

# SynFlex Insulate



# SynFlex Insulate

In the Insulate product range, you can find all the insulation materials you need for your electrical insulation system.

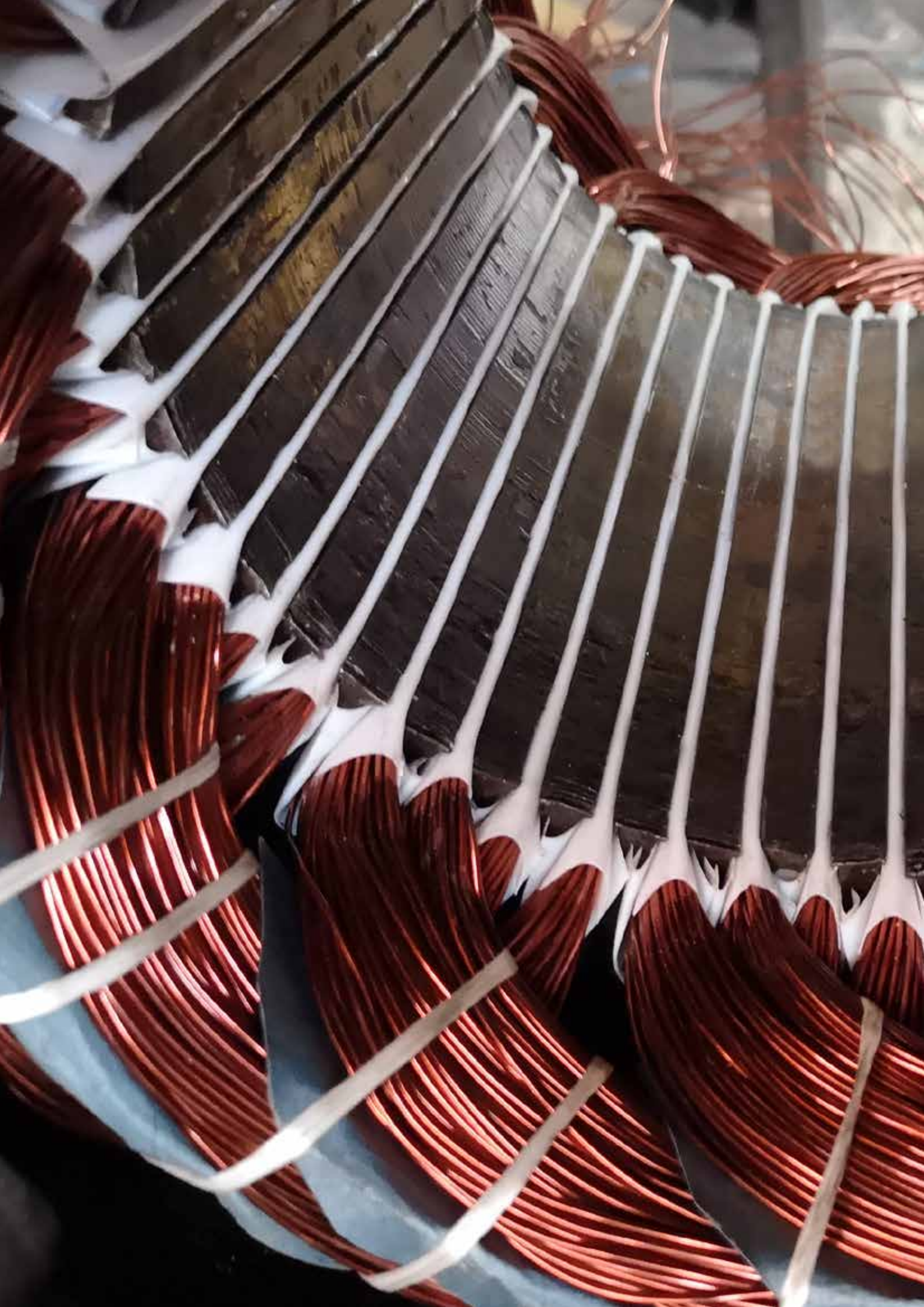
The largest area comprises the insulating materials of the SynTherm® product group. Here, there are outstanding individual solutions such as laminates produced at the Blomberg and Shanghai locations, e.g. the SynTherm® APA or SynTherm® AHA, along with the aramid papers of the SynTherm® YT series. In addition, you can find films, pressboard and specialties.

The SynTape® range involves electrical adhesive tapes of diverse backing materials such as polyester, polyimide or PTFE combined with different adhesive types.

The SynTherm® and SynTape® ranges are also found in the SynPrep area. Here, customer-specific punchings are produced out of adhesive and non-adhesive insulation materials. These include traditional slot insulations and phase insulations, not to mention highly-specialized punched and formed parts, produced at our SynFlex locations in Schramberg and Denmark. An additional selection in the segment of „Insulates“ are the SynSleeve electrical insulation sleeveings. In addition to traditional F/GS and H/GS sleeveings, the highlight here is above all the F/GS fibreglass sleeving with an acrylate-based coating and complete UL approval.

Comprising another major area are the impregnants and sealing compounds of the SynChem range. Special attention is placed on solvent-free paints and resins.





# SynTherm® Insulating Materials

Insulating materials are used in electrotechnical and electronic applications for electrical insulation and mechanical protection. In addition to serving as anti-skid protection for machine processing, they increase operational safety.

SynFlex offers a wide range of materials and dimensions in the field of insulating materials, assembling the entire SynTherm® range on state-of-the-art cutting and punching machines, as well as laminating machines. The individually assembled insulating materials can be tailored to the customer's requirements.

The materials are available in thicknesses of 12 to 1,000 µm and, depending upon the thickness, in widths from 6 mm.

Within the SynTherm® product range, the most diverse materials are available, each adapted to the specific area of application. The range extends from mechanically heavy-duty pressboards up to high temperature-resistant SynTherm® YT aramid papers or polyimide films.

**SynKraft®**  
pressboard and pressboard laminates

**SynTherm®**  
electrical insulating films

**SynTherm®**  
non-woven and non-woven laminates

**SynTherm® YT**  
aramid paper and aramid laminates

**SynTherm® H**  
polyimide films and polyimide laminates



# SynKraft®

## Pressboards and pressboard laminates

### SynKraft® M

Thermal class A / 105 °C

- pressboard (unbleached sulphate pulb)

#### Properties

- high flexibility, tensile and compressive strength
- compatibility with dip and trickle resins
- good absorption of impregnants
- high pureness
- high mechanical strength

#### Applications

- layer insulation and final binding in transformers
- slot insulation in stators and rotors
- especially for electric motor construction

### SynKraft® T

Thermal class A / 105 °C

- pressboard (unbleached sulphate pulb)

#### Properties

- high flexibility, tensile and compressive strength
- compatibility with dip and trickle resins
- good absorption of impregnants
- high pureness
- high mechanical strength

#### Applications

- layer insulation and final binding in transformers
- electrical insulating material in transformer and electric motor construction with little heat stress
- slot insulation for stators and rotors
- slot liner for electric motors
- especially for usage in transformer construction

### SynKraft® E

Thermal class A / 105 °C

- pressboard (unbleached sulphate pulb)

#### Properties

- high flexibility, tensile and compressive strength
- compatibility with dip and trickle resins
- good absorption of impregnants
- high pureness
- high mechanical strength

#### Applications

- layer insulation and final binding in transformers
- electrical insulating material in transformer and electric motor construction with little heat stress

### SynKraft® KP

Thermal class B / 130 °C

- 2-layer laminate made of:
  1. polyester film
  2. pressboard on rolls

#### Properties

- good absorption of impregnants
- improved electrical and mechanical properties of the pressboard layer within the compound
- high textile strength
- good sliding properties

#### Applications

- slot insulation in stators and rotors
- slot closure in stators and rotors
- interlayer and toplayer insulation in small transformer

### SynKraft® VSP-H3

Thermal class B / 130 °C

- composite pressboard
- 3-layer laminate made of:
  1. pressboard
  2. polyester film
  3. pressboard

#### Properties

- high dielectric strength
- high textile strength
- good absorption of impregnants

#### Applications

- slot insulation and slot closure in stators and rotors

### SynKraft® VSP-H2

Thermal class B / 130 °C

- composite pressboard
- 2-layer laminate made of:
  1. pressboard
  2. polyester film

#### Properties

- high dielectric strength
- high rupturing strength
- good absorption of impregnants

#### Applications

- slot insulation and liner in stators and rotors

# SynTherm®

## Electrical insulating films

Detailed information can be found in our technical data sheets.  
 Mylar® is a registered trade mark of DuPont Teijin Films U.S., Ltd. Partnership  
 Melinex® is a registered trade mark of DuPont Teijin Films U.S., Ltd. Partnership  
 Teonex® is a registered trade mark of Teijin DuPont Films Japan Ltd.  
 DuPont™ is a trade mark of E.I. Du Pont de Nemours and Company

### SynTherm® P

Thermal class B / 130 °C

- PET film (polyethylene terephthalate)

#### Properties

- good electrical insulation
- high tensile strength
- good thermal properties
- resistant to standard solvents

#### Applications

- interlayer and toplayer insulation for transformers, chokes and relay coils
- slot- and phase insulation

### Mylar® A

Thermal class B / 130 °C

- PET film (polyethylene terephthalate)

#### Properties

- good electrical insulation
- high tensile and rupturing strength
- good thermal properties
- resistant to standard solvents

#### Applications

- interlayer and toplayer insulation for transformers, chokes and relay coils
- slot and phase insulation

### SynTherm® DDF

Thermal class B / 130 °C

- PET film (polyethylene terephthalate)
- coated with thermosetting varnish (diamond dotted)

#### Properties

- bonding of winding layers without impairment of adjacent components
- good electrical insulation
- good thermal properties

#### Applications

- special applications, e.g. in gas-cooled transformers

### Melinex® 238

Thermal class B / 130 °C

- PET film (polyethylene terephthalate)

#### Properties

- good electrical insulation
- high tensile and rupturing strength
- good thermal properties
- resistant to standard solvents
- good compatibility to refrigerants due to small oligomer concentration

#### Applications

- interlayer and toplayer insulation for transformers, chokes and relay coils
- slot and phase insulation

### Melinex® 401

Thermal class B / 130 °C

- crystal clear PET film (polyethylene terephthalate)

#### Properties

- very smooth on one side
- crystal clear
- food compatibility

#### Applications

- packaging industry
- punched and shaped parts

### Teonex® Q51

Thermal class F / 155 °C

- PEN film (biaxially oriented polyethylene naphthalate)

#### Properties

- high dielectric strength
- good thermal conductivity
- good mechanical properties
- good resistance to solvents

#### Applications

- for thin insulations exposed to increased thermal load

# SynTherm®

## Non-woven laminates

### SynTherm® DMD

Thermal class F / 155 °C

- 3-layer laminate made of:
  1. polyester non-woven (impregnated)
  2. polyester film
  3. polyester non-woven (impregnated)

#### Properties

- high dielectric strength
- good mechanical stability
- good machine processability due to smooth surface

#### Applications

- slot insulation, wedges, phase insulation in motors and generators
- core-, layer- and final insulation in transformers

### SynTherm® DM

Thermal class F / 155 °C

- 2-layer laminate made of:
  1. polyester non-woven (impregnated)
  2. polyester film

#### Properties

- high dielectric strength
- good mechanical stability
- good machine processability due to smooth surface

#### Applications

- slot insulation, wedges, phase insulation in motors and generators
- core-, layer- and final insulation in transformers

### SynTherm® VPV

Thermal class B / 130 °C  
(with UL EIS up to F / 155 °C)

- 3-layer laminate made of:
  1. polyester non-woven
  2. polyester film
  3. polyester non-woven

#### Properties

- high dielectric strength
- temperature class F possible through impregnation
- good absorbency for impregnants
- good chemical resistance

#### Applications

- slot and interphase insulation, slot covering, interlayer insulation and final insulation

### SynTherm® VP

Thermal class B / 130 °C

- 2-layer laminate made of:
  1. polyester non-woven
  2. polyester film

#### Properties

- high dielectric strength
- good absorbency for impregnants
- good chemical resistance

#### Applications

- slot- or phase insulation, slot closure, layer insulation and final insulation



# SynTherm®

## Polyimide films and polyimide laminates

### SynTherm® H

Thermal class H / 180 °C  
(UL RT/ 230 °C)

- polyimide film

#### Properties

- high dielectric strength
- short-term resistant to 400 °C
- good chemical resistance

#### Applications

- insulation of windings, winding wires
- slot insulation in motors
- insulation of transformers and capacitors

#### Other standards

- polyimide film with low discharge resistant surface
- polyimide film with thermosetting fluoropolymer coating on one side

### SynTherm® HP

Thermal class H / 180 °C

- 2-layer laminate made of:
  1. SynTherm® H
  2. PET-film

#### Properties

- high dielectric strength
- mechanical protection and stability due to PET film

#### Applications

- Cost effective substitute product for polyimide films / laminates currently in use as special core-, layer- and final insulation

### SynTherm® AHA

Thermal class N / 200 °C

- 3-layer laminate made of:
  1. aramid paper
  2. polyimide film
  3. aramid paper

#### Properties

- high dielectric strength
- good mechanical and thermal properties of the aramid paper
- good thermal properties of the polyimide film

#### Applications

- slot insulation, phase insulation and wedges in motors with high utilization level
- core-, layer- and final insulation in transformers exposed to high thermal and mechanical load

### SynTherm® AH

Thermal class N / 200 °C

- 2-layer laminate made of:
  1. aramid paper
  2. polyimide film

#### Properties

- high dielectric strength
- good mechanical and thermal properties of the aramid paper
- good thermal properties of the polyimide film

#### Applications

- slot insulation, phase insulation and wedges in motors with high utilization level
- core-, layer- and final insulation in transformers exposed to high thermal and mechanical load

# SynTherm® Aramid papers

In addition to single-layer insulating materials, SynFlex also offers a wide range of multi-layer laminates, most of which are produced at the Blomberg plant. This enables us to guarantee a superior level of quality in this area.

By means of fully-automatic order processing and an online link to the IT-supported production planning system, we deliver individually assembled tapes, punched and shaped parts, feathered and cut-to-length material in the shortest lead times - upon request within 48 hours.

Particularly attractive are individual multi-layer laminates, considering SynFlex's proprietary UL electrical insulation systems. By utilizing innovative insulating materials, technically demanding parameters with minimal construction heights can be achieved.

By integrating the high-quality SynTherm® YT aramid papers and the SynTherm® H polyimide film in our in-house production process, SynFlex is able to meet customer-specific requirements in addition to the defined standard laminates. As each application is special, our experienced product managers analyze the requirements in cooperation with the customer and determine the suitable product for each planned project. For relevant material requirements, SynTherm® multi-layer laminates can be developed and produced especially for the customer project. The 2- and 3-layer laminates can be customized not only in terms of the material combination but also with respect to the structure.

**metastar® 民士达**

**Maximum material purity**

SynTherm® YT aramid papers consist of 100 % discrete meta-aramid.

**Excellent starting material**

Through many years of collaboration with our partner Yantai Metastar, we can guarantee that our SynTherm® YT aramid papers consist only of the best raw materials from Yantai Advanced Materials Co. Ltd.

**Aramid paper with low halogen content**

At < 400 ppm, SynTherm® YT aramid papers contain a very low level of halogen.

**Already RoHS 2.0 compatible**

Extensive laboratory investigations have shown that SynTherm® YT aramid papers already meet the strict requirements of RoHS 2.0. Furthermore, SynTherm® aramid papers contain no traces of PAA, PFOA, TBB-A, HBCDO, DMF or PVC.

**Aramid papers to REACH standards**

SynTherm® YT aramid papers meet all of the REACH requirements and SVHC criteria. The DMAC present in many aramid papers in SynTherm® YT aramid papers is at such a low level that it is well below the reporting limit, meaning that there is no risk in handling this material. SynTherm® YT – the green aramid paper.

**Top marks for rail applications**

In an electrical insulating system constructed in a way typical for its application, SynTherm® YT510 meets the demanding rail requirements R22, R23 and R24 in hazard class HL3 and can be used unrestrictedly both indoors and out.

**High thermal stability**

SynTherm® YT is UL-licensed with a RTI of 210 °C.

**High flame retardance**

Under tests to the standard UL94, SynTherm® YT aramid papers meet fire classifications VTM-0 and V-0. The LOI value is over 28 %.

**Excellent electrical insulation**

SynTherm® YT aramid papers are winners with their outstanding thermal and electrical properties. The extremely low moisture values of the material allow extremely good electrical properties, even in the case of long-term high-temperature applications. Due to a very low dielectric constant, the electromagnetic field is distributed very evenly. SynTherm® YT aramid papers can be used without restriction in indoor and outdoor areas.

**Good mechanical properties**

Due to their composition of discrete aramid fibres, SynTherm® YT aramid papers have an extremely high mechanical loading capacity. The material is characterised by high density, a smooth surface and high tensile load and tear strength.

**High chemical resistance**

SynTherm® YT aramid papers are compatible with all classes of standard resins, varnishes, adhesives, transformer fluids, lubricating oils and coolants. Standard solvents may cause slight, reversible swellings.

**Impregnability and dielectric material properties**

SynTherm® YT aramid papers have excellent impregnant absorption. Due to its discrete and open surface composition, impregnants can penetrate the material much better than other aramid papers.

The breakdown voltage of the materials can be increased enormously by impregnation.

# SynTherm® YT

## Aramid paper and aramid laminates

### SynTherm® YT510

Thermal class H / 180 °C

- aramid paper
- calendered aromatic polyamide-fibrine-flock-composition

#### Properties

- high short-term dielectric strength
- compatible with all classes of standard resins, varnishes, adhesives and transformer liquids, lubricants and cooling agents

#### Applications

- alternating and direct current motors
- generators, liquid- and dry-type transformers, chokes, even when exposed to beta and gamma radiation

#### Other standards

- SynTherm® YT511 – uncalendered

### SynTherm® YT56

Thermal class H / 180 °C

- aramid paper
- calendered aromatic polyamide-fibrine-flock-composition

#### Properties

- high short-term dielectric strength
- compatible with all classes of standard resins, varnishes, adhesives, and transformer liquids, lubricants and cooling agents

#### Applications

- alternating and direct current motors
- generators, liquid- and dry-type transformers, chokes, even when exposed to beta and gamma radiation

#### Other standards

- also available as non-calendered

### SynTherm® YT593

Thermal class H / 180 °C

- aramid pressboard average density
- 100 % pure meta aramid

#### Properties

- very good absorption of liquids
- high temperature resistance
- good mechanical properties

#### Applications

- spacer in liquid-based systems

### SynTherm® YT Crepe

Thermal class H / 180 °C

- aramid paper
- calendered aromatic polyamide-fibrine-flock-composition

#### Properties

- high dielectric strength
- good mechanical stability
- good thermal properties of the aramid paper

#### Applications

- winding applications with special requirements referring to elongation and flexibility.

### SynTherm® APA

Thermal class H / 180 °C

- 3-layer laminate made of:
  1. aramid paper
  2. polyester film
  3. aramid paper

#### Properties

- high dielectric strength
- good mechanical stability
- good thermal properties of the aramid paper

#### Applications

- slot insulation, wedges, phase insulation
- in motors and generators
- core-, layer- and final insulation in transformers

### SynTherm® AP

Thermal class F / 155 °C

- 2-layer laminate made of:
  1. aramid paper
  2. polyester film

#### Properties

- high dielectric strength
- good mechanical stability
- good thermal properties of the aramid paper

#### Applications

- slot insulation, wedges, phase insulation in motors and generators
- core-, layer- and final insulation in transformers



# SynTape®

## Electrical Adhesive Tapes

### Variable use

- for electrical insulation
- for mechanical protection
- for fixing
- for masking
- for labelling
- for bundling
- for marking

### Storage

SynTape® adhesive tapes should always be stored in a cool and dry place at approx. 20 °C and 50-60 % relative humidity.

### Insulating material classification

The SynTape® electrical adhesive tape from SynFlex can be allocated to specific insulating material classes. The respective letter in the adhesive tape name states the highest permanent temperature at which the adhesive tapes can be used. The classification is realised by determining the limit temperature.

### Cutting tolerance

Standard tolerance of SynTape® adhesive tapes is  $\pm 0.3$  mm. Smaller tolerances are available on request.

### Resins and varnishes

Due to the variety of impregnants, it is impossible to make general statements. Especially impregnants containing styrene can be problematic. Please carry out autonomous testing. We will gladly provide you with samples. When using impregnants, it is recommended to apply adhesive tapes with acrylate adhesive.

### Technical data sheets

Our technical data sheets contain detailed technical information. Download the data sheets at [www.synflex.com](http://www.synflex.com) or request them from us.

### Processing instructions

The surface of components to which tapes are to be applied should be dry, free of grease and clean. The adhesive surface of the tapes should not be soiled when being applied.

Favourable processing temperatures are room temperatures (approx. 18 - 24 °C). The initial bonding strength is poor at lower temperatures.

The adhesive force depends on the contact developed by the adhesive on the surface.

Higher contact pressure will press the adhesive into the surface and increases the adhesive force considerably.

### Note

Our technical data information is based on the information provided by our suppliers. This information is intended for specialists who should use it at their own discretion and at their own risk. Unfortunately, we cannot guarantee favourable results and shall not be responsible or liable for specified details or results based on this information.

Therefore, we recommend that you carry out test on the products which we supply to ensure their suitability for the intended processes and applications.

We guarantee the perfect quality of our products in accordance with our general sales terms and delivery conditions.



## Polyester

Product	UL Spec.	Colour	Backing	Backing thickness mm	Total thickness mm	Adhesive	Tear resistance N/10 mm	Elongation %	Adhesive-ness on steel N/10 mm	Dielectric strength $V_{eff}$	Class
SynTape® B 107/ P.31		clear. yellow. beige	polyester	0.023	0.060	K	40	80	5.0	4500	<b>B</b> 130 °C
SynTape® B 108/ P.315		yellow. black	polyester	0.050	0.087	K	70	100	6.0	7000	<b>B</b> 130 °C
SynTape® B/ TA.2560	-	5 colours*	polyester	0.025	0.060	A	35	80	3.5	4500	<b>B</b> 130 °C
SynTape® B 113/ P.34		clear	polyester	0.023	0.060	A	40	80	2.5	4500	<b>B</b> 130 °C
NR. 1350F-1 from 3M™		yellow, white	polyester	0.025	0.063	A	44	100	3.3	5500	<b>B</b> 130 °C
NR. 1350F-2 from 3M™		yellow, white	polyester	0.050	0.088	A	88	110	3.3	7000	<b>B</b> 130 °C
NR. 5 from 3M™		translucent	polyester	0.025	0.063	A	44	100	3.8	5500	<b>B</b> 130 °C
SynTape® B/ P.355	-	yellow, transparent	polyester	0.050	0.087	A	70	100	6.0	9000	<b>B</b> 130 °C
SynTape® B/ P.40	-	green	polyester	0.023	0.060	S	40	80	2.5	4500	<b>B</b> 130 °C
SynTape® B/ P.42	-	red-brown	polyester	0.023	0.100	S	40	80	1.3	4500	<b>B</b> 130 °C
SynTape® B/ P.47	-	transparent	polyester	0.075	0.110	S	100	110	5.0		<b>B</b> 130 °C

\* clear, yellow, green, blue, black

## Acetate fabric

Product	UL Spec.	Colour	Backing	Backing thickness mm	Total thickness mm	Adhesive	Tear resistance N/10 mm	Elongation %	Adhesive-ness on steel N/10 mm	Dielectric strength $V_{eff}$	Class
SynTape® A/ 560/ CA.100	-	black, white	acetate fabric	0.160	0.210	K	55	10	1.8	1500	<b>A</b> 105 °C
NR. 28 from 3M™	-	white	acetate fabric	-	0.203	K	70	10	4.4	2000	<b>A</b> 105 °C

## Glass fibre

Product	UL Spec.	Colour	Backing	Backing thickness mm	Total thickness mm	Adhesive	Tear resistance N/10 mm	Elongation %	Adhesive-ness on steel N/10 mm	Dielectric strength $V_{eff}$	Class
SynTape® B 616/ GL.95		white, black	glass fibre	0.120	0.170	K	300	5	3.5	2500	<b>B</b> 130 °C
NR. 27 from 3M™		white	glass fibre	-	0.177	K	252	5	3.3	3000	<b>B</b> 130 °C
SynTape® F 562/ GL.94		white	glass fibre	0.120	0.165	A	300	5	4.0	2500	<b>F</b> 155 °C
NR. 79 from 3M™		white	glass fibre	0.127	0.177	A	262	5	3.3	3000	<b>F</b> 155 °C
SynTape® H/ GL-1350G	-	white	glass fibre	0.125	0.175	S	280	5	3.6	2500	<b>H</b> 180 °C
SynTape® H 618/ GL.96		white	glass fibre	0.120	0.170	S	300	5	2.3	2500	<b>H</b> 180 °C
SynTape® H/ GL.99		white	glass fibre	0.120	0.165	S	250	5	2.2	2500	<b>H</b> 180 °C
NR. 69 from 3M™		white	glass fibre	0.150	0.177	S	314	5	4.4	3000	<b>H</b> 180 °C

## Polyester glass filament reinforced

Product	UL Spec.	Colour	Backing	Backing thickness mm	Total thickness mm	Adhesive	Tear resistance N/10 mm	Elongation %	Adhesive-ness on steel N/10 mm	Dielectric strength $V_{eff}$	Class
SynTape® B/ PR.25		white	polyester*	0.085	0.120	K	380	5	3.5	5000	<b>B</b> 130 °C
SynTape® B/ PR.30		clear	polyester*	0.100	0.175	K	550	5	4.0	5000	<b>B</b> 130 °C
SynTape® F/ PS.25		transparent	polyester*	0.085	0.155	A	380	5	6.5	5000	<b>F</b> 155 °C
SynTape® F/ PS.30		transparent	polyester*	0.100	0.175	A	550	5	6.0	5000	<b>F</b> 155 °C

\* Polyester glass filament reinforced



### Polyester glass fibre reinforced

Product	UL Spec.	Colour	Backing	Backing thickness mm	Total thickness mm	Adhesive	Tear resistance N/10 mm	Elongation %	Adhesive-ness on steel N/10 mm	Dielectric strength $V_{eff}$	Class
SynTape® F/ PVX.30		translucent	polyester	0.110	0.170	A	380	4	6.0	5000	<b>F</b> 155 °C

### Double-sided adhesive tape

Product	UL Spec.	Colour	Backing	Backing thickness mm	Total thickness mm	Adhesive	Tear resistance N/10 mm	Elongation %	Adhesive-ness on steel N/10 mm	Dielectric strength $V_{eff}$	Class
SynTape® A16-320	-	yellow	non-woven	-	0.100	A	-	-	6.4	-	-40 to +100 °C
SynTape® B/ P.231	-	yellow	polyester	0.023	0.090	K	40	80	5.0	4500	<b>B</b> 130 °C
NR. 75 from 3M™		yellow	polyester	0.025	0.096	K	44	100	4.9	6500	<b>B</b> 130 °C

### Laminates

Product	UL Spec.	Colour	Backing	Backing thickness mm	Total thickness mm	Adhesive	Tear resistance N/10 mm	Elongation %	Adhesive-ness on steel N/10 mm	Dielectric strength $V_{eff}$	Class
SynTape® B/ PT.25		white	polyester/ polyester non-woven	0.090	0.150	K	30	45	5.0	4800	<b>B</b> 130 °C
SynTape® B/ PT.45		white	polyester/ polyester non-woven	0.180	0.235	K	45	20	6.5	5000	<b>B</b> 130 °C
SynTape® B 354/ R.180		cream	polyester/ paper	0.160	0.220	K	70	20	6.5	8000	<b>B</b> 130 °C
SynTape® F/ PX.50		cream	aramid paper/ polyester	0.090	0.135	K	65	10	5.5	7000	<b>F</b> 155 °C
SynTape® F/ PT.20-20		translucent	polyester/ polyester non-woven	0.0980	0.160	A	30	45	8.0	4800	<b>F</b> 155 °C
SynTape® F 131/ PT.40		translucent	polyester/ polyester non-woven	0.160	0.215	A	45	20	6.0	5000	<b>F</b> 155 °C
SynTape® F 356/ PX.50AC	-	cream	aramid paper/ polyester	0.090	0.140	A	65	10	4.5	5500	<b>F</b> 155 °C
SynTape® F/ PX.11/18/23	-	cream	aramid paper/ polyester	0.225	0.265	A	40	100	4.0	6000	<b>F</b> 155 °C

### Aramid

Product	UL Spec.	Colour	Backing	Backing thickness mm	Total thickness mm	Adhesive	Tear resistance N/10 mm	Elongation %	Adhesive-ness on steel N/10 mm	Dielectric strength $V_{eff}$	Class
SynTape® F/ X.50		cream	aramid paper	0.050	0.100	A	35	5	5.5	2500	<b>F</b> 155 °C
SynTape® F/ X.80	-	cream	aramid paper	0.080	0.120	A	60	5	5.5	3800	<b>F</b> 155 °C

### PEN

Product	UL Spec.	Colour	Backing	Backing thickness mm	Total thickness mm	Adhesive	Tear resistance N/10 mm	Elongation %	Adhesive-ness on steel N/10 mm	Dielectric strength $V_{eff}$	Class
SynTape® F/ K.30AC		transparent	PEN	0.025	0.06	A	40	50	5.0	6000	<b>F</b> 155 °C
SynTape® F/ K.30		blue	PEN	0.025	0.06	S	32	50	3.0	6000	<b>H</b> 180 °C

## Polyimide

Product	UL Spec.	Colour	Backing	Backing thickness mm	Total thickness mm	Adhesive	Tear resistance N/10 mm	Elongation %	Adhesive-ness on steel N/10 mm	Dielectric strength $V_{eff}$	Class
SynTape® F 118/ H.20AC	-	brown-translucent	polyimide	0.025	0.060	A	45	35	4.0	6000	<b>F</b> 155 °C
SynTape® F/ H.50AC	-	brown-translucent	polyimide	0.050	0.090	A	75	35	3.8	10000	<b>F</b> 155 °C
SynTape® H/ 301	-	brown-translucent	polyimide	0.030	0.060	S	35	50	1.6	5500	<b>H</b> 180 °C
SynTape® H/ 560	-	brown-translucent	polyimide	0.025	0.060	S	40	35	2.3	6000	<b>H</b> 180 °C
NR. 92 from 3M™		brown-translucent	polyimide	0.025	0.075	S	50	55	2.5	7000	<b>H</b> 180 °C
SynTape® H 428/ H.20		brown-translucent	polyimide	0.025	0.060	S	45	35	2.3	6500	<b>H</b> 180 °C
SynTape® H/ H.50		brown-translucent	polyimide	0.050	0.085	S	75	35	2.5	10000	<b>H</b> 180 °C

## Polyester non-woven line coated

Product	UL Spec.	Colour	Backing	Backing thickness mm	Total thickness mm	Adhesive	Tear resistance N/10 mm	Elongation %	Adhesive-ness on steel N/25 mm	Dielectric strength $V_{eff}$	Class
SynTape® B.564		white	polyester non-woven	0.055	0.11 to 0.12	K	32	15	12.50	500 V*	<b>B</b> 130 °C
SynTape® H.564		white	SynTherm® YT511	0,130	0,190	K	25		10,0		<b>H</b> 180 °C

\* unimpregnated

\*\* Isolierstoffklasse und Durchschlagsspannung richten sich nach dem von Ihnen eingesetzten Imprägniermittel

## Specialties

Product	UL Spec.	Colour	Backing	Backing thickness mm	Total thickness mm	Adhesive	Tear resistance N/10 mm	Elongation %	Adhesive-ness on steel N/10 mm	Dielectric strength $V_{eff}$	Class
SynTape® AL.050		aluminium	aluminium	0.05	0.090	A	35	3	7.5	-	-50 to +150 °C
SynTape® AS.050		aluminium	aluminium	0.05	0.090	A	35	3	5.5	-	-50 to +150 °C
SynTape® AL.080	-	aluminium	aluminium	0.08	0.120	A	65	5	8.0	-	-50 to +150 °C
SynTape® AS.080	-	aluminium	aluminium	0.08	0.120	A	65	5	6.0	-	-50 to +150 °C
SynTape® AR.050	-	aluminium	aluminium	0.05	0.090	A	45	4	5.0	-	-40 to +150 °C
SynTape® AR.080	-	aluminium	aluminium	0.08	0.120	A	65	5	5.0	-	-40 to +150 °C
SynTape® B/ PM.099	-	aluminium	polyester alum. matelised	0.023	0.065	A	40	90	3.5	-	-60 to +150 °C
SynTape® 1695	-	copper	polyester alum. matelised	0.023	0.045	A	50	6	2.6	-	-15 to +130 °C
SynTape® SCUT 36	-	copper	copper foil	0.036	0.075	A	65	6	5.0	-	Shortt. to +180 °C
NR. 1181 from 3M™		copper	copper foil	0.04	0.070	A	44	-	3.8	-	-
NR. 1194 from 3M™		copper	copper foil	0.04	0.070	A	50	6	4.0	-	-
SynTape® TF.50	-	brown	PTFE	0.05	0.100	S	40	100	3.0	9000	<b>H</b> 180 °C
SynTape® TFE.130	-	grey	PTFE	0.13	0.190	S	80	320	3.5	11500	<b>H</b> 180 °C

## Masking tape for circuit boards

Product	UL Spec.	Colour	Backing	Backing thickness mm	Total thickness mm	Adhesive	Tear resistance N/10 mm	Elongation %	Adhesive-ness on steel N/10 mm	Dielectric strength $V_{eff}$	Class
SynTape® B/ P.40	-	green	polyester	0.023	0.060	S	40	90	3.0	4500	<b>B</b> 130 °C
SynTape® B/ P.42	-	red	polyester	0.023	0.100	S	40	90	2.0	4500	<b>B</b> 130 °C
SynTape® B/ P.47	-	clear	polyester	0.075	0.110	S	95	65	3.5	11000	<b>B</b> 130 °C
SynTape® H/ 301	-	brown-translucent	polyimide	0.030	0.060	S	35	50	1.6	5500	<b>H</b> 180 °C
SynTape® H/ 560	-	brown-translucent	polyimide	0.025	0.060	S	33	20	3.0	-	<b>H</b> 180 °C
NR. 92 from 3M™		brown-translucent	polyimide	0.025	0.075	S	50	55	2.5	7000	<b>H</b> 180 °C
SynTape® H 428/ H.20		brown-translucent	polyimide	0.025	0.060	S	41	40	2.7	6000	<b>H</b> 180 °C

## Paper

Product	UL Spec.	Colour	Backing	Backing thickness mm	Total thickness mm	Adhesive	Tear resistance N/10 mm	Elongation %	Adhesive-ness on steel N/25 mm	Dielectric strength $V_{eff}$	Class
SynTape® CS.60	-	cream	light crepe paper	0.095	0.130	K	60	10	3.0	800	<b>Y</b> 90 °C
SynTape® A/ CP.50	-	cream	light crepe insulating paper	0.110	0.150	K	45	9	2.5	1000	<b>A</b> 105 °C

## Pad-cleaning tapes

Product	UL Spec.	Colour	Backing	Backing thickness mm	Total thickness mm	Adhesive	Tear resistance N/10 mm	Elongation %	Adhesive-ness on steel N/10 mm	Dielectric strength $V_{eff}$	Class
TRB 16 Eco		transparent	Polypropylene film, orange-peel-embossing		0,090 +/- 5 %	A			1,20 +/- 10 %		
TRB 19 Optimo		transparent	HDPE film, pyramid embossing		0,130 +/- 5 %	A			1,40 +/- 10 %		

## Adhesives

A= acrylate adhesive  
K= rubber adhesive  
S= silicone adhesive

### Acrylate adhesive

Acrylate adhesives are temperature and ageing resistant. Furthermore they are characterised by their improved resistance to impregnants.

### Rubber adhesive

Rubber adhesives have a high initial adhesive strength. Furthermore they are easy to process.

### Silicone adhesive

Silicone adhesives are characterised by their high temperature and ageing resistance. They are suitable for bonding on non-adhesive surfaces and can be removed without residue.

## Thermal class

**Y** 90 °C

**A** 105 °C

**B** 130 °C

**F** 150 °C

**H** 180 °C

# SynSleeve

## Electrical Insulating Sleeving

In electrical and electronic applications, sleeveings are used as additional mechanical protection and to improve the electrical insulation of transformers, motors and equipment.

SynFlex supplies its sleeves in rings, on spools, in drums or as sections - individually according to customer requirements. From an inner diameter of 0.5 mm, they are available in standard colors and dimensions and can be delivered within 24 hours. Upon request, they are also available in many other colors.

Our range includes polyurethane, acrylate or silicone rubber sleeveings, as well as fibre glass sleeveings. They are available with or without UL certification and in thermal classes A to C.



Fibre glass sleeveings or non-woven sleeveings suitable for use as temperature resistant protective insulation of conductors in electrical machines, transformers and series application in electrical engineering and electronics.

#### **F/GS AC UL**

Thermal class F / 155 °C

- coating on acrylic basis
- full UL approval UZFT2, UZFT8
- E 468446, grade 7 kV
- high UV stability
- high resistance to solvents

#### **F/GS (UL)**

Thermal class F / 155 °C

- coating on PUR basis
- with or without UL approval UZKXZ
- E 363755
- flame retardant

#### **H/GS (UL)**

Thermal class H / 180 °C

- Coating on silicone basis
- with or without UL approval UZIQ2
- flame retardant VW-1

#### **Silicone sleeving**

Thermal class H / 180 °C

- non-woven
- extruded sleeving on silicone basis
- highly flexible



# SynChem

## Resins & Varnishes

### **From selected suppliers – for the sake of employees and the environment**

In the winding industry, impregnating agents are used to solidify the windings and protect them from external influences such as moisture, dust or chemicals. This increases the service life of the products, and the windings can withstand the forces generated during operation. In addition, the impregnating agents are used for electrical insulation and increase thermal conductivity.

For the protection of the environment and employees, SynFlex uses extremely compatible impregnants. We offer solvent-free, low-emission and environmentally-friendly impregnating agents expressly for these purposes: Impregnating, trickling and casting resins, electric UV resins, varnishes and sprays, as well as impregnating varnishes with water as a solvent – low odor for a pleasant working environment.

The range also includes: sealing compounds, electro pastes, adhesive pastes and other miscellaneous additives.



## **Voltatex® 4200 Series**

Thermal class H / 180 °C

- low-emission 1-component impregnating resin
- based on polyesterimide
- UL approved E 101752 (M)
- high temperature resistance
- minimal workplace pollution
- can be processed using impregnating, dip, VPI and current-UV procedures
- shelf life: 6 months

### **Voltatex® 4200**

- setting for highly-stressed electric motors, stators and particularly rotors
- freon 12-resistant

### **Voltatex® 4250**

- current-UV impregnating resin for stators

### **Voltatex® 4204**

- electric motors, generators, including large machines and transformers
- particularly for Mica-insulated litz cables
- for the medium- and high voltage range

## **Damisol 3630 Series**

Thermal class H / 180 °C

- Low-emission 1-component impregnating resins based on polyesterimide
- UL approved E 98511 (VOC free)
- no solvents
- no MAC value
- shelf life: 12 months

### **Damisol 3630 VPI 01**

- pseudoplastic setting for improved resin absorption and thickness of impregnant coating for transformers and large stators

### **Damisol 3630 HTP 01/300**

- resin of very-low viscosity
- standard resin for stators and rotors

## **Damisol**

Thermal class H / 180 °C

- 1-component casting resin based on epoxide
- low viscosity

### **Products:**

- Damisol 3500 LoV
- Damisol 3418 API

## Dolphon® XL 2100 Series

Thermal class H / 180 °C

- low-emission impregnating resins based on polyester
- UL approved E 317427 and E 317429
- rapid hardening
- good baking resistance
- no MAC value
- can be processed in impregnating, dip, VPI and in current-UV procedures
- shelf life: 12 months

### XL2102

- standard resin for stators and rotors

### XL 2103

- pseudoplastic setting for transformers and large stators and rotors
- high film thickness
- high resin absorption
- very good penetration behaviour

### XL 2109

- current-UV impregnating resin for stators

### XL 2112

- particularly environmentally-friendly impregnating resin
- low-emission

## AQUA-THERM Series

Thermal class H / 180 °C

- 1-component water-based varnishes
- very low emissions
- very low resin application
- hardens quickly
- good baking resistance
- highly flexible
- good electrical properties
- can be used for impregnating rotors, stators and transformers of up to medium size
- shelf life: 12 months

### AQUA-Therm BC-367/832-D

- 1-component varnish based on saturated polyester

### AQUA-Therm BC-380/870-D

- 1-component varnish based on epoxy resin





### **Voltacast 3000 Series**

Thermal class E / 120 °C to B / 130 °C

- 2-component polyurethane casting resin
- resin based on polyester polyethers containing hydroxyl groups
- hardener based on aromatic polyisocyanates
- resistant to transformer oil, organic solvents, and vapours such as petrol and hydrocarbons
- good adhesion to most metals
- for casting transformers, structural elements and units, as well as small objects
- non-abrasive
- recommended hardener: Voltacast H

#### **Products:**

- Voltacast 3100 / H131
- Voltacast 3110 / H132
- Voltacast 3200 / H132
- Voltacast 3210 / H131

### **WEVOPUR Series**

Thermal class B / 130 °C to F / 155 °C

- 2-component polyurethane casting resin
- resin based on polyurethane and modified polyurethanes
- no halogenated flame retardants
- non-abrasive mineral filler
- UL approved E 108835
- recommended hardener: WEVONAT

#### **Products:**

- WEVOPUR 390 / WEVONAT 300
- WEVOPUR 403FL / WEVONAT 300 RE
- WEVOPUR 552FL / WEVONAT 300
- WEVOPUR 7210FL / WEVONAT 507

### **Damival® 13682/13481**

Thermal class B / 130 °C

- 2-component casting resin based on polyurethane
- free from CMR substances
- MDI-free hardener
- temperature range for application: -60 °C to +150 °C
- very low water absorption
- high thermal conductivity
- flexible even at low temperatures
- for casting delicate objects



# SynPrep

## Stamped & Shaped Components

The range of SynPrep stamped and shaped components is very comprehensive and offers individual product solutions in perfection. The products are used for covering, insulating, protecting, underlaying and insulating.

SynFlex offers a wide range of stampings and preformed parts: as rolls (with remnants removed), component parts, single- and double-sided adhesive or non-adhesive, with or without grip handle, printed or plain.

We cut, stamp, mill and saw preformed parts, or produce them using water jet cutting. A wide variety of materials are processed into individual punched parts, including all types of films, non-wovens, foams, fabrics, laminates, but also mineral materials such as graphite.

The fields of application are as versatile as the cut pieces themselves. Customers come from the automotive industry, the electrical and electronic industries, medical and shielding technologies and communication and information technologies. You simply provide us with drawings, sketches, CAD graphics or explain your ideas. We will then work with you to find the matching solution.

### Basic materials

- films (polyester, PEN, polyimide)
- papers (aramid, pressboard)
- glass fibre
- laminates
- graphite
- foams
- fabrics
- metals (copper, aluminium)
- customer specific materials

### Functions of basic materials

- protection
- insulation
- marking
- soft bearing
- sealing
- cushioning
- heat transmission
- others





### Applications

- electronic - devices/control cabinet construction, printed circuit boards, media
- electrical engineering - electric motors, transformers, relays
- wind energy - rotors, generators, blades
- automotive applications
- white goods
- powder coating
- varnishing
- medical technology

### Production processes

- rotary stamping
- stroke punching
- punching with punch/matrix tools
- laser punching

### Dimensions

- material thickness from 50 - 2,000  $\mu\text{m}$
- max. dimensions 500 x 500 mm

### Formats

- flat lying with embossed lines, bending edges or perforation
- bent, preformed as individual part or on rolls

### Our service

- technical application advisory (also on-site)
- technical approvals according to PPAP specifications
- support in the selection of suitable materials
- testing in proprietary SynLab® test lab
- manufacturing also in small series
- issue of test certificates
- integrated UL approval through UL repackaging certificate



# SynWrap

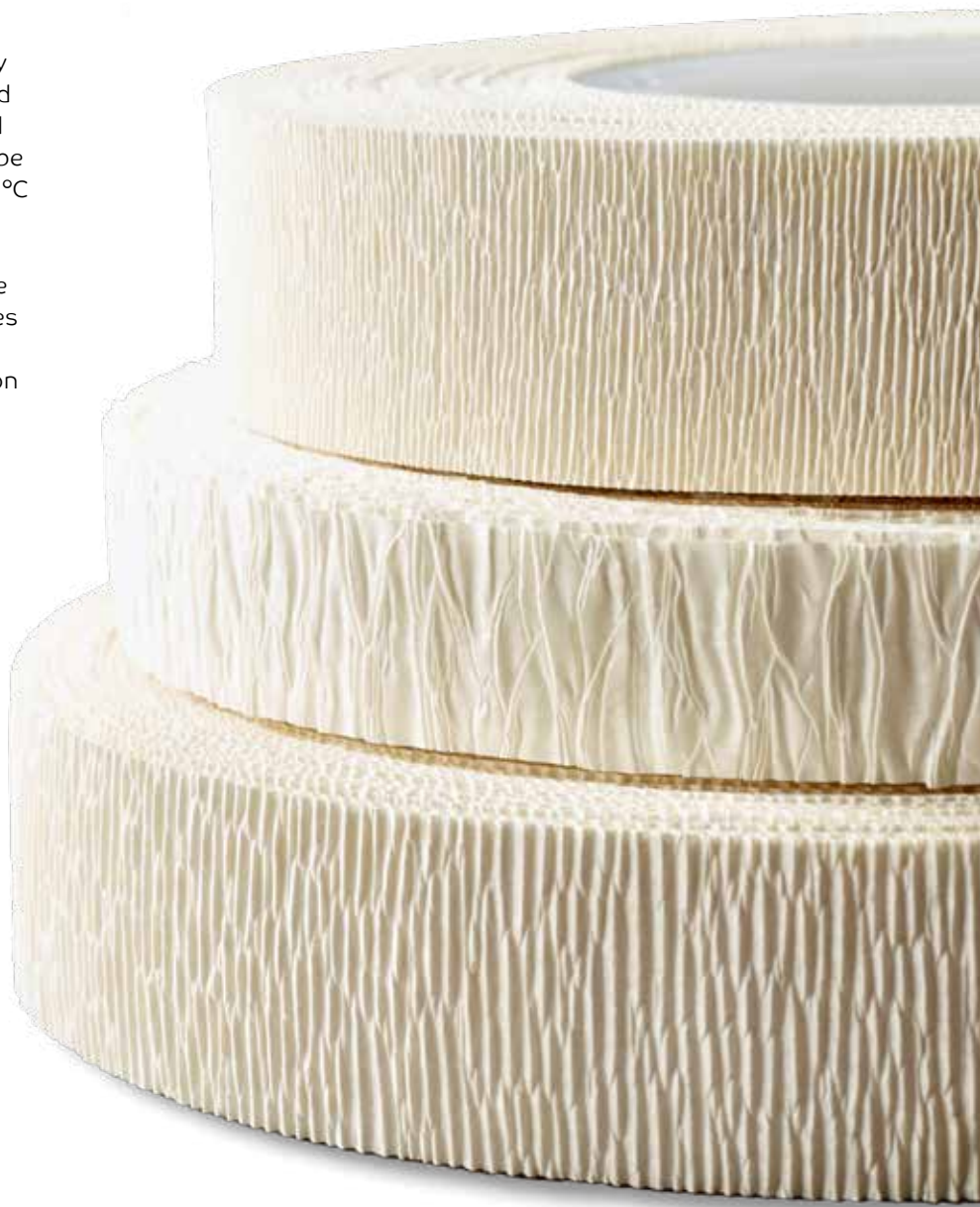
## Wrapping Tapes

The product group SynWrap contains various winding and wrapping tapes which are used for taping, winding and insulating components in electrical engineering. The most common application is the taping of winding heads in electric motors. In addition, winding tapes are used to fix components in electric motors and transformers.

Each tape in the SynFlex range has its own individual advantages. Among other things, the shrinkage of polyester shrink tape can increase the packing density of the winding during hardening.

Glass fibres are, for example, suitable for very high temperatures, resistant to chemicals and inelastic. The glass fibre tape is characterized by its extraordinary tensile strength and can be exposed to a continuous temperature of 450 °C without loss of strength.

On the other hand, our SynTherm® crepe tape can also be used very well at low temperatures down to -190 °C and is used in winding applications with increased demands on elongation and flexibility for the insulating material.



In addition to the company-specific product ranges of SHWire, SynFlex and IsoTek, the SynFlex Group offers all customers interdisciplinary services to which they have access at all times.

You can take advantage of these Group-wide services internationally at any time in all the SynFlex locations in Europe, Asia, Turkey and beyond.

**SynFlex Group and UL –  
A strong partnership**

As the first test laboratory in Europe to participate in the UL Third Party Test Data Program, the SynLab® carries out all the tests required for the enhancement and new configuration of an EIS.

The objective of this cooperation is to support customers in new approval, enhancement or adaptation of existing UL systems.

**The SynLab® test laboratory –  
Comprehensive testing services**

The SynFlex Group test laboratories at the SynFlex locations in Blomberg and Shanghai, and at headquarters of SHWire in Lügde are known for their variety of thermal, mechanical, chemical and electrical testing procedures.

The SynLab® is regularly inspected by UL, thus confirming its competence. The qualification is achieved by UL audits performed in our laboratory according to international and national standards, in particular the standard UL 1446 “Systems of Insulating Materials General”. Due to its memberships in expert committees SynFlex is involved in change and validation processes of norms and standards. Customers thus benefit from optimal project processing and a state-of-the-art laboratory that can carry out short or long-term tests according to UL 1446 and IEC standards or customer-specific tests for systems or materials.

**SynServ – services of the SynFlex Group  
Logistics competence**

Rapid and reliable availability of goods is the core objective of logistics in the SynFlex Group. From Blomberg, we supply our logistics and production plants of our subsidiaries and affiliates worldwide. Moreover, the complete logistics of SHWire are handled via the logistics center at the Blomberg plant.

**Metal trading**

Fluctuating volumes of demand, volatile commodity exchange prices and the necessity of a reliable basis for calculation are realities that are extremely difficult to reconcile when dealing with metals. To provide you, as a customer and partner of SynFlex Group, with greater certainty, not only commercially but also organizationally, we offer you several services, for example copper hedging, alongside the material supply of copper and aluminum.

**Product management**

The product management of the SynFlex Group provides you with competent support in the development, optimization and implementation of new ideas. We calculate, test and certify materials, components, structures, products or production processes. The technical and economic know-how of our product managers bridges the gap between research and market-driven products.



### **SynFlex International**

The network of the SynFlex Group provides its customers with consistent quality of service and products, goods availability and professional advice. We have production and logistics capacities at every location in Europe, Asia and Turkey. Thanks to our extensive sales network, we are also active in countries where we do not have a site, and we can provide individual advice there.

### **SynFlex Scandinavia**

With our location in Copenhagen, we deliver to all of Scandinavia and parts of the Baltic countries.

### **SynFlex France**

With our location in Paris, we supply France, the southern countries of Spain and Portugal, as well as North Africa.

### **SynFlex Italy**

With our location in Bologna, we deliver to customers in Italy and to neighboring countries in the Eastern Mediterranean region.

### **SynFlex Austria**

Our location in Vienna covers not only the Austrian market but also the entire Southern and Eastern European region from the Czech Republic and Bulgaria to the Ukraine.

### **SynFlex Poland**

With our location in Warsaw, we deliver to customers in Poland, the southern Baltic countries, all the way to Belarus.

### **SynFlex Turkey**

With our location in Istanbul, we supply customers in Turkey. At the same time, this location serves as a gateway to the Caucasus and the Middle East.

### **SynFlex China**

With our location in Shanghai, we serve the vast Chinese market, along with all neighboring countries in Central, Southern and Eastern Asia.

At highest level.  
The complete **SynFlex** product range.

## **SynFlex** Winding

**SHWire**  
Premium Winding Wires

**SynWire**  
Winding Wires

**SynWire WW**  
Litz & Special Wires

**SynShield®**  
Copper &  
Aluminium Foils

## **SynFlex** Insulate

**SynTherm®**  
Insulating Materials

**SynTape®**  
Electrical Adhesives Tapes

**SynSleeve**  
Electrical Insulating  
Sleeving

**SynChem**  
Resins & Varnishes

**SynPrep**  
Stamped & Shaped  
Components

**SynWrap**  
Wrapping Tapes

## **SynFlex** Connect & Equip

**SynCon®**  
Connecting Cables &  
Transformer Terminals

**SynTemp®**  
Temperature Monitoring

**SynProf**  
FRP Profiles

**SynParts**  
Special Components &  
Accessoires

## **SynFlex** Group

**SynLab®**  
Laboratory Services &  
UL Services acc. to 1446

**SynServ**  
Consulting & Services

**SynFlex** International  
SynFlex Scandinavia  
SynFlex Austria  
SynFlex Poland  
SynFlex Italy  
SynFlex France  
SynFlex Turkey  
SynFlex China

Common Goal – Joint Progress:  
The Resource of Power.



Insulation Systems, [www.synflex.com](http://www.synflex.com)



Magnet Wires, [www.sh-wire.de](http://www.sh-wire.de)



Electric Insulation, [www.isotek-gmbh.de](http://www.isotek-gmbh.de)