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L 1018.3

Testing Laboratory No 1018.3
accredited by ČIA pursuant to ČSN EN ISO/IEC 17025:2018

TEST REPORT

No 060-057935

On test of tensile properties, alkali resistance, determination of nominal diameter

Manufacturer:	Composite Group s.r.o.
Address:	Panenská 5, 811 03 Bratislava, Slovakia
Identification No:	SK2121417892, 53577892
Plant address:	Composite Group s.r.o. Priemyselná 8, 924 01 Galanta, Slovakia
Test sample:	**Composite GFRP reinforcement - TopBAR**
Order No:	Z060240046

No. of pages of the test report incl. title page: 4 Pages of annexes: -

Prepared by:

Ing. Lubomír Opat
test technician - specialist

Approved by:

Ing Robert Lhotský
deputy head of the Testing Department

TECHNICKÝ A ZKUŠEBNÍ ÚSTAV STAVEBNÍ PRAHA, s.p. Akreditovaná zkušební laboratoř č. 1018.3 ZÚS Zkušebna Brno Centrální laboratoř

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stamp of the testing laboratory No 1018.3

Brno, on 23rd May 2024

Declaration: 1) The test results in this Report relate only to the tested article and they do not substitute any other documents.
2) The test report must be copied as a whole only otherwise a written consent of the testing laboratory is needed.
3) The laboratory is not responsible for the result if it could be influenced by the information provided by the customer (marked with * in the report).
4) This test report is issued in Czech and English. In the event of a dispute the Czech version shall prevail.

1. Sample data

Evidence Number: VZ060240086 - 6 mm
Sample: FRP bars made of glass fibres (wrapped) diameter 6 mm
Date of sample delivery: 28th February 2024, taken over by Ing. Marek Sopko
Bars before tests were prepared by pouring epoxy resin into the metal ends.
The test results apply to the sample as received.

2. Test methods

Identification of the test method		Title of the test method
ISO 10406-1 chap. 5	Fibre-reinforced polymer (FRP) reinforcement of concrete - Test methods - Part 1: FRP bars and grids Test method for cross-sectional properties	Determination of the nominal cross-sectional area
ISO 10406-1 chap. 6	Fibre-reinforced polymer (FRP) reinforcement of concrete - Test methods - Part 1: FRP bars and grids Test method for tensile properties	Determination of the tensile strength, modulus of elasticity, elongation
ISO 10406-1 chap. 11.	Fibre-reinforced polymer (FRP) reinforcement of concrete - Test methods - Part 1: FRP bars and grids Test method for alkali resistance	Determination of the alkali resistance

deviations or exclusions from the standard procedure or use of non-standardized methods: were not applied.

3. Test results

The tests were evaluated on: 23rd May2024
Place of testing: Laboratories of Testing Department Brno
The tests were performed by: Ing. Lubomír Opat

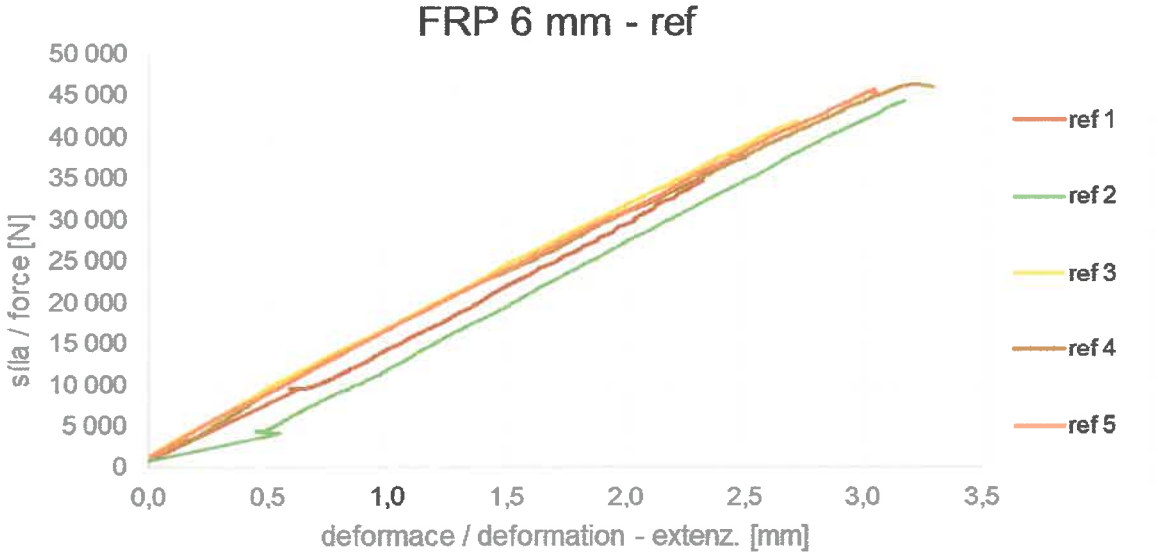
Measured data, test conditions and equipment used are listed in the Test Minutes. Apparatuses and measuring instruments that were used have been calibrated and verified pursuant to the valid plan of Testing Department Brno.

3.1 Determination of nominal diameter according to ISO 10406-1 chap. 5

Sample	Length [mm]	Volume [mm³]	Nom. diameter Ø [mm]	Cross-sec. area A [mm²]
I	99,56	3 400	6,59	34,15
II	99,28	3 400	6,60	34,25
III	100,46	3 400	6,56	33,84
Average	**99,77**	**3 400**	**6,59**	**34,10**

3.2 Determination of tensile strength according to ISO 10406-1 chap. 6.4.3

Sample No.	Maximum force F_u [N]	Tensile strength f_u [N/mm²]	Average tensile strength $f_{u\,m}$ [N/mm²]	Standard deviation [N/mm²]	Tensile strength - char. value $f_{u\,c}$ [N/mm²]
1 ref	40 587	1 190			
2 ref	45 959	1 348			
3 ref	41 910	1 229	**1 294**	70,0	**1 130**
4 ref	46 377	1 360			
5 ref	45 730	1 341			



Graph 1: expression of the dependence of the sample deformation on the load

3.2.1 Determination of elongation and tensile rigidity according to ISO 10406-1 chap. 6.4.4, 6.4.5.

The elongation is determined by calculation from the extensometer data, unless otherwise stated.
Tensile rigidity was determined by calculation from measured values from tensile strength tests.

Sample No.	Elongation [%]	Average elongation [%]	Tensile rigidity E_A [kN]	Average value of tensile rigidity $E_{A\,m}$ [kN]	Standard deviation S [kN]
1 ref	2,79 *		1 457		
2 ref	3,13 *		1 471		
3 ref	2,92	**3,07**	1 475	**1 473**	14,3
4 ref	3,37		1 462		
5 ref	3,16		1 498		

* - calc. according 6.4.5, formula (9)

3.2.2 Determination of Young's modulus of elasticity according to ISO 10406-1 chap. 6.4.4

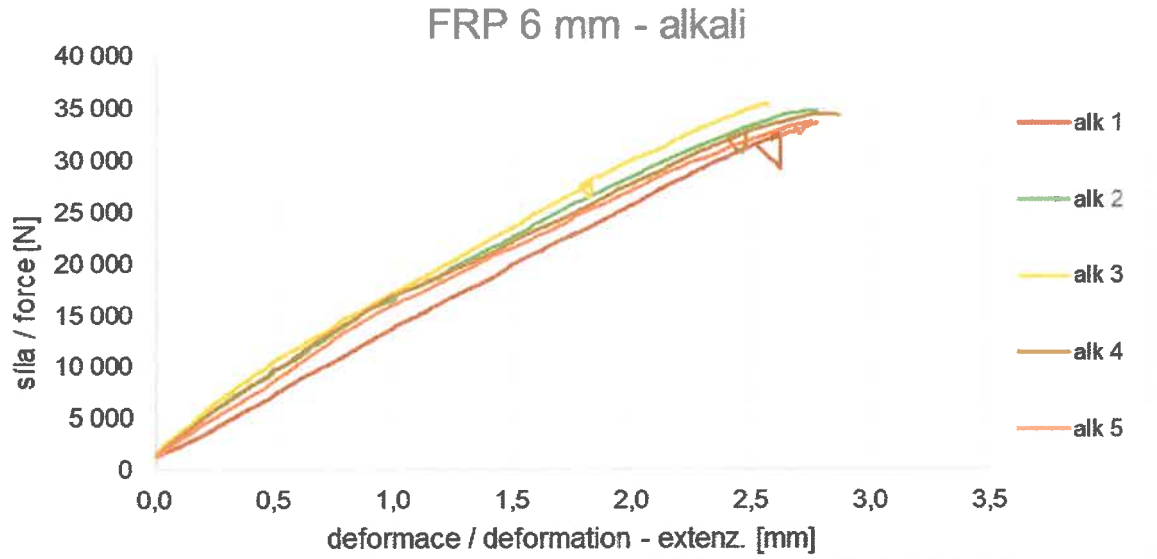
Modulus was determined by calculation from measured values from tensile strength tests.

Sample No.	Modulus of elasticity E [GPa]	Average value of the modulus of elasticity E_m [GPa]	Standard deviation S [GPa]
1 ref	42,7		
2 ref	43,1		
3 ref	43,3	**43,2**	0,41
4 ref	42,9		
5 ref	43,9		

3.3 Determination of alkali resistance according to ISO 10406-1 chap. 11

3.3.1 Determination of tensile strength according to ISO 10406-1 chap. 6.4.3

Sample No.	Maximum force F_u [N]	Tensile strength f_u [N/mm²]	Average tensile strength $f_{u\,m}$ [N/mm²]	Standard deviation [N/mm²]
1 alk	33 615	986		
2 alk	34 904	1 024		
3 alk	35 521	1 042	**1 011**	21,0
4 alk	34 553	1 013		
5 alk	33 759	990		



Graph 2: expression of the dependence of the sample deformation on the load after alkali cond.

3.3.2 Determination of elongation and tensile rigidity according to ISO 10406-1 chap. 6.4.4

The elongation is determined by calculation from the extensometer data, unless otherwise stated.
Tensile rigidity was determined by calculation from measured values from tensile strength tests.

Sample No.	Elongation [%]	Average elongation [%]	Tensile rigidity E_A [kN]	Average value of tensile rigidity $E_{A\,m}$ [kN]	Standard deviation S [kN]
1 alk	2,82		1 290		
2 alk	2,90		1 426		
3 alk	2,79	**2,87**	1 427	**1 395**	52,8
4 alk	3,01		1 411		
5 alk	2,82		1 422		

3.3.3 Determination of Young's modulus of elasticity according to ISO 10406-1 chap. 6.4.4

Modulus was determined by calculation from measured values from tensile strength tests.

Sample No.	Modulus of elasticity E [GPa]	Average value of the modulus of elasticity E_m [GPa]	Standard deviation S [GPa]
1 alk	37,8		
2 alk	41,8		
3 alk	41,8	**40,9**	1,56
4 alk	41,4		
5 alk	41,7		

END OF THE TEST REPORT