

Prepreg technology

For fabricating lightweight
and high-strength components



Quality for life





Prepreg technology

The term “prepreg” is derived from the word “pre-impregnated”. Prepreg incorporates the processing of pre-impregnated base materials, such as carbon fibres impregnated with epoxy resin.

In orthopaedics, prepreg technology is suitable for the fabrication of high-strength, lightweight orthotic and prosthetic components, among other applications.

Thanks to an optimal balance of base materials and resin content as well as accelerated handling processes using special curing temperatures, our prepreg materials ensure increased workflow efficiency.

Thermoset prepregs and auxiliary materials



Carbon fibre woven prepreg | 616B10=5

- For fabricating lightweight and dynamic carbon components, such as orthoses
- Problem-free fabrication of flexible to rigid orthosis designs
- Impregnated with epoxy resin
- High tensile strength and compressive strength
- Suitable for surfaces

Article number	616B10=5
Length	5 m
Width	1.25 m
Fibre weight per unit area	280 g/m ²
Weave type	Twill 4/4
Resin content	49% by weight



Carbon fibre nonwoven prepreg, unidirectional | 616B11=5

- For fabricating lightweight and dynamic carbon components, such as orthoses
- Problem-free fabrication of flexible to rigid orthosis designs
- Impregnated with epoxy resin
- High tensile strength and compressive strength
- For increasing bending rigidity
- Always embed in between webbings

Article number	616B11=5
Length	5 m
Width	0.3 m
Fibre weight per unit area	300 g/m ²
Weave type	UD
Resin content	37% by weight

Aramid fibre woven prepreg | 616B13=1

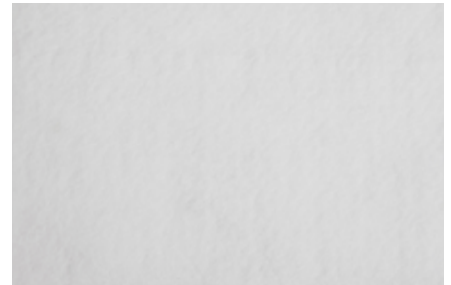
- For fabricating orthoses in prepreg technology
- For flexible seating tape
- Impregnated with epoxy resin
- Flexible and shape-retentive



Article number	616B13=1
Length	1 m
Width	1.20 m
Fibre weight per unit area	170 g/m ²
Weave type	Atlas 1/3
Resin content	50% by weight

Dyneema woven prepreg | 616B15=1

- For fabricating orthoses in prepreg technology
- For flaps and fasteners
- For flexible edge areas
- Impregnated with epoxy resin
- Highly flexible and strain-free



Article number	616B15=1
Length	1 m
Width	1 m
Fibre weight per unit area	160 g/m ²
Weave type	Twill 2/2
Resin content	50% by weight



Shipping information

- Shipping days: Monday, Tuesday, Wednesday

Tip

- When stored at a temperature of -18 °C/-0.4 °F, prepregs can be processed for approximately 12 months; at room temperature, a maximum of 21 days.
- Freeze in airtight sealed packaging; in order to avoid condensation, thaw to room temperature in airtight sealed packaging.
- Each thawing and freezing cycle reduces the storage stability and degrades the quality significantly.



Peel ply with coloured thread | 616B16=2

- Surface protection during lamination work
- Facilitates optimum strength values
- Excessive resin can escape via the peel ply fabric during the curing phase
- The peel ply fabric can be easily peeled off after curing
- Leads to rough, clean surface that is optimally suited for receiving a further coating, adhesion or painting

Article number	616B16=2
Length	2 m
Width	0.5 m
Weight per unit area	83 g/m ²
Weave type	Linen



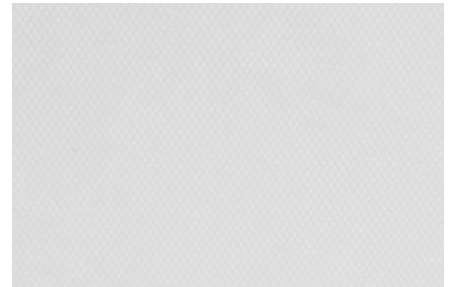
Perlon stockinette, white | 623T3

- For fabricating laminates
- Knitted fabric
- Finely meshed
- Good stretching properties
- Good shaping
- Smooth surface after laminating
- Suitable for surfaces

Article number	Length	Width	Weight
623T3=4	45.4 m	4 cm	0.5 kg
623T3=6	27.7 m	6 cm	0.5 kg
623T3=8	20.8 m	8 cm	0.5 kg
623T3=10	37 m	10 cm	1 kg
623T3=12	33.3 m	12 cm	1 kg
623T3=15	27 m	15 cm	1 kg
623T3=20	20 m	20 cm	1 kg
623T3=25	13.5 m	25 cm	1 kg
623T3=30	11.1 m	30 cm	1 kg
623T3=40	8.8 m	40 cm	1 kg

Compoflex® 250 absorbent fleece | 616G60=1x5

- Breathable, microporous absorbent fleece
- Low resin absorption
- Smooth functional side replaces the perforated sheeting
- 100% polypropylene
- Self-separating
- Processing temperature: 140 °C/284 °F (convection oven)



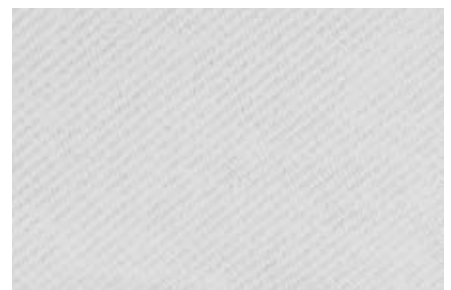
Article number	616G60=1x5
Length	5 m
Width	1 m
Resin capacity	810 cm ³ /m ²



Tip
Not for laminating

Compoflex® SB 250 absorbent fleece | 616G61=1x5

- Breathable, microporous absorbent fleece with peel ply fabric surface structure
- Low resin absorption
- Fabric-structured side replaces the peel ply fabric and perforated sheeting
- 100% polypropylene
- Self-separating
- Processing temperature: 140 °C/284 °F (convection oven)



Article number	616G60=1x5
Length	5 m
Width	1 m
Resin capacity	810 cm ³ /m ²



Tip
Not for laminating



PVA bags | 99B81

- For working with Orthocryl and polyester lamination resins
- Sizes available for all amputation and orthosis types
- Film adapts to contours extremely well
- Easy to weld with the 756E1 hand sealing iron
- Good stretching properties
- High resistance to tearing
- 0.08 mm thickness

Article number	For the fabrication of	Length	Width	Height	Order by
99B81=60x11x4	Upper limb prostheses	60 cm	11 cm	4 cm	10 pieces
99B81=70x19x5	Soft inner sockets and transtibial prostheses	70 cm	19 cm	5 cm	10 pieces
99B81=70x27x5	Thigh sleeves, transfemoral prostheses	70 cm	27 cm	5 cm	10 pieces
99B81=100x19x5	Transtibial prostheses	100 cm	19 cm	5 cm	10 pieces
99B81=100x26x5	Transfemoral prostheses	100 cm	26 cm	5 cm	10 pieces
99B81=100x30x5	Transfemoral prostheses	100 cm	30 cm	5 cm	10 pieces
99B81=100x36x5	Transfemoral prostheses	100 cm	36 cm	5 cm	10 pieces
99B81=120x50x10	Hip disarticulation	120 cm	50 cm	10 cm	10 pieces
99B81=130x19x5	KAFO	130 cm	19 cm	5 cm	10 pieces
99B81=130x22x5	KAFO	130 cm	22 cm	5 cm	10 pieces
99B81=130x26x5	KAFO	130 cm	26 cm	5 cm	10 pieces



Polyester adhesive tape | 636D14

- Temperature-stable adhesive tape (to 200 °C/392 °F) for vacuum technology
- Base material: polyester
- Water-resistant adhesion
- Can be peeled off any time

Article number	636D14
Length	66 m
Width	25 mm
Thickness	50 µm
Colour	red

Vacuum sealing tape | 636K38

- For adhering vacuum sheeting of all types to the edge of a mould
- Permanently elastic, heat-resistant sealing tape (to 190 °C/374 °F) made of synthetic rubber
- Basis for a stable vacuum
- Can be easily removed from the mould



Article number	636K38
Length	9 m
Width	12 mm
Colour	yellow

Rubber cork | 620P3

- For applications in orthopaedics and shoe technology
- Heat-resistant
- Elastic
- High resilience
- Resistant against frictional wear
- Impermeable to liquids
- Not thermoformable



Article number	620P3
Length	1 m
Width	0.5 m
Thickness	2 mm, 3 mm, 4 mm, 5 mm, 6 mm, 8 mm



Tip

Suitable for prepreg technology as a separating layer for padding.



Danger

Contact adhesive | 636N9

- For adhering flexible materials
- Particularly for adhering profiled rubber, wooden materials, laminated boards, veneer and plastic edges, rubber, leather, felt, fabric, cork, flexible foam, hard PVC, metal and ceramics
- Wide range of applications
- Not suitable for Styrofoam and soft PVC
- 634A6 suitable as a thinner
- Base: methyl acetate
- Short drying time
- Good resistance to ageing
- Temperature-resistant to approx. 100 °C/212 °F

Article number	636N9=0.660	636N9=4.500
Net contents	0.66 kg	4.5 kg
Colour	yellowish	yellowish



Tip

- Stir before use! The surfaces/components that are to be adhered to one another must be dry and free of dust, oil and grease.
- We recommend roughening the surface of rubber, thermosets and similar materials.
- Apply contact adhesive to both surfaces that are to be adhered. After a drying time of 5–20 minutes (depending on the thickness of the adhesive and the temperature), press the parts together briefly and firmly.
- Contact adhesive may not be stored below +10 °C/50 °F or above +25 °C/77 °F. The containers must be protected from direct sunlight and heat. When kept in a cool, dry place, the unopened original containers can be stored for at least 1 year.



Fibreglass grid adhesive tape | 627B3=50

- Partial reinforcement of vacuum sheeting
- Venting aid
- Non-elastic fibreglass weave
- High resistance to tearing
- Self-adhesive on both sides

Article number	627B3=50
Length	100 m
Width	50 mm
Colour	white
Weight per unit area	55 g/m ²

Wax | 633W8

- For insulating joints, components and dummies
- Excellent separating effect
- Easy to process



Article number	633W8=12.2	633W8
Net contents	12.2 g	425 g

Sample set of carbon profile bars | 646M39

- 3 carbon profile bars (0°, 45° und 90°)
- The mechanical properties of the carbon fabric are dependent on the direction in which a force is applied. Under tensile load in the warp or weft direction, woven fabrics stretch only slightly. But if the tensile load is applied diagonally, e.g. at an angle under 45°, woven carbon fabrics are highly stretchable. The direction of the fibres should be adjusted according to the load.



Article number	646M39
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Processing instructions for thermoset preregs

- Can be stored for a maximum of 6 months at -18 °C/0.4 °F when sealed against moisture (can be stored for no more than 30 days max. at room temperature)
- Thaw at room temperature in moisture-tight packaging
- Optimal processing temperature is between 20 °C/68 °F and 23 °C/73.4 °F. The higher the temperature, the more viscous the prepreg becomes
- Cure for 4 h under vacuum in a 130 °C/266 °F oven
- Make sure to avoid moisture in the material
- Prepare cuttings without removing the protective film
- Handle prepreg only with powder-free examination gloves (641H9=2)
- Make sure the processing area is dry and free of dust, talcum and grease
- Plaster models must be dry
- Metal surfaces must be pretreated for laminating
- All consumable and auxiliary materials (e.g. adhesive tape) must be appropriate for the curing temperature
- Precise cutting of layers saves reworking
- Fibres should be stretched as much as possible during processing for optimal force absorption
- Thickness gradation should be applied stepwise at a minimum of 0.5 cm intervals and the surface layers should be consistent
- A higher degree of rigidity and dimensional stability is primarily achieved through reinforcement and profile formation
- The build-up of layers must take into account the various thermal expansions of the materials to avoid excessive tension deviations
- No subsequent thermoforming

Shipping information

- Can be shipped throughout Europe

Notes

A series of horizontal dotted lines for taking notes.

Thermoplastic preregs



TPC carbon fibre woven | 617R15

- For high-strength, very thin orthoses on a thermoplastic material basis
- Matrix: TPU
- Can be thermoformed under pressure
- High tensile strength
- Suitable for surfaces
- Paintable
- Potentially adhesive
- Can be welded with components of the same matrix
- Clean processing
- No special storage requirements (e.g. no cooling)
- Moderate thermoforming temperature: approx. 220 °C/428 °F

Article number	617R15=1	617R15=2	617R15=5
Thickness	approx. 0.25 mm	approx. 0.25 mm	approx. 0.25 mm
Packaging format	3 sheets at 1,000 x 430 mm per sheet	6 sheets at 1,000 x 430 mm per sheet	12 sheets at 1,000 x 430 mm per sheet
Area	1.29 m ²	2.58 m ²	5.16 m ²
Fibre weight per unit area	200 g/m ²	200 g/m ²	200 g/m ²
Weave type	Twill 2/2	Twill 2/2	Twill 2/2
Fibre content	60% by weight	60% by weight	60% by weight
Resin content	40% by weight	40% by weight	40% by weight



Silicone foil | 616F27=5000x1000

- Processing aid for TPC
- Temperature-stable
- Highly elastic
- Processing temperature: max. 240 °C/464 °F

Article number	616F27=5000x1000
Length	5 m
Width	1 m
Thickness	1 mm
Colour	transparent

Separating foil | 616F28=10000x1220

- Processing aid for TPC
- Temperature-stable
- Elongation at break 300% +/-10%
- Tensile strength 24 N/mm²
- Processing temperature: max. 260 °C/500 °F



Article number	616F28=10000x1220
Length	10000 mm
Width	1220 mm
Thickness	0.013 mm
Colour	red

Bonding agent | 617H46

- Universally applicable for sealants, adhesives, coatings
- For bonding and repairing vulcanised silicone rubber
- For sealing valves
- Pasty consistency
- Easy to process
- Outstanding adhesive properties



Article number	617H46
Net contents	90 ml
Colour	transparent



Gefahr



Tip

During processing, a thin skin will form on the surface of the adhesive after one minute. Any shaping of the silicone adhesive must be completed before this skin starts to form. A wetted modelling instrument or an ice cube have proven useful in shaping transitions.

Processing instructions and detailed work steps for thermoplastic prepregs

- 1 • Cut carbon to size in desired fibre direction according to templates
- 2 • Layer carbon cuttings (1st and 2nd layers)
 - Point weld with soldering iron
 - Layer carbon cutting (3rd layer)
 - Point weld with soldering iron
 - Layer carbon cutting (4th layer)
 - Point weld with soldering iron
 - Layer carbon cutting (5th layer)
 - Point weld with soldering iron
- 3 • Apply 623F27 transparent silicone film to the underside of the open clamping frame of the vacuum press
 - Place the vacuum frame on the silicone film and align both with the clamping frame
 - Apply the second sheet of silicone film, position it and roll it back towards the clamping frame hinge
 - Place an oversize piece of peel ply fabric (approx. 4 cm of extra edge compared to the carbon cutting) on the silicone film
- 4 • Place an oversize piece of 616F28=10000x1220 red separating film (approx. 2 cm extra edge compared to the carbon cutting) at the centre of the peel ply fabric
 - Position the carbon cutting at the centre of the 616F28=10000x1220 red separating film
 - Apply a double layer of 616G6 Dacron felt to the carbon structure, overlapping slightly to the right and left
 - Lay the ends of the Dacron felt layers slightly overlapping on the suction hole of the vacuum frame
 - Place an oversize piece of 616F28=10000x1220 red separating film (approx. 2 cm extra edge compared to the carbon cutting) at the centre of the carbon structure
 - Place an oversize piece of peel ply fabric (approx. 4 cm of extra edge compared to the carbon cutting) at the centre of the 616F28=10000x1220 red separating film
 - Roll out the second sheet of rolled up silicone film carefully over the layered materials, avoiding wrinkles
 - Close the clamping frame
- 5 • Activate the vacuum frame
 - Move the clamping frame up and lock it
- 6 • Place extraction felt (616G6 Dacron) on the vacuum forming table
 - Pull 1 extra-long double layer of nylon stocking (81A1) over the model
 - Position the model including the extraction hose and felt
- 7 • Move the clamping frame towards the model
 - Align the model with the carbon structure

- 8 • Move the clamping frame to the heating position and lock it
 - Position the support tubes in the underside of the clamping frame
- 9 • Set the heating time according to the temperature table and switch on the heater
 - Depending on the heating time, this procedure may need to be repeated
- 10 • After the heating time has been completed, remove the support tubes as quickly as possible
 - Move the clamping frame towards the vacuum forming table and lock it
 - Carefully build up the vacuum on the table and smooth out any folds in the modelling area using long heat protection gloves
- 11 • Switch on the cooling function of the vacuum press and allow to cool to room temperature for a sufficient period
 - The warmer the component is when removed from the mould, the greater the cooling time
 - If there is no COOL-TEC available for cooling, dampen the upper silicone film in the model area with water spray (evaporative cooling)
- 12 • Switch off the vacuum frame after the cooling process
 - Open the clamping frame
 - Roll back the upper silicone film
 - Remove the upper ply peel fabric from the mould
 - Remove the upper red separating film from the mould
 - Remove the carbon component from the mould
 - Separate the Dacron felt from the carbon component
 - Trim the carbon component and then sand it

Number of layers (woven fabric)*	Heating time to reach desired material temperature	
	For TPC with Pa12 matrix=190 °C/374 °F	For TPC with TPU matrix=220 °C/428 °F
3 layers of fabric	350 sec.	550 sec.
6 layers of fabric	400-450 sec.	650-700 sec.
12 layers of fabric	650-700 sec.	1050-1100 sec.

* Temperature test only possible for TPU with fabric layers, as there is no unidirectional prepreg

* Layer thickness: 0.2-0.25 mm

Heating times are reference values determined by temperature tests. They apply only in the case of equal vacuum build-up, equal distance between the vacuum sheeting and the infrared heater, and equal temperature of the radiant heater. Deviations in the heating time may otherwise occur.

The 701E15 prepreg oven was developed specifically for the needs of processing prepreg materials in orthopaedics technology. The spacious housing design with its folding double doors allows multiple models to be hung in the oven. The distributor with four vacuum connections which is fixed in the interior comes standard fitted with a large external water separator. During development, special focus was placed on the control unit responsible for the heating process. The heart of the system is the microprocessor-controlled main unit including software and a user interface developed specifically for the oven. A touchscreen enables intuitive operation of the oven's extensive functions. In order to precisely control the entire process, the control system is equipped for the optional use of an external temperature sensor, which is a standard part of the scope of delivery. A thin wire probe is simply placed between the edges of the layers of prepreg material and plugged into the control unit. The core temperature of the material is thus determined precisely and is used to control the entire heating process. An integrated timer and ramping function also allows individual heating curves to be programmed and saved. This enables the user to

monitor the entire process on a graphic status display, both continually and following its completion. Faults can be read on an error display in the main menu. Thanks to its partitioning into three zones, the user can reduce the size of the oven. This reduces energy expended for smaller models to a minimum. The individual zones are automatically activated when the intermediate shelf is inserted. If desired, the prepreg oven can also be used for processing conventional thermoplastics.

At a glance:

- Microprocessor-based control system with PID function, optimised for prepreg processing
- User-friendly program guide via touchscreen
- Timer and ramping function for programming individual heating curves
- Model/material probe for controlling the oven and heating process using the material temperature
- Energy-saving 3 zone partition to reduce the size of the heating chamber for smaller models.
- 6-way vacuum connector with external water separator



Technical data:

Article number	701E15
Exterior dimensions WxDxH	1,230 x 920 x 1,570 mm
Interior dimensions WxDxH	1,000 x 620 x 1,200 mm
Temperature range	continuously adjustable between 50 °C/122 °F and 250 °C/482 °F
Electrical connection in V/Hz/kW	3 x 400 / 50 / 10.2
Weight (net)	283 kg
Colour	light grey (RAL 7035)

Temperature regulator:

Microprocessor-controlled, operated via touchscreen, PID control function, temperature continuously adjustable from 50 °C/122 °F to 250 °C/482 °F, temperature unit can be switched between °C/°F, individually programmable timer and ramping function, graphic status display, multilingual user interface (DE, EN, FR, IT)

Vacuum supply for prepreg technology

Ottobock's especially powerful vacuum units are ideally suited for the precise vacuum forming of thermoplastic sheet material and for prepreg fabrication. With an integrated 25 l tank and a nominal suction capacity of 40 m³/h, the mobile 755E80=2 vacuum pump is the optimal solution for prepreg fabrication. Thanks to its mobility it can also be used at other work spaces in addition to the 701E15 prepreg oven.

Technical data:

Article number	755E80=2
Nominal suction capacity	40 m ³ /h
End pressure	5 mbar
Tank volume	25 l
Electrical connection in V/Hz/kW	3x400 / 50 / 1.1
Hose connector diameter	25 mm
Dimensions WxDxH	595 x 520 x 831 mm



755E80=2 vacuum pump

Accessories for prepreg technology

The prepreg two-way vacuum pipes are fitted with:

- silicone tubing
- stop valve
- plug nipple
- Temperature range to 160 °C/320 °F



Prepreg two-way vacuum pipe

- 755X123=3
- 755X123=4

