

# C-WRAP 300/600 HS C-QUADRIWRAP HS

## On-site impregnated FRP strengthening systems consisting of carbon fibre fabrics and epoxy resin

### SYSTEM NAMES

The Ruregold FRP strengthening systems are as follows:

- **C-WRAP 300 HS**: consisting of a high resistance, 300 g/m<sup>2</sup>, unidirectional carbon fibre fabric, **WRAP 300 HS** and an epoxy resin for impregnating the fabric and bonding it to the structure, **C-RESIN**
- **C-WRAP 600 HS**: consisting of a high resistance, 600 g/m<sup>2</sup>, unidirectional carbon fibre fabric, **WRAP 600 HS** and an epoxy resin for impregnating the fabric and bonding it to the structure, **C-RESIN**
- **C-QUADRIWRAP HS**: consisting of a high resistance, 380 g/m<sup>2</sup>, quadriaxial carbon fabric, **QUADRIWRAP 380 HS** and an epoxy resin for impregnating the fabric and bonding it to the structure, **C-RESIN**

### FIELDS OF APPLICATION

- Retrofitting and upgrading the static and seismic behaviour of R.C. buildings.
- Retrofitting and upgrading the static and seismic behaviour of R.C. infrastructure.
- Retrofitting and upgrading the static and seismic behaviour of load-bearing masonry buildings.
- Flexural structural strengthening of beams.
- Structural strengthening against combined axial and flexural forces in columns.
- Shear structural strengthening of reinforced concrete beams, columns, beam-column nodes and walls.
- Confinement of reinforced concrete and masonry columns.
- Improving the ductility of reinforced concrete elements.

### METHOD OF USE

#### Preparing the substrate

Repair and prepare the substrate as necessary, in accordance with the following instructions, subject to prior approval of the Works Manager:

- Remove any deteriorated substrate by hydrodemolition of the concrete cover and stripping the reinforcement until reaching a concrete layer that is well-compacted and not carbonated.
- Eliminate any loose material, grease, or oil from the concrete rebars and remove the rust layers by brushing (manually or mechanically). We recommend also sand-blasting the concrete rebars.
- Coat the concrete rebars with a passivating layer, using a paintbrush to apply two coats of an anti-corrosive, cementitious mortar, e.g. **Ruregold Passivator** (consult the technical data sheet on the web site [www.ruregold.it](http://www.ruregold.it)) so that the exposed reinforcements are completely covered.
- Volumetric repair of the concrete cover using mortar, e.g. **MX-R4 Repair** type mortar, applying the product in 20-25 mm layers, while the preceding layer is still wet (consult the technical data sheet on the web site [www.ruregold.it](http://www.ruregold.it)).
- Before applying the FRP system, round off the sharp edges of the section (radius  $\geq$  20mm see CNR DT200 R1/2013).
- In the case of irregular substrates, we recommend priming the surface with **C-PRIMER** (consult the technical data sheet, available on the web site [www.ruregold.it](http://www.ruregold.it)), applying a single coat with a paintbrush or roller, and then applying the **C-RESIN**.
- If the roughness of the substrate exceeds 2-3 mm, we recommend regularising the surface using **C-RESIN LAM** epoxy putty before applying **C-RESIN** over the putty while it is still fresh.

**Preparing the fabrics**

- The **WRAP 300/600 HS** and **QUADRIWRAP 380 HS** fabrics are supplied in rolls of various lengths and widths.
- Cut the **WRAP 300/600 HS** or **QUADRIWRAP 380 HS** to the dimensions specified in the project using a pair of scissors or an angle grinder. Always cut the fabric perpendicularly to the main direction of the fibres.

**Preparing the impregnating resin**

**C-RESIN** does not require any additional material and:

- Mixing ratio for **C-RESIN (A:B = 2.5:1)**  
2.5 parts of component A by weight: 1 part of component B by weight
- Pour component A and component into a container and mix, using a low speed paddle mixer so as to obtain a homogeneous mix.
- We recommend mixing the product in larger quantities than those indicated in the supply specification.

**APPLICATION**

- Apply a first coat of **C-RESIN** using a paintbrush or roller.

- Apply the **WRAP 300/600 HS** or **QUADRIWRAP 380 HS** fabric on the first coat of resin while still fresh and press so that it adheres correctly (wear rubber gloves to protect the hands during this operation).
- Using a bubble breaker roller, impregnate the carbon fibre fabric, taking care to eliminate any air bubbles.
- Apply a second coat of **C-RESIN** using a paintbrush or roller.
- If it is necessary to apply any additional coats, repeat the above operations on the resin while the preceding layer is still fresh.
- If there are still any air bubbles present, eliminate them using the bubble breaker roller.

**FINISHING AND PROTECTION**

If it is necessary to apply a finishing, dust the resin with dry quartz sand while still fresh.  
Once the resin has set completely (approx. 2 days at 23 °C), apply the skim coat and any UV radiation and fire protection treatments.

**PROPERTIES OF FABRIC CARBON FIBRES**

Type of fibre	High resistance carbon
Fibres density	approx. 1.80 g/cm <sup>3</sup>
Tensile strength of the fibres	≥ 4900 MPa
Fibres strain	≥ 2.00 %
Fibres modulus of elasticity	≥ 230 GPa

**PROPERTIES OF THE C-RESIN**

Resin name	<b>C-RESIN</b>
Type of resin	Epoxy
Density	1.05±0.05 g/cm <sup>3</sup>
Glass transition temperature T <sub>g</sub>	≥ 57 °C
Catalysis ratio A:B	2.5:1
Pot life at 23 °C	45-60 min
Packaging	Kit A+B: 4.2 kg (3+1.2 kg)
Storage conditions	In the original packaging, indoors, in a cool, dry, unventilated place away from sources of heat.
Durability (Italian Ministerial Decree 10/05/2004)	Not more than 12 months from packing date.
Compliance	UNI EN 1504-4:2005/DPCS LL.PP. (Public Works Ministry) Guidelines No. 293 issued on 29/05/2019

## GEOMETRICAL AND PHYSICAL CHARACTERISTICS OF THE SYSTEMS C-WRAP 300/600 HS and C-QUADRIWRAP HS

System name	Test method Reference standard	C-WRAP 300 HS	C-WRAP 600 HS	C-QUADRIWRAP HS
Fabric name		WRAP 300 HS	WRAP 600 HS	QUADRIWRAP 380 HS
Resin name			C-RESIN	
Fibres density	ISO 1183-1/2013	1.80 g/cm <sup>3</sup>	1.80 g/cm <sup>3</sup>	1.80 g/cm <sup>3</sup>
Fabric mass per unit area	ISO 3374	300 g/m <sup>2</sup>	600 g/m <sup>2</sup>	380 g/m <sup>2</sup>
Resin density	ISO 1675		1.05 g/cm <sup>3</sup>	
Type of fabric		Unidirectional	Unidirectional	Quadri-axial
Equivalent area		167 mm <sup>2</sup> /m	333 mm <sup>2</sup> /m	209 mm <sup>2</sup> /m
Equivalent thickness		0.167 mm	0.333 mm	0.209 mm (total) 0.052 mm (single direction)
Glass transition temperature T <sub>g</sub>	ISO 11357-2 and 3:2013 DSC		≥ 57 °C	
Maximum and minimum operating temperature limits	L.G. C.S.LL.PP. (Ministry of Public Works Guidelines)		-18/42 °C	
System application temperatures			+5/+35 °C	
Reaction to fire	EN 13501-1		F	

## MECHANICAL PROPERTIES OF THE C-WRAP 300/600 HS and C-QUADRIWRAP HS FRP SYSTEMS

Certified in accordance with the “FRP Guidelines 05/2019” - Designed in accordance with “CNR-DT 200 R1/2013” (National Research Council Technical Guidelines)

System name	C-WRAP 300 HS	C-WRAP 600 HS	C-QUADRIWRAP HS
Classification in accordance with DPCS LL.PP. (Public Works Ministry) Guidelines No. 293 issued on 29/05/2019	210C	210C	210C
Modulus of elasticity with reference to the net area of the fibres (mean value)	$E_f$	≥ 210 GPa	≥ 210 GPa
Strength with respect to the net area of the fibres (characteristic value)	$f_{fib}$	≥ 2700 MPa	≥ 2700 MPa
Fracture strain	$\varepsilon_{fib}$	≥ 1.2 %	≥ 1.2 %

## C-RESIN COVERAGE

Resin	FRP system		
C-RESIN	C-WRAP 300 HS	C-WRAP 600 HS	C-QUADRIWRAP HS
Coverage	1-1.2 kg/m <sup>2</sup>	1.5-1.7 kg/m <sup>2</sup>	1.3-1.5 kg/m <sup>2</sup>

## SPECIFICATION ITEM

### C-WRAP300 HS

Supply and implementation of a FRP structural strengthening system, consisting of a carbon fibre unidirectional fabric tape, e.g. Ruregold Laterlite SpA **WRAP 300 HS**, having a density of 1.8 g/cm<sup>3</sup>, tensile strength of  $\geq 2700$  MPa in the direction of the fibre and tensile modulus of elasticity in the direction of the fibres  $\geq 210$  GPa, and Ruregold Laterlite SpA **C-RESIN** epoxy resin, having a compressive strength of  $\geq 60$  MPa, binding/adhesive force of  $\geq 14$  Mpa and glass transition temperature of  $\geq +57^\circ$ . The system consists of a unidirectional fabric, having a grammage of 300 g/m<sup>2</sup> and an equivalent thickness of 0.167 mm. The carbon fibre FRP system may be used to increase the resistance to combined axial and flexural forces, and confinement in columns; bending and shear in beams and slab joists; and to locally strengthen beam - column nodes. Increasing the ductility of one-dimensional elements such as reinforced concrete beams and columns.

### C-WRAP 600 HS

Supply and implementation of a FRP structural strengthening system, consisting of a carbon fibre unidirectional fabric tape, e.g. Ruregold Laterlite SpA **WRAP 600 HS**, having a density of 1.8 g/cm<sup>3</sup>, tensile strength of  $\geq 2700$  MPa in the direction of the fibre and tensile modulus of elasticity in the direction of the fibres  $\geq 210$  GPa, and Ruregold Laterlite SpA **C-RESIN** epoxy resin, having a compressive strength of  $\geq 60$  MPa, binding/adhesive force of  $\geq 14$  Mpa and glass transition temperature of  $\geq +57^\circ$ . The system consists of a unidirectional fabric, having a grammage of 600 g/m<sup>2</sup> and an equivalent thickness of 0.333 mm. The carbon fibre FRP system may be used to increase the resistance to combined axial and flexural forces, and confinement in columns; bending and shear in beams and slab joists; and to locally strengthen beam - column nodes. Increasing the ductility of one-dimensional elements such as reinforced concrete beams and columns.

### C-QUADRIWRAP HS

Supply and implementation of a FRP structural strengthening system, consisting of a carbon fibre quadriaxial fabric tape, e.g. Ruregold Laterlite SpA **QUADRIWRAP 380 HS**, having a density of 1.8 g/cm<sup>3</sup>, tensile strength of  $\geq 2700$  MPa in the direction of the fibre and tensile modulus of elasticity in the direction of the fibres  $\geq 210$  GPa, and Ruregold Laterlite SpA **C-RESIN** epoxy resin, having a compressive strength of  $\geq 60$  MPa, binding/adhesive force of  $\geq 14$  Mpa and glass transition temperature of  $\geq +57^\circ$ . The system consists of a unidirectional fabric, having a grammage of 380 g/m<sup>2</sup> and a total equivalent thickness of 0.209, and 0.052 per single direction mm. The carbon fibre FRP system may be used to increase the local strength of beam - column nodes.

#### Issued provisionally on 02/2024\_Revision 01

This technical data sheet is not a specification. The provided figures, and content thereof, are based on our best knowledge and experience, and are purely indicative in nature. The user is responsible for determining whether or not the product is suitable for the intended use, assuming all responsibility for its use and application. Laterlite reserves the right to change the packaging and the contained quantity without prior notice. Check that the revision of the TDS is the one currently in force. Laterlite products are intended for professional use only.

This Technical Data Sheet cancels and replaces previous editions, which are no longer in force.

