Einfach. Sicher.

DECLARATION OF PERFORMANCE

DoP 0372

for Upat frame fixing URD (Plastic anchor for use in concrete and masonry) EN

1. Unique identification code of the product-type: **DoP 0372**

2. Intended use/es: **Plastic anchor for multiple use in concrete and masonry for non-structural applications (base material group a b, c, d), see appendix, especially annexes B1 - B6.**

3. Manufacturer: **Upat Vertriebs GmbH, Bebelstraße 11, 79108 Freiburg im Breisgau, Germany**

4. Authorised representative: **–**

5. System/s of AVCP: **2+**

6. European Assessment Document: **EAD 330284-00-0604, Edition 12/2020**
   European Technical Assessment: **ETA-17/0811; 2025-01-16**
   Technical Assessment Body: **DIBt- Deutsches Institut für Bautechnik**
   Notified body/ies: **2873 TU Darmstadt**

7. Declared performance/s:

Mechanical resistance and stability (BWR 4)

Resistance to steel failure under tension loading: Annex C1
Resistance to steel or polymer failure under shear loading: Annex C1
Resistance to pull-out or concrete failure or polymer failure under tension loading (base material group a): Annex C1

Resistance in any load direction without lever arm (base material group b, c, d): see appendix, especially annexes C3 - C26
Edge distance and spacing (base material group a): Annex B4
Edge distance and spacing (base material group b, c, d): Annex B5
Displacements under short-term and long-term loading: Annex C2
Durability: Annexes A3, B1, B2

Safety in case of fire (BWR 2)

Reaction to fire:Class A1
Resistance to fire: Annex C2

8. Appropriate Technical Documentation and/or Specific Technical Documentation: **–**

The performance of the product identified above is in conformity with the set of declared performance/s. This declaration of performance is issued, in accordance with Regulation (EU) No 305/2011, under the sole responsibility of the manufacturer identified above.

Signed for and on behalf of the manufacturer by:

Dr. Ronald Mihala, Head of Development and Production Management

Dieter Pfaff, Head of International Production Federation and Quality Management

Tumlingen, 2025-03-05

This DoP has been prepared in different languages. In case there is a dispute on the interpretation the English version shall always prevail.

The Appendix includes voluntary and complementary information in English language exceeding the (language-neutrally specified) legal requirements.

Translation guidance Essential Characteristics and Performance Parameters for Annexes

Safety in case of fire (BWR 2)		
1	Reaction to fire:	-
2	Resistance to fire:	$N_{Rk,s,fi}$; $N_{Rk,p,fi}$; $F_{Rk,fi,90}$ [kN]
Mechanical resistance and stability (BWR 4)		
3	Resistance to steel failure under tension loading:	$N_{Rk,s}$ [kN]
4	Resistance to steel or polymer failure under shear loading:	$V_{Rk,s}$ [kN]; $M_{Rk,s}$ [Nm]; $V_{Rk,pol}$ [kN]
5	Resistance to pull-out or concrete failure or polymer failure under tension loading (base material group a)	$N_{Rk,p}$ [kN] / $N_{Rk,pol}$ [kN]
6	Resistance in any load direction without lever arm (base material group b,c,d):	F_{Rk} [kN]
7	Edge distance and spacing (base material group a)	$c_{cr;}$ $s_{cr;}$ $c_{min;}$ $s_{min;}$ $a_{;}$ h_{min} [mm]
8	Edge distance and spacing (base material group b,c,d):	$c_{min;}$ $s_{min;}$ h_{min} [mm]
9	Displacements under short-term and long-term loading:	δ_0; δ_∞ [mm]
Aspects of durability		
10	Durability:	-

Specific Part

1 Technical description of the product

The frame fixing in the range URD 8 and URD 10 is a plastic anchor consisting of a plastic sleeve made of polyamide and an accompanying specific screw of galvanised steel, of galvanised steel with an additional organic layer or of stainless steel.

The plastic sleeve is expanded by screwing in the specific screw which presses the sleeve against the wall of the drilled hole.

The product description is given in Annex A.

2 Specification of the intended use in accordance with the applicable European Assessment Document

The performances given in Section 3 are only valid if the anchor is used in compliance with the specifications and conditions given in Annex B.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the anchors 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 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire	see Annex C 2

3.2 Mechanical resistance and stability (BWR 4)

Essential characteristic	Performance
Resistance to steel failure under tension loading	see Annex C 1
Resistance to steel failure under shear loading	see Annex C 1
Resistance to pull-out or concrete failure under tension loading (base material group a)	see Annex C 1
Resistance in any load direction without lever arm (base material group b, c, d)	see Annexes C 11 – C 26
Edge distance and spacing (base material group a)	see Annex B 4
Edge distance and spacing (base material group b, c, d)	see Annex B 5
Displacements under short-term and long-term loading	see Annex C 2
Durability	see Annex B 1 and B 2

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

In accordance with European Assessment Document EAD 330284-00-0604 the applicable European legal act is: 97/463/EC.

The system to be applied is: 2+

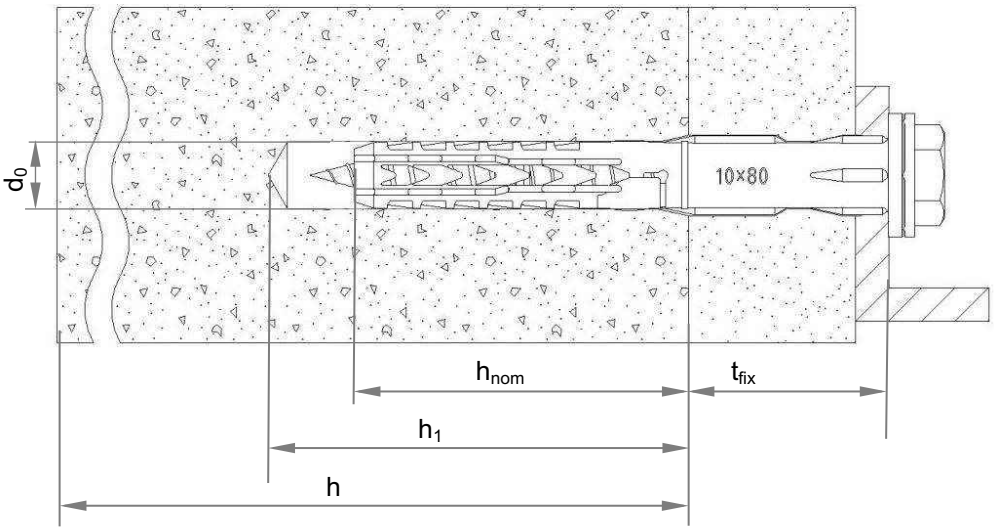
5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

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

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

- EOTA European Assessment Document EAD 330284-00-0604, edition December 2020: Plastic anchors for redundant non-structural systems in concrete and masonry
- EOTA Technical Report TR 051, Edition April 2018: Recommendations for job site tests of plastic anchors and screws
- EOTA Technical Report TR 064, Edition May 2018: Design of plastic anchors in conrete and masonry
- EN 206:2013+A1:2016: Concrete – Specification, performance, production and conformity
- EN 771-1:2011+A1:2015: Specification for masonry units – Part 1: Clay masonry units
- EN 771-2:2011+A1:2015: Specification for masonry units – Part 2: Calcium silicate
- EN 771-3:2011+A1:2015: Specification for masonry units – Part 3: Aggregate concrete masonry units (dense and lightweight aggregates)
- EN 771-4:2011+A1:2015: Specification for masonry units – Part 4: autoclaved aerated concrete masonry units
- EN 998-2:2010: Specification for mortar for masonry - Part 2: Masonry mortar
- EN 1993-1-4:2006 + A1:2015: Eurocode 3: Design of steel structures – Part 1-4: General rules - Supplementary rules for stainless steels
- EN ISO 4042:2022: Fasteners – Electroplated coating systems

URD



Legend

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

h_1 = Depth of drill hole to deepest point

d_0 = Nominal drill hole diameter

h = Thickness of member (base material)

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

Figure not to scale

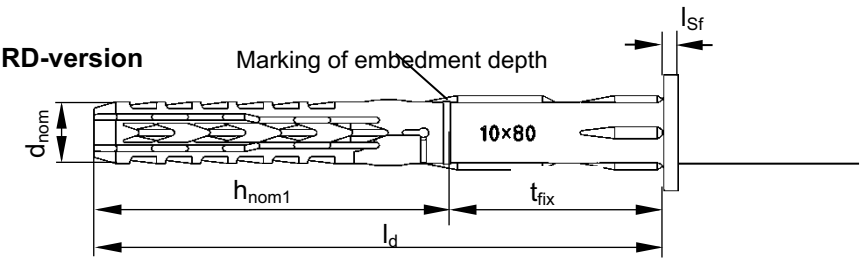
Frame fixing URD

Product description
Installed anchor

Annex A 1

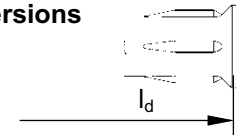
Anchor sleeves – flat collar versions of URD

URD-version



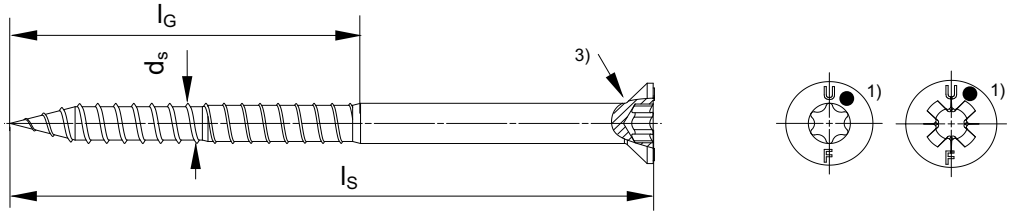
Marking:
Brand
Anchor type
Size
e.g. URD 10x80

Countersunk sleeve version also available for both versions

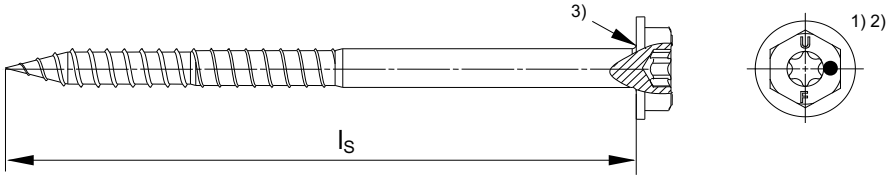


Special Screws

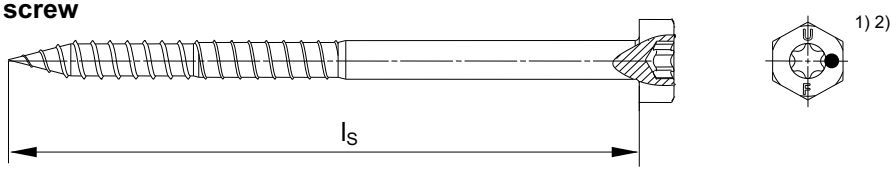
Countersunk screw



Hexagonal screw with washer



Hexagonal screw



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

Figures not to scale

Frame fixing URD	
Product description Anchor types / special screws	**Annex A 2** Appendix 4 / 37

Table A3.1: Dimensions

Anchor type	Anchor sleeve							Special screw		
	h_{nom1} [mm]	d_{nom} [mm]	t_{fix} [mm]	min. l_d [mm]	max. l_d [mm]	l_{Sf} [1)] [mm]	d_{Sf} [1)] [mm]	d_s [mm]	l_G [mm]	l_s [mm]
URD 8	**50**	**8**	**≥ 1**	**51**	**360**	**1,8**	**15,0**	**6,0**	**≥ 59**	$l_d + l_{Sf}$ [1)] $+ d_s$
URD 10	**50**	**10**	**≥ 1**	**51**	**360**	**2,2**	**18,5**	**7,0**	**≥ 57**	$l_d + l_{Sf}$ [1)] $+ d_s$

1) Only valid for flat collar version.

Table A3.2: Materials

Name	Material
Anchor sleeve	- Polyamide, PA6, colour grey, off-white
Special screw	- Galvanised steel gvz with Zn5/Ag or Zn5/An in accordance with EN ISO 4042 **or** - Galvanised steel gvz with Zn5/Ag or Zn5/An in accordance with EN ISO 4042 with additional organic layer (Zn5/Ag/T7 or Zn5/An/T7, respectively) in three layers (total layer thickness ≥ 6 µm) **or** - Stainless steel "A2" of corrosion resistance class CRC II in accordance with EN 1993-1-4 **or** - Stainless steel "A4" or "R" of corrosion resistance class CRC III in accordance with EN 1993-1-4

Specifications of intended use

Anchorages subject to:

- Static and quasi-static loads.
- Redundant non-structural systems.

Base materials:

- Reinforced or unreinforced compacted normal weight concrete without fibres, strength classes ≥ C12/15 (base material group "a"), as per EN 206, see Annex C 1 and C 3.
- Thin-walled concrete components (e.g. weather shells) strength classes ≥ C12/15 (base material group "a"), as per EN 206, thickness ≥ 40 mm, see Annex C 1 and C 3.
- Solid brick masonry (base material group "b") as per EN 771-1, EN 771-2 or EN 771-3, see Annex C 3 – C 4, C 12 – C 18.
  Note: The characteristic resistance is also valid for larger brick sizes and higher compressive strength of the masonry unit.
- Hollow or perforated brick masonry (base material group "c"), as per EN 771-1, EN 771-2 or EN 771-3, see Annex C 4 – C 10, C 18 – C 26.
- Unreinforced autoclaved aerated concrete (base material group "d") as per EN 771-4, see Annex C 10 and C 26.
- Mortar strength class of the masonry ≥ M2,5 in accordance with EN 998-2.
- For other comparable base materials of the base material group "a", "b", "c" and "d" the characteristic resistance of the anchor may be determined by job site tests in accordance with TR 051.

Temperature Range:

URD 8 and URD 10

- c: - 40 °C to 50 °C (max. short term temperature + 50 °C and max long term temperature + 30 °C)
- b: - 40 °C to 80 °C (max. short term temperature + 80 °C and max long term temperature + 50 °C)

Use conditions (Environmental conditions):

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

Design:

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

Installation:

- Hole drilling by the drilling method in accordance with Annex C 1 for base material group "a" and Annex C 12 - C 26 for base material group "b", "c" and "d".
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- Installation temperature from URD 8 and URD 10: - 5 °C to + 40 °C
- Exposure to UV due to solar radiation of the not protected anchor by rendering ≤ 6 weeks.
- No ingress of water in the borehole at temperatures < 0 °C.

Table B3.1: Installation parameters

Anchor type				URD 8	URD 10
Drill hole diameter	d_0	=	[mm]	8	10
Cutting diameter of drill bit	d_{cut}	≤	[mm]	8,45	10,45
Overall plastic anchor embedment depth in the base material[1)2)]	h_{nom}	≥	[mm]	50	50
Depth of drill hole to deepest point[1)]	h_1	≥	[mm]	60	60
Diameter of clearance hole in the fixture	d_f	≤	[mm]	8,50	10,50/12,50[3)]

1) See Annex A 1.
2) For base material group "c": If the embedment depth is higher than h_{nom} given in the Table B3.1, job site tests have to be carried out in accordance with TR 051.
3) See Table C2.1.

Table B3.2: Assignment of h_{nom}, l_d and t_{fix} for use in thin concrete slabs (e.g. weather resistant shells of external wall panels)

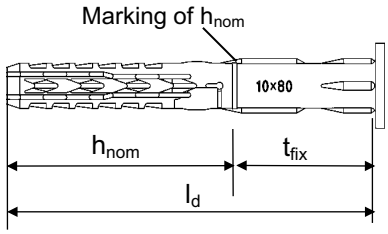
Anchor type	URD 10, h_{nom} ≥ 50 mm		
	l_d [mm]	$t_{fix, min}$	$t_{fix, max}$
Base material group “a”	[mm]	[mm]	[mm]
	52	1	2
	60	1	10
	80	21	30
	100	41	50
	120	61	70
	140	81	90
	160	101	110
	180	121	130
	200	141	150
	230	171	180
	260	201	210

Table B4.1: Minimum thickness of member, edge distances and spacing in concrete – base material group "a"

Anchor type	Embedment depth h_{nom} [mm]	Concrete strength class	Minimum thickness of member h_{min} [mm]	Characteristic edge distance c_{cr} [mm]	Characteristic spacing s_{cr} [mm]	Minimum edge distances and spacing[1] c_{min}, s_{min} [mm]
URD 8	≥ 50	C12/15	100	70	70	s_{min} = 70 for c ≥ 70 c_{min} = 70 for s ≥ 70
		≥ C16/20		50	65	s_{min} = 50 for c ≥ 50 c_{min} = 50 for s ≥ 50
URD 10	≥ 50	C12/15	100[2]	140	100	s_{min} = 70 for c ≥ 210 c_{min} = 85 for s ≥ 100
		≥ C16/20		100	90	s_{min} = 50 for c ≥ 150 c_{min} = 60 for s ≥ 70

1) Intermediate values by linear interpolation.
2) Also valid for thin concrete slabs, see Table B3.2 h ≥ 40 mm, h_{nom} = 50 mm to 59 mm.

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

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

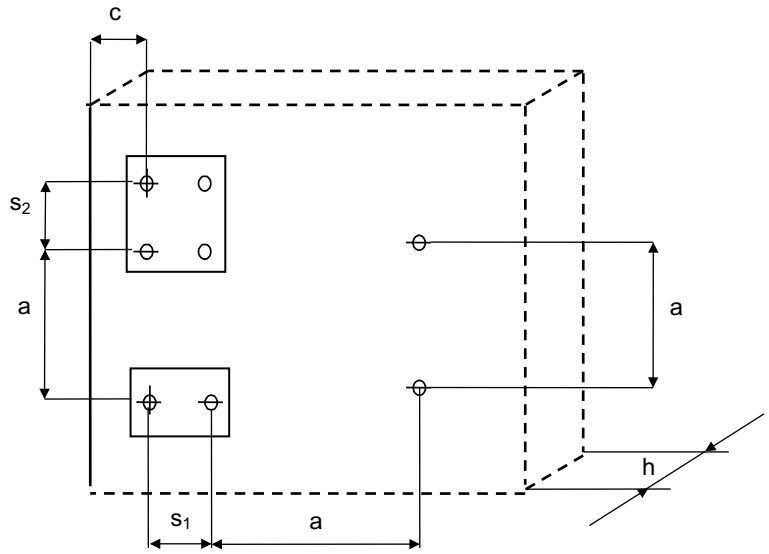


Figure not to scale

Frame fixing URD

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

Annex B 4

Table B5.1: Minimum thickness of member, edge distances and spacing in solid and hollow or perforated masonry – base material group "b" and "c"

Anchor type			URD 8	URD 10
Minimum thickness of member[1)]	h_{min}	[mm]	100	100
Distance between anchor groups and / or single anchors	a_{min}	[mm]	250	250
Single anchor				
Minimum edge distance[2)]	c_{min}	[mm]	100	100
Anchor group				
Minimum spacing perpendicular to free edge	$s_{1,min}$	[mm]	100[2)]	100[2)]
Minimum spacing parallel to free edge	$s_{2,min}$	[mm]	100[2)]	100[2)]
Minimum edge distance	c_{min}	[mm]	100[2)]	100[2)]

1) Thickness of member see Annex C 3 – C 26.

2) For some anchor sizes and bricks Footnotes 7) and 8) on Annex C 11 have to be considered

Table B5.2: Minimum thickness of member, edge distances and spacing in unreinforced autoclaved aerated concrete - base material group "d"

Anchor type			URD 10
Compressive strength	$f_{cm,decl}$	[N/mm²]	≥ 2
Nominal embedment depth	h_{nom} ≥	[mm]	50
Minimum thickness of member[1)]	h_{min}	[mm]	100
Distance between anchor groups and / or single anchors	a_{min}	[mm]	400
Single anchor			
Minimum edge distance	c_{min}	[mm]	100
Anchor group			
Minimum spacing perpendicular to free edge	$s_{1,min}$	[mm]	200
Minimum spacing parallel to free edge	$s_{2,min}$	[mm]	400
Minimum edge distance	c_{min}	[mm]	100

1) See Table C26.2.

Scheme of edge distances and spacing
in solid and hollow or perforated brick masonry base material group "b" and "c"
and unreinforced autoclaved aerated concrete base material group "d"

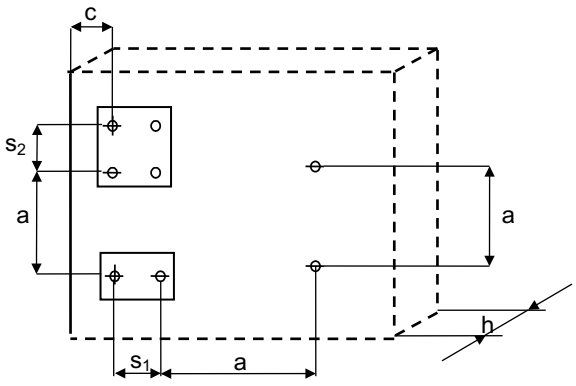


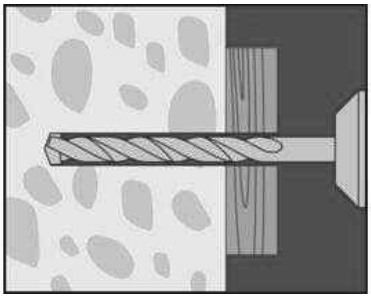
Figure not to scale

Frame fixing URD

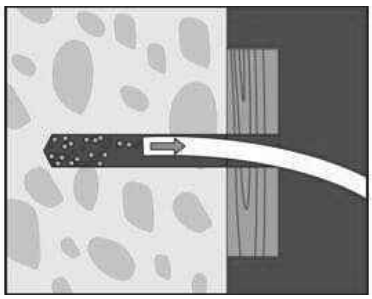
Intended use
Minimum thickness of member, edge distances and spacing for use in solid and hollow or perforated masonry and unreinforced autoclaved aerated concrete

Annex B 5

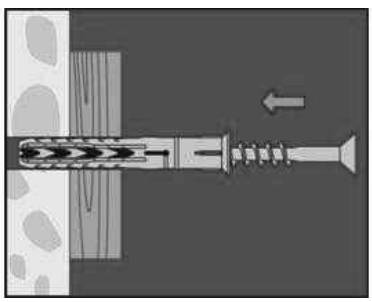
Installation instructions – pictures show e.g. use in anchorage base material group "a" concrete



1. Drill the bore hole according to Table B3.1 using the drilling method described in the corresponding Annex C.



2. Base material group „a", „b", „d": Remove dust from borehole.
   Base material group "b" (e.g. perforated clay brick): Dust from borehole must not be removed.



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

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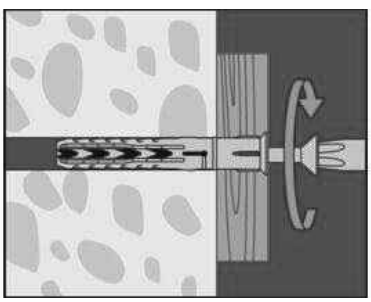
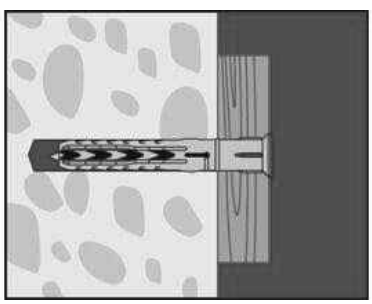


4. The screw is screwed-in until the head of the screw touches the sleeve. The anchor is correctly mounted, when the head of the screw fits tight on the surface and cannot be screwed-in any further.



5. Correctly installed anchor, e.g. in concrete.

Table C1.1: Characteristic resistance of the screw

Failure of expansion element (special screw)			URD 8		URD 10	
			galvanised steel	stainless steel	galvanised steel	stainless steel
Characteristic tension resistance	$N_{Rk,s}$	[kN]	**14,8**	**14,3**	**21,7**	**21,7**
Partial factor	γ_{Ms} [1)]	[-]	**1,50**	**1,55**	**1,55**	**1,55**
Characteristic shear resistance	$V_{Rk,s}$	[kN]	**7,4**	**7,1**	**10,8**	**10,8**
Partial factor	γ_{Ms} [1)]	[-]	**1,25**	**1,29**	**1,29**	**1,29**
Characteristic bending resistance of the screw						
Characteristic bending resistance	$M_{Rk,s}$	[Nm]	**12,4**	**12,0**	**20,6**	**20,6**
Partial factor	γ_{Ms} [1)]	[-]	**1,25**	**1,25**	**1,29**	**1,29**

1) In absence of other national regulations.

Table C1.2: Characteristic resistance due to pullout-failure for use in concrete - base material group "a"[1)]

Pull-out failure (plastic sleeve)				URD 8	URD 10
Embedment depth h_{nom} [mm]			**≥**	50	50
Concrete ≥ C12/15					
Characteristic tension resistance 30/50 °C	$N_{Rk,p}$	[kN]		**3,0**	**5,0**
Characteristic tension resistance 50/80 °C	$N_{Rk,p}$	[kN]		**2,5** **3,0**[3)]	**4,5**
Concrete ≥ C12/15 (e.g. weather resistant shells of external wall panels)					
Characteristic tension resistance 30/50 °C	$N_{Rk,p}$	[kN]	**h ≥ 40 mm**	[4)]	**3,5**
Characteristic tension resistance 50/80 °C	$N_{Rk,p}$	[kN]	**h ≥ 40 mm**	[4)]	**3,0**
Partial factor	γ_{Mc} [2)]	[-]		**1,8**	

1) Drilling method: Hammer drilling.
2) In absence of other national regulations.
3) Only valid in concrete ≥ C16/20.
4) No performance assessed.

Table C2.1: Displacements[1] under tension and shear loading in concrete and masonry

Displacements under			Tension load[2]		Shear load[2]	
Anchor type	h_{nom} [mm]	F [kN]	δ_{NO} [mm]	$\delta_{N\infty}$ [mm]	δ_{VO} [mm]	$\delta_{V\infty}$ [mm]
URD 8	**50**	1,2	0,65	1,30	1,02	1,53
URD 10	**50**	2,0	1,29	2,58	1,15[3]/3,05[4]	1,74[3]/4,58[4]

1) Valid for all ranges of temperatures.
2) Intermediate values by linear interpolation.
3) Valid for diameter in the clearance hole ≤ 10,5 mm (see Table B3.1).
4) Valid for diameter in the clearance hole = 12,5 mm (see Table B3.1).

Table C2.2: Displacements[1] under tension and shear loading in unreinforced autoclaved aerated concrete

Displacements under				Tension load[2]		Shear load[2]	
Anchor type	$f_{cm,decl}$ [N/mm²]	h_{nom} [mm]	F [kN]	δ_{NO} [mm]	$\delta_{N\infty}$ [mm]	δ_{VO} [mm]	$\delta_{V\infty}$ [mm]
URD 10	**≥ 2**	**50**	0,32	0,03	0,06	0,21	0,31

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

Table C2.3: Values under fire exposure in concrete C20/25 to C50/60 in any load direction (no permanent centric tension load, shear load without lever arm) fastening of façade systems

Anchor type	Fire resistance class	$F_{Rk,fi,90}$	$\gamma_{M,fi}$[1]
URD 10	**R 90**	0,8 kN	1,0

1) In absence of other national regulations.

If one-side fire load, see table B4.1 for edge distance.
In case of fire attack from more than one side the minimum edge distance shall be $c \geq 300$ mm, $c \geq 2 \cdot h_{ef}$; the bigger value is decisive.

Table C3.1: Summary of concrete – base material group "a" and solid bricks – base material group "b"[1)]

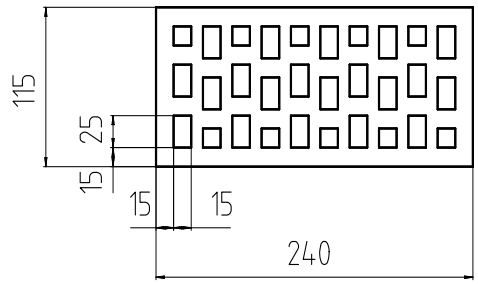
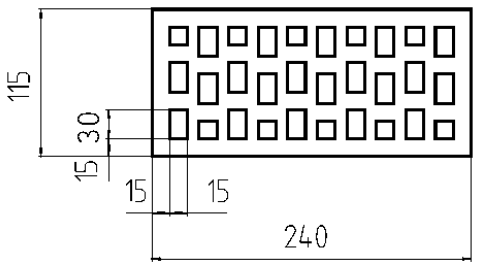
Base material	Format	Dimensions (L x W x H) [mm]	Mean compressive strength as per EN 771 [N/mm²]	Bulk density ρ [kg/dm³]	See Annex
Concrete ≥ C12/15 as per EN 206					C 1
Weather resistant shells of external wall panels ≥ C12/15 as per EN 206					C 1
Clay brick Mz as per EN 771-1, *e.g. Schlagmann, DE*	3 DF	240 x 175 x 113	≥ 10	≥ 1,8	C 12
Clay brick Mz as per EN 771-1, *e.g. Wienerberger, DK*	DF	240 x 115 x 52	≥ 10	≥ 1,8	C 12
Clay brick Mz as per EN 771-1, *e.g. Schlagmann, DE* *e.g. Ebersdobler, DE*	NF	240 x 115 x 71	≥ 10	≥ 1,8	C 13
Clay brick Mz as per EN 771-1, *e.g. Schlagmann, DE*	2 DF	240 x 115 x 113	≥ 10	≥ 2,4	C 14
Calcium silicate solid brick KS as per EN 771-2, *e.g. KS Wemding, DE*	NF	240 x 115 x 71	≥ 10	≥ 1,8	C 14 C 15
Calcium silicate solid brick KS as per EN 771-2, *e.g. KS Wemding, DE*	12 DF	495 x 175 x 240	≥ 10	≥ 1,8	C 15
Lightweight solid brick Vbl as per EN 771-3, *e.g. KLB, DE*	2 DF	240 x 115 x 113	≥ 2,5	≥ 1,2	C 15
Lightweight solid brick Vbl as per EN 771-3, *e.g. KLB, DE*	8 DF	490 x 115 x 240	≥ 2,5	≥ 1,0	C 15 C 16
Lightweight solid brick Vbl as per EN 771-3, *e.g. KLB, DE*	8 DF	245 x 240 x 240	≥ 2,5	≥ 1,4	C16 C17

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

Table C4.1: Summary of solid bricks – base material group "b"[1)]

Base material	Format	Dimensions (L x W x H) [mm]	Mean compressive strength as per EN 771 [N/mm²]	Bulk density ρ [kg/dm³]	See Annex
Lightweight solid brick concrete Vbl as per EN 771-3, *e.g. Tarmac, UK*	-	440 x 100 x 210	≥ 2,5	≥ 1,4	C 17
Solid brick normal concrete Vbn as per EN 771-3, *e.g. Adolf Blatt, DE*	-	240 x 245 x 240	≥ 5	≥ 1,8	C 17
Lightweight solid brick Vbn as per EN 771-3, *e.g. Tarmac UK*	-	440 x 100 x 210	≥ 7,5	≥ 1,8	C 18

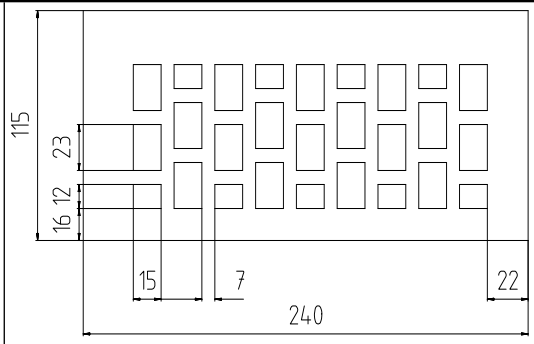
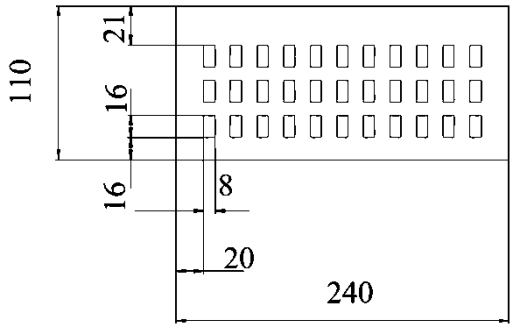
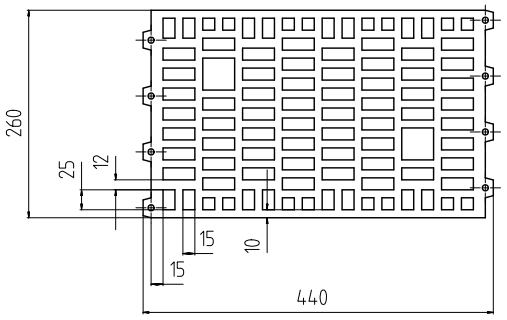
Table C4.2: Summary of hollow or perforated bricks – base material group "c"[1)]

Base material	Format/ Dimensions (L x W x H) [mm]	Brick drawing [mm]	Mean compressive strength as per EN 771 [N/mm²] / bulk density ρ [kg/dm³]	See Annex
Perforated clay brick HLz Form B, as per EN 771-1, *e.g. Wienerberger, DE*	2 DF 240 x 115 x 113		≥ 10 / ≥ 1,2	C 18
Perforated clay brick HLz as per EN 771-1, *e.g. Wienerberger, DE*	2 DF 240 x 115 x 113		≥ 10 / ≥ 1,0	C 19

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

Figures not to scale

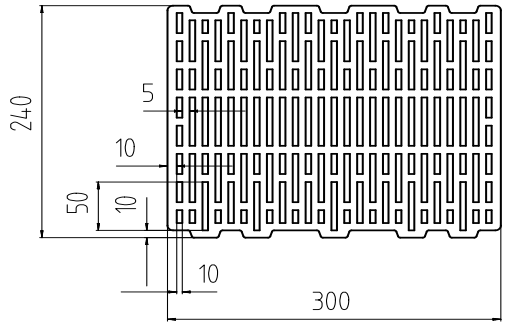
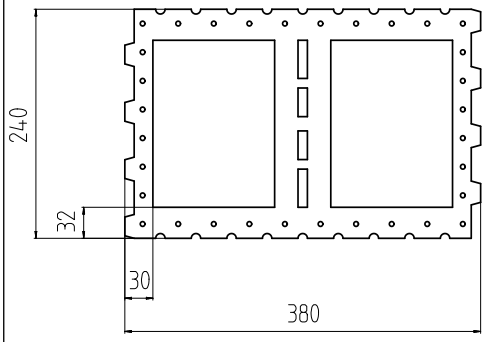
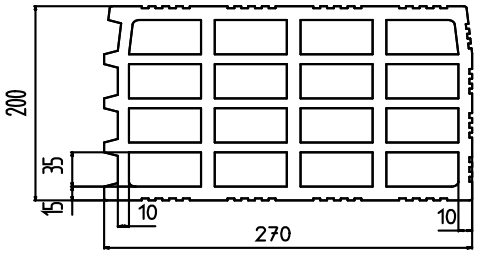
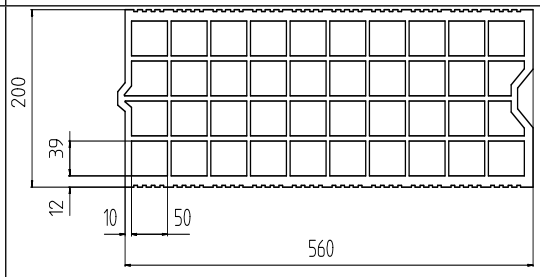
Table C5.1: Summary of hollow or perforated bricks – base material group "c"[1)]

Base material	Format/ Dimensions (L x W x H) [mm]	Brick drawing [mm]	Mean compressive strength as per EN 771 [N/mm²] / bulk density ρ [kg/dm³]	See Annex
Perforated clay brick VHLz as per EN 771-1, *e.g. Wienerberger, DE*	2 DF 240 x 115 x 113		≥ 12,5 / ≥ 1,6	C 19
Perforated clay brick HLz as per EN 771 -1, *e.g. Wienerberger, BS, DE*	DF 240 x 110 x 52		≥ 10 / ≥ 1,5	C 19
Perforated clay brick HLz as per EN 771 -1, *e.g. Schlagmann, DE*	10 DF 440 x 260 x 240		≥ 5 / ≥ 0,9	C 20

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

Figures not to scale

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

Base material	Format/ Dimensions (L x W x H) [mm]	Brick drawing [mm]	Mean compressive strength as per EN 771 [N/mm²] / bulk density ρ [kg/dm³]	See Annex
Perforated clay brick HLz as per EN 771-1, *e.g. Schlagmann Poroton T14, DE*	10 DF 240 x 300 x 240		≥ 5 / ≥ 0,7	C 20
Perforated clay brick HLz as per EN 771-1, *e.g. Schlagmann Planfüllziegel, DE*	12 DF 380 x 240 x 240		≥ 2,5 / ≥ 0,7	C 20
Perforated clay brick HLz as per EN 771-1, *e.g. Imerys Gelimatic, FR*	500 x 200 x 270		≥ 5 / ≥ 0,6	C 21
Perforated clay brick HLz as per EN 771-1, *e.g. Imerys Optibric, FR*	560 x 200 x 275		≥ 5 / ≥ 0,6	C 21

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

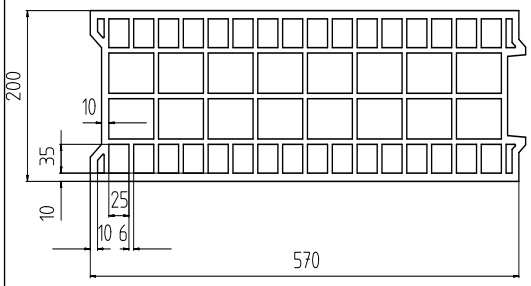
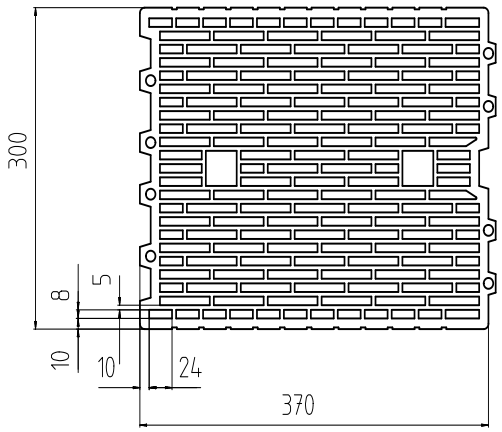
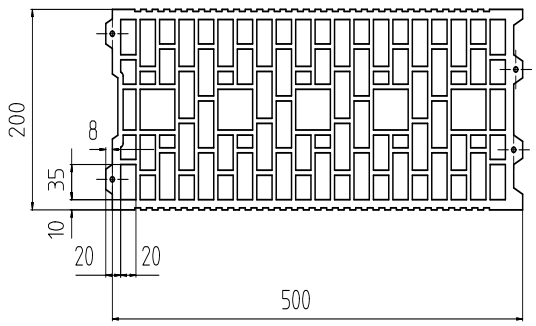
Figures not to scale

Frame fixing URD

Performances
Summary of base materials hollow or perforated bricks

Annex C 6

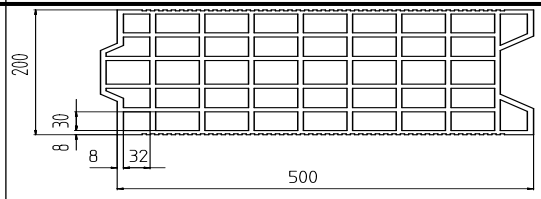
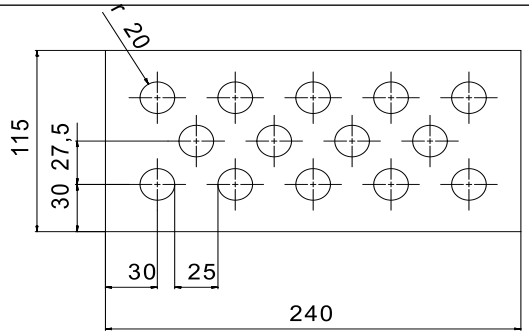
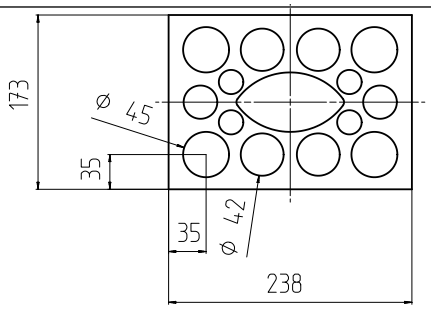
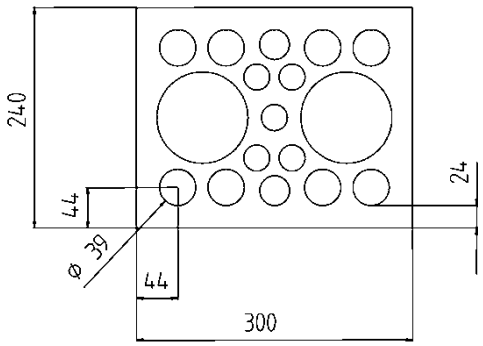
Table C7.1: Summary of hollow or perforated bricks – base material group "c"[1)]

Base material	Format/ Dimensions (L x W x H) [mm]	Brick drawing [mm]	Mean compressive strength as per EN 771 [N/mm²] / bulk density ρ [kg/dm³]	See Annex
Perforated clay brick HLz as per EN 771-1, *e.g. Bouyer Leroux BGV, FR*	570 x 200 x 315		≥ 5 / ≥ 0,6	C 21
Perforated clay brick HLz as per EN 771-1, *e.g. Wienerberger Porotherm 30 R, FR*	370 x 300 x 250		≥ 7,5 / ≥ 0,7	C 22
Perforated clay brick HLz as perEN 771-1, *e.g. Wienerberger Porotherm GF R20, FR*	500 x 200 x 275		≥ 5 / ≥ 0,7	C 22

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

Figures not to scale

Table C8.1: Summary of hollow or perforated bricks – base material group "c"[1)]

Base material	Format/ Dimensions (L x W x H) [mm]	Brick drawing [mm]	Mean compressive strength as per EN 771 [N/mm²] / bulk density ρ [kg/dm³]	See Annex
Perforated clay brick HLz as per EN 771-1, *e.g. Terreal Calibric, FR*	500 x 200 x 220		≥ 5 / ≥ 0,7	C 22
Hollow calcium silicate brick *KSL* as per EN 771-2, *e.g. KS Wemding, DE*	2 DF 240 x 115 x 113		≥ 7,5 / ≥ 1,4	C 23
Hollow calcium silicate brick KSL as per EN 771-2, *e.g. KS Wemding, DE*	3 DF 240 x 175 x 113		≥ 7,5 / ≥ 1,4	C 23
Hollow calcium silicate brick KSL as per EN 771-2, *e.g. KS Wemding, DE*	5 DF 300 x 240 x 113		≥ 7,5 / ≥ 1,4	C 23

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

Figures not to scale

Frame fixing URD

Performances
Summary of base materials hollow or perforated bricks

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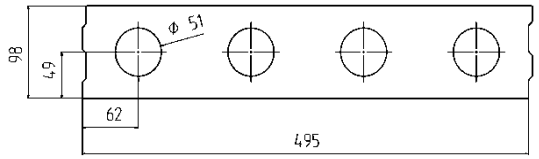
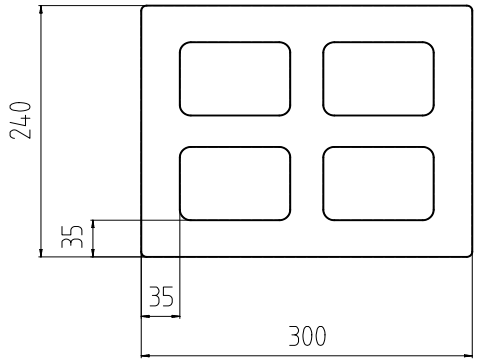
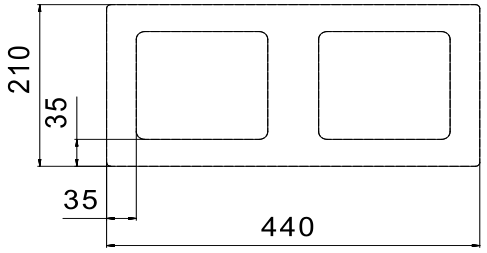
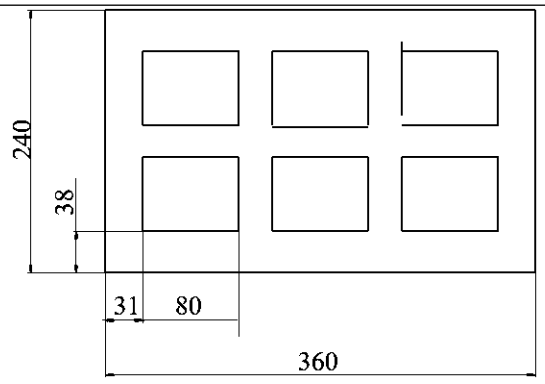
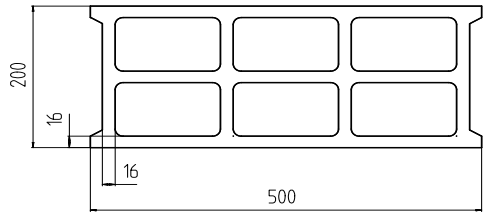
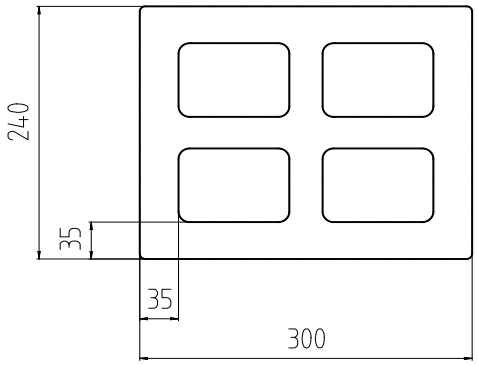
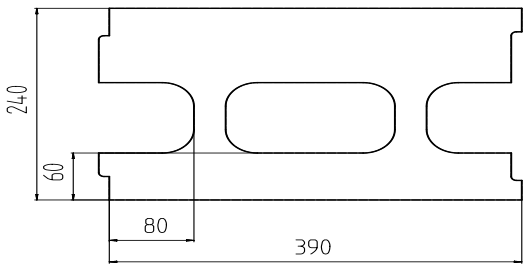
Table C9.1: Summary of hollow or perforated bricks – base material group "c"[1)]

Base material	Format/ Dimensions (L x W x H) [mm]	Brick drawing [mm]	Mean compressive strength as per EN 771 [N/mm²] / bulk density ρ [kg/dm³]	See Annex
Hollow calcium silicate brick KSL as per EN 771-2, *e.g. KS Wemding, P10, DE*	495 x 98 x 245		≥ 2,5 / ≥1,2	C 24
Hollow brick light-weight concrete Hbl as per EN 771-3, *e.g. KLB, DE*	300 x 240 x 240		≥ 2,5 / ≥ 1,4	C 24
Hollow brick light-weight concrete Hbl as per EN 771-3, *e.g. Roadstone masonry, IE*	440 x 210 x 215		≥ 2,5 / ≥ 1,2	C 24
Hollow brick light-weight concrete Hbl as per EN 771-3, *e.g. KLB, DE*	360 x 240 x 240		≥ 2,5 / ≥ 1,0	C 25

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

Figures not to scale

Table C10.1: Summary of hollow or perforated bricks – base material group "c"[1)]

Base material	Format/ Dimensions (L x W x H) [mm]	Brick drawing [mm]	Mean compressive strength as per EN 771 [N/mm²] / bulk density ρ [kg/dm³]	See Annex
Hollow brick light-weight concrete Hbl as per EN 771-3, *e.g. Sepa Parpaing, FR*	500 x 200 x 200		≥ 2,5 / ≥ 0,9	C 25
Hollow brick normal concrete Hbn as per EN 771-3, *e.g. Adolf Blatt, DE*	300 x 240 x 240		≥ 2,5 / ≥ 1,6	C 25
Heat insulation brick WDB *e.g. Gisoton, DE*	390 x 240 x 240		≥ 2,5 / ≥ 0,7	C 26

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

Table C10.2: Summary of autoclaved aerated concrete – base material group "d"

Base material	Format [mm]	Dimensions (L x W x H) [mm]	Mean compressive strength as per EN 771 [N/mm²]	Bulk density ρ [kg/dm³]	See Annex
Unreinforced autoclaved aerated concrete, as per EN 771-4					C26

Figures not to scale

Footnotes for Annex C 12 – C 26

1) In absence of other national regulations.
2) Only valid for temperature range 30/50 °C.
3) Only valid for edge distance c ≥ 150 mm; intermediate values by linear interpolation.
4) Only valid for edge distance c ≥ 200 mm; intermediate values by linear interpolation.
5) Only valid for edge distance c ≥ 150 mm for temperature range 30/50 °C; intermediate values by linear interpolation.
6) Only valid for edge distance c ≥ 200 mm for temperature range 30/50 °C; intermediate values by linear interpolation.
7) Only valid for spacing s ≥ 250 mm
8) Only valid for spacing s ≥ 250 mm for temperature range 30/50 °C
9) The compressive strength of the single brick must not be less than 80 % of the mean compressive strength.
10) No performance assessed.
11) The characteristic resistance F_{Rk} is taken from the lower compressive strength of the masonry unit.
12) If the compressive strength of the base material according to EN 771-1, EN 771-2 or EN 771-3 on the construction side is lower than the mean compressive strength given in the tables according to Annex C 12 – C 26, F_{Rk} shall be calculated as follows:

$$F_{Rk,\,construction\ site} = F_{Rk}\ (Table\ C.\text{“}X\text{”}) \cdot \frac{Mean\ compressive\ strength\ (construction\ site)}{Mean\ compressive\ strength\ (Table\ C.\text{"}X\text{"})}$$

Table C12.1: Characteristic resistance F_{Rk}[12)] in [kN] for use in solid masonry - base material group "b"

Base material; bulk density [kg/dm³] [*Supplier Title, country*] Geometry, DF or nominal Size (L x W x H) [mm] and drilling method	Mean compressive strength as per EN 771 / Minimum compressive strength single brick[9)] [N/mm²]	Characteristic resistance F_{Rk} [kN] Temperature range 30/50 °C and 50/80 °C	
		URD 8	URD 10
		h_{nom} [mm]	
		≥ 50	≥ 50
Clay brick Mz; ρ ≥ 1,8 as per EN 771-1 *e.g. Schlagmann, DE* **3 DF** (240x175x113) Hammer drilling	10/8	**0,90** **1,20**[2)]	**0,90** **1,50**[4)]
	12,5/10	**1,20** **1,50**[2)]	**1,20** **1,50**[4)] **2,00**[6)]
	15/12	**1,50** **2,00**[2)]	**1,50** **2,00**[4)] **2,50**[6)]
	20/16	**2,00** **2,50**[2)]	**2,00** **2,50**[4)] **3,00**[6)]
	24,7	**2,50** **3,00**[2)]	**2,50** **3,50**[4)] **4,00**[6)]
Clay brick Mz; ρ ≥ 1,8 as per EN 771-1 *e.g.Wienerberger, DK* **DF** (240x115x52) Hammer drilling	10/8	**0,90**[7)]	[10)]
	12,5/10	**0,90**[7)] **1,20**[8)]	**1,20**[7)]
	15/12	**1,20**[7)] **1,50**[8)]	**1,20**[7)] **1,50**[8)]
	20/16	**1,50**[7)] **2,00**[8)]	**1,50**[7)] **2,00**[8)]
	25/20	**2,00**[7)] **2,50**[8)]	**2,00**[7)] **2,50**[8)]
	26,7	**2,00**[7)] **2,50**[8)]	**2,00**[7)] **2,50**[8)]
	35/28	**3,00**[7)]	**3,00**[7)] **3,50**[8)]
	45/36	**3,00**[7)]	**4,00**[7)] **4,50**[8)]
Partial factor	γ_{Mm} [1)] **[-]**	**2,5**	

Footnotes see Annex C 11.

Table C13.1: Characteristic resistance F_{Rk}[12)] in [kN] for use in solid masonry - base material group "b"

Base material; bulk density [kg/dm³] [*Supplier Title, country*] Geometry, DF or nominal Size (L x W x H) [mm] and drilling method	Mean compressive strength as per EN 771 / Minimum compressive strength single brick[9)] [N/mm²]	Characteristic resistance F_{Rk} [kN] Temperature range 30/50 °C and 50/80 °C	
		URD 8	URD 10
		h_{nom} [mm]	
		≥ 50	≥ 50
Clay brick Mz; ρ ≥ 1,8 gas per EN 771-1 *e.g. Schlagmann, DE* *e.g. Ebersdobler, DE* **NF** (240x115x71) Hammer drilling	10/8	**0,75**[7)] **0,90**[8)]	[10)]
	12,5/10	**0,90**[7)] **1,20**[8)]	**0,90**[7)] **1,20**[3)7)]
	15/12	**1,20**[7)] **1,50**[8)]	**1,20**[7)] **1,50**[8)]
	18,5/-	**1,20**[7)] **1,50**[8)]	**1,20**[7)] **1,50**[8)]
	20/16	**1,50**[7)] **2,00**[8)]	**1,50**[7)] **2,00**[8)]
	25/20	**2,00**[7)] **2,50**[8)]	**2,00**[7)] **2,50**[8)]
	35/28	**2,50**[7)] **3,00**[8)]	**3,00**[7)] **3,50**[8)]
	35,4	**3,00**[7)]	**3,00**[7)] **3,50**[8)]
	38,4	[11)]	**3,50**[7)] **4,00**[8)]
	45/36	[11)]	**4,00**[7)] **4,50**[8)]
	60/48	[11)]	**5,00**[7)]
	60,7	[11)]	**5,00**[7)]
Partial factor	γ_{Mm}[1)] **[-]**	**2,5**	

Footnotes see Annex C 11.

Table C14.1: Characteristic resistance F_{Rk}[12)] in [kN] for use in solid masonry - base material group "b"

Base material; bulk density [kg/dm³] [*Supplier Title, country*] Geometry, DF or nominal Size (L x W x H) [mm] and drilling method	Mean compressive strength as per EN 771 / Minimum compressive strength single brick[9)] [N/mm²]	Characteristic resistance F_{Rk} [kN] Temperature range 30/50 °C and 50/80 °C	
		URD 8	URD 10
		h_{nom} [mm]	
		≥ 50	≥ 50
Clay brick Mz; ρ ≥ 2,2 as per EN 771-1 *e.g. Schlagmann, DE* **2 DF** (240x115x113) Hammer drilling	10/8	[10)]	**1,20**[7)]
	12,5/10	[10)]	**1,50**[7)]
	15/12	[10)]	**1,50**[7)] **2,00**[8)]
	20/16	[10)]	**2,00**[7)] **2,50**[8)]
	25/20	[10)]	**3,00**[7)]
	26,4	[10)]	**3,00**[7)] **3,50**[8)]
Calcium silicate solid brick KS; ρ ≥ 1,8 as per EN 771-2 *e.g. KS Wemding, DE* **NF** (240x115x71) Hammer drilling	10/8	**1,20**	**0,90**[7)] **2,00**[4)7)]
	12,5/10	**1,20** **1,50**[2)]	**1,20**[7)] **2,00**[4)7)] **2,50**[6)8)]
	15/12	**1,50** **2,00**[2)]	**1,50**[7)] **2,50**[4)7)] **3,00**[6)8)]
	20/16	**2,00** **2,50**[2)]	**2,00**[7)] **3,50**[4)7)] **4,00**[6)8)]
	25/20	**2,50** **3,00**[2)]	**2,50**[7)] **4,50**[4)7)] **5,00**[6)8)]
	27,0	**2,50** **3,00**[2)]	**3,00**[7)] **5,00**[4)7)]
	35/28	**3,00**	[11)]
	37,4/-	**3,00**	[11)]
Partial factor	γ_{Mm} [1)] **[-]**	**2,5**	

Footnotes see Annex C 11.

Frame fixing URD

Performances
Characteristic resistance for use in solid masonry

Annex C 14

Table C15.1: Characteristic resistance F_{Rk}[12)] in [kN] for use in solid masonry - base material group "b"

Base material; bulk density [kg/dm³] [*Supplier Title, country*] Geometry, DF or nominal Size (L x W x H) [mm] and drilling method	Mean compressive strength as per EN 771 / Minimum compressive strength single brick[9)] [N/mm²]	Characteristic resistance F_{Rk} [kN] Temperature range 30/50 °C and 50/80 °C	
		URD 8	URD 10
		h_{nom} [mm]	
		≥ 50	≥ 50
Calcium silicate solid brick KS; ρ ≥ 2,0 as per EN 771-2 *e.g. KS Wemding, DE* **NF** (240x115x71) Hammer drilling	10/8	**1,20** **1,50**[2)]	**0,90**
	12,5/10	**1,20** **1,50**[2)]	**1,20**
	15/12	**1,50** **2,00**[2)]	**1,20** **1,50**[2)]
	20/16	**2,00** **2,50**[2)]	**1,50** **2,00**[2)]
	25/20	**2,50** **3,00**[2)]	**2,00** **2,50**[2)]
	35/28	**3,00**	**3,00** **3,50**[2)]
	37,2/-	**3,00**	**3,00** **3,50**[2)]
	45/36	[11)]	**4,00** **4,50**[2)]
	54,6/-	[11)]	**5,00**
Calcium silicate solid brick KS; ρ ≥ 2,0 as per EN 771-2 *e.g. KS Wemding, DE* **12 DF** (495x175x240) Hammer drilling	10/8	**1,50**	**2,00**
	12,5/10	**1,50** **2,00**[2)]	**2,50** **3,00**[2)]
	15/12	**2,00** **2,50**[2)]	**3,00** **3,50**[2)]
	20/16	**3,00**	**4,00** **4,50**[2)]
	25/20	**3,00**	**5,00**
	33,9/-	**3,00**	**5,00**
Lightweight solid brick Vbl; ρ ≥ 1,2 as per EN 771-3 *e.g. KLB, DE* **2 DF** (240x115x113) Hammer drilling	2,5/2	**0,50**[7)]	**0,75**[7)] **0,90**[8)]
	2,7/-	**0,75**[7)] **0,90**[8)]	[10)]
Lightweight solid brick Vbl; ρ ≥ 1,0 as per EN 771-3 *e.g. KLB, DE* **8 DF** (490x115x240) Hammer drilling	2,5/2	**1,20**	[10)]
	3,1/-	**1,50**	[10)]
Partial factor	γ_{Mm}[1)] **[-]**	**2,5**	

Footnotes see Annex C 11.

Table C16.1: Characteristic resistance F_{Rk}[12)] in [kN] for use in solid masonry - base material group "b"

Base material; bulk density [kg/dm³] [*Supplier Title, country*] Geometry, DF or nominal Size (L x W x H) [mm] and drilling method	Mean compressive strength as per EN 771 / Minimum compressive strength single brick[9)] [N/mm²]	Characteristic resistance F_{Rk} [kN] Temperature range 30/50 °C and 50/80 °C	
		URD 8	URD 10
		h_{nom} [mm]	
		≥ 50	≥ 50
Lightweight solid brick Vbl; ρ ≥ 1,2 as per EN 771-3 *e.g. KLB, DE* **8 DF** (490x115x240) Hammer drilling	2,5/2	[10)]	**1,20**
Lightweight solid brick Vbl; ρ ≥ 1,6 as per EN 771-3 *e.g. KLB, DE* **8 DF** (490x115x240) Hammer drilling	2,5/2	[10)]	**0,90**[7)] **1,20**[8)]
	5/4	[10)]	**2,00**[7)] **2,00**[8)] **2,50**[5)8)]
	7,5/6	[10)]	**2,50**[7)] **3,00**[3)7)] **3,50**[5)8)]
	9,0/-	[10)]	**2,50**[7)] **3,50**[3)7)] **4,00**[5)8)]
Lightweight solid brick Vbl; ρ ≥ 1,8 as per EN 771-3 *e.g. KLB, DE* **8 DF** (490x240x115) Hammer drilling	5/4	**1,50**[7)] **2,00**[5)8)]	[10)]
	7,5/6	**2,00**[7)] **2,50**[3)7)]	[10)]
	10/8	**2,50**[7)] **3,00**[3)7)]	[10)]
	12,5/10	**2,50**[7)]	[10)]
	13,42/-	**3,00**[7)]	[10)]
Lightweight solid brick Vbl; ρ ≥ 1,4 as per EN 771-3 *e.g. KLB, DE* **8 DF** (245x240x240) Hammer drilling	5/4	**0,50**[7)] **0,60**[8)]	**2,00**[7)]
	7,5/6	**0,75**[7)] **0,90**[8)]	**2,50**[7)]
	8,65/-	**0,90**[7)]	**2,50**[7)]
Partial factor	γ_{Mm}[1)] **[-]**	**2,5**	

Footnotes see Annex C 11.

Table C17.1: Characteristic resistance F_{Rk}[12)] in [kN] for use in solid masonry - base material group "b"

Base material; bulk density [kg/dm³] [*Supplier Title, country*] Geometry, DF or nominal Size (L x W x H) [mm] and drilling method	Mean compressive strength as per EN 771 / Minimum compressive strength single brick[9)] [N/mm²]	Characteristic resistance F_{Rk} [kN] Temperature range 30/50 °C and 50/80 °C	
		URD 8	URD 10
		h_{nom} [mm]	
		≥ 50	≥ 50
Lightweight solid brick Vbl; ρ ≥ 1,6 as per EN 771-3 *e.g. KLB, DE* **8 DF** (245x240x240) Hammer drilling	2,5/2	[10)]	**1,20**[7)] **1,50**[5)8)]
	5/4	[10)]	**2,00**[7)] **2,50**[3)7)] **3,00**[5)8)]
	7,5/6	[10)]	**2,50**[7)] **4,00**[3)7)] **4,50**[5)8)]
	10/8	[10)]	**2,50**[7)] **4,00**[3)7)] **4,50**[5)8)]
	11,0/-	[10)]	[11)]
Lightweight solid brick Vbl; ρ ≥ 1,4 as per EN 771-3, *e.g. Tarmac, UK* (440x100x215) Hammer drilling	2,5/2	[10)]	**0,90**[7)]
	5/4	[10)]	**1,50**[7)]
	7,3/-	[10)]	**2,00**[7)] **2,50**[3)7)] **3,00**[5)8)]
Solid brick normal concrete, Vbn; ρ ≥ 1,8 as per EN 771-3 *e.g. Adolf Blatt, DE* (240x245x240) Hammer drilling	5/4	**1,50**[7)]	**1,50**[7)] **2,00**[8)]
	7,5/6	**2,00**[7)] **2,50**[8)]	**2,50**[7)] **3,00**[5)8)]
	10/8	**3,00**[7)]	**3,00**[7)] **3,50**[3)7)] **4,00**[5)8)]
	12,5/10	**3,00**[7)]	**3,50**[7)] **4,00**[3)7)] **5,00**[5)8)]
	15/12	**3,00**[7)]	**3,50**[7)] **5,00**[3)7)] **5,00**[5)8)]
	17,0/-	**3,00**[7)]	**4,00**[7)] **5,00**[3)7)] **5,00**[5)8)]
Partial factor	γ_{Mm}[1)] **[-]**	**2,5**	

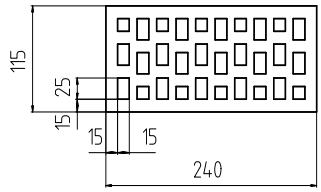
Footnotes see Annex C 11.

Table C18.1: Characteristic resistance F_{Rk}[12)] in [kN] for use in solid masonry - base material group "b"

Base material; bulk density [kg/dm³] [*Supplier Title, country*] Geometry, DF or nominal Size (L x W x H) [mm] and drilling method	Mean compressive strength as per EN 771 / Minimum compressive strength single brick[9)] [N/mm²]	Characteristic resistance F_{Rk} [kN] Temperature range 30/50 °C and 50/80 °C	
		URD 8	URD 10
		h_{nom} [mm]	
		≥ 50	≥ 50
Solid brick normal concrete Vbn; ρ ≥ 1,8 as per EN 771-3 *e.g. Tarmac, UK* (440x100x215) Hammer drilling	7,5/6	[10)]	**1,50**[7)] **2,00**[8)]
	10/8	[10)]	**2,00**[7)] **2,50**[8)]
	12,5/10	[10)]	**2,50**[7)] **3,00**[5)8)]
	15/12	[10)]	**3,00**[7)] **3,50**[5)8)]
	18,0/-	[10)]	**3,50**[7)] **4,00**[3)7)] **4,50**[5)8)]
Partial factor	γ_{Mm}[1)] **[-]**	**2,5**	

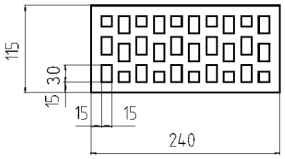
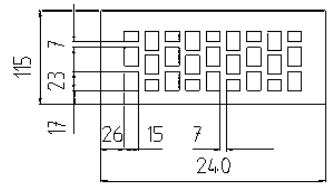
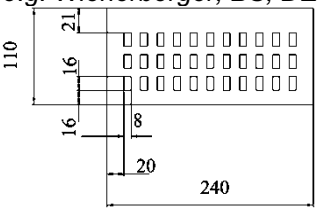
Footnotes see Annex C 11.

Table C18.2: Characteristic resistance F_{Rk}[12)] in [kN] for use in hollow or perforated brick masonry – base material group "c"

Base material; bulk density [kg/dm³] [*Supplier Title, country*] Geometry, DF or nominal Size (L x W x H) [mm] and drilling method	Mean compressive strength as per EN 771 / Minimum compressive strength single brick[9)] [N/mm²]	Characteristic resistance F_{Rk} [kN] Temperature range 30/50 °C and 50/80 °C	
		URD 8	URD 10
		h_{nom} [mm]	
		50	50
Perforated clay brick HLz; ρ ≥ 1,2 Form B, as per EN 771-1 *e.g. Wienerberger, DE*  **2 DF** (240x115x113) Rotary drilling	10/8	**0,40**[7)] **0,50**[8)]	**0,90**[7)]
	12,5/10	**0,60**[7)]	**1,20**[7)]
	15/12	**0,60**[7)] **0,75**[8)]	**1,50**[7)]
	20/16	**0,90**[7)]	**2,00**[7)]
	25/20	**1,20**[7)]	**2,50**[7)]
	26,7/-	**1,20**[7)] **1,50**[8)]	**2,50**[7)]
Partial factor	γ_{Mm}[1)] **[-]**	**2,5**	

Footnotes see Annex C 11.

Table C19.1: Characteristic resistance F_{Rk}[12)] in [kN] for use in hollow or perforated brick masonry – base material group "c"

Base material; bulk density [kg/dm³] [*Supplier Title, country*] Geometry, DF or nominal Size (L x W x H) [mm] and drilling method	Mean compressive strength as per EN 771 / Minimum compressive strength single brick[9)] [N/mm²]	Characteristic resistance F_{Rk} [kN] Temperature range 30/50 °C and 50/80 °C	
		URD 8	URD 10
		h_{nom} [mm]	
		50	50
Perforated clay brick HLz; ρ ≥ 1,0 as per EN 771-1 *e.g. Wienerberger, DE*  **2 DF** (240x115x113) Rotary drilling	10/8	**0,40**[7)]	**0,60**[7)] **0,75**[8)]
	12,5/10	**0,50**[7)]	**0,75**[7)] **0,90**[8)]
	15/12	**0,60**[7)]	**0,90**[7)]
	15,6/-	**0,60**[7)]	**0,90**[7)] **1,20**[8)]
Perforated clay brick VHLz; ρ ≥ 1,6 as per EN 771-1, *e.g. Wienerberger, DE*  **2 DF** (240x115x113) Rotary drilling	12,5/10	[10)]	**0,90**[7)]
	15/12	[10)]	**0,90**[7)] **1,20**[8)]
	20/16	[10)]	**1,50**[7)]
	25/20	[10)]	**1,50**[7)] **2,00**[8)]
	35/28	[10)]	**2,50**[7)]
	45/36	[10)]	**2,50**[7)]
	60/48	[10)]	**2,50**[7)]
	60,7/-	[10)]	**2,50**[7)]
Perforated clay brick HLz; ρ ≥ 1,5 as per EN 771 -1 *e.g. Wienerberger, BS, DE*  **DF** (240x110x52) Hammer drilling	10/8	**0,60**[7)]	**0,50**[7)] **0,60**[8)]
	12,5/10	**0,75**[7)]	**0,60**[7)] **0,75**[8)]
	15/12	**0,75**[7)] **0,90**[8)]	**0,75**[7)] **0,90**[8)]
	20/16	**1,20**[7)]	**0,90**[7)] **1,20**[8)]
	25/20	**1,50**[7)]	**1,20**[7)] **1,50**[8)]
	35/28	**2,00**[7)]	**1,50**[7)] **2,00**[8)]
	45/36	**2,50**[7)]	**2,00**[7)] **2,50**[8)]
	48,1/-	**2,50**[7)]	**2,50**[7)]
Partial factor	γ_{Mm}[1)] **[-]**	**2,5**	

Footnotes see Annex C 11.

Frame fixing URD

Performances
Characteristic resistance for use in hollow or perforated masonry

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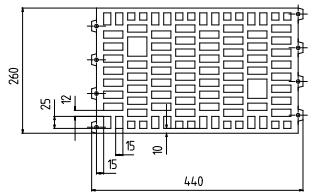
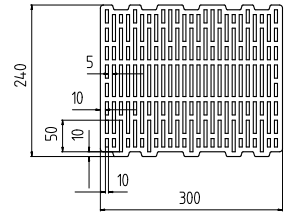
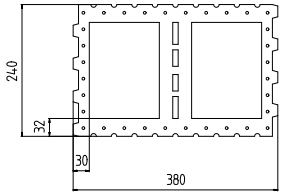
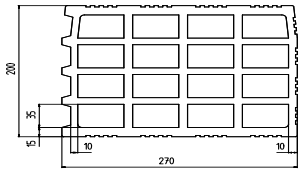
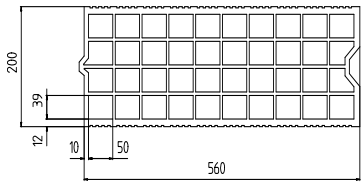
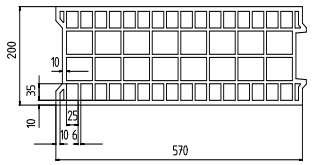
Table C20.1: Characteristic resistance F_{Rk}[12)] in [kN] for use in hollow or perforated brick masonry – base material group "c"

Base material; bulk density [kg/dm³] [*Supplier Title, country*] Geometry, DF or nominal Size (L x W x H) [mm] and drilling method	Mean compressive strength as per EN 771 / Minimum compressive strength single brick[9)] [N/mm²]	Characteristic resistance F_{Rk} [kN] Temperature range 30/50 °C and 50/80 °C	
		URD 8	URD 10
		h_{nom} [mm]	
		50	50
Perforated clay brick HLz; ρ ≥ 0,9 as per EN 771-1 *e.g. Schlagmann, DE*  **10 DF** (440x260x240) Rotary drilling	5/4	**0,40** **0,50**[2)]	**0,60**
	7,5/6	**0,60** **0,75**[2)]	**0,90**
	10/8	**0,90**	**1,20**
	10,9/-	**0,90** **1,20**[2)]	**1,20** **1,50**[2)]
Perforated clay brick HLz; ρ ≥ 0,7 as per EN 771-1 *e.g. Schlagmann Poroton T14, DE*  **10 DF** (240x300x240) Rotary drilling	5/4	[10)]	**0,30**
	6,4/-	[10)]	**0,30** **0,40**[2)]
	7,5/6	[10)]	**0,30** **0,40**[2)]
	7,7/-	[10)]	**0,30** **0,40**[2)]
Perforated clay brick HLz; ρ ≥ 0,7 as per EN 771-1 *e.g. Schlagmann Planfüllziegel, DE*  **12 DF** (380x240x240) Rotary drilling	2,5/2	**0,40** **0,50**[2)]	**0,60**
	5/4	**0,75** **0,90**[2)]	**1,20**
	7,5/6	**1,20** **1,50**[2)]	**2,00**
	8,0/-	**1,20** **1,50**[2)]	**2,00**
Partial factor	**γ_{Mm}[1)] [-]**	**2,5**	

Footnotes see Annex C 11.

Table C21.1: Characteristic resistance F_{Rk}[12)] in [kN] for use in hollow or perforated brick masonry – base material group "c"

Base material; bulk density [kg/dm³] [*Supplier Title, country*] Geometry, DF or nominal Size (L x W x H) [mm] and drilling method	Mean compressive strength as per EN 771 / Minimum compressive strength single brick[9)] [N/mm²]	Characteristic resistance F_{Rk} [kN] Temperature range 30/50 °C and 50/80 °C	
		URD 8	URD 10
		h_{nom} [mm]	
		50	50
Perforated clay brick HLz; ρ ≥ 0,6 as per EN 771-1, *e.g. Imerys Gelimatic, FR*  (500x200x270) Rotary drilling	5/4	10)	**0,50**[7)]
	6,5/-	10)	**0,60**[7)] **0,75**[8)]
Perforated clay brick HLz; ρ ≥ 0,6 as per EN 771-1, *e.g. Imerys Optibric, FR*  (560x200x275) Rotary drilling	5/5	10)	**0,50**[7)] **0,60**[8)]
	7,5/6	10)	**0,75**[7)] **0,90**[8)]
	10/8	10)	**0,90**[7)] **1,20**[8)]
	10,5/-	10)	**1,20**[7)]
Perforated clay brick HLz; ρ ≥ 0,6 as per EN 771-1, *e.g. Bouyer Leroux BGV, FR*  (570x200x315) Rotary drilling	5/4	10)	**0,60**[7)] **0,75**[8)]
	7,4/-	10)	**0,90**[7)] **1,20**[8)]
Partial factor	γ_{Mm}[1)] **[-]**	**2,5**	

Footnotes see Annex C 11.

Frame fixing URD

Performances
Characteristic resistance for use in hollow or perforated masonry

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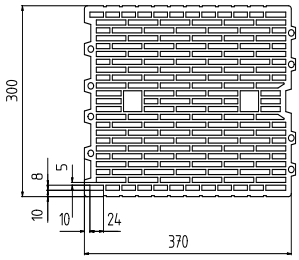
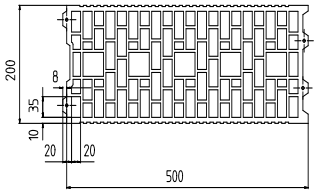
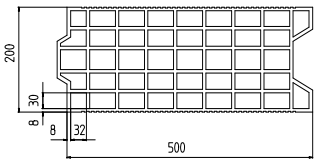
Table C22.1: Characteristic resistance F_{Rk}[12)] in [kN] for use in hollow or perforated brick masonry – base material group "c"

Base material; bulk density [kg/dm³] [*Supplier Title, country*] Geometry, DF or nominal Size (L x W x H) [mm] and drilling method	Mean compressive strength as per EN 771 / Minimum compressive strength single brick[9)] [N/mm²]	Characteristic resistance F_{Rk} [kN] Temperature range 30/50 °C and 50/80 °C	
		URD 8	URD 10
		h_{nom} [mm]	
		50	50
Perforated clay brick HLz; ρ ≥ 0,7 as per EN 771-1, *e.g. Wienerberger Porotherm 30 R, FR*  (370x300x250) Rotary drilling	7,5/6	10)	**0,40**[7)]
	10/8	10)	**0,50**[7)] **0,60**[8)]
	10,7/-	10)	**0,50**[7)] **0,60**[8)]
Perforated clay brick HLz; ρ ≥ 0,7 as per EN 771-1 *e.g. Wienerberger Porotherm GF R20, FR*  (500x200x275) Rotary drilling	5/4	10)	10)
	7,5/6	10)	**0,40** **0,50**[2)]
	10/8	10)	**0,60**
	11,8/-	10)	**0,60** **0,75**[2)]
Perforated clay brick HLz; ρ ≥ 0,7 as per EN 771-1, *e.g. Terreal Calibric, FR*  (500x200x220) Rotary drilling	5/4	10)	**0,30** **0,40**[2)]
	7,5/6	10)	**0,50** **0,60**[2)]
	9,4/-	10)	**0,60** **0,75**[2)]
Partial factor	**γ_{Mm}[1)] [-]**	**2,5**	

Footnotes see Annex C 11.

Frame fixing URD

Performances
Characteristic resistance for use in hollow or perforated masonry

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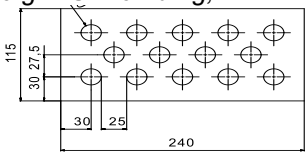
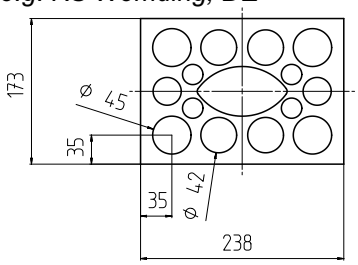
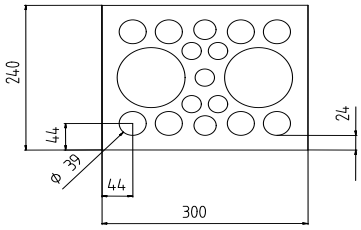
Table C23.1: Characteristic resistance F_{Rk}[12)] in [kN] for use in hollow or perforated brick masonry – base material group "c"

Base material; bulk density [kg/dm³] [*Supplier Title, country*] Geometry, DF or nominal Size (L x W x H) [mm] and drilling method	Mean compressive strength as per EN 771 / Minimum compressive strength single brick[9)] [N/mm²]	Characteristic resistance F_{Rk} [kN] Temperature range 30/50 °C and 50/80 °C	
		URD 8	URD 10
		h_{nom} [mm]	
		50	50
Hollow calcium silicate brick KSL; ρ ≥ 1,4 as per EN 771-2 *e.g. KS Wemding, DE*  **2 DF** (240x115x113) Hammer drilling	7,5/6	**0,75**[7)] **0,90**[8)]	**0,90**[7)]
	10/8	**0,90**[7)] **1,20**[8)]	**1,20**[7)] **1,50**[8)]
	12,5/10	**1,20**[7)] **1,50**[8)]	**1,50**[7)]
	15/12	**1,50**[7)] **2,00**[8)]	**2,00**[7)]
	17,6/-	**2,00**[7)]	**2,00**[7)] **2,50**[8)]
Hollow calcium silicate brick KSL; ρ ≥ 1,4 as per EN 771-2 *e.g. KS Wemding, DE*  **3 DF** (240x175x113) Hammer drilling	7,5/6	[10)]	**0,60**[7)] **0,75**[8)]
	10/8	**0,50**[7)]	**0,90**[7)]
	12,5/10	**0,60**[7)]	**1,20**[7)]
	15/12	**0,75**[7)]	**1,20**[7)] **1,50**[8)]
	20/16	**0,90**[7)] **1,20**[8)]	**1,50**[7)] **2,00**[8)]
	25/20	**1,20**[7)]	[10)]
	27,7/-	**1,20**[7)] **1,50**[8)]	[10)]
Hollow calcium silicate brick KSL; ρ ≥ 1,4 as per EN 771-2 *e.g. KS Wemding, DE*  **5 DF** (300x240x113) Hammer drilling	7,5/6	**0,40**[7)] **0,50**[8)]	**1,20**[7)]
	10/8	**0,50**[7)] **0,60**[8)]	**1,50**[7)]
	12,5/10	**0,60**[7)] **0,75**[8)]	**2,00**[7)]
	15/12	**0,75**[7)] **0,90**[8)]	**2,00**[7)] **2,50**[8)]
	20/16	**0,90**[7)] **1,20**[8)]	**2,50**[7)]
	25/20	**1,20**[7)] **1,50**[8)]	**2,50**[7)]
	35/28	**2,00**[7)]	**2,50**[7)]
	36,4/-	**2,00**[7)]	**2,50**[7)]
Partial factor	γ_{Mm}[1)] **[-]**	**2,5**	

Footnotes see Annex C 11.

Frame fixing URD

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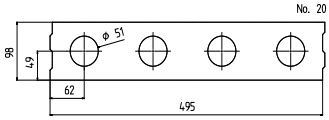
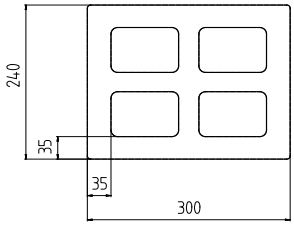
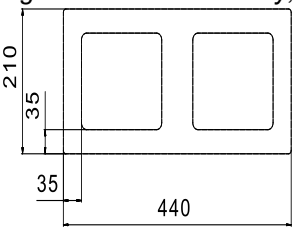
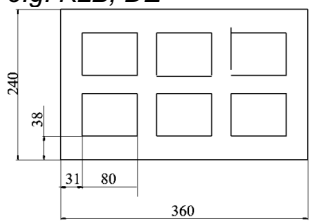
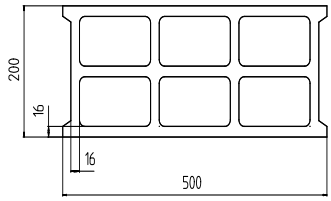
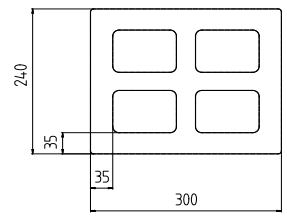
Table C24.1: Characteristic resistance F_{Rk}[12)] in [kN] for use in hollow or perforated brick masonry – base material group "c"

Base material; bulk density [kg/dm³] [*Supplier Title, country*] Geometry, DF or nominal Size (L x W x H) [mm] and drilling method	Mean compressive strength as per EN 771 / Minimum compressive strength single brick[9)] [N/mm²]	Characteristic resistance F_{Rk} [kN] Temperature range 30/50 °C and 50/80 °C	
		URD 8	URD 10
		h_{nom} [mm]	
		50	50
Hollow calcium silicate brick KSL; ρ ≥ 1,2 as per EN 771-2 *e.g. KS Wemding, P10, DE*  (495x98x245) Hammer drilling	2,5/2	**0,30** **0,40[2)]**	**0,60** **0,75[2)]**
	5/4	**0,60** **0,75[2)]**	**1,20** **1,50[2)]**
	7,5/6	**0,90** **1,20[2)]**	**2,00** **2,50[2)]**
	9,4/-	**1,20** **1,50[2)]**	**2,00** **2,50[2)]**
Hollow brick light-weight concrete Hbl; ρ ≥ 1,4 as per EN 771-3, *e.g. KLB, DE*  (300x240x240) Hammer drilling	2,5/2	**[10)]**	**1,50[7)]** **2,00[8)]**
	2,6/-	**[10)]**	**2,00[7)]**
Hollow brick light-weight concrete Hbl; ρ ≥ 1,2 as per EN 771-3, *e.g. Roadstone masonry, IE*  (440x210x215) Hammer drilling	2,5/2	**0,75[7)]** **0,90[8)]**	**0,90[7)]** **1,20[8)]**
	5/4	**1,50[7)]** **2,00[8)]**	**2,00[7)]**
	7,5/6	**2,50[7)]**	**2,50[7)]**
	10/8	**2,50[7)]**	**2,50[7)]**
	11,3/-	**2,50[7)]**	**2,50[7)]**
Partial factor	**γ_{Mm}[1)] [-]**	**2,5**	

Footnotes see Annex C 11.

Table C25.1: Characteristic resistance F_{Rk}[12)] in [kN] for use in hollow or perforated brick masonry – base material group "c"

Base material; bulk density [kg/dm³] [*Supplier Title, country*] Geometry, DF or nominal Size (L x W x H) [mm] and drilling method	Mean compressive strength as per EN 771 / Minimum compressive strength single brick[9)] [N/mm²]	Characteristic resistance F_{Rk} [kN] Temperature range 30/50 °C and 50/80 °C	
		URD 8	URD 10
		h_{nom} [mm]	
		50	50
Hollow brick light-weight concrete Hbl; ρ ≥ 1,0 as per EN 771-3, *e.g. KLB, DE*  (360x240x240) Hammer drilling	2,5/2	**0,50**[7)] **0,60**[8)]	[10)]
	5/4	**1,20**[7)]	[10)]
	6,3/-	**1,20**[7)] **1,50**[8)]	[10)]
Hollow brick light-weight concrete Hbl; ρ ≥ 0,9 as per EN 771-3, *e.g. Sepa Parpaing, FR*  (500x200x200) Rotary drilling	2,5/2	[10)]	**0,30** **0,60**[7)]
	5/4	**0,30**	**0,60** **1,20**[7)]
	5,9/-	**0,30** **0,40**[2)]	**0,75** **1,20**[7)] **1,50**[8)]
	7,5/6	**0,30** **0,40**[2)]	**0,75** **1,20**[7)] **1,50**[6)]
	8,4/-	**0,30** **0,40**[2)]	**0,75** **1,20**[7)] **1,50**[6)]
Hollow brick normal concrete Hbn; ρ ≥ 1,6 as per EN 771-3, *e.g. Adolf Blatt, DE*  (300x240x240) Hammer drilling	2,5/2	[10)]	**1,50**[7)]
	5/4	[10)]	**2,50**[7)]
	7,3/-	[10)]	**2,50**[7)]
Partial factor	γ_{Mm}[1)] **[-]**		

Footnotes see Annex C 11.

Frame fixing URD

Performances
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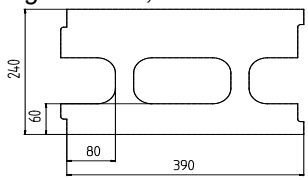
Table C26.1: Characteristic resistance F_{Rk}[12)] in [kN] for use in hollow or perforated brick masonry – base material group "c"

Base material; bulk density [kg/dm³] [*Supplier Title, country*] Geometry, DF or nominal Size (L x W x H) [mm] and drilling method	Mean compressive strength as per EN 771 / Minimum compressive strength single brick[9)] [N/mm²]	Characteristic resistance F_{Rk} [kN] Temperature range 30/50 °C and 50/80 °C	
		URD 8	URD 10
		h_{nom} [mm]	
		50	50
Heat insulation brick WDB; ρ ≥ 0,7 *e.g. Gisoton, DE*  (390x240x240) Hammer drilling	2,5/2	[10)]	**1,50**[7)]
	3,7/-	[10)]	**2,00**[7)] **2,50**[8)]
Partial factor	γ_{Mm}[1)] **[-]**	**2,5**	

Footnotes see Annex C 11.

Table C26.2: Characteristic resistance F_{Rk} in [kN] for use in unreinforced autoclaved aerated concrete – base material group "d"

Base material Size (L x W x H) [mm] and drilling method	Mean compressive strength as per EN 771-4 $f_{cm,decl}$ [N/mm²]	Characteristic resistance F_{Rk} [kN] Temperature range 30/50 °C and 50/80 °C	
		URD 8	URD 10
		h_{nom} [mm]	
		≥ 50	≥ 50
Autoclaved aerated concrete as per EN 771-4 e.g. (500x120x300) e.g. (500x250x300) Hammer drilling	**≥ 2,0**	[5)]	**0,40**[3)] **0,50**[2)3)]
	≥ 3,0	[5)]	**0,40**[3)] **0,50**[2)3)]
	≥ 4,0	[5)]	**0,75** **0,90**[2)]
	≥ 6,0	[5)]	**0,75** **0,90**[4)]
Partial factor	γ_{MAAC}[1)] **[-]**	**2,0**	

1) In absence of other national regulations.
2) Only valid for temperature range 30/50° C.
3) The characteristic resistance F_{Rk} is also valid for installation in the stretcher and in the header side of the blocks.
4) Only valid for edge distance $c_{1,min} \geq 120$ mm $c_{2,min} \geq 180$ mm.
5) No performance assessed.