Construction

Sika CarboDur® S NSM

Pultruded carbon fibre plates for structural strengthening as part of a Sika CarboDur® system

System Description

Sika CarboDur® plates are pultruded carbon fibre reinforced polymer (CFRP) laminates, designed for strengthening concrete, timber and masonry

Sika CarboDur® plates are bonded into slots as near surface mounted reinforcement using Sika AnchorFix®-3+, Sikadur®-330 or Sikadur®-30 epoxy resin based adhesives for normal application temperatures, or Sikadur®-30 LP epoxy resin based adhesive for elevated temperatures during application. Sikadur®-300 epoxy resin based adhesive is used for horizontal applications.

Please refer to the relevant Product Data Sheet for more detailed information about each of these adhesives.

Uses

Sika CarboDur® systems are used to improve, increase or repair the performance and resistance of structures for:

Increased Load Carrying Capacity:

- Increasing the load capacity of floor slabs, beams and bridge sections
- For the installation of heavier machinery
- To stabilise vibrating structures
- For changes in building use

Damage to structural elements due to:

- Deterioration of the original construction materials
- Steel reinforcement corrosion
- Accidents (Vehicle impact, earthquakes, fire)

Improvement of serviceability and durability:

- Reduced deflection and crack width
- Stress reduction in the steel reinforcement
- Improved fatigue resistance

Change of the structural system:

- Removal of walls and / or columns
- Removal of floor and wall sections to create access / openings

Resistance to possible events:

- Increased resistance to earthquakes, impact or explosion etc.

To repair design or construction defects such as:

- Insufficient / inadequate reinforcement
- Insufficient / inadequate structural depth

Characteristics / Advantages

- Non corroding
- Very high strength
- Excellent durability and fatigue resistance
- Unlimited lengths, no joints required
- Easy transportation (rolls)
- Lightweight, very easy to install
- Minimum preparation of plate
- Smooth edges without exposed fibres as result of production by pultrusion
- Extensive Testing and Approvals available from many countries worldwide

Tests

Approval / Standards

France: CSTB - Avis Technique 3/10-669, SIKA CARBODUR SIKA WRAP

Norway: NBI Teknisk Godkjenning, NBI Technical Approval, No. 2178, 2001, (Norwegian).

Slovakia: TSUS, Building Testing and research institutes, Technical Approval TO-09/0080, 2009: Systémy dodatočného zosilňovania konštrukcií Sika® CarboDur® a SikaWrap® (Slovak).

Poland: Technical Approval ITB AT-15-5604/2011: Zestaw wyrobów Sika CarboDur do wzmacniania i napraw konstrukcji betonowych (Polish)

Poland: Technical Approval IBDiM Nr AT/2008-03-0336/1 „Płaskowniki. pręty, kształtki i maty kompozytowe do wzmacniania betonu o nazwie handlowej: Zestaw materiałów Sika CarboDur® do wzmacniania konstrukcji obiektów mostowych (Polish)

Fib, Technical Report, bulletin 14: Externally bonded FRP reinforcement for RC structures, July 2001 (International).

USA: ACI 440.2R-08, Guide for the Design and construction of Externally Bonded FRP Systems for strengthening concrete structures, July 2008, (USA).

UK: Concrete Society Technical Report No. 55, Design guidance for strengthening concrete structures using fibre composite material, 2012 (UK).

Switzerland: SIA 166:2004 Klebebewehrungen

Italy: CNR-DT 200/2004 - Guide for the Design and Construction of Externally Bonded FRP Systems for Strengthening Existing Structures

Product Data

Form

Appearance / Colour

Carbon fibre reinforced polymer with an epoxy matrix, black.

Packaging

Cut to size as follows in non-returnable cardboard packaging.
Supplied in rolls of 100 or 250 m in nonreturnable cardboard boxes.

Types

Type	Width	Thickness	Cross sectional area
Sika CarboDur® S1.030	10 mm	3.0 mm	30 mm^2
Sika CarboDur® S1.525	15 mm	2.5 mm	37.5 mm^2
Sika CarboDur® S2.025	20 mm	2.5 mm	50 mm^2
Sika CarboDur® S212	20 mm	1.2 mm	24 mm^2
Sika CarboDur® S214	20 mm	1.4 mm	28 mm^2

Storage

Storage Conditions / Shelf Life

Unlimited, provided there is no exposure to direct sunlight (UV light), in dry conditions and at temperatures of max. 50°C

Transportation: only in the original packaging, or otherwise adequately protected against any mechanical damage

Technical Data

Density	1.60 g/cm^3	
Glass Transition Temperature	> 100°C	(according to EN 61006)
Fibre Volume Content	> 68%	

Mechanical / Physical Properties

E-Modulus	Values in the longitudinal direction of the fibres		(according to EN 2561)
	Mean Value	165’000 N/mm^2	
	Minimum Value	> 160’000 N/mm^2	
	5% Fractile-Value	162'000 N/mm^2	
	95% Fractile-Value	180’000 N/mm^2	
Tensile Strength	Values in longitudinal direction of fibres		(according to EN 2561)
	Mean Value	3'100 N/mm^2	
	Minimum Value	> 2’800 N/mm^2	
	5% Fractile-Value	3'000 N/mm^2	
	95% Fractile-Value	3’600 N/mm^2	
Strain at break	Value in longitudinal direction of fibres		(according to EN 2561)
	Minimum value	> 1.70%	

System Information

System Structure	The system build-up and configuration as described must be fully complied with and may not be changed. Resin Adhesive – Sika AnchorFix®-3+, Sikadur®-330, Sikadur®-30, Sikadur®-30 LP Structural strengthening Carbon plates – CarboDur S NSM For detailed information on the different resins, together with the application details, please refer to the latest Product Data Sheets and the “Method Statement Sika CarboDur® Near Surface Mounted Reinforcement” Ref: 850 41 07

Application Details

Consumption	All CarboDur® plates	≤ 0.12 kg/m
Substrate Quality	Recommended minimum concrete pull-off strength after surface preparation: 1.0 N/mm^2 Please refer to the “Method Statement for Sika CarboDur® Near Surface Mounted Reinforcement” Ref: 850 41 07 for more detailed information	
Substrate Preparation	Slits must be dry and free from dust and loose particles Please also refer to the “Method Statement Sika CarboDur® Near Surface Mounted Reinforcement” Ref: 850 41 07 for more detailed information	

Application Conditions / Limitations

Application Conditions / Limitations	Please refer to the relevant Sika® epoxy adhesive Product Data Sheet: - Sikadur®-30 - Sikadur®-30 LP - Sikadur®-330 - Sikadur®-300 - Sika® AnchorFix®-3+

Construction

Application Instructions

Application Method / Tools	Please refer to the relevant Product Data Sheet - Sikadur®-30 - Sikadur®-30 LP - Sikadur®-330 - Sikadur®-300 - Sika® AnchorFix®-3+ Please refer the “Method Statement Sika CarboDur® Near Surface Mounted Reinforcement” Ref: 850 41 07
Notes on Application / Limitations	A suitably qualified Structural Engineer must be responsible for the design of the strengthening works. **Additionally as this application is structural, great care must also be taken in selecting suitably experienced and trained specialist contractors.** Maximum permissible continuous service temperature is approx. +50°C. Note: When using the Sika CarboHeater for curing Sikadur®-30 LP to be used at elevated temperatures, the maximum continuous service temperature can be increased to max. +80°C. Please refer to the Sika CarboHeater Product Data Sheet for further information. Please also refer to the “Method Statement Sika CarboDur® Near Surface Mounted F Ref: 850 41 07 Detailed advice can always be obtained from Sika Services AG and your local Sika Technical Services Department
Fire Protection	Where required for local regulations, Sika CarboDur® plates can also be over coated with additional fire protection materials.

Value Base

All technical data stated in this Product Data Sheet are based on laboratory tests. Actual measured data may vary due to circumstances beyond our control.

Local Restrictions

Please note that as a result of specific local regulations the performance of this product may vary from country to country. Please consult the local Product Data Sheet for the exact description of the application fields.

Health and Safety Information

This product is an article as defined in article 3 of regulation (EC) No 1907/2006 (REACH). It contains no substances which are intended to be released from the article under normal or reasonably foreseeable conditions of use. A safety data sheet following article 31 of the same regulation is not needed to bring the product to the market, to transport or to use it. For safe use follow the instructions given in this product data sheet.
Based on our current knowledge, this product does not contain SVHC (substances of very high concern) as listed in Annex XIV of the REACH regulation or on the candidate list published by the European Chemicals Agency in concentrations above 0.1 % (w/w).

Legal Notes

The information, and, in particular, the recommendations relating to the application and end-use of Sika products, are given in good faith based on Sika's current knowledge and experience of the products when properly stored, handled and applied under normal conditions in accordance with Sika’s recommendations. In practice, the differences in materials, substrates and actual site conditions are such that no warranty in respect of merchantability or of fitness for a particular purpose, nor any liability arising out of any legal relationship whatsoever, can be inferred either from this information, or from any written recommendations, or from any other advice offered. The user of the product must test the product’s suitability for the intended application and purpose. Sika reserves the right to change the properties of its products. The proprietary rights of third parties must be observed. All orders are accepted subject to our current terms of sale and delivery. Users must always refer to the most recent issue of the local Product Data Sheet for the product concerned, copies of which will be supplied on request.

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