

Amorphous metallic fibre for concrete and mortar reinforcement

Product description

Composition

Amorphous metallic alloy (Fe,Cr)₈₀ (P,C,Si)₂₀

Dimensions and characteristics per grade





Reference	FF30L6	FF20L6	FF20E0	FF15E0	FF10E0	FF5E0
Thickness	29 µm		24 µm			
Width	1,6 mm		1 mm			
Length	30 mm	20 mm		15 mm	10 mm	5 mm
Average number of fibres/kg	100 000	150 000	275 000	385 000	580 000	1 100 000
Equivalent diameter	0,25 mm		0,18 mm			
Slenderness	120	80	111	83	56	28
Density	7,2					
Modulus of elasticity	130 GPa					
Specific surface	10 m ² per Kg					

Essential characteristics and product CE certification according to NF EN 14889-1

Reference	FF30L6	FF20L6	FF20E0	FF15E0	FF10E0	FF5E0
Assessment system	System 1	System 1	System 3	System 1	System 3	System 3
Assessed type of use	Structural	Structural	Non-structural	Structural	Non-structural	Non-structural
Minimum Tensile strength	1400 MPa					

Cf. Product CE declaration of performance available on <https://www.fibraflex.fr/en>.

Features

Tensile strength 	<ul style="list-style-type: none"> Average tensile strength resistance = 1 800 MPa (≥ 1 400 MPa guaranteed). First crack openings reduction → Improves concrete mechanical performance and durability.
Thinness 	<ul style="list-style-type: none"> Thickness = 24 or 29 microns. Equivalent diameter = 0,18 or 0,25 mm (like UHPFRC steel micro-fibers). Very high number of fibers per Kg (up to 1,1 millions). Very high specific surface = Very high bond to the concrete matrix.
Flexibility 	<ul style="list-style-type: none"> Easier process (mixing, pumping or spraying). Lower risk of injury.
Corrosion resistance 	<ul style="list-style-type: none"> Corrosion resistance and durability. Compatibility in contact with drinking water.

Production process

The fibres are produced by hyperquenching a liquid alloy jet over a high speed rotating wheel. This technique helps to obtain extremely thin ribbons (24 to 29 microns) with a very high quenching speed (by about one million degrees per second).

This quenching solidifies the liquid metal into amorphous state (non-crystalline) imparting it with three interesting properties:

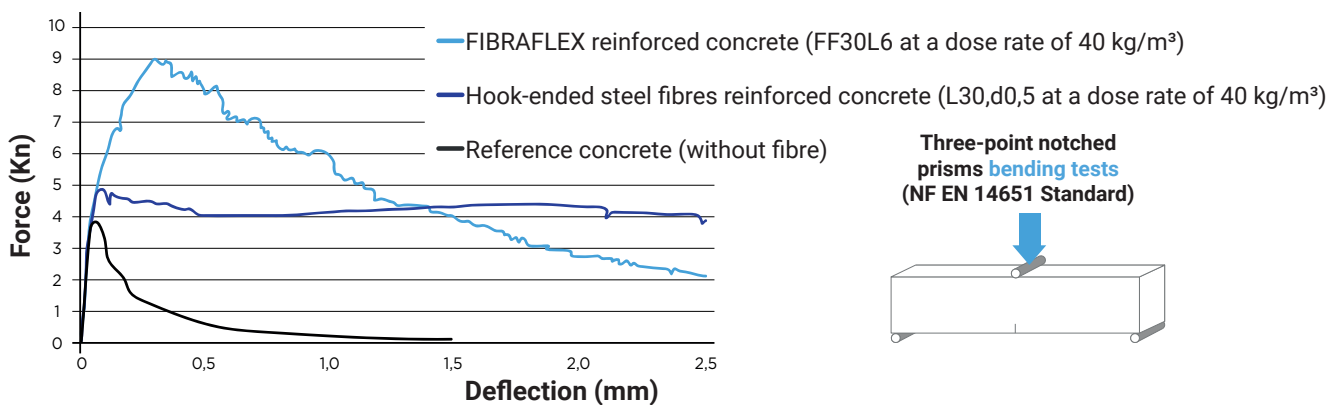
- exceptional mechanical strength;
- flexibility in the transversal direction;
- very high corrosion resistance.

Actions within concrete

The mechanical performance of a fibre-reinforced concrete depends on the anchoring mechanism of each fibre and the number of fibres 'stitching' the cracked section.

FIBRAFLEX is fine and highly adhesive so that it does not slip (thanks to its very large specific surface in contact with the cement matrix). This means the fibres are put under tension as soon as force is applied to the concrete and firmly hold the crack from opening. The crack only appears when the force applied exceeds the fibre breaking force (=1 400 MPa minimum guaranteed for each fibre).

FIBRAFLEX's excellent traction resistance and its very good adhesion to the matrix allow an improvement in the bending resistance and durability of reinforced concrete (prevents aggressive agents penetrating inside the matrix).



Source: R. HAMEED. « Apport d'un Renfort de Fibres sur les Performances des structures en Béton Armé pour les Applications Parasismiques » (Contribution of metallic fibers on the performance of reinforced concrete structures for the seismic application) Doctoral thesis submitted to Paul SABATIER University (TOULOUSE III) in 2010.

Applications

	Applications	Advantages	Typical fiber dosages
Repair mortars	<ul style="list-style-type: none"> • Restoration of visitable undergrounds works (sanitation collectors) • Restoration of hydraulic networks and/or systems 	<ul style="list-style-type: none"> • Improvement of the mechanical properties of the repair layer • Resistance to corrosion and aggressive chemicals • Improved durability • Optimised hydraulic properties • Simple and safe to implement 	<ul style="list-style-type: none"> • 15 to 35 Kg per m3
Fixing mortars	<ul style="list-style-type: none"> • Sealing of roadways elements (buffers, cobbles, etc.) and street furniture (benches, panels, etc.) • Roadway sealings 	<ul style="list-style-type: none"> • Increased resistance to bending • Reduced shrinkage • Durability provided by resistance to corrosion, de-icing salt, freeze thaw cycle • Resistance to thermal and mechanical fatigue • Rapid implementation 	<ul style="list-style-type: none"> • 10 to 25 Kg per m3
Technical floorings	<ul style="list-style-type: none"> • Screed for underfloor heating systems • Thin resetting of floors in industrial locations and private homes • Resistant screed to acid and freeze thaw cycle • Resistant screed to shear failure 	<ul style="list-style-type: none"> • Durability: Resistance to corrosion • Improvement of mechanical properties • Realisation of thin elements • Saves time and money: alternative to metallic wire-mesh 	<ul style="list-style-type: none"> • For conductive properties: from 1Kg per m3 • For mechanical properties: 10 to 40Kg per m3
Precasting / UHPFRC	<ul style="list-style-type: none"> • Containers for storage of radioactive waste • Façade panels • Street furniture • Architectural elements • UHPFRC (ultra high-performance fibre-reinforced concrete) • Self-compacting concrete • 3D printed concrete 	<ul style="list-style-type: none"> • Improvement of mechanical properties (resistance to bending) • Can be pumped over long distances • Increases thermal conductivity • Reduced withdrawal 	<ul style="list-style-type: none"> • For traditional concrete: 15 to 45 Kg per m3 • For UHPFRC: from 70 Kg per m3

Durability, safety and environment

Durability

Excellent corrosion to resistance of the amorphous alloy which FIBRAFLEX fibers are made of, makes them and FIBRAFLEX reinforced concrete or mortars particularly durable.

More details : Cf. article related to FIBRAFLEX corrosion resistance available on <https://www.fibraflex.fr/en>.

Safety information

Individual Protection Equipment: safety glasses, long sleeved protective clothing, protective gloves, dust mask.

More details: Cf. FIBRAFLEX material safety data sheet available on <https://www.fibraflex.fr/en>.

Carbon footprint

3,15 Kg CO2 equivalent.

More details : Cf. FIBRAFLEX Environmental Product Declaration available under request.

Packaging and storage

Samples

1 Kg paper bags available for trials and laboratory tests.

Standard packaging

Packaging unit: 10 Kg paper bags.

Handling unit: 1 000 Kg on CP3 pallets.

Pallets dimensions: 1 150 * 1 150 * 1 400 mm.

Pallets must not be stacked.

Full truck load = 22 pallets / 22 tons net weight.

20 ft shipping container = 10 pallets / 10 tons net weight.

40 ft shipping container = 20 pallets / 20 tons net weight.

Special packaging available under request

5 Kg paper bags, 500 Kg big bags, ... Please contact us.

Storage

Paper bags on pallets covered with a plastic foil.

Product to be imperatively stored in a dry place, away from rain, moisture, extreme temperatures as well as from direct sun and moon rays.

Shelf life

Not applicable, cf. durability chapter above.

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