



# Betonfix HCR EVO

ST6-0221

*High performance and high ductility pourable cementitious grout with fibres*



## DESCRIPTION

**Betonfix HCR EVO** is a two-component system for non-shrink cementitious grouts, with corrosion inhibitors, fibers reinforced, pourable consistency, with very high mechanical strength at short and long curing, high ductility, high resistance to sulphates. It is suitable for the consolidation of slabs and for the restoration and reinforcement of structural elements in concrete and for infrastructural works (road, railway, etc.). The **Betonfix HCR EVO** system is CE marked as R4 mortar according to EN 1504-3 ("Structural and non-structural repair") and is made out of the following components:

| Part                      | Packaging | Appearance | Mixing ratio<br>(Ref. to<br>a bag of powder<br>- Part A) |
|---------------------------|-----------|------------|--|
| Betonfix CR/HC evo Part A | Bag 25 kg | Powder     | 25 Kg*   |
| Kimitech FMR Part B       | Bag 20 kg | Fibre      | 1,125 Kg   |

\* The dosage of component B must be equal to 4.5% of component A. Contact the Technical Office for further information.

## ADVANTAGES

- High performance: very high compressive and flexural strength even in small thicknesses (thanks to the metal fibers, it also has good tensile strength); mechanical development and final adhesion required for R4 mortars already within the first 2 days; high strength / weight ratio; high ductility.
- Exceptional values of adherence to the old support and reinforcement bars.
- Thanks to the presence of metallic fibers, which constitute a diffuse reinforcement, it is characterized by a ductile behavior; fundamental property for structural reinforcement and to increase resistance to dynamic stresses and





## USES

**Betonfix HCR EVO** system is used to carry out the restoration and consolidation, in small thicknesses, of horizontal structural elements, such as slabs (structural reinforcement with low thickness collaborative extradossal casting for slabs in reinforced concrete, bricks cement, wood and mixed slabs steel bricks-and-beams) and for the restoration and reinforcement of concrete beams and pillars. For the slabs, we can intervene with collaborative extradossal casting which can be contained in 3-4 cm of thickness, even if there is no an electrically welded steel mesh. For beams and pillars, the collaborative casting will be performed in special formworks.

## WORKS

- Restoration and consolidation through the application of high performance and ductility pourable concrete mortar ([SA102](#)).
- Restoration and reinforcement of pillars by means of high performance concrete fiber cement pourable concrete casting ([SA107](#)).

## APPLICATION

|   |   |   |                                      |
|---|---|---|--------------------------------------|
|  | Pourable  |  | Normal curing time:<br>150 ± 30 mins |
|   |   |  | Mixing water:<br>3,125 lt/ 25Kg      |
|  | Max thickness per coat:<br>30-100 mm for horizontal application<br>30-100 mm for vertical application |   |                                      |

The system is ready to use with the simple addition of drinking water.

The mixing of the products can be carried out in a simple concrete mixer or preferably with a mechanical mixing unit. Add half of part A (powder) and start mixing adding half the amount of water shown in the table. Mix until a homogeneous and fluid mixture is obtained, then add the

remaining part of the powder gradually adding the remaining part of water until the desired mixing ratio is obtained. Mix further for at least another 5 minutes. Weigh the quantity of fibers required in relation to the volume of the jet to be made and add them gradually (over a period of about 3 minutes), using special fiber routing equipment. Add all the fibers, mix for at least 2-3 minutes.

The product can be mixed with aggregates and must be characterized from time to time depending on the percentage and type of aggregates added.

The substrate must be previously treated by mechanical scarification suitable to guarantee a rough surface, and free of flaking parts, clean and free from dust, grease, oil and release agents in general.

### Application on slabs

Please check if exposed metal armor treatment is necessary. Assess the need for insertion of shear connectors to ensure a connection of the system with the existing slab and metal connectors for the connection to the perimeter structures. The presence of the connecting pins is mandatory for low thicknesses castings.

Saturate the area to be treated, taking care to eliminate, at the time of casting, any pools of water.

Prepare the guides (wood or metal), as high as the thickness that has been planned for the reinforcement, to help the operator in the screeding phases of the material.

Run the casting **Betonfix HCR EVO** and, before proceeding with the straight edge, to carry out a step on the fresh product with a spiked roller, of suitable thickness, in order to eliminate any air pockets.

Apply **Antievaporante W** on fresh so as to allow the perfect casting curing.

For special application contact the Technical Department.

### Casting into formworks

Saturate the substrate evaluating the possible preliminar treatment of the reinforcement rods with passivating mortar **Betonfix KIMIFER**.

Prepare connectors on the surfaces by inserting dowels on each face of the element, at a distance of 50 cm (at staggered heights between the various faces). Proceed with treatment of formwork with release agent.

Perform the casting **Betonfix HCR EVO**. To facilitate the filling of the formwork carry a slight mechanical vibration or keystroke. Where necessary, use bars or rods to facilitate the spreading of the mortar.

### CONSUMPTION

20 Kg/m<sup>2</sup>/cm

### PACKAGING

- Component A: Bag 25 Kg.

- Component B: Bag 20 Kg.

### STORAGE

Store in a dry, sheltered place; in these conditions and in unopened containers, the product maintains its stability for 12 months.

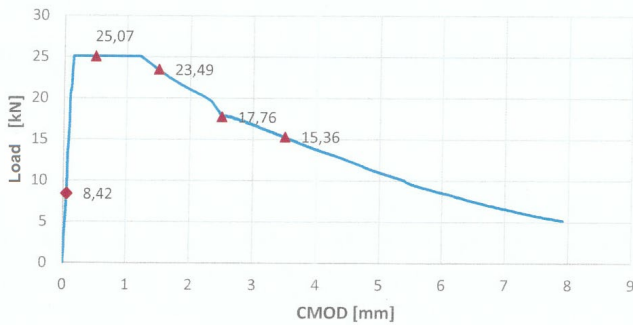
| Characteristics                      | Value                       |
|--------------------------------------|-----------------------------|
| Color                                | Grey                        |
| Max dimension of aggregate EN 1015-1 | 6 mm                        |
| Bulk of hardened mortar EN 1015-10   | 2347 ± 50 kg/m <sup>3</sup> |
| Bulk of fresh mortar EN 1015-6       | 2404 ± 50 Kg/m <sup>3</sup> |
| Curing time (start) EN 196-3         | 150 ± 30 mins               |
| Curing time (end) EN 196-3           | 240 ± 30 mins               |
| Min. temperature of application      | +5 °C                       |
| pH of the mixture                    | 12 ± 0,5                    |
| Stability EN 196-3                   | < 10 mm                     |
| Exudation UNI 8988                   | None                        |

| Characteristics (mixing water 12%)   | Limits EN 1504-3 for R4 mortars                                | Value   |
|--|--|---|
| Compressive strength in 28 days EN 12190 [MPa]   | In 28 days ≥ 45  | In 1 day ≥ 50<br>In 7 days ≥ 80<br>In 28 days ≥ 105 |
| Flexural strength in 28 days [MPa]   | Not required   | ≥ 18  |
| Direct tensile strength in 28 days [MPa]   | Not required   | 8   |
| Secant elastic modulus on compression EN 13412 [GPa]   | ≥ 20   | 27  |
| Chloride content EN 1015-17 [%]  | ≤ 0,05   | ≤ 0,05  |
| Concrete adhesion (EN 1542) [MPa]  | ≥ 2  | 3   |
| Thermal compatibility measured as adhesion (EN 1542) after 30 dry thermal cycles EN 13687-4 [MPa]                    | ≥ 2  | > 2   |
| Thermal compatibility measured as adhesion (EN 1542) after 30 thundershower cycles EN 13687-2 [MPa]                  | ≥ 2  | > 2   |
| Thermal compatibility measured as adhesion (EN 1542) after 50 freezethaw cycles with de-icing salts EN 13687-1 [MPa] | ≥ 2  | 2,9   |
| Resistance to accelerated carbonation, EN 13295  | Depth of carbonation, dk < reference concrete type MC 0.45 a/c | OK  |
| Waterproofing (capillary absorption coefficient, EN 13057) [Kg/m <sup>2</sup> ·h <sup>1/2</sup> ]                    | ≤ 0,5  | < 0,5   |

**Betonfix HCR EVO** thanks to the presence of metal fibers is characterized by a ductile behavior, essential for structural reinforcement and to increase resistance against dynamic stresses and shocks.

### FLEXURAL TENSILE STRENGTH TEST EN 14651

Graph: Load - CMOD



| Characteristics                     | Value |
|-------------------------------------|-------|
| $F_L$ [kN]                          | 8,42  |
| LOP $f_{ct,L}$ [N/mm <sup>2</sup> ] | 2,70  |
| $F_1$ [kN]                          | 25,07 |
| $F_{R,1}$ [N/mm <sup>2</sup> ]      | 8,02  |
| $F_2$ [kN]                          | 23,49 |
| $F_{R,2}$ [N/mm <sup>2</sup> ]      | 7,52  |
| $F_3$ [kN]                          | 17,76 |
| $F_{R,3}$ [N/mm <sup>2</sup> ]      | 5,68  |
| $F_4$ [kN]                          | 15,36 |
| $F_{R,4}$ [N/mm <sup>2</sup> ]      | 4,91  |
| $F_{END}$ [kN]                      | 5,19  |
| $f_{END}$ [N/mm <sup>2</sup> ]      | 1,66  |

$F_L$  : Max load for CMOD = 0-0,05 mm;  
 $f_{ct,L}$  = LOP : Limit of proportionality;  
 $F_J$  (J = 1, 2, 3, 4) : CMOD<sub>1</sub> = 0,5 mm, CMOD<sub>2</sub> = 1,5 mm,  
 CMOD<sub>3</sub> = 2,5 mm, CMOD<sub>4</sub> = 3,5 mm;  
 $F_{END}$ ;  $f_{END}$  : values at the end of the test  
 CMOD : crack mouth opening displacement

The **energy dissipated**, thanks to the ductile behavior, results 10 times higher than the energy we would have in case of fragile failure after the maximum load.

### WARNING

Product for professional use.  
 The addition of more water than recommended will cause the components to separate and lead to the loss of the product's mechanical and chemical properties.  
 Do not remix the product by adding water once it has started to set: it will lose all its chemical and physical properties.  
 Do not add concrete, additives or other Betonfix mortars.  
 Before using, check bags have not been damaged, and do

not use the product if there are any lumps.  
 Use the entire contents once the bag has been opened.  
 Take all necessary precautions to ensure correct curing of castings. Do not use at temperatures below +5 °C.  
 Wet with water for the first 48 hours, or cover with plastic coverings or damp jute bags.

The Obligations of marking are not related to the intrinsic nature of a given product, but to the use to which a specific material is used: before making the order in Kimia, the buyer shall submit all the documentation available to the D.L. in order to determine the materials suitability (in terms of certifications and performance) in relation to the use for which they are intended.

For further information and advice on safe handling, storage and disposal of chemical products, the user must refer to the most recent Safety Data Sheet, containing physical, ecological, toxicological and other data related to safety.

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

The information and requirements indicated in this Technical Data Sheet are based on our current knowledge and experience and are to be considered, in any case, purely indicative. They cannot guarantee the final result of the applied product and they have to be confirmed by exhaustive practical applications; therefore the user must test the suitability of the product for the intended application and its purpose. Users must always refer to the latest version of the local technical data sheet related to the product.

### TECHNICAL SPECIFICATIONS

**SK102** - Restoration and consolidation of slabs through the application of high performance and ductility pourable cementitious grout

**SK107**- Restoration and reinforcement of pillars by means of high-performance metallic fiber cement pourable concrete casting

(SK102) Removal of the floor and careful removal of the degraded and inconsistent concrete by means of mechanical scarification to get a rough surface, and free of flaking parts. Make sure the surface is clean and free from dust, grease, oil and release agents in general.

If necessary treat the metal reinforcements exposed. For the treatment of the rods, Betonfix Kimifer mortar by Kimia S.p.A. or similar product. The product will be applied by brush on the metal reinforcement to be protected.

If necessary insert pegs to ensure a collaborative connection of the system with the existing floor and metal connectors for connection to the perimeter structures.

The rungs, if necessary, must be fixed in advance to the casting to the load-bearing elements of the floor (joists, etc.).

The perimeter metal connectors must be grouted with special epoxy resins, such as Kimitech EP-IN, or cementitious grout, such as Betonfix 200.

Wet the area to be treated and remove any stagnant water at the time of casting.

Prepare guides (in wood or metal), as high as the thickness that has been provided for reinforcement, to help the operator during the laying of the product.

For the casting, a high-performance, ductility, fiber-reinforced pourable

cement grout will be used, such as Betonfix HCR EVO by Kimia S.p.A. A thickness of about 3-4 cm will be achieved and spread out using a straight edge.

It is advisable to use a bubble breaker of suitable thickness on the fresh product to eliminate any air pockets.

Apply an anti-evaporator, ANTIEVAPORANTE W by Kimia SpA on the fresh concrete, using a roller or spray. This forms a film that prevents the evaporation of the mixing water in the first phases of curing of the product and guarantees an excellent degree of curing.

(SK107) Accurate removal of degraded and inconsistent concrete by hammering until you see compact substrate.

The exposed metal reinforcements must be free of the concrete in contact with them by using a needle gun.

Positioning of new collaborative metal reinforcement in case of noticeable oxidation of existing irons with a strong reduction of the section and grouting with special epoxy resins.

Sandblasting or hydro-sandblasting of concrete and metal reinforcement. Wet the area to be treated and remove any stagnant water at the time of casting.

For the treatment of the rods, use Betonfix KIMIFER mortar by Kimia S.p.A. or similar product. The product will be applied by brush on the metal reinforcement to be protected. To improve the degree of connection between the casting and the existing structure, dowels will be inserted on each face of the pillar, every 50 cm (at staggered heights between the various faces). For the cast a high-performance, ductility, fiber-reinforced pourable cement grout will be used, such as Betonfix HCR EVO by Kimia S.p.A. To facilitate the filling of the formworks make a slight mechanical vibration or beating.

The pourable concrete for structural interventions will be prepared and applied scrupulously following the indications reported on the technical sheets provided by the manufacturer and will have the following characteristics:

- Compressive strength in 28 days UNI EN 12190: in 1 day > 50 MPa; in 28 days  $\geq$  105 MPa;
- Elastic secant modulus on compression EN 13412 [Gpa] = 27;
- Tensile strength at 28 days  $\geq$  8 Mpa;
- Flexural strength after 28 days  $\geq$  18 MPa;
- Compliance with concrete (EN 1542) [MPa]  $\geq$  2;

The product will be in possession of reports of tests related to the determination of the compressive elastic modulus and the compressive and flexural strength carried out in notified laboratories.

The mortar will be CE marked as R4 according to EN 1504-3. The manufacturer will be able to provide specific reports related to the initial type tests performed at notified laboratories for the most relevant data (adhesion, carbonation resistance, elastic modulus and chloride content). In addition to the certifications on the single material, the manufacturer will be able to demonstrate the solidity of its know-how in the sector of restoration of structures in r.c. through experiments on the durability of their own solutions.