

MasterEmaco S 499 FR

Cement mortar, premixed, thixotropic, highly ductile, with reinforced polymer fibres and highly resistant, contrasted air expansion, for the restoration of reinforced concrete structures with thicknesses from 1 to 5 cm.

DEFINITION OF THE MATERIAL

MasterEmaco S 499 FR is a cement-based, premixed, thixotropic mortar with contrasted air expansion, resistant to aggressive environmental agents, including polyacrylonitrile fibres and reinforced with high-resistance sprayable polymer fibres.

To guarantee contrasted air expansion mix MasterEmaco S 499 FR with its B component.

MAIN FIELDS OF APPLICATION

MasterEmaco S 499 FR is designed to restore and/or reinforce any concrete structure, in particular those requiring ductility, resistance to dynamic stress, impacts or hydraulic stress.

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

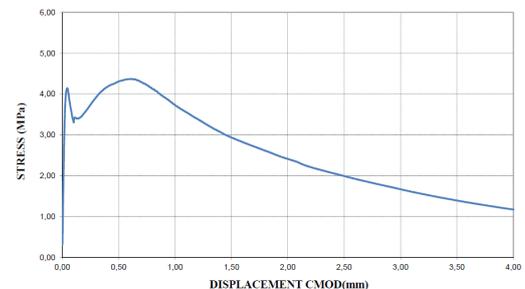
CHARACTERISTICS

MasterEmaco S 499 FR meets the acceptance limits indicated in UNI EN 1504/3

 1305	
BASF Construction Chemicals Italia Spa Via Vicinale delle Corti, 21 Treviso 09 1305-CPD-0805 BC2-563-0013-0002-001	
EN 1504-3 Malta CC per ripristini di strutture in calcestruzzo a base di cemento idraulico	
Resistenza a compressione	Classe R4
Contenuto di cloruri	< 0,05%
Adesione al supporto	> 2,0 MPa
Ritiro	> 2,0 MPa (adesione dopo la prova)
Resistenza alla carbonatazione	Specificata superata
Modulo elastico	> 20 GPa
Compatibilità termica	
Gelo-disgelo	> 2,0 MPa (adesione dopo i cicli)
Temporali	> 2,0 MPa (adesione dopo i cicli)
Cicli a secco	> 2,0 MPa (adesione dopo i cicli)
Assorbimento capillare	0,5 Kg/(m ² ·min ^{0,5})
Reazione al fuoco	Classe A1
Sostanze pericolose	Conforme DM 10/05/2004 e DM 14/05/1996

The particular characteristics of MasterEmaco S 499 FR are:

- Ductile, thanks to the use of special high-resistance polymeric fibres that also allow for the sprayed application of the product (these are features that could not be combined up until now)



It therefore guarantees a high resistance to dynamic stress, shocks or hydraulic stress.

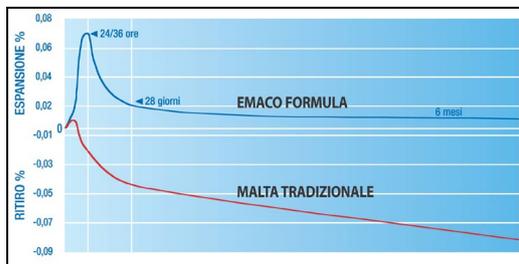
- application without the use of electro-welded mesh: the sprayable polymeric fibres contained in MasterEmaco S 499 FR help eliminate the use of mesh and easily apply the product, also by spraying it;
- contrasted air expansion (monolithic with the support): the ability to provide contrasted expansion with air hardening, that is under the actual on-site conditions, ensures MasterEmaco S 499 FR is monolithic with the supporting concrete.
- When subjected to the hogging/cupping test, already after 24 hours MasterEmaco S 499 FR shows a hogging (∩) of the test piece, which simply and immediately shows that the product can actually guarantee contrasted air expansion.

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Materials that would instead show signs of cupping, i.e. lifted (∪) would not be adequate for recovery work, because they shrink and are therefore incapable of guaranteeing stability against the support;



- resistance to long-term cracking: this basic requirement for the durability of the restoration work is assessed with the O-ring test. MasterEmaco S 499 FR does not show any cracks even during long curing processes;
- resistance to aggressive environmental agents: thanks to the very special chemistry and nature

of its components, MasterEmaco S 499 FR, provides 100% resistance to water, aggressive environmental agents such as chlorides and sulphates, is resistant to freeze/thaw cycles (thermal compatibility) and is not subject to carbonation phenomena;

- resistance to cracking in plastic phase: to tackle micro-cracking in the plastic phase, MasterEmaco S 499 FR is also enriched with PAN fibres in polyacrylonitrile;



CONSUMPTION AND PACKAGING

17,5 kg/m² per cm of thickness.

Package:

- 25 kg bag,
- component B: MasterEmaco A 400 - 5 kg can (the dosage of B component is variable from 0,25% to 1% on the powder weight).

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PERFORMANCE

The performance displayed in the table is obtained according to UNI EN 13395/1 with mixture having a 170-180 mm consistency, without bleeding

Requirements	Acceptance limits	Performance
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	≥ 2 MPa	> 2 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
Thermal compatibility (freezing-thawing cycles with deicing salts) measured as adhesion UNI EN 1542 after cycles UNI EN 13687/1 on MC 0.40 substrate (with a/c ratio = 0.40) in accordance with UNI EN 1766	≥ 2 MPa after 50 cycles	> 2 MPa
Water impermeability measured as capillary absorption coefficient, UNI EN 13057	$\leq 0.5 \text{ kg}\cdot\text{m}^{-2}\cdot\text{h}^{-0.5}$	$< 0.25 \text{ kg}\cdot\text{m}^{-2}\cdot\text{h}^{-0.5}$
Impermeability to water measured as resistance to water penetration under direct pressure, UNI EN 12390/8	----	average penetration depth < 5 mm
Contrasted expansion, UNI 8147	----	1 g > 0.04 %
Compression strength, UNI EN 12190 *	at 28 dd ≥ 45 MPa	1 d > 20 MPa 7 dd > 50 MPa 28 dd > 60 MPa
Tensile strength in bending, UNI EN 196/1	----	1 d > 7 MPa 7 dd > 9 MPa 28 dd > 10 MPa
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 of EN 14651	----	fR1k = 3.5MPa fR3k = 1.5MPa
Elastic modulus, UNI EN 13412	at 28 dd ≥ 20.000 MPa	28.000 (± 2.000) MPa

APPLICATION SHEET

STORAGE

Store in a dry and protected place at a temperature between 5°C and 40°C.

REMOVAL OF DETERIORATED OR CONTAMINATED CONCRETE

The thickness to be removed must be determined by the design engineer on the basis of preliminary surveys aimed at identifying the preservation conditions of the structure. Inconsistent or contaminated concrete must be removed by means of hydro-demolition or mechanical chiselling using light demolition equipment powered by compressed air, adopting all the necessary precautions in order to avoid damaging the structures.

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The surface of the support concrete must appear macroscopically rough (roughness about 5 mm deep) for the purpose of obtaining the utmost adhesion between the substrate and the repair material. Macro roughness is crucial for the realisation of the contrasted expansion mechanism, which is at the basis of the operation of expansive aggregates in air.

CLEANING REINFORCED BARS

Incoherent or contaminated concrete around the reinforced bars must be removed. If the removal of the deteriorated or contaminated concrete has been carried out through hydro-demolition, this generally also ensures adequate cleaning of the reinforcing bars.

PLACING ADDITIONAL STRUCTURAL REINFORCEMENTS

When it is necessary, for structural reasons, to add new reinforcements, you must guarantee a 2 cm cover.

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 during the wintertime). 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°C and +40°C. When the temperature is 5 ÷ 10°C, the mechanical strengths develop more slowly. It is recommended to store the bags of MasterEmaco S 499 FR in a heated environment, use heated mixing water (30 ÷ 50 °C), saturate the substrate with hot water and apply the mortar during the warmer hours of the day.

Do not apply at temperatures below + 5°C, as which also applies to any cement mix if you do not take special precautions.

On the other hand, when the temperature is 30-40°C, it is advisable to store the MasterEmaco S 499 FR bags in a cool place, to use low temperature mixing water and to apply the mortar during the cooler hours of the day.

PREPARING THE MIXTURE

It must be mixed in a concrete mixer or in the mixer of the spraying machine until a plastic, smooth mixture which is free of lumps is obtained. When mixing small amounts, you can also use a power drill; hand mixing, on the other hand, is not recommended. It is always necessary to mix the entire content of each bag. Each 25 kg bag of MasterEmaco S 499 FR must be mixed with 15 - 17% equal to about 3,75 – 4,25 litres. Expansion to compensate the shrinkage without wet curing is ensured by adding from 0,25 kg to 1% of B component for each bag. An additional benefit of the use of the B component is to prolonged the workability of the mortar for example in hot temperature. When the temperature is between 5 and 10°C, you can use a B component dose equivalent to less than 1% to avoid excessively slowing down the hardening time of the product.

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APPLICATION

MasterEmaco S 499 FR must be applied to macroscopically roughened surfaces with no loose parts, as well as being clean and saturated with water.

In the case of extended surfaces, it can be applied in a single coat for thicknesses from 1 to 5 mm by using spraying machines either with an auger or a piston (not featuring a continuous cycle).

During phases when the spray is interrupted (also according to the outside temperature), it is necessary to thoroughly clean the pipes and the pump itself with pressurised water and a soft rubber ball designed to clean pipes.

In trowel applications (on small surfaces) to achieve the desired thickness (up to 5 cm), first create a rough coat and then a browncoat.

FLOATING

Proper floating is essential to effectively counter the formation of micro-cracks resulting from plastic shrinkage. Floating must be applied using a plastic 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

In order to obtain the utmost performance on site that the MasterEmaco line is able to offer, proper curing is necessary. This operation is simple and effective thanks to the use of BASF's curing products.

PROTECTION

To increase the overall durability of restoration work, is always recommended to apply on the whole structure an elastic protective system that can ensure continuity of the outer surfaces.

The system is protected by applying MasterProtect 220 (with polyurethane elastomers) or Masterseal 325 EL (with acrylic elastomers in a water dispersion).

Since 16/12/1992 BASF Construction Chemicals Italia Spa has been operating under a Certified Quality System in compliance with UNI EN ISO 9001. The Environmental Management System is also certified according to Standard UNI EN ISO 14001.

BASF Construction Chemicals Italia Spa

Via Vicinale delle Corti, 21 – 31100 Treviso – Italy

T +39 0422 429200 F +39 0422 421802

<http://www.master-builders-solutions.basf.it>

e-mail: infomac@basf.com

For more information contact the BASF Construction Chemicals Italia Spa Technician in your area.

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This edition supersedes all previous ones.

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