MB Nylon Frame Plug for softer materials

MB Nylon Frame Plug with a special screw made from high quality Polyamide PA6, approved for multiple use in concrete and masonry

ETAG 020 F90

1 SPECIFICATIONS OF INTENDED USE

Anchorages subject to:
- For multiple use in concrete and masonry for non-structural applications, such as façade systems, for fixing or supporting elements which contribute to the stability of the systems

Base materials:
- Cracked and non-cracked, reinforced or unreinforced normal weight concrete of strength classes ≥ C12/15 according to EN 206-1:2014
-Masonry walls and aerated concrete blocks

Approvals:
- European Technical Approval, ETAG 020 anchors for for multiple use in concrete and masonry for non-structural applications

Installation:
- The influence of larger embedment depths, lower mortar strength and/or different bricks and blocks (according ETA-15/0068 regarding base material, size of the units, compressive strength) has to be detected by job site tests

Product assortment:
- MB Nylon Frame Plug for softer materials can be complied with countersunk, hexagon or with hexagon collar screw in stainless steel (A4/316) or in zinc plated version

Safety in case of fire:
- Anchorages satisfy requirements for Class A 1
- Assessment of resistance under fire exposure F90 for fastening of façade systems (for further information see ETA-15/0068, issued on 16.03.2015)

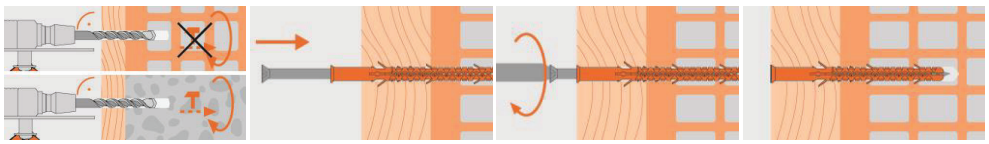
2 PRODUCT DESCRIPTION - MATERIALS

Product	Designation	Material	Nominal characteristic steel yield strength f_{yk} [N/mm^2]	Nominal characteristic steel ultimate strength f_{uk} [N/mm^2]	Surface coating
1	MB Frame Plug (sleeve)	Polyamide, PA6 (Nylon)	—	—	—
2	Carbon steel (screw)	Carbon steel	480	600	Galvanized >5µm, blue passivated
3	Stainless steel (screw)	Stainless steel A4 (EN 10088)	450	700	—

3 INSTALATION INSTRUCTIONS

1. Make the hole (no hammer drilling in hollow masonry brick or aerated concrete),
2. cleaning the hole (not necessary with hollow brick) and setting the preassembled fastener through the part to be fixed,
3. push the anchor till the collar of the sleeve contacts the part to be fixed, then fix the part with screw,
4. tightening the screw until sleeve collar contact.

Graphic installation instruction for MB Nylon Frame Plug



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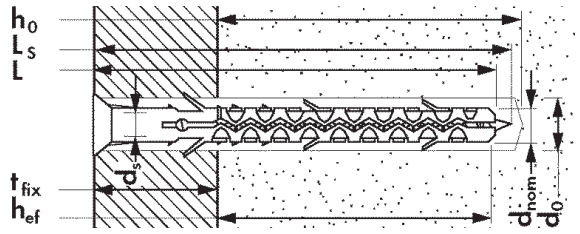
4 INSTALATION DATA

Fastener size			MB 10		
Anchor outer diameter	d_{nom}	[mm]	9.8		
Anchor length	L	[mm]	80-300		
Screw diameter	d_s	[mm]	7.3		
Installation parameters			**Concrete**	**Masonry**	**AAC**
Nominal drilling diameter	d_0	[mm]	10		
Depth of the drill hole	$h_0 \geq$	[mm]	80	80	100
Effective anchorage depth	h_{ef}	[mm]	70	70	90
Screw length	L_s	[mm]	L + 5 mm	L + 5 mm	L + 5 mm
Maximum fixture thickness	t_{fix}	[mm]	≤ 230	≤ 230	≤ 210



5 BASIC PERFORMANCE DATA IN CRACKED OR NON-CRACKED CONCRETE

Basic performance data for MB Nylon Frame Plug in cracked or non-cracked concrete, without influence of edge distance, spacing and splitting failure due to dimensions of concrete member.

CONCRETE				MB 10
Effective anchorage depth		h_{ef}	[mm]	**70**
Minimum thickness of concrete member		h_{min}	[mm]	100
Minimum edge distance	≥ C16/20	S_{min}	[mm]	50
	C12/15	S_{min}	[mm]	70
Minimum spacing	≥ C16/20	C_{min}	[mm]	50
	C12/15	C_{min}	[mm]	70
CHARACTERISTIC RESISTANCE				
Tension load for cracked or non-cracked concrete	≥ C16/20	N_{Rk}	[kN]	2.50
	C12/15	N_{Rk}	[kN]	1.50
Shear load for cracked or non-cracked concrete	Galvanized Steel	V_{Rk}	[kN]	8.50
	Stainless Steel	V_{Rk}	[kN]	8.50
Bending moment, steel failure	Galvanized Steel	M_{Rk}	[Nm]	15.30
	Stainless Steel	M_{Rk}	[Nm]	17.80
DESIGN RESISTANCE				
Tension load for cracked or non-cracked concrete	≥ C16/20	N_{Rd}	[kN]	1.39
	C12/15	N_{Rd}	[kN]	0.83
Shear load for cracked or non-cracked concrete	Galvanized Steel	V_{Rd}	[kN]	6.80
	Stainless Steel	V_{Rd}	[kN]	5.45
Bending moment, steel failure	Galvanized Steel	M_{Rd}	[Nm]	12.24
	Stainless Steel	M_{Rd}	[Nm]	11.41
RECOMENDED RESISTANCE				
Tension load for cracked or non-cracked concrete	≥ C16/20	N_{rec}	[kN]	0.99
	C12/15	N_{rec}	[kN]	0.60
Shear load for cracked or non-cracked concrete	Galvanized Steel	V_{rec}	[kN]	4.86
	Stainless Steel	V_{rec}	[kN]	3.89
Bending moment, steel failure	Galvanized Steel	M_{rec}	[Nm]	8.74
	Stainless Steel	M_{rec}	[Nm]	8.15

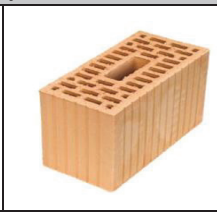
6 VALUES OF RESISTANCE UNDER TENSION AND SHEAR LOADS IN MASONRY UNITS

6.1 Clay masonry

CLAY SOLID BRICK					MB 10
Effective anchorage depth			h_{ef}	[mm]	70
Clay solid brick Mz 12-1.8-NF		Brick dimensions [mm]	237x112x71		
		Bulk density	≥ ρ	[kg/dm^3]	1.8
		Minimum member thickness	h_{min}	[mm]	112
		Minimum edge distance	C_{min}	[mm]	120
		Min. spacing (Vertical to edge)	$S_{1,min}$	[mm]	240
		Min. spacing (Parallel to edge)	$S_{2,min}$	[mm]	480
CHARACTERISTIC RESISTANCE					
Tension load for minimum compressive strength		≥ 10 N/mm^2	N_{Rk}	[kN]	1.50
		≥ 20 N/mm^2	N_{Rk}	[kN]	2.00
Shear load for minimum compressive strength		≥ 10 N/mm^2	V_{Rk}	[kN]	1.50
		≥ 20 N/mm^2	V_{Rk}	[kN]	2.00
DESIGN RESITANCE					
Tension load for minimum compressive strength		≥ 10 N/mm^2	N_{Rd}	[kN]	0.60
		≥ 20 N/mm^2	N_{Rd}	[kN]	0.80
Shear load for minimum compressive strength		≥ 10 N/mm^2	V_{Rd}	[kN]	0.60
		≥ 20 N/mm^2	V_{Rd}	[kN]	0.80
RECOMENDED RESISTANCE					
Tension load for minimum compressive strength		≥ 10 N/mm^2	N_{rec}	[kN]	0.43
		≥ 20 N/mm^2	N_{rec}	[kN]	0.57
Shear load for minimum compressive strength		≥ 10 N/mm^2	V_{rec}	[kN]	0.43
		≥ 20 N/mm^2	V_{rec}	[kN]	0.57

CLAY HOLLOW BRICK					MB 10
Effective anchorage depth			h_{ef}	[mm]	70
Klosterbeuren, Germany Z-17.1-993		Brick dimensions [mm]	308x240x249		
		Bulk density	≥ ρ	[kg/dm^3]	1.2
		Minimum member thickness	h_{min}	[mm]	240
		Minimum edge distance	C_{min}	[mm]	150
		Min. spacing (Vertical to edge)	$S_{1,min}$	[mm]	300
		Min. spacing (Parallel to edge)	$S_{2,min}$	[mm]	600
CHARACTERISTIC RESISTANCE					
Tension load for minimum compressive strength		≥ 12 N/mm^2	N_{Rk}	[kN]	0.50
Shear load for minimum compressive strength*		≥ 12 N/mm^2	V_{Rk}	[kN]	0.50
DESIGN RESISTANCE					
Tension load for minimum compressive strength		≥ 12 N/mm^2	N_{Rd}	[kN]	0.20
Shear load for minimum compressive strength*		≥ 12 N/mm^2	V_{Rd}	[kN]	0.20
RECOMENDED RESISTANCE					
Tension load for minimum compressive strength		≥ 12 N/mm^2	N_{rec}	[kN]	0.14
Shear load for minimum compressive strength*		≥ 12 N/mm^2	V_{rec}	[kN]	0.14

*Shear load with lever arm is not allowed

CLAY HOLLOW BRICK					MB 10
Effective anchorage depth			h_{ef}	[mm]	70
Swiss Modul		Brick dimensions [mm]	300x150x190		
		Bulk density	≥ ρ	[kg/dm³]	0.8
		Minimum member thickness	h_{min}	[mm]	150
		Minimum edge distance	C_{min}	[mm]	150
		Min. spacing (Vertical to edge)	$S_{1,min}$	[mm]	300
		Min. spacing (Parallel to edge)	$S_{2,min}$	[mm]	600
CHARACTERISTIC RESISTANCE					
Tension load for minimum compressive strength		≥ 25 N/mm²	N_{Rk}	[kN]	0.75
Shear load for minimum compressive strength*		≥ 25 N/mm²	V_{Rk}	[kN]	0.75
DESIGN RESISTANCE					
Tension load for minimum compressive strength		≥ 25 N/mm²	N_{Rd}	[kN]	0.30
Shear load for minimum compressive strength*		≥ 25 N/mm²	V_{Rd}	[kN]	0.30
RECOMENDED RESISTANCE					
Tension load for minimum compressive strength		≥ 25 N/mm²	N_{rec}	[kN]	0.21
Shear load for minimum compressive strength*		≥ 25 N/mm²	V_{rec}	[kN]	0.21

*Shear load with lever arm is not allowed

6.2 Calcium silicate masonry

CALCIUM SILICATE SOLID BRICK					MB 10
Effective anchorage depth			h_{ef}	[mm]	70
Calcium silicate solid brick KSV 12-1.8-2DF		Brick dimensions [mm]	240x115x113		
		Bulk density	≥ ρ	[kg/dm³]	1.8
		Minimum member thickness	h_{min}	[mm]	115
		Minimum edge distance	C_{min}	[mm]	120
		Min. spacing (Vertical to edge)	$S_{1,min}$	[mm]	240
		Min. spacing (Parallel to edge)	$S_{2,min}$	[mm]	480
CHARACTERISTIC RESISTANCE					
Tension load for minimum compressive strength		≥ 10 N/mm²	N_{Rk}	[kN]	1.50
		≥ 20 N/mm²	N_{Rk}	[kN]	2.00
Shear load for minimum compressive strength		≥ 10 N/mm²	V_{Rk}	[kN]	1.50
		≥ 20 N/mm²	V_{Rk}	[kN]	2.00
DESIGN RESISTANCE					
Tension load for minimum compressive strength		≥ 10 N/mm²	N_{Rd}	[kN]	0.60
		≥ 20 N/mm²	N_{Rd}	[kN]	0.80
Shear load for minimum compressive strength		≥ 10 N/mm²	V_{Rd}	[kN]	0.60
		≥ 20 N/mm²	V_{Rd}	[kN]	0.80
RECOMENDED RESISTANCE					
Tension load for minimum compressive strength		≥ 10 N/mm²	N_{rec}	[kN]	0.43
		≥ 20 N/mm²	N_{rec}	[kN]	0.57
Shear load for minimum compressive strength		≥ 10 N/mm²	V_{rec}	[kN]	0.43
		≥ 20 N/mm²	V_{rec}	[kN]	0.57

CALCIUM SILICATE HOLLOW BRICK					MB 10
Effective anchorage depth			h_{ef}	[mm]	70
Calcium silicate hollow brick KSL 12-1,2-10DF		Brick dimensions [mm]	300x240x238		
		Bulk density	≥ ρ	[kg/dm^3]	1.2
		Minimum member thickness	h_{min}	[mm]	240
		Minimum edge distance	C_{min}	[mm]	150
		Min. spacing (Vertical to edge)	$S_{1,min}$	[mm]	300
		Min. spacing (Parallel to edge)	$S_{2,min}$	[mm]	600
CHARACTERISTIC RESISTANCE					
Tension load for minimum compressive strength		≥ 8 N/mm^2	N_{Rk}	[kN]	0.40
Shear load for minimum compressive strength*		≥ 8 N/mm^2	V_{Rk}	[kN]	0.40
DESIGN RESISTANCE					
Tension load for minimum compressive strength		≥ 8 N/mm^2	N_{Rd}	[kN]	0.16
Shear load for minimum compressive strength*		≥ 8 N/mm^2	V_{Rd}	[kN]	0.16
RECOMENDED RESISTANCE					
Tension load for minimum compressive strength		≥ 8 N/mm^2	N_{rec}	[kN]	0.11
Shear load for minimum compressive strength*		≥ 8 N/mm^2	V_{rec}	[kN]	0.11

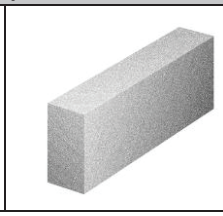
*Shear load with lever arm is not allowed

CALCIUM SILICATE HOLLOW BRICK					MB 10
Effective anchorage depth			h_{ef}	[mm]	70
Calcium silicate Ratio flat element 20-2.0-8DF		Brick dimensions [mm]	498x115x248		
		Bulk density	≥ ρ	[kg/dm^3]	2.0
		Minimum member thickness	h_{min}	[mm]	115
		Minimum edge distance	C_{min}	[mm]	100
		Min. spacing (Vertical to edge)	$S_{1,min}$	[mm]	200
		Min. spacing (Parallel to edge)	$S_{2,min}$	[mm]	400
CHARACTERISTIC RESISTANCE					
Tension load for minimum compressive strength		≥ 10 N/mm^2	N_{Rk}	[kN]	1.50
		≥ 20 N/mm^2	N_{Rk}	[kN]	2.00
Shear load for minimum compressive strength		≥ 10 N/mm^2	V_{Rk}	[kN]	1.50
		≥ 20 N/mm^2	V_{Rk}	[kN]	2.00
DESIGN RESISTANCE					
Tension load for minimum compressive strength		≥ 10 N/mm^2	N_{Rd}	[kN]	0.60
		≥ 20 N/mm^2	N_{Rd}	[kN]	0.80
Shear load for minimum compressive strength		≥ 10 N/mm^2	V_{Rd}	[kN]	0.60
		≥ 20 N/mm^2	V_{Rd}	[kN]	0.80
RECOMENDED RESISTANCE					
Tension load for minimum compressive strength		≥ 10 N/mm^2	N_{rec}	[kN]	0.43
		≥ 20 N/mm^2	N_{rec}	[kN]	0.57
Shear load for minimum compressive strength		≥ 10 N/mm^2	V_{rec}	[kN]	0.43
		≥ 20 N/mm^2	V_{rec}	[kN]	0.57

CALCIUM SILICATE HOLLOW BRICK					MB 10
Effective anchorage depth			h_{ef}	[mm]	70
Calcium silicate Ratio flat element 12-1.6-8DF		Brick dimensions [mm]	498x115x248		
		Bulk density	≥ ρ	[kg/dm^3]	1.6
		Minimum member thickness	h_{min}	[mm]	115
		Minimum edge distance	C_{min}	[mm]	100
		Min. spacing (Vertical to edge)	$S_{1,min}$	[mm]	200
		Min. spacing (Parallel to edge)	$S_{2,min}$	[mm]	400
CHARACTERISTIC RESISTANCE					
Tension load for minimum compressive strength		≥ 12 N/mm^2	N_{Rk}	[kN]	0.75
Shear load for minimum compressive strength		≥ 12 N/mm^2	V_{Rk}	[kN]	0.75
DESIGN RESISTANCE					
Tension load for minimum compressive strength		≥ 12 N/mm^2	N_{Rd}	[kN]	0.30
Shear load for minimum compressive strength		≥ 12 N/mm^2	V_{Rd}	[kN]	0.30
RECOMENDED RESISTANCE					
Tension load for minimum compressive strength		≥ 12 N/mm^2	N_{rec}	[kN]	0.21
Shear load for minimum compressive strength		≥ 12 N/mm^2	V_{rec}	[kN]	0.21

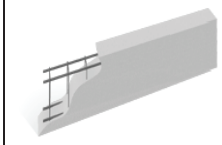
6.3 Solid brick made of concrete (with dense and lightweight aggregates)

LIGHTWEIGHT CONCRETE SOLID BRICK					MB 10
Effective anchorage depth			h_{ef}	[mm]	70
Lightweight concrete solid brick Vbl 2-0.8-2DF		Brick dimensions [mm]	240x115x113		
		Bulk density	≥ ρ	[kg/dm^3]	1.2/2.0
		Minimum member thickness	h_{min}	[mm]	115
		Minimum edge distance	C_{min}	[mm]	120
		Min. spacing (Vertical to edge)	$S_{1,min}$	[mm]	240
		Min. spacing (Parallel to edge)	$S_{2,min}$	[mm]	480
CHARACTERISTIC RESISTANCE					
Tension load for minimum compressive strength		≥ 10 N/mm^2	N_{Rk}	[kN]	1.20
		≥ 20 N/mm^2	N_{Rk}	[kN]	1.50
Shear load for minimum compressive strength		≥ 10 N/mm^2	V_{Rk}	[kN]	1.20
		≥ 20 N/mm^2	V_{Rk}	[kN]	1.50
DESIGN RESISTANCE					
Tension load for minimum compressive strength		≥ 10 N/mm^2	N_{Rd}	[kN]	0.48
		≥ 20 N/mm^2	N_{Rd}	[kN]	0.60
Shear load for minimum compressive strength		≥ 10 N/mm^2	V_{Rd}	[kN]	0.48
		≥ 20 N/mm^2	V_{Rd}	[kN]	0.60
RECOMENDED RESISTANCE					
Tension load for minimum compressive strength		≥ 10 N/mm^2	N_{rec}	[kN]	0.34
		≥ 20 N/mm^2	N_{rec}	[kN]	0.43
Shear load for minimum compressive strength		≥ 10 N/mm^2	V_{rec}	[kN]	0.34
		≥ 20 N/mm^2	V_{rec}	[kN]	0.43

LIGHTWEIGHT CONCRETE SOLID BRICK					MB 10
Effective anchorage depth			h_{ef}	[mm]	70
Lightweight concrete flat element PE12-0.5		Brick dimensions [mm]	997x240x623		
		Bulk density	≥ ρ	[kg/dm^3]	0.8
		Minimum member thickness	h_{min}	[mm]	115
		Minimum edge distance	C_{min}	[mm]	120
		Min. spacing (Vertical to edge)	$S_{1,min}$	[mm]	240
		Min. spacing (Parallel to edge)	$S_{2,min}$	[mm]	480
CHARACTERISTIC RESISTANCE					
Tension load for minimum compressive strength		≥ 4 N/mm^2	N_{Rk}	[kN]	0.40
Shear load for minimum compressive strength		≥ 4 N/mm^2	V_{Rk}	[kN]	0.40
DESIGN RESISTANCE					
Tension load for minimum compressive strength		≥ 4 N/mm^2	N_{Rd}	[kN]	0.16
Shear load for minimum compressive strength		≥ 4 N/mm^2	V_{Rd}	[kN]	0.16
RECOMENDED RESISTANCE					
Tension load for minimum compressive strength		≥ 4 N/mm^2	N_{rec}	[kN]	0.11
Shear load for minimum compressive strength		≥ 4 N/mm^2	V_{rec}	[kN]	0.11

6.4 Autoclaved aerated concrete (AAC)

AUTOCLAVED AERATED CONCRETE					MB 10
Effective anchorage depth			h_{ef}	[mm]	90
Autoclaved aerated concrete (EN 771-4:2011)		Brick dimensions [mm]	250x150x240		
		Bulk density	≥ ρ	[kg/dm^3]	0.55
		Minimum member thickness	h_{min}	[mm]	150
		Minimum edge distance	C_{min}	[mm]	125
		Min. spacing (Vertical to edge)	$S_{1,min}$	[mm]	250
		Min. spacing (Parallel to edge)	$S_{2,min}$	[mm]	500
CHARACTERISTIC RESISTANCE					
Tension load for minimum compressive strength		≥ 5.2 N/mm^2	N_{Rk}	[kN]	1.50
Shear load for minimum compressive strength		≥ 5.2 N/mm^2	V_{Rk}	[kN]	1.50
DESIGN RESISTANCE					
Tension load for minimum compressive strength		≥ 5.2 N/mm^2	N_{Rd}	[kN]	0.75
Shear load for minimum compressive strength		≥ 5.2 N/mm^2	V_{Rd}	[kN]	0.75
RECOMENDED RESISTANCE					
Tension load for minimum compressive strength		≥ 5.2 N/mm^2	N_{rec}	[kN]	0.54
Shear load for minimum compressive strength		≥ 5.2 N/mm^2	V_{rec}	[kN]	0.54

REINFORCED AUTOCLAVED AERATED CONCRETE					MB 10
Effective anchorage depth			h_{ef}	[mm]	90
Reinforced Autoclaved aerated concrete (EN 12602:2013)		Brick dimensions [mm]	250x150x240		
		Bulk density	≥ P	[kg/dm^3]	0.55
		Minimum member thickness	h_{min}	[mm]	150
		Minimum edge distance	C_{min}	[mm]	125
		Min. spacing (Vertical to edge)	$S_{1,min}$	[mm]	250
		Min. spacing (Parallel to edge)	$S_{2,min}$	[mm]	500
CHARACTERISTIC RESISTANCE					
Tension load for minimum compressive strength		≥ 5.2 N/mm^2	N_{Rk}	[kN]	0.90
Shear load for minimum compressive strength		≥ 5.2 N/mm^2	V_{Rk}	[kN]	0.90
DESIGN RESISTANCE					
Tension load for minimum compressive strength		≥ 5.2 N/mm^2	N_{Rd}	[kN]	0.45
Shear load for minimum compressive strength		≥ 5.2 N/mm^2	V_{Rd}	[kN]	0.45
RECOMENDED RESISTANCE					
Tension load for minimum compressive strength		≥ 5.2 N/mm^2	N_{rec}	[kN]	0.32
Shear load for minimum compressive strength		≥ 5.2 N/mm^2	V_{rec}	[kN]	0.32

7 IMPORTANT NOTICE

Values given in this document are valid under the assumptions of sufficient cleaning of the drill hole (not necessary with hollow brick). Resistance for tension, shear or combined tension and shear loading, is valid for a group of ≥ 3 anchors. For the design the complete European Technical Assessment has to be considered. In recommended resistance the partial safety factor for material as regulated in the ETA, as well as a partial safety factor for load action ɣL = 1.4 are considered. For combination of tensile loads, shear loads, bending moments as well as reduced edge distances or spacing's (anchor groups) see ETA or Mungo design software. The data must be checked by the user under the responsibility of an engineer experienced in anchorage and concrete work. This is to ensure there are no errors and all data is complete and accurate and complies with all rules and regulations for the actual conditions and application.