

## PRODUCT DATA SHEET

# Sika MonoTop<sup>®</sup>-4012

High-performance, more sustainable, Class R4 concrete repair mortar



## PRODUCT DESCRIPTION

Sika MonoTop<sup>®</sup>-4012 is a one-part, cementitious, fibre reinforced, low shrinkage repair mortar. It contains recycled raw materials and can reduce the carbon footprint application activity calculations.

## USES

Sika MonoTop<sup>®</sup>-4012 installation works to be carried out only by Sika Approved Contractors. Please observe information given by Product Data Sheets.

Sika MonoTop<sup>®</sup>-4012 is used to repair all types of reinforced concrete structures and components for:

- Buildings.
- Civil engineering structures.
- Dams.
- Marine structures.
- Suitable for interior or exterior applications.
- Sewage and waste water treatment plants.

The product is used for:

- Restoration work (Principle 3, method 3,1 and 3,3 of EN 1504-9). Repair of spalling and damaged concrete in infrastructure and superstructure works.
- Structural strengthening (Principle 4, method 4,4 of EN 1504-9). Increasing the bearing capacity of the concrete structure by adding mortar.
- Preserving or restoring passivity (Principle 7, method 7,1 and 7,2 of EN 1504-9) - Increasing cover with additional mortar and replacing contaminated or carbonated concrete.

## CHARACTERISTICS / ADVANTAGES

- Uses recycled raw materials.
- Layer thickness 6 to 120 mm.
- Sulphate resistant.
- Hand and machine application (wet spray technique).
- Easy to apply.
- Very low shrinkage.
- Dust reduced for a cleaner, healthier environment.
- Good resistance to sea water.
- Does not require a bonding primer.
- Can be safely used in contact with steel (very low chloride content).
- Low permeability.
- EuroClass A1 reaction to fire rating.
- Class R4 of EN 1504-3.
- Resistant to sulfuric acid attack (exposure classes XWW1 and XWW3).
- Drinking Water Certified.

## ENVIRONMENTAL INFORMATION

- Conforms with LEED v4 MR credit: Building product disclosure and optimisation — Environmental Product Declarations (option 1).
- Conforms with LEED v4 MR credit: Building product disclosure and optimisation — Sourcing of raw materials (option 2).
- Conforms with LEED v4 MR credit: Building product disclosure and optimisation — Material ingredients (option 2).
- Specific Environmental Product Declaration (EPD) in accordance with EN 15804. EPD independently verified by BRE Global.

## APPROVALS / STANDARDS

- CE marking and declaration of performance based on EN 1504-3 Products and systems for the protection and repair of concrete structures — Structural and non-structural repair.
- Specific electrical resistivity DIN EN ISO 12696, Sika MonoTop®-4012, OST.
- Tensile bond strength after vibrational stress DAFStb guideline, Sika MonoTop®-4012, Kiwa, Test report No. P 11864-1-E.
- Sulphate Resistance ÖNORM B 3309-1, Sika MonoTop®-4012, HARTL, No. 013108/2.
- Drinking Water Certificate: Water Regulations Advisory Scheme Ltd (WRAS) Approval Number: 2305560.

## PRODUCT INFORMATION

<b>Chemical Base</b>	Sulphate resistant and replacement cement, selected aggregates and additives.	
<b>Packaging</b>	25 kg bag	
<b>Shelf Life</b>	12 months from date of production	
<b>Storage Conditions</b>	The product must be stored in original, unopened and undamaged sealed packaging in dry conditions at temperatures between +5 °C and +35 °C. Protect the product from direct sunlight. Always refer to packaging. Refer to the current Safety Data Sheet for information on safe handling and storage.	
<b>Appearance / Colour</b>	Grey powder	
<b>Maximum Grain Size</b>	D <sub>max</sub> : 2 mm	
<b>Soluble Chloride Ion Content</b>	≤ 0.05 %	(EN 1015-17)

## TECHNICAL INFORMATION

<b>Abrasion Resistance</b>	Wear Resistance Böhme, wet procedure	< 12 cm <sup>3</sup> /50 cm <sup>2</sup>	(DIN 52108)
<b>Compressive Strength</b>	Class R4		(EN 1504-3)
	<b>Time</b>	<b>Compressive strength</b>	(EN 12190)
	1 day	~19 MPa	
	7 days	~43 MPa	
	28 days	~56 MPa	
<b>Modulus of Elasticity in Compression</b>	≥ 20 GPa		(EN 13412)
<b>Flexural Strength</b>	<b>Time</b>	<b>Tensile strength in flexure</b>	(EN 12190)
	1 day	~4.4 MPa	
	7 days	~7.0 MPa	
	28 days	~8.0 MPa	
<b>Tensile adhesion strength</b>	≥ 2.0 MPa		(EN 1542)
<b>Shrinkage</b>	~500 µm/m (+20 °C / 65 % relative humidity at 28 days)		(EN 12617-4)
<b>Restrained Shrinkage / Expansion</b>	≥ 2.0 MPa		(EN 12617-4)
<b>Electrical Resistivity</b>	~32 kΩ·cm at 100% relative humidity @ 20°C		(ISO 12696)
<b>Thermal Compatibility</b>	≥ 2.0 MPa (Part 1 - Freeze-Thaw)		(EN 13687-1)
<b>Capillary Absorption</b>	≤ 0.5 kg·m <sup>-2</sup> ·h <sup>-0.5</sup>		(EN 13057)
<b>Water Penetration under Pressure</b>	~10 mm		(EN 12390-8)
<b>Chloride Ion Diffusion Resistance</b>	Low: < 2000 coulombs		(ASTM C 1202)

	Chloride diffusion coefficient: $4.8 \times 10^{-12} \text{ m}^2/\text{s}$	(EN 12390-11)
<b>Carbonation Resistance</b>	$dk \leq$ control concrete MC (0.45)	(EN 13295)
<b>Reaction to Fire</b>	EuroClass A1	(EN 1504-3)

## SYSTEM INFORMATION

System Structure	Layer	Product	Function
	Bonding primer / Reinforcement corrosion protection	Sika MonoTop®-1010	Normal use
		SikaTop® Armatec®-110 EpoCem	Demanding requirements
	Concrete repair mortar	Sika MonoTop®-4012	High strength requirements
	Levelling mortar	Sika MonoTop®-3020	Normal use
		Sikagard®-720 Epo-Cem®	Demanding requirements

## APPLICATION INFORMATION

<b>Fresh mortar density</b>	~2.1 kg/L		
<b>Consumption</b>	~1.9 kg/m <sup>2</sup> /mm Note: Consumption data is theoretical and does not allow for any additional material due to surface porosity, surface profile, variations in level, wastage or any other variations. Apply product to a test area to calculate the exact consumption for the specific substrate conditions and proposed application equipment.		
<b>Yield</b>	25 kg of powder yields ~13.7 L of mortar		
<b>Layer Thickness</b>	<b>Orientation</b>	<b>Minimum</b>	<b>Maximum</b>
	Horizontal	6 mm	120 mm
	Vertical	6 mm	~85 mm (~120 mm in localised areas)
	Overhead	6 mm	~30 mm (~50 mm in localised areas)
<b>Product Temperature</b>	Maximum	+30 °C	
	Minimum	+5 °C	
<b>Ambient Air Temperature</b>	Maximum	+30 °C	
	Minimum	+5 °C	
<b>Mixing Ratio</b>	3.75 to 3.9 L of water for a 25 kg bag		
<b>Substrate Temperature</b>	Maximum	+30 °C	
	Minimum	+5 °C	
<b>Pot Life</b>	~60 minutes at +20 °C		

## VALUE BASE

All technical data stated in this Data Sheet are based on laboratory tests. Actual measured data may vary due to circumstances beyond our control.

## FURTHER DOCUMENTS

- Site Handbook 'Repair of Concrete Structures: Patch Repair and Spray Applications'.
- Sika Method Statement: Concrete Repair Using Sika MonoTop® System.
- Recommendations provided in EN 1504-10.

## LIMITATIONS

- Avoid application in direct sun and/or strong winds.
- Do not add water over recommended dosage.
- Apply only to stable, prepared substrates.
- Do not add additional water during the surface finishing as this can cause discolouration and cracking.
- Protect freshly applied material from freezing.
- Do not 'feather edge'.

## ECOLOGY, HEALTH AND SAFETY

Local safety regulations must be observed and it advisable to wear PPI when working with this product with particular attention paid to cutting and handling. Transportation Class: The product is not classified as hazardous good for transport. Disposal: The material is recyclable. Disposal must be according to local regulations. Please contact your local Sika sales organisation for more information.

## APPLICATION INSTRUCTIONS

### EQUIPMENT

Select the most appropriate equipment required for the project:

#### SUBSTRATE PREPARATION EQUIPMENT

- Mechanical hand-held tools.
- High or ultra-high pressure water blasting equipment.

#### STEEL REINFORCEMENT EQUIPMENT

- Abrasive blast cleaning equipment.
- High pressure water blasting equipment.

#### MIXING EQUIPMENT

- Clean mixing containers.
- Small quantities: low speed electric single or double paddle mixer (< 500 rpm).
- Large quantities: Forced action mixer.

#### APPLICATION EQUIPMENT

- Hand applied: Plasterers hawk, trowel.
- Wet Spray: All-in-one mixing and spraying machine or separate spraying machine and all associated ancillary equipment to suit application volumes.

#### FINISHING EQUIPMENT

- Trowel (PVC or wooden).
- Sponge.

Also refer to Site Handbook 'Repair of Concrete Structures – Patch Repair and Spray Applications'.

### SUBSTRATE QUALITY / PRE-TREATMENT

#### Concrete

- The substrate must be thoroughly clean, free from dust, loose material, surface contamination and material which reduce adhesion or prevent suction or wetting by repair materials.
- Remove delaminated, weak, damaged and deteriorated concrete and where necessary, sound concrete. Remove using mechanical handheld tools or high / ultra-high-pressure water blasting equipment
- Make sure sufficient concrete is removed from around corroded reinforcement to allow cleaning, corrosion protection coating (where required) and

compaction of the concrete repair mortar.

- Repair surface areas must be prepared to provide simple square or rectangular layouts to avoid shrinkage stress concentrations and cracking while the repair material cures. This can also avoid structural stress concentrations from thermal movement and loading during the service life.

#### Steel reinforcement

- Remove rust, scale, mortar, concrete, dust and other loose and deleterious material which reduces bond or contributes to corrosion.
- Prepare surfaces to bright steel using abrasive blast cleaning or high-pressure water blasting equipment.

### MIXING

#### HAND APPLIED AND WET SPRAY APPLICATION

1. Pour the minimum amount of water into a suitable clean mixing container or equipment.
2. Gradually add the powder to the water while stirring slowly.
3. Mix thoroughly for at least for 3 minutes, add additional water if necessary. Note: Do not add more water than the maximum specified amount.
4. Adjust to the required consistency to achieve a smooth consistent mix.
5. Check the consistency after every mix.

### APPLICATION

#### IMPORTANT

##### Protect from frost

Protect freshly applied material from freezing and frost to prevent cracking.

#### IMPORTANT

##### Application in the direct sun or strong winds

Avoid application in direct sun, strong winds or both to reduce the risk of the product cracking.

#### REINFORCEMENT CORROSION PROTECTION COATING

1. Where a reinforcement coating is required, apply to the whole exposed circumference Sika MonoTop®-1010 or SikaTop® Armatec®-110 EpoCem®. Refer to the individual Product Data Sheets.

#### BONDING PRIMER

On a well prepared and roughened substrate or for a sprayed application, a bonding primer is generally not required.

When a bonding primer is required to achieve the required adhesion values, use Sika MonoTop®-1010 or SikaTop® Armatec®-110 EpoCem®. Refer to the individual Product Data Sheets.

#### REPAIR MORTAR MANUAL APPLICATION

#### IMPORTANT

##### Substrate pre-wetting

Insufficient substrate saturation prior to application will cause the mortar to not gain full mechanical properties.

1. Only apply the product to stable, prepared substrates.
2. Thoroughly pre-wet the prepared substrate for a minimum of 2 hours before application.
3. Keep the surface wet and do not allow to dry.
4. The final pre-wetted surface must achieve a dark matt appearance (i.e. saturated surface dry).

## IMPORTANT

### Sagging or slumping of built up layers

Allow each layer to slightly harden and remain wet before applying subsequent layers.

1. Remove excess water from within the surface pores and cavities with a clean sponge.
2. Make a scratch coat using the repair mortar.
3. Apply the scratch coat over the complete substrate surface to form a thin layer to fill surface pores or cavities.
4. **IMPORTANT** Do not apply as a 'feather edge'. Apply the repair mortar onto the scratch coat 'wet-on-wet' between the minimum and maximum layer thicknesses without the formation of voids.

### REPAIR MORTAR SPRAYED APPLICATION - WET SPRAY

## IMPORTANT

### Substrate pre-wetting

Insufficient substrate saturation prior to application will cause the mortar to not gain full mechanical properties.

1. Only apply the product to stable, prepared substrates.
2. Thoroughly pre-wet the prepared substrate for a minimum of 2 hours before application.
3. Keep the surface wet and do not allow to dry.
4. The final pre-wetted surface must achieve a dark matt appearance (i.e. saturated surface dry).

## IMPORTANT

### Sagging or slumping of built up layers

Allow each layer to slightly harden and remain wet before applying subsequent layers.

1. Remove excess water from within the surface pores and cavities with a clean sponge.
2. Place the wet mixed repair mortar into the spraying equipment.
3. Spray the repair mortar onto the pre-wetted substrate between the minimum and maximum layer thicknesses without the formation of voids.

### SURFACE FINISHING

## IMPORTANT

### Adding water during surface finishing

Do not add water during the surface finishing as this can cause discolouration and cracking.

1. Allow mortar to surface harden.
2. Surface finish to the required surface texture using a stainless steel, steel, PVC or wooden float.

### COLD WEATHER WORKING

Store bags in a warm environment and use warm water to assist with achieving strength gain and maintaining physical properties.

### HOT WEATHER WORKING

Store bags in a cool environment and using cold water to assist with controlling the exothermic reaction to reduce cracking and maintaining physical properties.

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### Product Data Sheet

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## CURING TREATMENT

- Protect fresh mortar immediately from premature drying using an appropriate curing method, such as curing compound, moist geotextile membrane or polythene sheet.
- Curing compounds must not be used when they could adversely affect subsequently applied products and systems.

## CLEANING OF TOOLS

Clean all tools and application equipment with water immediately after use. Hardened material can only be removed mechanically.

## LOCAL RESTRICTIONS

Note that as a result of specific local regulations the declared data and recommended uses for this product may vary from country to country. Consult the local Product Data Sheet for the exact product data and uses.

## LEGAL NOTES

The information, and, in particular, the recommendations relating to the application and end-use of Sika products, are given in good faith based on Sika's current knowledge and experience of the products when properly stored, handled and applied under normal conditions in accordance with Sika's recommendations. In practice, the differences in materials, substrates and actual site conditions are such that no warranty in respect of merchantability or of fitness for a particular purpose, nor any liability arising out of any legal relationship whatsoever, can be inferred either from this information, or from any written recommendations, or from any other advice offered. The user of the product must test the product's suitability for the intended application and purpose. Sika reserves the right to change the properties of its products. The proprietary rights of third parties must be observed. All orders are accepted subject to our current terms of sale and delivery. Users must always refer to the most recent issue of the local Product Data Sheet for the product concerned, copies of which will be supplied on request.

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