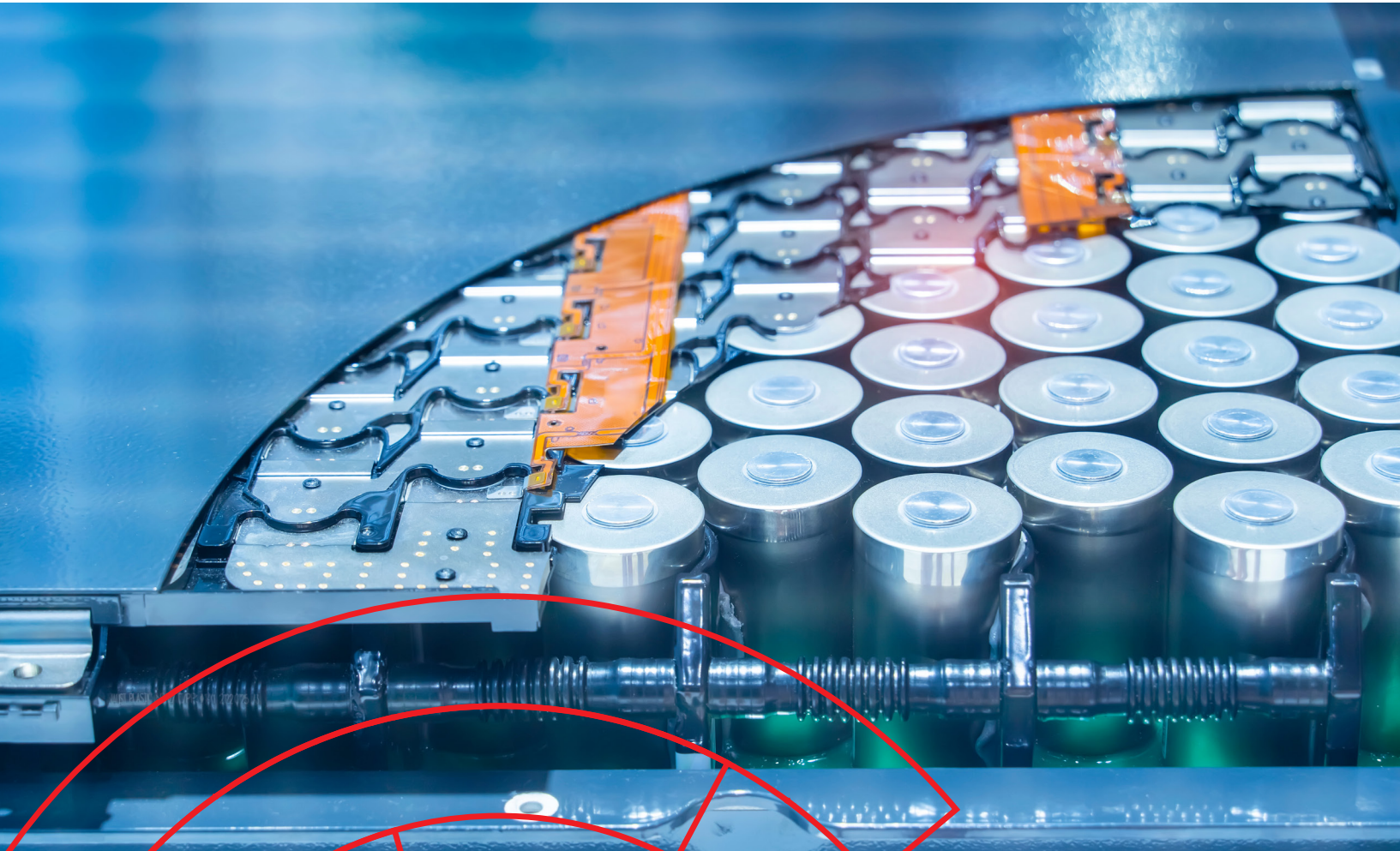




Insulation Systems
Part of SynFlex Group



High-performance materials for battery systems

Your one-stop shop

System solutions for the battery of tomorrow

SynFlex – The System Specialist

Modern battery systems place the highest demands on materials, processes and partnerships.

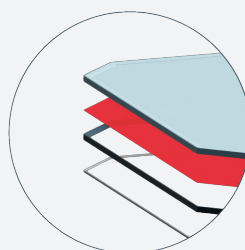
As a system provider, we do not just supply you with components - we provide solutions: **Safe, tried and tested, and ready for series production.**

Since 1963, SynFlex has been a system supplier of conductive and insulating materials for electrical insulation systems. In the field of insulating materials, we offer a broad portfolio of technical films, multilayer laminates and functional materials - specially developed for cell, module and system levels. Thanks to our many years of cooperation with leading OEMs and suppliers, our automotive certifications (including IATF 16949) and our partnership-based development approach, we are a reliable and experienced partner — from the initial idea to series production.

Modular insulation materials for safe battery systems

Thermal Management

Flame barrier / heat shield
Thermal propagation protection
Heat management

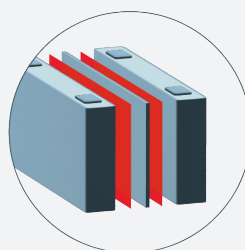


Flame barrier

(z.B. Fibercork, 3M™ FRB-NT, Calin 412)

Electrical insulation

High voltage insulation
Busbar protection

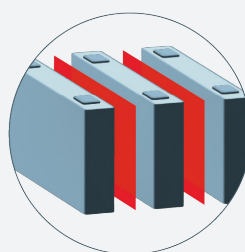


Thermal runaway protection

(z.B. Fibercork, 3M™ FRB-NT, Calin 412)

Structural adhesives

Bonding
Sealing
Damping / cell spacer



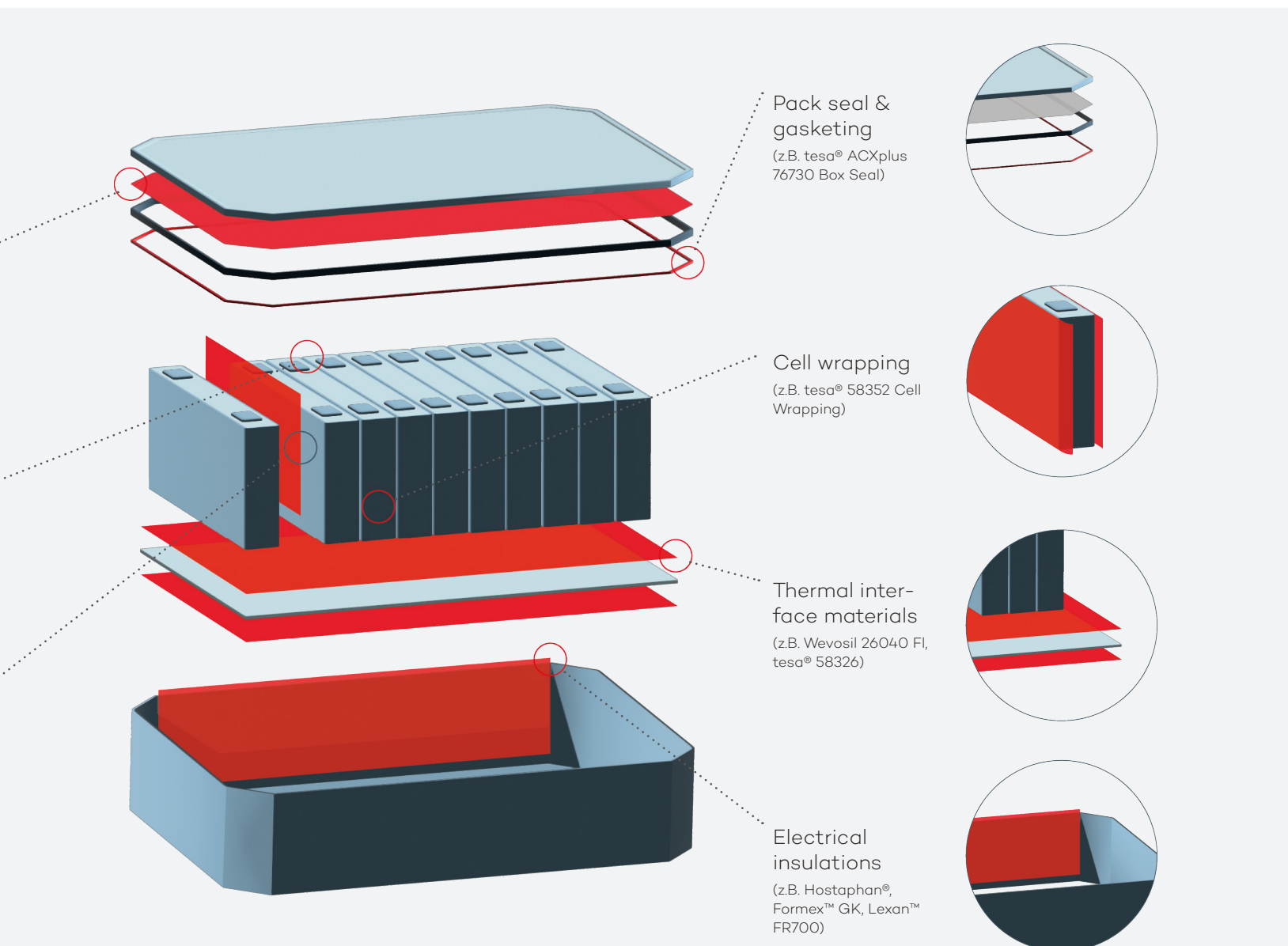
Cell to cell bonding

(z.B. SynTape® A16-320, tesa® 58374)



Our one-stop shop service promise

- 1. Consulting & Partnership** - At your side, right from the start - solution-oriented and technically substantiated - from concept to series production.
- 2. Semi-finished materials** - Insulating materials and laminates, adhesive tapes and thermal barriers – adapted to cell, module and system level.
- 3. Converting & Packaging** - Bent and stamped parts, customized and ready-to-use for your production processes.
- 4. SynLab® Testing & Certification** - Varied laboratory services – for maximum safety.
- 5. Supply chain & Availability** - Reliable and transparent logistics for worldwide deliveries.
- 6. Partner of the Automotive Industry** - IATF 16949, ISO 9001



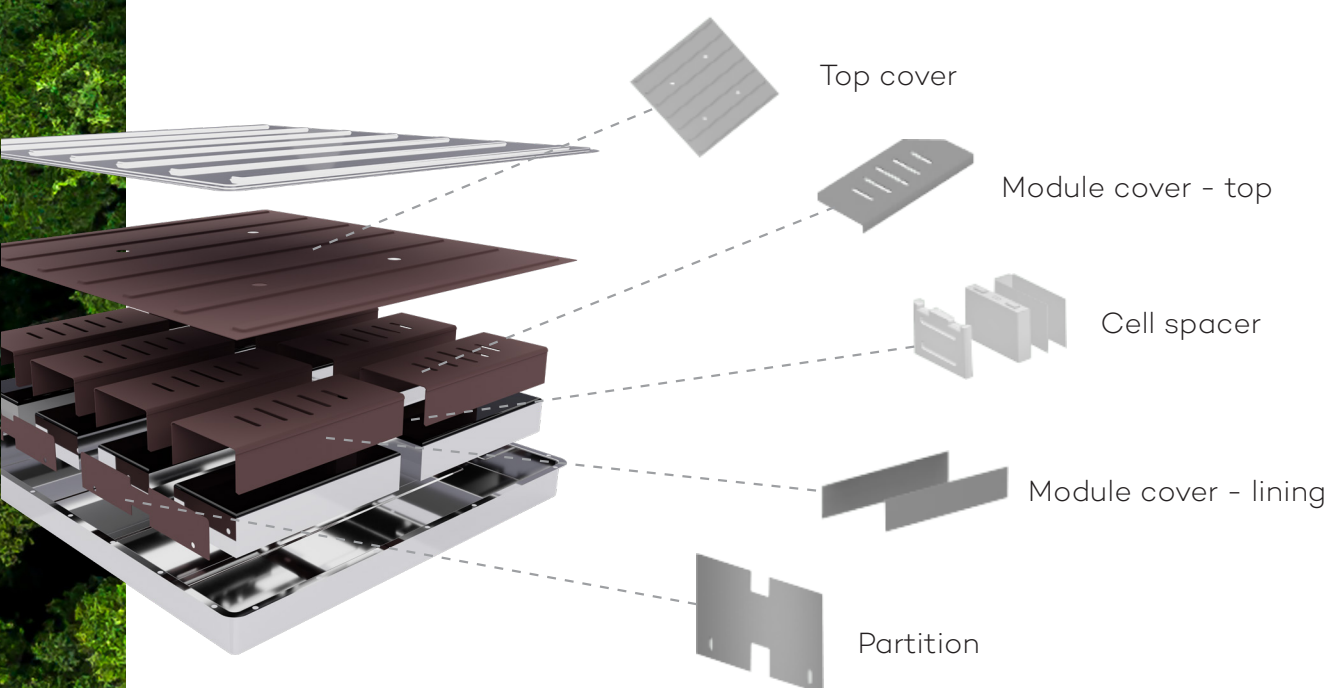
The new standard for sustainable battery safety

FiberCork - Sustainably safe against thermal runaway propagation

FiberCork und FiberCork+ are our response to the growing demand for thermal safety and sustainability in battery systems. These innovative, CO₂-negative multilayer materials have been specially developed to prevent thermal runaways from spreading in battery storage systems. The unique material combination of cork, beech and glass fiber offers

effective flame protection up to 1200 °C, and is recyclable, meeting the future requirements of the EU Battery Regulation –ideal for use in BEVs and BESSs.

- **Multilayer composite:** cork, beech, glass fiber
- **Fire-resistant:** up to 1200 °C (torch test)
- **CO₂-negative:** -4.4 kg CO₂e/kg
- **Recyclable:** >50 % renewable raw materials
- FiberCork helps to fulfil the requirements of **GB 3031:2020**, EU Supply Chain Act



Fulfil the highest international standards

- Certified safety:** FiberCork fulfils the requirements of the international standard GB 38031:2020 for rechargeable battery systems.
- Proven durability:** Outstanding performance in the **UL 2596** Torch and Grit Test what demonstrates superior fire resistance.

FiberCork and FiberCork+ by comparison

	FiberCork		FiberCork+		Mikanit	Aerogel	
Material Source	Europe		Europe		Varying sources such as India	Varying sources	
Density	up to 1.5 g/cm³	✓	up to 1.5 g/cm³	✓	2.00 - 2.36 g/cm³	✗	0.18 g/cm³ ✓
Thermal conductivity	0.118 W/(mK)	✓	0.092 W/(mK)	✓	0.30 W(mK)	✗	0.035 W(mK) ✓
Electrical conductivity	Not conductive	✓	Not conductive	✓	Not conductive	✓	Not conductive ✓
Protection against electrical discharges (Arc)	Protection fulfilled	✓	Protection fulfilled	✓	Protection fulfilled	✓	No data
Share of renewable resources	>50 %	✓	>65 %	✓	0 %	✗	0 % ✗
Recyclability	Recycable	✓	Recycable	✓	No data	✗	No data ✗
Responsible sourcing	Transparent supply chain	✓	Transparent supply chain	✓	No data		No data
Welding torch test	>15 min	✓	>5 min	✓	>15 min	✓	No data
Particle bombardement test	Unsuccessful	✗	Successful	✓	Unsuccessfull	✗	Unsuccessfull ✗
OEM assembly	No restriction	✓	No restriction	✓	Installation with mounting aid only	✗	Installation with mounting aid only ✗
Molding possibilities	Deformation possible	✓	Deformation possible	✓	Deformation restriction	✓	Deformation possible ✓

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Wide range of insulating and adhesive solutions for e-mobility and storage

For electrical insulation, flame protection, heat management and assembly & sealing

Our portfolio includes technical films, adhesive tapes, laminates, aramid papers and other materials and solutions - customized for cell, module and system levels. Whether electrically insulating, flame-retardant, thermally conductive or adhesive: Our solutions fulfil the highest requirements for battery applications, are flexible to combine into system solutions - tested, automotive-approved and ready for series production.

Thermal propagation protection / Flame barrier						
Product	Breakdown voltage* [KV]	Thickness [mm]	Protection level* °[C]	Thermal conductivity* [W/mK]	CTI	Flame class
FiberCork	5-15	1.4 - 5	700-1,200°C (>10 min, torch test)	0.118	-	UL 2596 TaG
FiberCork +	5-15	1.8 - 5	700-1,200°C (>10 min, torch test)	0.092	-	UL 2596 TaG
Calin 412	-	1.8 - 10	1,000°C	0.08	-	-
3M™ FRB NT	1.1 - 8	0.076 - 0.381	IEC 60695-2-1 Glow wire flammability index (GWFI) 960°C	0.15-0.25	600	UL 94 V-0, 5VA
Wevosil 22027 FL	-	-	1,000°C short therm	0.2	-	UL 94 V-1

Thermal interface materials							
Product	Thermal Conductivity [W/mk]	Type	Shore Hardness	Viscosity [mPa*s]	Temperature [°C]	Flame Class	Hardening time [h]
Wevosil 26040 FI	4.0	Silicone	Shore 00 60-80	100,000-150,000	-60°C to +200 °C	UL94 V-0	4
tesa® 58326	2.0	Acrylic Thermal Tape 1.2mm, 15KV	Shore 00 87STK	-, solid tape	-40 to +100	-	-
tesa® 58395	0.6	Acrylic Thermal Tape 0.25mm, 4KV	Shore 00 70 STK	-, solid tape	-40 to +125 (+150 short term)	-	-

Electrical insulation							
Product	Material	Breakdown voltage* [KV]	Thickness [mm]	Temperature	CTI [V]	Flame class*	UL file
Hostaphan®	PET film Polyethylen-terephthalat	4.5-30	0.019-0.500	-70 to 150	-	-	E53895
Melinex® 238		16-26	0.125-350	-70 to 150	≥ 600	VTM-2	E93687
Mylar® A		6.1-21	0.019-0.350	-70 to 150	400-599	VTM-2	E93687
SynTherm® P		4.5-26	0.023-0.350	-40 to 140	-	-	-
Nomex® 410	Aramid paper	0.9-20	0.05-0.760	-190 to 180	175-249	UL 94 V-0	E34739
SynTherm® YT510		0.65-14.4	0.05-0.760	-190 to 180	400-599	UL 94 V-0 / VTM-0	E358562
Kapton® HN	PI film (polyimide)	7.5-19.25	0.025-0.125	-190 to 240	100-175	UL 94 V-0	E39505
SynTherm® H		3.75-22	0.025-0.200	-190 to 240	100-175	UL 94 V-0	E358562
Formex™ GK	PP film (polypropylen)	11-41	0.127-1.57	to 115 °C	≥ 600	UL 94 V-0 / VTM-0	E121855
SynTherm® HV-D	ETFE film (Ethylen-Te-trafluorethylen)	17-29	0.1-0.25	-40 to 150	≥ 600	VTM-0	-
Teonex® Q5 100	PEN film (polyethylen-naphthalat)	9.6-28.7	0.012-0.250	-40 to 160	175-249	UL 94 VTM-2	E51743
Lexan™ FR700	PC (Polycarbonat)	14-44	0.250-0.750	-40 to 150	-	UL94-V0	E121562, E207780, E45329

Electrical insulation tapes (single side adhesive)							
Product	Film Material	Adhesive	Film Thickness / Total Thickness [mm]	Breakdown voltage* [KV]	Temperature [°C]	Flame Class	UL file
PET Tapes							
DuPont™ Kapton® Polyimidefolie (Intertape® 4118)	Polyimide Tapes / Kapton®	Silicone	0.025 / 0.067	7	-60 to +260	UL510	E20780
SynTape® H/ 560		Silicone	0.025 / 0.060	6	to 180	UL 510	-
SynTape® H/ 660		Silicone	0.050 / 0.065	10	to 180	UL 510	-
Isotape® 4419PV3		Silicone	0.050 / 0.090	8	-73 to 260	-	-
Intertape® 4616	Woven Glas Fiber	Rubber	0.127 / 0.178	2.5	to 155	BU 2	E20780
Intertape® 4617		Acrylic	0.127 / 0.178	3	to 155	BU 2	E20780
Intertape® 4618		Silicone	0.127 / 0.178	2.5	to 200	BU 1	E20780
Isotape® 4637PV3		Acrylic	0.145 / 0.180	2.5	to 155	-	E315249
Isotape® 4638PV3		Silicone	0.125 / 0.190	4	to 200	-	E315249
SynTape® B 616/ GL.95		Rubber	0.120 / 0.170	2.5	to 130	-	E 178 430
SynTape® F 562/ GL.94		Acrylic	0.120 / 0.165	2.5	to 155	-	E 178 430
SynTape® H 618/ GL.96		Silicone	0.120 / 0.170	2.5	to 180	UL 510	E 178 430
SynTape® X50		Aramid / No-mex®	Acrylic	0.050 / 0.100	2.5	to 155	-
SynTape® X80		Aramid + Polyimide	Acrylic	0.080 / 0.120	3.8	to 155	-
SynTape® 6455	Teonex® (PEN)	Rubber	0.080 / 0.135	7	-	-	-
SynTape® H/ K.30		Silicone	0.025 / 0.060	6	to 180	-	E 178430

Bonding and sealing (double side adhesives tapes and transfer materials)							
Product	Backing	Adhesive	Backing Thickness / Total Thickness [mm]	Breakdown voltage* [KV]	Adhesion to Steel [N/cm]	Temperature [°C]	Flame Class
SynTape® S2 AG100	none (transfer tape)	Acrylic	0 / 0.100	-	10 after 24 h	-40 to +200	-
SynTape® S20011	none (transfer tape)	Acrylic	0 / 0.50	-	8 after 24 h	-40 to +180	-
SynTape® A16-320	PET None Woven, 12 g/ m²	Acrylic	0.100 / 0.100	-	6.4	-40 to +100	-
3M™ no. 4646F	none (transfer tape)	Acrylic	0 / 0.6	-	25	-35 to +150	-
H220 H-Old	Kapton®	Silicone	0.025 / 0.100	7	2.7	180°C, short term +260°C	UL 510
ATP S- 4610 FR	PES/PVA mesh	Acrylic	0.09 / 0.09	-	6 after 24h	-40 to +140	VTM-0
tesa® 58374	PET	Acrylic	0.069/0.100	6	8.2 / 9.2 after 14 days	+125 short term +200	UL94 VTM-0
tesa® ACXplus 76730 Box Seal	Acrylic Foam	Acrylic	2.8	-	5	1050 °C (5 minutes)	-

Cell wrapping (cell insulation)							
Product	Film Material	Adhesive	Film Thickness / Total Thickness [mm]	Breakdown-voltage* [KV]	Adhesion to steel [N/cm]	CTI [V]	UL file
tesa® 58352 Cell Wrapping	PET tape	Acrylic	0.023/0.085	7	4.5	400 Backing / 600 Adhesive	-

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SynFlex

The System Expert.

For the entire Electrical Insulation System.

Winding

Premium Winding Wires

SHWire

Winding Wires

SynWire

Litz & Special Wires

SynWire WW

Copper & Aluminium Foils

SynShield®

Insulate

Insulating Materials

SynTherm®

Electrical Adhesives Tapes

SynTape® - Intertape® - Isotape®

Electrical Insulating Sleeving

SynSleeve

Resins & Varnishes

SynChem

Stamped & Shaped Components

SynPrep

Wrapping Tapes

SynWrap

Connect & Equip

Connecting Cables

SynCon®

Temperature Monitoring

SynTemp®

Special Components & Accessoires

SynParts

SynFlex Group

Laboratory Services & UL Services acc. to 1446

SynLab®

Consulting & Services

SynServ

SynFlex International



Your Leading Partner.
For Electrical Insulation Systems.

