

NORDIC GEO SUPPORT

Basalt and Glass Fibre

REINFORCED CONCRETE SOLUTIONS



Reinforcement Solutions Page



Basalt Technologies	3
Glass Fibre Technologies	5
Bars and Mesh	7

NORDIC GEO SUPPORT offers Innovative solutions in concrete reinforcement fibres from ReforceTech with two composite technologies available. The environmentally Basalt FRP Composite MiniBars™ provides ideal support structural applications! MiniBars™ are also available in Alkali-resistant Glass.

Light! Flexible! Strong!.

Nordic Geo Support Solutions

<div style="border: 1px solid green; border-radius: 10px; padding: 5px; text-align: center; margin-bottom: 10px;">Drilling Consumables</div> <p>High Performance rock drilling tools and consumables:</p> <ul style="list-style-type: none"> ➢ DTH Hammers ➢ Bits ➢ Shanks ➢ Rods ➢ Drill Pipes ➢ Adapters ➢ Augers, Accessories 	<div style="border: 1px solid green; border-radius: 10px; padding: 5px; text-align: center; margin-bottom: 10px;">Injection Grouts</div> <p>Leading edge resin injection technology for demanding cases:</p> <ul style="list-style-type: none"> ➢ Water Stopping ➢ Sealing ➢ Ground Consolidation ➢ Ground Stabilisation ➢ Construction and structural repairs 	<div style="border: 1px solid green; border-radius: 10px; padding: 5px; text-align: center; margin-bottom: 10px;">Anchoring & Bolting Grouts</div> <p>Grouting technologies offering ease of use, clean and fast setting:</p> <ul style="list-style-type: none"> ➢ Capsules ➢ Cartridges ➢ Pumpable grouts ➢ Additives 	<div style="border: 1px solid green; border-radius: 10px; padding: 5px; text-align: center; margin-bottom: 10px;">Anchoring & Bolting</div> <p>A broad range of rock bolting and anchoring technologies:</p> <ul style="list-style-type: none"> ➢ Double and single coated protected steel ➢ Steel Self Drilling Anchors ➢ GFRP bolts of all types ➢ Standard bolts and meshes 	<div style="border: 1px solid green; border-radius: 10px; padding: 5px; text-align: center; margin-bottom: 10px;">Cement-Based Additives</div> <p>Cement based admixtures and additives:</p> <ul style="list-style-type: none"> ➢ Concrete Repair ➢ Admixtures ➢ Modifiers ➢ Waterproofing ➢ Joint Sealants
<div style="border: 1px solid green; border-radius: 10px; padding: 5px; text-align: center; margin-bottom: 10px;">Pumps & Accessories</div> <p>Cement and resin mixing and pumping technologies:</p> <ul style="list-style-type: none"> ➢ Cement Pumps ➢ Resin Pumps ➢ Transfer systems ➢ Dataloggers ➢ Hoses, lances, packers 	<div style="border: 1px solid green; border-radius: 10px; padding: 5px; text-align: center; margin-bottom: 10px;">Water control</div> <p>Waterproofing, drainage and pumping:</p> <ul style="list-style-type: none"> ➢ TunnelDrain innovative strip drainage system ➢ Drainage pipes ➢ Waterproofing grouts, additives and sealants ➢ A broad range of dewatering pumps 	<div style="border: 1px solid green; border-radius: 10px; padding: 5px; text-align: center; margin-bottom: 10px;">Ventilation</div> <p>Air quality, ventilation and safety solutions:</p> <ul style="list-style-type: none"> ➢ Ventilation bags and systems, including Mecanica's rigid ducts ➢ Fans & inline coolers ➢ Water atomisers 	<div style="border: 1px solid green; border-radius: 10px; padding: 5px; text-align: center; margin-bottom: 10px;">Re-usable Hangers</div> <p>Developed in the Nordics, fast, easy to use & reuse:</p> <ul style="list-style-type: none"> ➢ Services Hooks for ventilation systems, water and pneumatic lines, electrical cables and distribution boards ➢ Blasting hooks 	<div style="border: 1px solid green; border-radius: 10px; padding: 5px; text-align: center; margin-bottom: 10px;">Other products</div> <p>A range of other products:</p> <ul style="list-style-type: none"> ➢ Coatings & sealants ➢ Personal protective products ➢ Mining accessories

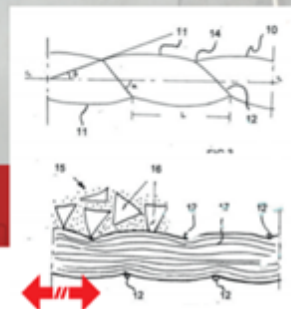
Warranty Statement

The information shown here inclusive of all drawings and tables is for informational purposes only. Details are subject to change; every effort has been made to ensure accuracy. The user shall ensure the appropriate guidelines and building codes are followed. ReforceTech and Nordic Geo Support no control over the use of their products and assumes no responsibility for the end products or uses of our materials.

Enabling innovation in concrete. Light! Ductile! Strong! Environmentally Friendly

Key MiniBar™ Properties

Fiber Reinforced Polymer (FRP) Composite MiniBars™ possess ideal properties for Pre-Reinforced Concrete.



Basalt Fibre Technologies for Structural Applications

Basalt MiniBars™ are made from Basalt rocks transformed into fibre and formed into a twisted shape with a specific gravity of 2.1, similar to that of concrete. Characteristics of ReforceTech's Basalt MiniBars™ include:

- ¼ the density of steel
- Enabling workable concrete
- Easily pumped
- No floating or sinking
- Class A1 according to Din Flammability testing
- Non-corrosive, non-conductive, non-magnetic

Basalt MiniBars™ have high tensile strength similar to that of steel with an elastic modulus similar to that of the concrete. The Basalt MiniBars™ also have a high fibre count per weight similar to that of synthetic fibres. These features allow for optimal reinforcement of concretes in light structural applications.

Flexural Tensile Strength

Basalt MiniBars™ mixed in concrete lead to a network of randomly placed fibres throughout the concrete. As the load is applied to the concrete the Basalt MiniBars™ act as crack control and distribute the load throughout the concrete. This action increases the Flexural Tensile Strength of the concrete, whilst increasing the Average Residual Strength of the concrete.

Basalt MiniBars have 4 strengthening mechanisms in concrete:

- 1) Length for friction resisting pull out
- 2) Rough Surface to increase friction
- 3) Helical form to utilize inter-fiber shear to resist pull out
- 4) Diameter

Results: Enhanced Fatigue and Creep Behaviours as well as shock resistance and ductility.

Properties and Specifications

	Metric	Imperial
Nominal Diameter	0.72mm	0.028 inches
Length	20 to 55mm	0.8 to 2.17 inches
Density	2.1 g/cc	0.071 ox/in ³
E Mod Min	44GPa	6380KSI
Minimum Tensile Strength	900MPa	131KSI

Basalt MiniBars come in boxes of:

Diameter	20mm	30mm	43mm	55mm
Box Weight	20Kg	15Kg	10Kg	8Kg
Count (MB)	62,000/Kg 28,000/lb	42,350/Kg 18,710/lb	28,850/Kg 13,000/lb	22,500/Kg 10,180/lb

*Also available in bags

Specification for MiniBars - MasterFormat® Section 03 24 00

Generic: Use macrofibers made from Basalt FRP rods with helical winding geometry and diameters in the range of 0.45mm to 0.70mm. FRP macrofibers should be fabricated with CBF (continuous basalt fiber) and vinyl ester resin with a minimum Heat Distortion Temperature of 115C (235F) and Modulus of Elasticity of 44 GPa (6380 ksi). The length of the fibres will be from 20mm to 60mm (0.80" to 2.40") with exact length to be determined by trial batch with guidance from the manufacturer. Dosage will be determined by trial batch using up to 63Kg/m³ or 130 lbs/cu.yd. based on the minimum ARS (average residual strength per ASTM C1399 or EN14651) and FTS (flexural tensile strength per ASTM C1609) established by the engineer-of-record. Dosing instructions are available on the ReforceTech website.

Specific: Use RFT-Basalt MiniBars by ReforceTech AS. Length of fibres and dosage to be determined by trial batch with guidance from the manufacturer based on the application requirements for ARS (ASTM C1399 or EN14651) and FTS (ASTM C1609) established by the engineer-of-record for the project.

Typical Applications

Shotcrete / Sprayed concrete
 Flooring Slab on Ground
 Screed
 Rafts (MiniBars give crack control in a hybrid design)
 Foundations
 Inner Walls precast and in-situ
 Façade Panels precast and in-situ
 Precast Sandwich Panels
 Edge Beams (Hybrid)
 Sea Walls and Weights
 Floating Pontoons



Certifications of Basalt MiniBars:

- DIBt (German National Approval) for Non Structural Applications
- Tested extensively at IBAC Aachen University Germany and NTNU in Norway
- Approved by Kontrollrådet

Independent testing by University of Akron, Aachen University, Norwegian University of Science and Technology, University of Florida.



Glass Fibre Technologies for Structural Support

AR Glass MiniBars are made from Owens Corning Cemfil Fibres formed into a unique helical twist shape with a specific gravity of 2.1, similar to that of concrete. Characteristics of ReforceTech's AR Glass MiniBars include:

- ¼ the density of steel
- Enabling workable concrete
- Easily pumped
- No floating or sinking
- Class A1 according to Din Flammability testing
- Non-corrosive, non-conductive, non-magnetic

The AR Glass MiniBars have high tensile strength similar to that of steel with an elastic modulus similar to that of the concrete. The Basalt Minibars also have a high fibre count per weight similar to that of synthetic fibres. These features allow for optimal reinforcement of concretes in non-structural applications.

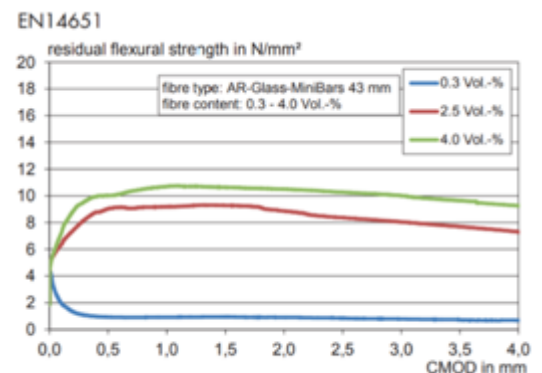
Flexural Tensile Strength

AR Glass MiniBars™ mixed in concrete lead to a network of randomly placed fibres throughout the concrete. As the load is applied to the concrete the AR Glass MiniBars™ act as crack control and distribute the load throughout the concrete. This action increases the Flexural Tensile Strength of the concrete, whilst increasing the Average Residual Strength of the concrete.

AR Glass MiniBars have 4 strengthening mechanisms in concrete:

- 1) Length for friction resisting pull out
- 2) Rough Surface to increase friction
- 3) Helix to utilize inter-fiber shear to resist pull out
- 4) Diameter

Results: Enhanced Fatigue and Creep Behaviours as well as shock resistance and ductility.



Typical residual flexural strength curves

Properties and Specifications

	Metric	Imperial
Nominal Diameter	0.72mm	0.028 inches
Length	20 to 55mm	0.8 to 2.17 inches
Density	2.1 g/cc	0.071 ox/in ³
E Mod Min	44GPa	6380KSI
Minimum Tensile Strength	900MPa	131KSI

AR Glass MiniBars come in boxes of:

Diameter	20mm	30mm	43mm	55mm
Box Weight	20Kg	15Kg	10Kg	8Kg
Count (MB)	62,000/Kg 28,000/lb	42,350/Kg 18,710/lb	28,850/Kg 13,000/lb	22,500/Kg 10,180/lb

*Also available in bags

Specification for MiniBars - MasterFormat® Section 03 24 00

Generic: Use macrofibers made from AR Glass FRP rods with helical winding geometry and diameters in the range of 0.45mm to 0.70mm. FRP macrofibers should be fabricated with ARG (alkali resistant glass) and vinyl ester resin with a minimum Heat Distortion Temperature of 115C (235F) and Modulus of Elasticity of 44 GPa (6380 ksi). The length of the fibres will be from 20mm to 60mm (0.80" to 2.40") with exact length to be determined by trial batch with guidance from the manufacturer. Dosage will be determined by trial batch using up to 63Kg/m³ or 130 lbs/cu.yd. based on the minimum ARS (average residual strength per ASTM C1399 or EN14651) and FTS (flexural tensile strength per ASTM C1609) established by the engineer-of-record. Dosing instructions are available on the ReforceTech website. Dosing Systems are also available from the manufacturer.

Specific: Use RFT- MiniBars by ReforceTech AS. Length of fibres and dosage to be determined by trial batch with guidance from the manufacturer based on the application requirements for ARS (ASTM C1399 or EN14651) and FTS (ASTM C1609) established by the engineer-of-record for the project.

Typical Applications

Flooring Slab on Ground
Screed
Rafts (MiniBars give crack control in a hybrid design)
Foundations
Inner Walls precast and in-situ
Façade Panels precast and in-situ
Precast Sandwich Panels
Edge Beams (Hybrid)
Sea Walls and Weights
Floating Pontoon
Shotcrete



Certifications of Basalt MiniBars:

- DIBt (German National Approval) for Non Structural Applications
- Tested extensively at IBAC Aachen University Germany and NTNU in Norway
- Approved by Kontrollrådet

Basalt Bars and Mesh

ENVIRONMENTAL PRODUCTS ENABLING INNOVATION IN CONCRETE STRUCTURES

Unique advantages in Basalt Fibre Technology:

- Zero Corrosion / Non-conductive / Non-magnetic
- Low weight (density 1/4 of steel) enables easy handling at manufacturing plant or construction site
- 33 to 48% less CO2 emission in final concrete structures due to material optimization
- Reduced concrete cover layer enables less concrete weight and lighter structures
- Solutions for pre and post-tensioning
- Labor saving techniques optimize total element costs through innovative geometries and construction kits
- Longer lifetime and lower life cycle costs

BasBar™

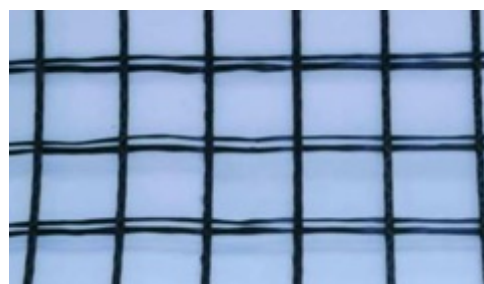
The Patented technology from, ReforceTech's BFRP BasBar™ is an engineered product with high integrity and alkali resistance designed to reinforce concrete structures. From melted volcanic Basalt stone, fibers are assembled into Basalt strands, which are then combined in ReforceTech's patented process to create unique and strong reinforcement bars. Det Norske Veritas (DNV) has carried out an extensive qualification test program of BFRP in concrete. This has resulted in a Certificate of Fitness and Design Guidelines and Code compliance for Norwegian Code 3472 Using ReforceTech's BFRP enabling properties and engineering approach, our customers realize cost effective and improved structural concrete applications.

Materials	Steel	Basalt Fibres	Basalt FRP
Tensile Strength (MPa)	500	2900	1100
E-Modulus GPa	210	88	44
Density (g/cc)			

Basalt Reinforcing Mesh

Basalt reinforcing mesh is designed for reinforcing road and highway overlays to prolong the pavement lifespan by reducing the effects of reflective cracking caused by traffic loading, age hardening and temperature cycling. Pavement life between maintenance can be prolonged significantly. Basalt reinforcing mesh makes it possible to reduce thickness of asphalt concrete pavement up to 20%.

	Open cell	Open cell, Strengthened
Window Size (mm)	30x30	25x25
Density, g/m ²	260+/- 10	330+/-33
Breaking load, W rap, kN/m	≤ 55	≤ 50
Breaking load, W eft, kN/m	≤ 55	≥ 100
Elongation warp, %	2.5 1/- 1.0	2.5 1/- 1.0
Elongation weft, %	2.5 1/- 1.0	2.5 1/- 1.0
Binder Content %	≥ 10	≥ 10
Width of the roll, cm	100, 200, 400	100,200,300, 400
Length of the roll, cm	1000	500



Compared to synthetic and polymer materials

- | | |
|---|--|
| <ul style="list-style-type: none"> ➤ Higher mechanical strength ➤ More resistive to chemicals ➤ High melting point 1450° - no loss of strength or distortion | <ul style="list-style-type: none"> ➤ Easy to use in hot and cool climates ➤ Lower elongation ➤ Easily milled or cut ➤ No stretching of materials |
|---|--|



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Web: www.nordicgeosupport.com