

MAPEGROUT HI-FLOW ZERO

Shrinkage-compensated, fibre-reinforced mortar for concrete repair



BENEFITS AND FEATURES

- High mechanical performance
- High fluidity
- High resistance to abrasion wear
- Structural restoration
- The pour does not need to be vibrated
- Excellent fatigue resistance
- Very low VOC emission

CO₂ FULLY OFFSET PRODUCTS

Mapegrout Hi-Flow Zero is part of the *CO₂ Fully Offset in the Entire Life Cycle* line of products. CO₂ emissions measured throughout the life cycle of products from the Zero line in 2024 using Life Cycle Assessment (LCA) methodology, verified and certified with EPDs, have been offset through the acquisition of certified carbon credits in support of forestry protection projects. A commitment to the planet, to people and to biodiversity. For more details on how emissions are calculated and on climate mitigation projects financed through certified carbon credits, visit the webpage zero.mapei.com.

WHERE TO USE

Repairing structures where particular thicknesses and the state of deterioration require the use of high-flow mortars.

Some application examples

- Structural reinstatement of reinforced concrete beams and pillars.
- Restoring the lower flanges of pre-stressed concrete beams of viaducts.
- Reinstatement of floor beams and slabs after scarification of deteriorated areas.
- Restoring concrete floors (industrial, road and airport).
- Grouting rigid joints between concrete elements.

TECHNICAL CHARACTERISTICS

Mapegrout Hi-Flow Zero is a ready-mixed mortar in powder form composed of highly resistant cements, selected aggregates, special admixtures and synthetic fibres prepared according to a formula developed in MAPEI Research & Development Laboratories.

Thanks to its particular formulation the product has excellent fatigue behaviour up to at least 300,000 cycles, which gives repaired structures a high level of resistance to cracking, including when subject to dynamic loads induced during normal service conditions.

This particular characteristic, together with the requirements of EN 1504, helps increase the durability of elements restored with **Mapegrout Hi-Flow Zero**.

Mapegrout Hi-Flow Zero when mixed with water, becomes a highly fluid mortar, suitable for pouring into formwork without separation of the aggregates even when forming great thicknesses.

To allow the product's expansive properties to develop fully and correctly, **Mapegrout Hi-Flow Zero** must be mixed with water and cured in a damp environment. However, it is very difficult to guarantee these conditions on site.

Therefore, to allow expansion in the open air, **Mapegrout Hi-Flow Zero** may also be admixed with 0.25% of **Mapecure SRA**.

Mapecure SRA carries out an extremely important role and guarantees better curing of the mortar. When mixed with **Mapegrout Hi-Flow Zero**, it can be considered a technologically advanced system, as it is able to reduce the rapid evaporation of water and promote the development of hydration reactions.

Mapecure SRA acts like an internal curing agent and, thanks to its interaction with some of the main components which make up the cement, it helps to reduce shrinkage by between 20 and 50% compared with the standard values of the product without the admix. This reduces the risk of cracking.

The product can be used also without using **Mapecure SRA** when environmental conditions allow for correct curing.

Mapegrout Hi-Flow Zero, once cured, has the following characteristics:

- high flexural and compressive strength;
- modulus of elasticity, thermal expansion coefficient and permeability coefficient similar to high-quality concrete;
- waterproof;
- excellent bond strength to old concrete, if dampened with water before application, and to reinforcement rods, especially if treated beforehand with **Mapefer** or **Mapefer 1K Zero**;
- high resistance to wear from abrasion.

Mapegrout Hi-Flow Zero is a product with very low emission of volatile organic compounds (VOC), which safeguards the health and safety of installers and final users. It is certified as EC1 Plus by the German association GEV.

Mapegrout Hi-Flow Zero helps earn important LEED credits.

Mapegrout Hi-Flow Zero meets the requirements defined by EN 1504-9 (*"Products and systems for the protection and repair of concrete structures - Definitions, requirements, quality control and evaluation of conformity - General principles for the use of products and systems"*) and the minimum requirements claimed by EN 1504-3 (*"Structural and non structural repair"*) for structural mortars of class R4.

Mapegrout Hi-Flow Zero is recommended for thicknesses up to 4 cm. For greater thicknesses, it is recommended to add suitable graded aggregates from 30 to 50% by weight of **Mapegrout Hi-Flow Zero**, only after consulting our Technical Services Department.

RECOMMENDATIONS

- Do not use **Mapegrout Hi-Flow Zero** on smooth concrete surfaces; roughen them to reach a sound, resistant and rough substrate with more than 5 mm coarseness and insert reinforcing rods if needed.
- Do not use **Mapegrout Hi-Flow Zero** for applications by spray or trowel (use **Mapegrout Thixotropic Zero**).
- Do not add cement or admixtures to **Mapegrout Hi-Flow Zero**.
- Do not add water after the mix has begun to set.
- Do not use **Mapegrout Hi-Flow Zero** if its packing has been damaged or if it has been opened prior to use.
- If higher flexural strength or impact resistance values are required, use **Mapegrout Hi-Flow TI 20**, hi-flow, shrinkage-compensated, steel fibre-reinforced, high-ductility cementitious mortar.

APPLICATION PROCEDURE

TECHNICAL INFORMATION FOR THE APPLICATION

Composition of mix:	100 kg of Mapegrout Hi-Flow Zero 12.5-13.5 kg of water 0.25 kg of Mapecure SRA (optional *)
Layer thickness:	from 10 to 40 mm (please refer to "Application of the mortar" paragraph for greater thicknesses)
Application temperature range:	environmental and substrate temperature from +5°C to +35°C
Pot life of mix:	approx. 60 mins. (at +20°C)
Environment of use (climatic and geographical conditions):	The product can be used in the environmental conditions pursuant to the following exposure classes (EN 206- table F.1) X0 XC1, XC2, XC3, XC4 XD1, XD2, XD3 XS1, XS2, XS3 XF1, XF2, XF3, XF4 XA1

* To allow expansion in air

Preparation of the substrate

- Remove all deteriorated, detaching or contaminated concrete until a rough, sound and resistant substrate is obtained. Remove any previous repair work or coating if not perfectly adhering to the substrate, using suitable tools (mechanical demolishing, hydroscarifying etc.).
- Clean concrete from previous scarifying works and clean reinforcing rods from dust, cement laitance, rust, grease, oil, paint and other contaminants through sandblasting and high-pressure water jets.
- After preparation, the concrete surface to be repaired must be rough, with irregularities at least 5 mm deep and inert fraction exposed to allow correct adhesion of the mortar to the substrate.
- Treat any exposed rebar with **Mapefer** or **Mapefer 1K Zero** according to the procedure illustrated in the relative Technical Data Sheet for each product.
- Wait until **Mapefer** or **Mapefer 1K Zero** dries.
- Soak the substrate with water.
- Allow the excess water to evaporate before pouring in the mix; if necessary, use compressed air to facilitate the removal of the excess water.

Preparation of the mortar

Pour 3.15-3.4 litres of water into a cement mixer and then slowly add **Mapegrout Hi-Flow Zero**.

If improved open-air curing of the mortar is required, add **Mapecure SRA** at the end of the mixing phase at a dosage of 0.25% by weight of the mortar (0.25 kg every 100 kg of **Mapegrout Hi-Flow Zero**).

Mix for 3-4 minutes, scrape any unmixed powder off the sides of the mixer and remix for another 1-2 minutes until the mix is fluid and free from lumps.

Depending on the quantity being prepared, a mortar mixer or a drilling machine with a stirrer attachment can be used.

Avoid stirring an excess of air into the mix. **Mapegrout Hi-Flow Zero** has a pot life of 1 hour at +20°C. Workability time may be extended by using **Dynamon EW** liquid admixture, according to MAPEI Technical Assistance recommendations.

The expansion of **Mapegrout Hi-Flow Zero** has been calculated to compensate for hygrometric shrinkage. To be effective, the forces of expansion must be countered with suitable reinforcement or formwork around the substrate.

The product may be transported using piston pumping or worm-screw double mixing rendering machine. For further information about mixing and pumping of the product contact MAPEI Building Technical Assistance. Instructions for the preparation of mortar for Lab testing samples can be found in the TECHNICAL DATA section.

Application of the mortar



To facilitate the expulsion of air, pour **Mapegrout Hi-Flow Zero** continuously into the formwork by one side only. Water from **Mapegrout Hi-Flow Zero** must not be absorbed by the formwork, which we recommend to be pre-treated with a form-release oil (e.g. MAPEI's **Mapeform DMA 1000**).

The pour does not need to be vibrated. Make sure that all the parts to be repaired have been filled. If necessary, use sticks or rods to tamp the slurry into particularly difficult areas.

Pours thicker than 4 cm must be carried out after placing reinforcement steel rebar anchored to the substrate, with at least 2 cm concrete covering.

Lower thicknesses may be carried out without applying reinforcing rods as long as the substrate is roughened with irregularities equal to or greater than 5 mm, in order to counter the expansion of mortar which completes during the first days of curing.

To complete the repair cycle paint surfaces using **Elastocolor Paint**.



Pouring into a formwork



Machine application

PRECAUTIONS TO BE TAKEN DURING AND AFTER APPLICATION

- To prepare the mix, only use bags of **Mapegrout Hi-Flow Zero** which have been stored on their original pallets.
- In hot weather, store the product in a cool place and use only cold water to blend the mortar.
- In cold weather, store the product in a place which is protected from frost and use lukewarm water to blend the mortar.
- After laying **Mapegrout Hi-Flow Zero**, we recommend that it is cured carefully, especially in hot or windy weather, to avoid the water evaporating too quickly and causing the formation of surface cracks due to plastic shrinkage. For horizontal pours spray water on the surface during application and immediately cover with a waterproof sheet for at least 3 days. For vertical pours spray water on the surface immediately after form-release and cover with a waterproof sheet for at least 3 days. Surface anti-evaporation products may be applied alternatively to wet curing, provided they are selected according to following operational steps.

CLEANING

Before hardening, the mortar can be cleaned from tools with water. After setting, cleaning is very difficult and it can only be removed mechanically.

CONSUMPTION

Approx. 20.5 kg/m² per cm of thickness.

PACKAGING

25 kg bags.

STORAGE

Mapegrout Hi-Flow Zero may be stored for up to 12 months in its original packaging.

The special 25 kg vacuum-packed polyethylene bags offer better protection of the product from rainfall. Some characteristics of the product are heavily influenced by storage conditions. It is advisable to stock the product in a dry and covered area at a temperature between +5°C and +35°C, in its original unopened packaging.

SAFETY INSTRUCTIONS FOR PREPARATION AND APPLICATION

Instructions for the safe use of our products can be found on the latest version of the Safety Data Sheet, available from our website www.mapei.com.

PRODUCT FOR PROFESSIONAL USE.

TECHNICAL DATA (typical values)

PRODUCT IDENTITY

Strength class according to EN 1504-3:	R4
Type according to EN 1504-1:	CC
Consistency:	powder
Colour:	grey
Maximum size of aggregate:	2.5 mm
Ion-chloride content according to EN 1015-17: (minimum requirement according to EN 1504 $\leq 0.05\%$)	$\leq 0.05\%$

TECHNICAL INFORMATION FOR THE PREPARATION OF PRODUCT

Composition of mix:	100 parts by weight of Mapegrout Hi-Flow Zero with 13 % water
Preparation of mix:	mixing of product according to EN 196-1

CHARACTERISTICS OF FRESH MIX (at +20°C - 50% R.H.)

Colour of mix:	grey
Consistency of mix:	fluid
Density of mix:	2300 kg/m ³

FINAL PERFORMANCE

According to curing defined in test methods

Performance characteristic	Test method	Requirements EN 1504-3 R4	Requirements EN 1504-6	Product performance
Compressive strength: - 1 day - 7 days - 28 days	EN 12190	- - ≥ 45 MPa	not required	25 MPa 60 MPa 75 MPa
Flexural strength: - 1 day - 7 days - 28 days	EN 196-1	not required	not required	5 MPa 10 MPa 11 MPa
Compressive modulus of elasticity:	EN 13412	≥ 20 GPa	not required	27 GPa
Bond strength by pull-off:	EN 1542	≥ 2.0 MPa	not required	> 2.0 MPa
Contrasted expansion in air (24 h):	UNI 8147 B method mod.	not required	not required	400 $\mu\text{m/m}$ ⁽¹⁾
Warp test:	-	not required	not required	convex behaviour ⁽¹⁾
Resistance to cracking:	"O Ring Test"	not required	not required	no cracking after 180 days ⁽¹⁾
Resistance to accelerated carbonation:	EN 13295	carbonation depth $\leq$ than reference concrete	not required	meets specifications
Water impermeability – penetration depth:	EN 12390-8	not required	not required	< 5 mm
Capillary absorption:	EN 13057	≤ 0.5 kg/m ² ·h ^{0.5}	not required	< 0.08 kg/m ² ·h ^{0.5}

Pull-out strength of steel rebar – displacement at load of 75 kN:	EN 1881	not required	≤ 0.6 mm	< 0.6 mm
Pull-out strength of ϕ 8 mm steel rebar – tension of adhesion t_{dm} :	EN 10080 Annex D (in compliance with recommendation RILEM RC 6)	not required	not required	> 25 MPa
Thermal compatibility – freeze-thaw cycles using de-icing salts (50 cycles):	EN 13687-1	≥ 2.0 MPa	not required	> 2.0 MPa
- storm cycles (30 cycles):	EN 13687-2	≥ 2.0 MPa		> 2.0 MPa
- dry thermal cycles (30 cycles):	EN 13687-4	≥ 2.0 MPa		> 2.0 MPa
Freeze-thaw resistance in presence of salts – scaling:	EN 12390-9	not required	not required	< than reference concrete (XF4) ⁽²⁾
Reaction to fire:	EN 13501-1	Euroclass	Euroclass	A1

NOTES:

Preparation of test samples: pour mortar in the moulds without settling.

⁽¹⁾ Performance figures obtained by adding 0.25% of **Mapecure SRA**.

⁽²⁾ **Mapegrout Hi-Flow Zero** has been tested according to EN 12390-9 by comparing it with reference concrete with a composition specified for class XF4 according to EN 206-1 standards.

WARNING

Although the technical details and recommendations contained in this product data sheet correspond to the best of our knowledge and experience, all the above information must, in every case, be taken as merely indicative and subject to confirmation after long-term practical application; for this reason, anyone who intends to use the product must ensure beforehand that it is suitable for the envisaged application. In every case, the user alone is fully responsible for any consequences deriving from the use of the product. The values declared in the TECHNICAL DATA table (typical values) were obtained in compliance with test methods and curing cycles defined in the technical standards referenced therein. Therefore, please note that the use of test procedures or methods other than those indicated in the table could lead to different values and that, in such cases, any liability of our company is excluded.

Please refer to the current version of the Technical Data Sheet, available from our website www.mapei.com

LEGAL NOTICE

The contents of this Technical Data Sheet ("TDS") may be copied into another project-related document, but the resulting document shall not supplement or replace requirements per the TDS in force at the time of the MAPEI product installation.

The most up-to-date TDS can be downloaded from our website www.mapei.com.

ANY ALTERATION TO THE WORDING OR REQUIREMENTS CONTAINED OR DERIVED FROM THIS TDS EXCLUDES THE RESPONSIBILITY OF MAPEI.

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