

MasterEmaco S 499 FR

R4 thixotropic and sprayable ductile mortar with HPF fibers, with contrasted expansion and very high durability for restoring the reinforced concrete. 10 to 50 mm without contrast reinforcement.

MATERIAL DESCRIPTION

MasterEmaco S 499 FR is a cementitious mortar, thixotropic, with contrasted expansion in the air, resistant to aggressive environmental agents, sprayable, containing PAN (polyacrylonitrile) fibers and reinforced with very high tenacity polymeric fibers. The special reinforcement fibers have these characteristics: length 12 mm, diameter 15 microns, tensile strength 1700 MPa, elasticity modulus 72000 MPa.

In the absence of wet maturation, a condition not always achievable on site, to improve the air expansion of MasterEmaco S 499 FR, it is possible to add component B (MasterEmaco A 400). This additive allows to reduce the shrinkage in the plastic and hygrometric phase, improving the seasoning.

FIELDS OF APPLICATION

MasterEmaco S 499 FR has been designed to restore and / or reinforce any concrete structure, in particular where characteristics of ductility, resistance to dynamic stresses, shocks or hydraulic stresses are required.

It can be applied with a spraying machine or trowel, on macroscopically roughened concrete (roughness of about 5 mm), in thicknesses between 1 and 5 cm, without applying an electro-welded mesh.

Typical interventions are represented by:

- repairs of portions of deteriorated concrete structures and reconstructions of the concrete cover layer;
- restoration of structural elements in concrete, including pre-stressed, of both civil and infrastructural works;
- structural restoration of elements subjected to cyclic stresses, impacts and abrasions;
- structural restoration of hydraulic works, sewer pipes and tunnels.

FEATURES AND BENEFITS

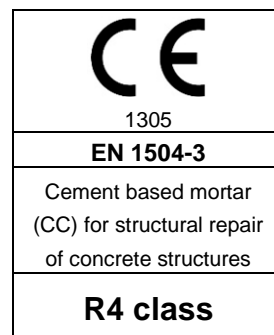
MasterEmaco S 499 FR also has the following peculiarities:

- ductile behavior, thanks to the use of special high tenacity polymeric fibers that also allow the spray application of the product (features that cannot be combined to date); it therefore guarantees high resistance to dynamic stresses, impacts or hydraulic stresses;
- contrasted expansion in the air (monolithicity with the support): the ability to provide a contrasted expansion

with the curing of the mortar in the air, that is, in real construction site conditions, allows MasterEmaco S 499 FR to obtain monolithicity with the support concrete; MasterEmaco S 499 FR, subjected to the bowing / bowing test, shows already after 24 hours an arching(∩) of the specimen which demonstrates, in a simple and immediate way, the effective ability of the product to guarantee the contrasted expansion in the air; on the other hand, materials that show a bending, ie lifting at the edges (∪), would be inadequate for restoration work because they are characterized by shrinkage and therefore unable to guarantee monolithicity with the support;

- resistance to cracking in the plastic phase: to combat micro-cracking in the plastic phase, MasterEmaco S 499 FR is also enriched with polyacrylonitrile PAN fibers;
- resistance to long-term cracking: this fundamental requirement for the durability of the restoration can be assessed through the O Ring test. MasterEmaco S 499 FR does not show any cracks even after long curing;
- resistance to aggressive environmental agents: MasterEmaco S 499 FR, thanks to the very particular chemistry and nature of its components, is absolutely impermeable to water, environmental agents such as chlorides and sulphates, resists freeze / thaw cycles (compatibility thermal) and is not subject to carbonation phenomena.

In compliance with the European Regulation (EU No 305/2011 and EU No. 574/2014) the product is provided with the CE marking according to UNI EN 1504-3 and the relative DoP (Declaration of Performance).



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CONSUMPTION

- 17.5 kg / m² per cm of thickness
- Possible Component B MasterEmaco A 400 (when used): minimum dosage 0.25% of the weight of the powder

PACKAGING

- 25 kg bag
- Possible Component B MasterEmaco A 400: 5 kg tank

STORAGE

Store the product in a dry and sheltered place at a temperature anywhere between 5 and +35°C.

Fiber Features	
Fibre shape	linear
Material	HPME
Length (mm) - according to EN 14889-2 (mm):	12
Diameter (mm) - according to EN 14889-2 (micron):	15
Tensile Strength (N/mm ²) - according to EN 14889-2	1700 MPa
Modulus of elasticity (GPa) - according to EN 14889-2	72 GPa
Elongation at break - according to EN 14889-2 (%)	3.5

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Technical Information			
1504-3 class		R4	
Typology		CC	
Granulometry		Max 2.5 mm	
Chloride content EN 1015-17		<0.05%	
Colour of mix		Grey	
Mixing ratio		3.75-4.25 l for bag (15-17%)	
Consistency of mix		Tixotropic	
Temperature of application		From 5°C to 35°C	
Packaging		25 kg bag.	
Consumption		17.5 kg/m ² for 1 cm	
Workability time (at 20°C)		60 minutes	
Minimum thickness		10 mm	
Maximum thickness in single layer		50 mm	
Essential characteristic in accordance to 1504-3 with a dosage of water of 17.5%		Limits and classes	Performances
Expansive characteristics with air curing:	- UNI 8147 modified - Arching / Winding test		1 g > 0.04 % Arching \cap
Crack test (O Ring test)			No crack after 180 days
Adhesion to concrete	UNI EN 1542 on MC 0.40 substrate (with w/c ratio = 0.40) according to UNI EN 1766	$\geq 1,5$ MPa	$\geq 2,0$ MPa
Resistance to freezing-thawing cycles with deicing salts measured as adhesion	UNI EN 1542 after cycles UNI EN 13687/1 on MC 0.40 substrate	$\geq 1,5$ MPa	$\geq 2,0$ MPa
Resistance to thunder shower cycles measured as adhesion	UNI EN 1542 after cycles UNI EN 13687/1 on MC 0.40 substrate	$\geq 1,5$ MPa	$\geq 2,0$ MPa
Resistance to thermal cycles without deicing salts measured as adhesion	UNI EN 1542 after cycles UNI EN 13687/1 on MC 0.40 substrate	$\geq 1,5$ MPa	$\geq 2,0$ MPa
Resistance to accelerated carbonation	UNI EN 13295	Carbonation depth \leq that of reference concrete MC 0.45 (with w/c ratio = 0.45) according to UNI EN 1766	Specification obsolete
Water impermeability measured as capillary absorption coefficient	UNI EN 13057	$\leq 0,5$ kg·m ⁻² ·h ^{-0,5}	$\leq 0,25$ kg·m ⁻² ·h ^{-0,5}
Elastic modulus	UNI EN13412	a 28 gg ≥ 20.000 MPa	28000 MPa
Compression strength	UNI EN 12190	a 28 gg ≥ 45 MPa	1 g > 20 MPa 7 gg > 50 MPa 28 gg > 60 MPa
Tensile strength in bending	UNI EN 196-1	-	1 d > 6 MPa 7 dd > 8 MPa 28 dd > 10 MPa
Impermeability to water measured as resistance to water penetration under direct pressure	UNI EN 12390/8	-	Average penetration depth < 5 mm
Pull-out resistance of steel bars	RILEM-CEB-FIP RC6-78	-	>25 MPa
Test method for metallic fibre concrete - Measuring the flexural tensile strength (limit of proportionality (LOP), residual) minimum requirements	EN 14651		$f_{cf,Lk}^f = 5,46$ MPa $f_{R,1k} = 5,12$ MPa $f_{R,2k} = 3,80$ MPa $f_{R,3k} = 2,75$ MPa $f_{R,4k} = 2,21$ MPa
Toughness class			Classe 5a

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APPLICATION SHEET

PREPARING THE SUBSTRATE

The thickness to be removed must be determined by the designer on the basis of preliminary investigations aimed at identifying the state of conservation of the structure.

The removal of incoherent or contaminated concrete must take place by means of hydro demolition or mechanical chiselling performed with light breakers powered by compressed air for a thickness determined by the designer on the basis of preliminary investigations aimed at identifying the state of conservation of the structure, adopting all the necessary precautions to avoid damage to the structures.

The surface of the support concrete must be macroscopically rough (roughness of about 5 mm in depth) in order to obtain maximum adhesion between the support and the restoration material. The macro-roughness is essential for the contrasted expansion mechanism to be realized, which is the basis of the operation of expansive conglomerates in the air.

CLEANING REINFORCED BARS

Incoherent or contaminated concrete that surrounds the reinforcing rods will need to be removed. Any exposed reinforcing rods must be cleaned of rust by mechanical brushing or sandblasting; if the removal of degraded or contaminated concrete has been carried out with hydrodemolition, this generally also guarantees a suitable cleaning of the reinforcing bars.

PLACING ADDITIONAL STRUCTURAL REINFORCEMENTS

When it is necessary, for structural reasons, to add new reinforcements, you must guarantee at least a 2 cm cover. To ensure a correct anchorage of the contrast mesh, use reinforcement steel sections inserted in holes with a diameter at least twice that of the bar and sealed with MasterFlow 960. The density and the diameter of said nailing will be established on a case-by-case basis by the Site Manager.

CLEANING AND SATURATION OF CONCRETE

Cleaning and saturation of the substrate concrete must be carried out with pressurised water (80 ÷ 100 atm and using hot water in winter). This operation is crucial in order to prevent the concrete substrate to steal water from the mixture. Inaccurate saturation leads to the loss of adherence and to the cracking of the added material. The use of pressurised water also guarantees effective cleaning of the surfaces in order to remove dust and small inconsistent parts that may be present after the milling of the concrete. The cleaning and saturation of the surfaces are crucial operations for obtaining high adherence values between the substrate and the added material.

APPLICATION TEMPERATURE

MasterEmaco S 499 FR can be applied when the ambient temperature is between 5 and 35 ° C. When the temperature is 5 ÷ 10 ° C the development of mechanical resistance occurs more slowly; it is recommended to store bags of MasterEmaco in a heated environment, to use heated mixing water (30 ÷ 50 ° C), to saturate the substrate with hot water, to apply the mortar in the middle of the day.

It is recommended not to apply at temperatures below 5 ° C, as indeed should be the case for any cementitious conglomerate if no special precautions are taken.

When the temperature is 30 ÷ 40 ° C it is recommended to keep the bags of MasterEmaco in a cool place, to use low temperature mixing water, to apply the mortar in the cooler hours.

PREPARING THE MIXTURE

Mixing must be carried out in a cement mixer or in the mixer of the spraying machine and continue until a plastic, homogeneous and lump-free mixture is obtained; the duration of mixing depends on the effectiveness of the mixer used and must not in any case be less than 6-7 minutes. To mix small quantities, a drill with whisk can be used, but mixing by hand is not recommended.

Each 25 kg bag of MasterEmaco S 499 FR must be mixed for its entire content with 3.75 - 4.25 (15 - 17%) liters of water.

The use of component B (MasterEmaco A 400, which is an additive that allows to improve the expansion in the air and to reduce the shrinkage in the plastic and hygrometric phase by improving the curing), with a minimum dosage

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of 0.25%, it is especially indicated in case of restorations with large surfaces exposed to the air and in the absence of correct curing. It also allows greater maintenance of workability in summer climates. In the case of multi-layer applications, fresh on hardened, MasterEmaco A 400 must be added only in the final layer and not in the lower layers. Any additions of aggregate must be checked in advance on site with test mixes to test their performance.

APPLICATION

MasterEmaco S 499 FR must be applied on macroscopically roughened, coherent, clean and water saturated surfaces.

In the case of large surfaces it can be applied for thicknesses from 10 to 50 mm in a single layer using auger or piston spraying machines (not continuous cycle) of specialized manufacturers (such as Turbosol, PFT, Putzmaister, Bunker, Imer, etc.) . For further details consult our. Technical Service.

During the spray interruption phases (also depending on the external temperature) it is necessary to provide for the thorough cleaning of the pipes and the pump itself using pressurized water and a soft rubber ball to clean the pipes.

In trowel applications (small surfaces) to achieve the desired thickness (maximum 5 cm) it is necessary to proceed first with a rough coat and then with the curling.

FLOATING

Proper floating is essential to effectively counter the formation of micro-cracks resulting from plastic shrinkage. Floating must be applied with a sponge float after sufficient time has elapsed following the application, depending on the weather.

The time interval between the application and the float finish depends on the first hardening phase of the mortar, which is determined by placing your hand on the surface and your fingers do not sink but leave a light mark on the mortar.

HARDENING

It is always advisable to carry out a correct wet maturation of the surfaces exposed to the air. In the case of particularly adverse conditions characterized by low relative humidity and high ventilation, both in hot and cold climates, in the absence of humid ripening, we recommend using the products of the MasterKure line.

PROTECTION

To lengthen the useful life of the structure, enhancing durability even in areas which require no maintenance, it is always recommended to apply a protective system of the MasterProtect line on the entire structure. This acts as a barrier to the entrance of aggressive environmental agents, also improving the aesthetic appearance of the structure.

SAFETY INSTRUCTION

For information on the correct and safe use, transport, storage and disposal of the product, consult the most recent Safety Data Sheet.

OTHER SERVICES

For price analysis, specifications, supplementary brochures, references, reports and technical assistance, visit the website www.master-builders-solutions.com/it-it or contact infomac@mbcc-group.com.

Scan the QR code to visit the product page and download the latest version of this datasheet.



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Since 16/12/1992, Master Builders Solutions Italia Spa has been operating under a Certified Quality System compliant with the UNI EN ISO 9001 Standard. Furthermore, the Environmental Management System is certified according to the UNI EN ISO 14001 Standard and the Safety Management System is certified according to the UNI ISO 45001 Standard.

Master Builders Solutions Italia Spa

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For further information, please consult the local Technician of Master Builders Solutions. The technical advice on how to use our products, either written or verbally given, are based on the current state of our scientific and practical expertise, and does not imply the assumption of any guarantee and/or responsibility for the final results of works executed using our products.

Therefore, the customer is not exempted from the exclusive task and responsibility of verifying the suitability of our products for the intended use and purposes.

This version supersedes all the previous ones.