

MasterFlow 916 AN

Polyester Resin Based, Anchoring Mortar

MATERIAL DESCRIPTION

MasterFlow 916 AN is a two-component, thixotropic, polyester based chemical anchoring mortar. The product is specially designed for applications where light to medium loads are to be fixed in hollow blocks or solid material.

Both parts of **MasterFlow 916 AN**, packed in a single cartridge with separate compartments, are correctly mixed in the mixing nozzle while pressing the material out of the cartridge.

APPROVALS AND TESTS

- ETAG 001 Part 5 Option 7 for threaded bars (M8-M24) in galvanized steel 5.8-8.8 & 10.9 and Stainless Steel A4-70; A4-80 & HCR (1.4529) in C20/25 to C50/60 uncracked concrete.
- A+ classification according to compulsory French VOC emissions regulation.
- Tested according to LEED 2009 EQ c4.1, SCAQMD rule 1168 (2005).

FIELDS OF APPLICATION

MasterFlow 916 AN is a universal anchoring mortar typically used for fixing:

- Gates, blinds, antennas
- Guard rails and barriers
- Air conditioning systems
- Connectors for carpentry
- Water heater systems
- Steel plates on concrete
- Street furniture

FEATURES AND BENEFITS

- Easy to use, easy to extrude in Suitable for dry, wet & flooded holes without loss of performance.
- Quick cure system - saves time and money.
- High adhesive power.
- High early and final mechanical strengths.
- For use with a classical silicon gun (300 ml).
- Resists to chemicals.

APPLICATION GUIDELINES

Preparation:

The substrate must be clean, structurally sound, and without substances which can have a negative effect on the adhesion of the chemical anchoring mortar. Concrete or mortars in which bolts, or rods are to be fixed should be at least 28 days old.

Holes:

Holes can be made using hammer drilling machines. Depth and diameter of the holes are to be determined by the substrate, effective loads, and the diameter of the anchor bolts or rebars. The drilled holes need to be cleaned with round brushes and oil-free compressed air directly from a compressor or using special hand pumps.

Using the Cartridges:

It is advised to store the cartridges in a warmer environment if the material is to be used in cold conditions, since squeezing the **MasterFlow 916 AN** requires more effort at cold temperatures. Remove the sealing plug and fix the mixing unit onto the cartridge. Place the cartridge in the extrusion gun and squeeze. Do not use the first few centimetres of material, until the mixed material is of uniform colour.

During longer application interruptions, remove the mixing unit and put back the sealing plug.

Application in Solid Material:

Insert the mixing unit of the **MasterFlow 916 AN** cartridge into the back of the hole and squeeze sufficient material while slowly pulling out. Ensure that no air is entrapped while filling the hole. Introduce the anchoring bolt or rebar by pressing and turning till the back of the hole is reached.

An excess of material needs to be visible. Respect the waiting times as shown in the tables hereafter before the anchors or rebars are exposed to loads.

Application in Hollow Blocks:

Drill a 16 mm hole, clean the hole as mentioned above and insert the sleeve specially designed for this type of application. Close the gasket of this sleeve, press the

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mixing unit against this gasket and inject, without entrapping air, sufficient **MasterFlow 916 AN** for total anchoring. Introduce the anchoring bolt by pressing and turning till the back of the hole. Do not move the bolt before final setting of the **MasterFlow 916 AN**. Before tightening the anchors and exposing them to loads, respect the waiting times as shown in the tables hereafter.

Cleaning of Tools:

Residual material must be mechanically removed after hardening, or by brush and with plenty of soapy water or solvent when still uncured.

PACKAGING

MasterFlow 916 AN is available in cartridges of 300 ml peel pack for standard silicon gun.

STORAGE

12 months in original unopened cartridges. Store at +5°C to + 25°C.

WATCHPOINTS

- **MasterFlow 916 AN** is in hardened condition resistant to many chemicals. A list of chemicals can be found hereafter.
- Material can be applied at temperatures from -5°C to +35°C, but cartridges have to be stored at +5°C or above.
- **MasterFlow 916 AN** can in unhardened conditions be a pollutant for water or soil. Take the necessary precautions and clean according to local guidelines.

HANDLING AND TRANSPORT

Avoid contact with skin by using protective gloves and/or protective cream. Should skin contact occur, wash immediately with soap and water. Protect eyes with safety goggles. Harmful if swallowed. Use only with adequate ventilation. Specific information on handling and transport can be found in the Material Safety Data Sheet of **MasterFlow 916 AN**. Dispose empty packaging and unused, hardened material according to local regulations.

DISCLAIMER

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NOTE

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All products originating from MB Construction Chemicals Solutions South Africa (Pty) Ltd are manufactured under a management system independently certified to conform to the requirements of the quality standards ISO 9001, environmental and occupational health and safety standards.

* Properties listed are based on laboratory controlled tests.

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TECHNICAL DATA

A. Working and Loading Times:

Resin cartridge Temperature °C			T Work minutes	Base Material Temperature °C			T Load minutes
+5	to	+10	12	+5	to	+10	120
+10	to	+20	6	+10	to	+20	80
+20	to	+25	4	+20	to	+25	40
+25	to	+30	3	+25	to	+30	30
+30	to	+35	2	+30	to	+35	20
+35	to	+40	1.5	+35	to	+40	15
+40			1.5	+40			10

Note: T Work is the typical time to get at the highest temperature in the range.

B. Chemical Resistance

The chemical mortar has undergone extensive chemical resistance testing. The results are summarised in the table below.

Chemical Environment	Concentration	Result
Aqueous Solution Aluminium Chloride	Saturated	√
Benzoic Acid	Saturated	√
Butyl Alcohol	100%	C
Carbon Monoxide	Gas	√
Citric Acid Aqueous Solution	Saturated	√
Diesel Fuel	100%	C
Hydrochloric Acid	10%	√
	15%	√
	25%	C
Lubricating Oil	100%	√
Mineral Oil	100%	√
Paraffin / Kerosene (Domestic)	100%	C
Phosphoric Acid	50%	√
Sea Water	100%	C
Sulphur Dioxide Solution	10%	√
Sulphur Dioxide (40°C)	5%	√
Sulphuric Acid	10%	√
	50%	√
White Spirit	100%	√

√ = Resistant to 75°C with at least 80% of physical properties retained.

C = Contact only to a maximum of 25°C.

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C. Installation Parameters:

Size			M8	M10	M12	M16	M20	M24
Nominal drill hole diameter	$\varnothing d_0$	[mm]	10	12	14	18	22	26
Diameter of cleaning brush d_b	d_0	[mm]	14	14	20	20	29	29
Torque moment T_{inst}	T_{inst}	[Nm]	10	20	40	80	150	200
$h_{ef.min} = 8d$								
Depth of drill hole h_0	h_0	[mm]	64	80	96	128	160	192
Minimum edge distance c_{min}	c_{min}	[mm]	35	40	50	65	80	96
Minimum spacing s_{min}	s_{min}	[mm]	35	40	50	65	80	96
Minimum thickness of member h_{min}	h_{min}	[mm]	$h_{ef} + 30mm \geq 100mm$				$h_{ef} + 2d_0$	
$h_{ef.max} = 12d$								
Depth of drill hole h_0	h_0	[mm]	96	120	144	192	240	288
Minimum edge distance c_{min}	c_{min}	[mm]	50	60	70	95	120	145
Minimum spacing s_{min}	s_{min}	[mm]	50	60	70	95	120	145
Minimum thickness of member h_{min}	h_{min}	[mm]	$h_{ef} + 30mm \geq 100mm$				$h_{ef} + 2d_0$	

D. Theoretical Number of Fixings per Cartridge:

Applies to solid substrates

h_{ef}	M8	M10	M12	M16	M20	M24
	Drilling \varnothing 10 mm	Drilling \varnothing 12 mm	Drilling \varnothing 14 mm	Drilling \varnothing 18 mm	Drilling \varnothing 22 mm	Drilling \varnothing 26 mm
8d	106	65	43	23	13	8
10d	85	52	34	18	11	7
12d	71	43	29	15	9	5

Note: Jobsite/contractor installations usually result in more resin being injected than the theoretical requirement resulting in lower number of fixings per cartridge. The reduction to the number of fixings per cartridge in practice is greater for smaller diameter holes and shallow embedment depths.

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E. Using the threaded bars

Combined pullout and concrete cone failure in non-cracked concrete C20/25

Size			M8	M10	M12	M16	M20	M24
Characteristic bond resistance dry/wet concrete and flooded hole	T_{Rk}	[N/mm ²]	10	9.5	9.5	9	8.5	7
Partial safety factor	γ_{Mc}	[-]	1.8					
Factor for concrete	C30/37	Ψ_c	[-]	1.12				
	C40/45			1.19				
	C50/60			1.30				

Tension load calculations for combined concrete cone & pull-out failure at various embedment depths using threaded rods in dry / wet / flooded, uncracked, C20/25 concrete. Temperature range -40°C to +80°C.

Property	Symbol	Unit	Anchor Size					
			M8	M10	M12	M16	M20	M24
Effective Embedment Depth = 8d	h_{ef}	Mm	64	80	96	128	160	192
Characteristics Load (Combined Concrete Cone & pull-out failure)	$N_{Rk,p}^0$	kN	16.08	23.88	34.38	57.91	85.45	101.34
Partial Safety Factor (Dry / Wet Concrete)	γ_{Mc}	-	1.80	1.80	1.80	1.80	1.80	1.80
Effective Embedment Depth = 10d	h_{ef}	Mm	80	100	120	160	200	240
Characteristics Load (Combined Concrete Cone & pull-out failure)	$N_{Rk,p}^0$	kN	20.11	29.85	42.98	72.38	106.81	126.67
Partial Safety Factor (Dry / Wet Concrete)	γ_{Mc}	-	1.80	1.80	1.80	1.80	1.80	1.80
Effective Embedment Depth = 12d	h_{ef}	Mm	96	120	144	192	240	288
Characteristics Load (Combined Concrete Cone & pull-out failure)	$N_{Rk,p}^0$	kN	24.13	35.81	51.57	86.86	128.18	152.00
Partial Safety Factor (Dry / Wet Concrete)	γ_{Mc}	-	1.80	1.80	1.80	1.80	1.80	1.80

1. Characteristic loads are valid for combined concrete cone and pull-out failure as defined by TR029 only. All other failure modes, including steel failure, detailed in TR029 as well as including combined effects of tension and shear, must be considered in accordance with TR029.
2. Characteristic loads are valid for single anchors without close edge, anchor spacing or eccentric loading considerations.
3. Tabulated values are valid for temperature range -40°C to +80°C (Max LTT = +50°C; Max STT = +80°C).
4. Tabulated values are only valid for the installation conditions stated. Other conditions, such as different temperature ranges, may affect the performance of the product.
5. Long term temperatures are those that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, eg: diurnal cycling.
6. The compressive strength of the concrete ($f_{ck,cube}$) is assumed to be 25 N/mm² for C20/25 concrete.
7. Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.

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Hollow Bricks: Type RC 40

Fixing Type		Sleeve Size mm	Drill Ø mm	Min. Drill Depth mm	Recommended Tensile Load kN	Recommended Shear Load kN	Installation Torque Nm
Threaded Bar	Socket						
M8	-	15 or 16 x 85	15 or 16	90	0.65	1.60	6
M10	-	15 or 16 x 85	15 or 16	90	0.65	1.60	6
M12	-	15 or 16 x 85	15 or 16	90	0.65	1.60	6
-	M8 x 80	20 x 85	20	90	0.80	1.85	6
-	M10 x 80	20 x 85	20	90	0.80	1.85	6
-	M12 x 80	20 x 85	20	90	0.80	1.85	6

Solid Bricks and Blocks

Anchor Size	Recommended Load KN Tension or Shear			
	Brickwork 20.5 N/mm ²	Brickwork 7 N/mm ²	Brickwork 3.5 N/mm ²	Brickwork 2.8 N/mm ²
M8	1.4	0.6	0.5	0.4
M10	2.9	1.3	0.9	0.7
M12	4.0	2.0	1.1	0.9
M16	5.0	3.0	Sizes above M12 are not recommended	
M20	Sizes above M16 are not recommended			
M24	Sizes above M16 are not recommended			

Do not install more than one fixing into a single masonry unit.

- In solid masonry, anchors should be spaced at a distance equal to or greater than 100mm centre to centre, and no less than 200mm from an edge.
- In hollow masonry, anchors should be spaced at a distance equal to or greater than 200mm centre to centre, and no less than 250mm from an edge.

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