

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



Aticelca® 11137-0008

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 1504-9, 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, $f_{R,1k} = 11.33$ MPa, $f_{R,2k} = 11.91$ MPa, $f_{R,3k} = 10.99$ MPa and $f_{R,4k} = 9.50$ 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	
Steel Fiber Hook		
Nature of material	cold drawn steel with a high carbon content	
Shape	hooked-end rigid fibres, bonded	
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	

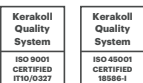
Values taken at +21 °C, 60% R.H. and no ventilation. Data may vary depending on specific conditions at the building site.

Performance – Metric R4 Flow			
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	$d_k \leq$ 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	Performance
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)

Performance – Steel Fiber Hook			
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	
Exposure classes	EN 206	X0	
		XC1, XC2, XC3, XC4	
		XD1, XD2, XD3	
		XS1, XS2, XS3	
		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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