

FASSATEX STEEL SYSTEM

DATA SHEET

FRCM reinforcement system comprising the FASSATEX STEEL 650 unidirectional stainless steel fibre fabric and the SISMA R4 high-strength one-component matrix.



Specifications

FRCM reinforcement system comprising the FASSATEX STEEL 650 unidirectional stainless steel fibre fabric and the SISMA R4 high-strength one-component matrix.

In cases where connectors are required, the system is completed by the FASSA STEEL CONNECTOR stainless steel connectors. Furthermore, end anchors can be made by extending the fabric into the substrate. The connectors are anchored using FASSA ANCHOR V chemical fixing.

The mechanical strength and durability of the FASSATEX STEEL 650 stainless steel fabric, in synergy with the special SISMA R4 one-component polymer-modified fibre-reinforced structural cement mortar containing sulphate-resistant cement, together effectively improve the structure's resistance to static and seismic forces.

Benefits

FASSATEX STEEL SYSTEM low thickness reinforcement has the following advantages:

- Lightweight, unintrusive
- Excellent durability of the stainless steel fibres
- Greater reversibility than organic matrix systems
- Applicability on still-wet substrate

Supply

- FASSATEX STEEL 650: 25 m long and 30 cm wide rolls
- FASSA STEEL CONNECTOR: 10 m long and 10 mm diameter rolls
- SISMA R4: special sacks with protection against moisture, approx. 25 kg
- FASSA ANCHOR V: 400 ml cartridges with static mixer (12 pieces per box)
- FASSA TE 60/50: pack of 100 pieces
- The production batch of each individual component is shown on the label affixed to each package.

Use

FASSATEX STEEL SYSTEM is used for the reinforcement of reinforced concrete and prestressed concrete structural elements, using the thin shell reinforcement technique. The system has the function of distributing stress due to static and seismic phenomena, making the structure highly ductile.

Examples of reinforcement that can be implemented using the FASSATEX STEEL SYSTEM include but are not limited to:

- Increase in flexural and shear strength of beams
- Increase in load-bearing capacity and ductility of pillars by confinement
- Increase in the load-bearing capacity of masonry-concrete floors
- Reinforcement of concrete partitions



Substrate preparation

Substrate preparation and installation of the **FASSATEX STEEL SYSTEM** must comply with the requirements specified in the system “**Installation and preparation manual**”.

Completely remove any finishes and layers of plaster on the surface to as to expose the substrate. Remove all the parts that are crumbling or coming loose until obtaining a solid, strong and roughened substrate. After scarifying all of the substrates, remove dirt, dust and any processing residues that may compromise adhesion of the mortar to the substrate.

Carry out any repairs based on the type of substrate.

The damaged concrete must be repaired using suitable products, depending on the thickness and area of mortar to be applied. In any case, the surfaces must be prepared so as to have rough parts protruding by at least 5 mm.

For uneven substrates with localised irregularities in terms of flatness, level the surface using SISMA R4 mortar, making sure to leave it rough so as to facilitate adhesion of the subsequent layer. The FRCM reinforcement will be applied after 24-72 h, depending on the temperature-humidity conditions.

Round off all the sharp edges of the structure where the FRCM reinforcement system will subsequently be applied, so as to avoid concentrations of stress that may cause premature failure of the composite. The radius of curvature of the rounding must not be less than 2 cm.

Preparation of the fibreglass components

The use, number and arrangement of the connectors must be evaluated by the designer in relation to the type of work and the envisaged stresses on the structure. Depending on the specific application, the use of connectors may be beneficial or even essential.

Connector preparation

Cut the connectors according to the dimensions defined in the design, using construction shears or an angle grinder. The connectors have free parts to be splayed for a length of at least 10 cm, and, in the case of non-through connectors, an anchoring section at least 15 cm long.

Fabric preparation

Prepare the FASSATEX STEEL 650 fabric according to the dimensions required by the design. The fabric can be cut perpendicularly using construction shears or an angle grinder and parallel (to the fibreglass part) using a utility knife.

For ringing, plating or in general for application on the corners of the product being reinforced, the fabric needs to be shaped using a special bending machine.

To create the anchoring end of FASSATEX STEEL 650, where necessary, the fabric itself can be extended into specially-made holes in the substrate: the ends will be divided into 10 cm wide bands (13 strands), each of which will enter into a hole. The section to be anchored will be at least 10 cm long.



Application

1. Saturate the substrate before applying the reinforcement system, avoiding the formation of pools of water on the surface.
2. Apply a first uniform layer of SISMA R4 using a metal trowel to a thickness of around 4-8 mm. If possible based on how the construction is organised, the product may after suitable evaluation be applied using a plaster sprayer.
3. Apply the strip of FASSATEX STEEL 650 fabric on the still-wet mortar, pressing it in using a metal spatula so that it is well bonded to the matrix, making sure that the mortar oozes out of the mesh of the fabric so as to embed it suitably. The adjoining strips of fabric must overlap by at least 30 cm.
4. Completely cover the fabric with a second layer of the same mortar, applied before the first layer has dried, to a thickness of 4-8 mm and in any case sufficient to cover the connectors. The fabric must be placed half-way into the total thickness (excluding substrate levelling layers).

End anchors

- Before applying the reinforcement, drill the holes in the substrate for installation of the ends of the fabric, divided into strips, with the diameter and depth of the hole defined according to the type of substrate (it is suggested to construct some samples). Remove all traces of dust and loose material from the holes by vacuuming or blowing.
- When laying the fabric, place the ends of the fabric divided into bands into the specially prepared holes (see "Fabric preparation") and inject FASSA ANCHOR into the holes.

Cross connections

- Before applying the reinforcement, drill the holes in the substrate for installation of the FASSA STEEL CONNECTORS specified in the design, with the diameter and depth of the hole defined according to the type of substrate (it is suggested to construct some samples). Remove all traces of dust and loose material from the holes, by vacuuming or blowing, and insert temporary markers as references, so as to avoid the holes being obstructed during the subsequent stages.
- Before laying the fabric, cut it at the holes to allow subsequent insertion of the connectors (cut where the fibreglass runs transversally to keep the strands of steel aligned).
- Before covering the fabric with a second layer of mortar, remove the marks, insert the FASSASTEELCONNECTORS into the holes and release the part to be opened from the protective gauze. To bend and open the FASSA STEEL CONNECTOR, use the special FASSA TE 60/50 fibreglass-reinforced polyamide fixing anchor. After positioning the FASSA STEEL CONNECTOR, insert the anchor in the centre of the connector: hammer in the anchor so as to splay the connector strands in the first layer of mortar. Inject FASSA ANCHOR V through the anchor: insert the mixer fully into the hole in the anchor, making sure to fill the hole completely.

Finishing and protection

When the reinforcing system matrix and the plaster/render has cured (generally after at least 4 weeks), apply a skim coat to the surfaces using FASSA K-OVER PLUS 3.30, GEOACTIVE FINE B 543, S 605 or other suitable products, making sure to embed FASSANET 160 alkali-resistant fibreglass mesh in the first layer. The work will be completed by a suitable decorative/protective finishing cycle. Alternatively, dry systems can be applied.



Warnings

- System comprising products exclusively for professional use.
- Optimal functioning of the reinforcement system depends on correct preventive preparation of the substrate and correct installation of the system: always read the system "Preparation and installation manual" beforehand.
- Always read the datasheets for the products used before installing the system.
- Always read the product safety data sheet before installing the system.
- The mortars comprising the reinforcement system can be used with temperatures between 5°C and 35°C and must be protected against frost and rapid drying. As hardening depends on the hydraulic setting of the cement, a temperature of +5°C is suggested as a minimum value for application and proper hardening of the mortar. Below this value, setting would be delayed excessively and below 0°C the fresh or partially hardened mortar could be broken up by frost. When the ambient temperature is above 30 °C, it is recommended to use cold water and moisten the mortar in the first 24 hours after application.
- The system must be installed according to the configuration defined in the design.

Storage

All of the products making up the system must be stored in a dry, sheltered place.

Quality

FASSATEX STEEL SYSTEM is subjected to accurate and constant checks in our laboratories.

Characteristics of the FASSATEX STEEL 650 fabric

Specifications	Test method	Product performance
Type of material	-	AISI 316 stainless steel
Density of the material making up the fabric	-	7.85 g/cm ³
Strand structure	-	Spiral strand of 19 wires
Average strand diameter	-	1 mm
Grammage	ISO 11667-1997	650 g/m ²
Equivalent thickness	-	0.083 mm
Area of a single wire	FCRM Ministerial Guidelines	**non tradotto**
Total resistant area of the dry fibre	FCRM Ministerial Guidelines	4.776 mm ² (8 wires)
Ultimate tensile strength of the fabric	FCRM Ministerial Guidelines	1449 MPa (average)
		1409 MPa (typical)
Tensile modulus of elasticity, average value	FCRM Ministerial Guidelines	184880 MPa
Average ultimate deformation value	FCRM Ministerial Guidelines	1.40%
Ultimate tensile strength of the folded fabric	FCRM Ministerial Guidelines	1230 MPa (average)
		1083 MPa (typical)
Ultimate tensile strength of the folded fabric after 1000 hours in a saline environment	FCRM Ministerial Guidelines	1053 MPa (medium)
		86% of the unconditioned fabric
Ultimate tensile strength of the folded fabric after 3000 hours in a saline environment	FCRM Ministerial Guidelines	1026 MPa (medium)
		83% of the unconditioned fabric)
Pull-out resistance test on the fabric used as a connector fixed using Fassa Anchor V on a concrete substrate (breaking load)	FCRM Ministerial Guidelines	11532 N

Characteristics of the FASSA STEEL CONNECTOR

Specifications	Test method	Product performance
Type of material	-	AISI 316 stainless steel
Density of the material making up the fabric	-	7.85 g/cm ³
Strand structure	-	Spiral strand of 19 wires
Average strand diameter	-	1 mm
Total resistant area of the dry fibre	FRCM Ministerial Guidelines	23.88 mm ² (40 wires)
Ultimate tensile strength referring to the area of the dry fibres only	FRCM Ministerial Guidelines	1695 MPa (medium)
		1602 MPa (typical)
Tensile modulus of elasticity, average value	FRCM Ministerial Guidelines	150380 MPa
Average ultimate deformation value	FRCM Ministerial Guidelines	1.46 %
Pull-out resistance test on the connector fixed using Fassa Anchor V on a concrete substrate (breaking load)	FRCM Ministerial Guidelines	45598 N

Characteristics of the SISMA R4 inorganic matrix

Specifications	Test method	Product performance
Compressive modulus of elasticity	EN 13412 - Method 2	≥ 22000 N/mm ²
Compressive strength after 7 days	EN 12190	≥ 45 N/mm ²
Compressive strength after 28 days	EN 12190	≥ 50 N/mm ²
Bond strength to substrate by pull-off	EN 1542	> 2 N/mm ²
Thermal compatibility after freeze-thaw cycles	EN 13687-1	> 2 N/mm ²
Capillary absorption	EN 13057	< 0.3 kg/m ² min ^{0.5}
Coefficient of permeability to free water	EN 1062-3	0.03 kg/m ² min ^{0.5}
Determination of water vapour transmission	EN ISO 7783	S _d = 1.46 m (CLASS I)
Compliant with standard	UNI EN 1504-3	R4
Compliant with standard	UNI EN 1504-2	Coating (C) MC - IR

Characteristics of the FRCM composite (SISMA R4 + FASSATEX STEEL 650)

Specifications	Test method	Product performance
Conventional limit stress $\sigma_{lim, conv}$ - concrete substrate	FRCM Ministerial Guidelines	1697 MPa
Conventional limit strain $\epsilon_{lim, conv}$ - concrete substrate	FRCM Ministerial Guidelines	0.76 %
Elastic modulus E ₁ in stage A	FRCM Ministerial Guidelines	2038970 MPa
Ultimate stress σ_u of the FRCM composite	FRCM Ministerial Guidelines	1701 MPa
Ultimate strain ϵ_u of the FRCM composite	FRCM Ministerial Guidelines	1.16 %

The above information refers to laboratory testing; it is possible that in practical applications on site these may differ considerably according to the conditions in which the material is applied. In any case the user must check that the product is suitable for the intended application, taking all responsibility for its use. Fassa reserves the right to make technical modifications without notice.

Technical specifications regarding the use of Fassa Bortolo products for structural or fire prevention applications will only be officially valid if provided by Fassa Bortolo's "Technical Service" and "Research, Development and Quality System". If necessary, contact Technical Service in your country of reference (IT: area.technica@fassabortolo.com, ES: asistencia.technica@fassabortolo.com, PT: asistencia.technica@fassabortolo.com, FR: bureau.technique@fassabortolo.fr, UK: technical.assistance@fassabortolo.com).

Please note that for the aforementioned products, the assessment is required by the appointed professional, in accordance with regulations in force.