

Metric R4 Flow & Steel Fiber Hook

Pourable mortar with compensated shrinkage and hooked-end steel fibres for FRC monolithic strengthening of reinforced concrete.

Metric R4 Flow & Steel Fiber Hook is a FRC system consisting of a high ductility, certified, fibre-reinforced, pourable mortar for repairing and consolidating reinforced concrete structures.



1. C.V.T. certified, pourable FRC system
2. It does not need additional rebars
3. Thicknesses from minimum 25 mm
4. For high ductility monolithic strengthening

Areas of application

→ Use

High ductility, ultra-high performance, fibre-reinforced, pourable, C.V.T.-certified Metric FRC mortar, for the repair and strengthening of structural elements, by means of low thickness interventions without the use of additional rebars.

Restoration and strengthening of reinforced concrete structures and infrastructures:

- by the formwork casting of concrete for vertical structures and at the soffit of horizontal elements;
- by pouring onto the top surface of horizontal elements or by bonded section underpinning in general.

Precision fastening and structural anchoring of sub-plates, tie-rods, bars, plates, machinery on reinforced concrete.

Instructions for use

→ Preparation of substrates

Before applying the Metric FRC system it is necessary to:

- thoroughly remove all weakened concrete until a solid, resistant substrate is obtained; roughen it by mechanical scarification or hydro-demolition to a depth of ≥ 5 mm, equivalent to level 9 of the Test kit for preparation of reinforced concrete and masonry substrates;
- remove the rust from the reinforcing bars, which must be cleaned by brushing (manual or mechanical) or sandblasting;
- clean the treated substrate using compressed air or a high pressure washer;
- saturate with water until the substrate is saturated yet with no excess water on the surface. Alternatively on horizontal concrete surfaces, apply Primer Uni on a dry substrate in order to ensure regular absorption and promote the natural crystallisation of the geomortar.
- apply Epobinder on a dry substrate to obtain a chemical-type anchoring; alternatively, use shear connectors for mechanical anchoring from the Steel Connect range.

Check that the resistance class of the supporting concrete is suitable.

→ Dosage

Metric R4 Flow & Steel Fiber Hook: add the fibres in the amount of 3.5% of the weight of the powder (0.90% by volume, 1 packaging of fibres every 4 bags of powder).

→ Preparation

The mixture can be prepared in:

- cement mixer;
- planetary mixer;
- a mortar mixer or drill-type mixing device with a low-rev agitator.

Mix the powder using the quantity of water shown on the package for approximately 6 minutes until a smooth and lump-free mortar is obtained; then add the fibres (while keeping the percentage unchanged) and further mix for approximately 2 minutes in order to ensure perfect distribution of the fibres inside the binder matrix.

→ Application

Apply the Metric FRC system by pouring or pumping it on the extrados of horizontal surfaces or in sealed formworks treated with a parting compound that assists air escape, using the correct application techniques.

Application thicknesses shall not be less than 25 mm.

For mechanized applications it is recommended to use a continuous cycle pump equipped with a stator suitable for the maximum grain size of the product (2.5 mm) and the steel fibres size (25 mm).

Allow the surfaces to cure for at least 48 hrs. Cover with a waterproof sheet for the next 5 days.

→ Acceptance tests

Take at least two samples every 100 m³ of concrete, to be subjected to flexural testing in accordance with standard EN 14651. For further details, refer to the FRC system qualification guidelines in paragraph 5.1..

→ Cleaning

Residual traces of the product can be removed from tools and machines using water before the product hardens.

Certificates and marks



Attestat 11137-0208

When properly emptied, the packaging is recyclable as paper (up to 80 per cent) according to the ATICELCA® 501 method.



* Émission dans l'air intérieur Information sur le niveau d'émission de substances volatiles dans l'air intérieur, présentant un risque de toxicité par inhalation, sur une échelle de classe allant de A+ (très faibles émissions) à C (fortes émissions).

Abstract

Metric FRC system – Metric R4 Flow & Steel Fiber Hook: supply and laying of repair and structural strengthening of reinforced concrete using a high ductility, ultra-high performance, pourable, fibre-reinforced mortar, FRC (Fibre Reinforced Concrete), created with steel fibres obtained by cold drawing of high-performance and high carbon content wire, such as Steel Fiber Hook, by Kerakoll Spa, CE-marked and compliant with the performance requirements of Standard EN 14889-1, immersed in a certified, pourable mortar, specific for the repair and strengthening of concrete structures and the anchoring of metal elements, such as Metric R4 Flow by Kerakoll Spa, CE-marked and compliant with the performance requirements of Standard EN 1504-3, Class R4, CC and PCC type, for volumetric reconstruction according to Principles 3, 4, 7 and 11 defined by EN 1504-9. C.V.T. certified mechanical characteristics: compressive strength C70/85 (EN 12390-3); modulus of elasticity under compression 41.83 GPa (NTC 2018); tensile strength 5.68 MPa (average value, CNR DT 204); tenacity class 10c, $f_{R,1k} = 11.33 \text{ MPa}$, $f_{R,2k} = 11.91 \text{ MPa}$, $f_{R,3k} = 10.99 \text{ MPa}$ and $f_{R,4k} = 9.50 \text{ MPa}$ (typical values, EN 14651).

Technical Data compliant with Kerakoll Quality Standard

Metric R4 Flow

| | | |
|-----------------------------------|---|------------|
| Appearance | Powder | |
| Apparent volumetric mass | ≈ 1380 kg/m ³ | UEAtc |
| Aggregate mineral content | silicate - carbonate | |
| Grading | 0 – 2,5 mm | EN 12192-1 |
| Shelf life | ≈ 12 months from production in the original sealed packaging, protect from humidity | |
| Pack | 25 kg bags | |
| Mixing water | ≈ 3.8 l / 1 x 25 kg bag | |
| Flow of the mixture | 280 – 300 mm with no shaker table vibration | EN 13395-1 |
| Density of the mixture | ≈ 2270 kg/m ³ | |
| pH of the mixture | ≥ 12,5 | |
| Pot life | ≥ 1 hr | |
| Temperature range for application | from +5 °C to +35 °C | |
| Minimum thickness | 25 mm | |
| Shape | Hooked-end rigid fibres, bonded | |

Steel Fiber Hook

| | | |
|-------------------------|---|--------------------------------|
| Nature of material | cold drawn steel with a high carbon content | |
| Density of the material | ρ_f 7,85 g/cm ³ | EN 14889 |
| Fibre length | l_f 25 mm | EN 14889 |
| Fibre diameter | d_f 0,30 mm | EN 14889 |
| Form ratio | 83 | EN 14889 |
| Shelf life | unlimited | |
| Pack | 3.5 kg boxes | |
| Number of fibres per kg | ≈ 71.906 | |
| Dosage | 1 pack of Steel Fiber Hook every 4 bags of Metric R4 Flow | (3.5% by weight of the powder) |

Metric R4 Flow & Steel Fiber Hook

| | |
|-------------------------------|--|
| Metric FRC system consumption | ≈ 21 kg/m ² per cm of thickness |
|-------------------------------|--|

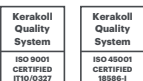
Values taken at +21 °C, 60% R.H. and no ventilation. Data may vary depending on specific conditions at the building site.

| Metric R4 Flow – Performance | | | |
|--|-----------------------|--|---|
| VOC Indoor Air Quality (IAQ) - Volatile organic compound emissions | | | |
| Conformity | EC 1 plus GEV-Emicode | GEV certified 17141/11.01.02 | |
| HIGH-TECH | | | |
| Performance characteristic | Test Method | Requirements of EN 1504-3 class R4 | Performance in CC and PCC conditions |
| Compressive strength | EN 12190 | ≥ 45 MPa (28 days) | > 30 MPa (24 hrs) |
| | | | > 60 MPa (7 days) |
| | | | > 75 MPa (28 days) |
| Flexural tensile strength | EN 196-1 | None | > 6 MPa (24 hrs) |
| | | | > 8 MPa (7 days) |
| | | | > 10 MPa (28 days) |
| Adhesive bond | EN 1542 | ≥ 2 MPa (28 days) | > 2 MPa (28 days) |
| Resistance to carbonation | EN 13295 | dk ≤ reference concrete [MC (0.45)] | value exceeded |
| Modulus of elasticity under compression | EN 13412 | ≥ 20 GPa (28 days) | 27 GPa in CC 24 GPa in PCC |
| Thermal compatibility with freeze/thaw cycles with de-icing salts | EN 13687-1 | bond strength after 50 cycles ≥ 2 MPa | > 2 MPa |
| Capillary absorption | EN 13057 | ≤ 0.5 kg·m ⁻² ·h ^{-0.5} | < 0.5 kg·m ⁻² ·h ^{-0.5} |
| Chloride ion content (determined on the product in powder form) | EN 1015-17 | ≤ 0,05% | < 0,05% |
| Reaction to fire | EN 13501-1 | Euroclass | A1 |
| | Test Method | Requirements of standard | Prestazione |
| Embedded bar adhesive tension | RILEM-CEB-FIPRC6-78 | None | > 25 MPa |
| Crack Bridging properties | O-Ring test | None | no cracks |
| Bleeding | UNI 8998 | None | none |
| Resistance to severe chemical attacks (group 3: unused heating oil, diesel oil and oils for engine and gear) | EN 13529 | analysis of damage and bond strength ≥ 2 MPa | no deterioration and bond strengths > 2 Mpa |
| Water-resistance | EN 12390-8 | None | < 4 mm |
| Aggregate performance characteristic | Test Method | Requirements of UNI 8520-22 | Aggregate performance |
| Alkali-aggregates reaction | UNI 11504 | reactivity class | NR (non-reactive) |

| Steel Fiber Hook – Performance | | | |
|---|-------------|-------------------------------------|------------------------|
| HIGH-TECH | | | |
| Tensile strength | f_{ft} | ≥ 3100 MPa | EN 14889 |
| Elastic modulus | E_f | ≥ 200 GPa | EN 14889 |
| Elongation at break | A_{ft} | $> 1\%$ | EN 14889 |
| Performance - Geolite FRC System – Matric R4 Flow & Steel Fiber Hook (in accordance with CVT, Certificato di Valutazione Tecnica/Technical Assessment Certificate, no. 466/2025) | | | |
| Performance characteristic | Test Method | Performance | |
| Density (product when hard) | EN 12390-7 | 2326 kg/m ³ | |
| Compressive strength (characteristic value) | EN 12390-3 | $R_{ck} = 93$ MPa C70/85 | |
| Modulus of elasticity under compression | NTC 2018 | 41,83 GPa | |
| Poisson coefficient | NTC 2018 | 0 – 0,2 | |
| Coefficient of linear thermal expansion | NTC 2018 | $10 \cdot 10^{-6}$ °C ⁻¹ | |
| Residual flexural strength (characteristic value) | EN 14651 | $f_{R,1k} = 11,33$ MPa | |
| | | $f_{R,2k} = 11,91$ MPa | |
| | | $f_{R,3k} = 10,99$ MPa | |
| | | $f_{R,4k} = 9,50$ MPa | |
| | | $f_{R,3k} / f_{R,1k} = 0,970$ | |
| Resistance to proportionality limit (average and characteristic value) | EN 14651 | $f_{fct,L} = 5,54$ MPa | |
| | | $f_{fct,Lk} = 4,59$ MPa | |
| Tenacity class | EN 14651 | 10c | |
| Tensile strength (average value) | CNR DT 204 | $f_{Fts} = 5,68$ MPa | |
| | | X0 | |
| | | XC1, XC2, XC3, XC4 | |
| | | XD1, XD2, XD3 | |
| | | XS1, XS2, XS3 | |
| Exposure classes | EN 206 | XA1 | |
| | | | |
| | | | |
| Water-resistance | EN 13529 | 0 mm | |
| Reaction to fire | EN 13501-1 | class A1 | |
| Installation conditions | | | |
| Temperature range (air and surface) | | | from +5 °C to +40 °C |
| Relative humidity (air and substrate) | | | irrelevant |
| Service conditions | | | |
| Temperature range (air and surface) | | | from -20 °C to +100 °C |
| Relative humidity (air and substrate) | | | irrelevant |

Warning

- abide by any standards and national regulations
- use at temperatures between +5 °C and +35 °C
- do not add binders or additives to the mixture
- do not apply to dirty, loose and flaking surfaces
- do not apply on gypsum, metal or wood
- following application, protect from direct sunlight and wind
- allow the product to cure during the first 24 hours
- if necessary, ask for the safety data sheet
- for any other issues, contact Kerakoll Technical Customer Service:
+ 39 0536.811.516
www.kerakoll.com/contatti



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