BUILDING TRUST

PRODUCT DATA SHEET

Sika® CarboDur® S

Pultruded Carbon Fibre Plates for Structural Strengthening as Part of the Sika® CarboDur® System

DESCRIPTION

Sika® CarboDur® plates are pultruded carbon fibre reinforced polymer (CFRP) laminates, designed for strengthening concrete, timber, masonry, steel and fibre reinforced polymer structures.
Sika® CarboDur® plates are bonded onto the structure as externally bonded reinforcement using Sikadur®-30 epoxy resin based adhesive for normal, or Sikadur®-30 LP epoxy resin based adhesive for elevated temperatures during application and / or service.
Please refer to the relevant Product Data Sheet for more detailed information about each of these adhesives.

USES

Sika® CarboDur® S may only be used by experienced professionals.

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
- Low system thickness, simple execution of plate intersections or crossings
- Easy transportation (rolls)
- Lightweight, very easy to install, especially overhead (without temporary support)
- Minimum preparation of plate, applicable in several layers
- Smooth edges without exposed fibres as result of production by pultrusion
- Extensive Testing and Approvals available from many countries worldwide

APPROVALS / STANDARDS

- Slovakia: TSUS, Building Testing and research institutes,
- Slovakia: Technical Approval TO-09/0080, 2009: Systémy dodatočného zosilňovania konštrukcií Sika® CarboDur® a SikaWrap®.
- Poland: Technical Approval ITB AT-15-5604/2011: Zestaw wyrobów Sika® CarboDur® do wzmacniania i napraw konstrukcji betonowych
- 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
- France: CSTB - Avis Technique 3/16-875, Sika CarboDur, SikaWrap

- Fib, Technical Report, bulletin 14: Externally bonded FRP reinforcement for RC structures, July 2001.
- USA: ACI 440.2R-08, Guide for the Design and construction of Externally Bonded FRP Systems for strengthening concrete structures, July 2008.
- UK: Concrete Society Technical Report No. 55, Design guidance for strengthening concrete structures using fibre composite material, 2012.
- Switzerland: SIA 166:2004 Klebebewehrungen
- Italy: CNR-DT 200 R1/2013 - Guide for the Design and Construction of Externally Bonded FRP Systems for Strengthening Existing Structures

PRODUCT INFORMATION

Fibre Volume Content	> 68 %
Packaging	Cut to size as follows in non-returnable cardboard packaging. Supplied in rolls of 250 m in nonreturnable cardboard boxes.
Shelf Life	Unlimited, provided the storage conditions are met.
Storage Conditions	Store in original, unopened, sealed and undamaged packaging in dry conditions at temperatures of max. +50 °C. Protect from direct sunlight. Transportation: only in the original packaging, or otherwise adequately protected against any mechanical damage
Appearance / Colour	Carbon fibre reinforced polymer with an epoxy matrix, black.

Dimensions

Type Sika® CarboDur® S	Width	Thickness	Cross section area
512	50 mm	1.2 mm	60 mm²
514	50 mm	1.4 mm	70 mm²
614	60 mm	1.4 mm	84 mm²
626	60 mm	2.6 mm	156 mm²
812	80 mm	1.2 mm	96 mm²
814	80 mm	1.4 mm	112 mm²
914	90 mm	1.4 mm	126 mm²
1012	100 mm	1.2 mm	120 mm²
1014	100 mm	1.4 mm	140 mm²
1214	120 mm	1.4 mm	168 mm²
1512	150 mm	1.2 mm	180 mm²
1514	150 mm	1.4 mm	210 mm²

Select dimensions according to local Sika product range

TECHNICAL INFORMATION

Laminate Tensile Strength

Mean value	3 100 N/mm²	(EN 2561)
5 % fractile-value	2 900 N/mm²	
Mean value	3 100 N/mm²	(ASTM 3039)
5 % fractile-value	2 900 N/mm²	
Mean value	3 200 N/mm²	(EN ISO 527)
5 % fractile-value	2 800 N/mm²	

Values in the longitudinal direction of the fibres
Select relevant standards

Laminate Modulus of Elasticity in Tension

Mean value	170 000 N/mm²	(EN 2561)
5 % Fractile-value	165 000 N/mm²	
Mean value	165 000 N/mm²	(ASTM 3039)
Mean value	155 000 N/mm²	(EN ISO 527)

Values in the longitudinal direction of the fibres

	Select relevant standards		
Laminate Elongation at Break in Tension	Mean value Values in the longitudinal direction of the fibres	1.80 %	(EN 2561)
Glass Transition Temperature	>100 °C		(EN 61006)

SYSTEM INFORMATION

System Structure

The system build-up and configuration as described must be fully complied with and may not be changed.
Resin adhesive - Sikadur®-30 or Sikadur®-30 LP.
Structural strengthening Carbon plates – Sika® CarboDur® S.
For detailed information on Sikadur®-30 and Sikadur®-30 LP, together with the application details, please refer to the Sikadur®-30 or Sikadur®-30 LP Product Data Sheet and the "Method Statement Sika® CarboDur® Externally Bonded Reinforcement" Ref: 850 41 05

APPLICATION INFORMATION

Consumption

Width of Sika® CarboDur® S plate	Typical consumption of Sikadur®-30*
50 mm	0.20 – 0.28 kg/m
60 mm	0.24 – 0.32 kg/m
80 mm	0.32 – 0.44 kg/m
90 mm	0.40 – 0.56 kg/m
100 mm	0.44 – 0.64 kg/m
120 mm	0.45 – 0.80 kg/m
150 mm	0.68 – 1.00 kg/m

*Note: Consumption is for standard application only. Rough or uneven substrate surfaces, plate crossings, loss and wastage can lead to a higher adhesive consumption of up to 20 %.

BASIS OF PRODUCT DATA

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.

LIMITATIONS

Please refer to the relevant Product Data Sheet of Sikadur® epoxy adhesive:
- Sikadur®-30
- Sikadur®-30 LP

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.
Sika® CarboDur® strengthening systems with Sika® CarboDur® plates must be protected from permanent exposure to direct sunlight, moisture and/or water.
Please refer to the relevant Method Statement and Product Data Sheets for the selection of suitable over coating materials, in situations where systems will be fully or partially exposed.
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 also refer to the relevant Method Statements for further limitations and guidelines: - "Method Statement Sika CarboDur® Externally Bonded Reinforcement" Ref: 850 41 05
Contact Sika technical service for detailed advice.

ECOLOGY HEALTH AND SAFETY

REGULATION (EC) NO 1907/2006 - REACH

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)

APPLICATION INSTRUCTIONS

SUBSTRATE QUALITY

Sika® CarboDur® plates externally bonded to the concrete surface
Recommended minimum concrete pull-off strength after surface preparation:
- Mean: 2.0 N/mm²
- Minimum: 1.5 N/mm²

The effective concrete pull-off strength after surface preparation has to be verified.
If concrete pull-off strength is below the stated minimum requirements, alternative Sika solutions are available:
- CarboDur® applied in slots as near surface mounted (NSM) reinforcement
- SikaWrap® fabrics: Please refer to the Product Data Sheet for the SikaWrap® fabrics

Concrete must generally be older than 28 days (dependent on curing conditions and the type of concrete etc.)

Sika® CarboDur® externally bonded to other substrates
For application of CarboDur® plates to all other substrates (brick, stone, steel, wood, fibre reinforced polymer etc.) please refer to the "Method Statement for Sika® CarboDur® Externally Bonded Reinforcement" Ref: 850 41 05. Contact Sika technical service for detailed advice.

SUBSTRATE PREPARATION

Concrete must be cleaned and prepared to achieve a laitance and contaminant free, open textured surface. Please also refer to the "Method Statement Sika® CarboDur® Externally Bonded Reinforcement" Ref: 850 41 05.

APPLICATION METHOD / TOOLS

Please refer to the relevant Product Data Sheet:
- Sikadur®-30
- Sikadur®-30 LP

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.

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. It may be necessary to adapt the above disclaimer to specific local laws and regulations. Any changes to this disclaimer may only be implemented with permission of Sika® Corporate Legal in Baar.

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