Technický a skúšobný ústav stavebný, n. o.
Building Testing and Research Institute
Studená 3
821 04 Bratislava
Slovak Republic
Phone: +421 2 49228101
E-mail: sternova@tsus.sk
Website: www.tsus.sk

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General Part

Technical Assessment Body issuing the ETA and designated according to Article 29 of the Regulation (EU) No 305/2011:	**Technický a skúšobný ústav stavebný, n. o.**
Trade name of the construction product	Composite GFRP bar reinforcement TopBAR
Product family to which the construction product belongs	Product area code: 26 PRODUCTS RELATED TO CONCRETE, MORTAR AND GROUT
Manufacturer	Composite Group s. r. o. Panenská 5 811 03 Bratislava – mestská časť Staré Mesto Slovak Republic https://composite-group.com/
Manufacturing plant	Composite Group s. r. o. Priemyselná 8 924 01 Galanta Slovak Republic
This European Technical Assessment contains	10 pages including 1 annex which form an integral part of this assessment
This European Technical Assessment is issued in accordance with regulation (EU) No 305/2011, on the basis of	EAD 260023-00-0301 Carbon, glass, basalt and aramid fibre reinforced polymer bars as reinforcement of structural elements
This version replaces	—

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Specific part

1 Technical description of the product

1.1 General

Composite GFRP bar reinforcement TopBAR is a glass fiber reinforced polymer bar made of strands of glass fibers that are impregnated with a thermoset polymer resin. The bars are profiled on the outside with reinforcing rib (winding) to improve cohesion with concrete. TopBAR is produced in diameters of 6 mm, 8 mm, 12 mm and 16 mm and with no limitations of length. Description of product is more detailed in Annex 1.

2 Specification of the intended use(s) in accordance with the applicable European Assessment Document (hereinafter EAD)

2.1 Intended use

Composite GFRP bar reinforcement TopBAR is used to reinforce load and non-load bearing elements of monolithic and precast concrete structures. It is used primarily in those parts of buildings that are exposed to an increased risk of corrosion, in structures with requirements for protection against electromagnetic influences, and in structures in which cutting of the reinforced structure is considered.

Composite GFRP bar reinforcement TopBAR is intended to be used as reinforcement of construction works and elements made of reinforced concrete (beams, columns, panels, slabs and other structural elements). Bars are use in parts of concrete structures in which is full bond between reinforcement bar and concrete at whole length of a bar.

The provisions made in this European Technical Assessment are based on the assumed working life of 100 years, provided that the product is subject to appropriate installation, use and maintenance. These provisions are based upon the current state of the art and the available knowledge and experience. The assumed working life of a system cannot be taken as a guarantee given by the producer, but is to be used as a mean for selecting the appropriate product in relation to the expected economically reasonable working life of the works. Assumed intended working life means that it is expected that, when the working life has elapsed, the real working life may be, under normal use conditions, considerably longer without major degradation affecting the Basic requirements for construction works.

2.2 Manufacturing

The European Technical Assessment is issued for the glass fiber reinforced polymer bar basis of agreed data/information, deposited with the Technical Assessment Body "Building Testing and Research Institute", which identified the kit that has been assessed and judged. Changes to product or production process, which could result in this deposited data/information being incorrect, shall be notified to the Technical Assessment Body "Building Testing and Research Institute" before the changes are introduced. The Technical Assessment Body "Building Testing and Research Institute" will decide whether or not such changes affect the ETA and consequently the validity of the CE marking on the basis of the ETA and if so whether further assessment or alternations to the ETA, shall be necessary.

2.3 Design and installation

The information about installation and design is provided with the technical documentation from the manufacturer and it is assumed that the product will be installed according to it and in absence of such instructions according to the usual practice of building professionals.

2.4 Usage, maintenance and repair

The information on use, maintenance and repair is given in the manufacturer´s technical documentation. It is responsibility of the manufacturer(s) to ensure that these provisions are easily accessible to the concerned people.

3 Performance of the product and reference to the methods used for its assessment

3.1 Cross-sectional properties

The cross-sectional properties have been determined according to the test method specified in EAD 260023-00-0301, clause 2.2.1. The average value and coefficient of variation of the effective cross-sectional area A_{eff} (mm²) and the corresponding effective diameter d_{eff} (mm) are presented in Table 1.

Table 1 – Cross-sectional properties

Cross-sectional properties		Ø6	Ø8	Ø12	Ø16
effective diameter d_{eff} (mm)	average	6,20	8,21	12,09	16,31
	coefficient of variation	0,9%	0,4%	0,6%	0,2%
effective cross-sectional area A_{eff} (mm²)	average	29,94	52,84	115,35	208,79
	coefficient of variation	1,7%	1,0%	1,4%	0,3%

3.2 Tensile strength

The tensile strength, has been determined according to the test method specified in EAD 260023-00-0301, clause 2.2.2. The average value (arithmetic mean) f_{ft0} and characteristic value f_{ftk0} of the tensile strength f_{ft} (MPa) are presented in Table 2.

Table 2 – Tensile strength

Tensile strength f_{ft} (MPa)		Ø6	Ø8	Ø12	Ø16
average value	f_{ft0}	1218,9	1165,0	1113,6	940,3
characteristic value	f_{ft0k}	**1103**	**1104**	**1056**	**884**
type of failure		rupture of vicinity and breaking rod near anchor area			

3.3 Tensile modulus of elasticity

The tensile modulus of elasticity, has been determined according to the test method specified in EAD 260023-00-0301, clause 2.2.2. The average value of the tensile modulus of elasticity E_f (GPa) is presented in Table 3.

Table 3 – Tensile modulus of elasticity

Tensile modulus of elasticity E_f (GPa)	Ø6	Ø8	Ø12	Ø16
average value E_f	51,4	52,4	51,9	52,4

3.4 Tensile failure strain

The tensile failure strain, has been determined according to the test method specified in EAD 260023-00-0301, clause 2.2.2. The average (ε_{ft0}) and characteristic value ε_{ftk0} of the tensile failure strain ε_{ft} (mm/mm) are presented in Table 4.

Table 4 – Tensile failure strain

Tensile failure strain ε_{ft} (mm/mm)	Ø6	Ø8	Ø12	Ø16
average value ε_{ft0}	0,022	0,022	0,021	0,021
characteristic value ε_{ft0k}	**0,020**	**0,021**	**0,019**	**0,019**

3.5 Compressive strength

The compressive strength, has been determined according to the test method specified in EAD 260023-00-0301, clause 2.2.3. The average value (arithmetic mean), characteristic value of the compressive strength f_c (MPa) and type of failure are presented in Table 5.

Table 5 – Compressive strength

Compressive strength f_c (MPa)	Ø6	Ø8	Ø12	Ø16
average value	320,3	513,1	478,6	402,5
characteristic value	**279,1**	**454,8**	**431,1**	**360,6**
type of failure	delamination			

3.6 Compressive modulus

The compressive modulus, has been determined according to the test method specified in EAD 260023-00-0301, clause 2.2.3. The average compressive modulus of elasticity E_c (GPa) is presented in Table 6.

Table 6 – Compressive modulus

Compressive modulus E_c (GPa)	Ø6	Ø8	Ø12	Ø16
average value	45,3	47,8	44,0	48,9

3.7 Bond strength in concrete by pull-out testing

The bond strength in concrete at temperature 20°C has been determined by pull-out testing according to the test method specified in EAD 260023-00-0301, clause 2.2.4. The average value (arithmetic mean) and characteristic value of the centric bond strength τ_b (MPa) and the compressive strength of the substrate, without exposure to alkali are presented in Table 7.

Table 7 – Bond strength in concrete

Bond strength in concrete by pull-out testing τ_b (MPa)	C20/25			C50/60
	Ø6	Ø12	Ø16	Ø16
average value	25,3	13,0	10,2	19,3
characteristic value	**18,8**	**11,5**	**9,4**	**17,3**
average substrate compressive strength in MPa	29,2	29,0	28,9	60,8
type of failure	pull-out			

The centric bond strength τ_b (MPa) after exposure to alkali: No performance assessed
The reduction in bond strength R_{cb} (%) from centric tests to eccentric tests: No performance assessed

3.8 Transverse shear strength

The transverse shear strength, has been determined according to the test method specified in EAD 260023-00-0301, clause 2.2.5. The average value (arithmetic mean) and characteristic value of the transverse shear strength τ_s (MPa) are presented in Table 8.

Table 8 – Transverse shear strength

Transverse shear strength $_s$ (MPa)	Ø6	Ø8	Ø12	Ø16
average value	223,8	186,7	174,8	157,1
characteristic value	**196,8**	**165,5**	**161,7**	**146,1**
type of failure	shear at both surfaces			

3.9 Interlaminar shear strength

The interlaminar shear strength, has been determined according to the test method specified in EAD 260023-00-0301, clause 2.2.6 at span to diameter ratio 3:1. The average value (arithmetic mean) and characteristic value of the interlaminar shear strength τ_i (MPa) are presented in Table 9.

Table 9 – Interlaminar shear strength

Interlaminar shear strength τ_i (MPa)	Ø6	Ø8	Ø12	Ø16
average value	45,8	46,0	47,9	47,5
characteristic value	**43,1**	**42,8**	**44,7**	**45,3**
type of failure	Interlaminar (horizontal) shear			

3.10 Tensile fatigue

No performance assessed

3.11 Creep failure

No performance assessed

3.12 Coefficient of longitudinal thermal expansion

The coefficient of longitudinal thermal expansion, has been determined according to the test method specified in EAD 260023-00-0301, clause 2.2.9. The average coefficient of longitudinal thermal expansion, $\alpha_{sp,L}$ ($°C^{-1}$) is presented in Table 10.

Table 10 – Coefficient of longitudinal thermal expansion

Coefficient of longitudinal thermal expansion $\alpha_{sp,L}$ (C^{-1})	Ø6	Ø12	Ø16
average value	5,4 E^{-06}	5,3 E^{-06}	4,8 E^{-06}

3.13 Coefficient of transverse thermal expansion

The coefficient of transverse thermal expansion, has been determined according to the test method specified in EAD 260023-00-0301, clause 2.2.10.

Coefficient of transverse thermal expansion is presented in Table 11.

Table 11 – Coefficient of transverse thermal expansion

Coefficient of transverse thermal expansion $\alpha_{sp,T}$ (C^{-1})	Ø6	Ø12	Ø16
average value	1,59 E^{-05}	1,57 E^{-05}	1,77 E^{-05}

3.14 Glass transition temperature

The glass transition temperature, has been determined according to the test method specified in EAD 260023-00-0301, clause 2.2.11. The minimum values of the glass transition temperature is obtained in the two heating cycles at standard conditions ($T_{g,I}^{S}$ and $T_{g,II}^{S}$ (°C)) and after conditioning ($T_{g,I}^{C}$ and $T_{g,II}^{C}$ (°C)), and the cure ratio (difference between min $T_{g,I}^{S}$ at standard conditions and min $T_{g,I}^{C}$ after conditioning) [°C] are presented in Table 12.

Table 12 – Glass transition temperature

Glass transition temperature T_g (°C)	Ø16			
Glass transition temperature, first cycle	$T_{g,I}^{S}$	89,6	$T_{g,I}^{C}$	93,9
Glass transition temperature, second cycle	$T_{g,II}^{S}$	106,3	$T_{g,II}^{C}$	109,7
Cure ratio $T_{g,I}^{S}$ - $T_{g,I}^{C}$	4,3			

3.15 Long-term relaxation

No performance assessed

3.16 Maximum service temperature

The maximum service temperature, has been determined according to the experimental test method specified in EAD 260023-00-0301, clause 2.2.13. The lower value of the maximum service temperature T_{max} (°C) is presented in Table 13.

Table 13 – Maximum service temperature

Maximum service temperature T_{max} (°C)	Ø6	Ø12	Ø16
lower value	65,2	67,8	68,6

3.17 Bond strength in concrete at maximum service temperature

The bond strength in concrete at maximum service temperature 80°C, has been determined according to the test method specified in EAD 260023-00-0301, clause 2.2.14. The characteristic value, average value (arithmetic mean) of the bond strength τ_{Tmax} (MPa) together with the compressive strength of the substrate and percentage of retained bond strength τ_{ret} (%) are presented in Table 14.

Table 14 – Bond strength in concrete at maximum service temperature

Bond strength in concrete at maximum service temperature τ_{max} (C20/25) (MPa)	Ø6	Ø12	Ø16
average value	17,2	11,4	8,5
characteristic value	**15,3**	**9,9**	**7,1**
retained bond strength	81,4%	86,1%	75,5%
type of failure	pull-out		
average substrate compressive strength in MPa	29,2	29,0	28,9

3.18 Strength of FRP bent bars

No performance assessed

3.19 Reaction to fire

No performance assessed

3.20 Alkali resistance

The alkali resistance, has been determined according to the test method specified in EAD 260023-00-0301, clause 2.2.16. Alkalic solution consisted from demineralized water mixed with 8,0 g of KOH and 22,4 g of NaOH. Resulting pH was > 13,0. The rate of percentage mass loss $R_{\Delta m}$ (%) is presented in Table 15.

Table 15 – Rate of percentage mass loss

Rate of percentage mass loss $R_{\Delta m}$ (%)	Ø6	Ø12	Ø16
average value	2,25	0,80	0,36
result of visual inspection	chalking of surface (loss of colour)		

The tensile retention capacity $R_{et,t}$ [%] for specimens with initial tensile strain 3000 με, at 1000 h and temperature of 60°C ±3°C is presented in Table 16.

Table 16 – Tensile retention rate

Tensile retention rate $R_{et,t}$ (%)	Ø6	Ø12	Ø16
average value	88	63	69

The tensile retention capacity $R_{et,t}$ (%)
for specimens of 3000 h at temperature of 60°C ±3°C: No performance assessed

The interlaminar $R_{et,i}$ (%) capacity retention: No performance assessed

4 Assessment and verification of constancy of performance (hereinafter AVCP) system applied, with reference to its legal base

According to the European Commission Decision 97/556/EC amended by the European Commission decision 2001/596/EC, the AVCP system (further described in Annex V to Regulation (EU) No. 305/2011) 1+ applies.

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

In order to help the Notified Body to make an evaluation of conformity, the Technical Assessment Body issuing the ETA shall supply the information detailed below. This information together with the requirements given in EC Guidance Paper B will generally form the basis on which the factory production control (FPC) is assessed by the Notified Body.

This information shall initially be prepared or collected by the Technical Assessment Body and shall be agreed with the manufacturer. The following gives guidance on the type of information required:

1) The ETA

Where confidentiality of information is required, this ETA makes reference to the manufacturer's technical documentation which contains such information.

2) Basic manufacturing process

The basic manufacturing process is described in sufficient detail to support the proposed FPC methods.

The different components TopBAR are generally manufactured using conventional techniques. Any critical process or treatment of the components which affects performance are highlighted in the manufacturer's documentation.

3) Product and materials specifications

The manufacturer's documentation includes:

- detailed drawings (possibly including manufacturing tolerances);
- incoming (raw) materials specifications and declarations;
- references to European and/or international standards;
- technical data sheets.

4) Control Plan (as a part of FPC)

The manufacturer and the "Technický a skúšobný ústav stavebný, n. o." have agreed a Control Plan which is deposited with the "Technický a skúšobný ústav stavebný, n. o." in documentation which accompanies the ETA. The Control Plan specifies the type and frequency of checks/tests conducted during production and on the final product. This includes the checks conducted during manufacture on properties that cannot be inspected at a later stage and for checks on the final product.

Where materials/components are not manufactured and tested by the supplier in accordance with agreed methods, then where appropriate they shall be subject to suitable checks/tests by the product manufacturer before acceptance.

In cases where the provisions of the European Technical Assessment and its Control Plan are no longer fulfilled, the Notified Body shall withdraw the certificate and inform Technický a skúšobný ústav stavebný, n. o. without delay.

Technický a skúšobný ústav stavebný, n. o.
Building Testing and Research Institute
Studená 3, 821 04 Bratislava, Slovak Republic

On behalf of the Technický a skúšobný ústav stavebný, n. o.
Bratislava, 20 November 2024

Prof. Ing. Zuzana Sternová, PhD.
Head of Technical Assessment Body

Annex 1
DESCRIPTION OF PRODUCT

Description of product	Ø6	Ø8	Ø12	Ø16
				
Density ρ (kg/m³) (average value)	2090	2050	2035	2020
Weight per meter g (g/m) (average value)	67	118	251	417
Winding distance w_t (mm) (average value)	16,3	16,2	16,5	15,9
Winding diameter w_d (g/m) (average value)	2,1	2,2	2,8	3,2
Content of reinforcing fiber in the rebar, v_f (%) (average value)	83	83	84	85
Effective diameter d_{eff} (mm) (average value)	6,20	8,21	12,09	16,31
Effective cross-sectional area A_{eff} (mm²) (average value)	29,94	52,84	115,35	208,79