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MasterEmaco S 5400

Extra high-strength, shrinkage compensated, fibre reinforced, thixotropic structural repair mortar.

DESCRIPTION
MasterEmaco S 5400 is a single component, extra high strength, high modulus, shrinkage compensated structural repair mortar that meets the requirements of the new European Norm EN 1504 part 3 class R4.
MasterEmaco S 5400 is a ready-to-use material that contains sulphate resistant Portland cement (HSR LA), hydraulic binders, well graded sands, specially selected polymer fibres (PAN – polyacrylonitryl) and special additives to significantly reduce the risk and incidence of shrinkage cracking.
When mixed with water, MasterEmaco S 5400 forms a highly thixotropic mortar that can easily be spray or trowel applied.

FIELD OF APPLICATION
MasterEmaco S 5400 is used for the structural repair of concrete elements such as:
- Columns, piers and cross beams of all bridges
- Cooling towers and chimneys and other industrial environments
- Water treatment and sewerage facilities
- Tunnels, pipes, outfalls and all below ground construction especially in harsh ground conditions
- Marine structures

FEATURES AND BENEFITS
- Can be applied inside and outside, on vertical and overhead surfaces, in dry and wet environments.
- Formulated with new nanotechnology, shrinkage compensation systems and fibre reinforcement (polyacrylonitryl fibres) to minimise crack tendency.
- Highly thixotropic - can be applied up to 50 mm without the need of secondary reinforcement.
- High early and ultimate strengths.
- Outstanding workability for easy placing and finishing.
- High modulus and excellent adhesion to host concrete ensuring load transfer.
- Excellent freeze/thaw resistance.
- High carbonation resistance.
- Sulphate resistant.
- Very low permeability to water and chlorides.
- Low chromate (Cr [VI] < 2 ppm).
- Does not contain chlorides.

APPLICATION METHOD
(A) SURFACE PREPARATION
Hardness and durability of concrete are increasingly important parameters for the preparation of the support. This is particularly valid for repair and/or protection of concrete formulated according to the most recent concrete technology. It is therefore recommended to determine a diagnosis in advance, in order to adapt choices and the way how to prepare the support to these parameters. Consult your Master Builders Solutions representative for additional information.
Concrete must be fully cured, clean and sound to ensure good adhesion. All loose traces of concrete or mortar, dust, grease oil, etc. must be removed.
Concrete must have a minimum direct tensile strength of 1,5 N/mm².
Damaged or contaminated concrete should be removed to obtain a keyed surface. Non-impact/vibrating cleaning methods, e.g. shot blasting, sandblasting or high water pressure blasting are recommended. Aggregate should be clearly visible on the surface of the concrete structure after surface preparation.
Cut the edges of the repair vertically to a minimum depth of 5 mm.

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BE0032/01

EN 1504-3
Concrete repair product for structural repair CC mortar (based on hydraulic cement)

EN 1504-3 Principles 3.1 / 3.3 / 4.4 / 7.1 / 7.2

Compressive strength	class R4
Chloride ion content	≤ 0,05 %
Adhesive bond	≥ 2,0 MPa
Carbonation resistance	passes
Elastic modulus	≥ 25 GPa
Thermal compatibility - Freeze-Thaw - Thunder Shower - Dry cycling	 ≥ 2,0 MPa ≥ 2,0 MPa ≥ 2,0 MPa
Capillary Absorption	≤ 0,5 kg/m².h^{0,5}
Reaction to fire (MPA Dresden)	A1
Dangerous substances	complies with 5.4

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If reinforcing steel is visible, clean to a minimum grade of Sa 2 according to ISO 8501-1 / ISO 12944-4. Ensure back of rebar is also clean. Only in case of chloride contamination of the concrete or when depth of cover is less than 5 mm, should the reinforcement be protected by using MasterEmaco P 5000 AP (see technical data sheet).
For hand applications we advise to apply a brushable bonding layer of MasterEmaco S 5400. For spray applications it is not necessary to apply a bonding layer of MasterEmaco S 5400.
Note: Apply MasterEmaco S 5400 wet on wet on the bonding layer.

(B) MIXING

Open the bags MasterEmaco S 5400 a short time before the mixing is started. Damaged or opened sacks should not be used.
Pour the minimum amount of mixing water into a pure vessel.
Mixing water needed: 3,8 to 4,2 litres per 25 kg bag depending upon consistency required. Add the MasterEmaco S 5400 powder rapidly and continuously and mix MasterEmaco S 5400 with a suitable paddle attached to a powerful, slow speed electric drill (max. 400 rpm) for 3 minutes until plastic consistency is achieved without any lump in the mortar. Only use clean uncontaminated water.
Allow the mortar to rest for 2 - 3 minutes and then remix briefly, adjusting the consistency when required.
Note: Add water if necessary but never exceed the maximum water demand!

(C) APPLICATION

The prepared substrate should be pre-soaked, preferably for 24 hours, but at least 2 hours before applying MasterEmaco S 5400. The surface must be mat-damp, but without standing water.
For optimum curing of the product the temperatures during application of MasterEmaco S 5400 are between +5°C and +30°C.
MasterEmaco S 5400 can be hand applied using a screeding beam, trowel or wooden board, or can be spray applied to the desired thickness of 5 to max. 50 mm. Apply the mixed MasterEmaco S 5400 directly to the prepared damp substrate, or wet on wet onto the primed surface.
Spraying MasterEmaco S 5400 with the necessary pressure (namely first a thin contact layer before building up to the required thickness) will improve the adhesion of MasterEmaco S 5400.
Before MasterEmaco S 5400 is applied to the desired layer thickness, we advise especially in case of hand application and to improve the adhesion, to apply wet in wet a thin scrape coat or contact layer.
Smoothing with a trowel or finishing by float or sponge can be done as soon as the mortar has begun to stiffen. Consult your Master Builders Solutions specialist for more information. At lower temperatures and/or higher humidity these times will be extended.
Immediately after MasterEmaco S 5400 is placed, cover all exposed mortar with clean wet hessian and keep moist by covering with polythene between 1 – 7 days depending on the weather conditions. To maintain effective curing the use of a curing membrane from the MasterTop CC range is recommended.

COVERAGE

Approx. 1.900 kg powder is needed to prepare 1 m^3 of fresh mortar. 25 kg bag will yield approximately 13,4 litres of mortar, when mixed with 4 litres water/bag.

CURING

Full cure is reached in 28 days after the application at a constant temperature of 23ºC.

WORKING TIME

45 – 60 minutes in 20 ºC ambient and substrate temperature.

FINISHING AND CLEANING

Tools and mixer must be cleaned immediately after use with water. Cured material can only be removed mechanically.

PACKAGING

MasterEmaco S 5400 is available in 25 kg paper bags.

STORAGE

Store at ambient temperatures, out of direct sunlight, in cool, dry warehouse conditions and clear of the ground on pallets protected from rainfall prior to application.

SHELF LIFE

12 months if stored at above mentioned storage conditions.

WATCH POINTS

- Do not apply MasterEmaco S 5400 at temperatures below +5ºC nor above +30ºC.
- Do not add cement, sand or other substances that could affect the properties of MasterEmaco S 5400.
- Never add water or fresh mortar to a mortar mix which has already begun to set.
- Keep the mixing water ratio between the recommended limits.

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HANDLING AND TRANSPORT

Usual preventive measures for the handling of chemical products should be observed when using this product, for example do not eat, smoke or drink while working and wash hands when taking a break or when the job is completed.
Specific safety information referring the handling and transport of this product can be found in the Material Safety Data Sheet. For full information on Health and Safety matters regarding this product the relevant Health and Safety Data Sheet should be consulted.
Disposal of product and its container should be carried out according to the local legislation in force. Responsibility for this lies with the final owner of the product.

PRODUCT DATA

Product Data				
Property		**Standard**	**Data**	**Unit**
Chemical Base		-	Cement	-
Color		-	Grey	-
Grain Size	maximum	-	1,4	mm
Chloride Ion Content		EN 1015-17	≤ 0,02	%
Layer Thickness	minimum maximum	-	5 50	mm
Fresh Mortar Density		-	Approx. 2,1	g/cm^3
Mixing Water for 25 kg Bag		-	ca. 3,8 – 4,2	l
Working Time		-	45[1] – 60[1]	Minute
Application Temperature (ambient and substrate)		-	+5 to +30	Celcius
Compressive Strength	1 day 28 days	EN 12190	≥ 18 ≥ 50	N/mm^2
Elasticity Modulus	28 days	EN13412	≥ 29.000	N/mm^2
Adhesion to Concrete	28 days	EN 1542	≥ 2,6	N/mm^2
Adhesion to Concrete after Freeze-Thaw (50 cycles with salt)	28 days	EN 13687-1	≥ 3,2	N/mm^2
Adhesion to Concrete after Thunder-Shower (50 cycles)	28 days	EN 13687-2	≥ 3,5	N/mm^2
Adhesion to Concrete after Dry Cycling (50 cycles)	28 days	EN 13687-4	≥ 3,5	N/mm^2
Carbonation resistance	28 days	EN 13295	d_k≤ Ref. Concrete	mm
Capillary Absorption	28 days	EN 13057	≤ 0,5	kg.m^{-2}.h$^{-0.5}$
Cracking Tendency (I)		Coutinho Ring	No cracking	Up to 180 days
Cracking Tendency (II)		DIN type V-channel	No cracking	Up to 180 days

Note: [1] Hardening times are measured at 21°C ± 2°C and 60% ± 10% relative humidity. Higher temperatures will reduce these times and lower temperatures will extend them. Technical data shown are statistical results and do not correspond to guaranteed minima. Tolerances are those described in appropriate performance standards.

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