

SynFlex

Winding

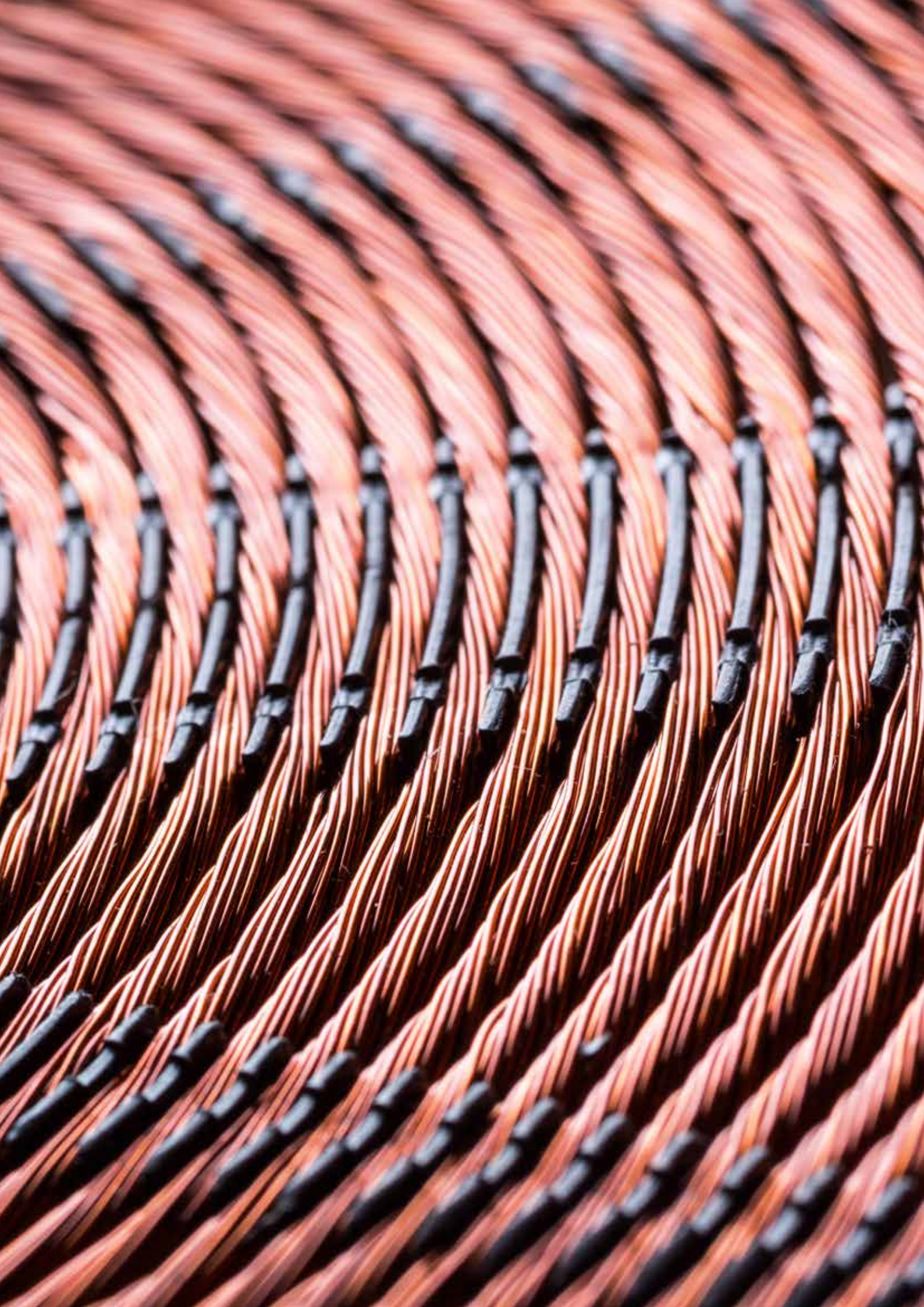


SynFlex

Winding

The Winding product segment includes all conductive materials for winding electrical motors, transformers and electric motors. Round and flat enameled copper and aluminum wires form the largest share of this segment. In addition to specialties such as the extremely conductive SHTherm® 210/220 Glide, you can also find very customized products in the SynWire WW range, in addition to the premium winding wires from SH Wire. These are conductors of copper and aluminum wound with tapes of insulating materials. In addition to these special wires, this product group includes round and flat (HF) litz cables, as well as bare round and pressed litz cables, which in turn are additionally wrapped or wound with insulating materials or yarns. The SynShield® as a special solution especially for transformer construction is a copper and aluminum tape that is shielded with insulating materials.





SHWire

Premium Winding Wires

The round and flat enameled copper and aluminum wires from SHWire are marked by their outstanding quality. In-house developed and patented monitoring systems can continuously and fully monitor more than 150,000 km of produced enameled wire per day. In addition, trained personnel carry out production-related tests according to a clearly defined cycle and specifications. In addition to traditional solderable and heat-resistant wires, the portfolio of Premium winding wires also includes special versions such

as the extremely conductive SHSold® V180 Glide, SHTherm® 210/220 Glide enameled wire and the SHBond® WD210 Glide as self-bonding wire. In addition to all round enameled wire versions, we also offer you a comprehensive portfolio of flat wire dimensions. SHWire also serves as conductor material for the SynWire WW wrapped copper and aluminum conductors. In this way, we combine products from SHWire and SynFlex – a strength of the SynFlex Group.

SHTherm® Series

Type	Acc. to IEC/ NEMA	UL-File Nr.	Enamel type & thermal class	Production range (mm)
SHTherm® V180 partially solderable	60317-23 MW 77-C	E75926 (M)	polyesterimide class 180	grade 1 on request grade 2 on request
SHTherm® 200 thermoresistant	60317-08 MW 30-C	E75926 (M)	THEIC mod. polyesterimide class 180	grade 1 on request grade 2 on request
SHTherm® 210 thermoresistant	60317-13 MW 35-C	E75926 (M)	THEIC mod. polyesterimide + polyamide-imide class 200	grade 1 0.112 - 2.500 (> 2.500 on request) grade 2 0.112 - 4.000 (> 4.000 on request)
SHTherm® 210 Glide thermoresistant self-lubricating	60317-13 MW 35-C	E75926 (M)	THEIC mod. polyesterimide + polyamide-imide class 200	grade 1 0.112 - 2.500 grade 2 0.112 - 2.500 (> 2.500 on request)
SHTherm® 210 TE thermoresistant partial discharge resistant	60317-13 MW 35-C		THEIC mod. polyesterimide + polyamide-imide class 200	grade 2 on request
SHTherm® 210 Alu thermoresistant	60317-25 MW 35-A	E75926 (M)	THEIC mod. polyesterimide + polyamide-imide class 200	grade 1 1.250 - 4.000 grade 2 1.250 - 4.000 (< 1.250 on request) (> 4.000 on request)
SHTherm® 220 thermoresistant	60317-26	E75926 (M)	polyamide-imide class 220	grade 1 0.200 - 1.200 (> 1.200 on request) grade 2 on request
SHTherm® 220 Glide thermoresistant self-lubricating	60317-26		polyamide-imide class 220	grade 1 0.200 - 1.200 (> 1.200 on request) grade 2 on request
SHTherm® 210 Flat thermoresistant	60317-29 MW 36-C / MW 38-C	E75926 (M)	THEIC mod. polyesterimide + polyamide-imide class 200/220	grade 1 on request grade 2 2.00 - 100.00 mm ²
SHTherm® 210 Flat Alu thermoresistant	60317-73 MW 36-A		THEIC mod. polyesterimide + polyamide-imide class 200	grade 1 on request grade 2 on request
SHTherm® 220 Flat thermoresistant	60317-58 MW 84-C		polyamide-imide class 220	grade 1 on request grade 2 on request

SHSold® Series

Type	Acc. to IEC/ NEMA	UL-File Nr.	Enamel type & thermal class	Production range (mm)
SHSold® V155 solderable	60317-20 MW 79-C	E75926 (M)	polyurethan class 155	grade 1 0.050 - 0.100 (> 0.100 on request) grade 2 on request
SHSold® V180 solderable	60317-51 MW 82-C	E75926 (M)	polyurethan class 180	grade 1 0.050 - 1.600 (> 1.600 on request) grade 2 on request
SHSold® V180 Glide solderable self-lubricating	60317-51 MW 82-C	E75926 (M)	polyurethan class 180	grade 1 0.112 - 0.710 (> 0.710 on request) grade 2 on request

SHBond® Series

Type	Acc. to IEC/ NEMA	UL-File Nr.	Enamel type & thermal class	Production range (mm)
SHBond® WD210 thermoreistant self-bonding	60317-38 MW 102-C	E75926 (M)	THEIC mod. polyesterimide + polyamide-imide + bonding layer class 200	grade 1 0.150 - 1.250 grade 2 0.300 - 1.250 (> 1.250 on request)
SHBond® WD210 Glide thermoreistant self-bonding self-lubricating	60317-38 MW 102-C		THEIC mod. polyesterimide + polyamide-imide + bonding layer class 200	grade 1 on request grade 2 on request
SHBond® WD210 Alu thermoreistant self-bonding	analog 60317-25 + bonding layer MW 102-A		THEIC mod. polyesterimide + polyamide-imide + bonding layer class 200	grade 1 on request grade 2 on request

SHBare® Series

Type	Acc. to IEC/ NEMA	UL-File Nr.	Enamel type & thermal class	Production range (mm)
SHBare®	1977 CU-ETP1		blank	Dim. acc. to IEC 60317-0-1 more on request
SHBare® Flat	1977 CU-ETP1		blank	Dim. acc. to IEC 60317-0-1 more on request

SynWire

Winding Wires

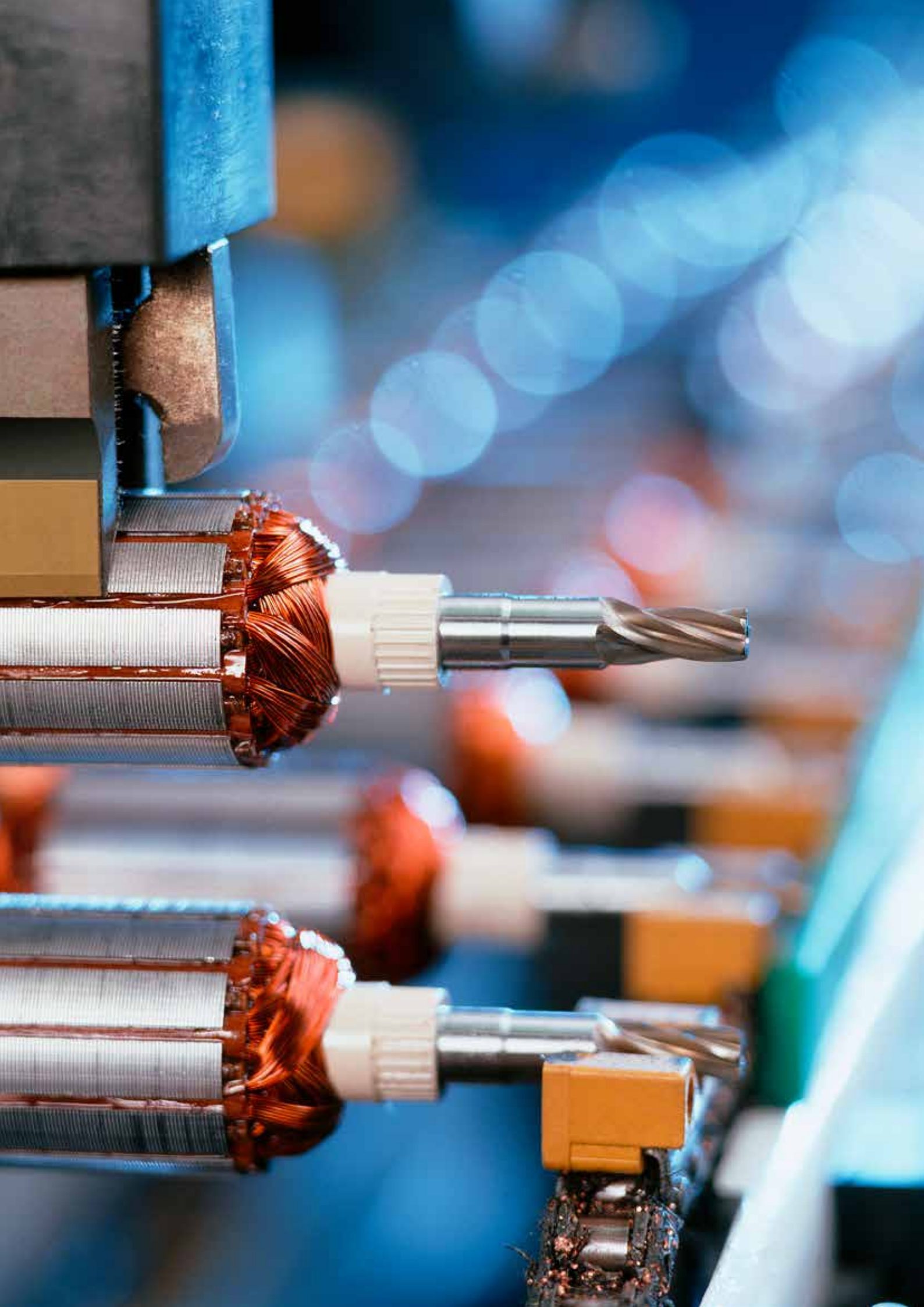
SynWire winding wires are available in various dimensions and with a vast range of properties. SynFlex offers round enameled copper wires in dimensions from 0.053 to 6.00 mm as directly tin-plated, heat-resistant or self-bonding wires.

The flat enameled wires are available in over 300 different dimensions from 2.0 x 0.8 to 20.0 x 5.0 mm.

Upon request, SynFlex also offers wrapped wires in various dimensions. The wrapping can be produced with aramid paper, mica film or fine mica on fibreglass.

In addition to wires, SynFlex also offers copper tapes in thicknesses from 0.035 to 2.0 mm in widths from 10 to 800 mm. Individual dimensions are also available upon request.

The range is made complete by round aluminum wires. The standard dimensions in the aluminum wire segment run from 0.4 mm to 4.5 mm.



SynWire

Winding Wires

SynWire V 155

Thermal class F / 155 °C

Properties

- insulated with polyurethane
- DIN EN / IEC 60317-20
- DIN EN / IEC 60317-0-1
- NEMA MW 79-C
- UL approved
- solderable
- resistant to commercial impregnants

Applications

- transformers
- relays
- contactors
- magnetic coils
- small motors

SynWire V 180

Thermal class H / 180 °C

Properties

- insulated with polyurethane
- DIN EN / IEC 60317-51
- DIN EN / IEC 60317-0-1
- NEMA MW 82-C
- UL approved
- solderable
- resistant to commercial impregnants

Applications

- transformers
- electric motors
- magnetic & ignition coils
- control gear

SynWire W 210

Thermal class N / 200 °C

Properties

- insulated with THEIC mod. polyester-imide plus polyamide-imide
- DIN EN / IEC 60317-13
- DIN EN / IEC 60317-0-1
- NEMA MW 35-C
- UL approved
- resistant to commercial impregnants and freons, dry transformer and hydraulic oils

Applications

- transformers
- electric motors
- pump drives
- power tools
- control gear
- refrigerators
- generators
- applications subject to particularly high mechanical and chemical loads

SynWire Self-bonding 155

Thermal class F / 155 °C

Properties

- insulated with polyurethane plus adhesive coat based on polyamide
- DIN EN / IEC 60317-35
- DIN EN / IEC 60317-0-1
- can be cured
- solderable

Applications

- self-supporting coils
- relays
- magnetic coils
- moving coils
- small motors

SynWire Self-bonding 180

Thermal class H / 180 °C

Properties

- insulated with polyesterimide plus adhesive coat based on polyamide
- DIN EN / IEC 60317-36
- DIN EN / IEC 60317-0-1
- UL approved
- can be cured
- solderable

Applications

- self-supporting coils
- TV-deflection coils
- motor stator
- magnetic coils
- moving coils

SynWire Self-bonding 210

Thermal class N / 200 °C

Properties

- insulated with THEIC-mod. polyesterimide plus polyamide-imide plus adhesive coat based on polyamide
- DIN EN / IEC 60317-38
- DIN EN / IEC 60317-0-1
- NEMA MW 102-C
- UL approved
- can be cured

Applications

- electric motors
- polar windings
- magnetic coils
- moving coils
- brake magnets

SynWire Rectangular wire W 210

Thermal class N / 200 °C

Properties

- insulated with mod. polyester plus polyamide-imide
- DIN EN/ IEC 60317-29
- DIN EN/ IEC 60317-0-2
- NEMA MW 36-C
- UL approved
- resistant to commercial impregnants, solvents, freons and transformer oils

Applications

- dry & oil transformers
- magnetic coils
- alternating and direct current machines
- generators
- applications subject to particularly high mechanical and chemical loads

SynWire W 210 ALU

Thermal class N / 200 °C

Properties

- Insulated with polyesterimide plus polyamide-imide
- DIN EN / IEC 60317-25
- NEMA MW 35-A / 73-A
- UL approved

Applications

- electric motor drives
- pump drives
- drives for household equipment
- control gears
- refrigerators
- transformers



SynWire WW

Wrapped copper & aluminium conductors

Production know-how and best possible quality

Our product policy follows the maxim – highest quality from a single source. We do not strive for quick success and partial solutions, but focus on comprehensive support for our customers.

Our state-of-the-art machinery enables us to meet most demanding specifications, regardless of the material – paper, non-woven, films, laminates, adhesive or non-adhesive.

The integration of SynWire WW into our existing production processes opens up an unlimited number of different insulations. The entire SynFlex converting know-how is accessible for the benefit of the production of SynWire WW.

No standards

Due to the large number of factor combinations, wrapped wires are always individual and tailored to the requirements of our customers.

There are no standard applications. Each demand requires reorientation with respect to the end product.

Our in-house production of SynWire WW enables us to follow your requirements and specifications and to support you from initial planning to implementation.

Areas of application

Wrapped copper & aluminium conductors are used in many applications in automation, power electronics, drive technology, medical and railway technology.

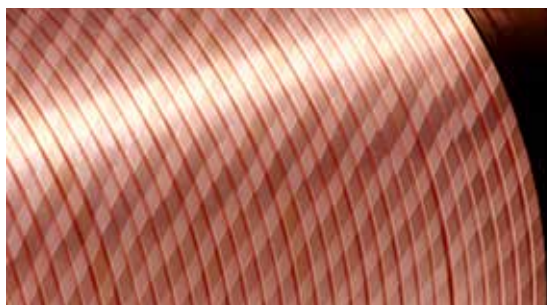


Your benefits

- high mechanical flexibility
- individual product structure due to different winding technologies
- highest possible temperature resistance
- very good mechanical protection
- good penetration during impregnation
- good machine processing



flat enamelled aluminium wire insulated with 2 layers SynTherm® P, in opposite directions, 20 % overlap



flat copper wire insulated with 1 layer SynTherm® P, 30 % overlap



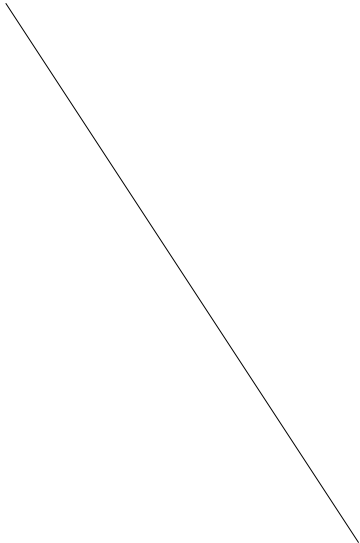
flat copper wire insulated with 2 layers SynTherm® YT510, in opposite directions, 30 % overlap



flat aluminium wire insulated with 2 layers SynTherm® H, in opposite directions, 25 % overlap

SynWire WW

Range of products

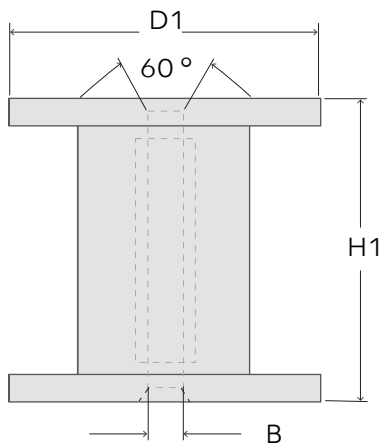
Range of products	Copper / aluminium conductor (bare)	Copper / aluminium conductor (coated)		
Cross section	up to 120 mm ²			
Diameter conductor	from 1.00 bis 6.00 mm (other dimensions on request)			
Insulation strands		Class	Standard	Delivery form
		155 °C	DIN EN 60317-50	grade 1 & 2
		180 °C	DIN EN 60317-51	grade 1 & 2
		180 °C	DIN EN 60317-23	grade 1 & 2
		200 °C	DIN EN 60317-08	grade 1 & 2
		210 °C	DIN EN 60317-13	grade 1 & 2
		210 °C	DIN EN 60317-38	grade 1 & 2
		220 °C	DIN EN 60317-26	grade 1 & 2
		other wire insulations on request		
Min. & max. profile	from 4.00 mm x 1.60 mm to 20.00 mm x 5.60 mm, other profile dimensions on request			
Wrapping	aramid papers SynTherm® YT510 and SynTherm® YT564, SynTherm® P, SynTherm® H, SynTape® electrical adhesive tapes, kraft paper (smooth or creped), mica, wrapping crosswise with 1 to 3 layer, other materials on request			
Overlay	standard overlap 20 % - 50 %, other on request			



SynWire WW

Bobbin types

Bobbin type cylindrical	D1	H1	B	CuL nom. \varnothing in mm		Tare	Filling weight	Bobbins per pallet
IEC 60264-2-2	mm	mm	mm	min	max	kg	appr. kg	piece
K355	355	200	36	0.710	2.000	3.20	45	12
K500	500	250	36	1.060	6.000	7.65	90	6
K630	630	230	40	flat wire		9.60	180	4
K710	710	250	47	flat wire		18.40	200	4



SynShield®
Copper- &
Aluminium Foils



SynShield® copper conductor is a flexible copper foil laminated with various insulating materials. SynShield® is just perfect for winding.

There are two production methods for SynShield®:

- The insulation is applied during a special process without adhesive. This process guarantees excellent soldering behaviour and a low total strength.
- The insulation is applied with the aid of an adhesive.

SynShield® is mainly used in transformers and can be applied as electromagnetic or electrostatic shielding between the primary and secondary winding.

SynShield® is also used as a replacement for enamelled copper wires. Possible types are listed in the following, other types on request.

SynShield® is produced in Blomberg. Therefore, we can flexibly and reliably satisfy your needs and provide rapid delivery periods.

On request SynShield® is also available with aluminium.

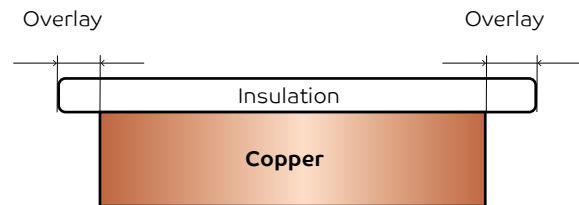
SynShield®

Range of products

SynShield® type 1

copper foil on one side with SynTherm® insulating material

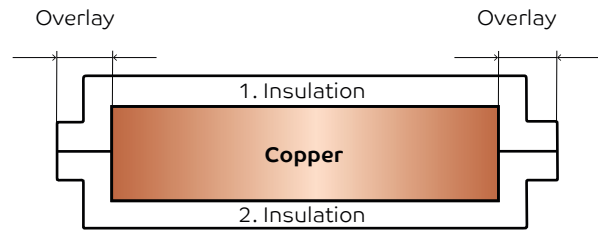
- lateral overlap acc. to customer specifications
- types without adhesive: PET films
- types with adhesive (SynTape®):
 - PET films
 - aramid papers (e.g. SynTherm® YT 510)
 - PI films (e.g. SynTherm® H)



SynShield® type 2

copper foil on both sides with SynTherm® insulating material

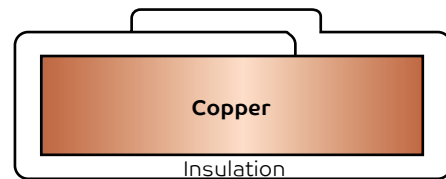
- lateral overlap acc. to customer specifications
- without soldering gap
- types without adhesive: PET films
- types with adhesive (SynTape®):
 - PET films
 - aramid papers (e.g. SynTherm® YT 510)
 - PI films (e.g. SynTherm® H)



SynShield® type 3

copper foil fully covered with SynTherm® insulating material with overlay

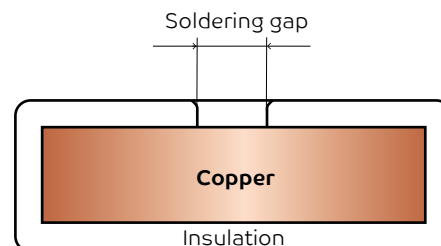
- without soldering gap
- types without adhesive: PET films
- types with adhesive (SynTape®):
 - PET films
 - aramid papers (e.g. SynTherm® YT510)
 - PI films (e.g. SynTherm® H)



SynShield® type 4

copper foil fully covered with SynTherm® insulating material

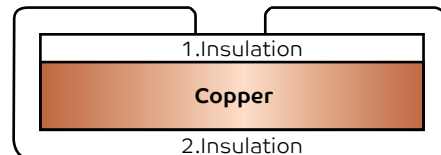
- with soldering gap
- types without adhesive: PET films
- types with adhesive (SynTape®):
 - PET films
 - aramid papers (e.g. SynTherm® YT510)
 - PI films (e.g. SynTherm® H)



SynShield® type 5

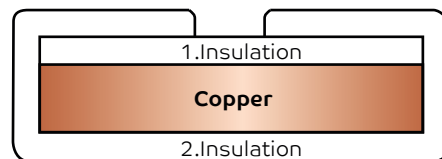
copper foil fully covered with SynTherm® insulating material

- with additional insulating strip – non-adhesive
- types without adhesive: PET films
- types with adhesive (SynTape®):
 - PET films
 - aramid papers (e.g. SynTherm® YT510)
 - PI films (e.g. SynTherm® H)

**SynShield® type 6**

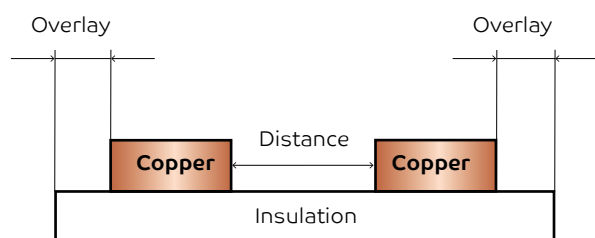
copper foil fully covered with SynTherm® insulating material

- with additional insulating strip – adhesive
- types without adhesive: PET films
- types with adhesive (SynTape®):
 - PET films
 - aramid papers (e.g. SynTherm® YT510)
 - PI films (e.g. SynTherm® H)

**SynShield® type 7**

several copper foils on SynTherm® insulating material

- min. distance of foils ≥ 2 mm
- types without adhesive: PET films
- types with adhesive (SynTape®):
 - PET films
 - aramid papers (e.g. SynTherm® YT510)
 - PI films (e.g. SynTherm® H)



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



Magnet Wires, www.sh-wire.de



Electric Insulation, www.isotek-gmbh.de