

PROtrough Cable Protection

Material & Product Properties

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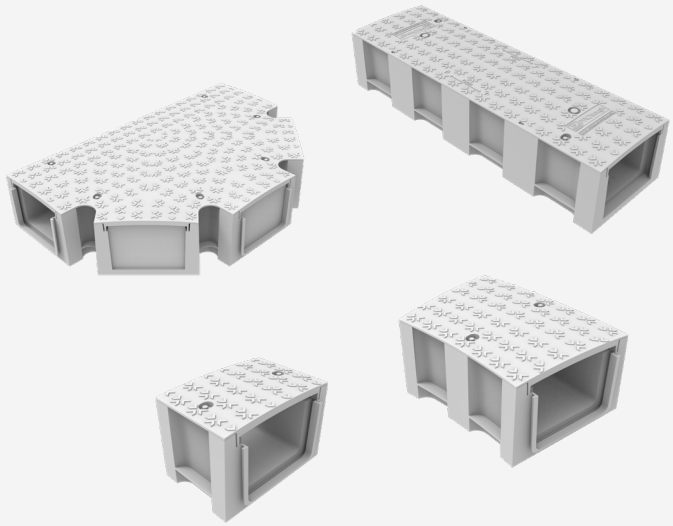
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BRIEF

The purpose of this document is to provide material and product performance properties for the GRP PROtrough system.

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1.1 GENERAL

General properties of the material used to manufacture PROtrough.

- GRP - (Glass Reinforced Polyester)
- Grey colour
- Classed as Non-Hazardous to the Environment (Halogen free)

1.2 MECHANICAL CHARACTERISTICS

Key mechanical properties of the GRP material used to manufacture PROtrough, from both in house tests and generically known values.

Characteristic	Test Method	Value
Elastic Modulus	ISO 527-4	11 GPa
Tensile Strength	ISO 527-4	70 MPa
Flexural Modulus	ISO 14125	9.5 GPa
Flexural Strength	ISO 14125	110 MPa
Impact Strength	ISO 179	50 KJ/m^2
Density	ISO 1183	1.75 g/cm^3

1.3 THERMAL CHARACTERISTICS

Relevant thermal properties of the GRP material used to manufacture PROtrough, from both material supplier tests and generically known values.

Characteristic	Test Method	Value
Heat Distortion Temperature	EN ISO 75-2	>200°C
Coefficient of Linear Thermal Expansion	ISO 11359-2	12 x 10-6 m/m.°C
Thermal Conductivity	EN12667	0.25 W/m deg C
Operating Range		-40 to 110°C

1.4 ELECTRICAL CHARACTERISTICS

Relevant electrical properties of the GRP material used to manufacture PROtrough, from both material supplier tests and generically known values .

Characteristic	Test Method	Value
Dielectric Strength	IEC 60243-1	12 Kv/mm
Dielectric Constant	ASTM D150 at 60 Hz	4.2 K
Dissipation Factor	ASTM D150 at 60 Hz	0.01
Volume Resistivity	IEC 60093	1E+12 Ohm/cm
Surface Resistivity	IEC 60093	1,00E+14 Ohm

1.5 FIRE BEHAVIOUR

Fire behavioural properties of the GRP material used to manufacture PROtrough, from both material supplier tests and independent third party tests.

GRP is a thermoset material and does not melt or form droplets. It is not sensitive to ambient operating temperatures and thus, not subject to heat distortion or thermal expansion.

Characteristic	Test Method	Value
Reaction to fire - single-flame source	ISO 11925-2 (surface @ 30 sec)	Pass @ 30 sec
Flammability fire test	UL 94	HB rating
Reaction to fire (*tested on the as moulded trough product)	DIN 53438-2	K1 rating*
Smoke test	NF F 16101&16102	Class F1 Classification
Limited Oxygen Index	EN ISO 4589-2	23%

1.6 UV STABILITY

UV tests conducted by the material supplier, on the GRP material used to manufacture PROtrough.

As moulded GRP sections were exposed to accelerated UV Exposure as per ISO 4892-3:2006 (Method A). The test consisted of a repetitive cycle of 4 hours of UV light (UVB-313 lamp) at 60°C followed by 4 hours condensation (UV light off) at 60°C for a total of 1000 hours. Flexural strength and Modulus was determined before and after exposure as per ISO 14125

Specimen	Average Change in Flexural Strength (%)	Flexual Modulus (%)
Unexposed Specimen		
Exposed Specimen @ 1000 hr	13	22

1.7 CHEMICAL RESISTANCE

Independent chemical resistance tests conducted by an independent third party, on the GRP material used to manufacture PROtrough.

Samples of GRP product (of the same material composition and a similar wall thickness) were exposed to each of the listed chemicals for 48 hours. Weight and shape changes were determined before and after exposure to the chemical reagents along with flexural modulus and strength.

Specimen	Average Weight Change (%)	Average Change in Flexural Strength (%)	Average Change in Flexural Modulus (%)
Herbicide (2%)	-0.14	-3.0	-1
Kerdane (0.1N)	0.02	-14.8	-4.1
Isooctane (0.1N)	-0.02	-11.1	0
Sodium Hydroxide (0.1N)	0.57	-10.6	0.1
Transformer Oil (Mineral Oil)	-0.02	-8.1	-5.1

1.8 OTHER PROPERTIES

Relevant properties for the GRP material used to manufacture PROtrough.

Characteristic	Test Method	Value
Water Absorption @ 24hrs	ISO 62	<0.5%

2.0 PRODUCT TESTS

2.1 VERTICAL LOAD TEST

Characteristic	Test Method	Value
Vertical Load	EN124 / EN 1433 (11.4 kN as per standard)*	Pass (A15)
Vertical Load (3 point bending)	Network Rail Test @ 9.6 kN	Pass (A15)

EN124 Test Document*

Note: In accordance with EN124, where the clear opening (CO) is less than 250 mm, the test load shall be multiplied by CO/250.

Test reports are available on request.





2.2 SIDE WALL TEST

Characteristic	Test Method	Value
Side Wall Compression Test	Network Rail Test @ 1.96 kN	Pass

Test reports are available on request.





2.3 COVER SLIP RESISTANCE

Characteristic	Test Method	Value
Cover Slip Resistance	Wet & Dry Tests	77 PTV (Dry) 61 PTV (Wet)

Test reports are available on request.





2.4 COVER HEAT RESISTANCE

Characteristic	Test Method	Value
Cover Heat Resistance	Hot brake shoe @ 650°C, 10mins (SNCF specification)	Pass (no loss of material or structural damage to the cover)

Test reports are available on request.

2.5 TEMPERATURE CYCLING

Characteristic	Test Method	Value
Temperature Cycling Resistance	3no. cycles between -20° & 55°	Pass (no splitting, fracture or distortion of product)

Test reports are available on request.