

# MasterEmaco S 485 FR

**Cementitious mortar for grouting, pourable, fibre-reinforced, recommended for the repair of reinforced concrete structures from 10 to 50 mm without weld mesh.**

## MATERIAL DESCRIPTION

MasterEmaco S 485 FR is an air-cured cementitious mortar with restrained expansion suitable for casting, fibre-reinforced with a combination of flexible and resilient inorganic fibres; it is resistant to environmental agents. The reinforcement fibres are 6 and 12 mm long with diameter 14 µm, tensile strength 1.700 MPa and modulus of elasticity 72000 MPa.



In the absence of wet curing, a condition not always achievable on site, MasterEmaco S 485 FR must be mixed with its component B (MasterEmaco A 400) to enhance expansion during air curing. This admixture reduces plastic and hygrometric shrinkage improving the curing.

## FIELDS OF APPLICATION

MasterEmaco S 485 FR has been designed to repair or thicken any concrete structure.

It may be applied by casting onto macroscopically roughened concrete (surface irregularity approx. 5 mm deep) for a thickness between 1 and 5 cm but without weld mesh.




MasterEmaco S 485 FR meets the acceptance limits

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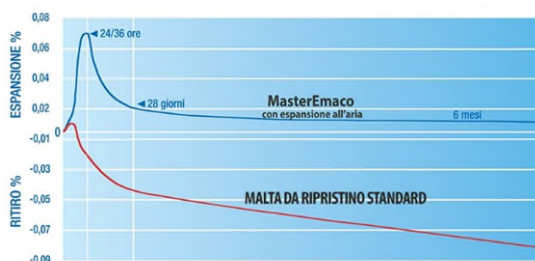
specified in the standard UNI EN 1504/3.

 1305
<b>EN 1504-3</b>  CC mortar for Structural and non-structural repair. EN 1504-3 methods 3.1/3.2/4.4/7.1/7.2.
<b>R4 Class</b>

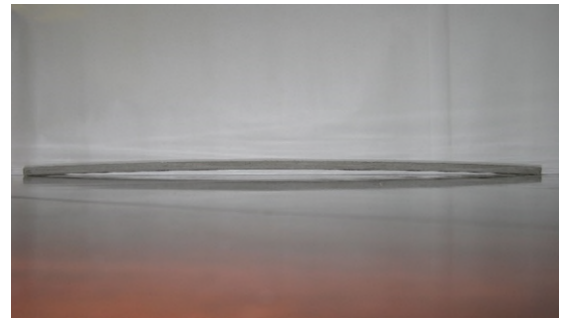
## FEATURES AND BENEFITS

Features peculiar to MasterEmaco S 485 FR are:

- **application without weld mesh:** the flexible inorganic fibres contained in MasterEmaco S 485 FR eliminate the need for weld mesh, making it simpler to apply the product;
- **restrained expansion with air curing (monolithicity with the substrate):** the ability to provide restrained expansion with air curing of the mortar, in other words in real worksite conditions, means that MasterEmaco S 485 FR becomes one with the substrate concrete;



- a test specimen of MasterEmaco S 485 FR subjected to the down/up warping test only 24 hours after application shows **up-warping** (∩), which very simply and immediately proves the effective capacity of the product to guarantee restrained expansion in air;



- materials that instead show down-warping, that is, a **lifting at the edges** (∪), would be unsuitable for repair work because they shrink and are therefore unable to guarantee monolithicity with the substrate;
- **long-term resistance to cracking:** this basic requirement for the duration of the repair work may be assessed through the O Ring test. MasterEmaco S 485 FR shows no signs of cracks after even long curing;
- **resistance to crazing in the plastic phase:** to counter micro-cracking in the plastic phase, MasterEmaco S 485 FR not only contains the fibres necessary to restrain expansion, but is also enriched with special inorganic fibres featuring a very high rate of dispersal and which enhance the rheological nature of the mortar;



- **resistance to environmental agents:** thanks to the very special chemical nature of its components, MasterEmaco S 485 FR is totally waterproof, impermeable to environmental agents such as chlorides and sulphates, resists freeze-thaw cycles (thermal compatibility) and is not subject to carbonation.

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## CONSUMPTION

- 19,7 kg/m<sup>2</sup> for cm thickness
- Component B MasterEmaco A 400 (when used): minimum dosage 0,25% on the powder weight

## PACKAGING

- 25 kg bag
- Component B MasterEmaco A 400: 5 kg can

## STORAGE

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

## APPLICATION SHEET

### PREPARING THE SUBSTRATE

The engineer decides the thickness to be removed on the basis of the preliminary surveys aimed at identifying the state of preservation of the structure.



Loose or contaminated concrete must be removed preferably by hydro demolition or, alternatively, by mechanical chipping using lightweight compressed-air operated concrete breakers and taking all the necessary precautions to avoid damaging the structures.

The surface of the concrete substrate must be macroscopically rough (surface irregularity approx. 5 mm deep) to obtain maximum bond between the substrate and the repair material. This macro-roughness is indispensable for the restrained expansion mechanism, which is essential

for the success of cementitious mixes expanding in air.

### CLEANING REINFORCED RODS

The loose or contaminated concrete around the reinforcement rods must be removed.

Any exposed reinforcement rods must have the rust removed by mechanical brushing or sand-blasting. If the damaged or contaminated concrete has been removed by hydro demolition, this usually guarantees suitable cleaning also of the reinforcement rods.

### PLACING ADDITIONAL STRUCTURAL REINFORCEMENT

Whenever it is necessary to add new reinforcement rods for structural reasons, a layer of 2 cm concrete must cover the rods.



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## TECHNICAL DATA

Product data	
Consistency	Powder and fibres
Colour of mix	Grey
Mixing ratio	3,5-4 litres of water per 25 kg bag (14,5-16%)
Consistency of mix	Fluid
Temperature of application	From +5°C to +35°C
Pot life of mix	80 min

## PERFORMANCE

*The performances shown below are obtained with a slump flow of 240-250 mm, UNI EN 13395/1 in the absence of bleeding*

Requirements	Acceptable tolerance in accordance with EN 1504/3 for R4 type mortars	Performance
Expansion characteristics with air curing: - UNI 8147 modified - Down/up warping test	----	1 g > 0,04 % Up-warping ◯
Cracking test (Ring test)	----	No crack after 180 days
Adhesion to the concrete, UNI EN 1542 on substrate MC 0.40 (having 0.40 w/c ratio) in accordance with UNI EN 1766	≥ 2 MPa	> 2 MPa
Resistance to accelerated carbonation, UNI EN 13295	Depth of carbonation ≤ that of the reference concrete type MC 0.45 (having 0.45 w/c ratio) in accordance with UNI EN 1766	Specification passed
Thermal compatibility (freeze-thaw cycling with de-icing salts) measured as adhesion UNI EN 1542 after the cycles UNI EN 13687/1 on substrate MC 0.40 (having w/c ratio = 0.40) according to UNI EN 1766	≥ 2 MPa after 50 cycles	> 2 MPa
Permeability to water measured as capillary absorption coefficient, UNI EN 13057	≤ 0,5 kg·m <sup>-2</sup> ·h <sup>-0,5</sup>	< 0,25 kg·m <sup>-2</sup> ·h <sup>-0,5</sup>
Permeability to water measured as depth of penetration of water under direct pressure UNI EN 12390/8	----	average depth of penetration < 5 mm
Restrained expansion, UNI 8147	----	1 day > 0,04 %
Compressive strength, UNI EN 12190	at 28 days ≥ 45 MPa	1 day > 25 MPa 7 days > 55 MPa 28 days > 65 MPa
Flexural strength, UNI EN 196/1	----	1 day > 6 MPa 7 days > 8 MPa 28 days > 10 MPa
Resistance to extraction of steel rods RILEM-CEB-FIP RC6-78	----	> 25 MPa
Modulus of elasticity, UNI EN 13412	at 28 days ≥ 20.000 MPa	28.000 (± 2.000) MPa

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## FORMWORK

MasterEmaco S 485 FR may be applied by casting also into formwork. Application of this type must, however, be limited to a maximum thickness of 5 cm.



For a thickness > 5 cm it is advisable to use the grout MasterEmaco S 465 MC.

The forms must be made of adequately strong material, be sufficiently watertight to avoid absorbing or wicking water out of the mortar and must be anchored, bucked and sealed to withstand the pressure of the mortar and avoid loss of material.

Wooden formwork must be saturated prior to casting.

## CLEANING AND SATURATION OF CONCRETE

The concrete substrate must preferably be cleaned and saturated using water under pressure (80-100 atm and warm water in winter).

This is indispensable to prevent the concrete substrate taking water from the mix. Incomplete saturation would cause loss of adherence and cracking of the added material.

The use of water under pressure also ensures effective cleaning of the surface by removing dust and small loose particles that may still be present after the concrete has been scarified. Cleaning and saturation of the surfaces are essential to obtain high values of adherence between the substrate and the applied material.

## APPLICATION TEMPERATURE

MasterEmaco S 485 FR may be applied at an ambient

temperature anywhere between +5°C and +35°C.

Whenever the temperature is between 5 - 10°C the mechanical strength will develop more slowly; it is advisable to keep the bags of MasterEmaco in a heated environment, to use warm mixing water (30 - 50°C), to saturate the substrate with warm water and to apply the mortar in the central hours of the day.

Do not apply at temperatures below + 5°C, as with any other cementitious mortar unless special measures are taken.

Whenever the temperature at the time of application is between 30 - 40°C it is advisable to keep the bags of MasterEmaco in a cool place, to use cold mixing water and to apply the mortar during the coolest hours of the day.

## PREPARING THE MIXTURE

Use a concrete mixer or the pumping machine mixer to mix until a lump-free, even plastic mix is obtained. Small quantities may be mixed with a drill with whisk attachment. Mixing by hand is not recommended. The whole contents of each bag must always be mixed at one time.

Each 25 kg bag of MasterEmaco S 485 FR must be mixed for its entire content with  $3.5 \div 4$  (14.5-16%) litres of water.

The use of component B (MasterEmaco A 400, admixture that reduces plastic and hygrometric shrinkage improving the curing) with a minimum dosage equal to 0,25%, is recommended in case of repairs of extended surfaces exposed to air and in case of incorrect curing. Furthermore, it allows a longer workability in hot periods. If an application in more layers is required (wet on hardened), the component B MasterEmaco A 400 must be used only in the final layer and not in the lower ones.

Any addition of aggregate must be previously checked on site using testing dough to check the performance.

## APPLICATION

At the time of application, the substrate must be saturated but with a dry surface; in other words, any free water must be removed.

MasterEmaco S 485 FR is cast with fluid consistency, also into formwork.

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Casting into formwork of the mortar is continuous and from one side only to avoid air entrapment.

Perfect compaction of the material must always be ensured, if necessary by vibrating it gently.

The mechanized applications can take place with not continuous-cycle worm or piston pump, by specialized manufactures (such as Turbosol, Putzmaister, Bunker, Imer, etc.). For further details consult our Technical Support.

## CURING

To obtain the best results with MasterEmaco products on site, correct curing is necessary.

## PROTECTION

To increase the overall durability of the repair work, it is advisable to apply protection over the whole structure.

The MasterEmaco protection system is accomplished with the application of MasterProtect products.

## ADDITIONAL SERVICES

For price analysis, specifications, supplementary brochures, references, reports and technical assistance, visit [www.master-builders-solutions.com/it.it](http://www.master-builders-solutions.com/it.it) or contact [infomac@mbcc-group.com](mailto:infomac@mbcc-group.com).



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This version supersedes all the previous ones.