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# European Technical Assessment ETA 26/0256 of 10/04/2026

General Part

| | |
|---|---|
| **Technical Assessment Body issuing the ETA:** | **TECNALIA RESEARCH & INNOVATION** |
| **Trade name of the construction product** | **Kimitech PLUG VR-HD** |
| **Product family to which the construction product belongs** | BUILDING KITS, UNITS, AND PREFABRICATED ELEMENTS. |
| **Manufacturer** | **KIMIA SPA**<br>Via del Rame, 73<br>06134 Ponte Felcino (PG), Italy<br>https://www.kimia.it/ |
| **Manufacturing plant** | Plant 1 |
| **This European Technical Assessment contains** | 15 pages including three Annexes which form an integral part of this assessment. |
| **This European Technical Assessment is issued in accordance with Article 95(4) of Regulation (EU) 2024/3110, on the basis of** | EAD 340392-00-0104 CRM (Composite Reinforced Mortar) systems for strengthening concrete and masonry structures. |

Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document and should be identified as such.

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## Specific parts

## 1. Technical description of the product

The CRM (Composite Reinforced Mortar) systems are composed of different components, namely:

- FRP (Fibre Reinforced Polymer) mesh (preformed);
- FRP mesh corner elements (preformed);
- FRP connectors (preformed).

This ETA refers to GFRP connector **Kimitech PLUG VR-HD**, as single product that is a component of a CRM systems for strengthening concrete and masonry structures:

- **Kimitech PLUG VR-HD**: GFRP L connector 100-1000 x 100 Ø 7 mm (ECR glass fibres impregnated with vinylester resin).

The connector´s geometrical and physical properties are reported in Annex A

The connection kit **Kimitech PLUG VR-HD** comprises the ECR glass fibres impregnated with vinylester resin. There are two alternative options for the bonding agent to be used for anchoring the FRP connector to the substrate: BOSSONG BCR V PLUS and FERRI REPIKIT VE40 SEISMIC. In the case of BOSSONG BCR V PLUS resin, it is also suitable for overlapping connectors.

The chemical anchor BOSSONG BCR V PLUS is a styrene-free bi-component vinylestere resin compliant with EAD 330499-02-0601 and EAD 330087-01-0601. Essential characteristics of BOSSONG BCR V PLUS are reported in ETA 09/0140 (issued on the basis of EAD 330499-02-0601) and in ETA-09/0246 (issued on the basis of EAD 330087-01-0601).

The chemical anchor FERRI REPIKIT VE40 SEISMIC is a styrene-free bi-component vinylestere resin compliant with EAD 330499-01-0601. Essential characteristics of REPIKIT VE40 SEISMIC are reported in ETA 23/0081 (issued on the basis of EAD 330499-01-0601).

## 2. Specification of the intended use in accordance with European Assessment Document EAD 340392-00-0104 (EAD hereinafter)

The GFRP connectors (of the CRM system) have been designed to be used with resin for securing the mesh, in highly specialized applications for the structural reinforcement of existing and new masonry and concrete elements. The GRFP connectors are used, as a part of a CRM system, for reinforcement of structural elements subject to static, quasi-static, seismic/dynamic loading, also in environments subject to critical exposure conditions.

Concerning product packaging, transport and storage it is the responsibility of the manufacturer to undertake the appropriate measures and to advise his clients on the transport and storage, as he considers necessary in order to reach the declared performances.

The information about installation is provided with the technical documentation from the manufacturer and it is assumed that the product will be installed according to it or (in absence of such instructions) according to the usual practice of the building professionals.

The specifications and conditions given by the manufacturer are summarized in Annex B.

The performances assessed in this European Technical Assessment, according to the applicable EAD, are based on an assumed intended working life of at least 50 years, provided that the conditions for the installation, packaging, transport, storage, installation as well as appropriate use, maintenance and repair are met. The indications given on the working life cannot be interpreted as a guarantee given by the manufacturer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

## 3. Performance of the product and references to the methods used for its assessment

The tests for performance assessment were carried out in compliance with EAD 340392-00-0104 according to the test methods reported herein, as well for what concerns sampling, conditioning and testing provisions.

The numbering (#) in the following tables corresponds to the numbering of Table 2.4 of EAD 340392-00-0104.

### 3.1 Mechanical resistance and stability (BWR 1)

#### 3.1.1. GFRP connector (Table 2.4 of EAD)

| # | Essential characteristic | Performance |
|---|---|---|
| 1 | Tensile strength | Annex C, Section C1, Table 2 |
| 2 | Ultimate strain | |
| 3 | Young's Modulus | |
| 4 | Pull-out from reference substrates | Annex C, Section C2, Table 4 and Table 5 |
| 5 | Lap-tensile strength | Annex C, Section C1, Table 3 |
| 6 | Freezing and thawing resistance | Annex C, Section C3, Table 6 and Table 7 |
| 7 | Water resistance | Annex C, Section C3, Table 8 and Table 9 |
| 8 | Saltwater resistance | Annex C, Section C3, Table 10 and Table 11 |
| 9 | Alkali resistance | Annex C, Section C3, Table 12 and Table 13 |
| 10 | Glass Transition Temperature | Annex C, Section C4, Table 14 |

## 4. Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

In accordance with the European Assessment Document EAD 340392-00-0104, the applicable European legal act is: Decision 1999/469/EC.

The AVCP system to be applied is: 2+.

## 5. Technical details necessary for the implementation of the AVCP system, as provided for in EAD

Technical details necessary for the implementation of the Assessment and Verification of Constancy of Performance (AVCP) system are laid down in the control plan deposited at Tecnalia Research & Innovation.

The Control Plan is a confidential part of the ETA and is only handed over to the notified body involved in the assessment and verification of constancy of performance.

Issued in Azpeitia, on 10/04/2026

TECNALIA LAB_SERVICES

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Miguel Mateos

Innovation and Conformity Assessment Point

Tecnalia Research & Innovation

# ANNEX A: MATERIAL PROPERTIES

## Table 1: GFRP "L" CONNECTOR PROPERTIES

| **Connector reference** | | **GFRP L Connectors 100-1000 x 100 Ø 7mm** |
|---|---|---|
| **Appearance** | |  |
| **Geometrical and physical characteristics** | | |
| | Unit | Value |
| Long side length | mm | 100 - 1000 |
| Short side length | mm | 100 |
| Nominal diameter | mm | 7 |
| Nominal cross sectional area | $mm^2$ | 38 |
| Weight | g/m | 75 |
| Fibre content by Weight (*mean value*) | % | 75 |
| Colour | - | White, translucent |
| Packaging | - | Box of 100 connectors |
| **Chemical and physical characteristics** | | |
| **Fibre properties** | | |
| Fibre type | - | ECR glass roving |
| Fibre density | $g/cm^3$ | 2.6 |
| Yarn linear density | tex | 56000 |
| **Resin properties** | | |
| Resin type | - | Thermosetting resin |
| Resin density (hardened, polymerized) | $g/cm^3$ | 1.2 |
| Resin glass transition temperature | ° C | 115 |

# ANNEX B: SPECIFICATION OF INTENDED USE

## B.1. STORAGE CONDITIONS

Store in a covered, dry place, protected from rain and direct sunlight. Exposure to dust, grease, oil, and any other material that could reduce the adhesion between the connector and the mortar should be avoided. Particular care should be taken during transport, handling, and storage to prevent breakage.

## B.2. INSTALLATION CONDITIONS

The application of the connectors should be carried out at temperatures ranging from -10°C to 60°C.

## B.3. INSTALLATION INSTRUCTIONS

For CRM application on only one side of the masonry, drill 12 mm diameter holes to a depth of at least 2/3 of the masonry thickness, with a number of 4 to 6 holes per square meter. After cleaning the holes with a metal brush and compressed air, insert the BCR 400 V PLUS chemical anchor, saturating the entire length of the perforation, and proceed with the insertion of the Kimitech PLUG VR-HD connectors, applying a slight rotation around their axis until the short side adheres to the mesh.

For CRM application on both sides of the masonry, drill holes, at a rate of 4 to 6 per square meter, which must be pass-through with a diameter of 12 mm and a 24 mm diameter countersink for the overlap of the two connectors (which must be 10 cm). After cleaning the holes with a metal brush and compressed air, insert the long connector from the side of the wall where the hole has not been enlarged. Then proceed with the injection of the BCR 400 V PLUS chemical anchor into the enlarged portion of the hole and insert the short connector, applying a slight rotation around its axis until the short side adheres to the mesh.

# ANNEX C: MECHANICAL PROPERTIES

## C1: GFRP CONNECTORS - MECHANICAL PROPERTIES

**Table 2: Mechanical properties of the GFRP connectors**

| Product | Tensile Strength $\sigma_{u,con}$ (MPa) | | Tensile Strain $\varepsilon_{u,con}$ (%) | | Modulus of elasticity $E_{con}$ -(GPa) | |
|---|---|---|---|---|---|---|
| | Average | Characteristic value | Average | Characteristic value | Average | Characteristic value |
| GFRP L connector Φ 7 mm | 854 | 662 | 2.77 | 1.25 | 47.2 | 32.9 |

**Table 3: Lap tensile test results for GFRP connectors**

| Product | Load at failure Fc (kN) | | Lap-tensile strength $\sigma_{lap}$ (MPa) | |
|---|---|---|---|---|
| | Average | Characteristic value | Average | Characteristic value |
| GFRP L connector Φ 7 mm | 27.58 | 23.12 | 726 | 608 |

The used overlap length $l_{lap}$ was 110 mm.

## C2: GFRP CONNECTORS - PULL-OUT FROM REFERENCE SUBSTRATES

**Table 4: Pull-out from reference substrates**

| Product | Substrate | Chemical anchor | Anchorage $L_{anc}$ (mm) | Pull-out load $P_{anc}$ (kN) | Failure mode |
|---|---|---|---|---|---|
| GFRP L connector Φ 7 mm | Clay | BOSSONG BCR 400 V-PLUS | 160 | 17.85 | 2+3+4 |
| | Natural stone | | | 19.13 | 2 |
| | Tuff | | | 8.58 | 2 |
| | Clay | FERRI REPIKIT VE40 SEISMIC | 160 | 12.9 | 1+2 |
| | Natural stone | | | 14.95 | 1+2 |
| | Tuff | | | 7.85 | 2 |

*Failure mode:*
*1. failure due to sliding of the connector*
*2. failure at the anchoring-substrate interface*
*3. failure of the substrate and/or substrate cone failure*
*4. failure of the connector*

**Table 5: Properties of substrates**

| Substrate | Compressive strength of material $f_b$ (MPa) |
|---|---|
| **Clay** | 20.8 |
| **Tuff** | 4.1 |
| **Natural stone** | 120.0 |

## C3: GFRP CONNECTORS - ENVIRONMENTAL DURABILITY

**Freeze-thaw exposure conditions:**
All samples were conditioned in a humidity chamber for a week, at a relative humidity >90% and at a temperature of 38±2°C; they were then subjected to 20 freeze-thaw cycles. Each cycle consisted of at least 4 hours at -18±1 °C, followed by 12 hours in a humidity chamber (>90% relative humidity, 38±2°C).

**Table 6: Resistance of GFRP connector after freeze-thaw exposure**

| Product | Tensile Strength $\sigma_{u,FT}$ (MPa) | Tensile Stress $\varepsilon_{u,FT}$ (%) | Modulus of elasticity $E_{FT}$ (GPa) |
|---|---|---|---|
| | Average | Average | Average |
| GFRP L connector Φ 7 mm | 823 | 2.6 | 46.71 |

No surface changes were evidenced.

**Table 7: Freeze-thaw resistance – Retained tensile properties**

| Product | Property | Retained |
|---|---|---|
| GFRP L connector Φ 7 mm | Tensile Strength | 96.4% |
| | Modulus of elasticity | 99% |

**Water exposure conditions:**
All samples were conditioned according to Section 2.2.2.4 of EAD 340210-00-0104 for 1000 hours at a temperature of 38±2°C and relative humidity > 90%.

**Table 8: Resistance of GFRP connector after water exposure**

| Product | Exposure time | Tensile Strength $\sigma_{u,w}$ (MPa) | Tensile Stress $\varepsilon_{u,w}$ (%) | Modulus of elasticity $E_w$ (GPa) |
|---|---|---|---|---|
| | | Average | Average | Average |
| GFRP L connector Φ 7 mm | 1000h | 840 | 2.35 | 46.78 |

No surface changes were evidenced.

**Table 9: Water resistance – Retained tensile properties**

| Product | Property | Exposure time | Retained |
|---|---|---|---|
| GFRP L connector Φ 7 mm | **Tensile Strength** | 1000h | 98.3% |
| | **Modulus of elasticity** | 1000h | 99.1% |

**Saltwater exposure conditions:**
All samples were conditioned by immerging specimens in saltwater (solution of 245 g NaCl and 40.94 g $Na_2SO_4$ for 10 l of distilled water) for 1000 hours at a temperature of 23±2°C.

**Table 10: Resistance of GFRP connector after saltwater exposure**

| Product | Exposure time | Tensile Strength $\sigma_{u,sw}$ (MPa) | Tensile Stress $\varepsilon_{u,sw}$ (%) | Modulus of elasticity $E_{sw}$ (GPa) |
|---|---|---|---|---|
| | | Average | Average | Average |
| GFRP L connector Φ 7 mm | 1000h | 849 | 2.21 | 50.20 |

No surface changes were evidenced.

**Table 11: Saltwater resistance – Retained tensile properties**

| Product | Property | Exposure time | Retained |
|---|---|---|---|
| GFRP L connector Φ 7 mm | Tensile Strength | 1000h | 99.4% |
| | Modulus of elasticity | 1000h | 106.4% |

**Alkali exposure conditions:**
All samples were conditioned by immerging specimens in an alkaline solution (pH=12.5) for 1000 hours at a temperature of 23±2°C.

**Table 12: Resistance of GFRP connector after alkali exposure**

| Product | Exposure time | Tensile Strength $\sigma_{u,alk}$ (MPa) | Tensile Stress $\varepsilon_{u,alk}$ (%) | Modulus of elasticity $E_{alk}$ (GPa) |
|---|---|---|---|---|
| | | Average | Average | Average |
| GFRP L connector Φ 7 mm | 1000h | 911 | 2.41 | 48.8 |

No surface changes were evidenced.

**Table 13: Alkali resistance – Retained tensile properties**

| Product | Property | Exposure time | Retained |
|---|---|---|---|
| GFRP L connector Φ 7 mm | **Tensile Strength** | 1000h | 106.7% |
| | **Modulus of elasticity** | 1000h | 103.4% |

## C4: GFRP CONNECTORS - GLASS TRANSITION TEMPERATURE

**Table 14: Glass transition temperature of GFRP connectors**

| Product | Tg (minimum) |
|---|---|
| GFRP L connector Φ 7 mm | 60,81ºC |