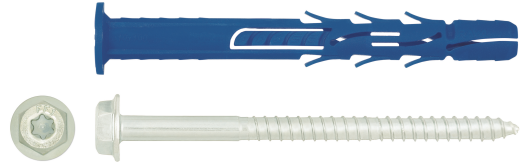


Declaration of Performance

DoP-12/0398-FF1

1. Unique identification code of the product-type:

FF1



The photo depicts an example of a product of the given type of goods

2. Intended use/es:

**general type
to be applied in**

Plastic anchor

Plastic anchors for multiple use in concrete and masonry for non-structural applications

option / category

ETAG 020

Loading

subject to static or quasi-static

material

The FF1 anchors are the plastic anchors consisting of a plastic sleeve and an accompanying specific steel screw. The plastic sleeve are made of polypropylene – FF1 PP or polyamide – FF1-PA. The accompanying specific screws are made of galvanized steel or stainless steel.

3. Manufacturer:

Rawlplug S.A.

ul. Kwidzyńska 6, 51-416 Wrocław, PL

www.rawlplug.com

4. System/s of AVCP:

System 2+

5. European Assessment Document:

ETAG 020 Plastic anchors for multiple use in concrete and masonry for non-structural applications. Part 1 General, Part 2 Plastic anchors for use in normal weight concrete, Part 3 Plastic anchors for use in solid masonry, Part 4 Plastic anchors for use in hollow or perforated masonry, Part 5 Plastic anchors for use in autoclaved aerated concrete.

Utilization category: A, B, C, D

6. European Technical Assessment:

ETA-12/0398 edition of 2020-06-30

7. Technical Assessment Body:

Instytut Techniki Budowlanej

8. Notified body/ies:

Instytut Techniki Budowlanej on the basis of:

- initial inspection of the manufacturing plant and of factory production control
- continuing surveillance, assessment and evaluation of factory production control

issued a certificate **1488-CPR-0527/Z**

9. Declared performance/s:

Essential Characteristics:

Technical Specification	Basic requirements according to CPR		Remarks:
ETA-12/0398	[1]	Mechanical resistance and stability	Declared values on the page 2
	[4]	Operational safety	Such criteria as those significant for [1]

Characteristic bending resistance of the screw in concrete and masonry

Anchor diameter		Ø8		Ø10		Ø14	
		carbon steel ¹⁾ □	stainless steel□	carbon steel ¹⁾ □	stainless steel□	carbon steel ¹⁾ □	stainless steel□
Characteristic bending resistance	$M_{Rk,s}$ [Nm]	5,1 ³⁾ 7,1 ⁴⁾	7,3	9,2 ³⁾ 12,6 ⁴⁾ 17,4 ⁵⁾	13,1	39,8 ³⁾ 54,9 ⁴⁾	56,8
Partial safety factor	γ_{Ms2}	1,61 ³⁾ 1,38 ⁴⁾	1,42	1,61 ³⁾ 1,38 ⁴⁾ 1,25 ⁵⁾	1,42	1,61 ³⁾ 1,38 ⁴⁾	1,42

¹⁾ Steel with electroplated zinc coating or steel with zinc flake coating

²⁾ In absence of other national regulations

³⁾ Type a: $f_{y,k} \geq 260$ MPa, $f_{u,k} \geq 420$ MPa, with "●" on the head marking

⁴⁾ Type b: $f_{y,k} \geq 420$ MPa, $f_{u,k} \geq 580$ MPa

⁵⁾ High-load: $f_{y,k} \geq 640$ MPa, $f_{u,k} \geq 800$ MPa, with "H" on the head marking

Characteristic resistance of the screw for use in concrete, failure of expansion element (screw)

Anchor diameter		Ø8		Ø10		Ø14	
		carbon steel ¹⁾ □	stainless steel□	carbon steel ¹⁾ □	stainless steel□	carbon steel ¹⁾ □	stainless steel□
Characteristic tension resistance	$N_{Rk,s}$ [kN]	7,3 ³⁾ 10,0 ⁴⁾	10,4	10,7 ³⁾ 14,8 ⁴⁾ 20,4 ⁵⁾	15,3	28,5 ³⁾ 39,4 ⁴⁾	40,7
Partial safety factor	γ_{Ms2}	1,94 ³⁾ 1,66 ⁴⁾	1,71	1,94 ³⁾ 1,66 ⁴⁾ 1,5 ⁵⁾	1,71	1,94 ³⁾ 1,66 ⁴⁾	1,71
Characteristic shear resistance	$V_{Rk,s}$ [kN]	3,6 ³⁾ 5,0 ⁴⁾	5,2	5,4 ³⁾ 7,4 ⁴⁾ 10,2 ⁵⁾	7,7	14,3 ³⁾ 19,7 ⁴⁾	20,4
Partial safety factor	γ_{Ms2}	1,61 ³⁾ 1,38 ⁴⁾	1,42	1,61 ³⁾ 1,38 ⁴⁾ 1,25 ⁵⁾	1,42	1,61 ³⁾ 1,38 ⁴⁾	1,42

¹⁾ Steel with electroplated zinc coating or steel with zinc flake coating

²⁾ In absence of other national regulations

³⁾ Type a: $f_{y,k} \geq 260$ MPa, $f_{u,k} \geq 420$ MPa, with "●" on the head marking

⁴⁾ Type b: $f_{y,k} \geq 420$ MPa, $f_{u,k} \geq 580$ MPa

⁵⁾ High-load: $f_{y,k} \geq 640$ MPa, $f_{u,k} \geq 800$ MPa, with "H" on the head marking

Characteristic resistance for use in cracked and non-cracked concrete, pull-out failure
(plastic sleeve); hammer drilling

Anchor diameter		Ø8	Ø10	Ø14
Concrete ≥ C16/20				
Characteristic resistance	$N_{Rk,p}$ [kN]	0,9 ¹⁾³⁾ 2,0 ²⁾³⁾	0,9 ¹⁾³⁾ 1,2 ¹⁾⁴⁾ 2,0 ²⁾³⁾ 5,5 ²⁾⁴⁾	2,5 ¹⁾⁴⁾ 5,5 ²⁾⁴⁾
Partial safety factor	γ_{Mc5}	1,8		
Concrete ≥ C12/15				
Characteristic resistance	$N_{Rk,p}$ [kN]	0,6 ¹⁾³⁾ 1,5 ²⁾³⁾	0,5 ¹⁾³⁾ 0,9 ¹⁾⁴⁾ 1,2 ²⁾³⁾ 4,0 ²⁾⁴⁾	2,0 ¹⁾⁴⁾ 4,0 ²⁾⁴⁾
Partial safety factor	γ_{Mc5}	1,8		

Valid for all ranges of temperatures according to Annex B1

¹⁾ FF1 PP; ²⁾ FF1 PA ³⁾ $h_{nom} = 50$ mm; ⁴⁾ $h_{nom} = 70$ mm

⁵⁾ In absence of other national regulations

Displacements under tension and shear loading in concrete⁵⁾⁶⁾

Anchor diameter	Tension load			Shear load		
	N [kN]	Δ_{N0} [mm]	$\Delta_{N\infty}$ [mm]	V [kN]	Δ_{V0} [mm]	$\Delta_{V\infty}$ [mm]
Ø8	0,36 ¹⁾³⁾ 0,79 ²⁾³⁾	0,95 ¹⁾³⁾ 1,11 ²⁾³⁾	1,90 ¹⁾³⁾ 2,22 ²⁾³⁾	0,36 ¹⁾³⁾ 0,79 ²⁾³⁾	0,18	0,27
Ø10	0,36 ¹⁾³⁾ 0,47 ¹⁾⁴⁾ 0,79 ²⁾³⁾ 3,37 ²⁾⁴⁾	0,38 ¹⁾³⁾ 0,55 ¹⁾⁴⁾ 0,67 ²⁾³⁾ 1,95 ²⁾⁴⁾	0,76 ¹⁾³⁾ 1,10 ¹⁾⁴⁾ 1,34 ²⁾³⁾ 3,90 ²⁾⁴⁾	0,36 ¹⁾³⁾ 0,47 ¹⁾⁴⁾ 0,79 ²⁾³⁾ 3,37 ²⁾⁴⁾	0,11	0,16
Ø14	0,99 ¹⁾⁴⁾ 2,18 ²⁾⁴⁾	1,56 ¹⁾⁴⁾ 1,70 ²⁾⁴⁾	3,12 ¹⁾⁴⁾ 3,40 ²⁾⁴⁾	0,99 ¹⁾⁴⁾ 2,18 ²⁾⁴⁾	0,43	0,64

¹⁾ FF1 PP; ²⁾ FF1 PA; ³⁾ $h_{nom} = 50$ mm; ⁴⁾ $h_{nom} = 70$ mm

⁵⁾ Valid for all ranges of temperatures


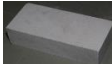





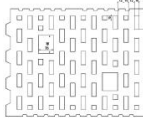
⁶⁾ Intermediate values by linear interpolation

Characteristic values F_{Rk} in any load direction under fire exposure in concrete C20/25 to C50/60,
no permanent centric tension load and shear load with lever arm

Anchor diameter	Fire resistance class	F_{Rk} [kN]
Ø10 ¹⁾²⁾³⁾ Ø14 ¹⁾²⁾³⁾	R90	0,8

¹⁾ FF1 PA; ²⁾ $h_{nom} = 50$ mm; ³⁾ $h_{nom} = 70$ mm

Characteristic resistance F_{Rk} [kN] of FF1-08 anchor in masonry

Base material	Bulk density class [kg/dm ³]	Compressive strength class [N/mm ²]	Picture	Drill method	F_{Rk14} [kN]
Clay brick HD ⁵⁾	≥ 1,80	≥ 20		hammer	1,2 ¹⁾ / 1,5 ²⁾ 3) / 4) - / -
Sand-lime brick HD ⁶⁾	≥ 1,80	≥ 20		hammer	0,75 ¹⁾ / 1,5 ²⁾ - 3) / -4)
Perforated ceramic brick ⁷⁾	≥ 0,80	≥ 15		rotary drilling only	0,5 ¹⁾ / 0,75 ²⁾ - 3) / -4)
Perforated ceramic brick ⁸⁾	≥ 0,80	≥ 15		rotary drilling only	0,3 ¹⁾ / 0,4 ²⁾ - ³⁾ / -4)
Calcium silicate hollow block ⁹⁾	≥ 1,60	≥ 20		rotary drilling only	0,4 ¹⁾ / 0,5 ²⁾ 3) / 4) - / -
Hollow lightweight aggregate concrete element ¹⁰⁾	≥ 0,80	≥ 2		rotary drilling only	0,5 ¹⁾ / 0,9 ²⁾ - ³⁾ / -4)
Perforated ceramic brick ¹¹⁾	≥ 0,90	≥ 12		rotary drilling only	0,4 ¹⁾ / 0,6 ²⁾ - ³⁾ / -4)
Perforated ceramic brick ¹²⁾	≥ 0,90	≥ 15		rotary drilling only	0,75 ¹⁾ / 1,2 ²⁾ - 3) / -4)
Autoclaved aerated concrete AAC 2 ¹³⁾	≥ 0,35	≥ 2	-	rotary drilling only	- ¹⁾ / - ²⁾ 0,5 ³⁾ / 0,4 ⁴⁾
Autoclaved aerated concrete AAC 6 ¹³⁾	≥ 0,65	≥ 6	-	rotary drilling only	- ¹⁾ / - ²⁾ 1,2 ³⁾ / 0,9 ⁴⁾
Partial safety factor ¹⁵⁾	$\gamma_{Mm} / \gamma_{MAAC}$	2,5 / 2,0			

¹⁾ FF1-08 PP ($h_{nom} = 50$ mm); ²⁾ FF1-08 PA ($h_{nom} = 50$ mm); ³⁾ FF1-08 PP ($h_{nom} = 70$ mm); ⁴⁾ FF1-08 PA ($h_{nom} = 70$ mm) ⁵⁾ According to EN 771-1; ⁶⁾ According to EN 771-2

⁷⁾ For example perforated brick MAX according to EN 771-1; a = 12 mm, b = 38 mm, c = 8 mm

⁸⁾ For example perforated brick Porotherm P+W 25 according to EN 771-1; a = 10,2 mm, b = 38 mm, c = 7 mm

⁹⁾ For example calcium silicate hollow block KSL 6DF according to DIN 106 and EN 771-2; a = 22 mm, b = 50 mm, c = 22 mm

¹⁰⁾ For example hollow lightweight aggregate concrete element HBL according to EN 771-3; a = 31 mm

¹¹⁾ For example perforated brick HLZ 12 according to DIN 105 and EN 771-1; a = 12 mm, b = 32 mm, c = 7 mm, d = 12 mm, e = 13 mm



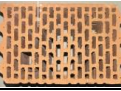



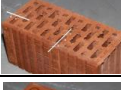
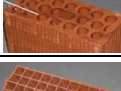


¹²⁾ For example perforated brick HLZ 15 according to DIN 105 and EN 771-1; a = 17 mm ¹³⁾ According to EN 771-4

¹⁴⁾ Characteristic resistance F_{Rk} for tension, shear or combined tension and shear loading

The characteristic resistance is valid for single plastic anchor or for a group of two or four plastic anchors with a spacing equal or larger than the minimum spacing s_{min} according to table B3 (Annex B4)

¹⁵⁾ Partial safety factor for use in masonry $\gamma_{Mm} = 2,5$ and partial safety factor for use in autoclaved aerated concrete $\gamma_{MAAC} = 2,0$ in absence of other national regulations

Characteristic resistance F_{Rk} [kN] of FF1-10 anchor in masonry

Base material	Bulk density class [kg/dm ³]	Compressive strength class [N/mm ²]	Picture	Drill method	F_{Rk15} [kN]
Clay brick HD ⁵⁾	≥ 1,80	≥ 50		hammer	1,5 ¹⁾ / - ²⁾ 2,5 ³⁾ / 5,0 ⁴⁾
Sand-lime brick HD ⁶⁾	≥ 1,80	≥ 30		hammer	1,2 ¹⁾ / 1,5 ²⁾ - ³⁾ / - ⁴⁾
Perforated ceramic brick ⁷⁾	≥ 0,80	≥ 15		rotary drilling only	- ¹⁾ / - ²⁾ 0,5 ³⁾ / 1,5 ⁴⁾
Perforated ceramic brick ⁸⁾	≥ 0,80	≥ 15		rotary drilling only	- ¹⁾ / - ²⁾ 0,6 ³⁾ / 1,5 ⁴⁾
Calcium silicate hollow block ⁹⁾	≥ 1,60	≥ 20		rotary drilling only	- ¹⁾ / - ²⁾ 0,75 ³⁾ / 3,5 ⁴⁾
Hollow lightweight aggregate concrete element ¹⁰⁾	≥ 0,80	≥ 2		rotary drilling only	- ¹⁾ / - ²⁾ 0,3 ³⁾ / 0,9 ⁴⁾
Perforated ceramic brick ¹¹⁾	≥ 0,90	≥ 12		rotary drilling only	- ¹⁾ / - ²⁾ 0,5 ³⁾ / 0,9 ⁴⁾
Perforated ceramic brick ¹²⁾	≥ 0,91	≥ 15		rotary drilling only	- ¹⁾ / - ²⁾ 0,6 ³⁾ / 0,75 ⁴⁾
Hollow ceramic brick ¹³⁾	≥ 0,60	≥ 7,5		rotary drilling only	- ¹⁾ / - ²⁾ 0,3 ³⁾ / 0,75 ⁴⁾
Autoclaved aerated concrete AAC 2 ¹⁴⁾	≥ 0,35	≥ 2		rotary drilling only	- ¹⁾ / - ²⁾ 0,5 ³⁾ / 0,4 ⁴⁾
Autoclaved aerated concrete AAC 6 ¹⁴⁾	≥ 0,65	≥ 6		rotary drilling only	- ¹⁾ / - ²⁾ 1,2 ³⁾ / 0,9 ⁴⁾
Autoclaved aerated concrete AAC 2 ¹⁴⁾	≥ 0,35	≥ 2		punch tool	- ¹⁾ / - ²⁾ - ³⁾ / 0,4 ⁴⁾ 17)
Autoclaved aerated concrete AAC 4 ¹⁴⁾	≥ 0,70	≥ 4		punch tool	- ¹⁾ / - ²⁾ - ³⁾ / 0,9 ⁴⁾ 17)
Autoclaved aerated concrete AAC 5 ¹⁴⁾	≥ 0,70	≥ 5		punch tool	- ¹⁾ / - ²⁾ - ³⁾ / 1,2 ⁴⁾ 17)
Partial safety factor ¹⁶⁾	$\gamma_{Mm} / \gamma_{MAcc}$	2,5 / 2,0			

¹⁾ FF1-10 PP ($h_{nom} = 50$ mm); ²⁾ FF1-10 PA ($h_{nom} = 50$ mm); ³⁾ FF1-10 PP ($h_{nom} = 70$ mm); ⁴⁾ FF1-10 PA ($h_{nom} = 70$ mm)

⁵⁾ According to EN 771-1; ⁶⁾ According to EN 771-2

⁷⁾ For example perforated brick MAX according to EN 771-1; a = 12 mm, b = 38 mm, c = 8 mm

⁸⁾ For example perforated brick Porotherm P+W 25 according to EN 771-1; a = 10,2 mm, b = 38 mm, c = 7 mm

⁹⁾ For example calcium silicate hollow block KSL 6DF according to DIN 106 and EN 771-2; a = 22 mm, b = 50 mm, c = 22 mm

¹⁰⁾ For example hollow lightweight aggregate concrete element HBL according to EN 771-3; a = 31 mm

¹¹⁾ For example perforated brick HLZ 12 according to DIN 105 and EN 771-1; a = 12 mm, b = 32 mm, c = 7 mm, d = 12 mm, e = 13 mm

¹²⁾ For example perforated brick Doppio uni according to EN 771-1; a = 11 mm, b = 24 mm, c = 10 mm

¹³⁾ For example perforated brick Optibric PV according to EN 771-1; a = 10 mm, b = 39 mm, c = 7, d = 38 mm, e = 6,5 mm ¹⁴⁾ According to EN 771-4




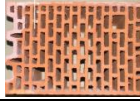

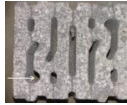

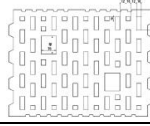

¹⁵⁾ Characteristic resistance F_{Rk} for tension, shear or combined tension and shear loading

The characteristic resistance is valid for single plastic anchor or for a group of two or four plastic anchors with a spacing equal or larger than the minimum spacing s_{min} according to table B3 (Annex B4)

¹⁶⁾ Partial safety factor for use in masonry $\gamma_{Mm} = 2,5$ and partial safety factor for use in autoclaved aerated concrete $\gamma_{MAcc} = 2,0$ in absence of other national regulations

¹⁷⁾ Drill method: punch tool (see Annex A)

Characteristic resistance F_{Rk} [kN] of FF1-14 anchor in masonry

Base material	Bulk density class [kg/dm ³]	Compressive strength class [N/mm ²]	Picture	Drill method	$F_{Rk(12)}$ [kN]
Clay brick HD ³⁾	≥ 1,80	≥ 20		hammer	4,0 ¹⁾ / 4,5 ²⁾
Sand-lime brick HD ⁴⁾	≥ 1,80	≥ 20		hammer	3,0 ¹⁾ / 3,5 ²⁾
Perforated ceramic brick ⁵⁾	≥ 0,80	≥ 15		rotary drilling only	0,9 ¹⁾ / 1,2 ²⁾
Perforated ceramic brick ⁶⁾	≥ 0,80	≥ 15		rotary drilling only	0,9 ¹⁾ / 1,2 ²⁾
Calcium silicate hollow block ⁷⁾	≥ 1,60	≥ 20		rotary drilling only	0,9 ¹⁾ / 1,2 ²⁾
Hollow lightweight aggregate concrete element ⁸⁾	≥ 0,80	≥ 2		rotary drilling only	1,2 ¹⁾ / 1,2 ²⁾
Perforated ceramic brick ⁹⁾	≥ 0,90	≥ 12		rotary drilling only	1,5 ¹⁾ / 0,9 ²⁾
Perforated ceramic brick ¹⁰⁾	≥ 0,90	≥ 15		rotary drilling only	1,5 ¹⁾ / 1,5 ²⁾
Autoclaved aerated concrete AAC 2 ¹¹⁾	≥ 0,35	≥ 2		rotary drilling only	0,75 ¹⁾ / 0,6 ²⁾
Autoclaved aerated concrete AAC 6 ¹¹⁾	≥ 0,65	≥ 6		rotary drilling only	2,5 ¹⁾ / 1,5 ²⁾
Partial safety factor ¹³⁾	$\gamma_{Mm} / \gamma_{MAAC}$	2,5 / 2,0			

¹⁾ FF1-14 PP ($h_{nom} = 70$ mm); ²⁾ FF1-14 PA ($h_{nom} = 70$ mm)

³⁾ According to EN 771-1; ⁴⁾ According to EN 771-2

⁵⁾ For example perforated brick MAX according to EN 771-1; a = 12 mm, b = 38 mm, c = 8 mm

⁶⁾ For example perforated brick Porotherm P+W 25 according to EN 771-1; a = 10,2 mm, b = 38 mm, c = 7 mm

⁷⁾ For example calcium silicate hollow block KSL 6DF according to DIN 106 and EN 771-2; a = 22 mm, b = 50 mm, c = 22 mm

⁸⁾ For example hollow lightweight aggregate concrete element HBL according to EN 771-3; a = 31 mm

⁹⁾ For example perforated brick HLZ 12 according to DIN 105 and EN 771-1; a = 12 mm, b = 32 mm, c = 7 mm, d = 12 mm, e = 13 mm

¹⁰⁾ For example perforated brick HLZ 15 according to DIN 105 and EN 771-1; a = 17 mm ¹¹⁾ According to EN 771-4

¹²⁾ Characteristic resistance F_{Rk} for tension, shear or combined tension and shear loading

The characteristic resistance is valid for single plastic anchor or for a group of two or four plastic anchors with a spacing equal or larger than the minimum spacing s_{min} according to table B3 (Annex B4)

¹³⁾ Partial safety factor for use in masonry $\gamma_{Mm} = 2,5$ and partial safety factor for use in autoclaved aerated concrete $\gamma_{MAAC} = 2,0$ in absence of other national regulations

Displacements under tension and shear loading of FF1-08 anchor in masonry

Anchor type	Base material	Tension load			Shear load		
		N [kN]	Δ_{N0} [mm]	$\Delta_{N\infty}$ [mm]	V [kN]	Δ_{V0} [mm]	$\Delta_{V\infty}$ [mm]
FF1-08	Clay brick HD ⁵⁾	0,34 ¹⁾ / 0,43 ²⁾ - 3) / -4)	1,13 ¹⁾ / 0,68 ²⁾ - 3) / -4)	2,26 ¹⁾ / 1,36 ²⁾ - 3) / -4)	0,34 ¹⁾ / 0,43 ²⁾ - 3) / -4)	0,28 ¹⁾ / 0,36 ²⁾ - 3) / -4)	0,42 ¹⁾ / 0,54 ²⁾ - 3) / -4)
	Sand-lime brick HD ⁶⁾	0,21 ¹⁾ / 0,43 ²⁾ - 3) / -4)	0,48 ¹⁾ / 1,14 ²⁾ - 3) / -4)	0,96 ¹⁾ / 2,28 ²⁾ - 3) / -4)	0,21 ¹⁾ / 0,43 ²⁾ - 3) / -4)	0,17 ¹⁾ / 0,36 ²⁾ - 3) / -4)	0,26 ¹⁾ / 0,54 ²⁾ - 3) / -4)
	Perforated ceramic brick ⁷⁾	0,14 ¹⁾ / 0,21 ²⁾ - 3) / -4)	0,64 ¹⁾ / 0,63 ²⁾ - 3) / -4)	1,28 ¹⁾ / 1,26 ²⁾ - 3) / -4)	0,14 ¹⁾ / 0,21 ²⁾ - 3) / -4)	0,12 ¹⁾ / 0,17 ²⁾ - 3) / -4)	0,18 ¹⁾ / 0,25 ²⁾ - 3) / -4)
	Perforated ceramic brick ⁸⁾	0,09 ¹⁾ / 0,11 ²⁾ - 3) / -4)	0,37 ¹⁾ / 0,46 ²⁾ - 3) / -4)	0,74 ¹⁾ / 0,92 ²⁾ - 3) / -4)	0,09 ¹⁾ / 0,11 ²⁾ - 3) / -4)	0,08 ¹⁾ / 0,09 ²⁾ - 3) / -4)	0,12 ¹⁾ / 0,14 ²⁾ - 3) / -4)
	Calcium silicate hollow block ⁹⁾	0,11 ¹⁾ / 0,14 ²⁾ - 3) / -4)	0,61 ¹⁾ / 0,65 ²⁾ - 3) / -4)	1,22 ¹⁾ / 1,30 ²⁾ - 3) / -4)	0,11 ¹⁾ / 0,14 ²⁾ - 3) / -4)	0,09 ¹⁾ / 0,12 ²⁾ - 3) / -4)	0,14 ¹⁾ / 0,18 ²⁾ - 3) / -4)
	Hollow lightweight aggregate concrete element ¹⁰⁾	0,14 ¹⁾ / 0,26 ²⁾ - 3) / -4)	0,21 ¹⁾ / 0,42 ²⁾ - 3) / -4)	0,42 ¹⁾ / 0,84 ²⁾ - 3) / -4)	0,14 ¹⁾ / 0,26 ²⁾ - 3) / -4)	0,12 ¹⁾ / 0,22 ²⁾ - 3) / -4)	0,18 ¹⁾ / 0,33 ²⁾ - 3) / -4)
	Perforated ceramic brick ¹¹⁾	0,11 ¹⁾ / 0,17 ²⁾ - 3) / -4)	0,41 ¹⁾ / 0,41 ²⁾ - 3) / -4)	0,82 ¹⁾ / 0,82 ²⁾ - 3) / -4)	0,11 ¹⁾ / 0,17 ²⁾ - 3) / -4)	0,09 ¹⁾ / 0,14 ²⁾ - 3) / -4)	0,14 ¹⁾ / 0,21 ²⁾ - 3) / -4)
	Perforated ceramic brick ¹²⁾	0,21 ¹⁾ / 0,34 ²⁾ - 3) / -4)	0,43 ¹⁾ / 0,87 ²⁾ - 3) / -4)	0,86 ¹⁾ / 1,74 ²⁾ - 3) / -4)	0,21 ¹⁾ / 0,34 ²⁾ - 3) / -4)	0,17 ¹⁾ / 0,28 ²⁾ - 3) / -4)	0,26 ¹⁾ / 0,42 ²⁾ - 3) / -4)
	Autoclaved aerated concrete AAC 2 ¹³⁾	- ¹⁾ / - ²⁾ 0,18 ³⁾ / 0,14 ⁴⁾	- ¹⁾ / - ²⁾ 0,65 ³⁾ / 0,52 ⁴⁾	- ¹⁾ / - ²⁾ 1,30 ³⁾ / 1,04 ⁴⁾	- ¹⁾ / - ²⁾ 0,18 ³⁾ / 0,14 ⁴⁾	- ¹⁾ / - ²⁾ 0,36 ³⁾ / 0,28 ⁴⁾	- ¹⁾ / - ²⁾ 0,54 ³⁾ / 0,42 ⁴⁾
	Autoclaved aerated concrete AAC 6 ¹³⁾	- ¹⁾ / - ²⁾ 0,43 ³⁾ / 0,32 ⁴⁾	- ¹⁾ / - ²⁾ 1,11 ³⁾ / 0,78 ⁴⁾	- ¹⁾ / - ²⁾ 2,22 ³⁾ / 1,56 ⁴⁾	- ¹⁾ / - ²⁾ 0,43 ³⁾ / 0,32 ⁴⁾	- ¹⁾ / - ²⁾ 0,86 ³⁾ / 0,64 ⁴⁾	- ¹⁾ / - ²⁾ 1,29 ³⁾ / 0,96 ⁴⁾

¹⁾ FF1-08 PP ($h_{nom} = 50$ mm)

²⁾ FF1-08 PA ($h_{nom} = 50$ mm)

³⁾ FF1-08 PP ($h_{nom} = 70$ mm)

⁴⁾ FF1-08 PA ($h_{nom} = 70$ mm)

⁵⁾ According to EN 771-1

⁶⁾ According to EN 771-2

⁷⁾ For example perforated brick MAX according to EN 771-1; a = 12 mm, b = 38 mm, c = 8 mm

⁸⁾ For example perforated brick Porotherm P+W 25 according to EN 771-1; a = 10,2 mm, b = 38 mm, c = 7 mm

⁹⁾ For example calcium silicate hollow block KSL 6DF according to DIN 106 and EN 771-2; a = 22 mm, b = 50 mm, c = 22 mm

¹⁰⁾ For example hollow lightweight aggregate concrete element HBL according to EN 771-3; a = 31 mm

¹¹⁾ For example perforated brick HLZ 12 according to DIN 105 and EN 771-1; a = 12 mm, b = 32 mm, c = 7 mm, d = 12 mm, e = 13 mm

¹²⁾ For example perforated brick HLZ 15 according to DIN 105 and EN 771-1; a = 17 mm

¹³⁾ According to EN 771-4

Displacements under tension and shear loading of FF1-10 anchor in masonry

Anchor type	Base material	Tension load			Shear load		
		N [kN]	Δ_{No} [mm]	$\Delta_{N\infty}$ [mm]	V [kN]	Δ_{Vo} [mm]	$\Delta_{V\infty}$ [mm]
FF1-10	Clay brick HD ⁵⁾	0,43 ¹⁾ / 0,71 ²⁾ - ³⁾ / 1,43 ⁴⁾	0,30 ¹⁾ / 0,51 ²⁾ - ³⁾ / 1,45 ⁴⁾	0,61 ¹⁾ / 1,02 ²⁾ - ³⁾ / 2,90 ⁴⁾	0,43 ¹⁾ / 0,71 ²⁾ - ³⁾ / 1,43 ⁴⁾	0,36 ¹⁾ / 0,59 ²⁾ - ³⁾ / 1,19 ⁴⁾	0,54 ¹⁾ / 0,88 ²⁾ - ³⁾ / 1,79 ⁴⁾
	Sand-lime brick HD ⁶⁾	0,34 ¹⁾ / - ²⁾ 0,43 ³⁾ / - ⁴⁾	0,69 ¹⁾ / - ²⁾ 0,33 ³⁾ / - ⁴⁾	1,38 ¹⁾ / - ²⁾ 0,66 ³⁾ / - ⁴⁾	0,34 ¹⁾ / - ²⁾ 0,43 ³⁾ / - ⁴⁾	0,28 ¹⁾ / - ²⁾ 0,36 ³⁾ / - ⁴⁾	0,42 ¹⁾ / - ²⁾ 0,54 ³⁾ / - ⁴⁾
	Perforated ceramic brick ⁷⁾	- ¹⁾ / 0,14 ²⁾ - ³⁾ / 0,43 ⁴⁾	- ¹⁾ / 0,08 ²⁾ - ³⁾ / 0,87 ⁴⁾	- ¹⁾ / 0,16 ²⁾ - ³⁾ / 1,74 ⁴⁾	- ¹⁾ / 0,14 ²⁾ - ³⁾ / 0,43 ⁴⁾	- ¹⁾ / 0,12 ²⁾ - ³⁾ / 0,36 ⁴⁾	- ¹⁾ / 0,18 ²⁾ - ³⁾ / 0,54 ⁴⁾
	Perforated ceramic brick ⁸⁾	- ¹⁾ / 0,14 ²⁾ - ³⁾ / 0,43 ⁴⁾	- ¹⁾ / 0,11 ²⁾ - ³⁾ / 0,62 ⁴⁾	- ¹⁾ / 0,22 ²⁾ - ³⁾ / 1,24 ⁴⁾	- ¹⁾ / 0,14 ²⁾ - ³⁾ / 0,43 ⁴⁾	- ¹⁾ / 0,12 ²⁾ - ³⁾ / 0,36 ⁴⁾	- ¹⁾ / 0,18 ²⁾ - ³⁾ / 0,54 ⁴⁾
	Calcium silicate hollow block ⁹⁾	- ¹⁾ / 0,21 ²⁾ - ³⁾ / 1,00 ⁴⁾	- ¹⁾ / 0,18 ²⁾ - ³⁾ / 0,19 ⁴⁾	- ¹⁾ / 0,36 ²⁾ - ³⁾ / 0,38 ⁴⁾	- ¹⁾ / 0,21 ²⁾ - ³⁾ / 1,00 ⁴⁾	- ¹⁾ / 0,17 ²⁾ - ³⁾ / 0,83 ⁴⁾	- ¹⁾ / 0,26 ²⁾ - ³⁾ / 1,25 ⁴⁾
	Hollow lightweight aggregate concrete element ¹⁰⁾	- ¹⁾ / 0,09 ²⁾ - ³⁾ / 0,26 ⁴⁾	- ¹⁾ / 0,10 ²⁾ - ³⁾ / 0,18 ⁴⁾	- ¹⁾ / 0,20 ²⁾ - ³⁾ / 0,36 ⁴⁾	- ¹⁾ / 0,09 ²⁾ - ³⁾ / 0,26 ⁴⁾	- ¹⁾ / 0,08 ²⁾ - ³⁾ / 0,22 ⁴⁾	- ¹⁾ / 0,12 ²⁾ - ³⁾ / 0,33 ⁴⁾
	Perforated ceramic brick ¹¹⁾	- ¹⁾ / 0,14 ²⁾ - ³⁾ / 0,26 ⁴⁾	- ¹⁾ / 0,19 ²⁾ - ³⁾ / 0,61 ⁴⁾	- ¹⁾ / 0,38 ²⁾ - ³⁾ / 1,02 ⁴⁾	- ¹⁾ / 0,14 ²⁾ - ³⁾ / 0,26 ⁴⁾	- ¹⁾ / 0,12 ²⁾ - ³⁾ / 0,22 ⁴⁾	- ¹⁾ / 0,18 ²⁾ - ³⁾ / 0,33 ⁴⁾
	Perforated ceramic brick ¹²⁾	- ¹⁾ / 0,09 ²⁾ - ³⁾ / 0,21 ⁴⁾	- ¹⁾ / 0,07 ²⁾ - ³⁾ / 0,26 ⁴⁾	- ¹⁾ / 0,14 ²⁾ - ³⁾ / 0,52 ⁴⁾	- ¹⁾ / 0,09 ²⁾ - ³⁾ / 0,21 ⁴⁾	- ¹⁾ / 0,08 ²⁾ - ³⁾ / 0,17 ⁴⁾	- ¹⁾ / 0,12 ²⁾ - ³⁾ / 0,26 ⁴⁾
	Hollow ceramic brick ¹³⁾	- ¹⁾ / 0,17 ²⁾ - ³⁾ / 0,21 ⁴⁾	- ¹⁾ / 0,11 ²⁾ - ³⁾ / 0,53 ⁴⁾	- ¹⁾ / 0,22 ²⁾ - ³⁾ / 1,06 ⁴⁾	- ¹⁾ / 0,17 ²⁾ - ³⁾ / 0,21 ⁴⁾	- ¹⁾ / 0,17 ²⁾ - ³⁾ / 0,17 ⁴⁾	- ¹⁾ / 0,26 ²⁾ - ³⁾ / 0,26 ⁴⁾
	Autoclaved aerated concrete AAC 2 ¹⁴⁾	- ¹⁾ / 0,18 ²⁾ - ³⁾ / 0,14 ⁴⁾	- ¹⁾ / 0,09 ²⁾ - ³⁾ / 0,12 ⁴⁾	- ¹⁾ / 0,18 ²⁾ - ³⁾ / 0,24 ⁴⁾	- ¹⁾ / 0,18 ²⁾ - ³⁾ / 0,14 ⁴⁾	- ¹⁾ / 0,36 ²⁾ - ³⁾ / 0,28 ⁴⁾	- ¹⁾ / 0,54 ²⁾ - ³⁾ / 0,42 ⁴⁾
	Autoclaved aerated concrete AAC 6 ¹⁴⁾	- ¹⁾ / 0,43 ²⁾ - ³⁾ / 0,32 ⁴⁾	- ¹⁾ / 0,44 ²⁾ - ³⁾ / 0,20 ⁴⁾	- ¹⁾ / 0,88 ²⁾ - ³⁾ / 0,40 ⁴⁾	- ¹⁾ / 0,43 ²⁾ - ³⁾ / 0,32 ⁴⁾	- ¹⁾ / 0,86 ²⁾ - ³⁾ / 0,64 ⁴⁾	- ¹⁾ / 1,25 ²⁾ - ³⁾ / 0,96 ⁴⁾

¹⁾ FF1-10 PP ($h_{nom} = 50$ mm)

²⁾ FF1-10 PA ($h_{nom} = 50$ mm)

³⁾ FF1-10 PP ($h_{nom} = 70$ mm)

⁴⁾ FF1-10 PA ($h_{nom} = 70$ mm)

⁵⁾ According to EN 771-1

⁶⁾ According to EN 771-2

⁷⁾ For example perforated brick MAX according to EN 771-1; a = 12 mm, b = 38 mm, c = 8 mm

⁸⁾ For example perforated brick Porotherm P+W 25 according to EN 771-1; a = 10,2 mm, b = 38 mm, c = 7 mm

⁹⁾ For example calcium silicate hollow block KSL 6DF according to DIN 106 and EN 771-2; a = 22 mm, b = 50 mm, c = 22 mm

¹⁰⁾ For example hollow lightweight aggregate concrete element HBL according to EN 771-3; a = 31 mm

¹¹⁾ For example perforated brick HLZ 12 according to DIN 105 and EN 771-1; a = 12 mm, b = 32 mm, c = 7 mm, d = 12 mm, e = 13 mm

¹²⁾ For example perforated brick Doppio uni according to EN 771-1; a = 11 mm, b = 24 mm, c = 10 mm

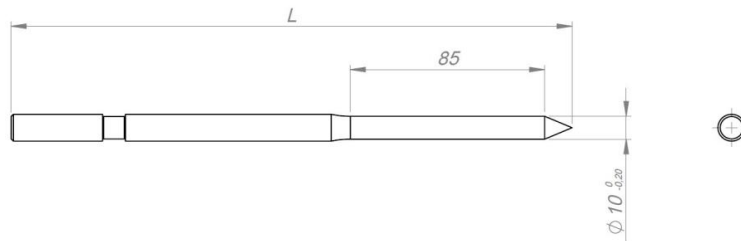
¹³⁾ For example perforated brick Optibric PV according to EN 771-1; a = 10 mm, b = 39 mm, c = 7, d = 38 mm, e = 6,5 mm ¹⁴⁾ According to EN 771-4

Displacements under tension and shear loading of FF1-10 anchor in autoclaved aerated concrete installation with punch-tool

Anchor type	Base material	Tension load			Shear load		
		N [kN]	δ_{N0} [mm]	$\delta_{N\infty}$ [mm]	V [kN]	δ_{V0} [mm]	$\delta_{V\infty}$ [mm]
FF1-10 PA ($h_{nom} = 70$ mm)	Autoclaved aerated concrete AAC 2 ¹⁾²⁾	0,14	0,19	0,38	0,14	0,28	0,42
	Autoclaved aerated concrete AAC 4 ¹⁾²⁾	0,43	0,29	0,58	0,43	0,86	1,29
	Autoclaved aerated concrete AAC 5 ¹⁾²⁾	0,53	0,35	0,70	0,53	1,06	1,59

¹⁾ According to EN 771-4

²⁾ Drill method: punch tool (see Annex A)



Displacements under tension and shear loading of FF1-14 anchor in masonry

Anchor type	Base material	Tension load			Shear load		
		N [kN]	Δ_{N0} [mm]	$\Delta_{N\infty}$ [mm]	V [kN]	Δ_{V0} [mm]	$\Delta_{V\infty}$ [mm]
FF1-14	Clay brick HD ³⁾	1,14 ¹⁾ 1,28 ²⁾	1,35 ¹⁾ 0,71 ²⁾	2,7 ¹⁾ 1,42 ²⁾	1,14 ¹⁾ 1,28 ²⁾	0,95 ¹⁾ 1,06 ²⁾	1,42 ¹⁾ 1,59 ²⁾
	Sand-lime brick HD ⁴⁾	0,86 ¹⁾ 1,00 ²⁾	1,28 ¹⁾ 0,79 ²⁾	2,56 ¹⁾ 1,58 ²⁾	0,86 ¹⁾ 1,00 ²⁾	0,71 ¹⁾ 0,83 ²⁾	1,06 ¹⁾ 1,25 ²⁾
	Perforated ceramic brick ⁵⁾	0,26 ¹⁾ 0,34 ²⁾	0,83 ¹⁾ 1,48 ²⁾	1,66 ¹⁾ 2,96 ²⁾	0,26 ¹⁾ 0,34 ²⁾	0,22 ¹⁾ 0,28 ²⁾	0,33 ¹⁾ 0,42 ²⁾
	Perforated ceramic brick ⁶⁾	0,26 ¹⁾ 0,34 ²⁾	0,52 ¹⁾ 1,24 ²⁾	1,04 ¹⁾ 2,48 ²⁾	0,26 ¹⁾ 0,34 ²⁾	0,22 ¹⁾ 0,28 ²⁾	0,33 ¹⁾ 0,42 ²⁾
	Calcium silicate hollow block ⁷⁾	0,26 ¹⁾ 0,34 ²⁾	0,61 ¹⁾ 0,80 ²⁾	1,22 ¹⁾ 1,60 ²⁾	0,26 ¹⁾ 0,34 ²⁾	0,22 ¹⁾ 0,28 ²⁾	0,33 ¹⁾ 0,42 ²⁾
	Hollow lightweight aggregate concrete element ⁸⁾	0,34 ¹⁾ 0,34 ²⁾	1,35 ¹⁾ 0,64 ²⁾	2,70 ¹⁾ 1,28 ²⁾	0,34 ¹⁾ 0,34 ²⁾	0,28 ¹⁾ 0,28 ²⁾	0,42 ¹⁾ 0,42 ²⁾
	Perforated ceramic brick ⁹⁾	0,43 ¹⁾ 0,26 ²⁾	0,79 ¹⁾ 0,86 ²⁾	1,58 ¹⁾ 1,72 ²⁾	0,43 ¹⁾ 0,26 ²⁾	0,36 ¹⁾ 0,22 ²⁾	0,54 ¹⁾ 0,33 ²⁾
	Perforated ceramic brick ¹⁰⁾	0,43 ¹⁾ 0,34 ²⁾	0,68 ¹⁾ 1,57 ²⁾	1,36 ¹⁾ 3,14 ²⁾	0,43 ¹⁾ 0,34 ²⁾	0,36 ¹⁾ 0,28 ²⁾	0,54 ¹⁾ 0,42 ²⁾
	Autoclaved aerated concrete AAC 2 ¹¹⁾	0,27 ¹⁾ 0,21 ²⁾	1,24 ¹⁾ 0,77 ²⁾	2,48 ¹⁾ 1,54 ²⁾	0,27 ¹⁾ 0,21 ²⁾	0,54 ¹⁾ 0,42 ²⁾	0,81 ¹⁾ 0,63 ²⁾
	Autoclaved aerated concrete AAC 6 ¹¹⁾	0,89 ¹⁾ 0,53 ²⁾	0,74 ¹⁾ 1,08 ²⁾	1,48 ¹⁾ 2,16 ²⁾	0,89 ¹⁾ 0,53 ²⁾	1,78 ¹⁾ 1,06 ²⁾	2,67 ¹⁾ 1,59 ²⁾

¹⁾ FF1-14 PP ($h_{nom} = 70$ mm)

²⁾ FF1-14 PA ($h_{nom} = 70$ mm)

³⁾ According to EN 771-1

⁴⁾ According to EN 771-2

⁵⁾ For example perforated brick MAX according to EN 771-1; a = 12 mm, b = 38 mm, c = 8 mm

⁶⁾ Perforated brick Porotherm P+W 25 according to EN 771-1; a = 10,2 mm, b = 38 mm, c = 7 mm

⁷⁾ For example calcium silicate hollow block KSL 6DF according to DIN 106 and EN 771-2; a = 22 mm, b = 50 mm, c = 22 mm

⁸⁾ For example hollow lightweight aggregate concrete element HBL according to EN 771-3; a = 31 mm

⁹⁾ For example perforated brick HLZ 12 according to DIN 105 and EN 771-1; a = 12 mm, b = 32 mm, c = 7 mm, d = 12 mm, e = 13 mm

¹⁰⁾ For example perforated brick HLZ 15 according to DIN 105 and EN 771-1; a = 17 mm

¹¹⁾ According to EN 771-4

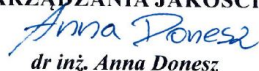
The performance of the product identified above is in conformity with the set of declared performance/s.
This declaration of performance is issued, in accordance with Regulation (EU) No 305/2011, under the sole responsibility of the manufacturer identified above.

Signed for and on behalf of manufacturer:

Anna Donesz

Wrocław, 24.08.2020.

PEŁNOMOCNIK SYSTEMU
ZARZĄDZANIA JAKOŚCIĄ

A handwritten signature in blue ink that reads "Anna Donesz".

dr inż. Anna Donesz