FiRep®

Fibre Reinforced Polymer

Durability for the future

Product Brochure

FiReP® Products Range

FiReP® POWERTHREAD

FiReP® SPINSET

FiReP® SPINMAX

FiReP® CABLEX

FiReP® POWERMESH

FiReP® THELOCK

FiReP® REBARD

FiReP® HIPREX

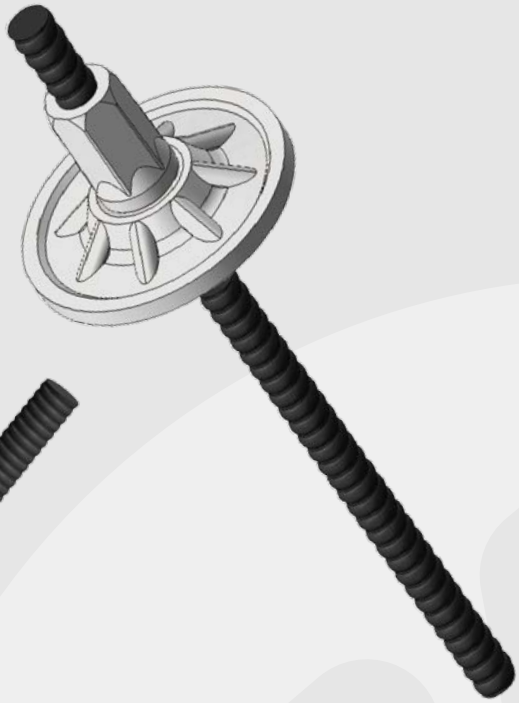
FiReP® DUARMAX

FiReP® SUNTHREAD

FiReP® Application Fields

FiReP® POWERTHREAD®

GFRP Rock Bolt



FiReP® POWERTHREAD® is a system of GFRP Rock Bolts and GFRP Injection Tubes with advanced strength and head load.
It was developed for strata support in mining and tunnelling as well as for slope and face stabilization.
Due to continuously threaded profiles the bolts and tubes can be trimmed if required.
The products have a high ultimate load and due to their profile they offer a maximum bondage with all grouting material.

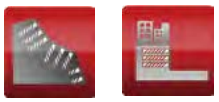
The cutting ability protects machinery and equipment and prevents damages to those while drifting and enlarging tunnels.

POWER NUT-DUO
Newly developed
"Super high end loading"

The bolts and tubes have a high corrosion resistance under acid conditions and are well suited for permanent support.
The improved flexibility of long tendons is well suited for application without couplings in confined locations.
Due to its high tensile strength the bolt has a high and immediate load bearing capacity if applied with fast setting resin capsules.
The low weight facilitates handling.

Mining

Civil Engineering

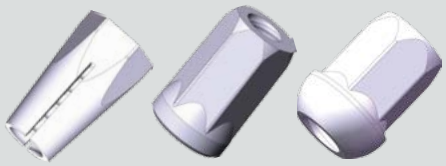
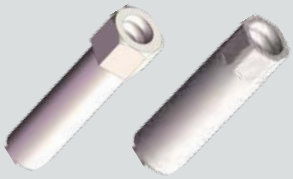
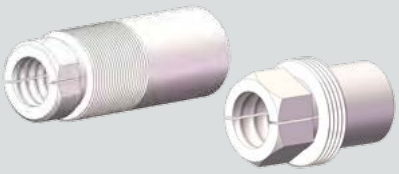


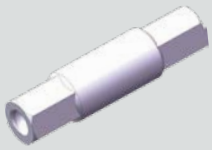
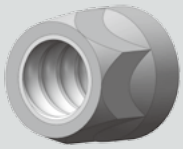
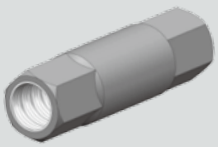
Tunnelling

ADVANTAGES

ACCESSORIES

For Powerthread® Rock Bolts different types of accessories can be used. FiReP offers nuts, plates as well as couplers.

GFRP Nut	Steel Nut	Steel Coupling	Power Nut-DUO
			

GFRP Plate	GFRP Coupling	Hybrid Nut	Hybrid Coupling
			

APPLICATIONS

- Permanent support
- Temporary application
- Cementious grout
- Injection of resin
- Resin capsules

TECHNICAL DATA (Polyester black & Polyester blue)

Product colour code

Antistatic Polyester Black | Polyester Blue | Epoxy Green * | Vinyl Ester Grey*

* Available upon request

			Solid Bolt					
Selection of Items		Unit	K60-22	K60-25	K60-27	K60-32	K60-38	K60-40
Outer diameter		mm	22	25	27	32	38	40
Tensile stress area		mm²	250	350	400	580	830	950
Ultimate load		kN	250	350	380	560	750	860
Ultimate strength		N/mm²	1,000	1,000	950	960	900	900
Tensile E-Modulus		N/mm²	50,000	50,000	50,000	50,000	50,000	50,000
Breaking Load Thread	GFRP Nut L=70mm	kN	60	70	70	90	–	–
	Steel Nut L=100mm	kN	100	180	200	–	–	–
	Steel Nut L=150mm	kN	–	–	–	320	360	380
	GFRP POWER Nut	kN	100	180	180	200	–	–
	Steel Duo Nut	kN	–	300	–	450	–	800
	Steel coupler L=200mm	kN	100	180	200	250	280	380*
Torsion resistance		Nm	70	120	130	230	–	–
Shear resistance 90°		N/mm²	460	460	460	420	420	420
Strain at failure		%	2.1	2.1	2.1	2.1	2.1	2.1
Weight		g/m	690	900	1,050	1,500	2,230	2,340

* UV protection type is available upon request *L=300mm

			Tubular Bolt		
Selection of Items		Unit	J64-25/12	J64-28/12	J64-32/12
Outer diameter		mm	25	28	32
Inner diameter		mm	12	12	12
Tensile stress area		mm²	250	350	470
Ultimate load		kN	220	320	420
Ultimate strength		N/mm²	880	900	890
Tensile E-Modulus		N/mm²	50,000	50,000	50,000
Breaking Load Thread	GFRP Nut L=70mm	kN	70	70	80
	Steel Nut L=100mm	kN	140	200	220
	GFRP POWER Nut	kN	120	180	–
Torsion resistance		Nm	80	120	–
Shear resistance 90°		N/mm²	300	350	350
Strain at failure		%	2.1	2.1	2.1
Weight		g/m	630	860	1,340

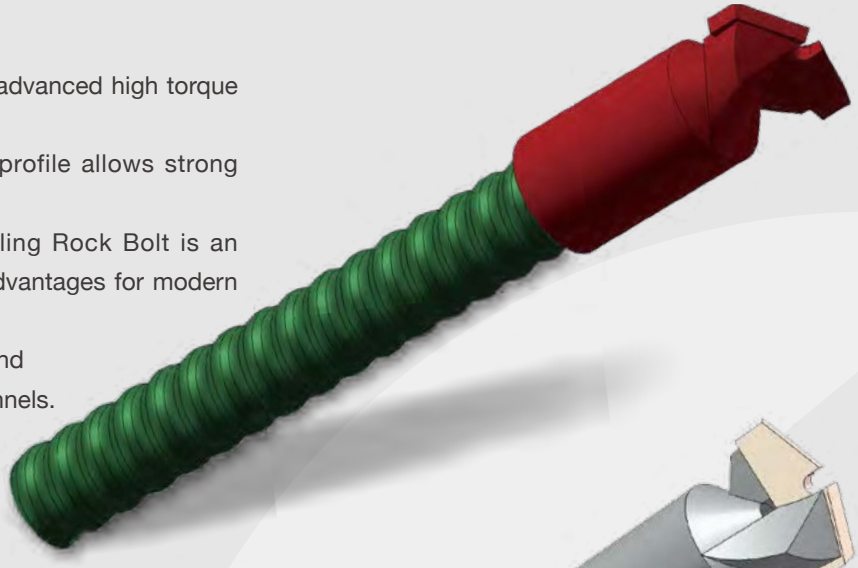
Patent No. (Hybrid Nut and Coupling)

AT-EP 2 035 715 / CH-EP 2 035 715 / CZ-EP 2 035 715 / DE-EP 2 035 715 / DK-EP 2 035 715 / ES-EP 2 035 715 / FR-EP 2 035 715 / GB-EP 2 035 715 / IT-EP 2 035 715 / NL-EP 2 035 715 PL-EP 2 035 715 / RO-EP 2 035 715 / SE-EP 2 035 715

FiReP® SPINMAX®

GFRP Self-Drilling Rock Bolt

FiReP® SPINMAX® is a Self-Drilling Rock Bolt with advanced high torque and pressure resistance.
The high load bearing capacity of the threaded profile allows strong jointing with drill bits, nuts and also couplers.
Due to it's cuttability SPINMAX® GFRP Self-Drilling Rock Bolt is an economical alternative and also offers enormous advantages for modern rapid heading methods in tunnelling.
Furthermore the cuttability protects the machinery and avoids obstructions while advancing or enlarging tunnels.



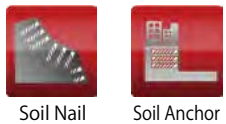
The bolt has a high radial pressure resistance for injections with resins or grout and is corrosion resistant for permanent support.

The SPINMAX® offers a high tensile strength and can carry high loads. Its low weight with high torsional strength makes the bolt well suited for works in loose rock up to a maximum hardness of 60 – 70 MPa.

Mining

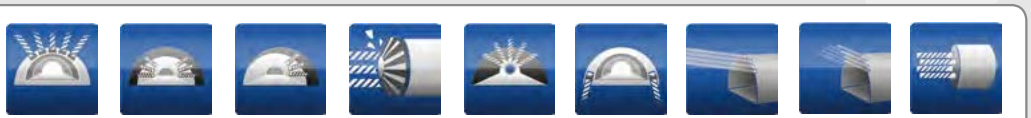
Roof-Bolts | Coal face support | Injection Work | Injection Work

Civil Engineering



Soil Nail | Soil Anchor

Tunnelling



Rockbolting | Enlargement | Enlargement | TBM face support | Pilot Tunnel | Leg Piling | Forepoling bolts | Roof-support | Face bolting

ADVANTAGES

High torque resistance | High end load | Easy handling | Flexibility

R32-R51
standard thread profile

APPLICATIONS

- Face stabilization
- Forepoling
- Slope stabilization
- Ground support in soft rock
- Systematic rock bolting
- Spiles

TECHNICAL DATA

Item		Unit	R32	R38	R51
Ultimate load		kN	365	500	680
Tensile stress area		mm²	365	500	680
Breaking load Thread	Steel Nut L=45mm	kN	120	-	-
	Steel Nut L=100mm	kN	-	320	-
	Coupling L=200mm	kN	250	320	-
Ultimate strength		N/mm²	1,000	1,000	1,000
Shear strength		N/mm²	360	360	360
Tensile E-Modulus		N/mm²	45,000	45,000	45,000
Strain at failure		%	2.1	2.1	2.1
Glass Fibre content		%	75	75	75
Torque resistance		Nm	300	420	700
Weight		g/m	950	1,350	1,960
Pitch		mm	12.7	12.7	12.7
Outer diameter		mm	32	38	51
Inside diameter		mm	15	20	33

Patent No.
AU-2007267379 / US-8,172,484 / AT-EP 2 027 366 / CH-EP 2 027 366 / DE-EP 2 027 366 / ES-EP 2 027 366 / FR-EP 2 027 366 / GB-EP 2 027 366 / IT-EP 2 027 366 / PL-EP 2 027 366

FiReP® SPINSET®

GFRP Setting System

FiReP® SPINSET® is a set, consisting of the SPIN BOLT, SPIN NUT and SPIN PLATE for an improved installation procedure especially in coal mines.
The purpose of this GFRP system is the accelerated and pre-tensioned installation of groups of bolts during systamic bolting for advanced strata support in mine galleries.

The application after drilling of bore hole continues with insertion of resin cartridges with different setting times and installation of bolts is easy to handle even for staff without skills. After insertion of bolts by spinning in a short break of 10 to 15 sec. follows before the spinning in procedure starts again for tightening the plate and tensioning the bolts by torsion of SPIN Nut.

The nut allows an initial torque for spinning in, afterwards free running for tensioning and at least a protection against overspun of bolt shaft.

The result is a safe, quick and very cost effective system and installation procedure.

Mining

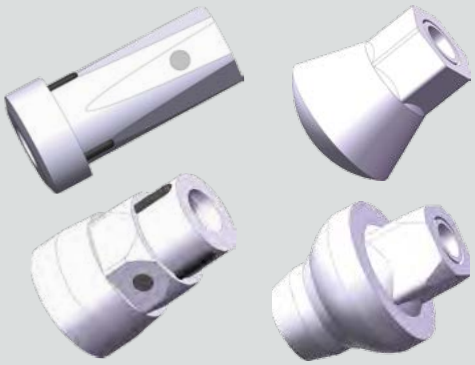
Roof-Bolts | Coal face support | Rib Support

ADVANTAGES

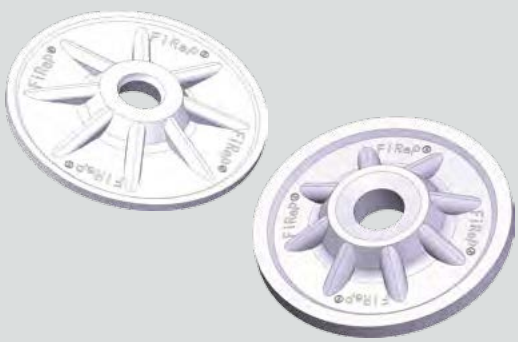
- High end load
- Easy handling
- High torque resistance
- Antistatic coating (optional)
- Anti-over spin function
- Continuous installation process
- Installation time saving

ACCESSORIES

GFRP SPIN Nut



GFRP SPIN Plate



FIREP SPINSET INSTALLATION

Insert fast polyester cartridges into the hole

Insert slow polyester cartridges into the hole

Assemble SPIN Nut / Plate on SPIN Bolt

Start mixing of polyester cartridges

Waiting for hardenning of fast resin

Final tensioning of SPINSET

TECHNICAL DATA

Out Dia. (mm)	Torque resistance (Nm)	
	SPIN Bolt	Standard FRP Rock Bolt
18	60	50
20	80	60
22	100	70
23	120	100
25	140	120

Plate Dia.	GFRP SPIN Plate Natural
mm	kN
140	> 100
200	> 100
250	> 100

Colour Code	GFRP SPIN Nut Torque resistance (Nm)		
	Torque Level	Shear Pin	Front Limiter Pin
	40	35-45	-
	60	45-65	60-70
	80	65-85	80-90
	100	85-105	100-110
	120	105-125	120-130
	140	125-145	140-150
	160	-	160-170

Patent No.
DE-10 2007 028 267.4 / AU-2008263816 / KZ-24453 / MX-306454 / RU-2484318 / UA-98331 / ZA-2010/0264 / CZ-EP 2 158 407 / DE-EP 2 158 407 / GB-EP 2 158 407 / PL-EP 2 158 407

FiReP® HIPPREX®

GFRP High Pressure Injection Bolt

FiReP® HIPPREX® is a GFRP Tube with integrated packer function for high pressure injection of weathered rock mass.
The high torque hollow bar is fitted with an expansion packer and integrated no return valve. Two additional valves are fitted to both ends of the tube, the top valve to open when the packer is inflated, the bottom valve to prevent backflow after injection.
The GFRP system allows cutting during heading or mining of resources.
Rapid heading will not be delayed. Light weight makes handling easy, even in confined underground conditions.

Mining

- Coal face support
- Injection Work
- Injection Work
- RIB Support

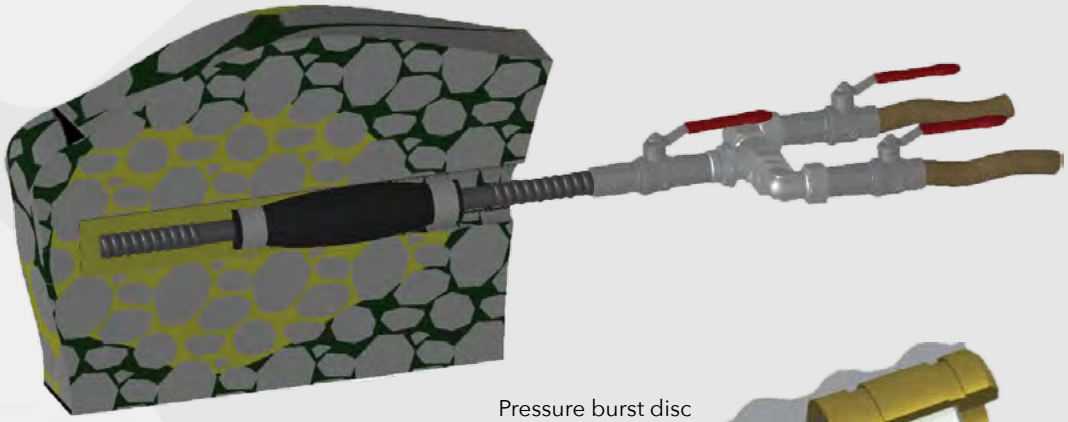
ADVANTAGES

- Super High pressure
- High end load
- Easy handling
- Flexibility
- Continuous thread

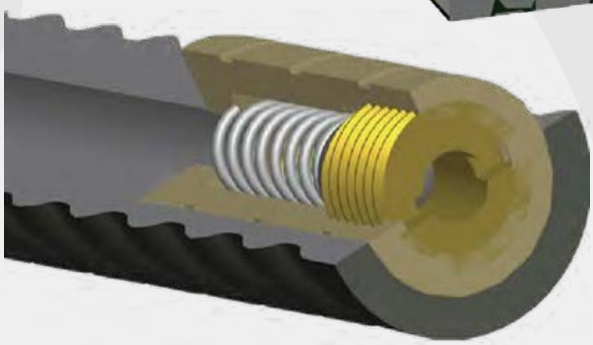
APPLICATIONS

- Stabilization of fractured rock and mineral
- Rapid heading
- Confined underground conditions
- Permanent application

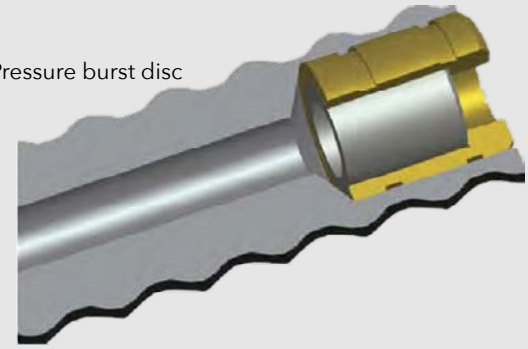
FIREP HIPREX INSTALLATION



Non return valve



Pressure burst disc



TECHNICAL DATA

Item		Unit	HIPREX 22/8	HIPREX 25/8	HIPREX 32/8
Outer diameter		mm	22	25	32
Inner diameter		mm	8	8	8
Tensile stress area		mm²	230	300	530
Ultimate load		kN	230	300	530
Breaking load Thread	Steel Nut L=100mm	kN	—	180	250
	GFRP Nut L=70mm	kN	60	70	90
Ultimate strength		N/mm²	1,000	1,000	1,000
Bending E-Modulus		N/mm²	40,000	40,000	40,000
Bending strength		N/mm²	560	560	560
Antistatic conductivity		Ω	10^8	10^8	10^8
Hydraulic pressure resistance		N/mm²	170	280	300
Strain at failure		%	2.1	2.1	2.1
Weight		g/m	580	780	1,400
Standard length		m	2.0/2.5	2.0 / 2.5	2.0/2.5

FiReP® CABLEX®

GFRP Injection Bolt

FiReP® CABLEX® is a GFRP Cable Bolt with high strength and high flexibility and durability in acid environment.
The bolt can be assembled easily, either at the factory or directly on job site, as there are no special tools or equipment required to do so.

Mining

Civil Engineering

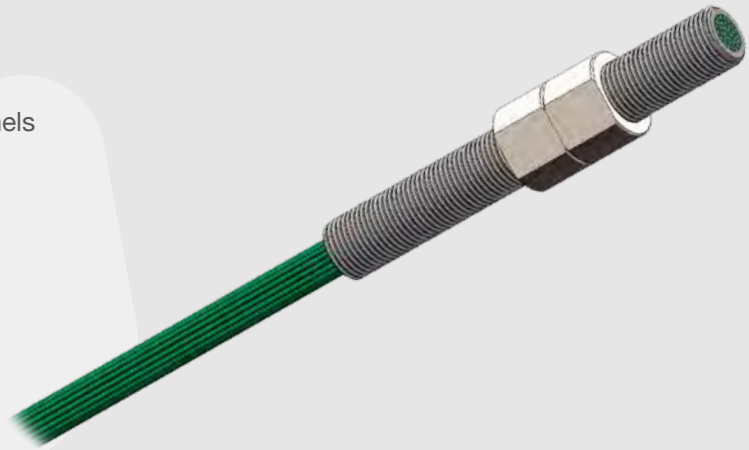
Tunnelling

ADVANTAGES

Flexibility Easy handling

APPLICATIONS

- Long bolting in tunnels
- Bolting set from parallel tunnels
- Face stabilization
- Slope protection



FiReP CABLEX INSTALLATION

1 Connect the rods into the clipper

2 Fix with cable binder

3 Insert injection tube

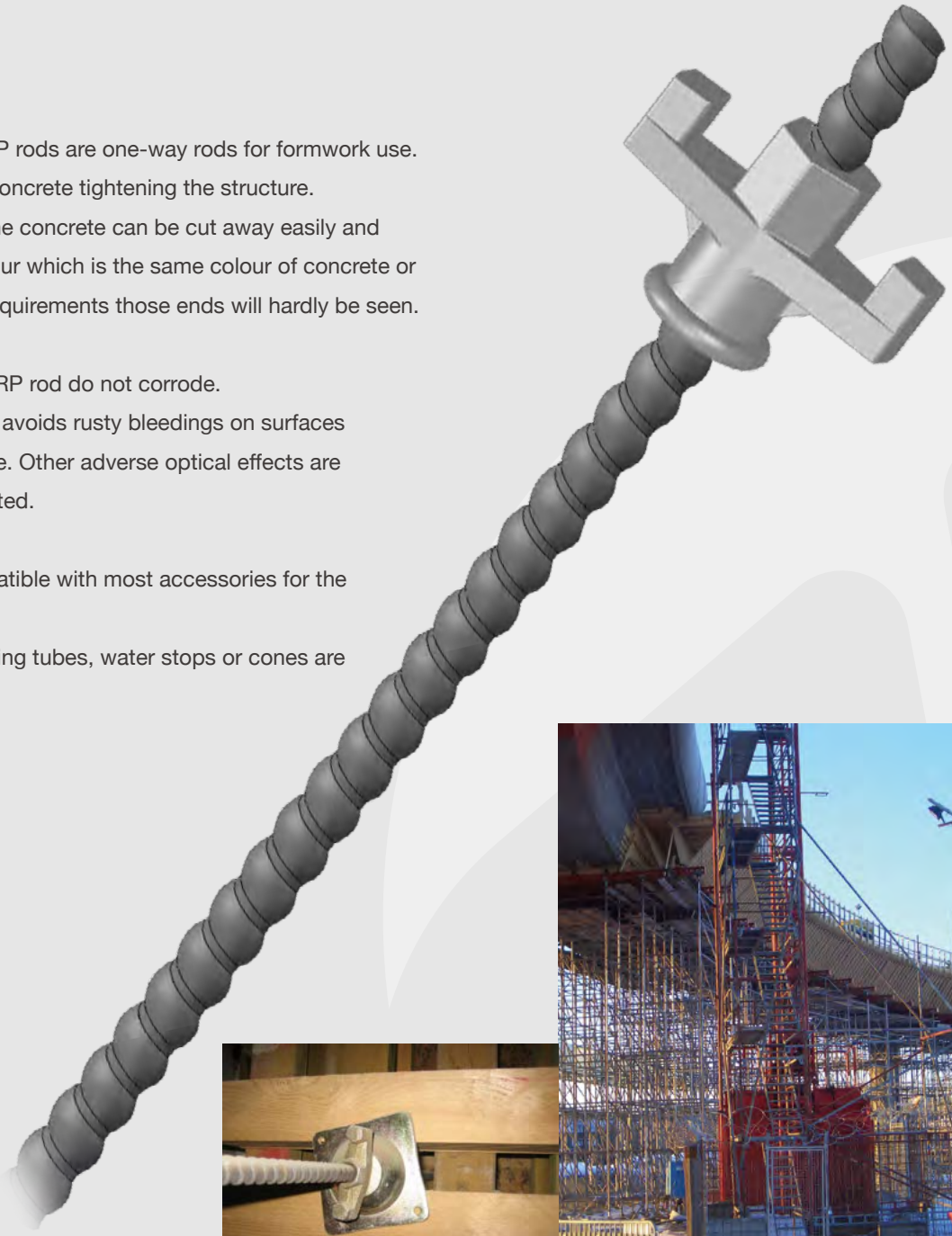
4 The finished Cablex is very flexible and easy to transport

TECHNICAL DATA

Single Rod				
Color	Unit	Green	Blue	Black
Diameter	mm	6	6	6
Weight	g/m	60	60	60
Breaking load	kN	30	28	28
Elongation at break	%	2.1	2.1	2.1
Bending radius	m	Approx.0.3	Approx. 0.3	Approx. 0.3
Cable Bolt				
Number of strands	pcs./ bolt	6 - 90	6 - 90	6 - 90
Breaking load	kN	6 strands : 180	6 strands : 168	6 strands : 168
		20 strands : 600	20 strands : 560	20 strands : 560
		90 strands : 2,700	90 strands : 2,520	90 strands : 2,520
Breaking load (Bolt head)	kN	0 - 800	0 - 800	0 - 800

FiReP® TIELOCK®

GFRP Form Tie Bar



FiReP® TIELOCK® GFRP rods are one-way rods for formwork use.
After use it remains in concrete tightening the structure.
The rod ends outside the concrete can be cut away easily and because of the rod colour which is the same colour of concrete or adapted to individual requirements those ends will hardly be seen.

The cut ends of the GFRP rod do not corrode.
Its corrosion resistance avoids rusty bleedings on surfaces of architectural concrete. Other adverse optical effects are also reduced or eliminated.

The TIELOCK® is compatible with most accessories for the GEWI thread.
Special parts like cladding tubes, water stops or cones are not necessary.

Civil Engineering

ADVANTAGES

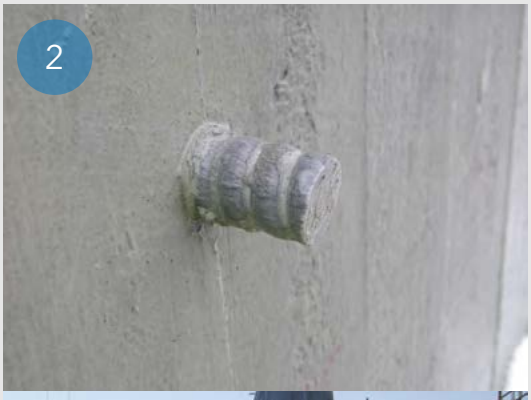
- High tensile strength
- Low weight
- Easy cutting
- Durability
- Thermal behaviour
- Anti-magnetic
- Easy application
- Cost-effective system
- Water Tight

APPLICATIONS

- Fair faced concrete
- Water tight concrete

FiReP TIELOCK INSTALLATION

Tielock® does not need any further special accessories like water stops



Tielock® is an one-way form tie which can remain in concrete after use

Tielock® can be cut off at the concrete surface after use and is hardly visible

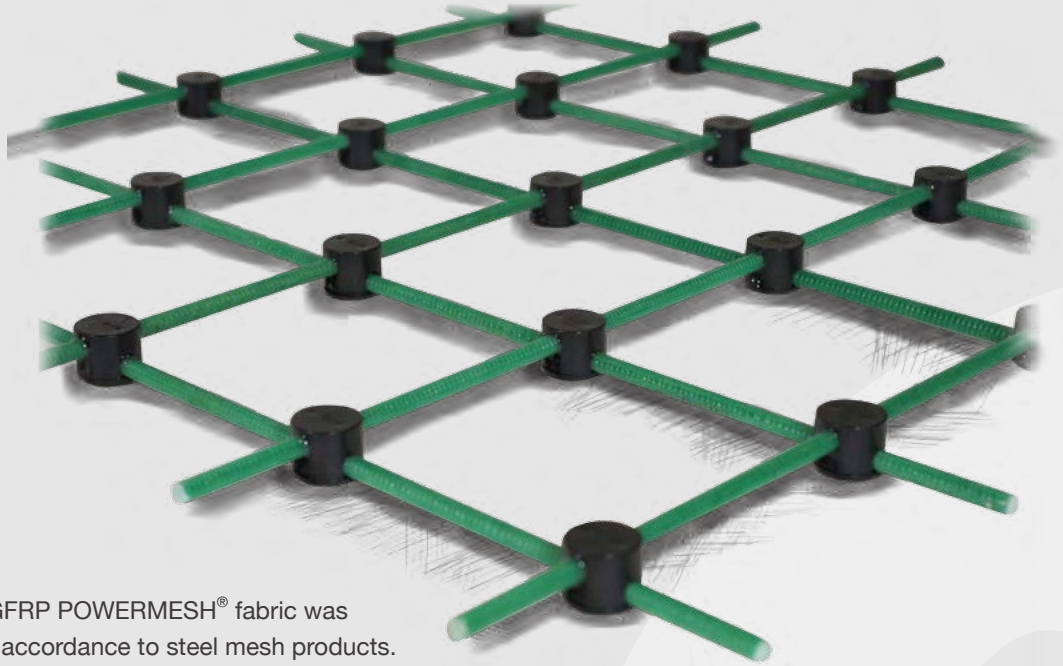
TECHNICAL DATA

Item		Unit	Ø 15	Ø 20	Ø 25
Model			H60-15	H60-20	H60-25
Outer diameter		mm	17	22	25
Tensile stress area		mm²	130	250	350
Ultimate load		kN	130	250	350
Breaking Load Thread	Steel GEWI Nut L=60mm	kN	60	–	–
	Steel GEWI Nut L=70mm	kN	–	120	180 *1
Ultimate strength		N/mm²	1,000	1,000	1,000
Torsion strength		Nm	50	100	120
Shear strength		N/mm²	460	460	460
E-Modulus		N/mm²	45,000	45,000	45,000
Strain at failure		%	2.1	2.1	2.1
Weight		g/m	350	700	900

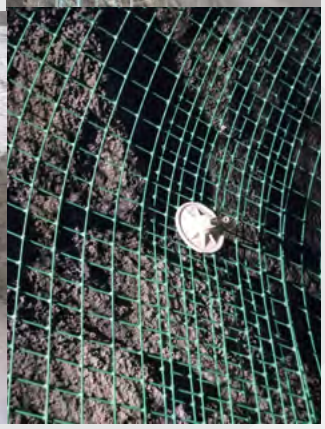
*1) FiReP standard steel 100mm nut

FiReP® POWERMESH

GFRP Mesh



The FiReP® GFRP POWERMESH® fabric was developed in accordance to steel mesh products.
It offers mechanical properties that are similar to steel mesh and high load capacities at each joint together with all advantages of GFRP products.
It makes construction easier and less time consuming, because there is no need for assembling single rods and the low weight of the fabric makes it very easy to handle.
Therfore, it is the right choice for plane RC structures or exposed applications for protection or stabilization purposes.



Mining

Coal face support

Civil Engineering

Soil Nail

Soil Anchor

Tunnelling

Enlargement

Enlargement

Spraying Concrete

ADVANTAGES

High durability

Corrosion resistant

Low weight

Thermal behaviour

High tensile strength

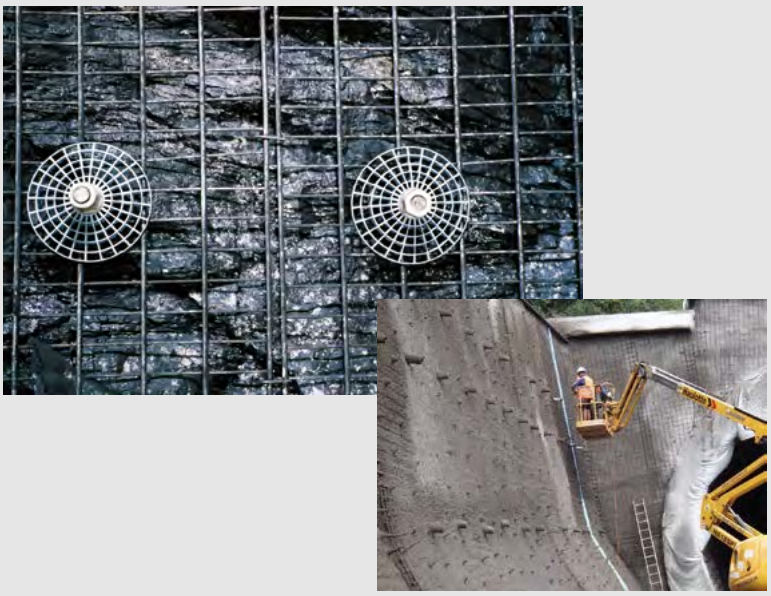
Easy cutting

Non-electrical conductivity

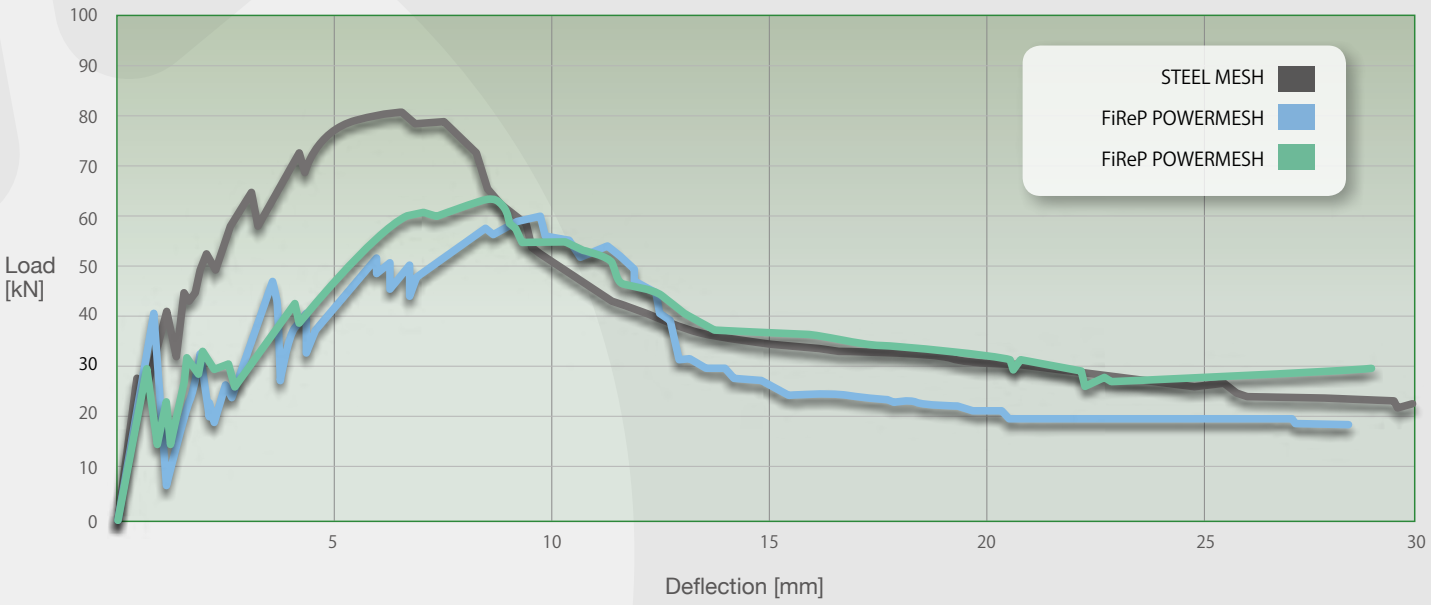
Antimagnetic

APPLICATIONS

- Precast concrete elements
- Thin plate elements e.g. facade panels
- Flat slab construction
- Concrete surface bed
- Concrete paving overlays
- Repair of corroded structures
- Shotcrete reinforcement
- Slope stabilisation
- Head / Wall protection
- Temporary application



Load - Deflection Curve



VSH Hagerbach Test Gallerv : Technical Report V500 0332, issued December 11th, 2009.

TECHNICAL DATA

Property	Unit				
Colour Code		black	blue	grey	green
Application		antistatic	temporary	permanent	permanent
Fibre		glass	glass	glass	glass
Resin		polyester	polyester	vinyl ester	epoxy
Nominal diameter	mm	4 , 6 , 8			
Fibre Content	mass-%	> 75			
Density	kg/dm³	2.2	2.2	2.2	2.2
Tension E-Modulus	N/mm²	50,000	50,000	60,000	60,000
Ultimate tensile strength	N/mm²	1,000	1,000	1,000	1,000
Strain at fracture	%	2.1	2.1	1.9	1.9

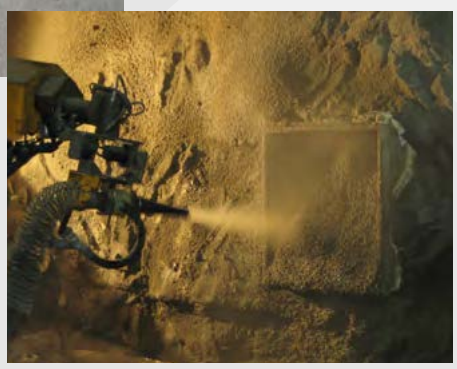
Patent No.

AU-2006289279 / CA-2,619,816 / CN-ZL 200680033098.4 / JP-4796143 / KR-10-1327118 / NZ-566212 / ZA-2008/03068 / AT-EP 1 924 751 / BE-EP 1 924 751 / CH-EP 1 924 751 / DE-EP 1 924 751 ES-EP 1 924 751 / FR-EP 1 924 751 / GB-EP 1 924 751 / IT-EP 1 924 751 / NL-EP 1 924 751 / PL-EP 1 924 751 / SE-EP 1 924 751

FiReP® DUARMAX

GFRP Fibres

DUARMAX® are GFRP Fibres for use in fibre reinforced concrete.
DUARMAX® Fibres combine the advantages of high corrosion resistance and high strength.



Mining
- Spraying Concrete

Civil Engineering
- Precast Concrete
- Building Foundation

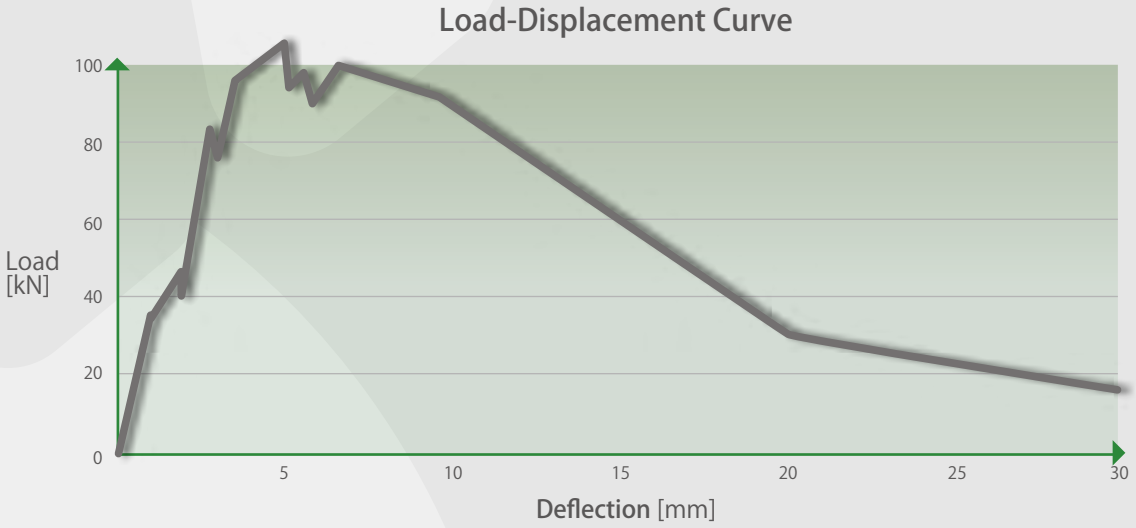
Tunnelling
- Spraying Concrete

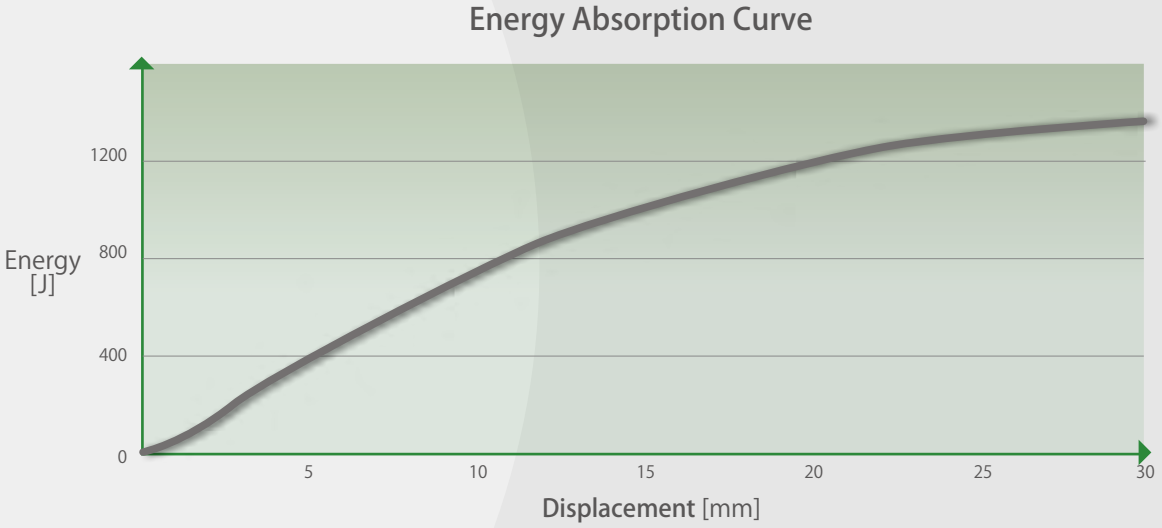
ADVANTAGES

- Corrosion resistant
- Antimagnetic
- High tensile strength
- Proper bonding to concrete
- Alkali resistant
- Chemical resistant
- Good distribution in concrete
- Good sprayability & low rebound

APPLICATIONS

- Shotcrete Lining
- Industrial floors
- Precast elements
- Watertight structures
- Crack width control
- In combination with rebar or alone





TECHNICAL DATA

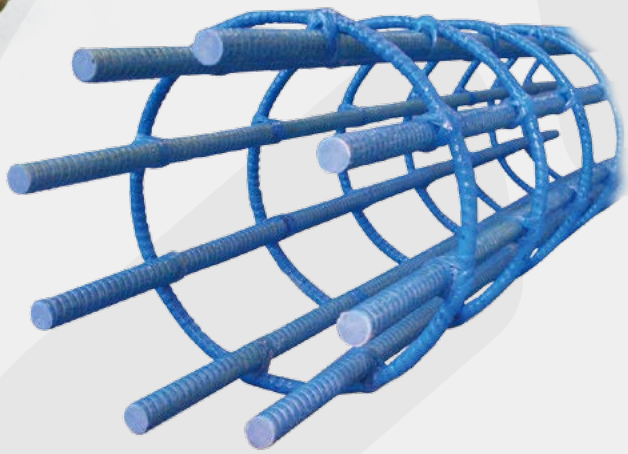
Fibre Type	Geometry	Length [mm]	Diameter [mm]
DUARMAX VE 35S	Straight	35	1
DUARMAX VE 35W	Waved	35	1
DUARMAX VE 40S	Straight	40	1
DUARMAX VE 40W	Waved	40	1

Fibre Type	Dosage [kg/m³]	Concrete	Energy Absorption [J]
DUARMAX VE 35S	30	C30/37	1,000
DUARMAX VE 35S	20	C20/25	500

FiReP® REBAR

GFRP Reinforcement

FiReP® REBAR is the GFRP production range for internal reinforcement of concrete structures.
It offers a wide range of different shapes,
that almost every shape known from steel rebars can be produced in GFRP.



FiReP® REBAR can either be used for permanent applications e.g. in case of requirements of highest durability, maintenance free and corrosion free structures as well as in the case of the requirement to avoid disturbances of electric or magnetic fields or for temporary application (e.g. Soft-Eyes).
For temporary reinforcement of diaphragm walls it is now state of the art to use a mixed cages of steel in the upper and lower section and GFRP in the middle section.
This section, called “Soft-Eye”, that will later be cut by TBM, is important for time and cost effective operation of TBM.

Civil Engineering

Soft-Eye | Precast Concrete | Building Foundation | Motor way

ADVANTAGES

- Corrosion resistant
- Proper bonding to concrete
- High tensile strength
- Low weight
- Antimagnetic
- Non-electrical conductivity
- Thermal behaviour
- Easy cutting
- Various shapes

APPLICATIONS

- Exposed Structures
- Infrastructural Constructions
- Precast Concrete
- Waterway Engineering
- Temporary application (Soft Eye)
- Railways/ aprons using induction loops
- Research facilities
- Avoiding of thermal bridges
- Foundations

Airport Zurich <Switzerland >

Tel Aviv Light Rail <Israel >

TECHNICAL DATA

Product group	Unit	S	P	E
Fibre type		Fibreglass	Fibreglass	Carbonfibre
Polymer		Polyester Resin	Vinyl Ester Resin	Vinyl Ester Resin
Application		temporary	permanent	permanent
Shape		all	all	all
Colour code		blue	pink	yellow
Ultimate strength	N/mm²	800-1,000	1,000	2,200
Tensile E-Modulus	N/mm²	50,000	60,000	150,000
Density	g/cm³	2.2	2.2	approx. 1.6
Diameter	mm	6-50		
Strain at failure	%	2	2	2

Patent No.

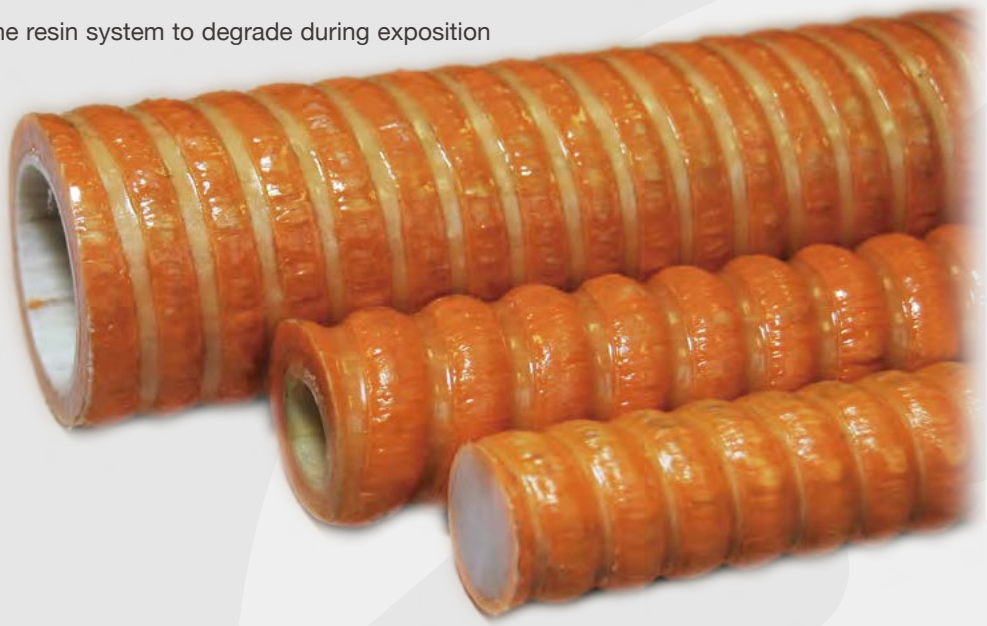
AU-2006289279 / CA-2,619,816 / CN-ZL 200680033098.4 / JP-4796143 / KR-10-1327118 / NZ-566212 / ZA-2008/03068 / AT-EP 1 924 751 / BE-EP 1 924 751 / CH-EP 1 924 751 / DE-EP 1 924 751 ES-EP 1 924 751 / FR-EP 1 924 751 / GB-EP 1 924 751 / IT-EP 1 924 751 / NL-EP 1 924 751 / PL-EP 1 924 751 / SE-EP 1 924 751

FiReP® SUNTHREAD

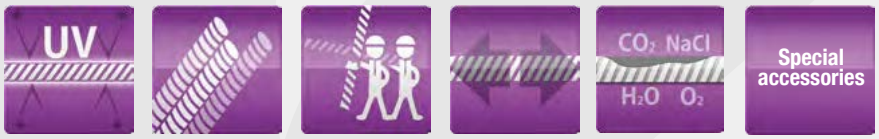
GFRP Bars and Fasteners with UV Protection

FiReP® SUNTREAD is a system consisting of GFRP Bars and fasteners with UV protection for sub construction of solar panels in photovoltaic plants.
The light weight allows quick installation in all ground even shore areas near coasts with reduced effort on transport or using smaller lorries saving sensitive natural soil grounds.
Its improved UV resistance will prevent the resin system to degrade during exposition to sunlight.

It is more cost effective than aluminium constructions and in combination with new technologies it is protecting the environment by having a reduced CO_2 footprint compared to aluminium.



ADVANTAGES



UV Protection | Continuous thread | Low weight | High tensile strength | Corrosion resistant

APPLICATIONS

- Sub constructions of photovoltaic plants
- Exposed to UV light

www.firep.com

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