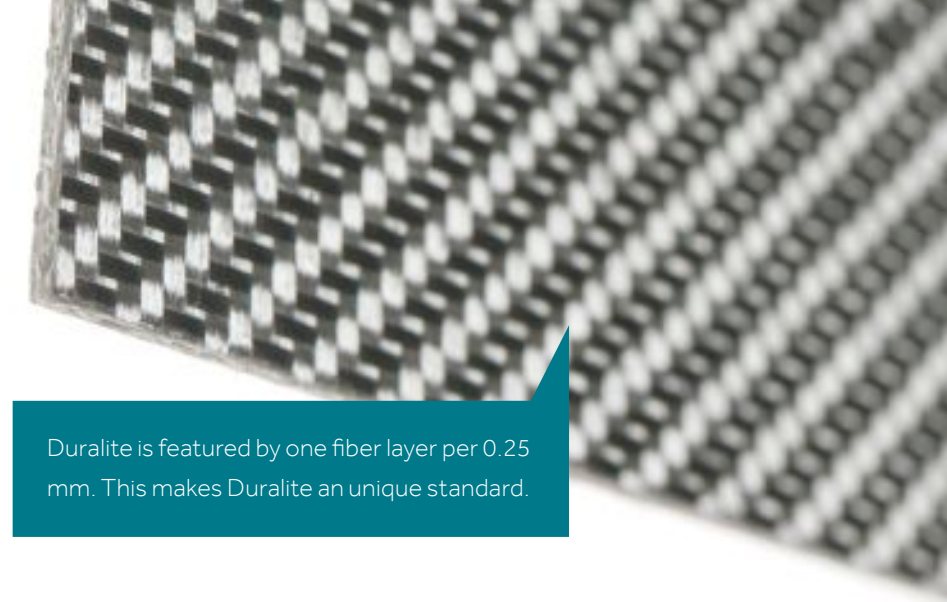




**Frecoma is a Dutch based supplier of products and components for the orthopaedics-, orthotics- and shoe industry with customers all over the world. The strong focus on developing and marketing of unique materials, guarantees a range that is in line with the latest market developments and trends. Duralite is one of those unique materials.**



Duralite is featured by one fiber layer per 0.25 mm. This makes Duralite an unique standard.

Duralite performance composites is the leading supplier of high performance fiber reinforced thermoplastic composite materials for the construction of orthopaedic and orthotic components. Duralite proprietary technology has advantages over other thermoplastic technologies in the method that the materials are produced, which leads to greater consistency and accuracy. Duralite composites have high durability with excellent damping and shock attenuation and resiliency which results in enhanced energy return and response. The composites provide superior stability and support, yet are lightweight and thin to reduce fatigue and stress.

## THE MATERIAL EDGE

Duralite Performance Composite materials are used to enhance footwear performance. Duralite materials have unique attributes that, when used strategically, can reduce the weight of footwear substantially while increasing biomechanical stability. Our materials are used in combination with other components to create footwear which is truly engineered. The 'resilience' (spring or responsiveness) effect of Duralite composite materials means they return to their original shape through millions of cycles thus contributing to reduced foot fatigue and injury prevention. Duralite materials have performance and weight advantages. Similar to a continuous 'bridge'. Duralite materials provides engineered strength from one end of the component to the other.



MANUFACTURING OVERVIEW

Products are offered in a variety of materials including:

- Glass Fiber

**The most cost effective woven composite.**

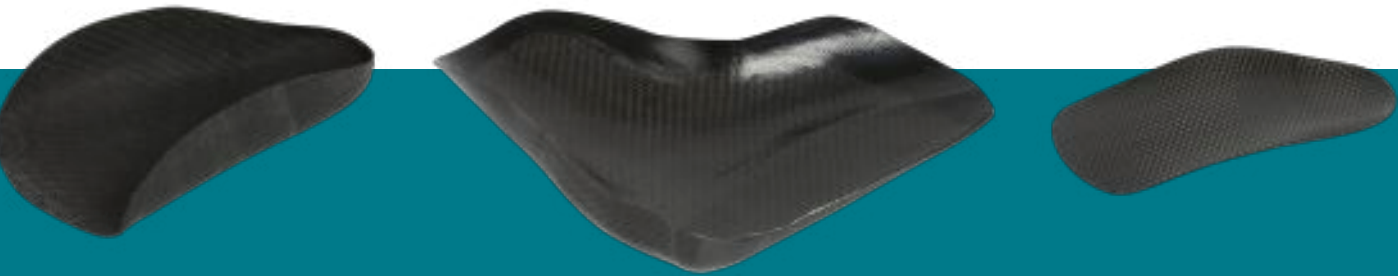
Glass fiber products are the most cost effective composite materials with all woven glass fiber reinforcement. Similar performance characteristics compared to the carbon/glass options but slightly thicker and heavier (glass weights more than carbon fiber) The glass fiber products are available in different thicknesses (see material selection guide overview).
- Carbon Fiber

**The greatest strength to weight option available.**

The carbon fiber products are the lightweight and resilient products for improved performance.
- Carbon/Glass Fiber

**The most efficient carbon product.**

Carbon/Glass fiber products blend the optimal performance, aesthetics and cost effectiveness with glasreplacing of carbon fibers on the outside. Carbon fibers are orientated 90 degrees to the glass fibers for bi-directional mechanical properties.



Our woven series materials are offered in a variety of fiber (carbon and glass) combinations. Each is chosen for its own unique performance, aesthetic and economic attributes.






MATERIAL SELECTION GUIDE

Duralite is built up out of carbon or glass fiber layers or a combination of both with a thermoplastic artificial resin. The high percentage of fiber layers (one fiber layer per 0.25 mm of material volume) makes Duralite one of the most durable composite materials. An increasing percentage of carbon fibers ensures a higher stiffness at a lower material weight.

Duralite offers excellent mechanical properties and good chemical resistance. At a temperature of 100°C, Duralite is already slightly deformable and at 210-230°C it is fully thermoplastic. After deformation and compression the material stiffness and stability increases by a factor of eight. The sheets may be sawn, die cutting, snipped or punched.

Duralite is available in three compositions:

<div><div>duralite GLASS</div></div>	100% glass fiber	1 fiber layer 2 fiber layers 3 fiber layers 4 fiber layers 6 fiber layers 8 fiber layers	290 gr/m² 66 oz/in²	86 x 100 cm 33,86 x 39,37 in	0,25 mm 0,50 mm 0,75 mm 1,00 mm 1,50 mm 2,00 mm
<div><div>duralite MIX</div></div>	carbon-/ glass fiber	3 fiber layers 4 fiber layers 6 fiber layers 8 fiber layers 10 fiber layers 12 fiber layers	245 gr/m² 55,76 oz/in²	86 x 100 cm 33,86 x 39,37 in	0,75 mm 1,00 mm 1,50 mm 2,00 mm 2,50 mm 3,00 mm
<div><div>duralite CARBON</div></div>	carbon fiber	1 fiber layer 2 fiber layers 3 fiber layers 4 fiber layers	200 gr/m² 45,51 oz/in²	86 x 100 cm 33,86 x 39,37 in	0,25 mm 0,50 mm 0,75 mm 1,00 mm
<div><div>SILICONE VACUUM FORM SHEETS</div></div>	100% silicones			100 x 120 cm 39,37 x 47,24 in	2,00 mm

BASIC PRINCIPLES OF SHAPING

Duralite is already slightly deformable at a temperature of 100°C. By heating the Duralite material to a temperature of 210 to 230°C it becomes fully deformable. It is important that Duralite is processed within 15 to a maximum of 30 seconds once it is in an activated state. This causes the fiber layers to melt together so that the structure becomes firmer and its original stiffness is increased. After cooling the shaped sheet recovers its original aesthetic appearance.

- Using a press Within a few seconds place the activated sheet (210-230°C) into the preheated press (175°C). Press the sheet material for 20 seconds at an applied pressure of approximately 6 bar. In this time the temperature is reduced to approximately 60°C, so that the material cools down and retains the shape imposed. This means of shaping is ideal for batch production.
- Using Vacutherm machine Probably the most-used method. Applicable to all thickness versions and compositions of Duralite. To prevent adhesion the component to be formed may be enclosed between two sheets of silicone. Sufficient applied pressure is essential to obtain a stable and homogeneous final result.
- Using an industrial hot air blower Post-processing is simple to achieve by reactivating the material locally using an industrial hot air blower.

Duralite Composites are easy to weld and glued. We can provide you with tailored advice on this.



PROCESSING

The fiber layers in a sheet of Duralite are woven at an angle of 45 degrees. In this way components may be processed out of a sheet in both the longitudinal and transverse directions.

Components may be produced in various ways:

- Sawing with a band saw (though with risk of rough edges)
- Snipping and/or die cutting (only for straight lines, standard method for panels, ideal for thin panels up to 0,75 mm thick)
- Waterjet cutting (extremely precise, smooth, clean edges, recommended)
- Punching (efficient for larger batches, not recommended for sheets over 1.5 mm thick)

To attain the required stiffness with minimal torsion diagonal processing is not recommended. When processing, take the necessary safety precautions into account. Protect eyes and hands (see personal protection).

MATERIAL SAFETY DATA INFORMATION

FIRST-AID MEASURES

**Inhalation** If decomposition products are inhaled, remove person to fresh air. If irritation develops or persists, obtain medical attention.

**Skin contact** Cool skin rapidly with cold water after contact with molten polymer do not peel polymer from the skin get medical attention if necessary.

**Eye contact** In case of contact with eyes, rinse immediately with plenty of water, seek medical advice.

FIRE-FIGHTING MEASURES

**Combustion products** Under fire conditions, composite decomposes and generates smoke and toxic/ irritating compounds (see section 10).

**Extinguish media** Water, foam, dry chemical, CO<sub>2</sub>.

**Fire fighter instructions** Fire fighters should wear positive pressure self-contained breathing apparatus and should be equipped with protective clothing. Keep people away and isolate fire area.

ACCIDENTAL RELEASE

**Personal precautions** Safety requirements, see section 8

**Environmental** None

**Cleaning/disposal** Pick up the remainders mechanically and dispose

HANDLING AND STORAGE

**Handling** Maintain recommended processing temperatures. Provide appropriate exhaust ventilation at machinery and at places where dust is formed. Take precautionary measures against static discharges Carbon fibers conduct electricity

**Storage** Keep sheets dry and dust-free

EXPOSURE CONTROLS/  
PERSONAL PROTECTION

**Respiratory protection** In case of dust and/or fumes use breathing apparatus

**Eye protection** Use safety glasses if there is a potential risk

**Hand protection** Wear heat insulating gloves when handling hot material

**Hygiene measure** Wash hands before breaks and at the end of the working day





FOOTWEAR COMPONENTS

Already, many manufactures of orthopaedic and orthotic components, podology use Duralite.

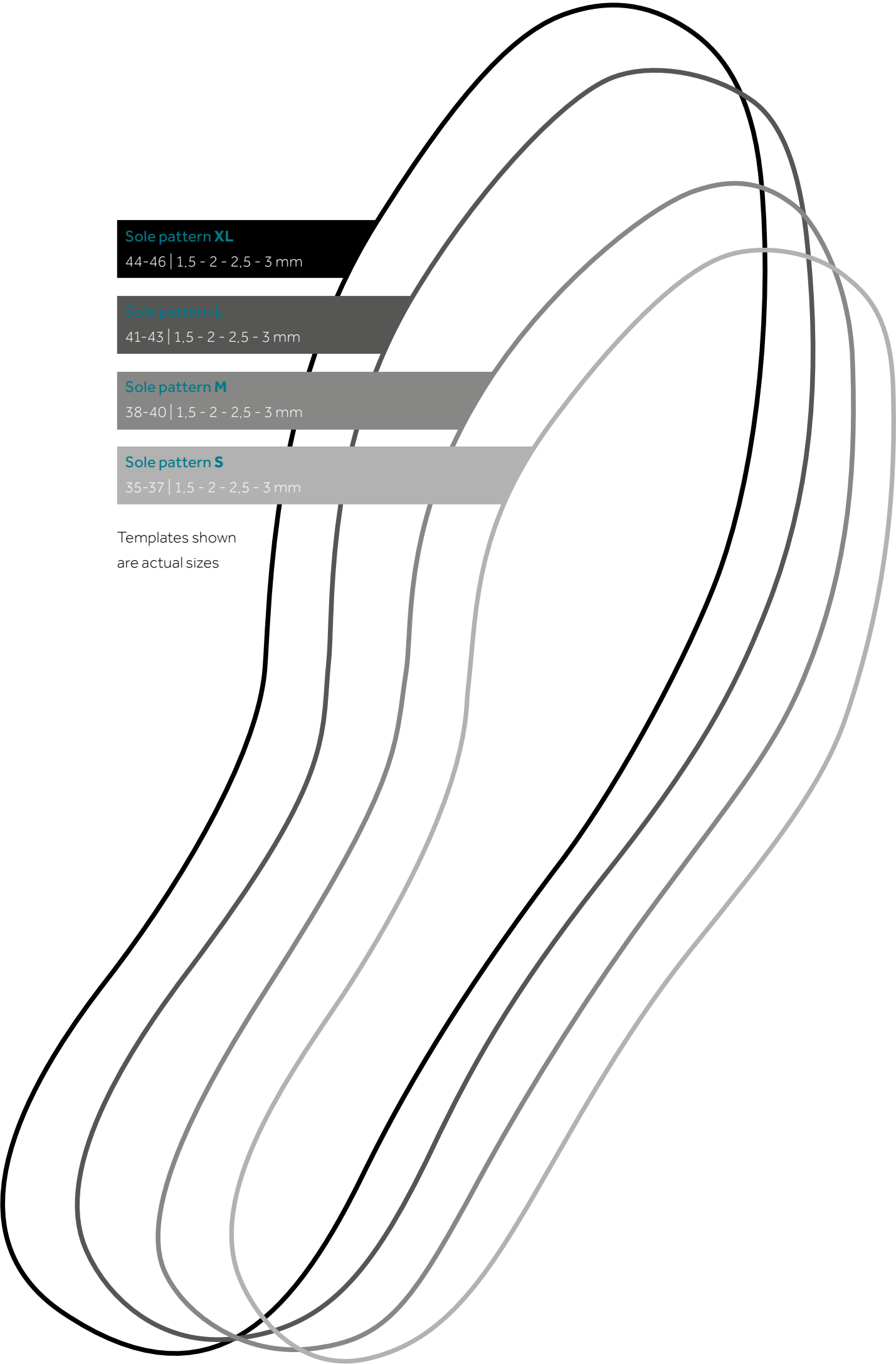
The normal sheets of 86 and 100 cm, special sole blanks are available in various thicknesses (1.5, 2, 2.5 and 3 mm) in the quality Duralite Mix, in sizes S, M, L and XL.

DELIVERY PROGRAM SHEETS

ARTICLE	ARTICLE CODE	COLOR	SIZE	UNIT	THICKNESS	
100 % Glass fiber sheets						
Duralite Glass	10.95.025	Silver	86 x 100 cm	Sheet	0.25 mm	
Duralite Glass	10.95.050	Silver	86 x 100 cm	Sheet	0.50 mm	
Duralite Glass	10.95.075	Silver	86 x 100 cm	Sheet	0.75 mm	
Duralite Glass	10.95.100	Silver	86 x 100 cm	Sheet	1.00 mm	
Duralite Glass	10.95.150	Silver	86 x 100 cm	Sheet	1.50 mm	
Duralite Glass	10.95.200	Silver	86 x 100 cm	Sheet	2.00 mm	
Carbon - Glass fiber sheets						
Duralite Mix	10.96.075	Anthracite	86 x 100 cm	Sheet	0.75 mm	
Duralite Mix	10.96.100	Anthracite	86 x 100 cm	Sheet	1.00 mm	
Duralite Mix	10.96.150	Anthracite	86 x 100 cm	Sheet	1.50 mm	
Duralite Mix	10.96.200	Anthracite	86 x 100 cm	Sheet	2.00 mm	
Duralite Mix	10.96.250	Anthracite	86 x 100 cm	Sheet	2.50 mm	
Duralite Mix	10.96.300	Anthracite	86 x 100 cm	Sheet	3.00 mm	
100 % Carbon fiber sheets						
Duralite Carbon	10.97.025	Black	86 x 100 cm	Sheet	0.25 mm	
Duralite Carbon	10.97.050	Black	86 x 100 cm	Sheet	0.50 mm	
Duralite Carbon	10.97.075	Black	86 x 100 cm	Sheet	0.75 mm	
Duralite Carbon	10.97.100	Black	86 x 100 cm	Sheet	1.00 mm	
100 % Silicone Vacuum form sheets						
Silicone	10.98.210	Transparent	60 x 45 cm	Sheet	2.00 mm	

DELIVERY PROGRAM SOLE PLATES

ARTICLE	ARTICLE CODE	TYPE	SIZE	SHOE SIZE	UNIT	THICKNESS	
Sole plate	10.99.100	Glass/Carbon	Small (S)	35-37	Pair	1.50 mm	
Sole plate	10.99.110	Glass/Carbon	Medium (M)	38-40	Pair	1.50 mm	
Sole plate	10.99.120	Glass/Carbon	Large (L)	41-43	Pair	1.50 mm	
Sole plate	10.99.130	Glass/Carbon	Extra (XL)	44-46	Pair	1.50 mm	
Sole plate	10.99.200	Glass/Carbon	Small (S)	35-37	Pair	2.00 mm	
Sole plate	10.99.210	Glass/Carbon	Medium (M)	38-40	Pair	2.00 mm	
Sole plate	10.99.220	Glass/Carbon	Large (L)	41-43	Pair	2.00 mm	
Sole plate	10.99.230	Glass/Carbon	Extra (XL)	44-46	Pair	2.00 mm	
Sole plate	10.99.300	Glass/Carbon	Small (S)	35-37	Pair	2.50 mm	
Sole plate	10.99.310	Glass/Carbon	Medium (M)	38-40	Pair	2.50 mm	
Sole plate	10.99.320	Glass/Carbon	Large (L)	41-43	Pair	2.50 mm	
Sole plate	10.99.330	Glass/Carbon	Extra (XL)	44-46	Pair	2.50 mm	
Sole plate	10.99.400	Glass/Carbon	Small (S)	35-37	Pair	3.00 mm	
Sole plate	10.99.410	Glass/Carbon	Medium (M)	38-40	Pair	3.00 mm	
Sole plate	10.99.420	Glass/Carbon	Large (L)	41-43	Pair	3.00 mm	
Sole plate	10.99.430	Glass/Carbon	Extra (XL)	44-46	Pair	3.00 mm	
Special sole plates with higher carbon content							
Sole plate Plus	10.99.250	Glass/Carbon	Small (S)	35-37	Pair	2.00 mm	
Sole plate Plus	10.99.260	Glass/Carbon	Medium (M)	38-40	Pair	2.00 mm	
Sole plate Plus	10.99.270	Glass/Carbon	Large (L)	41-43	Pair	2.00 mm	
Sole plate Plus	10.99.280	Glass/Carbon	Extra (XL)	44-46	Pair	2.00 mm	

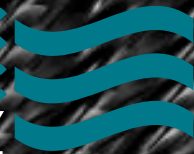


CARBON 200 GRAM/M<sup>2</sup>  
MIX 245 GRAM/M<sup>2</sup>  
GLASS FIBRE 290 GRAM/M<sup>2</sup>



AT LEAST  
**40%**  
LIGHTER  
COMPARING TO  
CONVENTIONAL  
MATERIALS

210°C  
/230°C  
**FULLY**  
DEFORMABLE



AT LEAST  
**50%**  
STRONGER  
COMPARING TO  
CONVENTIONAL  
MATERIALS

EXTREMELY  
DURABLE  
AND SOLID



SIMPLE  
FINISHED

RANGE  
SOLE  
PATTERNS



## FRECOMA COMPANY PROFILE

Frecoma is a Dutch based supplier of products and components for the orthopaedics-, orthotics- and shoe industry with customers all over the world.





Duralite Performance Composites participates in applications ranging from footwear, orthopedics to orthotics with the most complete line of thermoplastic advanced composites.

**www.duralite.com** provides our customers with easy access to product data, sheets, components and suppliers.



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Supplier