

**Product Data Sheet**

Version Nos.: 12/12 (replaces 02/12)

Only to be applied by a Sika Approved Contractor

This product is not held in stock and is only available on indent.

In the majority of cases Sika® CarboDur® S will provide a more economical solution.

# Sika® CarboDur® M

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

**Position 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® 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

**Advantages**

- Combination of very high strength and high stiffness
- Non corroding
- 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

# Construction



## Tests Approval / Standards

Germany: Deutsches Institut für Bautechnik Z-36.12-80, 2010: General Construction Authorisation for Sika® CarboDur®.

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

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

Slovenia: ZAG, Technical Approval No. S418/99-620-2, za uporabo nacina ojacitev armirano betonskih in prednapetih elementov konstrukcij z dolepljenjem lamel iz karbonskih vlaken "Sika® CarboDur®" v Republiki Slononiji (Slovenian).

Slovakia: TSUS, Building Testing and research institutes, Technical approval No. 5502A/02/0633/0/004, 2003: Systém dodatocného zosilnovania zelezobetonovych a drevenych konstrukcil Sika CarboDur® (Slovak).

Poland: Instytut badawczy drog i mostow, technical approval No. AT/2003-04-0336, System materialow Sika® CarboDur® do wzmacniania konstrukcji obiektow 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, 2000 (UK).

Switzerland: SIA 166, Klebebewehrungen, 2003 /2004 (CH).

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

## Product Data

### 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 100m in nonreturnable cardboard boxes.

### Types (Steel equivalent)

Type	Width	Thickness	Cross sectional area
Sika® CarboDur® M514	50mm	1.4mm	70mm <sup>2</sup>
Sika® CarboDur® M614	60mm	1.4mm	84mm <sup>2</sup>
Sika® CarboDur® M914	90mm	1.4mm	126mm <sup>2</sup>
Sika® CarboDur® M1014	100mm	1.4mm	140mm <sup>2</sup>
Sika® CarboDur® M1214	120mm	1.4mm	168mm <sup>2</sup>

Select dimensions according to your local Sika product range and plate supplier

### Storage & 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

1.60g/cm<sup>3</sup>

### 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	210,000 N/mm <sup>2</sup>
Minimum Value	> 200,000 N/mm <sup>2</sup>
5% Fractile-Value	210,000 N/mm <sup>2</sup>
95% Fractile-Value	230,000 N/mm <sup>2</sup>



<b>Tensile Strength</b>	Values in longitudinal direction of fibres (according to EN 2561)	
	Mean Value	3,200 N/mm <sup>2</sup>
	Minimum Value	> 2,900 N/mm <sup>2</sup>
	5% Fractile-Value	3,000 N/mm <sup>2</sup>
	95% Fractile-Value	3,900 N/mm <sup>2</sup>
<b>Strain at break</b>	Value in longitudinal direction of fibres (according to EN 2561)	
	Minimum value	> 1.35%

## System Information

<b>System Structure</b>	<p>The system build-up and configuration as described must be fully complied with and may not be changed.</p> <p>Resin Adhesive - Sikadur<sup>®</sup>-30 or Sikadur<sup>®</sup>-30 LP.</p> <p>Structural strengthening Carbon plates – CarboDur M.</p> <p>For detailed information on Sikadur<sup>®</sup>-30 and Sikadur<sup>®</sup>-30 LP, together with the application details, please refer to the Sikadur<sup>®</sup>-30 or Sikadur<sup>®</sup>-30 LP Product Data Sheet and the “Method Statement Sika<sup>®</sup> CarboDur<sup>®</sup> Externally Bonded Reinforcement” Ref: 850 41 05.</p>
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## Application Details

<b>Consumption</b>	Width of CarboDur <sup>®</sup> plate	Typical Consumption of Sikadur <sup>®</sup> 30
	50mm	0.25 – 0.35kg/m
	60mm	0.30 – 0.40kg/m
	90mm	0.50 – 0.70kg/m
	100mm	0.55 – 0.80kg/m
	120mm	0.65 – 1.00kg/m

<b>Substrate Quality</b>	<p><i>Sika<sup>®</sup> CarboDur<sup>®</sup> plates externally bonded to the concrete surface:</i></p> <p>Recommended minimum concrete pull-off strength after surface preparation</p> <ul style="list-style-type: none"> <li>- Mean: 2.0 N/mm<sup>2</sup></li> <li>- Minimum: 1.5 N/mm<sup>2</sup></li> </ul> <p>The effective concrete pull-off strength after surface preparation has to be verified.</p> <p>When the concrete pull-off strength is below the stated minimum requirements, alternative Sika<sup>®</sup> solutions are available:</p> <ul style="list-style-type: none"> <li>- CarboDur<sup>®</sup> applied in slots as near surface mounted (NSM) reinforcement</li> <li>- SikaWrap<sup>®</sup> fabrics: Please refer to the Product Data Sheet for the SikaWrap<sup>®</sup> fabrics.</li> </ul> <p>Concrete must generally be older than 28 days (dependent on curing conditions and the type of concrete etc.)</p> <p><i>Sika<sup>®</sup> CarboDur<sup>®</sup> externally bonded to other substrates:</i></p> <p>For application of Sika<sup>®</sup> CarboDur<sup>®</sup> plates to all other substrates (brick, stone, steel, wood, fibre reinforced polymer etc.) please refer to the “Method Statement for Sika<sup>®</sup> CarboDur<sup>®</sup> Externally Bonded Reinforcement”.</p>
<b>Substrate Preparation</b>	<p>Concrete must be cleaned and prepared to achieve a laitance and contaminant free, open textured surface.</p> <p>Please also refer to the “Method Statement Sika<sup>®</sup> CarboDur<sup>®</sup> Externally Bonded Reinforcement” Ref: 850 41 05.</p>

## Application Conditions

<b>Application Conditions / Limitations</b>	<p>Please refer to the relevant Sika<sup>®</sup> epoxy adhesive Product Data Sheet:</p> <ul style="list-style-type: none"> <li>- Sikadur<sup>®</sup>-30</li> <li>- Sikadur<sup>®</sup>-30 LP</li> </ul>
<b>Application Method / Tools</b>	<p>Please refer to the relevant Product Data Sheet</p> <ul style="list-style-type: none"> <li>- Sikadur<sup>®</sup>-30</li> <li>- Sikadur<sup>®</sup>-30 LP</li> </ul> <p>Please refer to the “Method Statement Sika<sup>®</sup> CarboDur<sup>®</sup> Externally Bonded Reinforcement”.</p>



## 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.**

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 overcoating 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 refer to the Sika® CarboHeater Product Data Sheet for further information.

Please also refer to the relevant Method Statements for further limitations and guidelines:

- "Method Statement Sika® CarboDur® Externally Bonded Reinforcement"  
Ref: 850 41 05.

Consult your Sika Technical Sales Representative for further assistance if required.

## Fire Protection

Where required for local regulations, Sika CarboDur® plates can also be overcoated with additional fire protection materials.

## Notes

All technical data stated in this Product Data Sheet are based on 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

### Protective Measures

- To avoid allergic reactions, we recommend the use of protective gloves. Change soiled work clothes and wash hands before breaks and after finishing work.
- Local regulations as well as health and safety advice on packaging labels must be observed.
- For further information refer to the Sika Material Safety Data Sheet which is available on [www.sika.co.nz](http://www.sika.co.nz), or on request.
- If in doubt always follow the directions given on the pack or label.

## 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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