ZAVOD ZA GRADBENIŠTVO SLOVENIJE
SLOVENIAN NATIONAL BUILDING AND CIVIL ENGINEERING INSTITUTE

Dimičeva 12,
1000 Ljubljana, Slovenija
Tel.: +386 (0)1 280 44 72, +386 (0)1-280 45 37
Fax: +386 (0)1 280 44 84
e-mail: info.ta@zag.si
http://www.zag.si

Member of
www.eota.eu

European Technical Assessment

ETA-19/0245
of 21.03.2022

English version prepared by ZAG

General Part

Technical Assessment Body issuing the European Technical Assessment	**ZAG Ljubljana**
Komercialno ime gradbenega proizvoda	**X3**
Product family to which the construction product belongs	**33: Plastic anchor for multiple use in concrete and masonry for non-structural applications**
Manufacturer	**FRIULSIDER S.p.A.** **via Trieste, 1** **33048 San Giovanni al Natisone (UD)** **Italy** www.friulsider.com
Manufacturing plant	**FRIULSIDER S.p.A.** **via Trieste, 1** **33048 San Giovanni al Natisone (UD)** **Italy**
This European Technical Assessment contains	24 pages including 3 annexes, which form an integral part of the document
This European Technical Assessment is issued in according to Regulation (EU) No 305/2011, on the basis of	EAD 330284-00-0604: Plastic anchors for redudant non-structural systems in concrete and masonry, June 2018
This version replaces	ETA-19/0245 issued on 12.03.2020

Specific parts

1 Technical description of the product

The X3 is a plastic anchor consisting of a plastic sleeve made of polyamide and an accompanying specific screw of galvanized steel 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 installed anchor is shown in Annex A (1/4).

2 Specification of the intended use(s) in accordance with the applicable European Assessment Document (hereinafter EAD)

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

The provisions made in this European Technical Assessment are based on an assumed working life of the anchor of 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the manufacturer, 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 this assessment

3.1 Safety in case of fire (BWR 2)

According to the Technical Report EOTA TR 020 "Evaluation of anchorages in concrete concerning resistance to fire" it can be assumed that for fastening of facade systems the load bearing behaviour of the Plastic anchor X3 ϕ 10 has a sufficient resistance to fire at least 90 minutes (R90) if the admissible load $[F_{Rk}/(\gamma_M \times \gamma_F)]$ is ≤ 0,8 kN (no permanent centric tension load).

3.2 Safety in use (BWR 4)

The basic work requirements for safety in use are listed in Annex C.

3.3 General aspects relating to fitness for use

Durability and serviceability are only ensured if specifications of intended use according to Annex B (1/3) are kept.

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

According to the decision 97/463/EC of the European Commission[1] the system of assessment and verification of constancy of performance (see Annex V to regulation (EU No 305/2011) 2+ apply.

[1] Official Journal of the European Communities L 198 of 25.07.1997

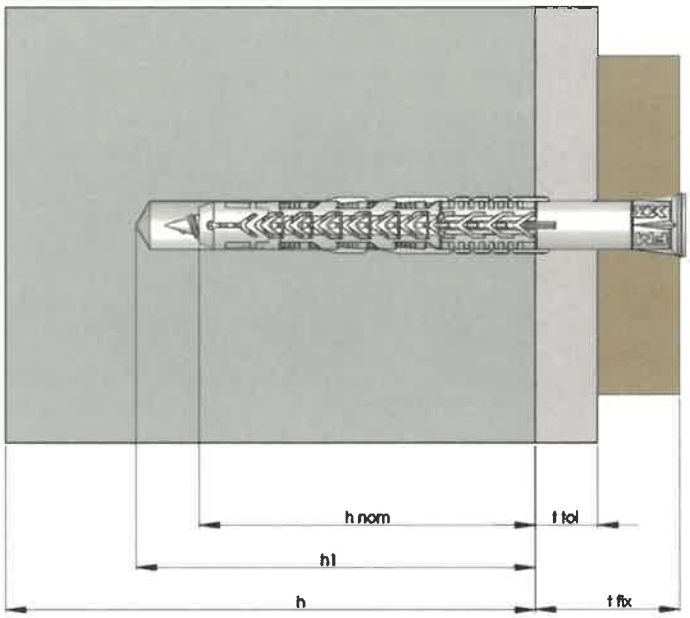
5 Technical details necessary for the implementation of the AVCP system, as provided in the applicable European Assessment Document

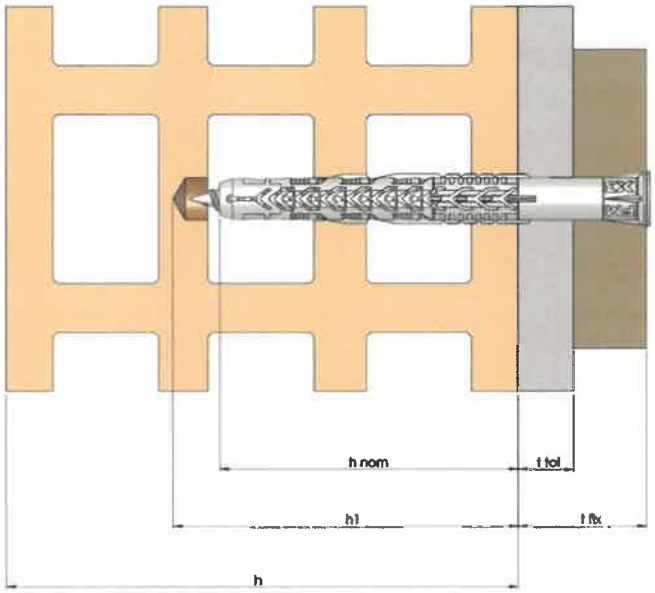
Technical details necessary for the implementation of the AVCP system are laid down in the Control plan deposited at the Slovenian National Building and Civil Engineering Institute (ZAG Ljubljana).

Issued in Ljubljana on 21.03.2021

ZAVOD ZA GRADBENIŠTVO SLOVENIJE LJUBLJANA 17

Signed by:
Franc Capuder, M.Sc.
Head of Service of TAB





h_1 = depth of drill hole to deepest point
h_{nom} = overall plastic anchor embedment depth in base material
h = thickness of member
t_{tol} = thickness of non-structural layer
t_{fix} = thickness of fixture

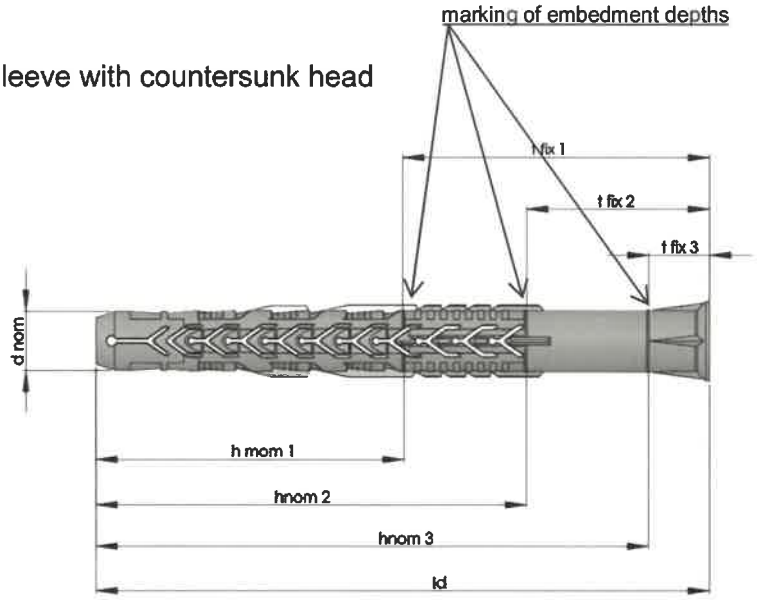
X3

Product description
Installed condition

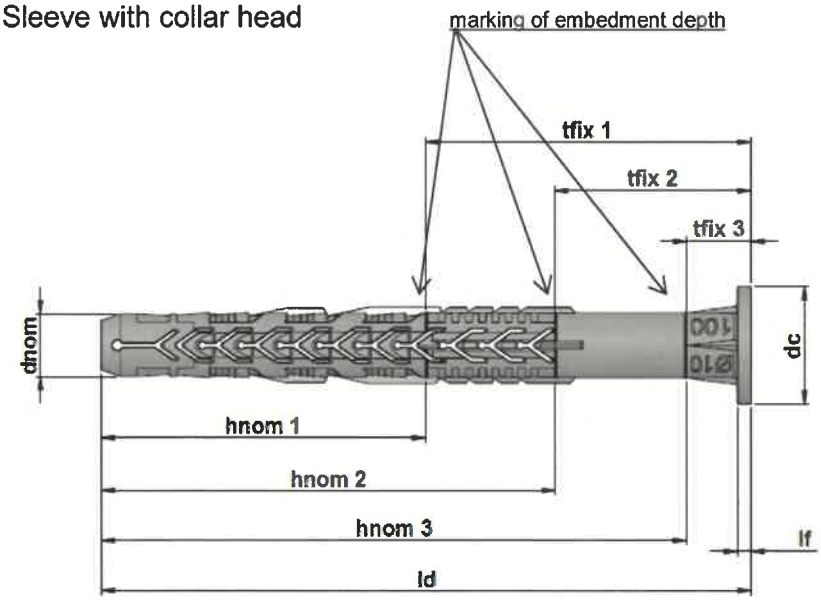
Annex A (1/4)

Plastic sleeve

Sleeve with countersunk head



Sleeve with collar head



Marking:
Producer, Type, size
e.g.

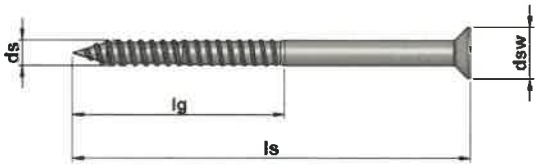
FM
or
FRIULSIDER

X3
Ø10x120

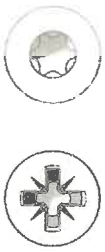
X3	
Product description Anchor types - sleeves	**Annex A (2/4)**

Special screw

Screw with countersunk head (used for both versions of a sleeve)

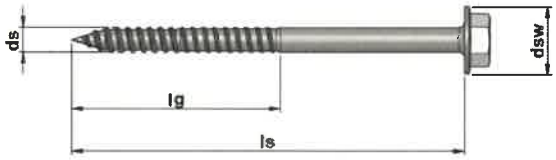


head of screw for galvanised steel



head of screw for stainless steel A4-70

Screw with hexagonal head (used for both versions of a sleeve)



head of screw for galvanised steel

head of screw for stainless steel A4-70

X3	
Product description Anchor types - screws	**Annex A (3/4)**

Table A1: Anchor dimensions

Anchor type			**X3 8**	**X3 10**
Overal plastic anchor embedment depth	$h_{nom} \geq$	[mm]	40-50	50-70-90
Plastic sleeve				
Plastic sleeve diameter	d_{nom}	[mm]	8	10
Length of plastic sleeve	l_d	[mm]	60-200	60-400
Diameter of collar head	d_c	[mm]	-	18
Thickness of collar head	l_f	[mm]	-	2,2
Thickness of fixture	t_{fix}	[mm]	1-160	1-350
Special screw				
Screw diameter	d_s	[mm]	6	7
Length of screw	l_s	[mm]	68-208	68-408
Minimum length of thread	l_g	[mm]	58	58
Head diameter-countersunk	d_{sw}	[mm]	11,5	13,5
Head diameter-hexhead	d_{sw}	[mm]	-	19
Head screw hexhead	SW	[mm]	-	13

Table A2: Materals

Part	**Material**
Anchor sleeve	Polyamide PA 6 acc. To ISO 1874 - grey color
Special screw	steel ϕ 6; white galvanized 5µm acc. to EN ISO 4042 grey galvanic coating 10 µm acc. to EN ISO 4042 $f_{uk} \geq 600$ MPa, $f_{yk} \geq 480$ MPa stainless A4-70 – 1.4401 or 1.4404 or 1.4571 or 1.4578 $f_{uk} \geq 700$ MPa, $f_{yk} \geq 450$ MPa steel ϕ 7; white galvanized 5µm acc. to EN ISO 4042 grey galvanic coating 10 µm acc. to EN ISO 4042 $f_{uk} \geq 600$ MPa, $f_{yk} \geq 480$ MPa stainless A4-70 – 1.4401 or 1.4404 or 1.4571 or 1.4578 $f_{uk} \geq 700$ MPa, $f_{yk} \geq 450$ MPa

X3

Product description

Dimensions and materials

Annex A (4/4)

ZAVOD ZA GRADBENIŠTVO SLOVENIJE LJUBLJANA 17

Specifications of intended use

Anchorages subject to:

- Static and quasi static load
- Multiple fixing for non-structural applications

Base materials:

- Reinforced and non-reinforced normal weight concrete C12/15 to C50/60 (base material group A) according EN 206: 2013+A1:2016;
- Solid masonry (base material group B), according to Annex C1 and C3;
- Hollow or perforated masonry (base material group C) according to Annex C1, C4-C11;
- Mortar strength class of the masonry has to be at least M 2,5 according to EN 998-2: 2016;
- Autoclaved Aerated Concrete (base material group D) according to Annex C1 and C12;
- For other base materials of the base material groups A, B, C and D the characteristic resistance of the anchor may be determined by job site tests according to EOTA TR 051, Edition April 2018.

Temperature range:

- a: -40°C to +40°C (max. long term temperature +24°C and max. short term temperature +40°C)
- b: -40°C to +80°C (max. long term temperature +50°C and max. short term temperature +80°C)

Use conditions (Environmental conditions):

- The specific screw made of galvanized steel may only be used in structures subject to dry internal conditions.
- The specific screw made of galvanized steel 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 the moisture into the anchor shaft is prevented. Therefore there shall be an external cladding or a ventilated rainscreen mounted in the front of the screw and the head of the screw itself shall be coated with additional zinc spray or a soft plastic, permanently elastic bitumen-oil – combination coating (e.g. undercoating of body cavity protection for cars).
- The specific screw made of stainless steel may be used in structures subject to dry internal conditions and also in structures subject to external atmospheric exposure (including industrial and marine environment), or exposure in permanently damp internal conditions, if no particular aggressive conditions exist. Such 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 design of anchorages is carried out in compliance with Technical Report TR 064:2018-05, under the responsibility of an engineer experienced in anchorages.
- 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.

Installation:

- Anchor installation carried out by appropriately qualified personnel under the supervision of the person responsible for technical matters on site.
- Anchor installation in accordance with the manufacturer's specifications and drawings using the tools indicated in this European Technical Approval
- Drilling method according Annex C3 to C12 for base material groups A, B, C and D.
- Temperature during installation of the anchor ≥ -10 °C (plastic sleeve and base material)
- Checks before placing the anchor, to ensure that the characteristic values of the base material in which the anchor is to be placed, is identical with the values, which the characteristic loads apply for.
- Placing drill holes without damaging the reinforcement.
- Holes to be cleaned of drilling dust.
- In case of aborted hole: New drilling at a minimum distance away of twice the depth of the aborted hole or smaller distance if the aborted drill hole is filled with high strength mortar.
- The plastic sleeve is inserted through the fixture by slight hammer blows and the special screw is screwed in until the head of the screw touches the sleeve. The anchor is correct mounted, if there is no turn-through of the plastic sleeve in the drill hole and if slightly move on turning of the screw is impossible after the complete turn-in of the screw.

X3	
Intended use Specification	**Annex B (1/3)**

Table B1: Installation parameters

Anchor type			X3 8	X3 10
Drill hole diameter	d_0=	[mm]	8	10
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	8,45	10,45
Depth of drill hole to deepest point	$h_{1,1} \geq$	[mm]	55	65
	$h_{1,2} \geq$	[mm]	65	85
	$h_{1,3} \geq$	[mm]	-	105
Overal plastic anchor embedment depth[1)]	$h_{nom,1}$	[mm]	40[2)]	50[2), 3), 4)]
	$h_{nom,2}$	[mm]	50[2), 3), 4)]	70[2), 4), 5)]
	$h_{nom,3}$	[mm]	-	90[5)]
Diameter of clearance hole in the fixture	d_f	[mm]	8,5	10,5
Thickness of fixture	t_{fix}	[mm]	1-160	1-350

[1)] See Annex A1
[2)] base material group "a" – concrete
[3)] base material group "b" – solid clay masonry
[4)] base material group "c" – hollow or perforated masonry
[5)] base material group "d" – autoclaved aerated concrete

Table B2: Minimum thickness of member, edge distance and anchor spacing in concrete

				X3 8		X3 10	
Overall plastic anchor embedment depth		h_{nom}	[mm]	40	50	50	70
Minimum thickness of member		h_{min}	[mm]	100	100	100	120
Minimum spacing and edge distance	C12/15	s_{min}	[mm]	85	85	70 for c ≥ 140	70 for c ≥ 140
		c_{min}	[mm]	70	70	70 for s ≥ 210	70 for s ≥ 210
Minimum spacing and edge distance	≥ C16/20	s_{min}	[mm]	60	60	50 for c ≥ 100	50 for c ≥ 100
		c_{min}	[mm]	50	50	50 for s ≥ 150	50 for s ≥ 150
Characteristic edge distance	C12/15	$c_{cr,N}$	[mm]	85	85	140	140
	≥ C16/20	$c_{cr,N}$	[mm]	60	60	100	100

X3

Intended use

Installation parameters, minimum thickness, edge distance and spacing

Annex B (2/3)

Table B3: Minimum thickness of member, edge distance and anchor spacing in masonry

X3				Masonry
Minimum thickness of member		h_{min}	[mm]	120[1)]
Single anchor				
	Minimum spacing	s_{min}	[mm]	250
	Minimum edge distance	c_{min}	[mm]	100
Anchor group				
	Spacing perpendicular to free edge	$s1_{min}$	[mm]	100
	Spacing parallel to free edge	$s2_{min}$	[mm]	100
	Minimum edge distance	c_{min}	[mm]	100

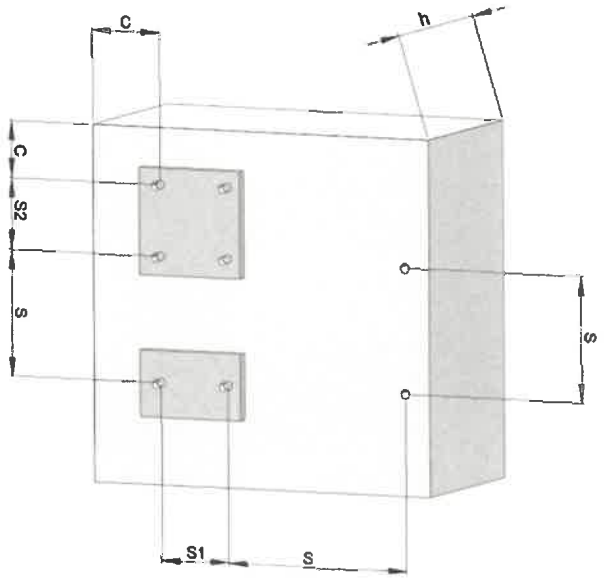
[1)] See Annexes C3 to C12

[2)] Values in brackets valid only for solid masonry Mz 2,0/20 verzahnt (according to Table C1) for size X3 10

Table B4: Minimum thickness of member, edge distance and anchor spacing in autoclaved aerated concrete

X3				AAC2 – AAC6
Minimum thickness of member		h_{min}	[mm]	240
Single anchor				
	Minimum spacing	s_{min}	[mm]	250
	Minimum edge distance	c_{min}	[mm]	100 (105)[1)]
Anchor group				
	Spacing perpendicular to free edge	$s1_{min}$	[mm]	100
	Spacing parallel to free edge	$s2_{min}$	[mm]	100
	Minimum edge distance	c_{min}	[mm]	100

[1)] Values in brackets valid only for solid AAC6 for h_{nom} = 90 mm



X3

Intended use

Minimum thickness, edge distance and spacing

Annex B (3/3)

Table C1: Base material

Base material	Dimensions L×B×H [mm]	Compressive strength [MPa]	Bulk density [kg/m³]	Annex
Concrete				
Concrete ≥ C12/15	EN 206			Annex C2
Solid masonry				
Solid brick - MZ 2,0/20 verzahnt 3DF acc. to EN 771-1	247×175×113	20,0	2000	Annex C3
Hollow or perforated masonry				
Hollow clay brick – Poroton P800 30.19.25 acc. to EN 771-1	250×300×190	10,5	898	Annex C4
Hollow clay brick – Pth BIO PLAN 45-25/19,9 acc. to EN 771-1	250×450×199	12,0	960	Annex C5
Hollow clay brick – Doppo UNI 12×25×12 acc.to EN 771-1	250×120×120	22,0	940	Annex C6
Hollow clay brick – Pth BIO PLAN 45-25/19,9T-0,09 acc. to EN 771-1	250×450×199	8,0	830	Annex C7
Hollow clay brick – SM B 15/19 acc.to EN 771-1	290×150×190	28,0	900	Annex C8
Hollow clay brick – Blocchi leggeri 12×25×50 acc.to EN 771-1	500×120×250	8,0	560	Annex C9
Hollow clay brick – Poroton P700 TS 35.24,5.25 inc.35 acc.to EN 771-1	250×350×245	11,0	751	Annex C10
Hollow lightweight concrete brick – Leca Universalblokk 20 acc.to EN 771-3	500×200×250	3,0	770	Annex C11
AAC2	625×200×240	2,0	350	Annex C12
AAC6	625×200×240	6,0	650	

Table C2: Characteristic bending resistance of the special screw in concrete, masonry and autoclaved aerated concrete

		Galvanized steel		Stainless steel A4-70	
		X3 8	X3 10	X3 8	X3 10
Characteristic bending resistance	$M_{Rk,s}$ [Nm]	14,14	22,71	12,98	25,92
Partial safety factor	γ_{Ms} [1)]	1,25	1,25	1,56	1,56

[1)] In absence of other national regulations

X3

Performance

Base material, characteristic bending resistance of the screw

Annex C (1/14)

Table C3: Characteristic resistance for use in concrete

Anchor type				**X3 8**		**X3 10**	
Overall plastic anchor embedment depth		h_{nom}	[mm]	40	50	50	70
Steel failure (special screw)							
Characteristic tension resistance	GVZ	$N_{Rk,s}$	[kN]	12,74		19,32	
	A4			14,87		22,54	
Partial safety factor	GVZ	γ_{Ms} [1]	[-]	1,50		1,50	
	A4			1,88		1,88	
Characteristic shear resistance	GVZ	$V_{Rk,s}$	[kN]	8,07		11,07	
	A4			8,02		12,71	
Partial safety factor	GVZ	γ_{Ms} [1]	[-]	1,25		1,25	
	A4			1,56		1,56	
Pull-out failure (plastic sleeve)							
Concrete ≥ C16/20							
Characteristic resistance	24°C[2]/40°C[3]	$N_{Rk,p}$	[kN]	1,5	3,0	4,5	6,5
	50°C[2]/80°C[3]	$N_{Rk,p}$	[kN]	1,2	2,5	4,0	5,5
Partial safety factor		γ_{Mc} [1]	[-]	1,8			
Concrete C12/15							
Characteristic resistance	24°C[2]/40°C[3]	$N_{Rk,p}$	[kN]	1,2	3,0	4,5	5,0
	50°C[2]/80°C[3]	$N_{Rk,p}$	[kN]	1,2	2,5	4,0	4,5
Partial safety factor		γ_{Mc} [1]	[-]	1,8			
Concrete cone failure and concrete edge failure for single anchor and anchor group							
Tension load[4]							
$N_{Rk,c} = 7{,}2 \cdot \sqrt{f_{ck,cube}} \cdot h_{ef}^{1,5} \cdot \frac{c}{c_{cr,N}} = N_{Rk,p} \cdot \frac{c}{c_{cr,N}}$ with: $h_{ef}^{1,5} = \frac{N_{Rk,p}}{7{,}2 \cdot \sqrt{f_{ck,cube}}}$, $\frac{c}{c_{cr,N}} \le 1$							
Shear load[4]							
$V_{Rk,c} = 0{,}45\sqrt{d_{nom}} \cdot \left(\frac{h_{nom}}{d_{nom}}\right)^{0,2} \cdot \sqrt{f_{ck,cube}} \times c_1^{1,5} \times 0{,}5 \times \sqrt{\frac{c_2}{1{,}5c_1}} \cdot \sqrt{\frac{h}{1{,}5c_1}}$ with: $\sqrt{\frac{c_2}{1{,}5c_1}} \le 1$, $\sqrt{\frac{h}{1{,}5c_1}} \le 1$							
c_1 edge distance closest to the edge in loading direction c_2 edge distance perpendicular to direction 1 $f_{ck,cube}$ nominal characteristic concrete compression strength (based on cubes), values for C50/60 at maximum							
Partial safety factor		γ_{Mc} [1]	[-]	1,8			

[1] In absence of other national regulations
[2] Maximum long term temperature
[3] Maximum short term temperature
[4] The design method according Technical Report TR 064:064:2018-05 is to be used

X3

Performance

Characteristic resistance in concrete (base material group "a")

Annex C (2/14)

Base material solid masonry: Solid brick

Table C4: Brick data

Description of brick			
Type of brick			Solid brick MZ 2,0/20 verzahnt 3DF
Bulk density	$\rho \geq$	[kg/dm^3]	2,0
Standard			EN 771-1
Producer of brick			Hörl &Hartmann Ziegeltechnik GmbH, Germany
Format (measurement)		[mm]	≥ 247/175/113
Minimum thickness of member	h_{min}	[mm]	175

Table C5: Installation parameters

Anchor size			**X3 8**	**X3 10**
Overall plastic embedment depth	h_{nom} =	[mm]	50	50
Drill hole diameter	d_0 =	[mm]	8	10
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	8,45	10,45
Depth of drill hole to deepest point	$h_1 \geq$	[mm]	65	65
Drill method		[-]	Hammer dilling	
Diameter of clearance hole in the fixture	d_f	[mm]	8,5	10,5

Table C6: Characteristic resistance F_{Rk} [1)] for single anchor

Anchor size			**X3 8**	**X3 10**
Overall plastic embedment depth	h_{nom} =	[mm]	50	50
Solid clay brick $f_b \geq 20$ MPa	24°C[3)]/40°C[4)]	[kN]	3,5	4,0
Characteristic resistance F_{Rk}	50°C[3)]/80°C[4)]	[kN]	3,5	3,5
Partial safety factor	γ_{Mm} [2)]	[-]	2,5	

[1)] Characteristic resistance F_{Rk} for tension, shear or combined tension and shear loading. The characteristic resistance is valid for single plastic anchor or for group of two or four plastic anchors with a spacing equal or larger than the minimum spacing s_{min} according to Table B3. The specific conditions for the design method have to be considered according to Annex B1.
[2)] In absence of other national regulations
[3)] Maximum long term temperature
[4)] Maximum short term temperature

X3

Performance

Characteristic resistance in solid clay brick - Mz 2,0/20 verzahnt – 3DF (base material group "b")

Annex C(3/14)

Base material hollow masonry: Hollow clay brick – Poroton P800 30.19.25

Table C7: Brick data

Description of brick			
Type of brick			Hollow clay brick - Poroton P800 30.19.25
Bulk density	$\rho \geq$	[kg/dm^3]	0,898
Standard			EN 771-1
Producer of brick			Fornaci Laterizi Danesi Spa, Italy
Format (measurement)		[mm]	≥ 250/300/190
Minimum thickness of member	h_{min}	[mm]	250

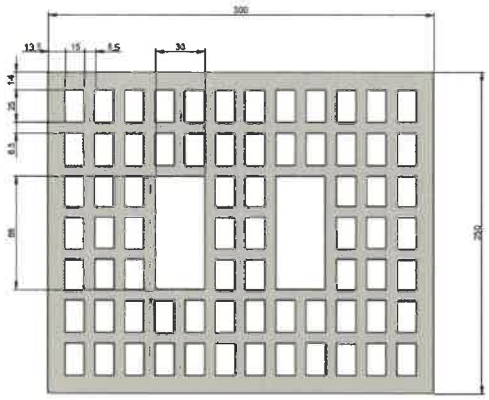


Table C8: Installation parameters

Anchor size			X3 8	X3 10	
Overall plastic embedment depth	h_{nom} =	[mm]	50	50	70
Drill hole diameter	d_0 =	[mm]	8	10	
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	8,45	10,45	
Depth of drill hole to deepest point	$h_1 \geq$	[mm]	65	65	85
Drill method		[-]	Rotary drilling		
Diameter of clearance hole in the fixture	d_f	[mm]	8,5	10,5	

Table C9: Characteristic resistance F_{Rk} [1] for single anchor

Anchor size				X3 8	X3 10	
Overall plastic embedment depth		h_{nom} =	[mm]	50	50	70
Hollow brick – Poroton P800 30.19.25 $f_b \geq$ 10,5 MPa Characteristic resistance F_{Rk}	24°C[3]/40°C[4]		[kN]	1,5	2,0	1,5
	50°C[3]/80°C[4]		[kN]	1,5	1,5	1,5
Partial safety factor		γ_{Mm} [2]	[-]	2,5		

[1] Characteristic resistance F_{Rk} for tension, shear or combined tension and shear loading. The characteristic resistance is valid for single plastic anchor or for group of two or four plastic anchors with a spacing equal or larger than the minimum spacing s_{min} according to Table B3. The specific conditions for the design method have to be considered according to Annex B1.
[2] In absence of other national regulations
[3] Maximum long term temperature
[4] Maximum short term temperature

X3

Performance

Characteristic resistance in hollow clay brick - Poroton P800 30.19.25
(base material group "c")

Annex C (4/14)

Base material hollow masonry: Hollow clay brick – Pth BIO PLAN 45-25/19,9

Table C10: Brick data

Description of brick			
Type of brick			Hollow clay brick - Pth BIO PLAN 45-25/19,9
Bulk density	$\rho \geq$	[kg/dm^3]	0,960
Standard			EN 771-1
Producer of brick			Winerberger AG, Austria
Format (measurement)		[mm]	≥ 250/450/199
Minimum thickness of member	h_{min}	[mm]	450

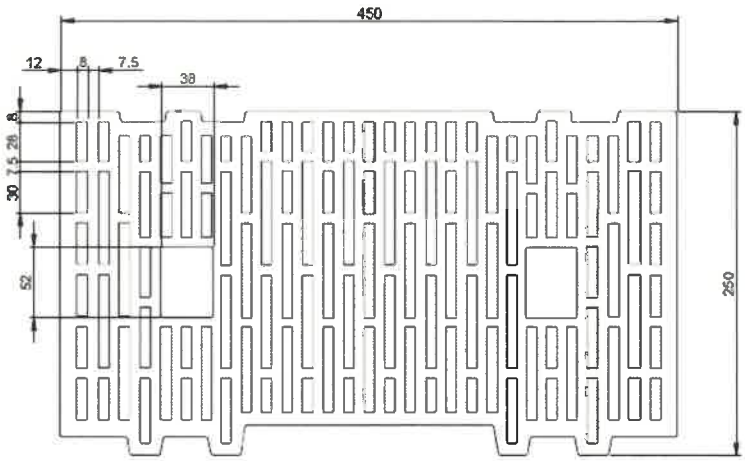


Table C11: Installation parameters

Anchor size			X3 8	X3 10	
Overall plastic embedment depth	h_{nom} =	[mm]	50	50	70
Drill hole diameter	d_0 =	[mm]	8	10	
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	8,45	10,45	
Depth of drill hole to deepest point	$h_1 \geq$	[mm]	65	65	85
Drill method		[-]	Rotary drilling		
Diameter of clearance hole in the fixture	d_f	[mm]	8,5	10,5	

Table C12: Characteristic resistance F_{Rk} [1] for single anchor

Anchor size			X3 8	X3 10	
Overall plastic embedment depth	h_{nom} =	[mm]	50	50	70
Hollow brick – Pth BIO PLAN 45-25/19,9 $f_b \geq$ **12,0 MPa** Characteristic resistance F_{Rk}	24°C[3]/40°C[4]	[kN]	1,2	1,5	2,0
	50°C[3]/80°C[4]	[kN]	0,9	1,5	1,5
Partial safety factor	γ_{Mm} [2]	[-]	2,5		

[1] Characteristic resistance F_{Rk} for tension, shear or combined tension and shear loading. The characteristic resistance is valid for single plastic anchor or for group of two or four plastic anchors with a spacing equal or larger than the minimum spacing s_{min} according to Table B3. The specific conditions for the design method have to be considered according to Annex B1.
[2] In absence of other national regulations
[3] Maximum long term temperature
[4] Maximum short term temperature

X3

Performance

Characteristic resistance in hollow clay brick - Pth BIO PLAN 45-25/19,9 (base material group "c")

Annex C (5/14)

Base material hollow masonry: Hollow clay brick – Doppo UNI 12×25×12

Table C13: Brick data

Description of brick			
Type of brick			Hollow clay brick - Doppo UNI 12×25×12
Bulk density	$\rho \geq$	[kg/dm^3]	0,940
Standard			EN 771-1
Producer of brick			Winerberger AG, Austria
Format (measurement)		[mm]	≥ 250/120/120
Minimum thickness of member	h_{min}	[mm]	120

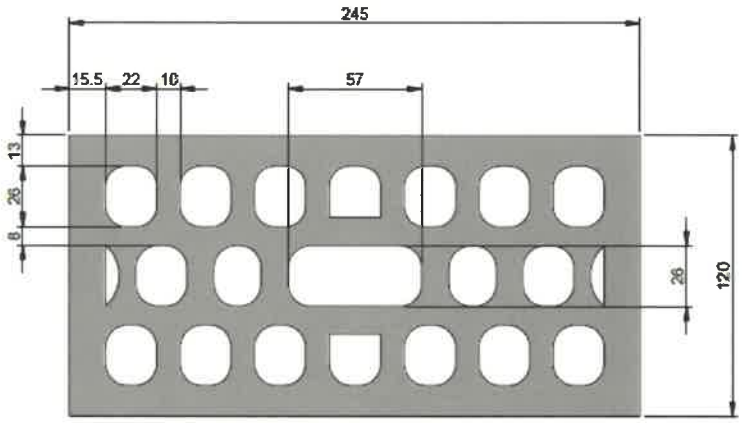


Table C14: Installation parameters

Anchor size			X3 8	X3 10	
Overall plastic embedment depth	h_{nom} =	[mm]	50	50	70
Drill hole diameter	d_0 =	[mm]	8	10	
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	8,45	10,45	
Depth of drill hole to deepest point	$h_1 \geq$	[mm]	65	65	85
Drill method		[-]	Rotary drilling		
Diameter of clearance hole in the fixture	d_f	[mm]	8,5	10,5	

Table C15: Characteristic resistance F_{Rk} [1] for single anchor

Anchor size			X3 8	X3 10	
Overall plastic embedment depth	h_{nom} =	[mm]	50	50	70
Hollow brick – Doppo UNI 12×25×12 **$f_b \geq 22,0$ MPa** Characteristic resistance F_{Rk}	24°C[3]/40°C[4]	[kN]	1,5	1,5	1,5
	50°C[3]/80°C[4]	[kN]	1,2	1,5	1,5
Partial safety factor	γ_{Mm} [2]	[-]	2,5		

[1] Characteristic resistance F_{Rk} for tension, shear or combined tension and shear loading. The characteristic resistance is valid for single plastic anchor or for group of two or four plastic anchors with a spacing equal or larger than the minimum spacing s_{min} according to Table B3. The specific conditions for the design method have to be considered according to Annex B1.
[2] In absence of other national regulations
[3] Maximum long term temperature
[4] Maximum short term temperature

X3

Performance

Characteristic resistance in hollow clay brick – Doppo UNI 12×25×12 (base material group "c")

Annex C (6/14)

Base material hollow masonry: Hollow clay brick – Pth BIO PLAN 45-25/19,9T-0,09

Table C16: Brick data

Description of brick			
Type of brick			Hollow clay brick - Pth BIO PLAN 45-25/19,9T-0,09
Bulk density	$\rho \geq$	[kg/dm^3]	0,830
Standard			EN 771-1
Producer of brick			Winerberger AG, Austria
Format (measurement)		[mm]	≥ 250/450/199
Minimum thickness of member	h_{min}	[mm]	450

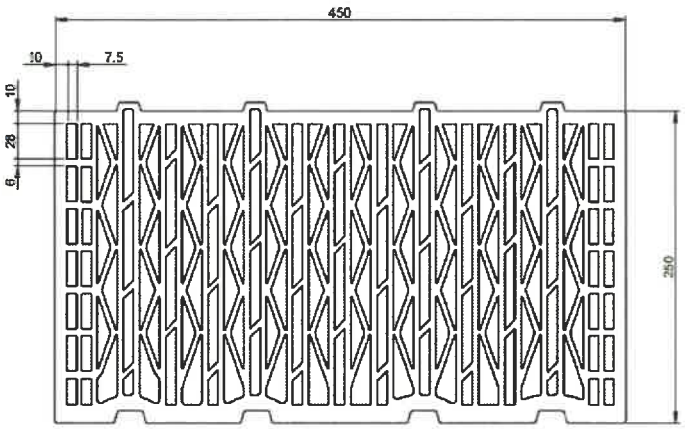


Table C17: Installation parameters

Anchor size			X3 8	X3 10	
Overall plastic embedment depth	h_{nom} =	[mm]	50	50	70
Drill hole diameter	d_0 =	[mm]	8	10	
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	8,45	10,45	
Depth of drill hole to deepest point	$h_1 \geq$	[mm]	65	65	85
Drill method		[-]	Rotary drilling		
Diameter of clearance hole in the fixture	d_f	[mm]	8,5	10,5	

Table C18: Characteristic resistance F_{Rk} [1] for single anchor

Anchor size			X3 8	X3 10	
Overall plastic embedment depth	h_{nom} =	[mm]	50	50	70
Hollow brick – Pth BIO PLAN 45-25/19,9T-0,09 $f_b \geq 8,0$ MPa Characteristic resistance F_{Rk}	24°C[3]/40°C[4]	[kN]	1,2	1,5	0,75
	50°C[3]/80°C[4]	[kN]	1,2	1,2	0,6
Partial safety factor	γ_{Mm} [2]	[-]	2,5		

[1] Characteristic resistance F_{Rk} for tension, shear or combined tension and shear loading. The characteristic resistance is valid for single plastic anchor or for group of two or four plastic anchors with a spacing equal or larger than the minimum spacing s_{min} according to Table B3. The specific conditions for the design method have to be considered according to Annex B1.
[2] In absence of other national regulations
[3] Maximum long term temperature
[4] Maximum short term temperature

X3

Performance

Characteristic resistance in hollow clay brick – Pth BIO PLAN 45-25/19,9T-0,09 (base material group "c")

Annex C (7/14)

Base material hollow masonry: Hollow clay brick – SM B 15/19

Table C19: Brick data

Description of brick			
Type of brick			Hollow clay brick - SM B 15/19
Bulk density	$\rho \geq$	[kg/dm^3]	0,900
Standard			EN 771-1
Producer of brick			ZZ Wancor AG, Switzerland
Format (measurement)		[mm]	≥ 290/150/190
Minimum thickness of member	h_{min}	[mm]	150

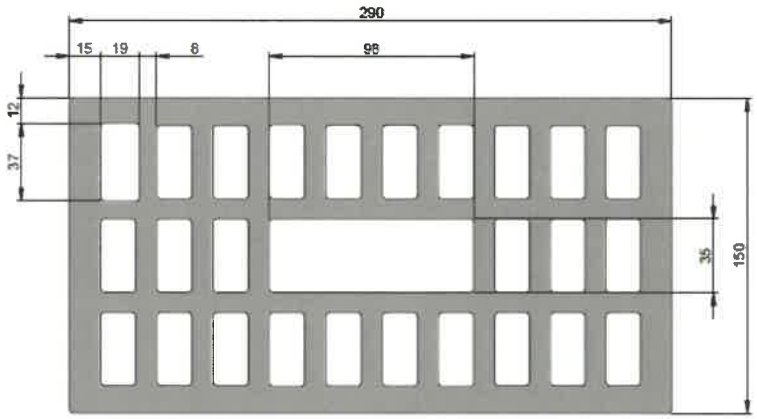


Table C20: Installation parameters

Anchor size			X3 8	X3 10	
Overall plastic embedment depth	h_{nom} =	[mm]	50	50	70
Drill hole diameter	d_0 =	[mm]	8	10	
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	8,45	10,45	
Depth of drill hole to deepest point	$h_1 \geq$	[mm]	65	65	85
Drill method		[-]	Rotary drilling		
Diameter of clearance hole in the fixture	d_f	[mm]	8,5	10,5	

Table C21: Characteristic resistance F_{Rk} [1] for single anchor

Anchor size			X3 8	X3 10	
Overall plastic embedment depth	h_{nom} =	[mm]	50	50	70
Hollow brick – SM B 15/19 $f_b \geq$ **28,0 MPa** Characteristic resistance F_{Rk}	24°C[3]/40°C[4]	[kN]	1,5	1,5	2,0
	50°C[3]/80°C[4]	[kN]	1,2	1,5	1,5
Partial safety factor	γ_{Mm} [2]	[-]	2,5		

[1] Characteristic resistance F_{Rk} for tension, shear or combined tension and shear loading. The characteristic resistance is valid for single plastic anchor or for group of two or four plastic anchors with a spacing equal or larger than the minimum spacing s_{min} according to Table B3. The specific conditions for the design method have to be considered according to Annex B1.
[2] In absence of other national regulations
[3] Maximum long term temperature
[4] Maximum short term temperature

X3

Performance

Characteristic resistance in hollow clay brick – SM B 15/19
(base material group "c")

Annex C (8/14)

Base material hollow masonry: Hollow clay brick – Blocchi leggeri 12×25×50

Table C22: Brick data

Description of brick			
Type of brick			Hollow clay brick - Blocchi leggeri
Bulk density	$\rho \geq$	[kg/dm^3]	0,560
Standard			EN 771-1
Producer of brick			Winerberger AG, Austria
Format (measurement)		[mm]	≥ 500/120/250
Minimum thickness of member	h_{min}	[mm]	120

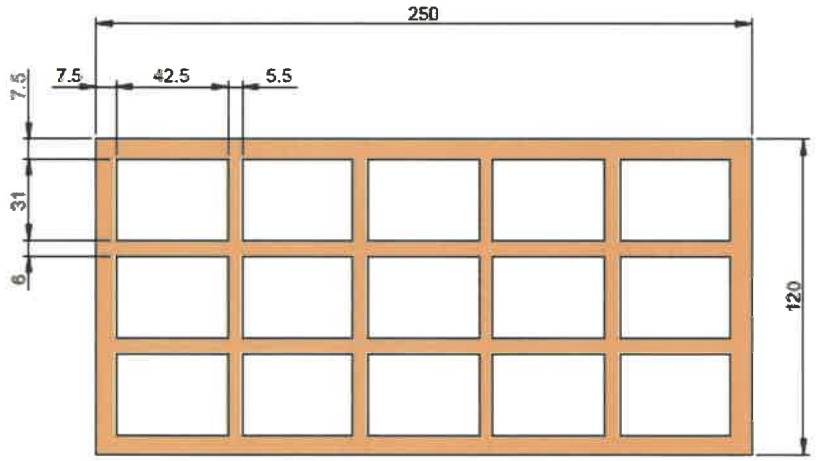


Table C23: Installation parameters

Anchor size			X3 8	X3 10	
Overall plastic embedment depth	h_{nom} =	[mm]	50	50	70
Drill hole diameter	d_0 =	[mm]	8	10	
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	8,45	10,45	
Depth of drill hole to deepest point	$h_1 \geq$	[mm]	65	65	85
Drill method		[-]	Rotary drilling		
Diameter of clearance hole in the fixture	d_f	[mm]	8,5	10,5	

Table C24: Characteristic resistance F_{Rk} [1] for single anchor

Anchor size			X3 8	X3 10	
Overall plastic embedment depth	h_{nom} =	[mm]	50	50	70
Blocchi leggeri 12×25×50 **$f_b \geq 8,0$ MPa** Characteristic resistance F_{Rk}	24°C[3]/40°C[4]	[kN]	0,9	0,6	0,9
	50°C[3]/80°C[4]	[kN]	0,75	0,6	0,9
Partial safety factor	γ_{Mm} [2]	[-]	2,5		

[1] Characteristic resistance F_{Rk} for tension, shear or combined tension and shear loading. The characteristic resistance is valid for single plastic anchor or for group of two or four plastic anchors with a spacing equal or larger than the minimum spacing s_{min} according to Table B3. The specific conditions for the design method have to be considered according to Annex B1.
[2] In absence of other national regulations
[3] Maximum long term temperature
[4] Maximum short term temperature

X3

Performance

Characteristic resistance in hollow clay brick – Blocchi leggeri 12×25×50 (base material group "c")

Annex C (9/14)

Base material hollow masonry: Hollow clay brick – Poroton P700 TS 35.24,5.25 inc.35

Table C25: Brick data

Description of brick			
Type of brick			Hollow clay brick - Poroton P700TS 35.24,5.25 inc.35
Bulk density	$\rho \geq$	[kg/dm^3]	0,560
Standard			EN 771-1
Producer of brick			Fornaci Laterizi Danesi Spa, Italy
Format (measurement)		[mm]	≥ 250/350/245
Minimum thickness of member	h_{min}	[mm]	350

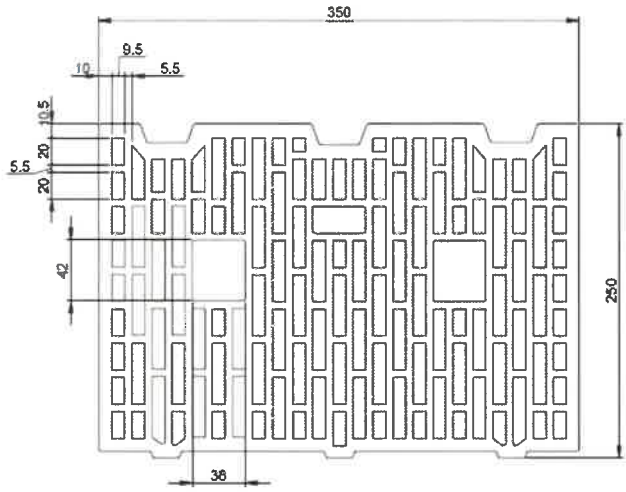


Table C26: Installation parameters

Anchor size			X3 8	X3 10	
Overall plastic embedment depth	h_{nom} =	[mm]	50	50	70
Drill hole diameter	d_0 =	[mm]	8	10	
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	8,45	10,45	
Depth of drill hole to deepest point	$h_1 \geq$	[mm]	65	65	85
Drill method		[-]	Rotary drilling		
Diameter of clearance hole in the fixture	d_f	[mm]	8,5	10,5	

Table C27: Characteristic resistance F_{Rk} [1] for single anchor

Anchor size			X3 8	X3 10	
Overall plastic embedment depth	h_{nom} =	[mm]	50	50	70
Poroton P700 TS 35.24,5.25 inc.35 **$f_b \geq 11,0$ MPa** Characteristic resistance F_{Rk}	24°C[3]/40°C[4]	[kN]	1,2	0,6	0,9
	50°C[3]/80°C[4]	[kN]	0,9	0,6	0,9
Partial safety factor	γ_{Mm} [2]	[-]	2,5		

[1] Characteristic resistance F_{Rk} for tension, shear or combined tension and shear loading. The characteristic resistance is valid for single plastic anchor or for group of two or four plastic anchors with a spacing equal or larger than the minimum spacing s_{min} according to Table B3. The specific conditions for the design method have to be considered according to Annex B1.
[2] In absence of other national regulations
[3] Maximum long term temperature
[4] Maximum short term temperature

X3

Performance

Characteristic resistance in hollow clay brick – Poroton P700 TS 35.24,5.25 inc.35 (base material group "c")

Annex C (10/14)

Base material hollow masonry: Hollow lightweight concrete brick – Leca Universalblokk 20

Table C28: Brick data

Description of brick			
Type of brick			Hollow lightweight concrete brick - Leca Universalblokk 20
Bulk density	$\rho \geq$	[kg/dm^3]	0,770
Standard			EN 771-3
Producer of brick			Leca Norge AC, Norway
Format (measurement)		[mm]	≥ 500/200/250
Minimum thickness of member	h_{min}	[mm]	200

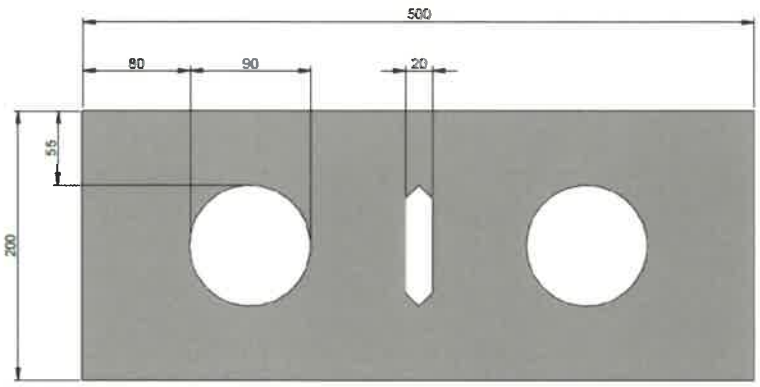


Table C29: Installation parameters

Anchor size			X3 8	X3 10	
Overall plastic embedment depth	h_{nom} =	[mm]	50	50	70
Drill hole diameter	d_0 =	[mm]	8	10	
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	8,45	10,45	
Depth of drill hole to deepest point	$h_1 \geq$	[mm]	65	65	85
Drill method		[-]	Rotary drilling		
Diameter of clearance hole in the fixture	d_f	[mm]	8,5	10,5	

Table C30: Characteristic resistance F_{Rk} [1] for single anchor

Anchor size			X3 8	X3 10	
Overall plastic embedment depth	h_{nom} =	[mm]	50	50	70
Leca Universalblokk 20 **$f_b \geq 3,0$ MPa** Characteristic resistance F_{Rk}	24°C[3]/40°C[4]	[kN]	1,2	1,5	1,5
	50°C[3]/80°C[4]	[kN]	0,9	1,5	1,5
Partial safety factor	γ_{Mm} [2]	[-]	2,5		

[1] Characteristic resistance F_{Rk} for tension, shear or combined tension and shear loading. The characteristic resistance is valid for single plastic anchor or for group of two or four plastic anchors with a spacing equal or larger than the minimum spacing s_{min} according to Table B3. The specific conditions for the design method have to be considered according to Annex B1.
[2] In absence of other national regulations
[3] Maximum long term temperature
[4] Maximum short term temperature

X3

Performance

Characteristic resistance in hollow lightweight concrete brick – Leca Universalblokk 20 (base material group "c")

Annex C (11/14)

Base material: Autoclaved Aerated Concrete

Table C31: Brick data

Description of brick			
Type of brick			Autoclaved aerated concrete
Bulk density	$\rho \geq$	[kg/dm^3]	0,35
Standard			EN 771-4
Producer of brick			Xella Italia S.r.l. YTONG
Format (measurement)		[mm]	≥ 600/250/240
Minimum thickness of member	h_{min}	[mm]	240

Table C32: Installation parameters

Anchor size			X3 10	
Overall plastic embedment depth	h_{nom} =	[mm]	70	90
Drill hole diameter	d_0 =	[mm]	10	
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	10,45	
Depth of drill hole to deepest point	$h_1 \geq$	[mm]	85	105
Drill method		[-]	Rotary drilling	
Diameter of clearance hole in the fixture	d_f	[mm]	10,5	

Table C33: Characteristic resistance F_{Rk} [1)] for single anchor

Anchor size				X3 10	
Overall plastic embedment depth		h_{nom} =	[mm]	70	90
Autoclaved aerated concrete AAC $f_b \geq 2,0$ MPa					
Characteristic resistance F_{Rk}	24°C[3)]/40°C[4)]	F_{Rk}	[kN]	0,5	0,6
	50°C[3)]/80°C[4)]	F_{Rk}	[kN]	0,3	0,4
Autoclaved aerated concrete AAC $f_b \geq 6,0$ MPa					
Characteristic resistance F_{Rk}	24°C[3)]/40°C[4)]	F_{Rk}	[kN]	2,0	2,5
	50°C[3)]/80°C[4)]	F_{Rk}	[kN]	1,2	2,0
Partial safety factor		γ_{Mm} [2)]	[-]	2,0	

[1)] Characteristic resistance F_{Rk} for tension, shear or combined tension and shear loading. The characteristic resistance is valid for single plastic anchor or for group of two or four plastic anchors with a spacing equal or larger than the minimum spacing s_{min} according to Table B3. The specific conditions for the design method have to be considered according to Annex B1.
[2)] In absence of other national regulations
[3)] Maximum long term temperature
[4)] Maximum short term temperature

X3

Performance

Characteristic resistance in autoclaved aerated concrete
(base material group "d")

Annex C (12/14)

Table C34: Displacements under tension and shear loading in concrete

Concrete ≥ C 16/20	h_{nom}	F	Tension load		Shear load	
			δ_{N0}	$\delta_{N\infty}$	δ_{V0}	$\delta_{V\infty}$
	[mm]	[kN]	[mm]	[mm]	[mm]	[mm]
X3 8	40	0,6	0,01	0,45	0,31	0,47
	50	1,2	0,03	0,60	0,63	0,94
X3 10	50	1,8	0,01	0,61	0,78	1,17
	70	2,6	0,15	0,87	1,14	1,71

Table C35: Displacements under tension and shear loading in masonry for X3 8

Base material	h_{nom} [mm]	F	Displacement			
			Tension load		Shear load	
			δ_{N0}	$\delta_{N\infty}$	δ_{V0}	$\delta_{V\infty}$
	[mm]	[kN]	[mm]	[mm]	[mm]	[mm]
Solid clay brick – Mz 2,0/20 verzahnt 3DF	50	1,00	0,017	0,033	0,833	1,250
Hollow clay brick – Poroton P800 30.19.25	50	0,43	0,000	0,001	0,357	0,536
Hollow clay brick – Pth BIO PLAN 45-25/19,9	50	0,34	0,031	0,062	0,283	0,425
Hollow clay brick – Doppo UNI 12×25×12	50	0,43	0,002	0,003	0,357	0,536
Hollow clay brick – Pth BIO PLAN 45-25/19,9T-0,09	50	0,34	0,002	0,005	0,283	0,425
Hollow clay brick – SM B 15/19	50	0,43	0,002	0,005	0,357	0,536
Hollow clay brick – Blocchi leggeri 12×25×50	50	0,26	0,002	0,005	0,216	0,325
Hollow clay brick – Poroton P700 TS 35.24,5.25 inc.35	50	0,34	0,004	0,008	0,283	0,425
Hollow brick – lightweight concrete – Leca Universalblokk 20	50	0,34	0,001	0,001	0,286	0,429

X3

Performance

Displacements in concrete and masonry

Annex C (13/14)

Table C36: Displacements under tension and shear loading in masonry for X3 10

Base material	h_{nom} [mm]	F	Displacement			
			Tension load		Shear load	
			δ_{N0}	$\delta_{N\infty}$	δ_{V0}	$\delta_{V\infty}$
	[mm]	[kN]	[mm]	[mm]	[mm]	[mm]
Solid clay brick – Mz 2,0/20 verzahnt 3DF	50	1,14	0,029	0,058	0,952	1,429
	70	/	/	/	/	/
Hollow clay brick – Poroton P800 30.19.25	50	0,57	0,002	0,003	0,476	0,714
	70	0,43	0,001	0,002	0,357	0,536
Hollow clay brick – Pth BIO PLAN 45-25/19,9	50	0,43	0,006	0,012	0,357	0,536
	70	0,57	0,003	0,006	0,476	0,714
Hollow clay brick – Doppo UNI 12×25×12	50	0,43	0,081	0,163	0,357	0,536
	70	0,43	0,001	0,002	0,357	0,536
Hollow clay brick – Pth BIO PLAN 45-25/19,9T-0,09	50	0,43	0,005	0,011	0,357	0,536
	70	0,21	0,000	0,000	0,179	0,268
Hollow clay brick – SM B 15/19	50	0,43	0,002	0,005	0,357	0,536
	70	0,57	0,008	0,016	0,476	0,714
Hollow clay brick – Blocchi leggeri 12×25×50	50	0,17	0,003	0,007	0,142	0,213
	70	0,26	0,000	0,000	0,214	0,321
Hollow clay brick – Poroton P700 TS 35.24,5.25 inc.35	50	0,17	0,001	0,001	0,142	0,213
	70	0,26	0,002	0,004	0,214	0,321
Hollow brick – lightweight concrete – Leca Universalblokk 20	50	0,43	0,005	0,010	0,357	0,536
	70	0,43	0,004	0,008	0,357	0,536

Table C37: Displacements under tension and shear loading in autoclaved aerated concrete

Base material	Anchor	h_{nom} [mm]	F	Displacement			
				Tension load		Shear load	
				δ_{N0}	$\delta_{N\infty}$	δ_{V0}	$\delta_{V\infty}$
		[mm]	[kN]	[mm]	[mm]	[mm]	[mm]
AAC 2	X3 10	70	0,18	0,04	0,08	0,36	0,54
		90	0,21	0,01	0,02	0,43	0,64
AAC 6		70	0,71	0,09	0,18	1,43	2,14
		90	0,90	0,02	0,04	1,79	2,68

X3

Performance

Displacements in masonry and autoclaved aerated concrete

Annex C (14/14)