 771-1:2011+A1:2015;
e.g. Wienerberger according to Annex C66



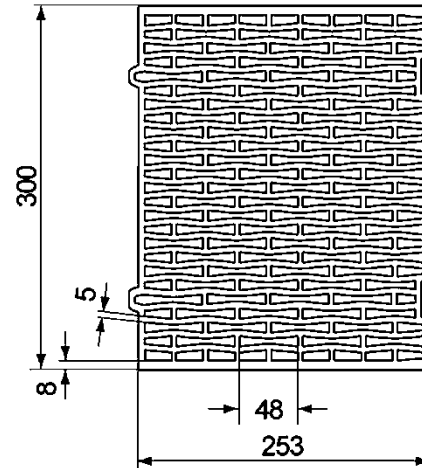
Vertical perforated brick HLz,
EN 771-1:2011+A1:2015;
e.g. Cermanica Farreny S.A. according to Annex C69



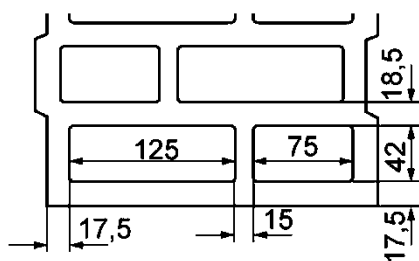
Vertical perforated brick HLz,
EN 771-1:2011+A1:2015;
e.g. Perceram according to Annex C72



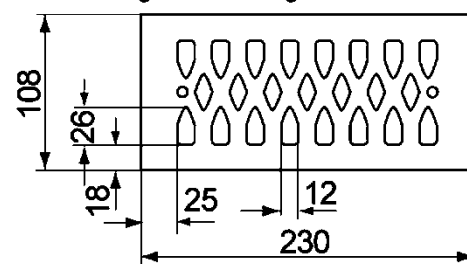
Vertical perforated brick HLz,
EN 771-1:2011+A1:2015;
e.g. Ziegelwerk Brenna according to Annex C76



Vertical perforated brick HLz, Porotherm W 44, filled
with mineral wool, EN 771-1:2011+A1:2015 according
to Annex C80



Vertical perforated brick HLz,
EN 771-1:2011+A1:2015;
e.g. Wienerberger according to Annex C84



Measures in [mm]
Figures not to scale

Upat injection system UPM 44 for masonry

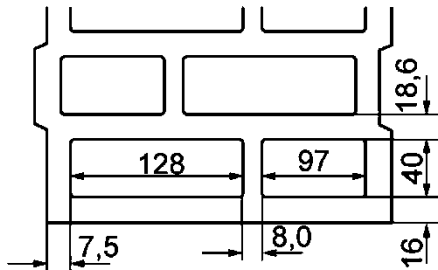
Intended Use

Overview dimensions of perforated and hollow bricks part 4

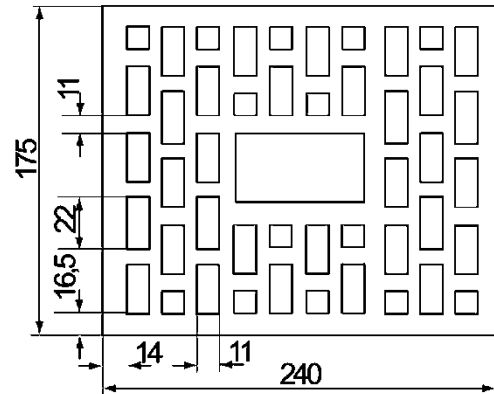
Annex B18

Table B19.1: Overview dimensions of perforated and hollow bricks part 5

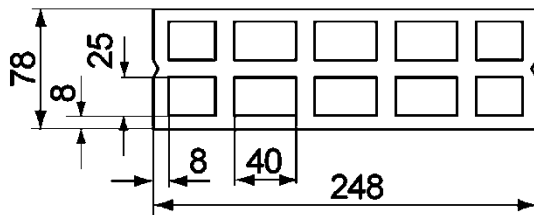
Vertical perforated brick filled with mineral wool,
EN 771-1:2011+A1:2015; according to Annex C86



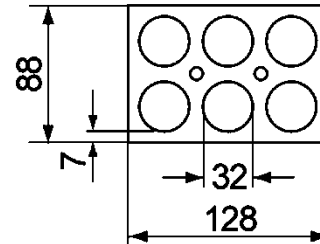
Vertical perforated brick HLz,
EN 771-1:2011+A1:2015;
e.g. Wienerberger according to Annex C90



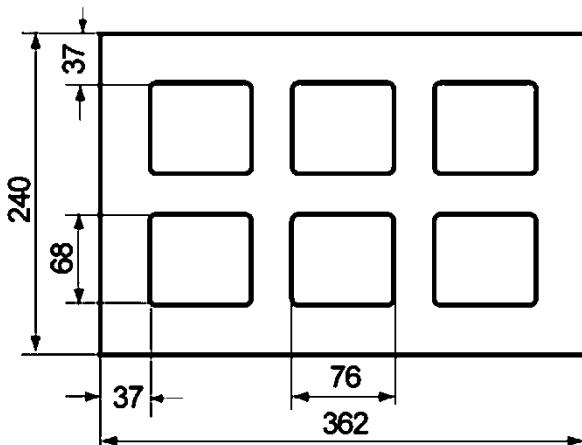
Horizontal perforated brick LLz,
EN 771-1:2011+A1:2015; according to Annex C94



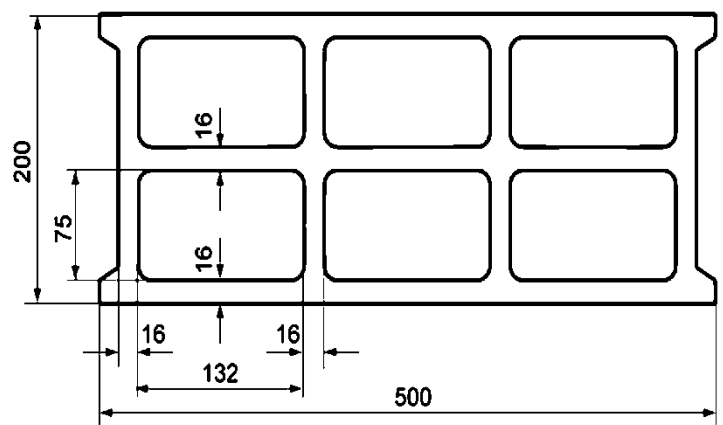
Horizontal perforated brick LLz,
EN 771-1:2011+A1:2015;
e.g. Cermanica Farreny S.A according to Annex C96



Light-weight concrete hollow block Hbl,
EN 771-3:2011+A1:2015; according to Annex C98



Light-weight concrete hollow block Hbl,
EN 771-3:2011+A1:2015;
e.g. Sepa according to Annex C102

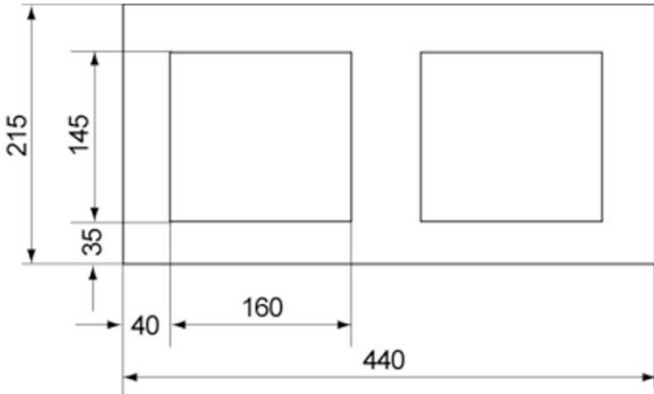
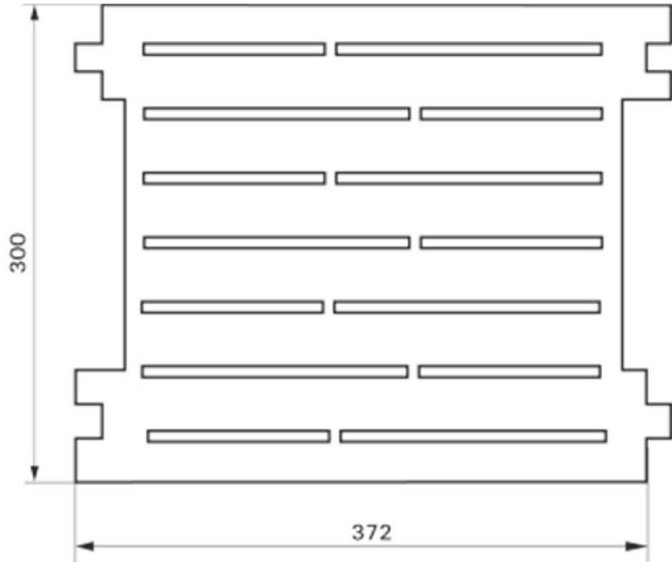
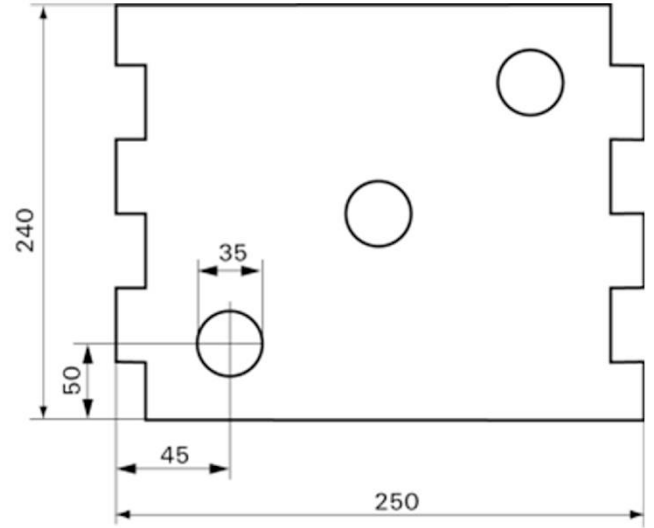


Measures in [mm]
Figures not to scale

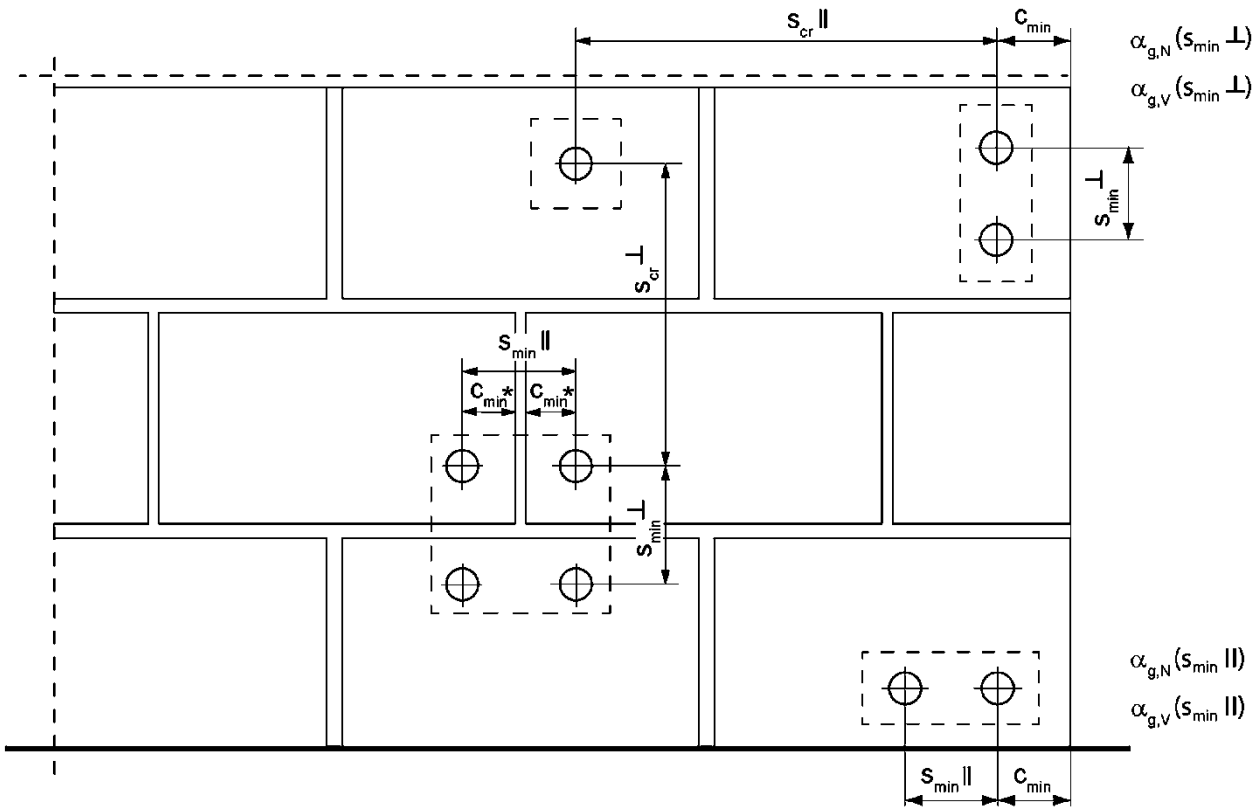
Upat injection system UPM 44 for masonry

Intended Use
Overview dimensions of perforated and hollow bricks part 5

Annex B19

Table B20.1: Overview dimensions of perforated and hollow bricks part 6		
Light-weight concrete hollow block Hbl, EN 771-3:2011+A1:2015 e.g. Roadstone wood according to Annex C104		Light-weight concrete hollow block Hbl, EN 771-3:2011+A1:2015 e.g. Sepa according to Annex C108
		
Light-weight concrete solid block Vbl, EN 771-3:2011+A1:2015; e.g. Sepa according to Annex C110		
		
Measures in [mm] Figures not to scale		
Upat injection system UPM 44 for masonry		Annex B20
Intended Use Overview dimensions of perforated and hollow bricks part 6		

Spacing and edge distance part 1



* Only, if vertical joints are not completely filled with mortar

$s_{min II}$	=	Minimum spacing parallel to horizontal joint
$s_{min \perp}$	=	Minimum spacing perpendicular to horizontal joint
$s_{cr II}$	=	Characteristic spacing parallel to horizontal joint
$s_{cr \perp}$	=	Characteristic spacing perpendicular to horizontal joint
$c_{cr} = c_{min}$	=	Edge distance
$\alpha_{g,N}(s_{min II})$	=	Group factor for tension load, anchor group parallel to horizontal joint
$\alpha_{g,V}(s_{min II})$	=	Group factor for shear load, anchor group parallel to horizontal joint
$\alpha_{g,N}(s_{min \perp})$	=	Group factor for tension load, anchor group perpendicular to horizontal joint
$\alpha_{g,V}(s_{min \perp})$	=	Group factor for shear load, anchor group perpendicular to horizontal joint

Figures not to scale

Upat injection system UPM 44 for masonry	Annex B21
Intended Use Spacing and edge distance part 1	

Spacing and edge distance part 2

For $s \geq s_{cr}$: $\alpha_g = 2$

For $s_{min} \leq s < s_{cr}$: α_g according to installation parameters of brick Annex C

Group of 2 anchors

$$N_{Rk}^g = \alpha_{g,N} \cdot N_{Rk}; V_{Rk,b}^g = V_{Rk,c,II}^g = V_{Rk,c,\perp}^g = \alpha_{g,V} \cdot V_{Rk}$$

Group of 4 anchors

$$N_{Rk}^g = \alpha_{g,N}(s_{minII}) \cdot \alpha_{g,N}(s_{min}^{\perp}) \cdot N_{Rk};$$

$$V_{Rk,b}^g = V_{Rk,c,II}^g = V_{Rk,c,\perp}^g = \alpha_{g,V}(s_{minII}) \cdot \alpha_{g,V}(s_{min}^{\perp}) \cdot V_{Rk}$$

with N_{Rk} and $\alpha_{g,N}$ depending on s_{minII} or $s_{min}^{\perp}$ acc. to Annex C

with V_{Rk} and $\alpha_{g,V}$ depending on s_{minII} or $s_{min}^{\perp}$ acc. to Annex C

Upat injection system UPM 44 for masonry

Intended Use
Spacing and edge distance part 2

Annex B22

Table C1.1: Characteristic resistance to steel failure under tension loading of Upat anchor rods and standard threaded rods

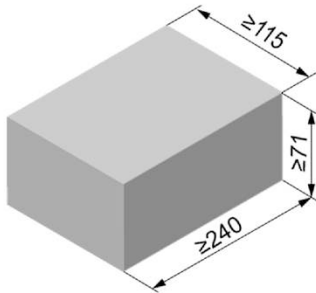
Anchor rod / standard threaded rod			M6	M8 ³⁾	M10 ³⁾	M12	M16		
Characteristic resistance to steel failure under tension loading									
Characteristic resistance $N_{Rk,s}$	Steel zinc plated	Property class	[kN]	4.6	8,0	14,6(13,2)	23,2(21,4)	33,7	62,8
				4.8	8,0	14,6(13,2)	23,2(21,4)	33,7	62,8
				5.8	10,0	18,3(16,6)	29,0(26,8)	42,1	78,5
				8.8	16,0	29,2(26,5)	46,4(42,8)	67,4	125,6
	Stainless steel R and High corrosion resistant steel HCR			50	10,0	18,3	29,0	42,1	78,5
				70	14,0	25,6	40,6	59,0	109,9
				80	16,0	29,2	46,4	67,4	125,6
Partial factors ¹⁾									
Partial factors $\gamma_{Ms,N}$	Steel zinc plated	Property class	[-]	4.6	2,00				
				4.8	1,50				
				5.8	1,50				
				8.8	1,50				
	Stainless steel R and High corrosion resistant steel HCR			50	2,86				
				70	1,50 ²⁾ / 1,87				
				80	1,60				
¹⁾ In absence of other national regulations									
²⁾ Only for Upat UPM A made of high corrosion resistant steel HCR									
³⁾ Values in brackets are valid for undersized threaded rods with smaller stress area A_s for hot-dip galvanised standard threaded rods according to EN ISO 10684:2004+AC:2009.									
Upat injection system UPM 44 for masonry							Annex C1		
Performance Characteristic resistance to steel failure under tension loading of Upat anchor rods and standard threaded rods									

Table C2.1: Characteristic resistance to steel failure under shear loading of Upat anchor rods and standard threaded rods

Anchor rod / standard threaded rod			M6	M8 ³⁾	M10 ³⁾	M12	M16		
Characteristic resistance to steel failure under shear loading									
without lever arm									
Characteristic resistance $V_{Rk,s}$	Steel zinc plated	Property class	4.6	[kN]	4,8	8,7(7,9)	13,9(12,8)	20,2	37,6
			4.8		4,8	8,7(7,9)	13,9(12,8)	20,2	37,6
	5.8		6,0		10,9(9,9)	17,4(16,0)	25,2	47,1	
	8.8		8,0		14,6(13,2)	23,2(21,4)	33,7	62,8	
	Stainless steel R and High corrosion resistant steel HCR		50		5,0	9,1	14,5	21,0	39,2
	70		7,0		12,8	20,3	29,5	54,9	
	80		8,0		14,6	23,2	33,7	62,8	
with lever arm									
Characteristic resistance $M_{Rk,s}^0$	Steel zinc plated	Property class	4.6	[Nm]	6,1	14,9(12,9)	29,9(26,5)	52,3	132,9
			4.8		6,1	14,9(12,9)	29,9(26,5)	52,3	132,9
	5.8		7,6		18,7(16,1)	37,3(33,2)	65,4	166,2	
	8.8		12,2		29,9(25,9)	59,8(53,1)	104,6	265,9	
	Stainless steel R and High corrosion resistant steel HCR		50		7,6	18,7	37,3	65,4	166,2
	70		10,6		26,2	52,3	91,5	232,6	
	80		12,2		29,9	59,8	104,6	265,9	
Partial factors ¹⁾									
Partial factors $\gamma_{Ms,V}$	Steel zinc plated	Property class	4.6	[-]	1,67				
			4.8		1,25				
	5.8		1,25						
	8.8		1,25						
	Stainless steel R and High corrosion resistant steel HCR		50		2,38				
	70		1,25 ²⁾ / 1,56						
	80		1,33						
¹⁾ In absence of other national regulations ²⁾ Only for Upat UPM A made of high corrosion resistant steel HCR ³⁾ Values in brackets are valid for undersized threaded rods with smaller stress area A_s for hot-dip galvanised standard threaded rods (M8 resp. M10) according to EN ISO 10684:2004+AC:2009.									
Upat injection system UPM 44 for masonry						Annex C2			
Performance Characteristic resistance to steel failure under shear loading of Upat anchor rods and standard threaded rods									

Table C3.1: Characteristic resistance to steel failure under tension / shear loading of internal threaded anchors UPM-I								
Upat internal threaded anchor UPM-I				M6	M8	M10	M12	
Characteristic resistance to steel failure under tension loading, decisive values of internal threaded anchor UPM-I with screw/threaded rod								
Characteristic resistance	N _{Rk,s}	Property class 4.6	[kN]	8,0	14,6	23,2	33,7	
		Property class 5.8		10,0	18,3	29,0	42,1	
		Property class 70		R	14,0	25,6	40,6	59,0
		HCR		14,0	25,6	40,6	59,0	
Partial factors ¹⁾								
Partial factors	γ _{Ms,N}	Property class 4.6	[-]	2,00				
		Property class 5.8		1,50				
		Property class 70		R	1,87			
		HCR		1,87				
Characteristic resistance to steel failure under shear loading; decisive values of internal threaded anchor UPM-I with screw/threaded rod								
without lever arm								
Characteristic resistance	V _{Rk,s}	Property class 4.6	[kN]	4,8	8,7	13,9	20,2	
		Property class 5.8		6,0	10,9	15,0	21,0	
		Property class 70		R	7,0	12,8	20,3	29,5
		HCR		7,0	12,8	20,3	29,5	
with lever arm								
Characteristic resistance	M ⁰ _{Rk,s}	Property class 4.6	[Nm]	6,1	14,9	29,9	52,3	
		Property class 5.8		7,6	18,7	37,3	65,4	
		Property class 70		R	10,6	26,2	52,3	91,5
		HCR		10,6	26,2	52,3	91,5	
Partial factors ¹⁾								
Partial factors	γ _{Ms,V}	Property class 4.6	[-]	1,67				
		Property class 5.8		1,25				
		Property class 70		R	1,56			
		HCR		1,56				
1) In absence of other national regulations								
Upat injection system UPM 44 for masonry						Annex C3		
Performance Characteristic resistance to steel failure under tension / shear loading of internal threaded anchors UPM-I								

Solid brick Mz, NF, EN 771-1:2011+A1:2015



Producer	e.g. Wienerberger			
Nominal dimensions	[mm]	length L	width W	height H
		≥ 240	≥ 115	≥ 71
Mean gross dry density ρ	[kg/dm ³]	≥ 1,8		
Mean compressive strength / Min. compressive strength single brick ¹⁾	[N/mm ²]	15 / 12 or 25 / 20 or 35 / 28		
Standard or annex	EN 771-1:2011+A1:2015			

Table C4.1: Installation parameters for edge distance $c=100\text{mm}$

Anchor rod		M6	M8	M10	M12	-		-	
Internal threaded anchor UPM-I		-	-	-	-	M6	M8	M10	M12
						11x85		15x85	
Anchor rod and internal threaded anchor UPM-I without perforated sleeve									
Effective anchorage depth h_{ef}	[mm]	50	50	50	50	85			
		80	80	80	80				
		200	200	200	200				
Max. installation torque $\max T_{inst}$	[Nm]	4	10			4	10		
General installation parameters									
Edge distance $c_{min} = C_{cr}$	[mm]	100				100			
Edge distance $h_{ef}=200$ $c_{min} = C_{cr}$		150				- ²⁾			
$s_{min II,N}$		60				60			
$h_{ef}=200$ $s_{min II,N}$		240				- ²⁾			
Spacing $s_{min II,V}$		240				240			
$s_{cr II}$		240				240			
$s_{cr \perp} = s_{min \perp}$		75				75			

Drilling method

Hammer drilling with hard metal hammer drill

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ No performance assessed

Table C4.2: Group factors

Anchor rods		M6	M8	M10	M12	-	-
Internal threaded anchor UPM-I		-	-	-	-	M6 11x85	M8 15x85
Edge distance c_{min}	[mm]	100					
Group factor	$\alpha_{q,N} (s_{min II})$	[-]	1,5				
	$\alpha_{q,V} (s_{min II})$		2,0				
	$h_{ef}=200$ $\alpha_{q,N} (s_{min II})$		1,5				
	$h_{ef}=200$ $\alpha_{q,V} (s_{min II})$		2,0				
	$\alpha_{q,N} (s_{min \perp})$		2,0				
	$\alpha_{q,V} (s_{min \perp})$		2,0				
	$h_{ef}=200$ $\alpha_{q,N} (s_{min \perp})$		2,0				
	$h_{ef}=200$ $\alpha_{q,V} (s_{min \perp})$		2,0				

Upat injection system UPM 44 for masonry

Performance

Solid brick Mz, NF, dimensions, installation parameters for edge distance $c=100\text{mm}$, Group factors

Annex C4

Solid brick Mz, NF, EN 771-1:211+A1:2015

Table C5.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading for edge distance $c=100\text{mm}$

Anchor rod	M6		M8		M10		M12		-		-	
Internal threaded anchor UPM-I	-		-		-		-		M6	M8	M10	M12
									11x85		15x85	
N _{RK} = N _{RK,p} = N _{RK,b} = N _{RK,p,c} = N _{RK,b,c} [kN]; temperature range 50/80°C ²⁾												
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions		Effective anchorage depth h _{ef} [mm]									
			≥50	≥50	50	80	200	50	80	200	85	
15 / 12 N/mm ²	w/w	w/d	2,5	2,5	2,0	3,0	7,5	2,0	3,5	5,0	3,5	
	d/d		4,0	4,0	3,5	5,0	12,0	3,0	5,5	8,0	5,5	
25 / 20 N/mm ²	w/w	w/d	3,5	3,5	3,0	4,5	11,0	3,0	5,0	7,0	5,0	
	d/d		5,5	5,5	5,0	7,0	12,0	4,5	8,0	11,5	8,0	

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120^\circ\text{C})} = 0,83 \cdot N_{Rk(50/80^\circ\text{C})}$.

Table C5.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading for edge distance $c=100\text{mm}$

Anchor rod	M6	M8	M10	M12	-		-	
Internal threaded anchor UPM-I	-	-	-	-	M6	M8	M10	M12
					11x85		15x85	
V _{Rk} = V _{Rk,b} = V _{Rk,c,II} = V _{Rk,c,⊥} [kN]; temperature range 50/80°C and 72/120°C								
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions	Effective anchorage depth h _{ef} [mm]						
		≥50	≥50	≥50	200	≥50	200	85
15 / 12 N/mm²	w/w	2,5	2,5	4,0	8,5	4,0	11,5	2,5
	w/d							
25 / 20 N/mm²	w/w	4,0	4,0	6,0	12,0	5,5	12,0	4,0
	w/d							
	d/d							

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Factor for job site tests and displacements see annex C123.

Upat injection system UPM 44 for masonry

Performance

Solid brick Mz, NF, Characteristic resistance under tension and shear loading, edge distance $c=100\text{mm}$

Annex C5

Solid brick Mz, NF, EN 771-1:2011+A1:2015

Table C6.1: Installation parameters for edge distance $c=60\text{mm}$

Anchor rod		M6	M8	M10	M12	M16	-		-	
Internal threaded anchor UPM-I		-	-	-	-	-	M6	M8	M10	M12
							11x85		15x85	
Anchor rod and internal threaded anchor UPM-I without perforated sleeve										
Effective anchorage depth	h_{ef}	[mm]	50	50	50	50	50	85		
			100	100	100	100	100			
			200	200	200	200	200			
Max. installation torque	$\max T_{inst}$	[Nm]	4	10				4	10	
General installation parameters										
Edge distance	$c_{min} = c_{cr}$	[mm]	60							
Edge distance	c_{min}		60							
Spacing	$s_{min \parallel, N}$		80							
	$h_{ef}=200 \ s_{min \parallel, N}$		80							
	$s_{min \parallel, V}$		80							
	$s_{cr \parallel}$		$3x h_{ef}$							
	$s_{min \perp}$		80							
	$s_{cr \perp}$		$3x h_{ef}$							
Drilling method										
Hammer drilling with hard metal hammer drill										

Table C6.2: Group factors

Anchor rods		M6	M8	M10	M12	M16	-		-	
Internal threaded anchor UPM-I		-	-	-	-	-	M6	M8	M10	M12
							11x85		15x85	
Edge distance	c_{min} [mm]	60								
Group factor	$\alpha_{g,N} (s_{min \parallel})$	[-]	0,6							
	$\alpha_{g,V} (s_{min \parallel})$		1,3							
	$h_{ef}=200 \ \alpha_{g,N} (s_{min \parallel})$		1,4							
	$h_{ef}=200 \ \alpha_{g,V} (s_{min \parallel})$		1,5							
	$\alpha_{g,N} (s_{min \perp})$		0,3							
	$\alpha_{g,V} (s_{min \perp})$		1,3							
	$h_{ef}=200 \ \alpha_{g,N} (s_{min \perp})$		2,0							
	$h_{ef}=200 \ \alpha_{g,V} (s_{min \perp})$		1,1							
Upat injection system UPM 44 for masonry							Annex C6			
Performance Solid brick Mz, NF, dimensions, installation parameters, edge distance c=60mm, Group factors										

Solid brick Mz, NF, EN 771-1:2011+A1:2015

Table C7.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading for edge distance $c=60\text{mm}$

Anchor rod	M6				M8				M10				M12				M16				-		-	
Internal threaded anchor UPM-I	-				-				-				-				-				M6	M8	M10	M12
																					11x85		15x85	
N _{RK} = N _{RK,p} = N _{RK,b} = N _{RK,p,c} = N _{RK,b,c} [kN]; temperature range 50/80°C ³⁾																								
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions		Effective anchorage depth h _{ef} [mm]																					
			50	100	50	100	50	100	200	50	100	200	50	100	200	85								
15 / 12 N/mm²	w/w	w/d	1,5	2,0	2,0	2,0	2,5	2,5	2,0	2,5	2,5	2,0	5,5	2,5	2,5	2,0	2,0							
	d/d		2,5	3,0	4,0	3,0	4,0	9,5	3,0	4,0	9,5	3,0	8,5	9,5	2,0									
25 / 20 N/mm²	w/w	w/d	2,0	2,5	3,0	2,5	3,5	2,5	3,0	3,5	2,5	3,0	7,5	2,5	2,5	2,0	2,0							
	d/d		3,5	4,5	5,5	4,5	5,5	12	4,5	5,5	12	4,5	12	12	2,0									
35 / 28 N/mm²	w/w	w/d	2,5	3,0	4,0	3,0	4,0	2,5	3,5	4,0	2,5	3,5	9,0	2,5	2,5	2,0	2,0							
	d/d		4,0	5,5	6,5	5,5	6,5	12	5,5	6,5	12	5,5	12	12	2,0									

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ No performance assessed.

³⁾ For temperature range 72/120°C: $N_{Rk}(72/120^\circ\text{C}) = 0,83 \cdot N_{Rk}(50/80^\circ\text{C})$.

Table C7.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading for edge distance $c=60\text{mm}$

Anchor rod	M6	M8	M10	M12	M16	-		-							
Internal threaded anchor UPM-I	-	-	-	-	-	M6	M8	M10	M12						
						11x85	15x85								
V _{Rk} = V _{Rk,b} = V _{Rk,c,II} = V _{Rk,c,I} [kN]; temperature range 50/80°C and 72/120°C															
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions	Effective anchorage depth h _{ef} [mm]													
		50	100	50	100	50	100	200	50	100	200	50	100	200	85
15 / 12 N/mm ²	w/w w/d d/d	1,2	2,5	1,2	3,0	2,0	3,0	1,5	1,5	3,0	3,0	0,6	3,0	4,5	..2)
25 / 20 N/mm ²		1,5	3,5	1,5	4,5	3,0	4,5	2,5	2,0	4,5	4,5	0,9	4,5	6,0	..2)
35 / 28 N/mm ²		2,0	4,0	2,0	5,0	3,5	5,0	3,0	2,5	5,0	5,0	1,2	5,0	7,5	..2)

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ No performance assessed.

Factor for job site tests and displacements see annex C123.

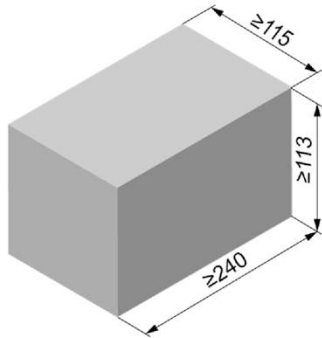
Upat injection system UPM 44 for masonry

Performance

Solid brick Mz, NF, Characteristic resistance under tension and shear loading, edge distance $c=60\text{mm}$

Annex C7

Solid brick Mz, 2DF, EN 771-1:2011+A1:2015



Producer	e.g. Wienerberger			
Nominal dimensions	[mm]	length L	width W	height H
		≥ 240	≥ 115	≥ 113
Mean gross dry density ρ	[kg/dm³]	≥ 1,8		
Mean compressive strength / Min. compressive strength single brick ¹⁾	[N/mm²]	12,5 / 10 or 20 / 16		
Standard or annex	EN 771-1:2011+A1:2015			

Table C8.1: Installation parameters

Anchor rod		M6		M8		M10		M12		M16		-		-	
Internal threaded anchor UPM-I		-		-		-		-		-		M6		M8	
												11x85		15x85	
Anchor rod and internal threaded anchor UPM-I without perforated sleeve															
Effective anchorage depth h_{ef}		[mm]	50	100	50	100	50	100	50	100	50	100	85		
Max. installation torque $\max T_{inst}$		[Nm]	4		10								4	10	
Anchor rod and internal threaded anchor UPM-I with perforated sleeve UPM SH 16x85 K															
Effective anchorage depth h_{ef}		[mm]	_2)		85		_2)					85		_2)	
Max. installation torque $\max T_{inst}$		[Nm]			10							4	10		
General installation parameters															
Edge distance $c_{min} = c_{cr}$		[mm]	60												
$s_{min} \parallel$			120												
Spacing $s_{cr} \parallel$			240												
$s_{cr} \perp = s_{min} \perp$			115												
Drilling method															
Hammer drilling with hard metal hammer drill															
1) The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength. 2) No performance assessed.															
Table C8.2: Group factors															
Anchor rods		M6		M8		M10		M12		M16		-		-	
Internal threaded anchor UPM-I		-		-		-		-		-		M6		M8	
												11x85		15x85	
Group factor	$\alpha_{g,N} (s_{min} \parallel)$	[-]	1,5												
	$\alpha_{g,V} (s_{min} \parallel)$		1,4												
	$\alpha_{g,N} (s_{min} \perp)$		2,0												
	$\alpha_{g,V} (s_{min} \perp)$														
Upat injection system UPM 44 for masonry												Annex C8			
Performance Solid brick Mz, 2DF, dimensions, installation parameters, Group factors															

Solid brick Mz, 2DF, EN 771-1:2011+A1:2015

Table C9.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading

Anchor rod	M6	M8	M10	M12	M16	-	-	M8	M10	-	
Internal threaded anchor UPM-I	-	-	-	-	-	M6	M8	M10	M12	M6	M8
						11x85		15x85			
Perforated sleeve UPM SH K	-	-	-	-	-	-	-	16x85			

$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; temperature range 50/80°C ²⁾

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions		Effective anchorage depth h _{ef} [mm]												
			50	100	50	100	50	100	50	100	50	100	85		
12,5 / 10 N/mm ²	w/w	w/d	1,5	2,5	1,5	2,5	1,5	3,0	2,0	3,5	2,0	3,5	2,0		1,5
	d/d		3,0	4,0	3,0	4,0	3,0	4,5	3,0	5,5	3,0	5,5	3,0		3,0
20 / 16 N/mm ²	w/w	w/d	2,5	4,0	2,5	4,0	2,5	4,5	3,5	5,5	3,5	5,5	3,5		2,5
	d/d		4,5	7,0	4,5	7,0	4,5	7,5	5,5	8,0	5,5	8,0	5,5		4,5

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120^\circ C)} = 0,83 \cdot N_{Rk(50/80^\circ C)}$.

Table C9.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading

Anchor rod	M6	M8	M10	M12	M16	-	-	M8	M10	-	
Internal threaded anchor UPM-I	-	-	-	-	-	M6	M8	M10	M12	M6	M8
						11x85	15x85	11x85			
Perforated sleeve UPM SH K	-	-	-	-	-	-	-	16x85			

$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; temperature range 50/80°C and 72/120°C

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions	Effective anchorage depth h _{ef} [mm]												
		≥ 50						85						
12,5 / 10 N/mm ²	w/w	2,5	3,0	3,0	3,5	3,0	2,5	3,0	3,0	3,0	3,0	3,5	2,5	3,0
	w/d													
20 / 16 N/mm ²	w/w	4,0	5,0	5,5	5,5	5,0	4,0	5,0	5,0	5,0	5,0	6,0	4,0	5,0
	w/d													
	d/d <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th>													

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Factor for job site tests and displacements see annex C123.

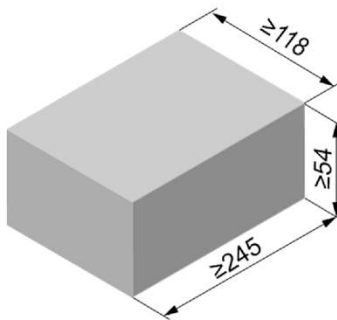
Upat injection system UPM 44 for masonry

Performance

Solid brick Mz, 2DF, Characteristic resistance under tension and shear loading

Annex C9

Solid brick Mz, EN 771-1:2011+A1:2015



Producer	e.g. Nigra		
Nominal dimensions [mm]	length L	width W	height H
	≥ 245	≥ 118	≥ 54
Mean gross dry density ρ [kg/dm³]	≥ 1,8		
Mean compressive strength / Min. compressive strength single brick ¹⁾ [N/mm²]	12,5 / 10 or 25 / 20		
Standard or annex	EN 771-1:2011+A1:2015		

Table C10.1: Installation parameters

Anchor rod	M6	M8	M10	M12	M16	-		-						
Internal threaded anchor UPM-I	-	-	-	-	-	M6	M8	M10	M12					
						11x85		15x85						
Anchor rod and internal threaded anchor UPM-I without perforated sleeve														
Effective anchorage depth h_{ef}	[mm]	50	100	50	100	50	100	50	100	50	100	85		
Max. installation torque $\max T_{inst}$	[Nm]	4		10								4	10	
General installation parameters														
Edge distance $C_{min} = C_{cr}$	[mm]	60												
Spacing $s_{cr \parallel} = s_{min \parallel}$		245												
$s_{cr \perp} = s_{min \perp}$		60												
Drilling method														
Hammer drilling with hard metal hammer drill														

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C10.2: Group factors

Anchor rods	M6	M8	M10	M12	M16	-	-
Internal threaded anchor UPM-I	-	-	-	-	-	M6 11x85	M8 M10 M12 15x85
Group factor	$\alpha_{g,N} (s_{min \parallel})$ $\alpha_{g,V} (s_{min \parallel})$ $\alpha_{g,N} (s_{min \perp})$ $\alpha_{g,V} (s_{min \perp})$	2					

Upat injection system UPM 44 for masonry

Performance

Solid brick Mz, dimensions, installation parameters, Group factors

Annex C10

Solid brick Mz, EN 771-1:2011+A1:2015

Table C11.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading

Anchor rod			M6	M8	M10	M12	M16	-		-	
Internal threaded anchor UPM-I			-	-	-	-	-	M6	M8	M10	M12
								11x85		15x85	
N _{RK} = N _{RK,p} = N _{RK,b} = N _{RK,p,c} = N _{RK,b,c} [kN]; temperature range 50/80°C ²⁾											
Mean compressive strength/ Min. compressive strength single brick ¹⁾	Use con- ditions		Effective anchorage depth h _{ef} [mm]								
			≥ 50					85			
12,5 / 10 N/mm ²	w/w	w/d	0,60	0,90	0,75	0,75	0,75	0,60	0,75		
	d/d		1,20	1,50	1,20	1,20	1,20	1,20	1,20		
25 / 20 N/mm ²	w/w	w/d	0,90	1,50	1,20	1,20	1,20	0,90	1,20		
	d/d		1,50	2,50	2,00	2,00	2,00	1,50	2,00		

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120^\circ C)} = 0,83 \cdot N_{Rk(50/80^\circ C)}$.

Table C11.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading

Anchor rod			M6	M8	M10	M12	M16	-		-	
Internal threaded anchor UPM-I			-	-	-	-	-	M6	M8	M10	M12
								11x85		15x85	
V _{Rk} = V _{Rk,b} = V _{Rk,c,II} = V _{Rk,c,⊥} [kN]; temperature range 50/80°C and 72/120°C											
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions		Effective anchorage depth h _{ef} [mm]								
			≥ 50					85			
12,5 / 10 N/mm ²	w/w	w/d	2,0	3,0	4,0	4,5	5,5	2,0	3,0	4,0	4,5
	d/d										
25 / 20 N/mm ²	w/w	w/d	2,5	4,0	5,5	6,0	8,0	2,5	4,0	5,5	6,0
	d/d										

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Factor for job site tests and displacements see annex C123.

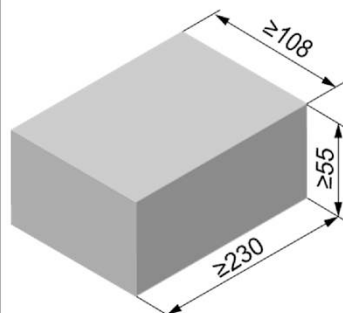
Upat injection system UPM 44 for masonry

Performance

Solid brick Mz, Characteristic resistance under tension and shear loading

Annex C11

Solid brick Mz, EN 771-1:2011+A1:2015



Producer	e.g. Wienerberger			
Nominal dimensions	[mm]	length L	width W	height H
		≥ 230	≥ 108	≥ 55
Mean gross dry density ρ	[kg/dm³]	≥ 1,8		
Mean compressive strength / Min. compressive strength single brick ¹⁾	[N/mm²]	12,5 / 10 or 25 / 20		
Standard or annex	EN 771-1:2011+A1:2015			

Table C12.1: Installation parameters

Anchor rod		M6		M8		M10		M12		M16		-		-	
Internal threaded anchor UPM-I		-		-		-		-		-		M6	M8	M10	M12
												11x85		15x85	
Anchor rod and internal threaded anchor UPM-I without perforated sleeve															
Effective anchorage depth	h_{ef}	[mm]	50	90	50	90	50	90	50	90	50	90	85		
Max. installation torque	$\max T_{inst}$	[Nm]	4		10								4	10	
General installation parameters															
Edge distance	$C_{min} = C_{cr}$	[mm]	60												
Spacing	$s_{cr \parallel} = s_{min \parallel}$		230												
	$s_{cr \perp} = s_{min \perp}$		60												
Drilling method															
Hammer drilling with hard metal hammer drill															

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C12.2: Group factors

Anchor rods		M6	M8	M10	M12	M16	-	-
Internal threaded anchor UPM-I		-	-	-	-	-	M6 11x85	M8 15x85
Group factor	$\alpha_{g,N} (s_{min \parallel})$ $\alpha_{g,V} (s_{min \parallel})$ $\alpha_{g,N} (s_{min \perp})$ $\alpha_{g,V} (s_{min \perp})$	2						

Upat injection system UPM 44 for masonry

Performance

Solid brick Mz, dimensions, installation parameters, Group factors

Annex C12

Solid brick Mz, EN 771-1:2011+A1:2015

Table C13.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading

Anchor rod			M6	M8	M10	M12	M16	-		-	
Internal threaded anchor UPM-I			-	-	-	-	-	M6	M8	M10	M12
								11x85		15x85	
N _{RK} = N _{RK,p} = N _{RK,b} = N _{RK,p,c} = N _{RK,b,c} [kN]; temperature range 50/80°C ²⁾											
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions		Effective anchorage depth h _{ef} [mm]								
			≥ 50						85		
12,5 / 10 N/mm ²	w/w	w/d	0,60	0,90	0,75	0,75	0,75	0,75			
	d/d	1,20	1,50	1,20	1,20	1,20	1,20				
25 / 20 N/mm ²	w/w	w/d	0,90	1,50	1,20	1,20	1,20	1,20			
	d/d	1,50	2,50	2,00	2,00	2,00	2,00				

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120^\circ C)} = 0,83 \cdot N_{Rk(50/80^\circ C)}$.

Table C13.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading

Anchor rod			M6	M8	M10	M12	M16	-		-	
Internal threaded anchor UPM-I			-	-	-	-	-	M6	M8	M10	M12
								11x85		15x85	
V _{Rk} = V _{Rk,b} = V _{Rk,c,II} = V _{Rk,c,⊥} [kN]; temperature range 50/80°C and 72/120°C											
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions		Effective anchorage depth h _{ef} [mm]								
			≥ 50					85			
12,5 / 10 N/mm ²	w/w	w/d	2,0	3,0	4,0	4,5	5,5	2,0	3,0	4,0	4,5
	d/d										
25 / 20 N/mm ²	w/w	w/d	2,5	4,0	5,5	6,0	8,0	2,5	4,0	5,5	6,0
	d/d										

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Factor for job site tests and displacements see annex C123.

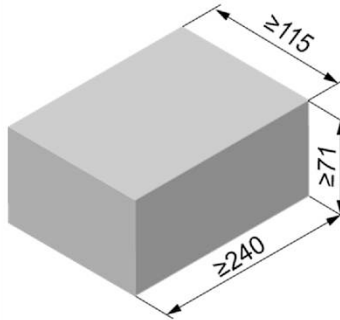
Upat injection system UPM 44 for masonry

Performance

Solid brick Mz, Characteristic resistance under tension and shear loading

Annex C13

Solid calcium silicate brick KS, NF, EN 771-2:2011+A1:2015



Producer	-			
Nominal dimensions	[mm]	length L	width W	height H
		≥ 240	≥ 115	≥ 71
Mean gross dry density ρ	[kg/dm ³]	≥ 1,8		
Mean compressive strength / Min. compressive strength single brick ¹⁾	[N/mm ²]	15 / 12 or 25 / 20 or 35 / 28		
Standard or annex	EN 771-2:2011+A1:2015			

Table C14.1: Installation parameters

Anchor rod	M6		M8		M10		M12		M16		-		-	
Internal threaded anchor UPM-I	-	-	-	-	-	-	-	-	-	-	M6	M8	M10	M12
											11x85		15x85	
Anchor rod and internal threaded anchor UPM-I without perforated sleeve														
Effective anchorage depth h_{ef}	[mm]	50	100	50	100	50	100	50	100	50	100	85		85
						200		200		200				
Max. installation torque $\max T_{inst}$	[Nm]	3		5		15		15		25		3	5	15
General installation parameters														
Edge distance $c_{min} = c_{cr}$	[mm]	60												
$s_{min} \parallel$		80												
$s_{cr} \parallel$		80												
$s_{min} \perp$		3x h_{ef}												
$s_{cr} \perp$		3x h_{ef}												
Drilling method														
Hammer drilling with hard metal hammer drill														

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength..

Table C14.2: Group factors

Anchor rod	M6	M8	M10	M12	M16	-	-
Internal threaded anchor UPM-I	-	-	-	-	-	M6 11x85	M8 M10 M12 15x85
Group factor	$\alpha_{g,N} (s_{min} \parallel)$	0,7					
	$\alpha_{g,V} (s_{min} \parallel)$	1,3					
	$\alpha_{g,N} (s_{min} \perp)$	2,0					
	$\alpha_{g,V} (s_{min} \perp)$	2,0					

Upat injection system UPM 44 for masonry

Performance

Solid calcium silicate brick KS, NF, dimensions, installation parameters, Group factors

Annex C14

Solid calcium silicate brick KS, NF, EN 771-2:2011+A1:2015

Table C15.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading

Anchor rod	M6		M8		M10		M12		M16		-		-				
Internal threaded anchor UPM-I	-		-		-		-		-		M6	M8	M10	M12			
											11x85		15x85				
N _{RK} = N _{RK,p} = N _{RK,b} = N _{RK,p,c} = N _{RK,b,c} [kN]; temperature range 50/80°C ²⁾																	
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions		Effective anchorage depth h _{ef} [mm]														
			50	100	50	100	50	100	200	50	100	200	50	100	200	85	85
15 / 12 N/mm ²	w/w	w/d	2,0	3,0	2,5	4,5	2,5	3,5	7,0	2,5	3,0	6,5	2,5	3,5	8,0	2,5	2,5
	d/d		4,0	5,5	4,0	8,0	4,0	5,5	12	4,0	4,5	12	4,5	5,5	12	4,0	4,0
25 / 20 N/mm ²	w/w	w/d	3,0	4,5	3,5	6,5	3,5	4,5	10	3,5	4,0	9,5	4,0	5,0	11	3,5	3,5
	d/d		5,5	7,5	6,0	11	6,0	8,0	12	6,0	6,5	12	6,5	8,0	12	6,0	6,0
35 / 28 N/mm ²	w/w	w/d	3,5	5,0	4,0	8,0	4,5	5,5	12	4,5	5,0	11	4,5	5,5	12	4,5	4,5
	d/d		6,5	9,0	7,0	12	7,0	9,0	12	7,0	7,5	12	7,5	9,5	12	7,0	7,0

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120°C)} = 0,83 \cdot N_{Rk(50/80°C)}$.

Table C15.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading

Anchor rod		M6		M8		M10		M12		M16		-		-	
Internal threaded anchor UPM-I		-		-		-		-		-		M6	M8	M10	M12
												11x85		15x85	
V _{RK} = V _{RK,b} = V _{RK,c,II} = V _{RK,c,⊥} [kN]; temperature range 50/80°C and 72/120°C															
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions		Effective anchorage depth h _{ef} [mm]												
			50	100	50	100	50	≥100	50	≥100	50	≥100	85	85	
15 / 12 N/mm²	w/w	w/d	1,5	3,0	1,5	3,0	1,2	2,0	1,2	2,0	1,2	2,0	1,2	1,2	
	d/d														
25 / 20 N/mm²	w/w	w/d	2,5	4,0	2,5	4,0	1,5	3,0	1,5	3,0	1,5	3,0	1,5	1,5	
	d/d														
35 / 28 N/mm²	w/w	w/d	3,0	4,5	3,0	4,5	1,5	3,5	1,5	3,5	1,5	3,5	1,5	1,5	
	d/d														

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Factor for job site tests and displacements see annex C123.

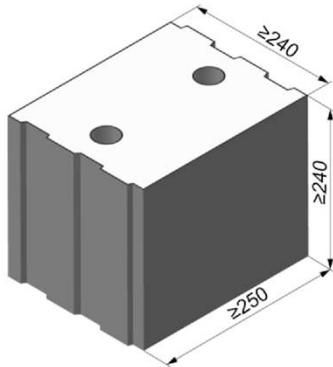
Upat injection system UPM 44 for masonry

Performance

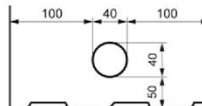
Solid calcium silicate brick KS, NF, Characteristic resistance under tension and shear loading

Annex C15

Solid calcium silicate brick KS, 8DF, EN 771-2:2011+A1:2015



Producer	-
Nominal dimensions [mm]	length L width W height H
	≥ 250 ≥ 240 ≥ 240
Mean gross dry density ρ [kg/dm ³]	≥ 2,0
Mean compressive strength / Min. compressive strength single brick ¹⁾ [N/mm ²]	12,5 / 10 or 25 / 20 or 35 / 28
Standard or annex	EN 771-2:2011+A1:2015



Dimension see also
Annex B15

Table C16.1: Installation parameters

Anchor rod		M6		M8		M10		M12		M16		-		-		
Internal threaded anchor UPM-I		-		-		-		-		-		M6	M8	M10	M12	
												11x85		15x85		
Anchor rod and internal threaded anchor UPM-I without perforated sleeve																
Effective anchorage depth	h_{ef}	[mm]	50	100	50	100	50	100	50	100	50	100	85			
Max. installation torque	$\max T_{inst}$	[Nm]	4		10								4	10		
Anchor rod and internal threaded anchor UPM-I with perforated sleeve UPM SH 16x85 K																
Effective anchorage depth	h_{ef}	[mm]	_2)		85				_2)				85		_2)	
Max. installation torque	$\max T_{inst}$	[Nm]			10								4			
General installation parameters																
Edge distance	$c_{min} = c_{cr}$	[mm]	60													
Spacing	$s_{min} \parallel$		80													
	$s_{cr} \parallel$		3x h_{ef}													
	$s_{min} \perp$		80													
	$s_{cr} \perp$		3x h_{ef}													

Drilling method

Hammer drilling with hard metal hammer drill

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ No performance assessed.

Table C16.2: Group factors

Anchor rods	M6	M8	M10	M12	M16	-	-
Internal threaded anchor UPM-I	-	-	-	-	-	M6 M8 11x85	M10 M12 15x85
Group factors $\alpha_{a,N} (s_{min} \parallel)$	1,5						
Group factors $\alpha_{a,V} (s_{min} \parallel)$	1,2						
Group factors $\alpha_{a,N} (s_{min} \perp)$	1,5						
Group factors $\alpha_{a,V} (s_{min} \perp)$	1,2						

Upat injection system UPM 44 for masonry

Performance

Solid calcium silicate brick KS, 8DF, dimensions, installation parameters, Group factors

Annex C16

Solid calcium silicate brick KS, 8DF, EN 771-2:2011+A1:2015

Table C17.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading

Anchor rod			M6	M8	M10	M12	M16	-		-		M8	M10	-	
Internal threaded anchor UPM-I			-	-	-	-	-	M6	M8	M10	M12	-	-	M6	M8
								11x85		15x85				11x85	
Perforated sleeve UPM SH K			-	-	-	-	-	-		-		16x85			
N _{Rk} = N _{Rk,p} = N _{Rk,b} = N _{Rk,p,c} = N _{Rk,b,c} [kN]; temperature range 50/80°C ²⁾															
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions		Effective anchorage depth h _{ef} [mm]												
			≥ 50					85							
12,5 / 10 N/mm ²	w/w	w/d	3,0	4,0	4,5	4,5	3,5	3,0	3,5		4,5		3,0	4,5	
	d/d		5,0	7,0	7,0	7,0	5,5	5,0	5,5		8,0		5,0	8,0	
25 / 20 N/mm ²	w/w	w/d	4,5	6,0	6,0	6,0	5,0	4,5	5,0		6,5		4,5	6,5	
	d/d		7,5	10,0	10,0	10,0	7,5	7,5	7,5		11,0		7,5	11	
35 / 28 N/mm ²	w/w	w/d	5,0	8,0	8,5	8,5	7,0	5,0	7,0		8,5		5,0	8,5	
	d/d		8,5	12,0	12,0	12,0	11,0	8,5	11,0		12,0		8,5	12	

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120^\circ C)} = 0,83 \cdot N_{Rk(50/80^\circ C)}$.

Table C17.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading

Anchor rod	M6	M8	M10	M12	M16	-		-		M8	M10	-	
Internal threaded anchor UPM-I	-	-	-	-	-	M6	M8	M10	M12	-	-	M6	M8
						11x85		15x85				11x85	
Perforated sleeve UPM SH K	-	-	-	-	-	-		-		16x85			
V _{Rk} = V _{Rk,b} = V _{Rk,c,II} = V _{Rk,c,I} [kN]; temperature range 50/80°C and 72/120°C													
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions		Effective anchorage depth h _{ef} [mm]										
			≥ 50					85					
12,5 / 10 N/mm²	w/w	w/d	2,5	4,5		2,5	4,5		4,5	2,5	4,5		
	d/d												
25 / 20 N/mm²	w/w	w/d	4,0	6,5		4,0	6,5		6,5	4,0	6,5		
	d/d												
35 / 28 N/mm²	w/w	w/d	5,0	9,0		5,0	9,0		9,0	5,0	9,0		
	d/d												

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Factor for job site tests and displacements see annex C123.

Upat injection system UPM 44 for masonry

Performance

Solid calcium silicate brick KS, 8DF, Characteristic resistance under tension and shear loading

Annex C17

Solid calcium silicate brick KS, EN 771-2:2011+A1:2015

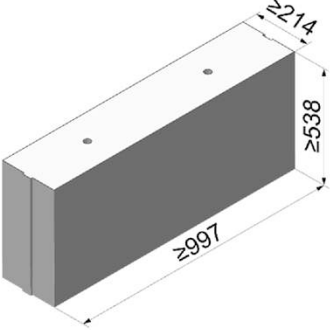
	Producer	e.g. Calduran		
	Nominal dimensions [mm]	length L	width W	height H
		≥ 997	≥ 214	≥ 538
	Mean gross dry density ρ [kg/dm ³]	1,8		2,2
	Mean compressive strength / Min. compressive strength single brick ¹⁾ [N/mm ²]	12,5 / 10 or 25 / 20		45 / 36
Standard or annex		EN 771-2:2011+A1:2015		



Table C18.1: Installation parameters

Anchor rod	M6		M8		M10		M12		M16		-		-		
Internal threaded anchor UPM-I	-		-		-		-		-		M6		M8	M10	M12
											11x85		15x85		
Anchor rod and internal threaded anchor UPM-I without perforated sleeve															
Effective anchorage depth h_{ef}	[mm]	50	100	50	100	50	100	50	100	50	100	85			
Max. installation torque $\max T_{inst}$	[Nm]	4		10								4	10		
General installation parameters															
Edge distance $c_{min} = c_{cr}$	[mm]	75													
Spacing $s_{cr \parallel} = s_{min \parallel}$		3x h_{ef}													
$s_{cr \perp} = s_{min \perp}$		3x h_{ef}													
Drilling method															
Hammer drilling with hard metal hammer drill															

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C18.2: Group factors

Anchor rod	M6	M8	M10	M12	M16	-	-
Internal threaded anchor UPM-I	-	-	-	-	-	M6 11x85	M8 15x85
Group factors	$\alpha_{g,N} (s_{min \parallel})$	$\alpha_{g,V} (s_{min \parallel})$	$\alpha_{g,N} (s_{min \perp})$	$\alpha_{g,V} (s_{min \perp})$	2		

Upat injection system UPM 44 for masonry

Performance

Solid calcium silicate brick KS, dimensions, installation parameters, Group factors

Annex C18

Solid calcium silicate brick KS, EN 771-2:2011+A1:2015

Table C19.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading

Anchor rod			M6		M8		M10		M12		M16		-		-	
Internal threaded anchor UPM-I			-		-		-		-		-		M6	M8	M10	M12
													11x85		15x85	
N _{RK} = N _{RK,p} = N _{RK,b} = N _{RK,p,c} = N _{RK,b,c} [kN]; temperature range 50/80°C ²⁾																
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions		Effective anchorage depth h _{ef} [mm]													
			50	100	50	100	50	100	50	100	50	100	85			
12,5 / 10 N/mm ²	w/w	w/d	4,0	4,0	7,0	5,0	6,0	5,0	6,0	5,5	7,5	5,5				
	d/d		7,0	7,0	12,0	8,0	9,5	8,0	10,0	9,0	11,5	9,0				
25 / 20 N/mm ²	w/w	w/d	5,5	6,0	10,0	7,0	8,5	7,0	9,0	8,0	11,0	8,0				
	d/d		8,5	10,5	12,0	11,5	12,0	11,0	12,0	12,0	12,0	12,0				
45 / 36 N/mm ²	w/w	w/d	4,5	8,0	12,0	11,5	12,0	12,0	12,0	12,0	12,0	12,0				
	d/d		8,0	12,0	12,0	12,0	12,0	12,0	12,0	12,0	12,0	12,0				

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120°C)} = 0,83 \cdot N_{Rk(50/80°C)}$.

Table C19.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading

Anchor rod	M6		M8		M10		M12		M16		-		-	
Internal threaded anchor UPM-I	-		-		-		-		-		M6	M8	M10	M12
											11x85		15x85	
V _{Rk} = V _{Rk,b} = V _{Rk,c,II} = V _{Rk,c,I} [kN]; temperature range 50/80°C and 72/120°C														
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions		Effective anchorage depth h _{ef} [mm]											
			≥ 50								85			
12,5 / 10 N/mm ²	w/w	w/d	3,0	5,0	5,5	4,0	4,0	3,0	5,0	5,5	4,0			
	d/d													
25 / 20 N/mm ²	w/w	w/d	4,5	7,0	7,5	6,0	6,0	4,5	7,0	7,5	6,0			
	d/d													
45 / 36 N/mm ²	w/w	w/d	4,5	9,0	11,0	12,0	12,0	4,5	9,0	11,0	12,0			
	d/d													

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Factor for job site tests and displacements see annex C123.

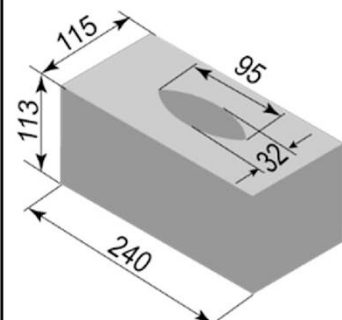
Upat injection system UPM 44 for masonry

Performance

Solid calcium silicate brick KS, Characteristic resistance under tension and shear loading

Annex C19

Solid calcium silicate brick KS, EN 771-2:2011+A1:2015



Producer	-
Nominal dimensions [mm]	length L width W height H
	≥ 240 ≥ 115 ≥ 113
Mean gross dry density ρ [kg/dm ³]	1,8
Mean compressive strength / Min. compressive strength single brick ¹⁾ [N/mm ²]	12,5 / 10 or 25 / 20
Standard or annex	EN 771-2:2011+A1:2015

Table C20.1: Installation parameters
(Pre-positioned installation with perforated sleeve UPM SH K)

Anchor rod	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	M6 M8	11x85	-	-	-	M10 M12	15x85	-	-	-	-
Perforated sleeve UPM SH K	12x85	16x85	16x130	20x85	20x130							

Anchor rod and internal threaded anchor UPM-I with perforated sleeve UPM SH K

Max. installation torque	max T_{inst} [Nm]	2	4
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General installation parameters

Edge distance	$c_{min} = c_{cr}$	100
Spacing	$s_{min \parallel}$ $s_{cr \parallel}$ $s_{min \perp}$ $s_{cr \perp}$	255 255 390 255 390

Drilling method

Hammer drilling with hard metal hammer drill

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C20.2: Group factors

Anchor rod	M6	M8	M8	M10	M8	M10	M12	M16	M12	M16
Perforated sleeve UPM SH K	12x85	16x85	16x130	20x85	20x130					
Group factors	$\alpha_{g,N} (s_{min \parallel}) =$ $\alpha_{g,V} (s_{min \parallel}) =$ $\alpha_{g,N} (s_{min \perp}) =$ $\alpha_{g,V} (s_{min \perp}) =$	[-]	2							

Upat injection system UPM 44 for masonry

Performance

Solid calcium silicate brick KS, dimensions, installation parameters, Group factors

Annex C20

Solid calcium silicate brick KS, EN 771-2:2011+A1:2015

Table C21.1: Installation parameters
(Push through installation with perforated sleeve UPM SH K)

Anchor rod		M10	M12	M16
Perforated sleeve UPM SH K		18x130/200		22x130/200
Anchor rod with perforated sleeve UPM SH K				
Max. installation torque	max T _{inst}	[Nm]	4	
General installation parameters				
Edge distance	c _{min} = c _{cr}	[mm]	100	
Spacing	s _{min}		390	
	s _{cr}		390	
	s _{min} ⊥		390	
	s _{cr} ⊥		390	
Drilling method				
Hammer drilling with hard metal hammer drill				

Table C21.2: Group factors

Anchor rod		M10	M12	M16
Perforated sleeve UPM SH K		18x130/200		22x130/200
Group factors	$\alpha_{g,N} (s_{min} \parallel)$	[-]	2	
	$\alpha_{g,V} (s_{min} \parallel)$			
	$\alpha_{g,N} (s_{min} \perp)$			
	$\alpha_{g,V} (s_{min} \perp)$			

Upat injection system UPM 44 for masonry

Performance
Solid calcium silicate brick KS, dimensions, installation parameters, Group factors

Annex C21

Solid calcium silicate brick, EN 771-2:2011+A1:2015

Table C22.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Pre-positioned installation)

Anchor rod	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	M6 11x85	M8	-	-	-	-	M10 15x85	M12	-	-	-
Perforated sleeve UPM SH K	12x85	16x85	16x130	20x85	20x130							
$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; temperature range 50/80°C ²⁾												
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions											
12,5 / 10 N/mm²	w/w	3,5	2,0	2,0	2,0	6,5	4,5					
	d/d	6,0	4,0	3,5	3,5	10,5	7,0					
25 / 20 N/mm²	w/w	5,0	3,0	3,0	3,0	9,5	6,0					
	d/d	8,5	5,5	5,5	5,5	12,0	10,0					

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C no performance assessed.

Table C22.2: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Push through installation)

Anchor rod	M10	M12	M16
Perforated sleeve UPM SH K	18x130/200	22x130/200	
$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; temperature range 50/80°C ²⁾			
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions		
12,5 / 10 N/mm²	w/w	2,0	4,5
	d/d	3,5	7,0
25 / 20 N/mm²	w/w	3,0	6,0
	d/d	5,5	10,0

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C no performance assessed.

Factor for job site tests and displacements see annex C123.

Upat injection system UPM 44 for masonry

Performance

Solid calcium silicate brick KS, Characteristic resistance under tension loading

Annex C22

Table C23.1: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Pre-positioned installation)

Anchor rod	M6	M8	-		M8	M10	M8	M10	-		M12	M16	M12	M16
Internal threaded anchor UPM-I	-		M6	M8	-		-		M10	M12	-		-	
			11x85						15x85					
Perforated sleeve UPM SH K	12x85		16x85				16x130		20x85				20x130	

$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; temperature range 50/80°C ²⁾

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions	
12,5 / 10 N/mm ²	w/w d/d	3,0
25 / 20 N/mm ²	w/w d/d	4,0

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C no performance assessed.

Table C23.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Push through installation)

Anchor rod	M10	M12	M16
Perforated sleeve UPM SH K	18x130/200		22x130/200

$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; temperature range 50/80°C ²⁾

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions	
12,5 / 10 N/mm ²	w/w d/d	3,5
25 / 20 N/mm ²	w/w d/d	5,5

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C no performance assessed.

Factor for job site tests and displacements see annex C123.

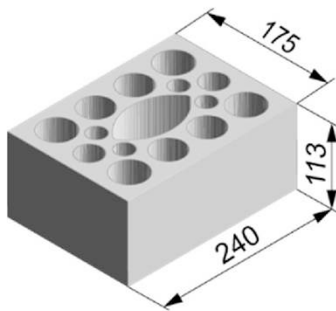
Upat injection system UPM 44 for masonry

Performance

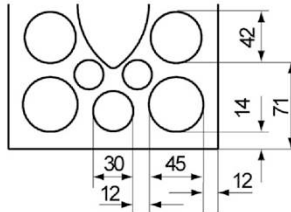
Solid calcium silicate brick KS, Characteristic resistance under shear loading

Annex C23

Perforated calcium silicate brick KSL, 3DF, EN 771-2:2011+A1:2015



Producer	-		
Nominal dimensions [mm]	length L	width W	height H
	240	175	113
Mean gross dry density ρ [kg/dm ³]	≥ 1,4		
Mean compressive strength / Min. compressive strength single brick ¹⁾ [N/mm ²]	10 / 8 or 12,5 / 10 or 15 / 12 or 20 / 16 or 25 / 20		
Standard or annex	EN 771-2:2011+A1:2015		



Dimension see also
Annex B15

Table C24.1: Installation parameters
(Pre-positioned installation with perforated sleeve UPM SH K)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6 M8 11x85	-	-	-	-	M10 M12 15x85	-	-	-	-
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x85	16x130	16x130	16x130	20x85	20x85	20x130	20x130	20x130

Anchor rod and internal threaded anchor UPM-I with perforated sleeve UPM SH K

Max. installation torque	max T _{inst} [Nm]	2
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General installation parameters

Edge distance	C _{min} = C _{cr}	60	80
Spacing	s _{min}	100	
	s _{cr} [mm]	240	
	s _{min} ⊥	115	
	s _{cr} ⊥	115	

Drilling method

Hammer drilling with hard metal hammer drill

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C24.2: Group factors

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6 M8 11x85	-	-	-	-	M10 M12 15x85	-	-	-	-
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x85	16x130	16x130	16x130	20x85	20x85	20x130	20x130	20x130

Group factors	$\alpha_{g,N} (s_{min}) =$ $\alpha_{g,V} (s_{min})$	[-]	1,5
	$\alpha_{g,N} (s_{min} \perp) =$ $\alpha_{g,V} (s_{min} \perp)$		2,0

Upat injection system UPM 44 for masonry

Performance

Perforated calcium silicate brick KSL, 3DF, dimensions, installation parameters, Group factors

Annex C24

Perforated calcium silicate brick KSL, 3DF, EN 771-2:2011+A1:2015

Table C25.1: Installation parameters
(Push through installation with perforated sleeve UPM SH K)

Anchor rod		M10	M12	M16
Perforated sleeve UPM SH K		18x130/200		22x130/200
Anchor rod with perforated sleeve UPM SH K				
Max. installation torque	max T _{inst}	[Nm]	2	
General installation parameters				
Edge distance	c _{min} = C _{cr}	[mm]	80	
Spacing	s _{min}		100	
	s _{cr}		240	
	s _{min} ⊥		115	
	s _{cr} ⊥		115	
Drilling method				
Hammer drilling with hard metal hammer drill				

Table C25.2: Group factors

Anchor rod		M10	M12	M16
Perforated sleeve UPM SH K		18x130/200		22x130/200
Group factors	$\alpha_{g,N} (s_{\text{min II}})$	[-]	1,5	
	$\alpha_{g,V} (s_{\text{min II}})$			
	$\alpha_{g,N} (s_{\text{min } \perp})$		2,0	
	$\alpha_{g,V} (s_{\text{min } \perp})$			

Upat injection system UPM 44 for masonry

Performance

Perforated calcium silicate brick KSL, 3DF, dimensions, installation parameters, Group factors

Annex C25

Perforated calcium silicate brick KSL, 3DF, EN 771-2:2011+A1:2015

Table C26.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Pre-positioned installation)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	M6	M8	-	-	-	-	-	M10	M12	-	-	-
			11x85							15x85				
Perforated sleeve UPM SH K	12x50	12x85	16x85	16x130	20x85	20x130								
$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; temperature range 50/80°C ²⁾														
Mean compressive strength/ Min. comp. strength single brick ¹⁾	Use conditions													
10 / 8 N/mm²	w/w	w/d	1,5	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0
	d/d		1,5	2,0	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5
12,5 / 10 N/mm²	w/w	w/d	2,0	2,0	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5
	d/d		2,0	2,5	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0
15 / 12 N/mm²	w/w	w/d	2,5	2,5	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0
	d/d		2,5	3,0	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5
20 / 16 N/mm²	w/w	w/d	3,0	3,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5
	d/d		3,5	4,0	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5
25 / 20 N/mm²	w/w	w/d	4,0	4,5	5,5	5,5	5,5	5,5	5,5	5,5	5,5	5,5	5,5	5,5
	d/d		4,5	5,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120^\circ C)} = 0,83 \cdot N_{Rk(50/80^\circ C)}$.

Table C26.2: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Push through installation)

Anchor rod	M10	M12	M16
Perforated sleeve UPM SH K	18x130/200	22x130/200	
$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; temperature range 50/80°C ²⁾			
Mean compressive strength / Min. comp. strength single brick ¹⁾	Use conditions		
10 / 8 N/mm²	w/w	w/d	2,0
	d/d		2,5
12,5 / 10 N/mm²	w/w	w/d	2,5
	d/d		3,0
15 / 12 N/mm²	w/w	w/d	3,0
	d/d		3,5
20 / 16 N/mm²	w/w	w/d	4,5
	d/d		4,5
25 / 20 N/mm²	w/w	w/d	5,5
	d/d		6,0

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120^\circ C)} = 0,83 \cdot N_{Rk(50/80^\circ C)}$.

Factor for job site tests and displacements see annex C123.

Upat injection system UPM 44 for masonry

Performance

Perforated calcium silicate brick KSL, 3DF, Characteristic resistance under tension loading

Annex C26

Perforated calcium silicate brick KSL, 3DF, EN 771-2:2011+A1:2015

Table C27.1: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Pre-positioned installation)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	M6	M8	M6	M8	-	-	M10	M12	-	-	-	-
			11x85						15x85					
Perforated sleeve UPM SH K	12x50	12x85	16x85	16x130	20x85	20x130								

$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; temperature range 50/80°C and 72/120°C

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions													
10 / 8 N/mm ²	w/w d/d			1,5				3,0				2,5	3,0	2,5
12,5 / 10 N/mm ²	w/w d/d			2,0				3,5						
15 / 12 N/mm ²	w/w d/d			2,5				4,5				4,0	4,5	4,0
20 / 16 N/mm ²	w/w d/d	3,0	3,5	3,0	3,5	3,0		6,0				5,5	6,0	5,5
25 / 20 N/mm ²	w/w d/d	4,0	4,5	4,0	4,5	4,0		7,5				6,5	7,5	6,5

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C27.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Push through installation)

Anchor rod	M10	M12	M16
Perforated sleeve UPM SH K	18x130/200	22x130/200	

$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; temperature range 50/80°C and 72/120°C

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions		
10 / 8 N/mm ²		3,0	2,5
12,5 / 10 N/mm ²	w/w	3,5	3,5
15 / 12 N/mm ²	w/d	4,5	4,0
20 / 16 N/mm ²	d/d	6,0	5,5
25 / 20 N/mm ²		7,5	6,5

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Factor for job site tests and displacements see annex C123.

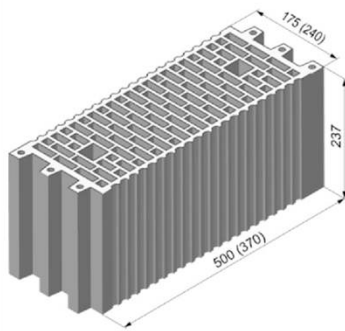
Upat injection system UPM 44 for masonry

Performance

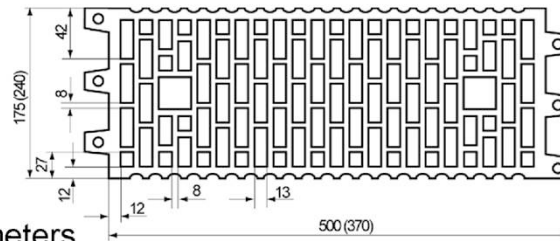
Perforated calcium silicate brick KSL, 3DF, Characteristic resistance under shear loading

Annex C27

Vertical perforated brick HLz, EN 771-1:2011+A1:2015



Producer	e.g. Wienerberger, Poroton		
Nominal dimensions [mm]	length L	width W	height H
	500	175	237
	370	240	237
Mean gross dry density ρ [kg/dm ³]	$\geq 1,0$		
Mean compressive strength / Min. compressive strength single brick ¹⁾ [N/mm ²]	5 / 4 or 7,5 / 6 or 10 / 8 or 12,5 / 10 or 15 / 12		
Standard or annex	EN 771-1:2011+A1:2015		



Dimension see also Annex B15

Table C28.1: Installation parameters

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6 M8 11x85	-	-	-	-	M10 M12 15x85	-	-	-	-
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x130	16x130	16x130	16x130	20x85	20x85	20x130	20x130	20x130

Anchor rod and internal threaded anchor UPM-I with perforated sleeve UPM SH K

Max. installation torque	$\max T_{\text{inst}}$	[Nm]	2
General installation parameters			
Edge distance	$C_{\text{min}} = C_{\text{cr}}$	[mm]	100
Spacing	$s_{\text{min}} \parallel$		100
	$s_{\text{cr}} \parallel$		500 (370)
	$s_{\text{min}} \perp$		100
	$s_{\text{cr}} \perp$		240

Drilling method

Hammer drilling with hard metal hammer drill

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C28.2: Group factors

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6 M8 11x85	-	-	-	-	M10 M12 15x85	-	-	-	-
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x130	16x130	16x130	16x130	20x85	20x85	20x130	20x130	20x130

Group factors	$\alpha_{g,N} (s_{\text{min II}}) =$ $\alpha_{g,V} (s_{\text{min II}}) =$ $\alpha_{g,N} (s_{\text{min } \perp}) =$ $\alpha_{g,V} (s_{\text{min } \perp}) =$	[-]	1											
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Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, dimensions, installation parameters, Group factors

Annex C28

Vertical perforated brick HLz, EN 771-1:2011+A1:2015

Table C29.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading

Anchor rod	M6	M8	M6	M8	-		M8	M10	M8	M10	-		M12	M16	M12	M16
Internal threaded anchor UPM-I	-		-		M6	M8	-		-		M10	M12	-		-	
					11x85						15x85					
Perforated sleeve UPM SH K	12x50		12x85		16x85				16x130		20x85				20x130	
N _{RK} = N _{RK,p} = N _{RK,b} = N _{RK,p,c} = N _{RK,b,c} [kN]; temperature range 50/80°C ²⁾																
Mean compressive strength / Min. comp. strength single brick ¹⁾	Use con- ditions															
5 / 4 N/mm ²	w/w	w/d	0,30				0,90				1,20					
	d/d		0,40				0,90				1,20					
7,5 / 6 N/mm ²	w/w	w/d	0,50				1,50				2,00					
	d/d		0,60				1,50				2,00					
10 / 8 N/mm ²	w/w	w/d	0,75				2,00				2,50					
	d/d		0,75				2,00				2,50					
12,5 / 10 N/mm ²	w/w	w/d	0,90				2,50				3,00					
	d/d		0,90				2,50				3,50					
15 / 12 N/mm ²	w/w	w/d	0,90				3,00				3,50					
	d/d		1,20				3,00				4,00					

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{RK(72/120°C)} = 0,83 \cdot N_{RK(50/80°C)}$.

Table C29.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading

Anchor rod	M6	M8	M6	M8	-		M8	M10	M8	M10	-		M12	M16	M12	M16
Internal threaded anchor UPM-I	-		-		M6	M8	-		-		M10	M12	-			-
					11x85						15x85					
Perforated sleeve UPM SH K	12x50		12x85		16x85				16x130		20x85				20x130	
V _{Rk} = V _{Rk,b} = V _{Rk,c,II} = V _{Rk,c,⊥} [kN]; temperature range 50/80°C and 72/120°C																
Mean compressive strength / Min. comp. strength single brick ¹⁾	Use conditions															
5 / 4 N/mm ²	w/w w/d d/d	0,50						0,60		0,50				0,60		
7,5 / 6 N/mm ²		0,75						0,90		0,75				0,90		
10 / 8 N/mm ²		0,90						1,20		0,90				1,20		
12,5 / 10 N/mm ²		1,20						1,50		1,20				1,50		
15 / 12 N/mm ²		1,50						2,00		1,50				2,00		

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Factor for job site tests and displacements see annex C123.

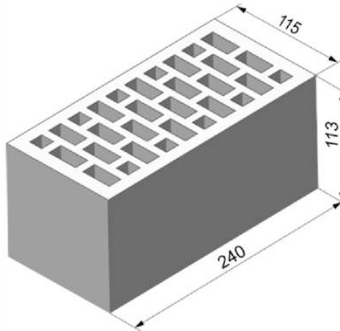
Upat injection system UPM 44 for masonry

Performance

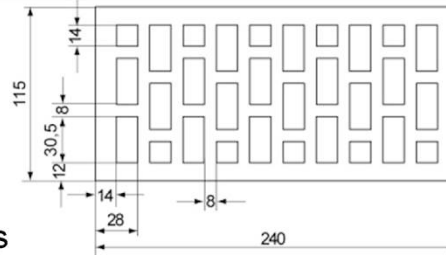
Vertical perforated brick HLz, Characteristic resistance under tension and shear loading

Annex C29

Vertical perforated brick HLz, 2DF, EN 771-1:2011+A1:2015



Producer	e.g. Wienerberger			
Nominal dimensions	[mm]	length L	width W	height H
		240	115	113
Mean gross dry density ρ	[kg/dm ³]	≥ 1,4		
Mean compressive strength / Min. compressive strength single brick ¹⁾	[N/mm ²]	7,5 / 6 or 12,5 / 10 or 20 / 16 or 25 / 20 or 35 / 28		
Standard or annex	EN 771-1:2011+A1:2015			



Dimension see also Annex B15

Table C30.1: Installation parameters

Anchor rod	M6	M8	M6	M8	-	M8	M10	-	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6	M8	-	M10	M12	-
					11x85			15x85		
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x85	16x85	20x85	20x85	20x85

Anchor rod and internal threaded anchor UPM-I with perforated sleeve UPM SH K

Max. installation torque	max T_{inst}	[Nm]	2
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General installation parameters

Edge distance	$c_{min} = c_{cr}$	[mm]	80
Spacing	$s_{cr \parallel} = s_{min \parallel}$	[mm]	240
	$s_{cr \perp} = s_{min \perp}$	[mm]	115

Drilling method

Hammer drilling with hard metal hammer drill

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C30.2: Group factors

Anchor rod	M6	M8	M6	M8	-	M8	M10	-	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6	M8	-	M10	M12	-
					11x85			15x85		
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x85	16x85	20x85	20x85	20x85

Group factors	$\alpha_{g,N} (s_{min \parallel})$	$\alpha_{g,V} (s_{min \parallel})$	$\alpha_{g,N} (s_{min \perp})$	$\alpha_{g,V} (s_{min \perp})$	2					
					[-]					

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, 2DF, dimensions, installation parameters, Group factors

Annex C30

Vertical perforated brick HLz, 2DF, EN 771-1:2011+A1:2015

Table C31.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading

Anchor rod	M6	M8	M6	M8	-	M8	M10	-	M12	M16
Internal threaded anchor UPM-I	-	-	M6	M8	-	M10	M12	-	-	-
			11x85			15x85				
Perforated sleeve UPM SH K	12x50	12x85	16x85	20x85						
$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; temperature range 50/80°C ²⁾										
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions									
7,5 / 6 N/mm²	w/w	w/d	0,75	0,90	0,75	0,90				
	d/d		0,75	1,20	0,75	0,90				
12,5 / 10 N/mm²	w/w	w/d	1,20	1,50	1,20	1,50				
	d/d		1,20	2,00	1,20	1,50				
20 / 16 N/mm²	w/w	w/d	2,00	2,50	2,00	2,50				
	d/d		2,00	3,00	2,00	2,50				
25 / 20 N/mm²	w/w	w/d	2,50	3,50	2,50	3,00				
	d/d		2,50	4,00	2,50	3,00				
35 / 28 N/mm²	w/w	w/d	3,00	5,00	3,50	4,00				
	d/d		3,50	5,50	3,50	4,50				

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120°C)} = 0,83 \cdot N_{Rk(50/80°C)}$.

Table C31.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading

Anchor rod	M6	M8	M6	M8	-	M8	M10	-	M12	M16
Internal threaded anchor UPM-I	-	-	M6	M8	-	M10	M12	-	-	-
			11x85			15x85				
Perforated sleeve UPM SH K	12x50	12x85	16x85	20x85						
$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,I}$ [kN]; temperature range 50/80°C and 72/120°C										
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions									
7,5 / 6 N/mm²	w/w w/d d/d	1,2	1,5	1,2	2,0	1,2	1,5	2,5		
12,5 / 10 N/mm²		2,0	2,5	2,0	4,0	2,0	2,5	4,5		
20 / 16 N/mm²		3,0	3,5	3,0	6,0	3,0	3,5	7,0		
25 / 20 N/mm²		4,0	4,5	4,0	7,5	4,0	4,5	8,5		
35 / 28 N/mm²		5,0	6,5	5,0	9,5	5,0	6,5	12,0		

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Factor for job site tests and displacements see annex C123.

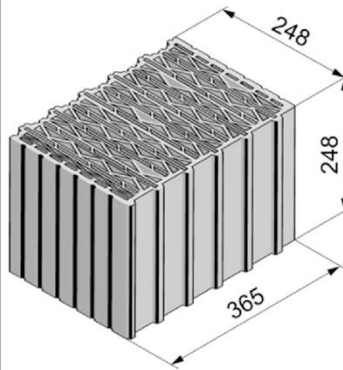
Upat injection system UPM 44 for masonry

Performance

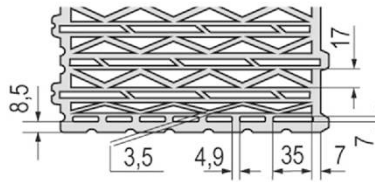
Vertical perforated brick HLz, 2DF,
Characteristic resistance under tension and shear loading

Annex C31

Vertical perforated brick HLz, U8, EN 771-1:2011+A1:2015



Producer	e.g. Wienerberger		
Nominal dimensions [mm]	length L	width W	height H
	248	365	248
Mean gross dry density ρ [kg/dm ³]	0,6		
Mean compressive strength / Min. compressive strength single brick ¹⁾ [N/mm ²]	5 / 4 or 7,5 / 6 or 10 / 8		
Standard or annex	EN 771-1:2011+A1:2015		



Dimension see also
Annex B15

Table C32.1: Installation parameters
(Pre-positioned installation with perforated sleeve UPM SH K)

Anchor rod	M6	M8	M6	M8	-		M8	M10	M8	M10	-		M12	M16	M12	M16	M12	M16
Internal threaded anchor UPM-I	-		-		M6	M8	-		-		M10	M12	-		-		-	
					11x85	15x85												
Perforated sleeve UPM SH K	12x50		12x85		16x85				16x130		20x85				20x130		20x200	
Anchor rod and internal threaded anchor UPM-I with perforated sleeve UPM SH K																		
Max. installation torque	max T _{inst}	[Nm]	3	5	3	5	3	5	5									
General installation parameters																		
Edge distance	C _{min} = C _{cr}	[mm]	60															
	S _{min}		80															
Spacing	S _{scr}		250															
	S _{min} ⊥		80															
	S _{scr} ⊥		250															
Drilling method																		
Rotary drilling with carbide drill																		

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C32.2: Group factors

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6	M8	-	-	-	M10	M12	-	-	-	-	-
					11x85					15x85						
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x130	20x85	20x130	20x200							
Group factors α _{g,N} (S _{min} II)	1,3															
α _{g,V} (S _{min} II)	1,2															
α _{g,N} (S _{min} ⊥)	1,3															
α _{g,V} (S _{min} ⊥)	1,0															

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, U8, dimensions, installation parameters, Group factors

Annex C32

Vertical perforated brick HLz, U8, EN 771-1:2011+A1:2015

Table C33.1: Installation parameters
(Push through installation with perforated sleeve UPM SH K)

Anchor rod		M10	M12	M16
Perforated sleeve UPM SH K		18x130/200		22x130/200
Anchor rod with perforated sleeve UPM SH K				
Max. installation torque	max T _{inst}	[Nm]	5	
General installation parameters				
Edge distance	C _{min} = C _{cr}	[mm]	60	
Spacing	S _{min}		80	
	S _{cr}		250	
	S _{min} ⊥		80	
	S _{cr} ⊥		250	
Drilling method				
Rotary drilling with carbide drill				

Table C33.2: Group factors

Anchor rod		M10	M12	M16
Perforated sleeve UPM SH K		18x130/200		22x130/200
Group factors	$\alpha_{g,N} (s_{\text{min}} \parallel)$	[-]	1,3	
	$\alpha_{g,V} (s_{\text{min}} \parallel)$		1,2	
	$\alpha_{g,N} (s_{\text{min}} \perp)$		1,3	
	$\alpha_{g,V} (s_{\text{min}} \perp)$		1,0	

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, U8, dimensions, installation parameters, Group factors

Annex C33

Vertical perforated brick HLz, U8, EN 771-1:2011+A1:2015

Table C34.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Pre-positioned installation)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6 M8 11x85	-	-	-	-	M10 M12 15x85	-	-	-	-	-	-
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x130	16x130	16x130	16x130	20x85	20x85	20x130	20x130	20x200	20x200	20x200

$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; temperature range 50/80°C ²⁾

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions	
5 / 4 N/mm²	w/w w/d	1,2
	d/d	1,2
7,5 / 6 N/mm²	w/w w/d	1,5
	d/d	1,5
10 / 8 N/mm²	w/w w/d	1,5
	d/d	2,0

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120^\circ C)} = 0,83 \cdot N_{Rk(50/80^\circ C)}$.

Table C34.2: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Push through installation)

Anchor rod	M10	M12	M16
Perforated sleeve UPM SH K	18x130/200	18x130/200	22x130/200

$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; temperature range 50/80°C ²⁾

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions	
5 / 4 N/mm²	w/w w/d	1,2
	d/d	1,5
7,5 / 6 N/mm²	w/w w/d	1,5
	d/d	1,5
10 / 8 N/mm²	w/w w/d	2,0
	d/d	2,0

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120^\circ C)} = 0,83 \cdot N_{Rk(50/80^\circ C)}$.

Factor for job site tests and displacements see annex C123.

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, U8, Characteristic resistance under tension loading

Annex C34

Vertical perforated brick HLz, U8, EN 771-1:2011+A1:2015

Table C35.1: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Pre-positioned installation)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6 M8 11x85	-	-	-	-	M10 M12 15x85	-	-	-	-	-	-
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x130	16x130	16x130	16x130	20x85	20x130	20x130	20x130	20x130	20x200	20x200

$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; temperature range 50/80°C and 72/120°C

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions	
5 / 4 N/mm ²	w/w w/d d/d	1,2
7,5 / 6 N/mm ²	w/w w/d d/d	1,5
10 / 8 N/mm ²	w/w w/d d/d	1,5

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C35.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Push through installation)

Anchor rod	M10	M12	M16
Perforated sleeve UPM SH K	18x130/200	18x130/200	22x130/200

$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; temperature range 50/80°C and 72/120°C

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions	
5 / 4 N/mm ²	w/w w/d d/d	1,2
7,5 / 6 N/mm ²	w/w w/d d/d	1,5
10 / 8 N/mm ²	w/w w/d d/d	1,5

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Factor for job site tests and displacements see annex C123.

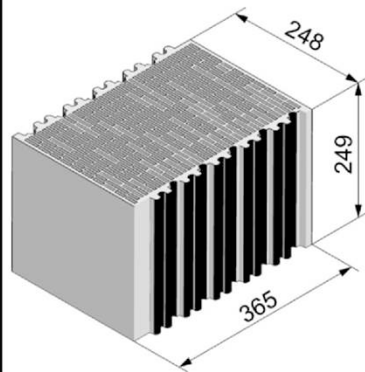
Upat injection system UPM 44 for masonry

Performance

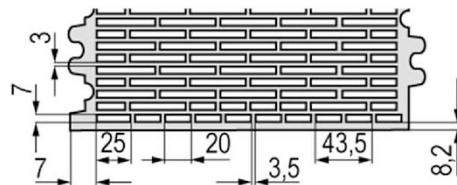
Vertical perforated brick HLz, U8, Characteristic resistance under shear loading

Annex C35

Vertical perforated brick HLz, T10, T11, EN 771-1:2011+A1:2015



Producer	e.g. Wienerberger			
Nominal dimensions	[mm]	length L	width W	height H
		248	365	249
Mean gross dry density ρ	[kg/dm ³]	0,7		
Mean compressive strength / Min. compressive strength single brick ¹⁾	[N/mm ²]	10 / 8 or 12,5 / 10 or 15 / 12		
Standard or annex	EN 771-1:2011+A1:2015			



Dimension see also
Annex B16

Table C36.1: Installation parameters
(Pre-positioned installation with perforated sleeve UPM SH K)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6 M8 11x85	-	-	-	-	M10 M12 15x85	-	-	-	-	-	-
Perforated sleeve UPM SH K	12x50		12x85		16x85		16x130		20x85		20x130		20x200			

Anchor rod and internal threaded anchor UPM-I with perforated sleeve UPM SH K

Max. installation torque	max T_{inst} [Nm]	3				5	3	5			
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General installation parameters

Edge distance	$C_{min} = C_{cr}$	60			
Spacing	$s_{min \parallel}$	80			
	$s_{cr \parallel}$ [mm]	250			
	$s_{min \perp}$	80			
	$s_{cr \perp}$	250			

Drilling method

Rotary drilling with carbide drill

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C36.2: Group factors

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6 M8 11x85	-	-	-	-	M10 M12 15x85	-	-	-	-	-	-
Perforated sleeve UPM SH K	12x50		12x85		16x85		16x130		20x85		20x130		20x200			

Group factors	$\alpha_{g,N} (s_{min \parallel})$	[-]	1,7			
	$\alpha_{g,V} (s_{min \parallel})$		0,5			
	$\alpha_{g,N} (s_{min \perp})$		1,3			
	$\alpha_{g,V} (s_{min \perp})$		0,5			

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, T10, T11, dimensions, installation parameters, Group factors

Annex C36

Vertical perforated brick HLz, T10, T11, EN 771-1:2011+A1:2015

Table C37.1: Installation parameters
(Push through installation with perforated sleeve UPM SH K)

Anchor rod		M10	M12	M16
Perforated sleeve UPM SH K		18x130/200		22x130/200
Anchor rod with perforated sleeve UPM SH K				
Max. installation torque	max T _{inst}	[Nm]	5	
General installation parameters				
Edge distance	c _{min} = c _{cr}	[mm]	60	
Spacing	s _{min}		80	
	s _{cr}		250	
	s _{min} ⊥		80	
	s _{cr} ⊥		250	
Drilling method				
Rotary drilling with carbide drill				

Table C37.2: Group factors

Anchor rod		M10	M12	M16
Perforated sleeve UPM SH K		18x130/200		22x130/200
Group factors	$\alpha_{g,N} (s_{\text{min}} \parallel)$	[-]	1,7	
	$\alpha_{g,V} (s_{\text{min}} \parallel)$		0,5	
	$\alpha_{g,N} (s_{\text{min}} \perp)$		1,3	
	$\alpha_{g,V} (s_{\text{min}} \perp)$		0,5	

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, T10, T11, dimensions, installation parameters, Group factors

Annex C37

Vertical perforated brick HLz, T10, T11, EN 771-1:2011+A1:2015

Table C38.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Pre-positioned installation)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6 11x85	-	-	-	-	M10 15x85	-	-	-	-	-	-
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x130	16x130	16x130	16x130	20x85	20x85	20x130	20x130	20x200	20x200	20x200

$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; temperature range 50/80°C ²⁾

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions	
10 / 8 N/mm ²	w/w	1,5
	d/d	1,5
12,5 / 10 N/mm ²	w/w	1,5
	d/d	2,0
15 / 12 N/mm ²	w/w	2,0
	d/d	2,0

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120^\circ C)} = 0,83 \cdot N_{Rk(50/80^\circ C)}$.

Table C38.2: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Push through installation)

Anchor rod	M10	M12	M16
Perforated sleeve UPM SH K	18x130/200	18x130/200	22x130/200

$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; temperature range 50/80°C ²⁾

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions	
10 / 8 N/mm ²	w/w	1,5
	d/d	2,0
12,5 / 10 N/mm ²	w/w	2,0
	d/d	2,0
15 / 12 N/mm ²	w/w	2,0
	d/d	2,5

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120^\circ C)} = 0,83 \cdot N_{Rk(50/80^\circ C)}$.

Factor for job site tests and displacements see annex C123.

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, T10, T11, Characteristic resistance under tension loading

Annex C38

Vertical perforated brick HLz, T10, T11, EN 771-1:2011+A1:2015

Table C39.1: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Pre-positioned installation)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	M6	M8	-	-	-	-	-	M10	M12	-	-	-	-	-
			11x85							15x85						
Perforated sleeve UPM SH K	12x50	12x85	16x85	16x130	20x85	20x130	20x200									

$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; temperature range 50/80°C and 72/120°C

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions			
10 / 8 N/mm ²	w/w d/d	0,9	1,5	2,0
12,5 / 10 N/mm ²	w/w d/d	0,9	1,5	2,0
15 / 12 N/mm ²	w/w d/d	1,2	2,0	2,0

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C39.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Push through installation)

Anchor rod	M10	M12	M16
Perforated sleeve UPM SH K	18x130/200	22x130/200	

$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; temperature range 50/80°C and 72/120°C

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions		
10 / 8 N/mm ²	w/w d/d	1,5	2,0
12,5 / 10 N/mm ²	w/w d/d	1,5	2,0
15 / 12 N/mm ²	w/w d/d	2,0	2,0

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Factor for job site tests and displacements see annex C123.

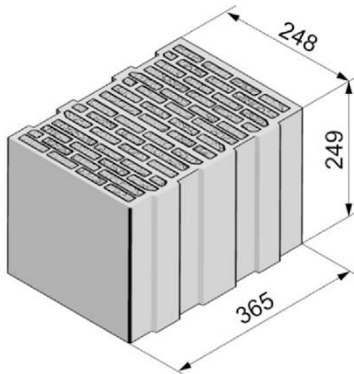
Upat injection system UPM 44 for masonry

Performance

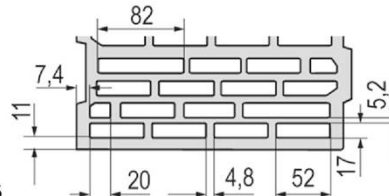
Vertical perforated brick HLz, T10, T11, Characteristic resistance under shear loading

Annex C39

Vertical perforated brick HLz, T7 PF, filled with perlite, EN 771-1:2011+A1:2015



Producer	e.g. Wienerberger			
Nominal dimensions	[mm]	length L	width W	height H
		248	365	249
Mean gross dry density ρ	[kg/dm³]	0,5		
Mean compressive strength / Min. compressive strength single brick ¹⁾	[N/mm²]	5 / 4 or 8 / 6		
Standard or annex	EN 771-1:2011+A1:2015			



Dimension see also
Annex B16

Table C40.1: Installation parameters
(Pre-positioned installation with perforated sleeve UPM SH K)

Anchor rod	M6	M8	M6	M8	-		M8	M10	M8	M10	-		M12	M16	M12	M16	M12	M16
Internal threaded anchor UPM-I	-		-		M6	M8	-		-		M10	M12	-		-		-	
					11x85						15x85							
Perforated sleeve UPM SH K	12x50		12x85		16x85				16x130		20x85				20x130		20x200	
Anchor rod and internal threaded anchor UPM-I with perforated sleeve UPM SH K																		
Max. installation torque	max T _{inst}	[Nm]	2					5	2	5								
General installation parameters																		
Edge distance	C _{min} = C _{cr}	[mm]	60															
	S _{min}		80															
Spacing	S _{scr}		250															
	S _{min} ⊥		80															
	S _{scr} ⊥		250															
Drilling method																		
Rotary drilling with carbide drill																		

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C40.2: Group factors

Anchor rod		M6	M8	M6	M8	-		M8	M10	M8	M10	-		M12	M16	M12	M16	M12	M16
Internal threaded anchor UPM-I		-		-		M6	M8	-		-		M10	M12	-		-		-	
						11x85						15x85							
Perforated sleeve UPM SH K		12x50		12x85		16x85				16x130		20x85				20x130		20x200	
Group factors	$\alpha_{g,N} (s_{min II})$	[-]	1,1																
	$\alpha_{g,V} (s_{min II})$		1,2																
	$\alpha_{g,N} (s_{min \perp})$		1,1																
	$\alpha_{g,V} (s_{min \perp})$		1,2																

Upat injection system UPM 44 for masonry

Performance
Vertical perforated brick HLz, T7 PF, filled with perlite,
dimensions, installation parameters, Group factors

Annex C40

Vertical perforated brick HLz, T7 PF, filled with perlite, EN 771-1:2011+A1:2015

Table C41.1: Installation parameters
(Push through installation with perforated sleeve UPM SH K)

Anchor rod		M10	M12	M16
Perforated sleeve UPM SH K		18x130/200		22x130/200
Anchor rod with perforated sleeve UPM SH K				
Max. installation torque	max T _{inst} [Nm]	5		
General installation parameters				
Edge distance	c _{min} = c _{cr}	[mm]	60	
Spacing	s _{min}		80	
	s _{cr}		250	
	s _{min} ⊥		80	
	s _{cr} ⊥		250	
Drilling method				
Rotary drilling with carbide drill				

Table C41.2: Group factors

Anchor rod		M10	M12	M16
Perforated sleeve UPM SH K		18x130/200		22x130/200
Group factors	$\alpha_{g,N} (s_{\text{min}} \parallel)$	[-]	1,1	
	$\alpha_{g,V} (s_{\text{min}} \parallel)$		1,2	
	$\alpha_{g,N} (s_{\text{min}} \perp)$		1,1	
	$\alpha_{g,V} (s_{\text{min}} \perp)$		1,2	

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, T7 PF, filled with perlite,
dimensions, installation parameters, Group factors

Annex C41

Vertical perforated brick HLz, T7 PF, filled with perlite, EN 771-1:2011+A1:2015

Table C42.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Pre-positioned installation)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6 11x85	M8	-	-	-	M10 15x85	M12	-	-	-	-	-
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x130	16x130	16x130	16x130	20x85	20x85	20x130	20x130	20x200	20x200	20x200
$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; temperature range 50/80°C ²⁾																
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions															
5 / 4 N/mm²	w/w	w/d	1,2				1,2				1,2				1,2	
	d/d	d/d	1,5				1,5				1,5				1,5	
8 / 6 N/mm²	w/w	w/d	1,5				1,5				1,5				1,5	
	d/d	d/d	1,5				2,0				1,5				2,0	

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk (72/120^\circ C)} = 0,83 \cdot N_{Rk (50/80^\circ C)}$.

Table C42.2: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Push through installation)

Anchor rod		M10	M12	M16
Perforated sleeve UPM SH K		18x130/200		22x130/200
N _{RK} = N _{RK,p} = N _{RK,b} = N _{RK,p,c} = N _{RK,b,c} [kN]; temperature range 50/80°C ²⁾				
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions			
5 / 4 N/mm ²	w/w w/d	1,2		1,2
	d/d	1,5		1,5
8 / 6 N/mm ²	w/w w/d	1,5		1,5
	d/d	2,0		2,0

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk (72/120^\circ C)} = 0,83 \cdot N_{Rk (50/80^\circ C)}$.

Factor for job site tests and displacements see annex C123.

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, T7 PF, filled with perlite,
Characteristic resistance under tension loading

Annex C42

Vertical perforated brick HLz, T7 PF, filled with perlite, EN 771-1:2011+A1:2015

Table C43.1: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Pre-positioned installation)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	M6	M8	-	-	M10	M12	-	-	-	-	-	-	-	-
			11x85				15x85									
Perforated sleeve UPM SH K	12x50	12x85	16x85	16x130	20x85	20x130	20x200									

$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; temperature range 50/80°C and 72/120°C

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions			
5 / 4 N/mm ²	w/w d/d	0,9	1,5	1,2
8 / 6 N/mm ²	w/w d/d	1,2	2,0	1,5

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C43.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Push through installation)

Anchor rod	M10	M12	M16
Perforated sleeve UPM SH K	18x130/200	22x130/200	

$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; temperature range 50/80°C and 72/120°C

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions		
5 / 4 N/mm ²	w/w d/d	1,5	1,2
8 / 6 N/mm ²	w/w d/d	2,0	1,5

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Factor for job site tests and displacements see annex C123.

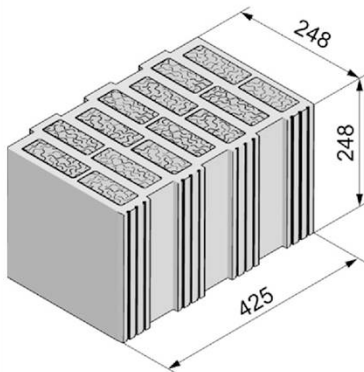
Upat injection system UPM 44 for masonry

Performance

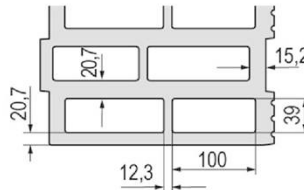
Vertical perforated brick HLz, T7 PF, filled with perlite,
Characteristic resistance under shear loading

Annex C43

Vertical perforated brick HLz, T9 MW, filled with mineral wool, EN 771-1:2011+A1:2015



Producer	e.g. Wienerberger			
Nominal dimensions	[mm]	length L	width W	height H
		248	425	248
Mean gross dry density ρ	[kg/dm³]	0,8		
Mean compressive strength / Min. compressive strength single brick ¹⁾	[N/mm²]	5 / 4 or 8 / 6 or 10 / 8		
Standard or annex	EN 771-1:2011+A1:2015			



Dimension see also
Annex B16

Table C44.1: Installation parameters
(Pre-positioned installation with perforated sleeve UPM SH K)

Anchor rod		M6	M8	M6	M8	-		M8	M10	M8	M10	-		M12	M16	M12	M16	M12	M16
Internal threaded anchor UPM-I		-		-		M6	M8	-		-		M10	M12	-		-		-	
						11x85						15x85							
Perforated sleeve UPM SH K		12x50		12x85		16x85				16x130		20x85				20x130		20x200	
Anchor rod and internal threaded anchor UPM-I with perforated sleeve UPM SH K																			
Max. installation torque	max T _{inst}	[Nm]	3						5	3	5								
General installation parameters																			
Edge distance		C _{min} = C _{cr}	[mm]	60															
Spacing	S _{min}			80															
	S _{cr}			250															
	S _{min} ⊥			80															
	S _{cr} ⊥			250															

Drilling method

Rotary drilling with carbide drill

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C44.2: Group factors

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6 M8 11x85	-	-	-	-	M10 M12 15x85	-	-	-	-	-	-
Perforated sleeve UPM SH K	12x50		12x85		16x85		16x130		20x85		20x130		20x200			
Group factors	α _{g,N} (S _{min})						1,3									
	α _{g,V} (S _{min})						1,2									
	α _{g,N} (S _{min} ⊥)						0,6									
	α _{g,V} (S _{min} ⊥)						1,2									

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, T9 MW, filled with mineral wool, dimensions, installation parameters, Group factors

Annex C44

Vertical perforated brick HLz, T9 MW, filled with mineral wool, EN 771-1:2011+A1:2015

Table C45.1: Installation parameters
(Push through installation with perforated sleeve UPM SH K)

Anchor rod		M10	M12	M16
Perforated sleeve UPM SH K		18x130/200		22x130/200
Anchor rod with perforated sleeve UPM SH K				
Max. installation torque	max T _{inst}	[Nm]	5	
General installation parameters				
Edge distance	C _{min} = C _{cr}	[mm]	60	
Spacing	S _{min}		80	
	S _{cr}		250	
	S _{min} ⊥		80	
	S _{cr} ⊥		250	
Drilling method				
Rotary drilling with carbide drill				

Table C45.2: Group factors

Anchor rod		M10	M12	M16
Perforated sleeve UPM SH K		18x130/200		22x130/200
Group factors	$\alpha_{g,N} (s_{\min \parallel})$	[-]	1,3	
	$\alpha_{g,V} (s_{\min \parallel})$		1,2	
	$\alpha_{g,N} (s_{\min \perp})$		0,6	
	$\alpha_{g,V} (s_{\min \perp})$		1,2	

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, T9 MW, filled with mineral wool,
dimensions, installation parameters, Group factors

Annex C45

Vertical perforated brick HLz, T9 MW, filled with mineral wool, EN 771-1:2011+A1:2015

Table C46.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Pre-positioned installation)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6 11x85	M8	-	-	-	M10 15x85	M12	-	-	-	-	-
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x130	16x130	16x130	16x130	20x85	20x130	20x130	20x130	20x130	20x200	20x200

$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; temperature range 50/80°C ²⁾

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions						
5 / 4 N/mm²	w/w w/d	1,5	2,0	3,0	2,5	4,0	
	d/d	2,0	2,5	3,0	2,5	4,5	
8 / 6 N/mm²	w/w w/d	2,0	2,5	3,5	3,0	5,0	
	d/d	2,0	3,0	4,0	3,0	5,5	
10 / 8 N/mm²	w/w w/d	2,5	3,0	4,0	3,5	6,0	
	d/d	2,5	3,0	4,5	3,5	6,5	

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120^{\circ}C)} = 0,83 \cdot N_{Rk(50/80^{\circ}C)}$.

Table C46.2: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Push through installation)

Anchor rod	M10	M12	M16
Perforated sleeve UPM SH K	18x130/200	18x130/200	22x130/200

$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; temperature range 50/80°C ²⁾

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions		
5 / 4 N/mm²	w/w w/d	3,0	4,0
	d/d	3,0	4,5
8 / 6 N/mm²	w/w w/d	3,5	5,0
	d/d	4,0	5,5
10 / 8 N/mm²	w/w w/d	4,0	6,0
	d/d	4,5	6,5

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120^{\circ}C)} = 0,83 \cdot N_{Rk(50/80^{\circ}C)}$.

Factor for job site tests and displacements see annex C123.

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, T9 MW, filled with mineral wool;
Characteristic resistance under tension loading

Annex C46

Vertical perforated brick HLz, T9 MW, filled with mineral wool, EN 771-1:2011+A1:2015

Table C47.1: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Pre-positioned installation)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6 11x85	M8	-	-	-	M10 15x85	M12	-	-	-	-	-
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x130	16x130	16x130	16x130	20x85	20x130	20x130	20x130	20x130	20x200	20x200

$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; temperature range 50/80°C and 72/120°C

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions															
5 / 4 N/mm ²	w/w	w/d	2,0	2,0	2,5	2,0	2,0	2,5	2,0	2,0	2,5	2,0	2,0	2,5	2,0	1,5
	d/d	d/d														
8 / 6 N/mm ²	w/w	w/d	2,5	2,5	3,0	2,5	2,5	3,0	2,5	2,5	3,0	2,5	2,5	3,0	2,0	2,0
	d/d	d/d														
10 / 8 N/mm ²	w/w	w/d	2,5	3,0	4,0	3,0	3,0	4,0	3,0	3,0	4,0	3,0	3,0	4,0	2,5	2,5
	d/d	d/d														

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C47.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Push through installation)

Anchor rod	M10	M12	M16
Perforated sleeve UPM SH K	18x130/200	18x130/200	22x130/200

$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; temperature range 50/80°C and 72/120°C

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions															
5 / 4 N/mm ²	w/w	w/d	2,5	2,5	3,0	3,0	3,0	4,0	3,0	3,0	4,0	3,0	3,0	4,0	2,0	2,0
	d/d	d/d														
8 / 6 N/mm ²	w/w	w/d	3,0	3,0	4,0	3,0	3,0	4,0	3,0	3,0	4,0	3,0	3,0	4,0	2,5	2,5
	d/d	d/d														
10 / 8 N/mm ²	w/w	w/d	4,0	4,0	5,0	4,0	4,0	5,0	4,0	4,0	5,0	4,0	4,0	5,0	3,0	3,0
	d/d	d/d														

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Factor for job site tests and displacements see annex C123.

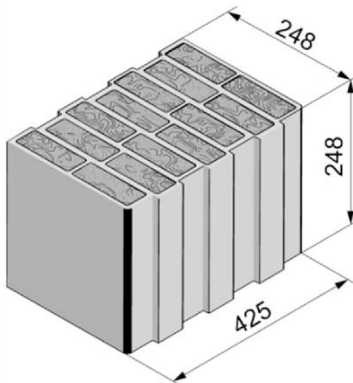
Upat injection system UPM 44 for masonry

Performance

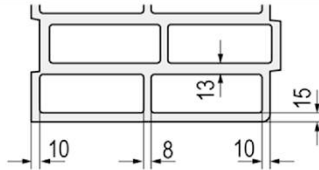
Vertical perforated brick HLz, T9 MW, filled with mineral wool;
Characteristic resistance under shear loading

Annex C47

Vertical perforated brick HLz, FZ 7, filled with mineral wool, EN 771-1:2011+A1:2015



Producer	e.g. Wienerberger			
Nominal dimensions	[mm]	length L	width W	height H
		248	425	248
Mean gross dry density ρ	[kg/dm³]	0,8		
Mean compressive strength / Min. compressive strength single brick ¹⁾	[N/mm²]	5 / 4 or 7,5 / 6 or 10 / 8		
Standard or annex	EN 771-1:2011+A1:2015			



Dimension see also
Annex B16

Table C48.1: Installation parameters
(Pre-positioned installation with perforated sleeve UPM SH K)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6 M8 11x85	-	-	-	-	M10 M12 15x85	-	-	-	-	-	-
Perforated sleeve UPM SH K	12x50		12x85		16x85		16x130		20x85		20x130		20x200			

Anchor rod and internal threaded anchor UPM-I with perforated sleeve UPM SH K

Max. installation torque	max T_{inst} [Nm]	2		5		2		5	
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General installation parameters

Edge distance	$c_{min} = c_{cr}$	60	
Spacing	$s_{min \parallel}$	80	
	$s_{cr \parallel}$ [mm]	250	
	$s_{min \perp}$	80	
	$s_{cr \perp}$	250	

Drilling method

Rotary drilling with carbide drill

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C48.2: Group factors

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6 M8 11x85	-	-	-	-	M10 M12 15x85	-	-	-	-	-	-
Perforated sleeve UPM SH K	12x50		12x85		16x85		16x130		20x85		20x130		20x200			

Group factors	$\alpha_{g,N} (s_{min \parallel})$	[-]	1,9	
	$\alpha_{g,V} (s_{min \parallel})$		0,9	
	$\alpha_{g,N} (s_{min \perp})$		1,0	
	$\alpha_{g,V} (s_{min \perp})$		0,7	

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, FZ 7, filled with mineral wool;
dimensions, installation parameters, Group factors

Annex C48

Vertical perforated brick HLz, FZ 7, filled with mineral wool, EN 771-1:2011+A1:2015

Table C49.1: Installation parameters
(Push through installation with perforated sleeve UPM SH K)

Anchor rod		M10	M12	M16
Perforated sleeve UPM SH K		18x130/200		22x130/200
Anchor rod with perforated sleeve UPM SH K				
Max. installation torque	T _{inst}	[Nm]	5	
General installation parameters				
Edge distance	c _{min} = c _{cr}	[mm]	60	
Spacing	s _{min}		80	
	s _{cr}		250	
	s _{min} ⊥		80	
	s _{cr} ⊥		250	
Drilling method				
Rotary drilling with carbide drill				

Table C49.2: Group factors

Anchor rod		M10	M12	M16
Perforated sleeve UPM SH K		18x130/200		22x130/200
Group factors	$\alpha_{g,N} (s_{\text{min}} \parallel)$	[-]	1,9	
	$\alpha_{g,V} (s_{\text{min}} \parallel)$		0,9	
	$\alpha_{g,N} (s_{\text{min}} \perp)$		1,0	
	$\alpha_{g,V} (s_{\text{min}} \perp)$		0,7	

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, FZ 7, filled with mineral wool;
dimensions, installation parameters, Group factors

Annex C49

Vertical perforated brick HLz, FZ 7, filled with mineral wool, EN 771-1:2011+A1:2015

Table C50.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Pre-positioned installation)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6	M8	-	-	-	M10	M12	-	-	-	-	-
					11x85					15x85						
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x130	16x130	16x130	16x130	20x85	20x85	20x130	20x130	20x130	20x200	20x200
$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; temperature range 50/80°C ²⁾																
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions															
5 / 4 N/mm²	w/w	w/d	0,60	0,75	1,50	2,00	1,20	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00
	d/d	d/d	0,60	0,90	1,50	2,00	1,50	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,50
7,5 / 6 N/mm²	w/w	w/d	0,75	0,90	1,50	2,00	1,50	2,00	2,00	2,00	2,50	2,50	2,50	2,50	2,50	2,50
	d/d	d/d	0,90	0,90	2,00	2,50	2,00	2,50	2,00	2,00	2,50	2,50	2,50	2,50	2,50	3,00
10 / 8 N/mm²	w/w	w/d	0,90	1,20	2,00	2,50	2,00	2,50	2,00	2,00	2,50	2,50	2,50	2,50	2,50	3,00
	d/d	d/d	0,90	1,20	2,00	3,00	2,00	3,00	2,00	2,00	2,00	3,00	3,00	3,00	3,00	3,50

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120^\circ C)} = 0,83 \cdot N_{Rk(50/80^\circ C)}$.

Table C50.2: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Push through installation)

Anchor rod	M10	M12	M16
Perforated sleeve UPM SH K	18x130/200	18x130/200	22x130/200
$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; temperature range 50/80°C ²⁾			
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions		
5 / 4 N/mm²	w/w	w/d	2,0
	d/d	d/d	2,0
7,5 / 6 N/mm²	w/w	w/d	2,0
	d/d	d/d	2,5
10 / 8 N/mm²	w/w	w/d	2,5
	d/d	d/d	3,0

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120^\circ C)} = 0,83 \cdot N_{Rk(50/80^\circ C)}$.

Factor for job site tests and displacements see annex C123.

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, FZ 7, filled with mineral wool;
Characteristic resistance under tension loading

Annex C50

Vertical perforated brick HLz, FZ 7, filled with mineral wool, EN 771-1:2011+A1:2015

Table C51.1: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Pre-positioned installation)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6	M8	-	-	-	M10	M12	-	-	-	-	-
					11x85					15x85						
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x130	16x130	16x130	16x130	20x85	20x130	20x130	20x130	20x130	20x200	20x200

$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; temperature range 50/80°C and 72/120°C

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions			
5 / 4 N/mm ²	w/w d/d	1,2	1,5	1,5
7,5 / 6 N/mm ²	w/w d/d	1,5	2,0	1,5
10 / 8 N/mm ²	w/w d/d	1,5	2,5	2,0

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C51.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Push through installation)

Anchor rod	M10	M12	M16
Perforated sleeve UPM SH K	18x130/200	18x130/200	22x130/200

$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; temperature range 50/80°C and 72/120°C

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions		
5 / 4 N/mm ²	w/w d/d	1,5	1,5
7,5 / 6 N/mm ²	w/w d/d	2,0	2,0
10 / 8 N/mm ²	w/w d/d	2,5	2,5

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Factor for job site tests and displacements see annex C123.

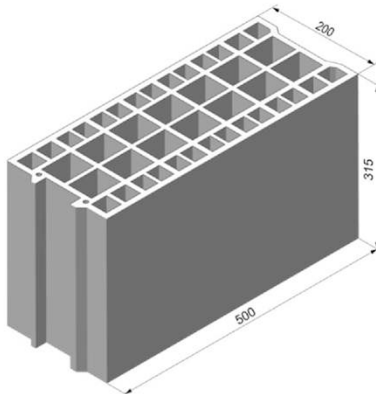
Upat injection system UPM 44 for masonry

Performance

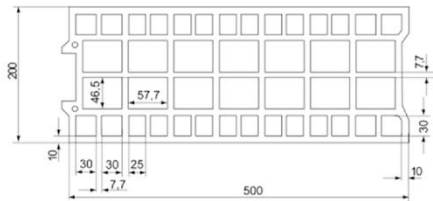
Vertical perforated brick HLz, FZ 7, filled with mineral wool;
Characteristic resistance under shear loading

Annex C51

Vertical perforated brick HLz, EN 771-1:2011+A1:2015



Producer	e.g. Bouyer Leroux			
Nominal dimensions	[mm]	length L	width W	height H
		500	200	315
Mean gross dry density ρ	[kg/dm ³]	≥ 0,6		
Mean compressive strength / Min. compressive strength single brick ¹⁾	[N/mm ²]	5 / 4 or 7,5 / 6 or 10 / 8		
Standard or annex	EN 771-1:2011+A1:2015			



Dimension see also
Annex B16

Table C52.1: Installation parameters
(Pre-positioned installation with perforated sleeve UPM SH K)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6	M8	-	-	-	M10	M12	-	-	-
					11x85					15x85				
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x85	16x130	16x130	16x130	20x85	20x85	20x130	20x130	20x130

Anchor rod and internal threaded anchor UPM-I with perforated sleeve UPM SH K

Max. installation torque $\max T_{\text{inst}}$	[Nm]	2
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General installation parameters

Edge distance $c_{\text{min}} = c_{\text{cr}}$	[mm]	120
Spacing $s_{\text{min II}}$	[mm]	120
Spacing $s_{\text{cr II}}$	[mm]	500
Spacing $s_{\text{min } \perp} = s_{\text{cr } \perp}$	[mm]	315

Drilling method

Hammer drilling with hard metal hammer drill

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C52.2: Group factors

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6	M8	-	-	-	M10	M12	-	-	-
					11x85					15x85				
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x85	16x130	16x130	16x130	20x85	20x85	20x130	20x130	20x130

Group factors $\alpha_{g,N} (s_{\text{min II}})$	[-]	1,3
Group factors $\alpha_{g,V} (s_{\text{min II}})$	[-]	1,7
Group factors $\alpha_{g,N} (s_{\text{min } \perp})$	[-]	2,0
Group factors $\alpha_{g,V} (s_{\text{min } \perp})$	[-]	2,0

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, dimensions, installation parameters, Group factors

Annex C52

Vertical perforated brick HLz, EN 771-1:2011+A1:2015

Table C53.1: Installation parameters
(Push through installation with perforated sleeve UPM SH K)

Anchor rod		M10	M12	M16
Perforated sleeve UPM SH K		18x130/200		22x130/200
Anchor rod with perforated sleeve UPM SH K				
Max. installation torque	max T _{inst} [Nm]	2		
General installation parameters				
Edge distance	c _{min} = c _{cr}	[mm]	120	
Spacing	s _{min}		120	
	s _{cr}		500	
	s _{min} ⊥ = s _{cr} ⊥		315	

Drilling method

Hammer drilling with hard metal hammer drill

Table C53.2: Group factors

Anchor rod		M10	M12	M16
Perforated sleeve UPM SH K		18x130/200		22x130/200
Group factors	$\alpha_{g,N} (s_{\text{min II}})$	[-]	1,3	
	$\alpha_{g,V} (s_{\text{min II}})$		1,7	
	$\alpha_{g,N} (s_{\text{min } \perp})$		2,0	
	$\alpha_{g,V} (s_{\text{min } \perp})$			

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, dimensions, installation parameters, Group factors

Annex C53

Vertical perforated brick HLz, EN 771-1:2011+A1:2015

Table C54.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Pre-positioned installation)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	M6	M8	-	-	-	-	-	M10	M12	-	-	-
			11x85							15x85				
Perforated sleeve UPM SH K	12x50	12x85	16x85	16x130	20x85	20x130								
$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; temperature range 50/80°C ²⁾														
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions													
5 / 4 N/mm²	w/w	w/d	0,50	1,50	0,75	1,50	1,50							
	d/d		0,60	1,50	0,90	1,50	2,00							
7,5 / 6 N/mm²	w/w	w/d	0,75	2,00	1,20	2,00	2,50							
	d/d		0,90	2,50	1,20	2,50	3,50							
10 / 8 N/mm²	w/w	w/d	0,90	3,00	1,50	3,00	3,50							
	d/d		1,20	3,00	2,00	3,00	3,50							

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120^\circ C)} = 0,83 \cdot N_{Rk(50/80^\circ C)}$.

Table C54.2: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Push through installation)

Anchor rod	M10	M12	M16
Perforated sleeve UPM SH K	18x130/200	22x130/200	
$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; temperature range 50/80°C ²⁾			
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions		
5 / 4 N/mm²	w/w	w/d	0,75
	d/d		0,90
7,5 / 6 N/mm²	w/w	w/d	1,20
	d/d		1,20
10 / 8 N/mm²	w/w	w/d	1,50
	d/d		2,00

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120^\circ C)} = 0,83 \cdot N_{Rk(50/80^\circ C)}$.

Factor for job site tests and displacements see annex C123.

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, Characteristic resistance under tension loading

Annex C54

Vertical perforated brick HLz, EN 771-1:2011+A1:2015

Table C55.1: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Pre-positioned installation)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	M6	M8	-	-	-	M10	M12	-	-	-	-	-
			11x85					15x85						
Perforated sleeve UPM SH K	12x50	12x85	16x85	16x130	20x85	20x130								

$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; temperature range 50/80°C and 72/120°C

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions					
5 / 4 N/mm ²	w/w d/d	1,5	0,9	1,5	2,5	0,9
7,5 / 6 N/mm ²	w/w d/d	2,5	1,5	2,5	3,5	1,5
10 / 8 N/mm ²	w/w d/d	3,5	2,0	3,5	4,5	2,0

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C55.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Push through installation)

Anchor rod	M10	M12	M16
Perforated sleeve UPM SH K	18x130/200	22x130/200	

$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; temperature range 50/80°C and 72/120°C

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions	
5 / 4 N/mm ²	w/w d/d	0,9
7,5 / 6 N/mm ²	w/w d/d	1,5
10 / 8 N/mm ²	w/w d/d	2,0

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Factor for job site tests and displacements see annex C123.

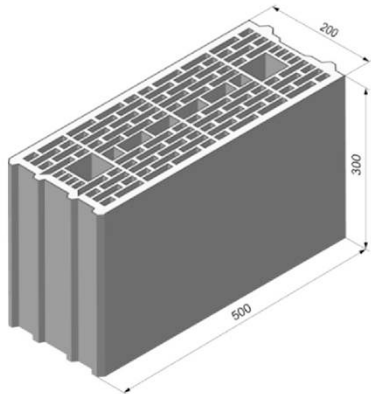
Upat injection system UPM 44 for masonry

Performance

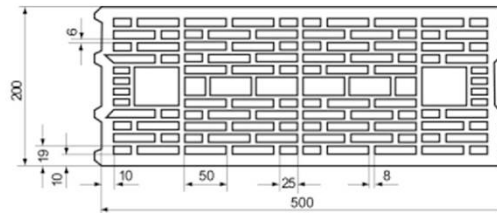
Vertical perforated brick HLz, Characteristic resistance under shear loading

Annex C55

Vertical perforated brick HLz, EN 771-1:2011+A1:2015



Producer	e.g. Wienerberger			
Nominal dimensions	[mm]	length L	width W	height H
		500	200	300
Mean gross dry density ρ	[kg/dm ³]	≥ 0,7		
Mean compressive strength / Min. compressive strength single brick ¹⁾	[N/mm ²]	5 / 4 or 7,5 / 6 or 10 / 8 12,5 / 10		
Standard or annex	EN 771-1:2011+A1:2015			



Dimension see also Annex B17

Table C56.1: Installation parameters
(Pre-positioned installation with perforated sleeve UPM SH K)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6 M8 11x85	-	-	-	-	M10 M12 15x85	-	-	-	-
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x130	16x130	16x130	16x130	20x85	20x85	20x130	20x130	20x130

Anchor rod and internal threaded anchor UPM-I with perforated sleeve UPM SH K

Max. installation torque $\max T_{inst}$ [Nm]	2													
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General installation parameters

Edge distance	$c_{min} = c_{cr}$	[mm]	50		80	50	80
Spacing	$s_{min} \parallel$		100				
	$s_{cr} \parallel$		500				
	$s_{min} \perp = s_{cr} \perp$		300				

Drilling method

Hammer drilling with hard metal hammer drill

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C56.2: Group factors

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6 M8 11x85	-	-	-	-	M10 M12 15x85	-	-	-	-
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x130	16x130	16x130	16x130	20x85	20x85	20x130	20x130	20x130

Group factors	$\alpha_{g,N} (s_{min} \parallel)$	[-]	1,4											
	$\alpha_{g,V} (s_{min} \parallel)$		1,4											
	$\alpha_{g,N} (s_{min} \perp)$		2											
	$\alpha_{g,V} (s_{min} \perp)$		2											

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, dimensions, installation parameters, Group factors

Annex C56

Vertical perforated brick HLz, EN 771-1:2011+A1:2015

Table C57.1: Installation parameters
(Push through installation with perforated sleeve UPM SH K)

Anchor rod		M10	M12	M16
Perforated sleeve UPM SH K		18x130/200		22x130/200
Anchor rod with perforated sleeve UPM SH K				
Max. installation torque	max T _{inst}	[Nm]	2	
General installation parameters				
Edge distance	c _{min} = c _{cr}	[mm]	80	
Spacing	s _{min} II		100	
	s _{cr} II		500	
	s _{min} ⊥ = s _{cr} ⊥		300	

Drilling method

Hammer drilling with hard metal hammer drill

Table C57.2: Group factors

Anchor rod		M10	M12	M16
Perforated sleeve UPM SH K		18x130/200		22x130/200
Group factors	$\alpha_{g,N} (s_{\text{min II}})$	1,4		
	$\alpha_{g,V} (s_{\text{min II}})$	2		
	$\alpha_{g,N} (s_{\text{min } \perp})$			
	$\alpha_{g,V} (s_{\text{min } \perp})$			

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, dimensions, installation parameters, Group factors

Annex C57

Vertical perforated brick HLz, EN 771-1:2011+A1:2015

Table C58.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Pre-positioned installation)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	M6	M8	-	-	-	-	-	M10	M12	-	-	-
			11x85							15x85				
Perforated sleeve UPM SH K	12x50	12x85	16x85	16x130	20x85	20x130								

$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; temperature range 50/80°C ²⁾

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions					
5 / 4 N/mm ²	w/w	w/d	0,50	0,60	1,20	0,75
	d/d		0,60	0,75	1,20	0,90
7,5 / 6 N/mm ²	w/w	w/d	0,75	0,90	1,50	1,20
	d/d		0,90	1,20	2,00	1,20
10 / 8 N/mm ²	w/w	w/d	0,90	1,20	2,00	1,50
	d/d		1,20	1,50	2,50	1,50
12,5 / 10 N/mm ²	w/w	w/d	1,20	1,50	2,50	2,00
	d/d		1,50	2,00	3,00	2,00

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120^\circ C)} = 0,83 \cdot N_{Rk(50/80^\circ C)}$.

Table C58.2: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Push through installation)

Anchor rod	M10	M12	M16
Perforated sleeve UPM SH K	18x130/200	22x130/200	

$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; temperature range 50/80°C ²⁾

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions		
5 / 4 N/mm ²	w/w	w/d	1,2
	d/d		1,2
7,5 / 6 N/mm ²	w/w	w/d	1,5
	d/d		2,0
10 / 8 N/mm ²	w/w	w/d	2,0
	d/d		2,5
12,5 / 10 N/mm ²	w/w	w/d	2,5
	d/d		3,0

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120^\circ C)} = 0,83 \cdot N_{Rk(50/80^\circ C)}$.

Factor for job site tests and displacements see annex C123.

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, Characteristic resistance under tension loading

Annex C58

Vertical perforated brick HLz, EN 771-1:2011+A1:2015

Table C59.1: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Pre-positioned installation)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	M6	M8	-	-	-	-	-	M10	M12	-	-	-
			11x85							15x85				
Perforated sleeve UPM SH K	12x50	12x85	16x85	16x130	20x85	20x130								

$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; temperature range 50/80°C and 72/120°C

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions								
5 / 4 N/mm ²	w/w d/d	0,9	1,2	0,9	1,2	0,6	2,0	0,6	
7,5 / 6 N/mm ²	w/w d/d	1,2	1,5	1,2	1,5	0,9	3,0	0,9	
10 / 8 N/mm ²	w/w d/d	1,5	2,0	1,5	2,0	1,2	4,0	1,2	
12,5 / 10 N/mm ²	w/w d/d	2,0	3,0	2,0	3,0	1,5	5,0	1,5	

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C59.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Push through installation)

Anchor rod	M10	M12	M16
Perforated sleeve UPM SH K	18x130/200	22x130/200	

$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; temperature range 50/80°C and 72/120°C

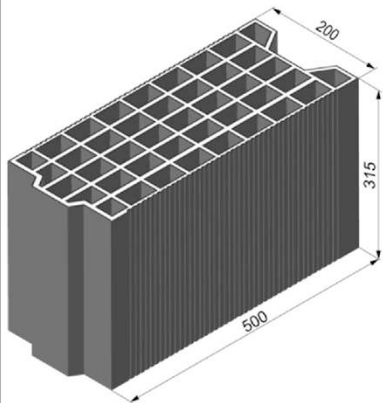
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions	
5 / 4 N/mm ²	w/w d/d	0,6
7,5 / 6 N/mm ²	w/w d/d	0,9
10 / 8 N/mm ²	w/w d/d	1,2
12,5 / 10 N/mm ²	w/w d/d	1,5

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

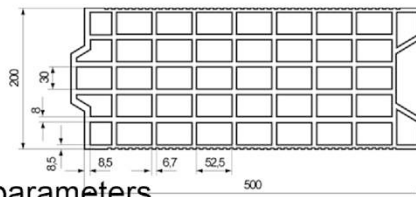
Factor for job site tests and displacements see annex C123.

Upat injection system UPM 44 for masonry	Annex C59
Performance Vertical perforated brick HLz, Characteristic resistance under shear loading	

Vertical perforated brick HLz, EN 771-1:2011+A1:2015



Producer	e.g. Terreal			
Nominal dimensions	[mm]	length L	width W	height H
		500	200	315
Mean gross dry density ρ	[kg/dm ³]	≥ 0,7		
Mean compressive strength / Min. compressive strength single brick ¹⁾	[N/mm ²]	2,5 / 2 or 5 / 4 or 7,5 / 6 or 10 / 8		
Standard or annex	EN 771-1:2011+A1:2015			



Dimension see also
Annex B17

Table C60.1: Installation parameters
(Pre-positioned installation with perforated sleeve UPM SH K)

Anchor rod	M6	M8	M6	M8	-		M8	M10	M8	M10	-		M12	M16	M12	M16
Internal threaded anchor UPM-I	-		-		M6	M8	-		-		M10	M12	-		-	
					11x85						15x85					
Perforated sleeve UPM SH K	12x50		12x85		16x85				16x130		20x85				20x130	
Anchor rod and internal threaded anchor UPM-I with perforated sleeve UPM SH K																
Max. installation torque	max T _{inst}	[Nm]	2													
General installation parameters																
Edge distance	C _{min} = C _{cr}	[mm]	50						80		50				80	
Spacing	s _{min}		100													
	s _{cr}		500													
	s _{min} ⊥		100													
	s _{cr} ⊥		315													
Drilling method																
Hammer drilling with hard metal hammer drill																

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C60.2: Group factors

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6	M8	-	-	-	M10	M12	-	-	-
					11x85					15x85				
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x85	16x130	16x130	16x130	20x85	20x85	20x130	20x130	20x130
Group factors	$\alpha_{g,N}$ (S _{min})	1,1												
	$\alpha_{g,V}$ (S _{min})	1,2												
	$\alpha_{g,N}$ (S _{min} ⊥)	1,1												
	$\alpha_{g,V}$ (S _{min} ⊥)	1,2												

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, dimensions, installation parameters, Group factors

Annex C60

Vertical perforated brick HLz, EN 771-1:2011+A1:2015

Table C61.1: Installation parameters
(Push through installation with perforated sleeve UPM SH K)

Anchor rod		M10	M12	M16
Perforated sleeve UPM SH K		18x130/200		22x130/200
Anchor rod with perforated sleeve UPM SH K				
Max. installation torque	max T _{inst} [Nm]	2		
General installation parameters				
Edge distance	C _{min} = C _{cr}	[mm]	80	
Spacing	S _{min}		100	
	S _{cr}		500	
	S _{min} ⊥		100	
	S _{cr} ⊥		315	
Drilling method				
Hammer drilling with hard metal hammer drill				

Table C61.2: Group factors

Anchor rod		M10	M12	M16
Perforated sleeve UPM SH K		18x130/200		22x130/200
Group factors	$\alpha_{g,N} (s_{\text{min}} \parallel)$	[-]	1,1	
	$\alpha_{g,V} (s_{\text{min}} \parallel)$		1,2	
	$\alpha_{g,N} (s_{\text{min}} \perp)$		1,1	
	$\alpha_{g,V} (s_{\text{min}} \perp)$		1,2	

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, dimensions, installation parameters, Group factors

Annex C61

Vertical perforated brick HLz, EN 771-1:2011+A1:2015

Table C62.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Pre-positioned installation)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	M6	M8	-	-	-	-	-	M10	M12	-	-	-
			11x85							15x85				
Perforated sleeve UPM SH K	12x50	12x85	16x85	16x130	20x85	20x130								

$N_{RK} = N_{RK,p} = N_{RK,b} = N_{RK,p,c} = N_{RK,b,c}$ [kN]; temperature range 50/80°C ²⁾

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions	
2,5 / 2 N/mm ²	w/w w/d	0,5
	d/d	0,5
5 / 4 N/mm ²	w/w w/d	0,9
	d/d	0,9
7,5 / 6 N/mm ²	w/w w/d	1,5
	d/d	1,5
10 / 8 N/mm ²	w/w w/d	2,0
	d/d	2,0

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{RK(72/120^\circ C)} = 0,83 \cdot N_{RK(50/80^\circ C)}$.

Table C62.2: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Push through installation)

Anchor rod	M10	M12	M16
Perforated sleeve UPM SH K	18x130/200	22x130/200	

$N_{RK} = N_{RK,p} = N_{RK,b} = N_{RK,p,c} = N_{RK,b,c}$ [kN]; temperature range 50/80°C ²⁾

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions	
2,5 / 2 N/mm ²	w/w w/d	0,5
	d/d	0,6
5 / 4 N/mm ²	w/w w/d	0,9
	d/d	1,2
7,5 / 6 N/mm ²	w/w w/d	1,5
	d/d	1,5
10 / 8 N/mm ²	w/w w/d	2,0
	d/d	2,0

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{RK(72/120^\circ C)} = 0,83 \cdot N_{RK(50/80^\circ C)}$.

Factor for job site tests and displacements see annex C123.

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, Characteristic resistance under tension loading

Annex C62

Vertical perforated brick HLz, EN 771-1:2011+A1:2015

Table C63.1: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Pre-positioned installation)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	M6	M8	-	-	-	-	-	M10	M12	-	-	-
			11x85							15x85				
Perforated sleeve UPM SH K	12x50	12x85	16x85	16x130	20x85	20x130								

$V_{RK} = V_{RK,b} = V_{RK,c,II} = V_{RK,c,\perp}$ [kN]; temperature range 50/80°C and 72/120°C

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions								
2,5 / 2 N/mm ²	w/w d/d	0,30	0,60	0,3	0,60	0,60	0,90	0,75	
5 / 4 N/mm ²	w/w d/d	0,75	1,20	0,7	1,20	1,20	2,00	1,50	
7,5 / 6 N/mm ²	w/w d/d	0,90	2,00	0,9	2,00	1,50	3,00	2,00	
10 / 8 N/mm ²	w/w d/d	1,50	2,50	1,5	2,50	2,00	4,00	3,00	

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C63.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Push through installation)

Anchor rod	M10	M12	M16
Perforated sleeve UPM SH K	18x130/200	22x130/200	

$V_{RK} = V_{RK,b} = V_{RK,c,II} = V_{RK,c,\perp}$ [kN]; temperature range 50/80°C and 72/120°C

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions		
2,5 / 2 N/mm ²	w/w d/d	0,60	0,75
5 / 4 N/mm ²	w/w d/d	1,20	1,50
7,5 / 6 N/mm ²	w/w d/d	1,50	2,00
10 / 8 N/mm ²	w/w d/d	2,00	3,00

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Factor for job site tests and displacements see annex C123.

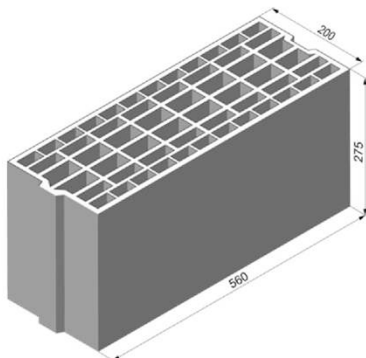
Upat injection system UPM 44 for masonry

Performance

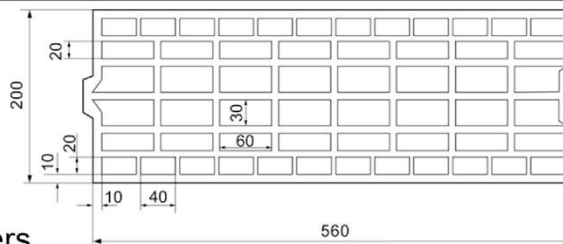
Vertical perforated brick HLz, Characteristic resistance under shear loading

Annex C63

Vertical perforated brick HLz, EN 771-1:2011+A1:2015



Producer	e.g. Imery			
Nominal dimensions	[mm]	length L	width W	height H
		560	200	275
Mean gross dry density ρ	[kg/dm ³]	≥ 0,7		
Mean compressive strength / Min. compressive strength single brick ¹⁾	[N/mm ²]	5 / 4 or 8 / 6 or 10 / 8		
Standard or annex	EN 771-1:2011+A1:2015			



Dimension
see also
Annex B17

Table C64.1: Installation parameters

Anchor rod	M8	M10	M10	M12	M12	M16	M16
Perforated sleeve UPM SH K	16x130		18x130/200		20x130		22x130/200
Anchor rod with perforated sleeve UPM SH K							
Max. installation torque	max T _{inst}	[Nm]	2				
General installation parameters							
Edge distance	C _{min} = C _{cr}	[mm]	80				
Spacing	s _{min} = s _{cr}		560				
	s _{min} ⊥ = s _{cr} ⊥		275				
Drilling method							
Hammer drilling with hard metal hammer drill							

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C64.2: Group factors

Anchor rod		M8	M10	M10	M12	M12	M16	M16
Perforated sleeve UPM SH K		16x130		18x130/200		20x130		22x130/200
Group factors	$\alpha_{g,N} (s_{min \parallel})$	[-]	2					
	$\alpha_{g,V} (s_{min \parallel})$							
	$\alpha_{g,N} (s_{min \perp})$							
	$\alpha_{g,V} (s_{min \perp})$							

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, dimensions, installation parameters, Group factors

Annex C64

Vertical perforated brick HLz, EN 771-1:2011+A1:2015

Table C65.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading

Anchor rod		M8	M10	M10	M12	M12	M16	M16
Perforated sleeve UPM SH K		16x130		18x130/200		20x130		22x130/200
N _{RK} = N _{RK,p} = N _{RK,b} = N _{RK,p,c} = N _{RK,b,c} [kN]; temperature range 50/80°C ²⁾								
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions							
5 / 4 N/mm ²	w/w w/d	0,9				1,2		
	d/d	1,2				1,5		
8 / 6 N/mm ²	w/w w/d	1,5				2,0		
	d/d	1,5				2,0		
10 / 8 N/mm ²	w/w w/d	2,0				2,5		
	d/d	2,5				3,0		

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{RK(72/120^\circ C)} = 0,83 \cdot N_{RK(50/80^\circ C)}$.

Table C65.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading

Anchor rod		M8	M10	M10	M12	M12	M16	M16
Perforated sleeve UPM SH K		16x130		18x130/200		20x130		22x130/200
V _{Rk} = V _{Rk,b} = V _{Rk,c,II} = V _{Rk,c,⊥} [kN]; temperature range 50/80°C and 72/120°C								
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions							
5 / 4 N/mm ²	w/w	w/d	0,9					
	d/d							
8 / 6 N/mm ²	w/w	w/d	1,5					
	d/d							
10 / 8 N/mm ²	w/w	w/d	2,0					
	d/d							

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Factor for job site tests and displacements see annex C123.

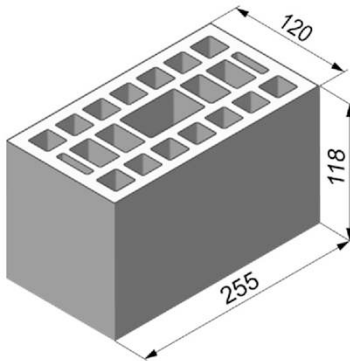
Upat injection system UPM 44 for masonry

Performance

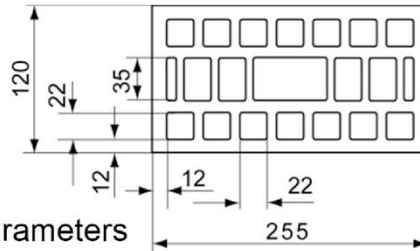
Vertical perforated brick HLz, Characteristic resistance under tension and shear loading

Annex C65

Vertical perforated brick HLz, EN 771-1:2011+A1:2015



Producer	e.g. Wienerberger		
Nominal dimensions [mm]	length L	width W	height H
	255	120	118
Mean gross dry density ρ [kg/dm ³]	≥ 1,0		
Mean compressive strength / Min. compressive strength single brick ¹⁾ [N/mm ²]	2,5 / 2 or 5 / 4 or 8 / 6 or 10 / 8 or 12,5 / 10 or 15 / 12		
Standard or annex	EN 771-1:2011+A1:2015		



Dimension see also
Annex B18

Table C66.1: Installation parameters

Anchor rod	M6	M8	M6	M8	-	M8	M10	-	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6	M8	-	M10	M12	-
					11x85			15x85		
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x85	16x85	20x85	20x85	20x85

Anchor rod and internal threaded anchor UPM-I with perforated sleeve UPM SH K

Max. installation torque	max T_{inst}	[Nm]	2
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General installation parameters

Edge distance	$c_{min} = c_{cr}$	[mm]	60
Spacing	$s_{cr \parallel} = s_{min \parallel}$	[mm]	255
	$s_{cr \perp} = s_{min \perp}$	[mm]	120

Drilling method

Hammer drilling with hard metal hammer drill

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C66.2: Group factors

Anchor rod	M6	M8	M6	M8	-	M8	M10	-	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6	M8	-	M10	M12	-
					11x85			15x85		
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x85	16x85	20x85	20x85	20x85

Group factors	$\alpha_{g,N} (s_{min \parallel})$	$\alpha_{g,V} (s_{min \parallel})$	$\alpha_{g,N} (s_{min \perp})$	$\alpha_{g,V} (s_{min \perp})$	[-]	2
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Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, dimensions, installation parameters, Group factors

Annex C66

Vertical perforated brick HLz, EN 771-1:2011+A1:2015

Table C67.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading

Anchor rod	M6	M8	M6	M8	-		M8	M10	-		M12	M16
Internal threaded anchor UPM-I	-		-		M6	M8	-		M10	M12	-	
					11x85				15x85			
Perforated sleeve UPM SH K	12x50		12x85		16x85				20x85			
N _{Rk} = N _{Rk,p} = N _{Rk,b} = N _{Rk,p,c} = N _{Rk,b,c} [kN]; temperature range 50/80°C ¹⁾												
Mean compressive strength / Min. compressive strength single brick ²⁾	Use con- ditions											
2,5 / 2 N/mm ²	w/w	w/d	0,40		0,50				- ³⁾			
	d/d		0,50		0,50				- ³⁾			
5 / 4 N/mm ²	w/w	w/d	0,90		0,90				0,50			
	d/d		0,90		1,20				0,50			
8 / 6 N/mm ²	w/w	w/d	1,20		1,50				0,75			
	d/d		1,50		1,50				0,75			
10 / 8 N/mm ²	w/w	w/d	1,50		2,00				0,90			
	d/d		2,00		2,00				0,90			
12,5 / 10 N/mm ²	w/w	w/d	2,00		2,50				1,20			
	d/d		2,50		2,50				1,20			
15 / 12 N/mm ²	w/w	w/d	2,50		3,00				1,50			
	d/d		3,00		3,50				1,50			

¹⁾ For temperature range 72/120°C: $N_{Rk(72/120^\circ C)} = 0,83 \cdot N_{Rk(50/80^\circ C)}$.

²⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

³⁾ No performance assessed.

Factor for job site tests and displacements see annex C123.

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, Characteristic resistance under tension loading

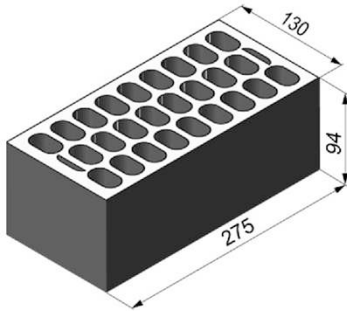
Annex C67

Vertical perforated brick HLz, EN 771-1:2011+A1:2015

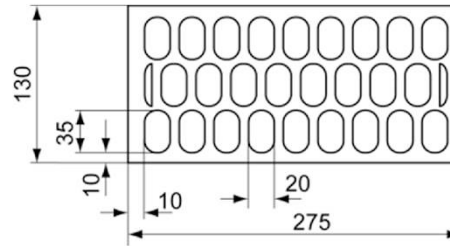
Table C68.1: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading

Anchor rod			M6	M8	M6	M8	-		M8	M10	-		M12	M16
Internal threaded anchor UPM-I			-		-		M6	M8	-		M10	M12	-	
							11x85				15x85			
Perforated sleeve UPM SH K			12x50		12x85		16x85				20x85			
V _{RK} = V _{RK,b} = V _{RK,c,II} = V _{RK,c,⊥} [kN]; temperature range 50/80°C and 72/120°C														
Mean compressive strength / Min. compressive strength single brick ¹⁾			Use con- dition											
2,5 / 2 N/mm ²			w/w	w/d	0,60	0,75	0,60	0,75	0,90					
			d/d											
5 / 4 N/mm ²			w/w	w/d	1,20	1,50	1,20	1,50	2,00					
			d/d											
8 / 6 N/mm ²			w/w	w/d	2,00	2,00	2,00	2,00	2,50					
			d/d											
10 / 8 N/mm ²			w/w	w/d	2,50	3,00	2,50	3,00	3,50					
			d/d											
12,5 / 10 N/mm ²			w/w	w/d	3,00	3,50	3,00	3,50	4,50					
			d/d											
15 / 12 N/mm ²			w/w	w/d	4,00	4,50	4,00	4,50	5,50					
			d/d											
¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength. Factor for job site tests and displacements see annex C123.														
Upat injection system UPM 44 for masonry											Annex C68			
Performance Vertical perforated brick HLz, Characteristic resistance under shear loading														

Vertical perforated brick HLz, EN 771-1:2011+A1:2015



Producer	e.g. Cermanica Farreny S.A.			
Nominal dimensions	[mm]	length L	width W	height H
		275	130	94
Mean gross dry density ρ	[kg/dm ³]	≥ 0,8		
Mean compressive strength / Min. compressive strength single brick ¹⁾	[N/mm ²]	7,5 / 6 or 10 / 8 or 15 / 12 or 20 / 16 or 25 / 20		
Standard or annex	EN 771-1:2011+A1:2015			



Dimension see also Annex B18

Table C69.1: Installation parameters

Anchor rod	M6	M8	M6	M8	-	M8	M10	-	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6	M8	-	M10	M12	-
					11x85			15x85		
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x85	16x85	20x85	20x85	20x85

Anchor rod and internal threaded anchor UPM-I with perforated sleeve UPM SH K

Max. installation torque	max T_{inst} [Nm]	2
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General installation parameters

Edge distance	$C_{min} = C_{cr}$	100	120
Spacing	$S_{cr \parallel} = S_{min \parallel}$	275	
	$S_{cr \perp} = S_{min \perp}$	95	

Drilling method

Hammer drilling with hard metal hammer drill

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C69.2: Group factors

Anchor rod	M6	M8	M6	M8	-	M8	M10	-	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6	M8	-	M10	M12	-
					11x85			15x85		
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x85	16x85	20x85	20x85	20x85

Group factors	$\alpha_{g,N} (S_{min \parallel})$	[-]	2
	$\alpha_{g,V} (S_{min \parallel})$		
	$\alpha_{g,N} (S_{min \perp})$		
	$\alpha_{g,V} (S_{min \perp})$		

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, dimensions, installation parameters, Group factors

Annex C69

Vertical perforated brick HLz, EN 771-1:2011+A1:2015

Table C70.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading

Anchor rod	M6	M8	M6	M8	-	M8	M10	-	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6 11x85	M8	-	M10 15x85	M12	-
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x85	16x85	20x85	20x85	20x85
$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; temperature range 50/80°C ²⁾										
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions									
7,5 / 6 N/mm²	w/w	w/d	0,40		0,90					
	d/d	d/d	0,40		0,90					
10 / 8 N/mm²	w/w	w/d	0,50		1,20					
	d/d	d/d	0,60		1,20					
15 / 12 N/mm²	w/w	w/d	0,75		1,50					
	d/d	d/d	0,90		2,00					
20 / 16 N/mm²	w/w	w/d	0,90		2,00					
	d/d	d/d	1,20		2,50					
25 / 20 N/mm²	w/w	w/d	1,20		3,00					
	d/d	d/d	1,50		3,00					

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120^{\circ}C)} = 0,83 \cdot N_{Rk(50/80^{\circ}C)}$.

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, Characteristic resistance under tension loading

Annex C70

Vertical perforated brick HLz, EN 771-1:2011+A1:2015

Table C71.1: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading

Anchor rod	M6	M8	M6	M8	-	M8	M10	-	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6 11x85	M8	-	M10 15x85	M12	-
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x85	16x85	20x85	20x85	20x85
$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; temperature range 50/80°C and 72/120°C										
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions									
7,5 / 6 N/mm²	w/w d/d	w/d	1,2	1,2						
10 / 8 N/mm²	w/w d/d	w/d	1,5	1,5						
15 / 12 N/mm²	w/w d/d	w/d	2,0	2,5						
20 / 16 N/mm²	w/w d/d	w/d	3,0	3,0						
25 / 20 N/mm²	w/w d/d	w/d	4,0	4,0						

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Factor for job site tests and displacements see annex C123.

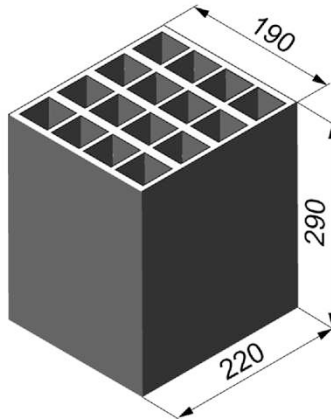
Upat injection system UPM 44 for masonry

Performance

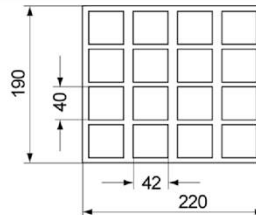
Vertical perforated brick HLz, Characteristic resistance under tension loading

Annex C71

Vertical perforated brick HLz, EN 771-1:2011+A1:2015



Producer	e.g. Perceram		
Nominal dimensions [mm]	length L	width W	height H
	220	190	290
Mean gross dry density ρ [kg/dm³]	≥ 0,7		
Mean compressive strength / Min. compressive strength single brick ¹⁾ [N/mm²]	7,5 / 6 or 10 / 8 or 12,5 / 10		
Standard or annex	EN 771-1:2011+A1:2015		



Dimension see also
Annex B18

Table C72.1: Installation parameters
(Pre-positioned installation with perforated sleeve UPM SH K)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6 M8 11x85	-	-	-	-	M10 M12 15x85	-	-	-	-
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x130	16x130	16x130	16x130	20x85	20x85	20x130	20x130	20x130

Anchor rod and internal threaded anchor UPM-I with perforated sleeve UPM SH K

Max. installation torque $\max T_{\text{inst}}$ [Nm]	2													
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General installation parameters

Edge distance $c_{\text{min}} = c_{\text{cr}}$	110													
Spacing $s_{\text{min}} \parallel = s_{\text{cr}} \parallel$	220													
$s_{\text{min}} \perp = s_{\text{cr}} \perp$	290													

Drilling method

Hammer drilling with hard metal hammer drill

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C72.2: Group factors

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6 M8 11x85	-	-	-	-	M10 M12 15x85	-	-	-	-
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x130	16x130	16x130	16x130	20x85	20x85	20x130	20x130	20x130

Group factors	$\alpha_{g,N} (s_{\text{min}} \parallel)$ $\alpha_{g,V} (s_{\text{min}} \parallel)$ $\alpha_{g,N} (s_{\text{min}} \perp)$ $\alpha_{g,V} (s_{\text{min}} \perp)$	[-]	2											
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Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, dimensions, installation parameters, Group factors

Annex C72

Vertical perforated brick HLz, EN 771-1:2011+A1:2015

Table C73.1: Installation parameters
(Push through installation with perforated sleeve UPM SH K)

Anchor rod		M10	M12	M16
Perforated sleeve UPM SH K		18x130/200		22x130/200
Anchor rod with perforated sleeve UPM SH K				
Max. installation torque	max T _{inst}	[Nm]	2	
General installation parameters				
Edge distance	C _{min} = C _{cr}	[mm]	110	
Spacing	s _{min} = s _{cr}		220	
	s _{min} ⊥ = s _{cr} ⊥		290	
Drilling method				
Hammer drilling with hard metal hammer drill				

Table C73.2: Group factors

Anchor rod		M10	M12	M16
Perforated sleeve UPM SH K		18x130/200		22x130/200
Group factors	$\alpha_{g,N} (s_{\min \parallel})$	[-]	2	
	$\alpha_{g,V} (s_{\min \parallel})$			
	$\alpha_{g,N} (s_{\min \perp})$			
	$\alpha_{g,V} (s_{\min \perp})$			

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, dimensions, installation parameters, Group factors

Annex C73

Vertical perforated brick HLz, EN 771-1:2011+A1:2015

Table C74.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Pre-positioned installation)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	M6	M8	-	-	-	-	-	M10	M12	-	-	-
			11x85							15x85				
Perforated sleeve UPM SH K	12x50	12x85	16x85	16x130	20x85	20x130								
$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; temperature range 50/80°C ²⁾														
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions													
7,5 / 6 N/mm²	w/w w/d	0,3	1,2	1,2	1,5	1,2	1,5							
	d/d	0,4	1,5	1,5	1,5	1,5	1,5							
10 / 8 N/mm²	w/w w/d	0,5	1,5	1,5	2,0	1,5	2,0							
	d/d	0,5	2,0	2,0	2,5	2,0	2,5							
12,5 / 10 N/mm²	w/w w/d	0,6	2,0	2,0	2,5	2,0	2,5							
	d/d	0,6	2,5	2,5	3,0	2,5	3,0							

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120^\circ C)} = 0,83 \cdot N_{Rk(50/80^\circ C)}$.

Table C74.2: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Push through installation)

Anchor rod	M10	M12	M16
Perforated sleeve UPM SH K	18x130/200	22x130/200	
$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; temperature range 50/80°C ²⁾			
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions		
7,5 / 6 N/mm²	w/w w/d	1,5	
	d/d	1,5	
10 / 8 N/mm²	w/w w/d	2,0	
	d/d	2,5	
12,5 / 10 N/mm²	w/w w/d	2,5	
	d/d	3,0	

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120^\circ C)} = 0,83 \cdot N_{Rk(50/80^\circ C)}$.

Factor for job site tests and displacements see annex C123.

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, Characteristic resistance under tension loading

Annex C74

Vertical perforated brick HLz, EN 771-1:2011+A1:2015

Table C75.1: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Pre-positioned installation)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	M6	M8	-	-	-	-	-	M10	M12	-	-	-
			11x85							15x85				
Perforated sleeve UPM SH K	12x50	12x85	16x85	16x130	20x85	20x130								

$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; temperature range 50/80°C and 72/120°C

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions						
7,5 / 6 N/mm ²	w/w d/d	1,5	1,5	1,5	2,5	1,5	2,0
10 / 8 N/mm ²	w/w d/d	2,0	2,0	2,0	3,5	2,0	3,0
12,5 / 10 N/mm ²	w/w d/d	2,5	3,0	3,0	4,5	3,0	3,5

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C75.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Push through installation)

Anchor rod	M10	M12	M16
Perforated sleeve UPM SH K	18x130/200	22x130/200	

$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; temperature range 50/80°C and 72/120°C

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions	
7,5 / 6 N/mm ²	w/w d/d	2,0
10 / 8 N/mm ²	w/w d/d	3,0
12,5 / 10 N/mm ²	w/w d/d	3,5

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Factor for job site tests and displacements see annex C123.

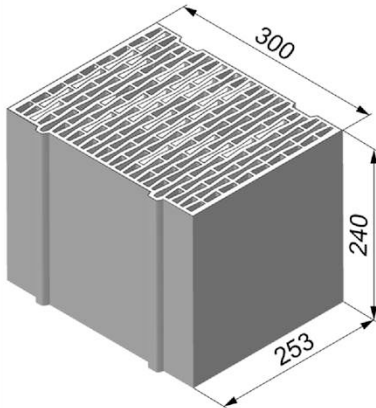
Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, Characteristic resistance under shear loading

Annex C75

Vertical perforated brick HLz, EN 771-1:2011+A1:2015



Producer	e.g. Ziegelwerk Brenna			
Nominal dimensions	[mm]	length L	width W	height H
		253	300	240
Mean gross dry density ρ	[kg/dm ³]	≥ 0,8		
Mean compressive strength / Min. compressive strength single brick ¹⁾	[N/mm ²]	2,5 / 2 or 5 / 4 or 8 / 6		
Standard or annex	EN 771-1:2011+A1:2015			

Dimension see also Annex B18

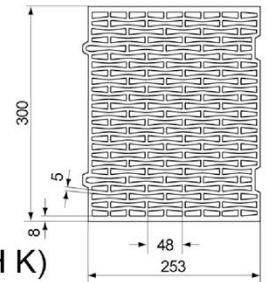


Table C76.1: Installation parameters
(Pre-positioned installation with perforated sleeve UPM SH K)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6 M8 11x85	-	-	-	-	M10 M12 15x85	-	-	-	-
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x130	16x130	16x130	16x130	20x85	20x85	20x130	20x130	20x130

Anchor rod and internal threaded anchor UPM-I with perforated sleeve UPM SH K

Max. installation torque $\max T_{\text{inst}}$ [Nm]	2													
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General installation parameters

Edge distance $c_{\text{min}} = c_{\text{cr}}$	60													
Spacing $s_{\text{min}} \parallel = s_{\text{cr}} \parallel$	255													
$s_{\text{min}} \perp = s_{\text{cr}} \perp$	240													

Drilling method

Hammer drilling with hard metal hammer drill

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C76.2: Group factors

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6 M8 11x85	-	-	-	-	M10 M12 15x85	-	-	-	-
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x130	16x130	16x130	16x130	20x85	20x85	20x130	20x130	20x130

Group factors	$\alpha_{g,N} (s_{\text{min}} \parallel)$ $\alpha_{g,V} (s_{\text{min}} \parallel)$ $\alpha_{g,N} (s_{\text{min}} \perp)$ $\alpha_{g,V} (s_{\text{min}} \perp)$	2												
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Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, dimensions, installation parameters, Group factors

Annex C76

Vertical perforated brick HLz, EN 771-1:2011+A1:2015

Table C77.1: Installation parameters
(Push through installation with perforated sleeve UPM SH K)

Anchor rod		M10	M12	M16
Perforated sleeve UPM SH K		18x130/200		22x130/200
Anchor rod with perforated sleeve UPM SH K				
Max. installation torque	T _{inst}	[Nm]	2	
General installation parameters				
Edge distance	c _{min} = c _{cr}	[mm]	60	
Spacing	s _{min} = s _{cr}		255	
	s _{min} ⊥ = s _{cr} ⊥		240	
Drilling method				
Hammer drilling with hard metal hammer drill				

Table C77.2: Group factors

Anchor rod		M10	M12	M16
Perforated sleeve UPM SH K		18x130/200		22x130/200
Group factors	$\alpha_{g,N} (s_{\text{min II}})$	[-]	2	
	$\alpha_{g,V} (s_{\text{min II}})$			
	$\alpha_{g,N} (s_{\text{min } \perp})$			
	$\alpha_{g,V} (s_{\text{min } \perp})$			

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, dimensions, installation parameters, Group factors

Annex C77

Vertical perforated brick HLz, EN 771-1:2011+A1:2015

Table C78.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Pre-positioned installation)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	M6	M8	-	-	-	-	-	M10	M12	-	-	-
			11x85							15x85				
Perforated sleeve UPM SH K	12x50	12x85	16x85	16x130	20x85	20x130								
$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; temperature range 50/80°C ²⁾														
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions													
2,5 / 2 N/mm²	w/w	w/d	- ³⁾	0,50	0,50	0,40	0,50	0,40	0,50	0,40	0,50	0,40	0,50	0,40
	d/d	d/d	0,30	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50
5 / 4 N/mm²	w/w	w/d	0,50	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90
	d/d	d/d	0,60	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90
8 / 6 N/mm²	w/w	w/d	0,75	1,50	1,50	1,20	1,50	1,20	1,50	1,20	1,50	1,20	1,50	1,20
	d/d	d/d	0,90	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120^{\circ}C)} = 0,83 \cdot N_{Rk(50/80^{\circ}C)}$.

³⁾ No performance assessed.

Table C78.2: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Push through installation)

Anchor rod	M10	M12	M16
Perforated sleeve UPM SH K	18x130/200	22x130/200	22x130/200
$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; temperature range 50/80°C ²⁾			
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions		
2,5 / 2 N/mm²	w/w	w/d	0,4
	d/d	d/d	0,5
5 / 4 N/mm²	w/w	w/d	0,9
	d/d	d/d	0,9
8 / 6 N/mm²	w/w	w/d	1,2
	d/d	d/d	1,5

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120^{\circ}C)} = 0,83 \cdot N_{Rk(50/80^{\circ}C)}$.

Factor for job site tests and displacements see annex C123.

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, Characteristic resistance under tension loading

Annex C78

Vertical perforated brick HLz, EN 771-1:2011+A1:2015

Table C79.1: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Pre-positioned installation)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	M6	M8	-	-	-	M10	M12	-	-	-	-	-
			11x85					15x85						
Perforated sleeve UPM SH K	12x50	12x85	16x85	16x130	20x85	20x130								

$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; temperature range 50/80°C and 72/120°C

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions	
2,5 / 2 N/mm ²	w/w w/d d/d	0,5
5 / 4 N/mm ²	w/w w/d d/d	0,9
8 / 6 N/mm ²	w/w w/d d/d	1,5

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C79.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Push through installation)

Anchor rod	M10	M12	M16
Perforated sleeve UPM SH K	18x130/200	22x130/200	

$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; temperature range 50/80°C and 72/120°C

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions	
2,5 / 2 N/mm ²	w/w w/d d/d	0,5
5 / 4 N/mm ²	w/w w/d d/d	0,9
8 / 6 N/mm ²	w/w w/d d/d	1,5

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Factor for job site tests and displacements see annex C123.

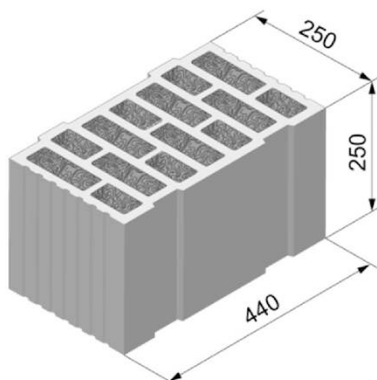
Upat injection system UPM 44 for masonry

Performance

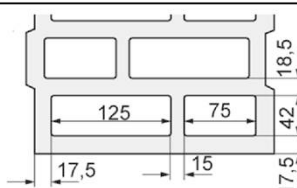
Vertical perforated brick HLz, Characteristic resistance under shear loading

Annex C79

**Vertical perforated brick HLz, Porothersm W 44, filled with mineral wool,
EN 771-1:2011+A1:2015**



Producer	e.g. Wienerberger		
Nominal dimensions [mm]	length L	width W	height H
	250	440	250
Mean gross dry density ρ [kg/dm ³]	0,7		
Mean compressive strength / Min. compressive strength single brick ¹⁾ [N/mm ²]	8 / 6 or 10 / 8 or 12,5 / 10		
Standard or annex	EN 771-1:2011+A1:2015		



Dimension see also
Annex B18

Table C80.1: Installation parameters
(Pre-positioned installation with perforated sleeve UPM SH K)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6	M8	-	-	-	M10	M12	-	-	-	-	-
					11x85					15x85						
Perforated sleeve UPM SH K	12x50	12x85	16x85	16x130	20x85	20x130	20x200									

Anchor rod and internal threaded anchor UPM-I with perforated sleeve UPM SH K

Max. installation torque	max T_{inst} [Nm]	2	5	2	5	6
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General installation parameters

Edge distance	$c_{min} = c_{cr}$	60
Spacing	$s_{min II}$	80
	$s_{cr II}$ [mm]	250
	$s_{min \perp}$	80
	$s_{cr \perp}$	250

Drilling method

Rotary drilling with carbide drill

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C80.2: Group factors

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6	M8	-	-	-	M10	M12	-	-	-	-	-
					11x85					15x85						
Perforated sleeve UPM SH K	12x50	12x85	16x85	16x130	20x85	20x130	20x200									

Group factors	$\alpha_{g,N} (s_{min II})$	[-]	1,3
	$\alpha_{g,V} (s_{min II})$		1,3
	$\alpha_{g,N} (s_{min \perp})$		0,8
	$\alpha_{g,V} (s_{min \perp})$		1,3

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, Porothersm W 44, filled with mineral wool;
dimensions, installation parameters, Group factors

Annex C80

**Vertical perforated brick HLz, Porothersm W 44, filled with mineral wool,
EN 771-1:2011+A1:2015**

Table C81.1: Installation parameters
(Push through installation with perforated sleeve UPM SH K)

Anchor rod		M10	M12	M16
Perforated sleeve UPM SH K		18x130/200		22x130/200
Anchor rod with perforated sleeve UPM SH K				
Max. installation torque	max T _{inst}	[Nm]	5	6
General installation parameters				
Edge distance	C _{min} = C _{cr}	[mm]	60	
Spacing	S _{min}		80	
	S _{cr}		250	
	S _{min} ⊥		80	
	S _{cr} ⊥		250	
Drilling method				
Rotary drilling with carbide drill				

Table C81.2: Group factors

Anchor rod		M10	M12	M16
Perforated sleeve UPM SH K		18x130/200		22x130/200
Group factors	$\alpha_{g,N} (s_{min \parallel})$	[-]	1,3	
	$\alpha_{g,V} (s_{min \parallel})$		1,3	
	$\alpha_{g,N} (s_{min \perp})$		0,8	
	$\alpha_{g,V} (s_{min \perp})$		1,3	

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, Porothersm W 44, filled with mineral wool;
dimensions, installation parameters, Group factors

Annex C81

**Vertical perforated brick HLz, Porothersm W 44, filled with mineral wool,
EN 771-1:2011+A1:2015**

Table C82.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Pre-positioned installation)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6 11x85	-	-	-	-	M10 15x85	-	-	-	-	-	-
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x130	16x130	16x130	16x130	20x85	20x130	20x200	20x200	20x200	20x200	20x200
$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; temperature range 50/80°C ²⁾																
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions															
8 / 6 N/mm²	w/w	w/d	0,75	1,50	1,20	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50
	d/d	d/d	0,90	1,50	1,20	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50
10 / 8 N/mm²	w/w	w/d	0,90	1,50	1,20	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50
	d/d	d/d	0,90	2,00	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50
12,5 / 10 N/mm²	w/w	w/d	0,90	2,00	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50
	d/d	d/d	1,20	2,00	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120^\circ C)} = 0,83 \cdot N_{Rk(50/80^\circ C)}$.

Table C82.2: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Push through installation)

Anchor rod		M10		M12		M16	
Perforated sleeve UPM SH K		18x130/200				22x130/200	
N _{Rk} = N _{Rk,p} = N _{Rk,b} = N _{Rk,p,c} = N _{Rk,b,c} [kN]; temperature range 50/80°C ²⁾							
Mean compressive strength / Min. compressive strength single brick ¹⁾		Use con- ditions					
8 / 6 N/mm ²		w/w	w/d	1,5			
		d/d		1,5			
10 / 8 N/mm ²		w/w	w/d	1,5			
		d/d		2,0			
12,5 / 10 N/mm ²		w/w	w/d	2,0			
		d/d		2,0			

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120^\circ C)} = 0,83 \cdot N_{Rk(50/80^\circ C)}$.

Factor for job site tests and displacements see annex C123.

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, Porothersm W 44, filled with mineral wool,
Characteristic resistance under tension loading

Annex C82

**Vertical perforated brick HLz, Porothersm W 44, filled with mineral wool,
EN 771-1:2011+A1:2015**

Table C83.1: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Pre-positioned installation)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6 M8 11x85	-	-	-	-	M10 M12 15x85	-	-	-	-	-	-
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x130	16x130	16x130	16x130	20x85	20x85	20x130	20x130	20x200	20x200	20x200

$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; temperature range 50/80°C and 72/120°C

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions					
8 / 6 N/mm ²	w/w d/d	0,9	1,2	0,9	1,2	1,2
10 / 8 N/mm ²	w/w d/d	0,9	1,5	0,9	1,5	1,2
12,5 / 10 N/mm ²	w/w d/d	1,2	1,5	1,2	1,5	1,5

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C83.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Push through installation)

Anchor rod	M10	M12	M16
Perforated sleeve UPM SH K	18x130/200	18x130/200	22x130/200

$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; temperature range 50/80°C and 72/120°C

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions		
8 / 6 N/mm ²	w/w d/d	1,2	1,2
10 / 8 N/mm ²	w/w d/d	1,5	1,5
12,5 / 10 N/mm ²	w/w d/d	1,5	1,5

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Factor for job site tests and displacements see annex C123.

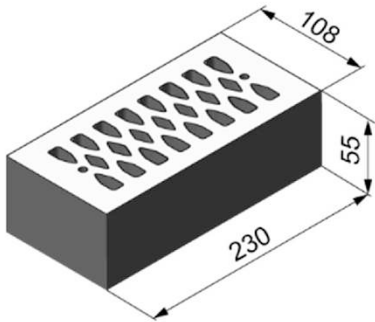
Upat injection system UPM 44 for masonry

Performance

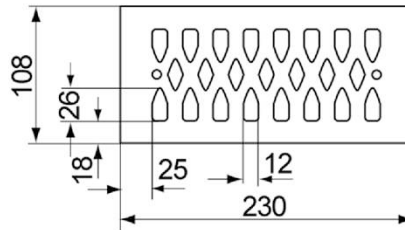
Vertical perforated brick HLz, Porothersm W 44, filled with mineral wool;
Characteristic resistance under shear loading

Annex C83

Vertical perforated brick HLz, EN 771-1:2011+A1:2015



Producer	e.g. Wienerberger.			
Nominal dimensions	[mm]	length L	width W	height H
		230	108	55
Mean gross dry density ρ	[kg/dm ³]	≥ 1,4		
Mean compressive strength / Min. compressive strength single brick ¹⁾	[N/mm ²]	2,5 / 2 or 5 / 4 or 8 / 6 or 10 / 8		
Standard or annex	EN 771-1:2011+A1:2015			



Dimension see also Annex B18

Table C84.1: Installation parameters

Anchor rod	M6	M8	M6	M8	-	M8	M10	-	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6	M8	-	M10	M12	-
					11x85			15x85		
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x85	16x85	20x85	20x85	20x85

Anchor rod and internal threaded anchor UPM-I with perforated sleeve UPM SH K

Max. installation torque	max T_{inst} [Nm]	2
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General installation parameters

Edge distance	$c_{min} = c_{cr}$	60
Spacing	$s_{min II}$	80
	$s_{cr II}$ [mm]	230
	$s_{min \perp}$	60
	$s_{cr \perp}$	60

Drilling method

Hammer drilling with hard metal hammer drill

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C84.2: Group factors

Anchor rod	M6	M8	M6	M8	-	M8	M10	-	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6	M8	-	M10	M12	-
					11x85			15x85		
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x85	16x85	20x85	20x85	20x85

Group factors	$\alpha_{g,N} (s_{min II})$	[-]	2
	$\alpha_{g,V} (s_{min II})$		
	$\alpha_{g,N} (s_{min \perp})$		
	$\alpha_{g,V} (s_{min \perp})$		

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, dimensions, installation parameters, Group factors

Annex C84

Vertical perforated brick HLz, EN 771-1:2011+A1:2015

Table C85.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading ¹⁾

Anchor rod	M6	M8	M6	M8	-		M8	M10	-		M12	M16
Internal threaded anchor UPM-I	-		-		M6	M8	-		M10	M12	-	
					11x85				15x85			
Perforated sleeve UPM SH K	12x50		12x85		16x85				20x85			
N _{Rk} = N _{Rk,p} = N _{Rk,b} = N _{Rk,p,c} = N _{Rk,b,c} [kN]; temperature range 50/80°C ³⁾												
Mean compressive strength / Min. compressive strength single brick ²⁾	Use con- ditions											
2,5 / 2 N/mm ²	w/w	w/d	0.30		0.90		0.75			0.50		
	d/d		0,30		0,90		0,90			0,60		
5 / 4 N/mm ²	w/w	w/d	0.60		1.50		1.50			0.90		
	d/d		0,75		2,00		1,50			1,20		
8 / 6 N/mm ²	w/w	w/d	0.90		2.50		2.50			1.50		
	d/d		0,90		3,00		2,50			1,50		
10 / 8 N/mm ²	w/w	w/d	1.20		3.50		3.00			2.00		
	d/d		1,50		4,00		3,50			2,50		

¹⁾ If the fixing is in a solid area, for use condition w/w, the characteristic value shall be reduced with the factor 0,64.

²⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

³⁾ For temperature range 72/120°C: $N_{Rk(72/120^\circ C)} = 0,83 \cdot N_{Rk(50/80^\circ C)}$.

Table C85.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading

Anchor rod	M6	M8	M6	M8	-		M8	M10	-		M12	M16
Internal threaded anchor UPM-I	-		-		M6	M8	-		M10	M12	-	
					11x85				15x85			
Perforated sleeve UPM SH K	12x50		12x85		16x85				20x85			
V _{Rk} = V _{Rk,b} = V _{Rk,c,II} = V _{Rk,c,I} [kN]; temperature range 50/80°C and 72/120°C												
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions											
2,5 / 2 N/mm ²	w/w	w/d	0,6						0,4			
	d/d											
5 / 4 N/mm ²	w/w	w/d	1,2						0,9			
	d/d											
8 / 6 N/mm ²	w/w	w/d	1,5						1,2			
	d/d											
10 / 8 N/mm ²	w/w	w/d	2,5						1,5			
	d/d											

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength. Factor for job site tests and displacements see annex C123.

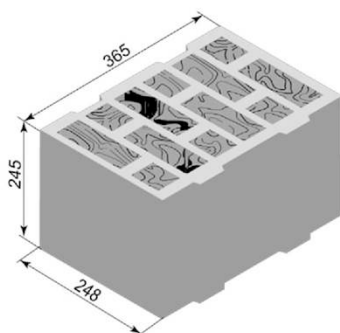
Upat injection system UPM 44 for masonry

Performance

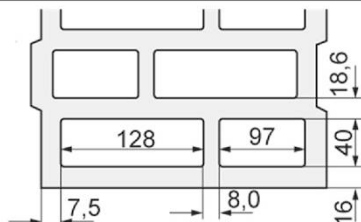
Vertical perforated brick HLz, Characteristic resistance under tension and shear loading

Annex C85

Vertical perforated brick HLz filled with mineral wool, EN 771-1:2011+A1:2015



Producer	e.g. Wienerberger			
Nominal dimensions	[mm]	length L	width W	height H
		≥ 365	≥ 248	≥ 245
Mean gross dry density ρ	[kg/dm³]	0,6		
Mean compressive strength / Min. compressive strength single brick ¹⁾	[N/mm²]	10 / 8		
Standard or annex	EN 771-1:2011+A1:2015			



Dimension see also Annex B19

Table C86.1: Installation parameters
(Pre-positioned installation with perforated sleeve UPM SH K)

Anchor rod	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	M6	M8	-	-	-	-	M10	M12	-	-	-
		11x85						15x85				
Perforated sleeve UPM SH K	12x85	16x85	16x130	20x85	20x130							

Anchor rod and internal threaded anchor UPM-I with perforated sleeve UPM SH K

Max. installation torque	max T_{inst} [Nm]	2	4
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General installation parameters

Edge distance	$c_{min} = c_{cr}$	100
Spacing	$s_{min \parallel}$	250
	$s_{cr \parallel}$ [mm]	
	$s_{min \perp}$	245
	$s_{cr \perp}$	

Drilling method

Hammer drilling with hard metal hammer drill

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C86.2: Group factors

Anchor rod	M6	M8	M8	M10	M8	M10	M12	M16	M12	M16
Perforated sleeve UPM SH K	12x85	16x85	16x130	20x85	20x130					
Group factors	$\alpha_{g,N} (s_{min \parallel}) =$ $\alpha_{g,V} (s_{min \parallel}) =$ $\alpha_{g,N} (s_{min \perp}) =$ $\alpha_{g,V} (s_{min \perp}) =$	2								

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz filled with mineral wool, dimensions, installation parameters, Group factors

Annex C86

Vertical perforated brick HLz filled with mineral wool, EN 771-1:2011+A1:2015

Table C87.1: Installation parameters

(Push through installation with perforated sleeve UPM SH K)

Anchor rod		M10	M12	M16
Perforated sleeve UPM SH K		18x130/200		22x130/200
Anchor rod with perforated sleeve UPM SH K				
Max. installation torque	max T _{inst}	[Nm]	4	
General installation parameters				
Edge distance	c _{min} = c _{cr}	[mm]	100	
Spacing	s _{min}		250	
	s _{cr}			
	s _{min} ⊥		245	
	s _{cr} ⊥			
Drilling method				
Hammer drilling with hard metal hammer drill				

Table C87.2: Group factors

Anchor rod		M10	M12	M16
Perforated sleeve UPM SH K		18x130/200		22x130/200
Group factors	$\alpha_{g,N} (s_{min} \parallel)$	2		
	$\alpha_{g,V} (s_{min} \parallel)$			
	$\alpha_{g,N} (s_{min} \perp)$			
	$\alpha_{g,V} (s_{min} \perp)$			

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz filled with mineral wool, dimensions, installation parameters, Group factors

Annex C87

Vertical perforated brick HLz filled with mineral wool, EN 771-1:2011+A1:2015

Table C88.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Pre-positioned installation)

Anchor rod	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	M6	M8	-	-	M10	M12	-	-	-	-	-	-	-
		11x85				15x85								
Perforated sleeve UPM SH K	12x85	16x85	16x130	20x85	20x130	20x200								
$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; temperature range 50/80°C ²⁾														
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions													
10 / 8 N/mm²	w/w	2,0	1,5	2,5	2,0	2,0	3,0							
	d/d	2,0	2,0	3,0	2,0	2,0	3,0							

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C no performance assessed.

Table C88.2: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Push through installation)

Anchor rod	M10	M12	M16
Perforated sleeve UPM SH K	18x130/200	22x130/200	
$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; temperature range 50/80°C ²⁾			
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions		
10 / 8 N/mm²	w/w	1,5	2,0
	d/d	2,0	2,0

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C no performance assessed.

Factor for job site tests and displacements see annex C123.

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz filled with mineral wool, Characteristic resistance under tension loading

Annex C88

Vertical perforated brick HLz filled with mineral wool, EN 771-1:2011+A1:2015

Table C89.1: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Pre-positioned installation)

Anchor rod	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16	M12	M16
Internal threaded anchor UPM-I	-		M6 M8 11x85	-	-			M10 M12 15x85	-	-	-	-	-	-
Perforated sleeve UPM SH K	12x85		16x85		16x130			20x85		20x130		20x200		
$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; temperature range 50/80°C ²⁾														
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions													
10 / 8 N/mm²	w/w	2,5	3,0	3,0	3,0	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5
	d/d	2,5	3,0	3,0	3,0	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C no performance assessed.

Table C89.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Push through installation)

Anchor rod	M10	M12	M16
Perforated sleeve UPM SH K	18x130/200	22x130/200	
$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; temperature range 50/80°C ²⁾			
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions		
10 / 8 N/mm²	w/w	3,0	1,5
	d/d	3,0	1,5

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C no performance assessed.

Factor for job site tests and displacements see annex C123.

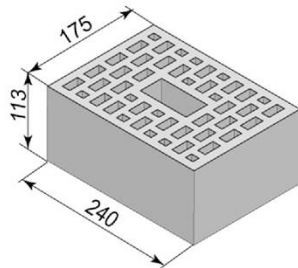
Upat injection system UPM 44 for masonry

Performance

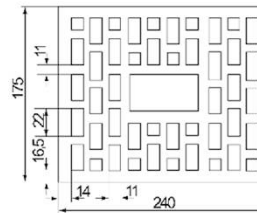
Vertical perforated brick HLz filled with mineral wool, Characteristic resistance under shear loading

Annex C89

Vertical perforated brick HLz, EN 771-1:2011+A1:2015



Producer	e.g. Wienerberger		
Nominal dimensions [mm]	length L	width W	height H
	≥ 240	≥ 175	≥ 113
Mean gross dry density ρ [kg/dm ³]	0,9		
Mean compressive strength / Min. compressive strength single brick ¹⁾ [N/mm ²]	12,5 / 10		
Standard or annex	EN 771-1:2011+A1:2015		



Dimension see also Annex B19

Table C90.1: Installation parameters
(Pre-positioned installation with perforated sleeve UPM SH K)

Anchor rod	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	M6	M8	-	-	-	-	M10	M12	-	-	-
		11x85						15x85				
Perforated sleeve UPM SH K	12x85	16x85		16x130		20x85		20x130				

Anchor rod and internal threaded anchor UPM-I with perforated sleeve UPM SH K

Max. installation torque	max T_{inst} [Nm]	2	4
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General installation parameters

Edge distance	$C_{min} = C_{cr}$	100
Spacing	$s_{min \parallel}$	240
	$s_{cr \parallel}$	
	$s_{min \perp}$	115
	$s_{cr \perp}$	

Drilling method

Hammer drilling with hard metal hammer drill

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C90.2: Group factors

Anchor rod	M6	M8	M8	M10	M8	M10	M12	M16	M12	M16
Perforated sleeve UPM SH K	12x85	16x85	16x130	20x85	20x130					
Group factors	$\alpha_{g,N} (s_{min \parallel}) =$ $\alpha_{g,V} (s_{min \parallel}) =$ $\alpha_{g,N} (s_{min \perp}) =$ $\alpha_{g,V} (s_{min \perp}) =$	[-] 2								

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, dimensions, installation parameters, Group factors

Annex C90

Vertical perforated brick HLz, EN 771-1:2011+A1:2015

Table C91.1: Installation parameters
(Push through installation with perforated sleeve UPM SH K)

Anchor rod		M10	M12	M16
Perforated sleeve UPM SH K		18x130/200		22x130/200
Anchor rod with perforated sleeve UPM SH K				
Max. installation torque	max T _{inst}	[Nm]	4	
General installation parameters				
Edge distance	C _{min} = C _{cr}	[mm]	100	
Spacing	s _{min}		240	
	s _{cr}			
	s _{min} ⊥		115	
	s _{cr} ⊥			
Drilling method				
Hammer drilling with hard metal hammer drill				

Table C91.2: Group factors

Anchor rod		M10	M12	M16
Perforated sleeve UPM SH K		18x130/200		22x130/200
Group factors	$\alpha_{g,N} (s_{\min \parallel})$	2		
	$\alpha_{g,V} (s_{\min \parallel})$			
	$\alpha_{g,N} (s_{\min \perp})$			
	$\alpha_{g,V} (s_{\min \perp})$			

Upat injection system UPM 44 for masonry

Performance
Vertical perforated brick HLz, dimensions, installation parameters, Group factors

Annex C91

Vertical perforated brick HLz, EN 771-1:2011+A1:2015

Table C92.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Pre-positioned installation)

Anchor rod	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	M6 11x85	M8	-	-	-	M10 15x85	M12	-	-	-	-
Perforated sleeve UPM SH K	12x85	16x85	16x130	20x85	20x130							
$N_{RK} = N_{RK,p} = N_{RK,b} = N_{RK,p,c} = N_{RK,b,c}$ [kN]; temperature range 50/80°C ²⁾												
Mean compressive strength/ Min. compressive strength single brick ¹⁾	Use con- ditions											
12,5 / 10 N/mm ²	w/w	3,5	4,0	4,5	4,5	4,0						
	d/d	4,0	4,5	5,0	5,0	4,0						

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C no performance assessed.

Table C92.2: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Push through installation)

Anchor rod	M10	M12	M16
Perforated sleeve UPM SH K	18x130/200	22x130/200	
$N_{RK} = N_{RK,p} = N_{RK,b} = N_{RK,p,c} = N_{RK,b,c}$ [kN]; temperature range 50/80°C ²⁾			
Mean compressive strength/ Min. compressive strength single brick ¹⁾	Use con- ditions		
12,5 / 10 N/mm ²	w/w	4,5	4,0
	d/d	5,0	4,0

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C no performance assessed.

Factor for job site tests and displacements see annex C123.

Upat injection system UPM 44 for masonry

Performance

Vertical perforated brick HLz, Characteristic resistance under tension loading

Annex C92

Vertical perforated brick HLz, EN 771-1:2011+A1:2015

Table C93.1: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Pre-positioned installation)

Anchor rod	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	M6	M8	-	-	-	-	M10	M12	-	-	-
		11x85						15x85				
Perforated sleeve UPM SH K	12x85	16x85	16x130	20x85	20x130							

$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; temperature range 50/80°C ²⁾

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions														
12,5 / 10 N/mm ²	w/w	4,0	5,5	4,0	5,5	5,5	7,0	5,5	7,0	7,0	6,0	6,0	8,0	6,0	8,0
	d/d	4,0	5,5	4,0	5,5	5,5	7,0	5,5	7,0	7,0	6,0	6,0	8,0	6,0	8,0

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C no performance assessed.

Table C93.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Push through installation)

Anchor rod	M10	M12	M16
Perforated sleeve UPM SH K	18x130/200	22x130/200	

$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; temperature range 50/80°C ²⁾

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions			
12,5 / 10 N/mm ²	w/w	7,0	6,0	8,0
	d/d	7,0	6,0	8,0

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C no performance assessed.

Factor for job site tests and displacements see annex C123

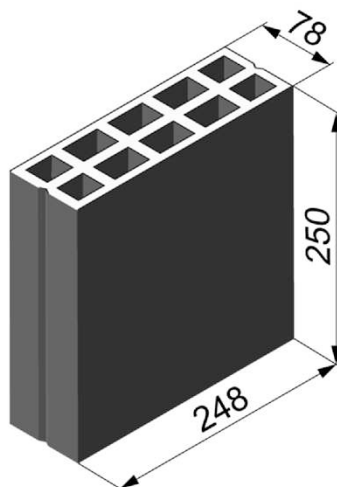
Upat injection system UPM 44 for masonry

Performance

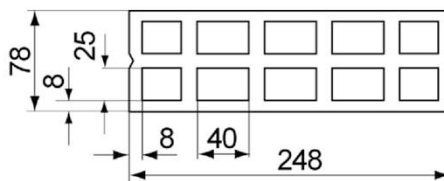
Vertical perforated brick HLz, Characteristic resistance under shear loading

Annex C93

Horizontal perforated brick LLz, EN 771-1:2011+A1:2015



Producer	-			
Nominal dimensions	[mm]	length L	width W	height H
		250	78	248
Mean gross dry density ρ	[kg/dm³]	≥ 0,7		
Mean compressive strength / Min. compressive strength single brick ¹⁾	[N/mm²]	2,5 / 2 or 5 / 4 or 8 / 6		
Standard or annex	EN 771-1:2011+A1:2015			



Dimension see also
Annex B19

Table C94.1: Installation parameters

Anchor rod		M6	M8
Perforated sleeve UPM SH K		12x50	
Anchor rod with perforated sleeve UPM SH K			
Max. installation torque	max T _{inst}	[Nm]	2
General installation parameters			
Edge distance	C _{min} = C _{cr}	[mm]	100
Spacing	s _{min}		75
	s _{cr}		250
	s _{min} ⊥ = s _{cr} ⊥		250
Drilling method			
Hammer drilling with hard metal hammer drill			

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C94.2: Group factors

Anchor rod		M6	M8
Perforated sleeve UPM SH K		12x50	
Group factors	$\alpha_{g,N} (s_{\text{min II}})$	[-]	1,6
	$\alpha_{g,V} (s_{\text{min II}})$		1,1
	$\alpha_{g,N} (s_{\text{min } \perp})$		2,0
	$\alpha_{g,V} (s_{\text{min } \perp})$		

Upat injection system UPM 44 for masonry

Performance

Horizontal perforated brick LLz, dimensions, installation parameters, Group factors

Annex C94

Horizontal perforated brick LLz, EN 771-1:2011+A1:2015

Table C95.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading

Anchor rod		M6		M8	
Perforated sleeve UPM SH K		12x50			
N _{Rk} = N _{Rk,p} = N _{Rk,b} = N _{Rk,p,c} = N _{Rk,b,c} [kN]; temperature range 50/80°C ²⁾					
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions				
2,5 / 2 N/mm ²	w/w w/d	0,5			
	d/d	0,6			
5 / 4 N/mm ²	w/w w/d	0,9			
	d/d	1,2			
8 / 6 N/mm ²	w/w w/d	1,5			
	d/d	1,5			

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength..

²⁾ For temperature range 72/120°C: $N_{Rk(72/120°C)} = 0,83 \cdot N_{Rk(50/80°C)}$.

Table C95.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading

Anchor rod		M6	M8
Perforated sleeve UPM SH K		12x50	
V _{Rk} = V _{Rk,b} = V _{Rk,c,II} = V _{Rk,c,⊥} [kN]; temperature range 50/80°C and 72/120°C			
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions		
2,5 / 2 N/mm ²	w/w w/d	0,5	
	d/d		
5 / 4 N/mm ²	w/w w/d	0,9	
	d/d		
8 / 6 N/mm ²	w/w w/d	1,5	
	d/d		

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Factor for job site tests and displacements see annex C123.

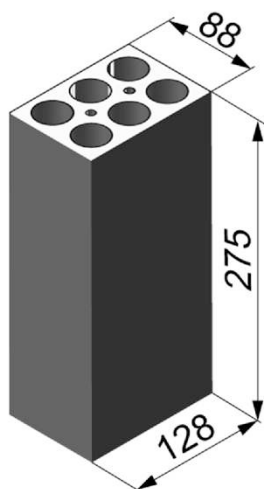
Upat injection system UPM 44 for masonry

Performance

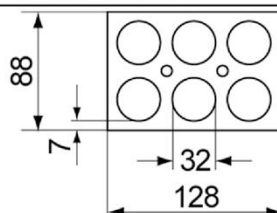
Horizontal perforated brick LLz, Characteristic resistance under tension and shear loading

Annex C95

Horizontal perforated brick LLz, EN 771-1:2011+A1:2015



Producer	e.g. Cermanica Farreny S.A.			
Nominal dimensions	[mm]	length L	width W	height H
		275	88	128
Mean gross dry density ρ	[kg/dm³]	≥ 0,8		
Mean compressive strength / Min. compressive strength single brick ¹⁾	[N/mm²]	2,5 / 2		
Standard or annex	EN 771-1:2011+A1:2015			



Dimension see also
Annex B19

Table C96.1: Installation parameters

Anchor rod		M6	M8
Perforated sleeve UPM SH K		12x50	
Anchor rod with perforated sleeve UPM SH K			
Max. installation torque	T _{inst}	[Nm]	2
General installation parameters			
Edge distance	C _{min} = C _{cr}	[mm]	60
Spacing	s _{min}		75
	s _{cr}		275
	s _{min} ⊥		75
	s _{cr} ⊥		130
Drilling method			
Hammer drilling with hard metal hammer drill			

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C96.2: Group factors

Anchor rod		M6	M8
Perforated sleeve UPM SH K		12x50	
Group factors	$\alpha_{g,N} (s_{min} \parallel)$	1,3	
	$\alpha_{g,V} (s_{min} \parallel)$	1,5	
	$\alpha_{g,N} (s_{min} \perp)$	1,3	
	$\alpha_{g,V} (s_{min} \perp)$	1,5	

Upat injection system UPM 44 for masonry

Performance

Horizontal perforated brick LLz, dimensions, installation parameters, Group factors

Annex C96

Horizontal perforated brick LLz, EN 771-1:2011+A1:2015

Table C97.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading

Anchor rod		M6		M8	
Perforated sleeve UPM SH K		12x50			
N _{Rk} = N _{Rk,p} = N _{Rk,b} = N _{Rk,p,c} = N _{Rk,b,c} [kN]; temperature range 50/80°C ²⁾					
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions				
2,5 / 2 N/mm ²	w/w w/d	1,5			
	d/d				

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{RK(72/120^\circ C)} = 0,83 \cdot N_{RK(50/80^\circ C)}$.

Table C97.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading

Anchor rod		M6		M8	
Perforated sleeve UPM SH K		12x50			
V _{Rk} = V _{Rk,b} = V _{Rk,c,II} = V _{Rk,c,⊥} [kN]; temperature range 50/80°C and 72/120°C					
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions				
2,5 / 2 N/mm ²	w/w w/d	1,2			
	d/d				

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Factor for job site tests and displacements see annex C123.

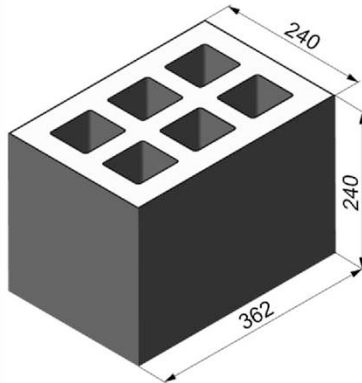
Upat injection system UPM 44 for masonry

Performance

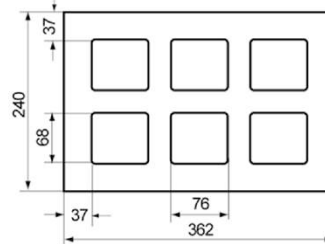
Horizontal perforated brick LLz, Characteristic resistance under tension and shear loading

Annex C97

Light-weight concrete hollow block Hbl, EN 771-3:2011+A1:2015



Producer	-		
Nominal dimensions [mm]	length L	width W	height H
	362	240	240
Mean gross dry density ρ [kg/dm³]	≥ 1,0		
Mean compressive strength / Min. compressive strength single brick ¹⁾ [N/mm²]	2,5 / 2 or 5 / 4		
Standard or annex	EN 771-3:2011+A1:2015		



Dimension see also
Annex B19

Table C98.1: Installation parameters
(Pre-positioned installation with perforated sleeve UPM SH K)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6	M8	-	-	-	M10	M12	-	-	-	-	-
					11x85					15x85						
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x130	16x130	16x130	16x130	20x85	20x130	20x130	20x130	20x200	20x200	20x200

Anchor rod and internal threaded anchor UPM-I with perforated sleeve UPM SH K

Max. installation torque	$\max T_{\text{inst}}$ [Nm]	2
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General installation parameters

Edge distance	$c_{\text{min}} = c_{\text{cr}}$	60
Spacing	$s_{\text{min II}}$	100
	$s_{\text{cr II}}$	362
	$s_{\text{min } \perp} = s_{\text{cr } \perp}$	240

Drilling method

Hammer drilling with hard metal hammer drill

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C98.2: Group factors

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6	M8	-	-	-	M10	M12	-	-	-	-	-
					11x85					15x85						
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x130	16x130	16x130	16x130	20x85	20x130	20x130	20x130	20x200	20x200	20x200

Group factors	$\alpha_{g,N} (s_{\text{min II}})$	[-]	1,2
	$\alpha_{g,V} (s_{\text{min II}})$		1,1
	$\alpha_{g,N} (s_{\text{min } \perp})$		2,0
	$\alpha_{g,V} (s_{\text{min } \perp})$		

Upat injection system UPM 44 for masonry

Performance

Light-weight concrete hollow block Hbl, dimensions, installation parameters, Group factors

Annex C98

Light-weight concrete hollow block Hbl, EN 771-3:2011+A1:2015

Table C99.1: Installation parameters
(Push through installation with perforated sleeve UPM SH K)

Anchor rod		M10	M12	M16
Perforated sleeve UPM SH K		18x130/200		22x130/200
Anchor rod with perforated sleeve UPM SH K				
Max. installation torque	max T _{inst}	[Nm]	2	
General installation parameters				
Edge distance	c _{min} = c _{cr}	[mm]	60	
Spacing	s _{min}		100	
	s _{cr}		362	
	s _{min} ⊥ = s _{cr} ⊥		240	

Drilling method

Hammer drilling with hard metal hammer drill

Table C99.2: Group factors

Anchor rod		M10	M12	M16
Perforated sleeve UPM SH K		18x130/200		22x130/200
Group factors	$\alpha_{g,N} (s_{\text{min II}})$	1,2		
	$\alpha_{g,V} (s_{\text{min II}})$	1,1		
	$\alpha_{g,N} (s_{\text{min } \perp})$	2,0		
	$\alpha_{g,V} (s_{\text{min } \perp})$			

Upat injection system UPM 44 for masonry

Performance

Light-weight concrete hollow block Hbl, dimensions, installation parameters, Group factors

Annex C99

Light-weight concrete hollow block Hbl, EN 771-3:2011+A1:2015

Table C100.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Pre-positioned installation)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6 M8 11x85	-	-	-	-	M10 M12 15x85	-	-	-	-	-	-
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x130	16x130	16x130	16x130	20x85	20x85	20x130	20x130	20x200	20x200	20x200
$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; temperature range 50/80°C ²⁾																
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions															
2,5 / 2 N/mm²	w/w	w/d	1,2	1,5										2,5		
	d/d	d/d	1,2	1,5										2,5		
5 / 4 N/mm²	w/w	w/d	2,0	3,0										5,0		
	d/d	d/d	2,5	3,0										5,5		

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120^\circ C)} = 0,83 \cdot N_{Rk(50/80^\circ C)}$.

Table C100.2: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Push through installation)

Anchor rod	M10	M12	M16
Perforated sleeve UPM SH K	18x130/200	18x130/200	22x130/200
$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; temperature range 50/80°C ²⁾			
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions		
2,5 / 2 N/mm²	w/w	w/d	1,5
	d/d	d/d	1,5
5 / 4 N/mm²	w/w	w/d	3,0
	d/d	d/d	3,0

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120^\circ C)} = 0,83 \cdot N_{Rk(50/80^\circ C)}$.

Factor for job site tests and displacements see annex C123.

Upat injection system UPM 44 for masonry

Performance

Light-weight concrete hollow block Hbl, Characteristic resistance under tension loading

Annex C100

Light-weight concrete hollow block Hbl, EN 771-3:2011+A1:2015

Table C101.1: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Pre-positioned installation)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	M6	M8	-	-	-	-	-	M10	M12	-	-	-	-	-
			11x85							15x85						
Perforated sleeve UPM SH K	12x50	12x85	16x85	16x130	20x85	20x130	20x200									

$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; temperature range 50/80°C and 72/120°C

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions	
2,5 / 2 N/mm ²	w/w w/d d/d	0,9
5 / 4 N/mm ²	w/w w/d d/d	2,0

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C101.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Push through installation)

Anchor rod	M10	M12	M16
Perforated sleeve UPM SH K	18x130/200	22x130/200	

$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; temperature range 50/80°C and 72/120°C

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions	
2,5 / 2 N/mm ²	w/w w/d d/d	0,9
5 / 4 N/mm ²	w/w w/d d/d	2,0

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Factor for job site tests and displacements see annex C123.

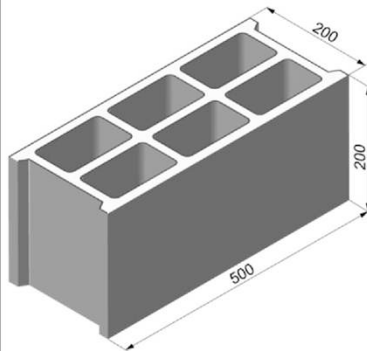
Upat injection system UPM 44 for masonry

Performance

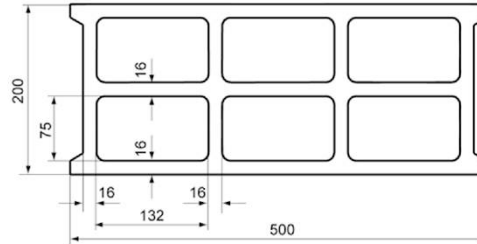
Light-weight concrete hollow block Hbl, Characteristic resistance under shear loading

Annex C101

Light-weight concrete hollow block Hbl, EN 771-3:2011+A1:2015



Producer	e.g. Sepa		
Nominal dimensions [mm]	length L	width W	height H
	500	200	200
Mean gross dry density ρ [kg/dm³]	≥ 1,0		
Mean compressive strength / Min. compressive strength single brick ¹⁾ [N/mm²]	2,5 / 2 or 5 / 4 or 8 / 6		
Standard or annex	EN 771-1:2011+A1:2015		



Dimension see also Annex B19

Table C102.1: Installation parameters

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	M10	M12	-	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6 M8 11x85	-	-	-	-	-	-	M10/M12 15x85	-	-
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x130	18x130/200	16x130	18x130/200	18x130/200	20x85	20x85	20x85	20x85

Anchor rod and internal threaded anchor UPM-I with perforated sleeve UPM SH K

Max. installation torque $\max T_{inst}$ [Nm]	1	2
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General installation parameters

Edge distance $c_{min} = c_{cr}$	100
Spacing $s_{min \parallel} = s_{cr \parallel}$ [mm]	500
$s_{min \perp} = s_{cr \perp}$	200

Drilling method

Hammer drilling with hard metal hammer drill

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C102.2: Group factors

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	M10	M12	-	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6 M8 11x85	-	-	-	-	-	-	M10/M12 15x85	-	-
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x130	18x130/200	16x130	18x130/200	18x130/200	20x85	20x85	20x85	20x85

Group factors	$\alpha_{g,N} (s_{min \parallel})$ $\alpha_{g,V} (s_{min \parallel})$ $\alpha_{g,N} (s_{min \perp})$ $\alpha_{g,V} (s_{min \perp})$	[-]	2
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Upat injection system UPM 44 for masonry

Performance

Light-weight concrete hollow block Hbl, dimensions, installation parameters, Group factors

Annex C102

Light-weight concrete hollow block Hbl, EN 771-3:2011+A1:2015

Table C103.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	M10	M12	-	M12	M16
Internal threaded anchor UPM-I	-	-	M6	M8	-	-	-	-	-	-	-	M10	M12	-
			11x85									15x85		
Perforated sleeve UPM SH K	12x50	12x85	16x85	16x130	18x130/200	20x85								

$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; temperature range 50/80°C ²⁾

Mean compressive strength / Min. compressive strength single brick ¹⁾	use conditions	
2,5 / 2 N/mm ²	w/w w/d	0,4
	d/d	0,5
5 / 4 N/mm ²	w/w w/d	0,9
	d/d	0,9
8 / 6 N/mm ²	w/w w/d	1,2
	d/d	1,5

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120^\circ C)} = 0,83 \cdot N_{Rk(50/80^\circ C)}$.

Table C103.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	M10	M12	-	M12	M16
Internal threaded anchor UPM-I	-	-	M6	M8	-	-	-	-	-	-	-	M10	M12	-
			11x85									15x85		
Perforated sleeve UPM SH K	12x50	12x85	16x85	16x130	18x130/200	20x85								

$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,I}$ [kN]; temperature range 50/80°C and 72/120°C

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions	
2,5 / 2 N/mm ²	w/w w/d	0,9
	d/d	
5 / 4 N/mm ²	w/w w/d	1,5
	d/d	
8 / 6 N/mm ²	w/w w/d	2,5
	d/d	

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Factor for job site tests and displacements see annex C123.

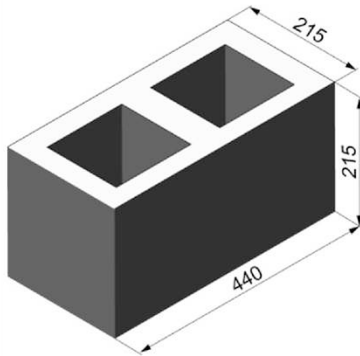
Upat injection system UPM 44 for masonry

Performance

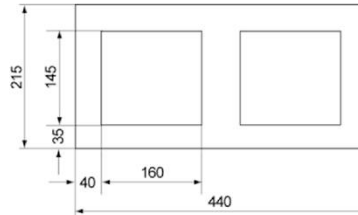
Light-weight concrete hollow block Hbl,
Characteristic resistance under tension and shear loading

Annex C103

Light-weight concrete hollow block Hbl, EN 771-3:2011+A1:2015



Producer	e.g. Roadstone wood			
Nominal dimensions	[mm]	length L	width W	height H
		440	215	215
Mean gross dry density ρ	[kg/dm ³]	≥ 1,2		
Mean compressive strength / Min. compressive strength single brick ¹⁾	[N/mm ²]	5 / 4 or 8 / 6 or 10 / 8 or 12,5 / 10		
Standard or annex	EN 771-3:2011+A1:2015			



Dimension see also Annex B20

Table C104.1: Installation parameters
(Pre-positioned installation with perforated sleeve UPM SH K)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6 M8	-	-	-	-	M10 M12	-	-	-	-
					11x85					15x85				
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x130	20x85	20x130	20x130	20x130	20x130	20x130	20x130	20x130

Anchor rod and internal threaded anchor UPM-I with perforated sleeve UPM SH K

Max. installation torque	max T_{inst} [Nm]	2
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General installation parameters

Edge distance	$c_{min} = c_{cr}$	110
Spacing	$s_{min} \parallel$	100
	$s_{cr} \parallel$ [mm]	440
	$s_{min} \perp$	100
	$s_{cr} \perp$	215

Drilling method

Hammer drilling with hard metal hammer drill

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C104.2: Group factors

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6 M8	-	-	-	-	M10 M12	-	-	-	-
					11x85					15x85				
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x130	20x85	20x130	20x130	20x130	20x130	20x130	20x130	20x130

Group factors	$\alpha_{g,N} (s_{min} \parallel)$	[-]	1,4
	$\alpha_{g,V} (s_{min} \parallel)$		2,0
	$\alpha_{g,N} (s_{min} \perp)$		1,4
	$\alpha_{g,V} (s_{min} \perp)$		1,2

Upat injection system UPM 44 for masonry

Performance

Light-weight concrete hollow block Hbl, dimensions, installation parameters, Group factors

Annex C104

Light-weight concrete hollow block Hbl, EN 771-3:2011+A1:2015

Table C105.1: Installation parameters

(Push through installation with perforated sleeve UPM SH K)

Anchor rod		M10	M12	M16
Perforated sleeve UPM SH K		18x130/200		22x130/200
Anchor rod with perforated sleeve UPM SH K				
Max. installation torque	max T _{inst}	[Nm]	2	
General installation parameters				
Edge distance	C _{min} = C _{cr}	[mm]	110	
Spacing	s _{min}		100	
	s _{cr}		440	
	s _{min} ⊥		100	
	s _{cr} ⊥		215	
Drilling method				
Hammer drilling with hard metal hammer drill				

Table C105.2: Group factors

Anchor rod		M10	M12	M16
Perforated sleeve UPM SH K		18x130/200		22x130/200
Group factors	$\alpha_{g,N} (s_{\min \parallel})$	1,4		
	$\alpha_{g,V} (s_{\min \parallel})$	2,0		
	$\alpha_{g,N} (s_{\min \perp})$	1,4		
	$\alpha_{g,V} (s_{\min \perp})$	1,2		

Upat injection system UPM 44 for masonry

Performance

Light-weight concrete hollow block Hbl, dimensions, installation parameters, Group factors

Annex C105

Light-weight concrete hollow block Hbl, EN 771-3:2011+A1:2015

Table C106.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Pre-positioned installation)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	M10	M12	-	M12	M16
Internal threaded anchor UPM-I	-	-	M6	M8	-	-	-	-	-	-	-	M10	M12	-
			11x85									15x85		
Perforated sleeve UPM SH K	12x50	12x85	16x85	16x130	20x130/200	20x85								

$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; temperature range 50/80°C ²⁾

Mean compressive strength / Min. comp. strength single brick ¹⁾	Use conditions			
5 / 4 N/mm ²	w/w w/d	0,9	1,2	2,0
	d/d	1,2	1,5	2,0
8 / 6 N/mm ²	w/w w/d	1,5	2,0	3,0
	d/d	1,5	2,0	3,0
10 / 8 N/mm ²	w/w w/d	2,0	2,5	3,5
	d/d	2,0	3,0	4,0
12,5 / 10 N/mm ²	w/w w/d	2,5	3,0	4,5
	d/d	3,0	3,5	5,0

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120^\circ C)} = 0,83 \cdot N_{Rk(50/80^\circ C)}$.

Table C106.2: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Push through installation)

Anchor rod	M10	M12	M16
Perforated sleeve UPM SH K	18x130/200	22x130/200	

$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; temperature range 50/80°C ²⁾

Mean compressive strength / Min. comp. strength single brick ¹⁾	Use conditions		
5 / 4 N/mm ²	w/w w/d	1,2	2,0
	d/d	1,5	2,0
8 / 6 N/mm ²	w/w w/d	2,0	3,0
	d/d	2,0	3,0
10 / 8 N/mm ²	w/w w/d	2,5	3,5
	d/d	3,0	4,0
12,5 / 10 N/mm ²	w/w w/d	3,0	4,5
	d/d	3,5	5,0

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120^\circ C)} = 0,83 \cdot N_{Rk(50/80^\circ C)}$.

Factor for job site tests and displacements see annex C123.

Upat injection system UPM 44 for masonry

Performance

Light-weight concrete hollow block Hbl, Characteristic resistance under tension loading

Annex C106

Light-weight concrete hollow block Hbl, EN 771-3:2011+A1:2015

Table C107.1: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Pre-positioned installation)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6	M8	-	-	-	M10	M12	-	-	-
					11x85					15x85				
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x130	16x130	16x130	16x130	20x85	20x85	20x130	20x130	20x130

$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; temperature range 50/80°C and 72/120°C

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions													
5 / 4 N/mm ²	w/w d/d	0,75	1,20	0,75	1,20	0,75							1,20	
8 / 6 N/mm ²	w/w d/d	1,20	2,00	1,20	2,00	1,20							2,00	
10 / 8 N/mm ²	w/w d/d	1,50	2,50	1,50	2,50	1,50							2,50	
12,5 / 10 N/mm ²	w/w d/d	2,00	3,00	2,00	3,00	2,00							3,00	

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C107.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Push through installation)

Anchor rod	M10	M12	M16
Perforated sleeve UPM SH K	18x130/200	18x130/200	22x130/200

$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; temperature range 50/80°C and 72/120°C

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions													
5 / 4 N/mm ²	w/w d/d												1,2	
8 / 6 N/mm ²	w/w d/d												2,0	
10 / 8 N/mm ²	w/w d/d												2,5	
12,5 / 10 N/mm ²	w/w d/d												3,0	

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Factor for job site tests and displacements see annex C123.

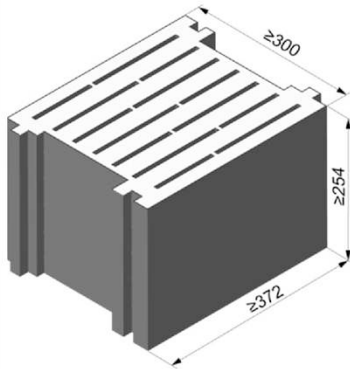
Upat injection system UPM 44 for masonry

Performance

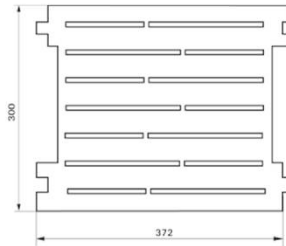
Light-weight concrete hollow block Hbl, Characteristic resistance under shear loading

Annex C107

Light-weight concrete solid block Vbl, EN 771-3:2011+A1:2015



Producer	e.g. Sepa		
Nominal dimensions [mm]	length L	width W	height H
	≥ 372	≥ 300	≥ 254
Mean gross dry density ρ [kg/dm³]	≥ 0,6		
Mean compressive strength / Min. compressive strength single brick ¹⁾ [N/mm²]	2,5 / 2		
Standard or annex	EN 771-3:2011+A1:2015		



Dimension see also
Annex B20

Table C108.1: Installation parameters

Anchor rod	M8	M10	M10	M12	M12	M16	M16	M12	M16
Perforated sleeve UPM SH K	16x130		18x130/200		20x130		22x130/200		20x200

Anchor rod with perforated sleeve UPM SH K

Max. installation torque	max T_{inst}	[Nm]	4
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General installation parameters

Edge distance	$C_{min} = C_{cr}$	[mm]	130
Spacing	$s_{min \parallel} = s_{cr \parallel}$	[mm]	370
	$s_{min \perp} = s_{cr \perp}$	[mm]	250

Drilling method

Hammer drilling with hard metal hammer drill

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C108.2: Group factors

Anchor rod	M8	M10	M10	M12	M12	M16	M16	M12	M16
Perforated sleeve UPM SH K	16x130		18x130/200		20x130		22x130/200		20x200

Group factors	$\alpha_{g,N} (s_{min \parallel})$ $\alpha_{g,V} (s_{min \parallel})$ $\alpha_{g,N} (s_{min \perp})$ $\alpha_{g,V} (s_{min \perp})$	[-]	2
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Upat injection system UPM 44 for masonry

Performance

Light-weight concrete solid block Vbl, dimensions, installation parameters, Group factors

Annex C108

Light-weight concrete solid block Vbl, EN 771-3:2011+A1:2015

Table C109.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading

Anchor rod			M8	M10	M10	M12	M12	M16	M16	M12	M16
Perforated sleeve UPM SH K			16x130		18x130/200		20x130		22x130/200		20x200
N _{Rk} = N _{Rk,p} = N _{Rk,b} = N _{Rk,p,c} = N _{Rk,b,c} [kN]; temperature range 50/80°C ²⁾											
Mean compressive strength / Min. compressive strength single brick ¹⁾		Use conditions									
2,5 / 2 N/mm ²		w/w	w/d	2,0			2,5			3,0	
		d/d		2,0			3,0			4,0	

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120°C)} = 0,83 \cdot N_{Rk(50/80°C)}$.

Table C109.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading

Anchor rod	M8	M10	M10	M12	M12	M16	M16	M12	M16
Perforated sleeve UPM SH K	16x130		18x130/200		20x130		22x130/200		20x200
V _{Rk} = V _{Rk,b} = V _{Rk,c,II} = V _{Rk,c,⊥} [kN]; temperature range 50/80°C and 72/120°C									
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions								
2,5 / 2 N/mm ²	w/w	w/d	4,5				6,5		
	d/d								

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Factor for job site tests and displacements see annex C123.

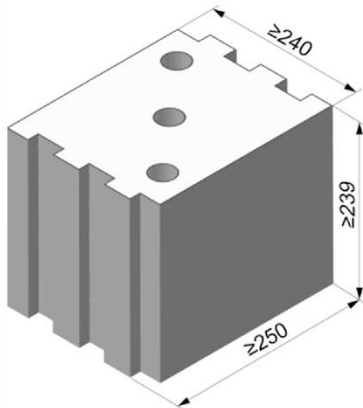
Upat injection system UPM 44 for masonry

Performance

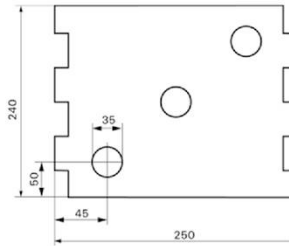
Light-weight concrete solid block Vbl,
Characteristic resistance under tension and shear loading

Annex C109

Light-weight concrete solid block Vbl, EN 771-3:2011+A1:2015



Producer	KLB		
Nominal dimensions [mm]	length L	width W	height H
	≥ 250	≥ 240	≥ 239
Mean gross dry density ρ [kg/dm ³]	≥ 1,6		
Mean compressive strength / Min. compressive strength single brick ¹⁾ [N/mm ²]	5 / 4 or 8 / 6 or 10 / 8		
Standard or annex	EN 771-3:2011+A1:2015		



Dimension see also
Annex B20

Table C110.1: Installation parameters
(Pre-positioned installation with perforated sleeve UPM SH K)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6	M8	-	-	-	M10	M12	-	-	-	-	-
					11x85					15x85						
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x130	16x130	16x130	16x130	20x85	20x130	20x130	20x130	20x130	20x200	20x200

Anchor rod and internal threaded anchor UPM-I with perforated sleeve UPM SH K

Max. installation torque $\max T_{\text{inst}}$	[Nm]	4
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General installation parameters

Edge distance $c_{\text{min}} = c_{\text{cr}}$	[mm]	130
Spacing $s_{\text{min}} \parallel = s_{\text{cr}} \parallel$	[mm]	250
$s_{\text{min}} \perp = s_{\text{cr}} \perp$	[mm]	250

Drilling method

Hammer drilling with hard metal hammer drill

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C110.2: Group factors

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6	M8	-	-	-	M10	M12	-	-	-	-	-
					11x85					15x85						
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x130	16x130	16x130	16x130	20x85	20x130	20x130	20x130	20x130	20x200	20x200

Group factors	$\alpha_{g,N} (s_{\text{min}} \parallel)$ $\alpha_{g,V} (s_{\text{min}} \parallel)$ $\alpha_{g,N} (s_{\text{min}} \perp)$ $\alpha_{g,V} (s_{\text{min}} \perp)$	[-]	2,0
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Upat injection system UPM 44 for masonry

Performance

Light-weight concrete solid block Vbl, dimensions, installation parameters, Group factors

Annex C110

Light-weight concrete solid block Vbl, EN 771-3:2011+A1:2015

Table C111.1: Installation parameters

(Push through installation with perforated sleeve UPM SH K)

Anchor rod		M10	M12	M16
Perforated sleeve UPM SH K		18x130/200		22x130/200
Anchor rod with perforated sleeve UPM SH K				
Max. installation torque	max T _{inst}	[Nm]	2,0	
General installation parameters				
Edge distance	C _{min} = C _{cr}	[mm]	130	
Spacing	s _{min} = s _{cr}		250	
	s _{min} ⊥ = s _{cr} ⊥		250	
Drilling method				
Hammer drilling with hard metal hammer drill				

Table C111.2: Group factors

Anchor rod	M10	M12	M16
Perforated sleeve UPM SH K	18x130/200		22x130/200
Group factors $\alpha_{g,N} (s_{\text{min II}})$ $\alpha_{g,V} (s_{\text{min II}})$ $\alpha_{g,N} (s_{\text{min } \perp})$ $\alpha_{g,V} (s_{\text{min } \perp})$ [-]	2,0		

Upat injection system UPM 44 for masonry

Performance

Light-weight concrete solid block Vbl, dimensions, installation parameters, Group factors

Annex C111

Light-weight concrete solid block Vbl, EN 771-3:2011+A1:2015

Table C112.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Pre-positioned installation)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6 M8 11x85	-	-	-	-	M10 M12 15x85	-	-	-	-	-	-
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x130	16x130	16x130	16x130	20x85	20x85	20x130	20x130	20x200	20x200	20x200
$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; temperature range 50/80°C ²⁾																
Mean compressive strength/ Min. compressive strength single brick ¹⁾	Use con- ditions															
5 / 4 N/mm²	w/w	w/d	1,2	2,0	2,5		3,0		3,0		3,0		3,0		3,0	
	d/d	d/d	2,0	3,5	4,0		5,0		5,0		5,0		5,0		5,0	
8 / 6 N/mm²	w/w	w/d	1,5	3,0	4,0		5,0		5,0		5,0		5,0		5,0	
	d/d	d/d	3,0	5,0	6,5		7,5		7,5		7,5		7,5		7,5	
10 / 8 N/mm²	w/w	w/d	2,0	4,0	5,0		6,5		6,5		6,5		6,5		6,5	
	d/d	d/d	4,0	7,0	8,5		9,0		9,0		9,0		9,0		9,0	

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120^\circ C)} = 0,83 \cdot N_{Rk(50/80^\circ C)}$.

Table C112.2: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Push through installation)

Anchor rod		M10	M12	M16
Perforated sleeve UPM SH K		18x130/200		22x130/200
N _{Rk} = N _{Rk,p} = N _{Rk,b} = N _{Rk,p,c} = N _{Rk,b,c} [kN]; temperature range 50/80°C ²⁾				
Mean compressive strength/ Min. compressive strength single brick ¹⁾	Use con- ditions			
5 / 4 N/mm ²	w/w w/d	2,5		3,0
	d/d	4,0		5,0
8 / 6 N/mm ²	w/w w/d	4,0		5,0
	d/d	6,5		7,5
10 / 8 N/mm ²	w/w w/d	5,0		6,5
	d/d	8,5		9,0

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120^\circ C)} = 0,83 \cdot N_{Rk(50/80^\circ C)}$.

Factor for job site tests and displacements see annex C123.

Upat injection system UPM 44 for masonry

Performance

Light-weight concrete solid block Vbl, Characteristic resistance under tension loading

Annex C112

Light-weight concrete solid block Vbl, EN 771-3:2011+A1:2015

Table C113.1: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Pre-positioned installation)

Anchor rod	M6	M8	M6	M8	-	M8	M10	M8	M10	-	M12	M16	M12	M16	M12	M16
Internal threaded anchor UPM-I	-	-	-	-	M6	M8	-	-	-	M10	M12	-	-	-	-	-
					11x85					15x85						
Perforated sleeve UPM SH K	12x50	12x85	12x85	12x85	16x85	16x85	16x130	16x130	16x130	20x85	20x85	20x130	20x130	20x200	20x200	20x200

$V_{RK} = V_{RK,b} = V_{RK,c,II} = V_{RK,c,\perp}$ [kN]; temperature range 50/80°C and 72/120°C

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions															
5 / 4 N/mm ²	w/w d/d	2,0	3,0	2,0	3,0	2,0	3,5	3,5	3,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5
8 / 6 N/mm ²	w/w d/d	3,0	4,5	3,0	4,5	3,0	5,5	5,5	5,5	6,5	6,5	6,5	6,5	6,5	6,5	6,5
10 / 8 N/mm ²	w/w d/d	4,0	6,0	4,0	6,0	4,0	7,0	7,0	7,0	8,5	8,5	8,5	8,5	8,5	8,5	8,5

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C113.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Push through installation)

Anchor rod	M10	M12	M16
Perforated sleeve UPM SH K	18x130/200	18x130/200	22x130/200

$V_{RK} = V_{RK,b} = V_{RK,c,II} = V_{RK,c,\perp}$ [kN]; temperature range 50/80°C and 72/120°C

Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions															
5 / 4 N/mm ²	w/w d/d	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5
8 / 6 N/mm ²	w/w d/d	5,5	5,5	5,5	5,5	5,5	5,5	5,5	5,5	6,5	6,5	6,5	6,5	6,5	6,5	6,5
10 / 8 N/mm ²	w/w d/d	7,0	7,0	7,0	7,0	7,0	7,0	7,0	7,0	8,5	8,5	8,5	8,5	8,5	8,5	8,5

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Factor for job site tests and displacements see annex C123.

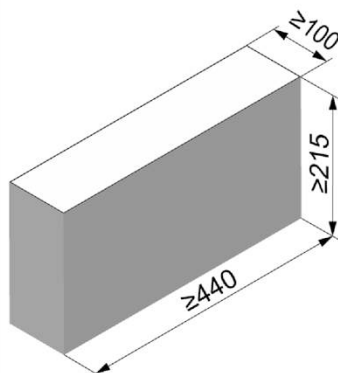
Upat injection system UPM 44 for masonry

Performance

Light-weight concrete solid block Vbl, Characteristic resistance under shear loading

Annex C113

Light-weight concrete solid block Vbl, EN 771-3:2011+A1:2015



Producer	Roadstone wood		
Nominal dimensions [mm]	length L	width W	height H
	≥ 440	≥ 100	≥ 215
Mean gross dry density ρ [kg/dm³]	≥ 2,0		
Mean compressive strength / Min. compressive strength single brick ¹⁾ [N/mm²]	5 / 4 or 8 / 6 or 10 / 8 or 12,5 / 10		
Standard or annex	EN 771-3:2011+A1:2015		

Table C114.1: Installation parameters

Anchor rod			M6		M8		M10		M12		M16	
Anchor rod without perforated sleeve												
Effective anchorage depth	h_{ef}	[mm]	50	70	50	70	50	70	50	70	50	70
Max. installation torque	$\max T_{inst}$	[Nm]	4		10							
General installation parameters												
Edge distance	$c_{min} = c_{cr}$	[mm]	100									
Spacing	$s_{min} \parallel$		75									
	$s_{cr} \parallel$		$3 \times h_{ef}$									
	$s_{min} \perp$		75									
	$s_{cr} \perp$		$3 \times h_{ef}$									

Drilling method

Hammer drilling with hard metal hammer drill

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C114.2: Group factors

Anchor rod			M6	M8	M10	M12	M16
Group factors	$\alpha_{g,N} (s_{min} \parallel)$	[-]	1,6				
	$\alpha_{g,V} (s_{min} \parallel)$		1,3				
	$\alpha_{g,N} (s_{min} \perp)$		1,4				
	$\alpha_{g,V} (s_{min} \perp)$		1,3				

Upat injection system UPM 44 for masonry

Performance

Light-weight concrete solid block Vbl, dimensions, installation parameters, Group factors

Annex C114

Light-weight concrete solid block Vbl, EN 771-3:2011+A1:2015

Table C115.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading

Anchor rod		M6	M8	M10	M12	M16
$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; temperature range 50/80°C ²⁾						
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions	Effective anchorage depth h_{ef} [mm] ≥ 50				
5 / 4 N/mm²	w/w w/d	1,2		1,2		
	d/d	2,0		2,0		
8 / 6 N/mm²	w/w w/d	1,5		2,0		
	d/d	3,0		3,5		
10 / 8 N/mm²	w/w w/d	2,0		2,5		
	d/d	4,0		4,5		
12,5 / 10 N/mm²	w/w w/d	3,0		3,5		
	d/d	5,0		5,5		

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120°C)} = 0,83 \cdot N_{Rk(50/80°C)}$.

Table C115.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading

Anchor rod		M6	M8	M10	M12	M16
$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,I}$ [kN]; temperature range 50/80°C and 72/120°C						
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use conditions	Effective anchorage depth h_{ef} [mm] ≥ 50				
5 / 4 N/mm²	w/w w/d	1,2	1,5	1,5	1,5	1,5
	d/d					
8 / 6 N/mm²	w/w w/d	2,0	2,0	2,5	2,5	2,5
	d/d					
10 / 8 N/mm²	w/w w/d	2,5	2,5	3,0	3,0	3,5
	d/d					
12,5 / 10 N/mm²	w/w w/d	3,0	3,5	4,0	4,0	4,5
	d/d					

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Factor for job site tests and displacements see annex C123.

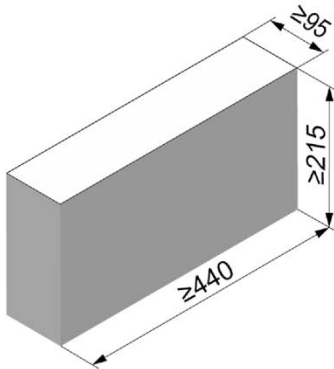
Upat injection system UPM 44 for masonry

Performance

Light-weight concrete solid block Vbl,
Characteristic resistance under tension and shear loading

Annex C115

Light-weight concrete solid block Vbl, EN 771-3:2011+A1:2015



Producer	Tramac		
Nominal dimensions [mm]	length L	width W	height H
	≥ 440	≥ 95	≥ 215
Mean gross dry density ρ [kg/dm ³]	≥ 2,0		
Mean compressive strength / Min. compressive strength single brick ¹⁾ [N/mm ²]	7,5 / 6 or 10 / 8 or 12,5 / 10 or 15 / 12		
Standard or annex	EN 771-3:2011+A1:2015		

Table C116.1: Installation parameters

Anchor rod			M6		M8		M10		M12		M16	
Anchor rod without perforated sleeve												
Effective anchorage depth	h_{ef}	[mm]	50	70	50	70	50	70	50	70	50	70
Max. installation torque	$\max T_{inst}$	[Nm]	4		10							
General installation parameters												
Edge distance	$c_{min} = c_{cr}$	[mm]	60									
Spacing	$s_{min} \parallel$		75									
	$s_{cr} \parallel$		$3 \times h_{ef}$									
	$s_{min} \perp$		75									
	$s_{cr} \perp$		$3 \times h_{ef}$									

Drilling method

Hammer drilling with hard metal hammer drill

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C116.2: Group factors

Anchor rod			M6	M8	M10	M12	M16
Group factors	$\alpha_{g,N} (s_{min} \parallel)$	[-]	1,9				
	$\alpha_{g,V} (s_{min} \parallel)$		1,4				
	$\alpha_{g,N} (s_{min} \perp)$		1,9				
	$\alpha_{g,V} (s_{min} \perp)$		1,4				

Upat injection system UPM 44 for masonry

Performance

Light-weight concrete solid block Vbl, dimensions, installation parameters, Group factors

Annex C116

Light-weight concrete solid block Vbl, EN 771-3:2011+A1:2015

Table C117.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading

Anchor rod			M6		M8		M10		M12		M16	
N _{Rk} = N _{Rk,p} = N _{Rk,b} = N _{Rk,p,c} = N _{Rk,b,c} [kN]; temperature range 50/80°C ²⁾												
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions		Effective anchorage depth h _{ef} [mm]									
			50	70	50	70	50	70	50	70	50	70
7,5 / 6 N/mm ²	w/w	w/d	1,5	2,0	1,5	2,0	1,5	2,0	1,5	2,0	1,5	2,0
		d/d	2,5	3,5	2,5	3,5	2,5	3,5	2,5	3,5	2,5	3,5
10 / 8 N/mm ²	w/w	w/d	2,0	2,5	2,0	2,5	2,0	3,0	2,0	3,0	2,0	3,0
		d/d	3,5	4,5	3,5	4,5	3,5	5,0	3,5	5,0	3,5	5,0
12,5 / 10 N/mm ²	w/w	w/d	2,5	3,5	2,5	3,5	2,5	3,5	2,5	3,5	2,5	3,5
		d/d	4,5	6,0	4,5	6,0	4,5	6,0	4,5	6,0	4,5	6,0
15 / 12 N/mm ²	w/w	w/d	3,0	4,0	3,0	4,0	3,0	4,5	3,0	4,5	3,0	4,5
		d/d	5,0	7,0	5,0	7,0	5,0	7,5	5,0	7,5	5,0	7,5

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120°C)} = 0,83 \cdot N_{Rk(50/80°C)}$.

Table C117.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading

Anchor rod			M6	M8	M10	M12	M16
V _{RK} = V _{RK,b} = V _{RK,c,II} = V _{RK,c,I} [kN]; temperature range 50/80°C and 72/120°C							
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions		Effective anchorage depth h _{ef} [mm]				
			≥ 50				
7,5 / 6 N/mm ²	w/w	w/d	2,0	2,0	2,0	1,5	1,5
	d/d						
10 / 8 N/mm ²	w/w	w/d	2,5	2,5	3,0	2,5	2,5
	d/d						
12,5 / 10 N/mm ²	w/w	w/d	3,5	3,5	4,0	3,0	3,0
	d/d						
15 / 12 N/mm ²	w/w	w/d	4,0	4,0	4,5	3,5	3,5
	d/d						

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Factor for job site tests and displacements see annex C123.

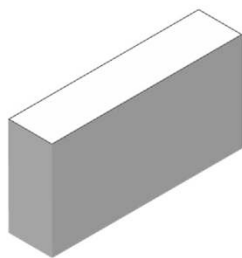
Upat injection system UPM 44 for masonry

Performance

Light-weight concrete solid block Vbl,
Characteristic resistance under tension and shear loading

Annex C117

Autoclaved aerated concrete (cylindrical drill hole), EN 771-4:2011+A1:2015



Producer	e.g. Ytong			
Mean gross dry density ρ	[kg/dm ³]	0,35	0,5	0,65
Mean compressive strength / Min. compressive strength single brick ¹⁾	[N/mm ²]	2,5 / 2	5 / 4	8 / 6
Standard or annex	EN 771-4:2011+A1:2015			

Table C118.1: Installation parameters

Anchor rod		M6		M8		M10		M12		M16		-		-					
Internal threaded anchor UPM-I		-		-		-		-		-		M6		M8		M10		M12	
												11x85		15x85					
Anchor rod and internal threaded anchor UPM-I without perforated sleeve																			
Effective anchorage depth h_{ef}		[mm]	100	200	100	200	100	200	100	200	100	200	85						
Max. installation torque $\max T_{inst}$		[Nm]	1	4	1	8	2	12	2	16	2	20	1		2				
General installation parameters																			
Edge distance $c_{min} = c_{cr}$		[mm]	100																
$s_{cr \parallel} = s_{min \parallel}$			250																
$h_{ef}=200mm$ $s_{min \parallel}$			80																
$h_{ef}=200mm$ $s_{cr \parallel}$			$3x h_{ef}$																
Spacing $s_{cr \perp} = s_{min \perp}$			250																
$h_{ef}=200mm$ $s_{min \perp}$			80																
$h_{ef}=200mm$ $s_{cr \perp}$			$3x h_{ef}$																
Drilling method																			
Hammer drilling with hard metal hammer drill																			
¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.																			

Table C119.1: Group factors for autoclaved aerated concrete
(Min. compressive strength single brick = 2 N/mm²)

Anchor rod		M6	M8	M10	M12	M16	-		-	
Internal threaded anchor UPM-I		-	-	-	-	-	M6	M8	M10	M12
							11x85		15x85	
Group factors	$h_{ef}=200 \alpha_{g,N} (s_{min II})$	1,6					- ¹⁾		- ¹⁾	
	$h_{ef}=200 \alpha_{g,V} (s_{min II})$	1,1					- ¹⁾		- ¹⁾	
	$\alpha_{g,N II}, \alpha_{g,V} (s_{min II})$	2,0								
	$h_{ef}=200 \alpha_{g,N} (s_{min \perp})$	1,6					- ¹⁾		- ¹⁾	
	$h_{ef}=200 \alpha_{g,V} (s_{min \perp})$	0,8					- ¹⁾		- ¹⁾	
	$\alpha_{g,N \perp}, \alpha_{g,V} (s_{min \perp})$	2,0								

¹⁾ No performance assessed.

Table C119.2: Group factors for autoclaved aerated concrete
(Min. compressive strength single brick = 4 N/mm²)

Anchor rod		M6	M8	M10	M12	M16	-		-	
Internal threaded anchor UPM-I		-	-	-	-	-	M6	M8	M10	M12
							11x85		15x85	
Group factors	$h_{ef}=200 \alpha_{g,N} (s_{min II})$	0,7					- ¹⁾		- ¹⁾	
	$h_{ef}=200 \alpha_{g,V} (s_{min II})$	2,0					- ¹⁾		- ¹⁾	
	$\alpha_{g,N II}, \alpha_{g,V} (s_{min II})$	2,0								
	$h_{ef}=200 \alpha_{g,N} (s_{min \perp})$	0,7					- ¹⁾		- ¹⁾	
	$h_{ef}=200 \alpha_{g,V} (s_{min \perp})$	1,2					- ¹⁾		- ¹⁾	
	$\alpha_{g,N \perp}, \alpha_{g,V} (s_{min \perp})$	2,0								

¹⁾ No performance assessed.

Table C119.3: Group factors for autoclaved aerated concrete
(Min. compressive strength single brick = 6 N/mm²)

Anchor rod		M6	M8	M10	M12	M16	-		-	
Internal threaded anchor UPM-I		-	-	-	-	-	M6	M8	M10	M12
							11x85		15x85	
Group factors	$h_{ef}=200 \alpha_{g,N} (s_{min II})$	0,7					- ¹⁾		- ¹⁾	
	$h_{ef}=200 \alpha_{g,V} (s_{min II})$	2,0					- ¹⁾		- ¹⁾	
	$\alpha_{g,N II}, \alpha_{g,V} (s_{min II})$	2,0								
	$h_{ef}=200 \alpha_{g,N} (s_{min \perp})$	0,7					- ¹⁾		- ¹⁾	
	$h_{ef}=200 \alpha_{g,V} (s_{min \perp})$	1,2					- ¹⁾		- ¹⁾	
	$\alpha_{g,N \perp}, \alpha_{g,V} (s_{min \perp})$	2,0								

¹⁾ No performance assessed.

Upat injection system UPM 44 for masonry

Performance
Autoclaved aerated concrete (cylindrical drill hole), Group factors

Annex C119

Autoclaved aerated concrete (cylindrical drill hole), EN 771-4:2011+A1:2015

Table C120.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading

Anchor rod	M6	M8	M10	M12	M16	-	-
Internal threaded anchor UPM-I	-	-	-	-	-	M6 M8 M10 M12	
						11x85	15x85

$N_{RK} = N_{RK,p} = N_{RK,b} = N_{RK,p,c} = N_{RK,b,c}$ [kN]; temperature range 50/80°C ³⁾

Mean compressive strength / Min. compressive strength single brick ²⁾	Use conditions	Effective anchorage depth h_{ef} [mm]											
		100	200	100	200	100	200	100	200	100	200	85	
2,5 / 2 N/mm ²	w/w w/d	1,2	1,2	1,5	2,0	1,5	3,0	1,5	3,0	2,0	3,0	1,5	1,5
	d/d	1,5	3,0	1,5	3,0	1,5	3,5	2,0	4,0	2,0	4,0	1,5	1,5
5 / 4 N/mm ²	w/w w/d	1,2	- ¹⁾	2,0	1,5	2,5	3,5	2,5	3,5	2,0	3,5	2,0	1,5
	d/d	1,5	- ¹⁾	2,0	3,0	3,0	5,0	2,5	5,0	2,0	5,0	2,0	1,5
8 / 6 N/mm ²	w/w w/d	1,5	- ¹⁾	3,0	2,5	4,5	5,0	4,5	7,0	3,0	8,5	3,5	2,5
	d/d	1,5	- ¹⁾	3,5	4,0	5,0	7,0	5,0	9,0	3,0	11,5	3,5	2,5

¹⁾ No performance assessed.

²⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

³⁾ For temperature range 72/120°C: $N_{RK(72/120°C)} = 0,83 \cdot N_{RK(50/80°C)}$.

Table C120.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading

Anchor rod	M6	M8	M10	M12	M16	-	-
Internal threaded anchor UPM-I	-	-	-	-	-	M6 M8 M10 M12	
						11x85	15x85

$V_{RK} = V_{RK,b} = V_{RK,c,II} = V_{RK,c,L}$ [kN]; temperature range 50/80°C and 72/120°C

Mean compressive strength / Min. compressive strength single brick ²⁾	Use conditions	Effective anchorage depth h_{ef} [mm]											
		100	200	100	200	100	200	100	200	100	200	85	
2,5 / 2 N/mm ²	w/w w/d	1,2	1,2	1,2	1,2	1,2	1,2	1,5	1,2	1,2	1,2	1,2	1,5
	d/d	1,2	1,2	1,2	1,2	1,2	1,2	1,5	1,2	1,2	1,2	1,2	1,5
5 / 4 N/mm ²	w/w w/d	2,0	- ¹⁾	2,5	2,0	2,0	2,0	2,5	2,0	2,0	2,0	2,0	2,5
	d/d	2,0	- ¹⁾	2,5	2,0	2,0	2,0	2,5	2,0	2,0	2,0	2,0	2,5
8 / 6 N/mm ²	w/w w/d	2,5	- ¹⁾	3,0	2,5	3,0	3,0	3,5	4,0	4,5	4,5	2,5	3,5
	d/d	2,5	- ¹⁾	3,0	2,5	3,0	3,0	3,5	4,0	4,5	4,5	2,5	3,5

¹⁾ No performance assessed.

²⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength

Factor for job site tests and displacements see annex C123.

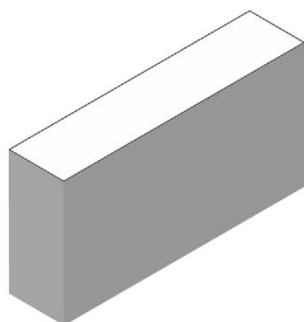
Upat injection system UPM 44 for masonry

Performance

Autoclaved aerated concrete (cylindrical drill hole),
Characteristic resistance under tension and shear loading

Annex C120

Autoclaved aerated concrete (conical drill hole with special drill bit PBB), EN 771-4:2011+A1:2015



Producer	e.g. Ytong			
Mean gross dry density ρ	[kg/dm ³]	0,35	0,5	0,65
Mean compressive strength / Min. compressive strength single brick ¹⁾	[N/mm ²]	2,5 / 2	5 / 4	8 / 6
Standard or annex	EN 771-4:2011+A1:2015			

Table C121.1: Installation parameters

Anchor rod		M8		M10		M12		-	
Internal threaded anchor UPM-I		-	-	-	-	-	-	M6	M8
								11x85	
Anchor rod and internal threaded anchor UPM-I without perforated sleeve									
Effective anchorage depth	h_{ef}	[mm]	75	95	75	95	75	95	85
Max. installation torque	$\max T_{inst}$	[Nm]	2						
General installation parameters									
Edge distance	$C_{min} = C_{cr}$	[mm]	120	150	120	150	120	150	150
Spacing	$s_{cr \parallel} = s_{min \parallel}$		240	300	240	300	240	300	300
	$s_{cr \perp} = s_{min \perp}$		240	250	240	250	240	250	250

Drilling method

Hammer drilling with hard metal hammer drill

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C121.2: Group factors

Anchor rod		M8		M10		M12		-
Internal threaded anchor UPM-I		-	-	-	-	-	-	M6 M8 11x85
Group factors	$\alpha_{g,N} (s_{min \parallel})$	[-]	2					
	$\alpha_{g,V} (s_{min \parallel})$							
	$\alpha_{g,N} (s_{min \perp})$							
	$\alpha_{g,V} (s_{min \perp})$							

Upat injection system UPM 44 for masonry

Performance

Autoclaved aerated concrete (conical drill hole with special drill bit PBB),
dimensions, installation parameters, Group factors

Annex C121

**Autoclaved aerated concrete (conical drill hole with special drill bit PBB),
EN 771-4:2011+A1:2015**

Table C122.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading

Anchor rod		M8		M10		M12		-
Internal threaded anchor UPM-I		-	-	-	-	-	-	M6 M8 11x85
$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; temperature range 50/80°C ²⁾								
Mean compressive strength / Min. compressive strength single brick ¹⁾	Use con- ditions	Effective anchorage depth h_{ef} [mm]						
		75	95	75	95	75	95	85
2,5 / 2 N/mm²	w/w w/d	2,0	2,5	2,0	2,5	2,0	2,5	2,0
	d/d	2,0	2,5	2,0	2,5	2,0	2,5	2,0
5 / 4 N/mm²	w/w w/d	3,0	3,5	3,0	3,5	3,0	3,5	3,0
	d/d	3,0	3,5	3,0	3,5	3,0	3,5	3,0
8 / 6 N/mm²	w/w w/d	3,5	4,0	3,5	4,0	3,5	4,0	3,5
	d/d	4,0	4,5	4,0	4,5	4,0	4,5	4,0

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

²⁾ For temperature range 72/120°C: $N_{Rk(72/120°C)} = 0,83 \cdot N_{Rk(50/80°C)}$.

Table C122.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading

Anchor rod		M8		M10		M12		-
Internal threaded anchor UPM-I		-	-	-	-	-	-	M6 M8 11x85
$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; temperature range 50/80°C and 72/120°C								
Mean compressive strength / Min. com-pressive strength single brick ¹⁾	Use con- ditions	Effective anchorage depth h_{ef} [mm]						
		75	95	75	95	75	95	85
2,5 / 2 N/mm²	w/w w/d	2,5						
	d/d							
5 / 4 N/mm²	w/w w/d	4,5						
	d/d							
8 / 6 N/mm²	w/w w/d	6,0						
	d/d							

¹⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Factor for job site tests and displacements see annex C123.

Upat injection system UPM 44 for masonry

Performance

Autoclaved aerated concrete (conical drill hole with special drill bit PBB),
Characteristic resistance under tension and shear loading

Annex C122

β-factors for job site tests; displacements

Table C123.1: β-factors for job site tests

use conditions		w/w and w/d		d/d	
temperature range [°C]		50/80	72/120	50/80	72/120
Material	Size	β-factors			
solid units	M6	0,55	0,46	0,96	0,80
	M8	0,57	0,51		
	M10	0,59	0,52		
	M12 UPM-I 11x85	0,60	0,54		
	M16 UPM-I 15x85	0,62	0,52		
	UPM SH 16x85 K	0,55	0,46		
hollow units	all sizes	0,86	0,72	0,96	0,80
Autoclaved aerated concrete cylindrical drill hole	all sizes	0,73	0,73	0,81	0,81
Autoclaved aerated concrete conical drill hole	all sizes	0,66	0,59	0,73	0,66

Table C123.2: Displacements

Material	N [kN]	δN ₀ [mm]	δN _∞ [mm]	V [kN]	δV ₀ [mm]	δV _∞ [mm]
solid units and autoclaved aerated concrete h _{ef} =100mm	$\frac{N_{Rk}}{1,4 \cdot \gamma_{Mm}}$	0,03	0,06	$\frac{V_{Rk}}{1,4 \cdot \gamma_{Mm}}$	0,82	0,88
hollow units	$\frac{N_{Rk}}{1,4 \cdot \gamma_{Mm}}$	0,48	0,06	$\frac{V_{Rk}}{1,4 \cdot \gamma_{Mm}}$	1,71	2,56
solid brick Mz NF Annex C4 - C7	$\frac{N_{Rk}}{1,4 \cdot \gamma_{Mm}}$	0,74	1,48	$\frac{V_{Rk}}{1,4 \cdot \gamma_{Mm}}$	1,23	1,85
solid brick KS NF Annex C14 / C15	$\frac{N_{Rk}}{1,4 \cdot \gamma_{Mm}}$	0,20	0,40	$\frac{V_{Rk}}{1,4 \cdot \gamma_{Mm}}$	0,91	1,37
AAC h _{ef} =200 mm Annex C118 - C120	$\frac{N_{Rk}}{1,4 \cdot \gamma_{Mm}}$	1,03	2,06	$\frac{V_{Rk}}{1,4 \cdot \gamma_{Mm}}$	1,25	1,88
brick Annex C102 / C103	$\frac{N_{Rk}}{1,4 \cdot \gamma_{Mm}}$	0,03	0,06	$\frac{V_{Rk}}{1,4 \cdot \gamma_{Mm}}$	6,44	9,66

For anchorage in autoclaved aerated concrete (AAC), the partial factor γ_{MAAC} shall be used instead of γ_{Mm} .

Upat injection system UPM 44 for masonry

Performance
β-factors for job site tests; displacements

Annex C123

Table C124.1: Characteristic values under tension and shear loading under fire exposure; considering all failure modes

Brick		Solid brick Mz, NF, acc. to Annex C4			Solid calcium silicate brick KS, NF, acc. to Annex C14			Perforated calcium silicate brick KSL, acc. to Annex C24			Vertical perforated brick HLz, acc. to Annex C28			Vertical perforated brick HLz, acc. to Annex C30			Autoclaved aerated concrete, acc. to Annex C118					
Mean compressive strength / Min. comp. strength single brick ³⁾		≥ 15 / ≥ 12			≥ 15 / ≥ 12			≥ 10 / ≥ 8			≥ 5 / ≥ 4			≥ 7,5 / ≥ 6			≥ 2,5 / ≥ 2					
Size		M8	M10	M12	M8	M10	M12	M8	M10	M12	M8	M10	M12	M8	M10	M12	M8	M10	M12	M16		
Perforated Sleeve		-			-			16x130		16x 130	16x130		20x 130	16x85		20x 85	-					
Perforated Sleeve for bridging of unbearing layer		-			-			-		20x 200	-		20x 200	16x130		20x 130	-					
h _{ef}		[mm]		≥ 80			≥ 50			≥ 130			≥ 130			≥ 85			≥ 100			
Characteristic resistance to failure under tension loading																						
$N_{Rk,s,fi} =$ $N_{Rk,p,fi} =$ $N_{Rk,b,fi}^{2)}$	R30	[kN]	0,82			0,32			1,07	1,09	1,10	0,31			0,28	0,30	0,35	0,84	0,82	0,80	0,80	
	R60		0,73			0,31			0,66	0,61	0,56	0,22			0,19	0,22	0,22	0,71	0,67	0,63	0,63	
	R90		0,64			0,29			0,25	0,13	- ¹⁾	0,13			0,10	0,10	0,10	0,58	0,51	0,45	0,45	
	R120		0,59			0,28			- ¹⁾	- ¹⁾	- ¹⁾	- ¹⁾			- ¹⁾	- ¹⁾	- ¹⁾	- ¹⁾	- ¹⁾	- ¹⁾	- ¹⁾	
Characteristic resistance to failure under shear loading ²⁾																						
without lever arm																						
$V_{Rk,s,fi}$	R30	[kN]	0,82			0,32			1,07	1,09	1,10	0,31			0,28	0,30	0,35	1,10	1,75	2,54	4,74	
	R60		0,73			0,31			0,66	0,61	0,56	0,22			0,19	0,22	0,22	0,86	1,37	1,99	3,71	
	R90		0,64			0,29			0,25	0,13	- ¹⁾	0,13			0,10	0,10	0,10	0,62	0,99	1,44	2,68	
	R120		0,59			0,28			- ¹⁾	- ¹⁾	- ¹⁾	- ¹⁾			- ¹⁾	- ¹⁾	- ¹⁾	- ¹⁾	- ¹⁾	- ¹⁾	- ¹⁾	
with lever arm																						
$M^0_{Rk,s,fi}$	R30	[Nm]	0,83	1,05	1,27	0,33	0,42	0,50	1,09	1,40	1,71	0,32	0,40	0,48	0,29	0,39	0,54	1,12	2,26	3,95	10,0	
	R60		0,74	0,93	1,13	0,31	0,39	0,47	0,67	0,78	0,86	0,22	0,28	0,34	0,19	0,28	0,34	0,87	1,77	3,20	7,87	
	R90		0,65	0,82	0,99	0,29	0,37	0,44	0,26	0,17	- ¹⁾	0,13	0,16	0,20	0,10	0,12	0,15	0,63	1,28	2,24	5,69	
	R120		0,60	0,76	0,92	0,28	0,35	0,43	- ¹⁾	- ¹⁾	- ¹⁾	- ¹⁾	- ¹⁾	- ¹⁾	- ¹⁾	- ¹⁾	- ¹⁾	- ¹⁾	- ¹⁾	- ¹⁾	- ¹⁾	
General installation Parameters																						
Edge distance and spacing	$C_{cr,fi}$	[mm]	100			60			80			80			100			200				
	$S_{cr,fi}$		320			200			520			340			520			400				
¹⁾ No performance assessed. ²⁾ $V_{Rk,b,fi} = N_{Rk,b,fi}$ ³⁾ The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength. In absence of national regulations, the recommended partial factor $\gamma_{M,fi} = 1,0$.																						
Upat injection system UPM 44 for masonry																Annex C124						
Performance Characteristic values under tension and shear loading under fire exposure																						