

S&P CFRP - Laminates

S&P slot-applied laminates



Carbon fibre plates for structural reinforcement

Description



S&P CFRP - Laminates are prefabricated (pultruded), carbon fiber reinforced polymers for structural reinforcement of structures made of concrete, masonry, steel or wood.

The S&P CFRP - Laminates are bonded with epoxy resin (S&P Resin 220) as external support elements with the concrete ground.

The S&P slot-applied laminates are bonded and anchored with an epoxy adhesive (S&P Resin 220 or S&P Resin 55) in milling cuts in the concrete ground.

Application areas

Increasing the load

- increase of life or traffic loads for ceilings, beams and bridges
- change of use of buildings
- installation of heavier machinery and equipment in the industry
- stabilization of vibrations and oscillations

Modification of the support system due to

- distance from columns and walls
- creating cutouts in ceiling
- increasing resistance to earthquake
- project- or building mistakes

Damage to structural parts due to

- corrosion of steel reinforcement (rebar loss)
- aging of building materials
- damage to the structure due to fire, earthquake, impact, etc.

Increase the usability

- reduction of crack widths
- reduction of the deflection
- reduction of steel tensile stresses
- reduction of fatigue

Advantages

- Very high tensile strength
- Corrosion resistance
- Low deadweight and building height
- Any delivery length (no overlapping required)
- Easy application also overhead
- Excellent behavior in fatigue
- Simple, flexible and economic gain technology
- Laminates intersections easily possible
- Very short loss of use of the building
- No noise and no vibration during installation

Product data	
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Type	
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Appearance/ Colour	Carbon fibre-reinforced plastic material (epoxy resin) / black
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Delivery	Cut to size or rolls of 150 m (from a width of 120 mm: 100 m)
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Surface-applied laminates	Laminate type	Cross section	Tensile strength at elongation 6 ‰	Tensile strength at elongation 8 ‰
	150/2000 Modulus of elasticity: ≥ 170 kN/mm ² (average)	[mm²]	Theoretical tensile strength for the design: 1'050 N/mm²	Theoretical tensile strength for the design: 1'400 N/mm²
	50 / 1.2	60	63.0 kN	84.0 kN
	50 / 1.4	70	73.5 kN	98.0 kN
	60 / 1.4	84	88.2 kN	117.6 kN
	80 / 1.2	96	100.8 kN	134.4 kN
	80 / 1.4	112	117.6 kN	156.8 kN
	90 / 1.4	126	132.3 kN	176.4 kN
	100 / 1.2	120	126.0 kN	168.0 kN
	100 / 1.4	140	147.0 kN	196.0 kN
	120 / 1.2	144	151.2 kN	201.6 kN
	120 / 1.4	168	176.4 kN	235.2 kN
	150 / 1.2	180	189.0 kN	252.0 kN
	150 / 1.4	210	220.5 kN	294.0 kN
	200/2000 Modulus of elasticity: ≥ 205 kN/mm ² (average)	[mm²]	Theoretical tensile strength for the design: 1'250 N/mm²	Theoretical tensile strength for the design: 1'650 N/mm²
	50 / 1.4	70	87.5 kN	115.5 kN
	60 / 1.4	84	105.0 kN	138.6 kN
	80 / 1.4	112	140.0 kN	184.8 kN
	90 / 1.4	126	157.7 kN	207.9 kN
	100 / 1.4	140	175.0 kN	231.0 kN
	120 / 1.4	168	210.0 kN	277.2 kN

Slot-applied laminates	Laminate type	Cross section	Tensile strength
	150/2000 Modulus of elasticity: ≥ 170 kN/mm ² (average)	[mm²]	Theoretical tensile strength for the design: 1'650 N/mm²
	10 / 1.4	14	23.1 kN
	10 / 2.8	28	46.2 kN
	15 / 2.5	38	61.9 kN
	20 / 1.4	28	46.2 kN
	200/2000 Modulus of elasticity: ≥ 205 kN/mm ² (average)	[mm²]	Theoretical tensile strength for the design: 2'050 N/mm²
	10 / 1.4 (upon request)	14	28.7 kN
	20 / 1.4	28	57.4 kN

Technical data

Density	1.6 g/cm ³		
Fibre volume content	> 68 Vol.-%		
Mechanical / physical Properties	CFRP 150/2000	CFRP 200/2000	(EN 2561)
Tensile strength	≥ 2'800 N/mm ²	≥ 2'800 N/mm ²	
Modulus of elasticity:	≥ 170 kN/mm ²	≥ 205 kN/mm ²	
Elongation at break	> 16 ‰	> 13.5 ‰	

Storage

Storage conditions/ Storage life	Store it in a dry and safe place: - no direct sunlight (UV) - max. + 50 °C
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Application instructions

Consumption /Dosage of epoxy adhesive

S&P CFRP - Laminates

Width of laminate	S&P Resin 220
50 mm	ca. 350 g/m
60 mm	ca. 450 g/m
80 mm	ca. 550 g/m
90 mm	ca. 650 g/m
100 mm	ca. 700 g/m
120 mm	ca. 850 g/m
150 mm	ca. 1'050 g/m

S&P slot-applied laminates

Type of laminate	S&P Resin 55 / 220
10/1.4 or 10/2.8	ca. 80 / 120 g/m
15/2.5	ca. 110 / 160 g/m
20/1.4	ca. 130 / 200 g/m

The material consumption depends on the flatness and roughness of the ground and of the crossing of the laminates. Therefore the effective consumption can be higher.

Condition of the ground

Unevenness

(SIA 166, fib 14)

Before gluing of the laminate, the flatness of the surface is to check with a metal bar. Tolerance is maximum 5 mm for a length of 2 m and a maximum of 1 mm for a length of 30 cm.

The temperature of the concrete ground should be at least 8 °C and at least 3 °C above the dew point.

The stability of the ground (concrete, masonry, natural stone) should be checked in each case. The tensile strength of the prepared concrete ground should be 2.0 N/mm² at least 1.5 N/mm².

The concrete moisture must be < 4 weight-%.

Preparation of the ground

Concrete and masonry

The ground must be load-bearing, dry, clean and free of dust and loose particles, dirt, oil, grease and other separating substances.

The ground is prepared by suitable methods such as grinding, sand blasting or high pressure water jets (> 800 bar). Dust must be removed with a vacuum cleaner.

Concrete repairs and uneven places must be equalized with the reprofiling mortar S&P Resin 230. Whenever possible working "wet on wet". If this is not possible, the surface must be roughened before application of the laminates to guarantee a good adhesion between the S&P Resin 230 and S&P Resin 220.

For S&P slot-applied laminates

With a special concrete mill are milled slots of about 5 - 8 mm width and 12 - 15 mm depth (for 10 mm width laminates), 17 - 20 mm depth (for 15 width laminates) or 22 - 25 mm depth (for 20 mm width laminates) into the concrete ground. The slot must be dry, free of dust and loose particles, dirt and other parting compounds.

Steel surfaces

Degrease and prepare steel surfaces in the standard-grade Sa 3.0 (according to EN 12944-4)

Immediately after the above preparation, the steel surfaces must be protected against corrosion or the S&P CFRP - Laminates must be applied. During the entire work the dew point may not be reached.

Wood surfaces

Ground prepare by grinding or planing. Dust must be removed with a vacuum cleaner.

Adhesive surface primed with S&P Resin 50 immediately before bonding of the S&P CFRP - Laminates.

Preparation of the S&P CFRP - Laminates

Shortly before the application of the S&P Resin 220 the contact surface of the laminate must be cleaned with a white rag moistened with S&P Cleaner. Wait until the surface is dry (> 5 minutes).

Application conditions/limits

Temperature of the substrate	See product data sheet of the used epoxy resin adhesive
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Air temperature	See product data sheet of the used epoxy resin adhesive
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Humidity of the substrate	See product data sheet of the used epoxy resin adhesive
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Dew point	See product data sheet of the used epoxy resin adhesive
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Application instructions

Mixing	See product data sheet of the used epoxy resin adhesive
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Mixing time	See product data sheet of the used epoxy resin adhesive
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Handling



S&P CFRP - Laminates

Arrange the laminate on a clean surface (workbench) and clean the unlabeled side with a white cloth and S&P Cleaner. Wait at least 5 minutes to let completely dry the surface. Using the S&P adhesive-forming unit for put on the well-mixed S&P Resin 220 on the laminate in a roof shape. In the edge region of the laminate it needs about 1 mm adhesive thickness in the middle of the laminate about 3 mm.

The S&P CFRP - Laminate is to fix with light finger pressure on the prepared concrete surface and then pressed with a special roller until the adhesive runs out on both sides of the laminate. The excess glue is wiped off and can't be reused. The adhesive layer thickness should be 2 mm on average. Interfering adhesive residue on the fin surface should be removed, as long as the adhesive is not cured.

Thanks to the excellent resistance of the adhesive no tools are required to support.

At intersections of laminates the first applied laminate is to clean with S&P Cleaner. When gluing of several laminates above the other, both sides must be completely clean.

After the curing of the S&P Resin 220, the bond is tested by gently tapping on hollow sites.

To test the adhesion of the S&P CFRP - Laminate on the concrete ground, we recommend to stick one or more tests laminate pieces and to take at least 3 pull out tests (according to EN 1542).

- Requirement bond tensile strength:
 - average > 2.0 N/mm²
 - at least > 1.5 N/mm²
 - 100 % concrete failure

S&P slot-applied laminates

The clean and dry slots are filled with the homogeneous mixture of the S&P Resin 220 with a puttyknife or -gun. In horizontal slots it's also possible to pour in S&P Resin 55. One or two S&P slot-laminates are inserted in the slot. The run out adhesive are peeled off with a spatula, so that is an even surface.

Processing aids and devices



S&P Cleaner

For cleaning and degreasing of the S&P CFRP - Laminates prior to bonding, as well as cleaning of the tools. Available in 2, 10 or 25 liter containers.

S&P press roller

For pressing of the S&P CFRP - Laminates in 3 different widths (60, 90, 130 mm) available piecewise

S&P adhesive-forming unit

For a dosed and roof shape application of the adhesive on the S&P CFRP - Laminates. For all types optimized adhesive required!

S&P Roll dispenser

For a controlled and safe rolling and cutting the S&P CFRP - Laminates on the site. Adaptable for all types of laminates.

Cleaning of equipment	Clean equipment immediately after use with S&P Cleaner. Hardened material can only be removed mechanically.
Indications	<p>Reinforcing works should be carried out by well-trained and experienced specialists.</p> <p>For the functionality of the S&P CFRP - Laminates and the S&P slot-applied laminate, any kind of damage must be avoided. In particular, the CFRP system must be protected against direct sunlight (UV).</p> <p>During the application, the pot life of the epoxy resin is observed.</p> <p>When cutting the laminates protective clothing, gloves, goggles and mouth protection is needed.</p> <p>The S&P CFRP - Laminates can after cleaning with S&P Cleaner be coated with a paint or coated with an adhesive bridge (S&P Resin 55 + quartz sand) for application a plaster.</p> <p>S&P provides a special software for flexural and shear design of S&P CFRP systems.</p> <p>For a detailed consultation, please contact our technical service.</p>
Fire protection	If necessary, the S&P CFRP - Laminates can be protected with fire protection plates. Depending on the requirements of fire resistance, there are various alternative solutions. Please contact our technical service.
Measured data	All technical data stated in this product data sheet are based on laboratory tests. From circumstances beyond our control may lead to deviations of actual values.
Country-specific data	The information in this product data sheet is valid for products which are delivered from S&P Clever Reinforcement Company AG, Switzerland. Please note that the information in other countries may differ. Note the local product data sheet abroad.
Important safety instructions	For detailed safety information it is recommended to seek advice in the current safety data sheet on www.sp-reinforcement.eu .
Specific indications	<p>The information and data in this technical data sheet are to ensure the normal intended use and normal application suitability and based on our knowledge and experience. They do not absolve the user from own responsibility to check the suitability and use.</p> <p>Make changes to products specifications are reserved. Furthermore, our general sales and delivery terms are applied. Valid is the recent product data sheet, which should be requested from us.</p>

