



# TEKAMAL SILIKA MSM 2

## Fibre-reinforced repair mortar with microsilica

### SIST EN 1504-3: PCC mortar for structural repair, class R4



Bridge Teharje.

 1404	
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<b>EN 1504-3</b> <b>Mortar for structural repair of concrete, PCC</b> <b>Polymer modified mortar made on the basis of hydraulic cement</b>	
Compressive strength:	Class R4
Chloride ion content:	≤ 0,05 %
Adhesive bond:	≥ 2,0 MPa
Resistance to carbonation:	Adequate
Elastic modulus:	≥ 20 GPa
Thermal compatibility:	
freezing - thawing	≥ 2,0 MPa
Capillary absorption:	≤ 0,5 kgm <sup>-2</sup> h <sup>-0,5</sup>
Harmful substances:	Meets requirement 5.4.
Inflammability class:	Euroclass F

#### PROPERTIES

**Tekamal Silika MSM 2** is a ready-to-use mixture of cement, flint sand, microsilica, special chemical admixtures and polymer fibres to reduce the risk and incidence of shrinkage cracking. Fresh mortar is thixotropic and as such especially suitable for construction repairs on oblique, vertical and above-the-head surfaces.

It is recommended that the layer of **Tekamal Silika MSM 2** be 9-45 mm thick. However, this depends on the position of the surface to be repaired and on its smoothness. If more than one layer of mortar is being applied (multilayer application), the next one is to be applied only after the previous one has already well adhered and stabilised, but has not set yet.

#### FIELD OF APPLICATION

**Tekamal Silika MSM 2** is used for repairing damaged concrete and mortars: filling damaged areas, joints, impact damages, i.e. patching and thin-layer overlaying on facilities exposed to heavy mechanical and physical loads or chemical corrosion:

- Pilots, pillars and beams on bridges and viaducts;
- Treatment plants,
- Energy generating facilities: hydroelectric power plants, thermal power plants, nuclear power plants,
- Industrial facilities,
- Filling rigid joints in stone walls,  
Filling rigid joints between concrete elements.

#### ADVANTAGES

**Tekamal Silika MSM 2** contains silica fume, an amorphous SiO<sub>2</sub> powder of great specific surface, which can fill up even the smallest concrete pores. Besides, it also has implicit cement-like properties which develop in reaction with lime which is released when cement is being hydrated. Consequently, hardened Tekamal Silika MSM 2 has highly reduced permeability and highly increased resistance to corrosion caused by salts which react with lime.

#### Fresh mortar:

- Ready-to-use mixture: only the required amount of water is to be added at the construction site,
- Good workability,
- Reduced risk of water secretion – »bleeding«,
- Retains water/moisture over a longer period of time;
- Easy to apply;
- Does not stick to the tools,
- Easy smoothening/final works,
- Reduced risk of cracks formation due to plastic shrinkage.

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**Hardened mortar:**

- Cement-based: excellent compatibility with substrate and high alkaline reinforcement protection,
- High strengths: adhesive, bending and compressive,
- Resistance to carbonation,
- Low capillary water absorption,
- High resistance to water penetration,
- High resistance to:
  - changes in temperature;
  - the effects of cold and salt;
  - chemical aggression,
  - abrasion,
- Durability.

**TECHNICAL DATA**

Property	Test	Unit	Standard requirement SIST EN 1504-3	Declared
<b>Dry mixture</b>				
Colour and appearance	Visual	-	-	Dark grey powder
Maximum size of aggregate particles	-	mm	-	3
Recommended thickness of a single layer:	-	mm	-	
- Min.				9
- Max.				45
Chloride ion content:	SIST EN 1015-17	%	≤ 0,05	≤ 0,05
<b>Fresh mixture</b>				
Mixing water	-	l	-	approx. 4.0 – 4.5 per 25 kg depending on the desired workability
Workability	SIST EN 13395-1	mm	-	151 ± 15 %
Workability time	-	min	-	approx. 30 – 60 depending on the quantity of mixing water and the temperature
Working temperature: mortar, substrate, environment	-	°C	-	+ 5°C do + 30°C, optimal: + 15°C do + 25°C

Property	Test	Unit	Standard requirement SIST EN 1504-3		Declared
<b>Hardened mortar</b>					
Compressive strength	SIST EN 12190	MPa	Class		
- 3 days			R4	-	≥ 20
- 7 days				-	≥ 37
- 28 days				≥ 45	≥ 48
Density	SIST EN 12190	kg/m <sup>3</sup>	-	-	2020 ± 5 %
Adhesive bond, 28 days	SIST EN 1542	MPa	R4	≥ 2,0	≥ 2,0
Resistance to carbonation	SIST EN 13295	-	R4	$d_k \leq$ reference concrete ( MC (0,45) )	$d_k \leq$ reference concrete ( MC (0,45) )
Elastic modulus, 28 days	SIST EN 13412	GPa	R4	≥ 20	≥ 20
Capillary absorption:	SIST EN 13687-1	kgm <sup>-2</sup> h <sup>0.5</sup>	R4	≤ 0,5	≤ 0,5
Thermal compatibility, Part 1: Adhesive bond after freezing and thawing in the presence of salt (50 cycles) (1)	SIST EN 13057	MPa	R4	≥ 2,0	≥ 2,0

(1) When a product satisfies Part 1 it is deemed to satisfy Part 2: Thunder shower, 30 cycles and Part 4: Dry cycling, 30 cycles.

**APPLICATION GUIDELINES****SUBSTRATE PREPARATION**

The areas on which **Tekamal Silika MSM 2** will be applied must be solid and free of dust, greasy spots, corrosion by-products, mould and other impurities. Any loose materials and remainings of old coatings must be removed mechanically by grinding, grit blasting or water blasting. **Well cleaned substrate should be thoroughly soaked with water, but without any standing water or water film which would prevent Tekamal MSM 0-7 to adhere well to the old substrate.**

**MORTAR PREPARATION**

The most appropriate way of preparing the mortar is by adding dry mortar into water during constant mixing. Depending on its

quantity, the mortar can be mixed using a slow speed drill and a paddle, special mortar mixer or a forced action concrete mixer. Do not use free-fall mixers!

Pour the smallest amount of water still allowed into the mixer and add mortar during constant mixing. Mix for 1-2 minutes; scrape any unmixed dry mortar from the sides of mixing drum and mix for another 2-3 minutes until a completely uniform mixture is obtained. Try to entrain as little air as possible. Leave mortar to rest for approx. 5-10 minutes, add water if needed, then remix and apply. Workability time is 30-60 minutes; it depends on the amount of mixing water used, the consistency of the obtained mixture and temperature. Remix from time to time.

**APPLICATION**

**Tekamal Silika MSM 2** is applied either manually, using ordinary

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masonry tools such as trowel or by spraying. The type of application depends on the size and position of the surface the mortar is being applied to and on the type of work (patching, overlaying). It is important to apply the mortar well i.e. to press it firmly onto the surface. The final smoothing should be done when the mortar is stable enough to allow final corrections without »smearing« the surface.

When mortar is applied manually it is recommended for the purpose of better adhesion and easier application, to apply a thin layer first serving as a bond layer, and then to apply the rest, until a desired thickness is achieved. Apply "wet in wet"!

If the mortar is applied in more than one layer, subsequent layers have to be applied when the previous one is already well-adhered and stable. In order for the mortar to adhere well, the previous layer should not be smoothed and should be left as rough as possible. If the previous layer has been completely hardened it should be damped prior to the application of the subsequent layer.

When repairing smaller surfaces (patching), the damaged areas should be cut at a minimum angle of 90° and maximum angle of 135° to reduce the possibility of debonding with the top surface of the adjacent sound surface as this leads to an uneven curing of mortar and to the formation of cracks on the contact between the old substrate and mortar.

When repairing concrete floors, dilatation, working and border joints should be taken into account! To seal dilatation joints, the use of permanent elastic sealants such as **Tioelast KVZ**, **Tioelast KOS**, **Tekasil Neutral PROFI** and **Tekafleks MS 15** is recommended.

Surfaces repaired with **Tekamal Silika MSM 2** can be subsequently coated or protected with dispersion- or polymer-based protective coatings (acrylic, epoxy etc.) However, be careful the repaired surfaces are sufficiently dry. In any case, we recommend you consult the coating producer!

### • CURING

**Freshly applied mortar should be protected against excessive evaporation (sun, high temperatures, wind, and draught) for 3-4 days. In more unfavourable conditions the protection should be prolonged up to 7-10 days.** The most adequate way of protection is periodic wetting or covering with a wet cloth made of felt or jute and polyethylene film, etc. In case the protection with water is not possible the use of **Kontrasol 22 V** - curing and protection agent, suitable for fresh concrete and mortar - is recommended.

### • CLEANING THE TOOLS AND OTHER ACCESSORIES

Tools and other accessories used during work should be thoroughly cleaned immediately after use!

### ADDITIONAL RECOMMENDATIONS AND WARNINGS

- Do not apply mortar at temperatures below 5°C and above + 35°C!
- Low temperatures (below 10°C) prolong the setting and hardening time. Thus, it is recommended to store the mortar in heated places, to use warm mixing water (approx. 20-30°C) and to execute works during the warmest time of a day.
- In order to accelerate the setting time of concrete, **Cementol Omega P** - set accelerating admixture (approx. 1 % per mortar weight) can be added.
- High temperatures (above 30°C) shorten the setting and hardening time. Thus, it is recommended to store the mortar in cooled places, to use cold mixing water and to execute works during the coldest time of a day.
- Large surfaces exposed to more unfavourable conditions (high temperatures, wind, draught, low air humidity) and to a risk that insufficient protection is/will be provided, can be additionally protected against the formation of cracks due to plastic shrinkage

by adding a shrinking reducing admixture **Cementol Antikontrakt T** (approx. 0.25-0.5 % per mortar weight).

- Technical data indicated in the table apply for the original, prepacked **Tekamal Silika MSM 2** and **NOT** for **Tekamal Silika MSM 2 with one of the admixtures added during mixing**. In cases when contractors decide to add chemical admixtures to the mortar, they should do some preliminary tests in order to find out, if mortar changed in this way still meets the requirements for fresh and hardened mortar.
- Use only originally packed, closed, non-damaged and adequately stored packs of mortar!
- Never apply mortar onto smooth, insufficiently roughened substrates!
- Never apply mortar onto dry substrates!
- Never add water or dry mortar to over thickened mortar. Such mortar should be thrown away.
- During works follow the requirements of standard SIST EN 1504-10: Products and systems for the protection and repair of concrete structures – Part 10: Site application of products and systems and quality control of the works.
- For any additional information and explanations please contact our technical service.

### CONSUMPTION

- approx. 20 kg/m<sup>2</sup>/cm or 2 kg of dry mortar per 1 L of wet mortar depending on the quantity of water added and on the smoothness of the surface.

### PACKAGING

- 25 kg sacks

### STORAGE

- Store the product in tightly closed package in a dry and well ventilated space in order to protect it against potential damage and damp.
- If stored in a dry place, in tightly closed and undamaged packaging the shelf life of the product is min. 1 year from the production date.
- The product may still be used after the date of expiry, but the characteristics important for the intended use have to be examined.

### SAFETY PRECAUTIONS

Because it contains cement, irritates the skin and eyes and may cause allergic reactions if it comes into contact with skin.

- When handling the product, protective gloves and goggles should be used.
- Do not breathe in dry powder.
- Use a protection mask when handling dry powder.
- Eating, drinking or smoking during work is prohibited.
- After finishing work, hands should be thoroughly washed with water.

### WARNING

Instructions are given on the basis of examinations and technical experience of the firm. However, due to specific conditions and work methods, preliminary tests are advised for every type of use. Since we cannot influence the course of work, we cannot be held responsible for its quality.

*Tekamal Silika MSM 2 complies with the requirements of standard SIST EN 1504-3: Products and systems for the protection and repair of concrete structures – Part 3: Structural and non-structural repair: PCC mortar for structural repair, class R4 (for methods based on principles: 3.1, 3.3, 4.4, 7.1, 7.2).*