



SHWire

The World of Magnet Wires



SHWire

Contents

SHWire - The world of magnet wires	4
SHWire - Production programme	6
SHTherm® V180	8
SHTherm® 200	10
SHTherm® 210	12
SHTherm® 210 Glide	14
SHTherm® 210 TE	16
SHTherm® 210 Alu	18
SHTherm® 220	20
SHTherm® 220 Glide	22
SHTherm® 210 Flat	24
SHTherm® 210 Flat Alu	26
SHTherm® 220 Flat	28
SHSold® V155	30
SHSold® V180	32
SHSold® V180 Glide	34
SHBond® WD210	36
SHBond® WD210 Glide	38
SHBond® WD210 Alu	40
SHBare® & SHBare® Flat	42
General terms and conditions of delivery	43
Metal terms	44
Minimum quantity per order	44
Reel sizes	45
Dimensions and filling weights of reels	46
Deposits for reels, covers and packaging	48
Recommendations for return of empties	49
Conditions for credit	49
Recommendations for pallet stacking	50
SHWire Know-how network	52
SynFlex Group	54

SHWire

The World of Magnet Wires

Superior quality for a variety of applications

In the following pages we will present our extensive product range of round and flat winding wires. Since its foundation SHWire has developed into an acknowledged quality leader within its industry.

The product range encompasses all enamelled copper and aluminium wires demanded by the winding wire industry on a global basis. In addition to the standard types required, SHWire develops and produces new types of enamelled wires, including the innovative low friction SHTherm® 210 Glide and the „shaped“ wire, which provides superior mechanical properties way above current industry standards.

Special requirements and customisation for all wire types can be catered for depending on the quantity required. This in co-operation between the sales department, application engineers and the customer.



Foundation:

Schwering & Hasse was founded in 1858, initially as a manufacturer of cigars and has been manufacturing magnet wire since 1946.

Employees:

SHWire employs 240 persons.

Customer base:

SHWire's customers include blue chip companies in the electrical industry, numerous tier 1 and tier 2 companies as well as OEM's.

Our customers are in the following industrial sectors:

- automotive and e-mobility
- industrial motors
- energy production and renewable energy
- energy distribution and conversion
- home appliances

Production and product information:

SHWire produces a comprehensive range of round as well as flat copper and aluminium wires, including braided wires. The annual capacity is approximately 50,000 metric tons.

Dimension ranges:

copper round wire: 0,050 mm - 4,500 mm
 aluminium round wire: 1,250 mm - 4,500 mm
 flat wire: 2,50 mm² - 100,00 mm²

We can adapt our production to provide for individual customer requirements.

Certificates**Digital magnet wire slide rule**

SHWire®

Production programme

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 thermoreistant	60317-08 MW 30-C	E75926 (M)	THEIC mod. polyesterimide class 180	grade 1 on request grade 2 on request
SHTherm® 210 thermoreistant	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 thermoreistant 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 thermoreistant partial discharge resistant	60317-13 MW 35-C		THEIC mod. polyesterimide + polyamide-imide class 200	grade 2 on request
SHTherm® 210 Alu thermoreistant	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 thermoreistant	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 thermoreistant 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 thermoreistant	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 thermoreistant	60317-73 MW 36-A		THEIC mod. polyesterimide + polyamide-imide class 200	grade 1 on request grade 2 on request
SHTherm® 220 Flat thermoreistant	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)	polyurethane 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)	polyurethane 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)	polyurethane 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	analogue 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		bare	Dim. acc. to IEC 60317-0-1 more on request
SHBare® Flat	1977 CU-ETP1		bare	Dim. acc. to IEC 60317-0-1 more on request

SHTherm® V180

Technical data

- Enamelled round copper wire, solderable
- Insulated with polyesterimide
- Class 180
- IEC / DIN EN 60317-23
- NEMA MW 77-C
- UL approved

Production range

Grade 1: on request

Grade 2: on request

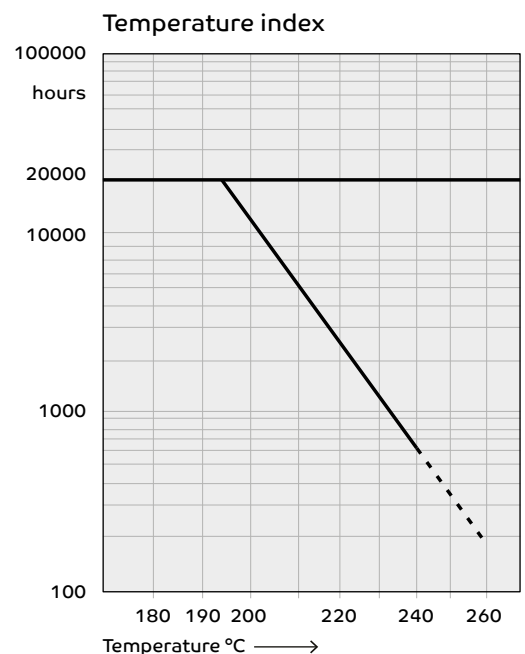
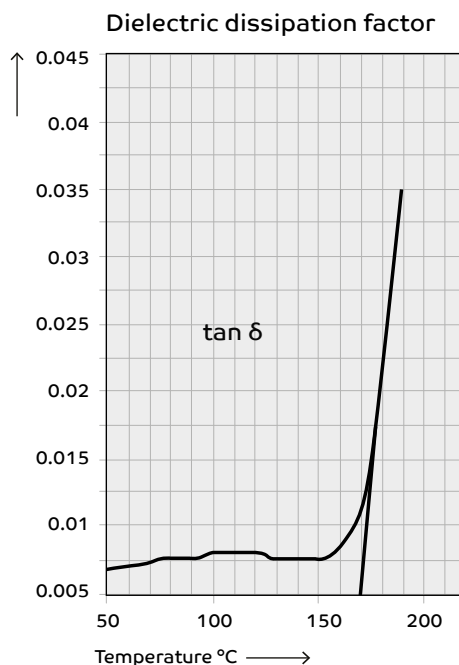
Properties

SHTherm® V180 is a thermoresistant, self-fluxing enamelled copper wire of thermal performance class H which, at solder bath temperatures from 465°C upwards, provides the possibility of contacting without prior removal of the insulation film. This coating shows good thermo-resistance and chemical compatibility with commercial impregnating agents, impregnating varnishes, extrusion-coating agents, sealing compounds, solvents, and detergents. Sophisticated process technology and process setting ensure easy mouldability, very good elongation properties and low coefficients of friction as well as good and constant dielectric insulation properties of these wires. Thanks to this SHTherm® V180 is ideally suited for processing on highspeed, sophisticated winding machines. Enamelled copper wires of this type can also be welded and mechanically connected.

Application

Contactors, magnetic coils, relays, small motors, transformers

Temperature diagrams



Typical properties of enamelled round copper wire 0.500 mm, with insulation film grade 1

Mechanical	Set value	Actual value (typ.)
Bare wire diameter (mm)	0.351 - 0.359	as set value
Overall diameter (mm)	min. 0.524 - max. 0.544	as set value
Adhesion (no cracks in film after winding)	mandrel diameter 0.500 mm	1 x d / 10 % pre-elongation
Scrape resistance (N)	≥ 3.100	≥ 6.000
Pencil hardness	H	2H - 3H
Elongation at break (%)	≥ 28	≥ 37
Coefficient of friction μ	/	≤ 0.140
Thermal	Set value	Actual value (typ.)
Temperature index TI	180	190
Cut trough temperature (°C) (pre-heated block)	265	≥ 280
Dielectric loss factor (°C) (tan δ)	/	≥ 150
Heat shock at 200 °C (no cracks in varnish coat after winding)	mandrel diameter 1.120 mm	1 x d / 10 % pre-elongation
Solderability at 470 °C (s)	≤ 3	≤ 2
Electrical	Set value	Actual value (typ.)
Dielectrical strength at RT (kV)	≥ 2.4 (Twist)	≥ 3 (Cylinder)
High voltage discontinuities test voltage 750 V	≤ 10 on 30 m	≤ 7 on 100 m
Electrical conductivity of CU conductor (MS/m)	58 - 59	≥ 58.5
Chemical	Set value	Actual value (typ.)
Pencil hardness		
Storage in standard solvent ½ h / 60 °C	min. H	2H
Storage in alcohol ½ h / 60 °C	min. H	2H
Resistance to commercial		
Impregnants ⁽¹⁾	/	yes
Refrigerants ⁽¹⁾	/	no
Dry transformer oils ⁽¹⁾	/	yes
Hydraulic oils ⁽¹⁾	/	no

⁽¹⁾ Due to the variety of individual applications we cannot make any generally binding commitments regarding the compatibility. We recommend testing compatibility with the materials being used.

SHTherm® 200

Technical data

- Enamelled round copper wire, thermoresistant
- Insulated with THEIC mod. polyesterimide
- Class 180
- IEC / DIN EN 60317-08
- NEMA MW 30-C
- UL approved

Production range

Grade 1: on request

Grade 2: on request

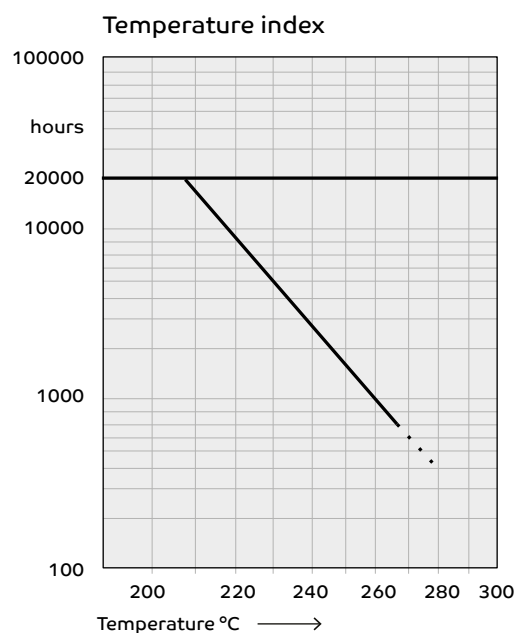
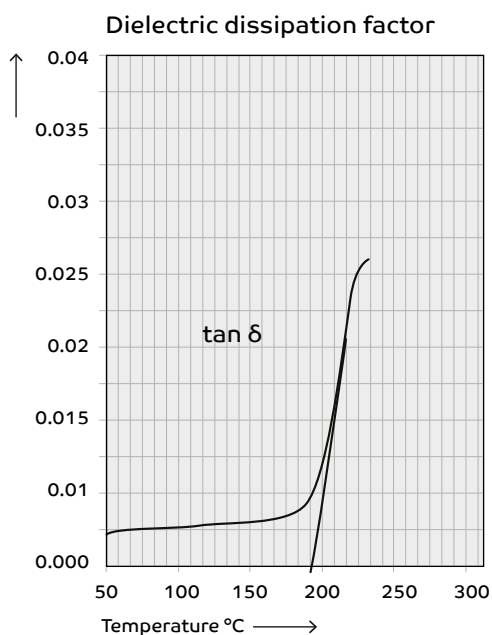
Properties

SHTherm® 200 is a highly thermoresistant enamelled copper wire of heat performance class H. Its single coat insulation offers very good resistance to thermal overloads, thanks to its high thermoplastic flow and heat shock temperature. It also provides good resistance to commercial impregnating agents, impregnating resins, extrusion-coating agents, sealing resins, solvents and detergents. Furthermore the insulating enamel film distinguishes itself through high film elasticity and abrasion resistance. Sophisticated process technology and process setting ensure easy mouldability, very good elongation properties and low coefficients of friction, as well as good and constant dielectric insulation properties of these wires. In particular, resistance to halogenated hydrocarbon (Freon) is to be emphasized. Thanks to the described wide range of excellent properties SHTherm® 200 is ideally suited for all standard applications in heat performance classes F and H, when sophisticated winding and draw-in technologies are used, as well as for use in refrigeration machines filled with Freon. SHTherm® 200 can be welded and mechanically connected but is not solderable.

Application

Control gears, electric motors, magnetic & ignition coils, refrigeration units, transformers

Temperature diagrams



Typical properties of enamelled round copper wire 0.355 mm, with insulation film grade 1

Mechanical	Set value	Actual value (typ.)
Bare wire diameter (mm)	0.351 - 0.359	as set value
Overall diameter (mm)	min. 0.375 - max. 0.392	as set value
Adhesion (no cracks in film after winding)	mandrel diameter 0.355 mm	1 x d / 10 % pre-elongation
Scrape resistance (N)	≥ 3.050	≥ 4.500
Pencil hardness	H	3H - 4H
Elongation at break (%)	≥ 27	≥ 33
Coefficient of friction μ	/	≤ 0.140
Thermal	Set value	Actual value (typ.)
Temperature index TI	180	190
Cut trough temperature (°C) (pre-heated block)	300	≥ 320
Dielectric loss factor (°C) (tan δ)	/	≥ 185
Heat shock at 200 °C (no cracks in varnish coat after winding)	mandrel diameter 0.800 mm	1 x d / 10 % pre-elongation
Solderability	no	no
Electrical	Set value	Actual value (typ.)
Dielectrical strength at RT (kV)	≥ 2.3 (twist)	≥ 2.5 (cylinder)
High voltage discontinuities test voltage 750 V	≤ 10 on 30 m	≤ 7 on 100 m
Electrical conductivity of CU conductor (MS/m)	58 - 59	≥ 58.5
Chemical	Set value	Actual value (typ.)
Pencil hardness		
Storage in standard solvent ½ h / 60 °C	min. H	3H
Storage in alcohol ½ h / 60 °C	min. H	3H
Resistance to commercial		
Impregnants ⁽¹⁾	/	yes
Refrigerants ⁽¹⁾	/	yes
Dry transformer oils ⁽¹⁾	/	yes
Hydraulic oils ⁽¹⁾	/	yes

⁽¹⁾ Due to the variety of individual applications we cannot make any generally binding commitments regarding the compatibility. We recommend testing compatibility with the materials being used.

SHTherm® 210

Technical data

- Enamelled round copper wire, thermoresistant
- Insulated with THEIC mod. polyesterimide plus polyamide-imide overcoat
- Class 200
- IEC / DIN EN 60317-13
- NEMA MW 35-C / 73-C
- UL approved

Production range

Grade 1: 0.150 - 2.500 mm

Grade 2: 0.200 - 4.000 mm

≥ 4.000 mm on request

Properties

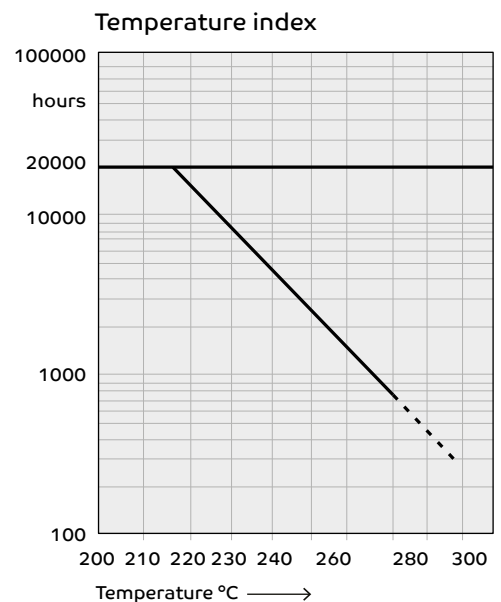
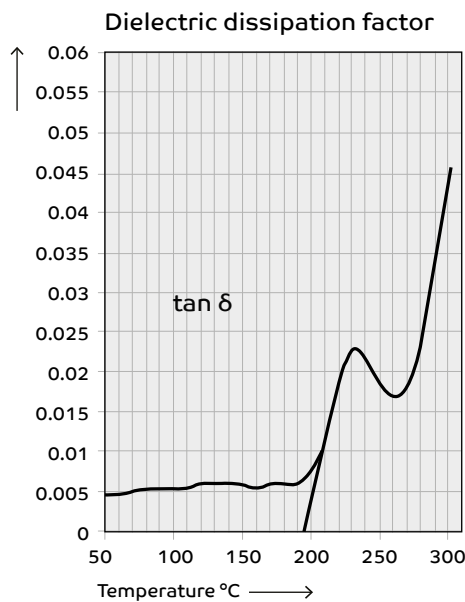
SHTherm® 210 is a highly thermoresistant enamelled copper wire of heat performance class N with a wide range of excellent quality features. As it is a dual-coat wire its insulation film consists of 2 different coatings on top of one another. These ensure: a very good permanent thermal and overload resistance, excellent resistance to chemical attacks e.g. by alkalines, washing and cleaning agents, impregnating varnishes and resins, sealing compounds, thinners, solvents and refrigerants as well as their vapours, an excellent mechanical abrasion resistance and a very low coefficient of friction of the wire surface. This range of excellent features makes SHTherm® 210 an all-round wire meeting the requirements of all applications requiring above average resistance to chemical, thermal, mechanical and electrical loads which occur during processing or during operating conditions. High coating resistance to abrasion and a low coefficient of friction result in less stress and damage to the wire and maintain a higher and more constant dielectric insulating resistance of the insulation film.

The consistent further developments carried out by our R&D team allow this excellent “all-round” wire to be optimised to take into account specific customer requirements (e.g. improved adhesion after ageing, workability, electrical characteristics).

Application

E-Mobility, control gears, electric motors, power tools, generators, refrigeration units, pump drives, refrigerators, transformers

Temperature diagrams



Typical properties of enamelled round copper wire 0.500 mm, with insulation film grade 1

Mechanical	Set value	Actual value (typ.)
Bare wire diameter (mm)	0.495 - 0.505	as set value
Overall diameter (mm)	min. 0.524 - max. 0.544	as set value
Adhesion (no cracks in film after winding)	mandrel diameter 0.500 mm	1 x d / 10 % pre-elongation
Scrape resistance (N)	≥ 3.950	≥ 7.500
Pencil hardness	H	4H - 5H
Elongation at break (%)	≥ 28	≥ 38
Coefficient of friction μ	/	≤ 0.140
Thermal	Set value	Actual value (typ.)
Temperature index TI	200	210
Cut trough temperature (°C) (pre-heated block)	320	≥ 360
Dielectric loss factor (°C) (tan δ)	/	≥ 185
Heat shock at 220 °C (no cracks in varnish coat after winding)	mandrel diameter 1.120 mm	1 x d / 10 % pre-elongation
Solderability	no	no
Electrical	Set value	Actual value (typ.)
Dielectrical strength at RT (kV)	≥ 2.4 (twist)	≥ 3 (cylinder)
High voltage discontinuities test voltage 750 V	≤ 10 on 30 m	≤ 7 on 100 m
Electrical conductivity of CU conductor (MS/m)	58 - 59	≥ 58.5
Chemical	Set value	Actual value (typ.)
Pencil hardness		
Storage in standard solvent ½ h / 60 °C	min. H	3H - 5H
Storage in alcohol ½ h / 60 °C	min. H	3H - 5H
Resistance to commercial		
Impregnants ⁽¹⁾	/	yes
Refrigerants ⁽¹⁾	/	yes
Dry transformer oils ⁽¹⁾	/	yes
Hydraulic oils ⁽¹⁾	/	yes

⁽¹⁾ Due to the variety of individual applications we cannot make any generally binding commitments regarding the compatibility. We recommend testing compatibility with the materials being used.

SHTherm® 210 Glide

Technical data

- Enamelled round copper wire, thermoresistant and self lubricating
- Insulated with THEIC mod. polyesterimide plus polyamide-imide
- Class 200
- IEC / DIN EN 60317-13
- NEMA MW 35-C / 73-C
- UL approved

Production range

Grade 1: 0.150 - 2.500 mm

Grade 2: 0.200 - 2.500 mm

> 2.500 mm on request

Properties

SHTherm® 210 Glide is a highly thermoresistant enamelled copper wire of heat performance class N with a wide range of excellent quality features. The insulation of this dual coat wire consists of 3 different coatings on top of one another. These ensure: a very good permanent thermal and over-load resistance, excellent resistance to chemical attacks e.g. by alkalines, washing and cleaning agents, impregnating varnishes and resins, sealing compounds, thinners, solvents and refrigerants as well as their vapours, an excellent mechanical abrasion resistance.

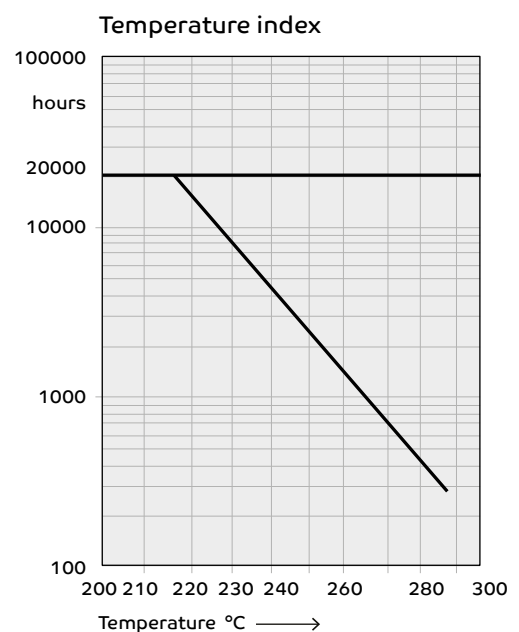
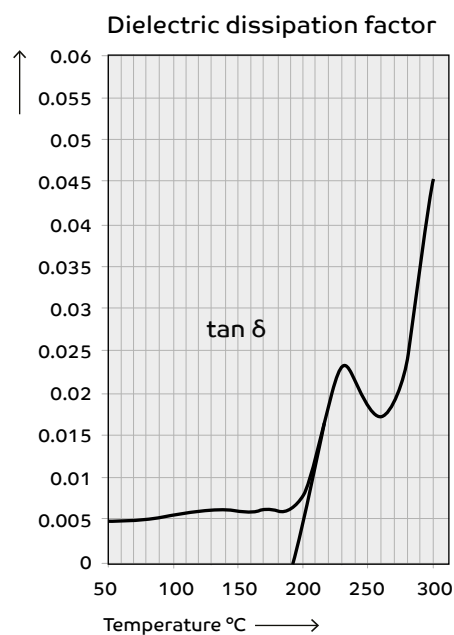
The number of excellent characteristics makes SHTherm® 210 Glide an ideal all-round wire for all applications involving above average demands on the product, be it in operating conditions, demanding winding processes or the general functional reliability in safety relevant electrical systems.

The third layer provides superior gliding properties and gives excellent windability, high filling factors, high process speeds and reduced soiling of the winding machines during operation. Compatibility with common resins has to be proved individually. Reduced mechanical force during winding. The reduced coefficient of friction helps to avoid damage to the wire during winding and thus maintains the insulation properties of the wire.

Application

E-Mobility, control gears, electric motors, power tools, magnetic coils, pump drives, refrigerators, transformers, generators

Temperature diagrams



Typical properties of enamelled round copper wire 0.500 mm, with insulation film grade 1

Mechanical	Set value	Actual value (typ.)
Bare wire diameter (mm)	0.495 - 0.505	as set value
Overall diameter (mm)	min. 0.524 - max. 0.544	as set value
Adhesion (no cracks in film after winding)	mandrel diameter 0.500 mm	1 x d / 10 % pre-elongation
Scrape resistance (N)	≥ 3.950	≥ 7.500
Pencil hardness	H	4H - 5H
Elongation at break (%)	≥ 28	≥ 38
Coefficient of friction μ	/	≤ 0.110
Thermal	Set value	Actual value (typ.)
Temperature index TI	200	210
Cut trough temperature (°C) (pre-heated block)	320	≥ 360
Dielectric loss factor (°C) (tan δ)	/	≥ 185
Heat shock at 220 °C (no cracks in varnish coat after winding)	mandrel diameter 1.120 mm	1 x d / 10 % pre-elongation
Solderability	no	no
Electrical	Set value	Actual value (typ.)
Dielectrical strength at RT (kV)	≥ 2.4 (twist)	≥ 3 (cylinder)
High voltage discontinuities test voltage 750 V	≤ 10 on 30 m	≤ 7 on 100 m
Electrical conductivity of CU conductor (MS/m)	58 - 59	≥ 58.5
Chemical	Set value	Actual value (typ.)
Pencil hardness		
Storage in standard solvent ½ h / 60 °C	min. H	3H - 5H
Storage in alcohol ½ h / 60 °C	min. H	3H - 5H
Resistance to commercial		
Impregnants ⁽¹⁾	/	yes
Refrigerants ⁽¹⁾	/	yes
Dry transformer oils ⁽¹⁾	/	yes
Hydraulic oils ⁽¹⁾	/	yes

⁽¹⁾ Due to the variety of individual applications we cannot make any generally binding commitments regarding the compatibility. We recommend testing compatibility with the materials being used.

SHTherm® 210 TE

Technical data

- Enamelled round copper wire, thermoresistant, spike resistant
- Insulated with THEIC mod. polyesterimide plus polyamide-imide overcoat
- Class 200
- IEC / DIN EN 60317-13
- NEMA MW 35-C / 73-C

Production range

Grade 1: on request

Grade 2: on request

Properties

SHTherm® 210 is a highly thermoresistant enamelled copper wire of heat performance class N with a wide range of excellent quality features. As it is a dual-coat wire its insulation film consists of 2 different coatings on top of one another. These ensure: a very good permanent thermal and overload resistance, excellent resistance to chemical attacks e.g. by alkalines, washing and cleaning agents, impregnating varnishes and resins, sealing compounds, thinners, solvents and refrigerants as well as their vapours, an excellent mechanical abrasion resistance and a very low coefficient of friction of the wire surface. This range of excellent features makes SHTherm® 210 an all-round wire meeting the requirements of all applications requiring above average resistance to chemical, thermal, mechanical and electrical loads which occur during processing or during operating conditions. High coating resistance to abrasion and a low coefficient of friction result in less stress and damage to the wire and maintain a higher and more constant dielectric insulating resistance of the insulation film.

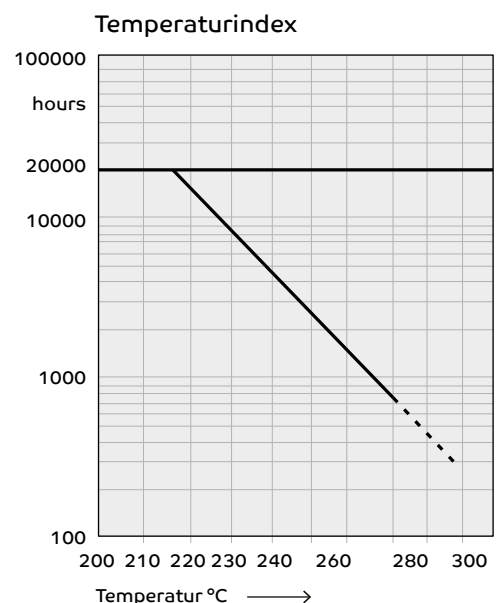
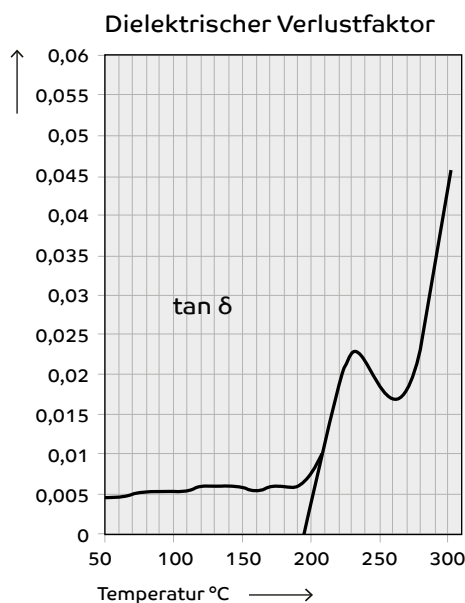
The consistent further developments carried out by our R&D team allow this excellent “all-round” wire to be optimised to take into account specific customer requirements (e.g. improved adhesion after ageing, workability, electrical characteristics).

The varnish system is designed to be resistant to partial discharge.

Application

E-Mobility, electric motors

Temperature diagrams



Typical properties of enamelled round copper wire 0.500 mm, with insulation film grade 1

Mechanical	Set value	Actual value (typ.)
Bare wire diameter (mm)	0.495 - 0.505	as set value
Overall diameter (mm)	min. 0.524 - max. 0.544	as set value
Adhesion (no cracks in film after winding)	mandrel diameter 0.500 mm	1 x d / 10 % pre-elongation
Scrape resistance (N)	≥ 3.950	≥ 7.500
Pencil hardness	H	4H - 5H
Elongation at break (%)	≥ 28	≥ 38
Coefficient of friction μ	/	≤ 0.140
Thermal	Set value	Actual value (typ.)
Temperature index TI	200	210
Cut trough temperature (°C) (pre-heated block)	320	≥ 360
Dielectric loss factor (°C) (tan δ)	/	≥ 185
Heat shock at 220 °C (no cracks in varnish coat after winding)	mandrel diameter 1.120 mm	1 x d / 10 % pre-elongation
Solderability	no	no
Electrical	Set value	Actual value (typ.)
Dielectrical strength at RT (kV)	≥ 2.4 (twist)	≥ 3 (cylinder)
High voltage discontinuities test voltage 750 V	≤ 10 on 30 m	≤ 7 on 100 m
Electrical conductivity of CU conductor (MS/m)	58 - 59	≥ 58.5
Chemical	Set value	Actual value (typ.)
Pencil hardness		
Storage in standard solvent ½ h / 60 °C	min. H	3H - 5H
Storage in alcohol ½ h / 60 °C	min. H	3H - 5H
Resistance to commercial		
Impregnants ⁽¹⁾	/	yes
Refrigerants ⁽¹⁾	/	yes
Dry transformer oils ⁽¹⁾	/	yes
Hydraulic oils ⁽¹⁾	/	yes

⁽¹⁾ Due to the variety of individual applications we cannot make any generally binding commitments regarding the compatibility. We recommend testing compatibility with the materials being used.

SHTherm® 210 Alu

Technical data

- Enamelled aluminium wire, thermoresistant
- Insulated with THEIC mod. polyesterimide and polyamide-imide topcoat
- Class 200
- IEC /DIN EN 60317-25
- NEMA MW 35-A / 73-A
- UL approved

Production range

Grade 1: from 1.250 - 4.000 mm

Grade 2: from 1.250 - 4.000 mm

< 1.250 mm on request

> 4.000 mm on request

Properties

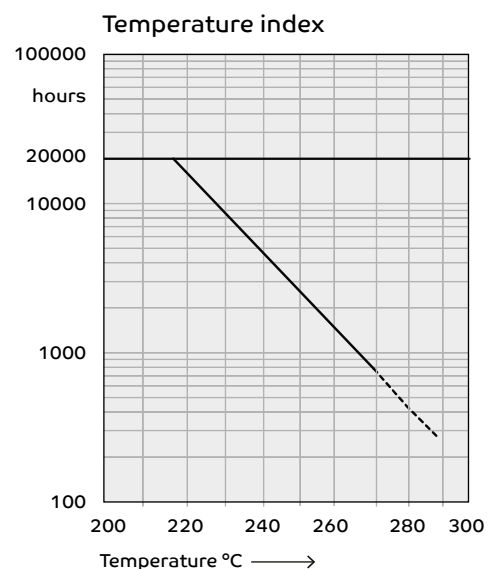
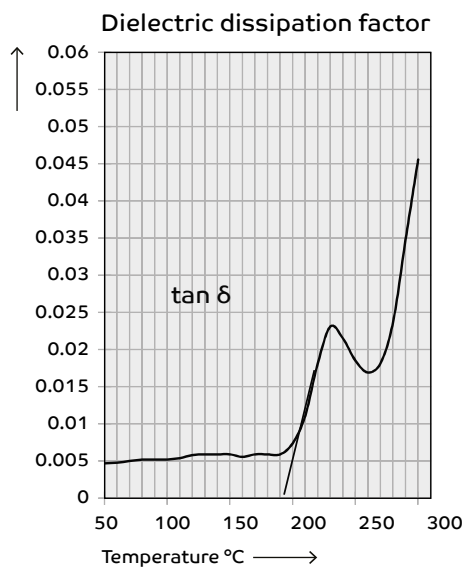
SHTherm® 210 Alu is a highly thermoresistant enamelled aluminium wire of heat performance class N with a wide range of excellent quality features. As it is a dual-coat wire its insulation film consists of two different coatings on top of one another. These ensure: a very good permanent thermal and overload resistance, excellent resistance to chemical attacks e.g. by alkalines, washing and cleaning agents, impregnating varnishes and resins, sealing compounds, thinners, solvents and refrigerants as well as their vapours, an excellent mechanical abrasion resistance.

On demand the system can be offered with an additional layer of selflubricating enamel thus giving enhanced properties for winding operations

Application

Control gears, drives for household equipment, electric motor drives, pump drives, refrigerators, transformers

Temperature diagrams



Typical properties of enamelled round aluminium wire 0.600 mm, with insulation film grade 1

Mechanical	Set value	Actual value (typ.)
Bare wire diameter (mm)	0.594 - 0.606	as set value
Overall diameter (mm)	min. 0.627 - max. 0.649	as set value
Adhesion (no cracks in film after winding)	3 x d	2 x d
Scrape resistance (N)	≥ 2.2	≥ 3.5
Pencil hardness	H	4H - 5H
Elongation at break (%)	≥ 12	≥ 20
Coefficient of friction μ	/	≤ 0.140
Thermal	Set value	Actual value (typ.)
Temperature index TI	200	207
Cut trough temperature (°C) (pre-heated block)	/	/
Dielectric loss factor (°C) (tan δ)	/	≥ 185
Heat shock at 220 °C (no cracks in varnish coat after winding)	3 x d	3 x d
Solderability	no	no
Electrical	Set value	Actual value (typ.)
Dielectrical strength at RT (kV)	≥ 2.6 (twist)	≥ 3 (cylinder)
High voltage discontinuities test voltage 1000 V	≤ 25 on 30 m	≤ 7 on 100 m
Electrical conductivity of AL conductor (MS/m)	35.5 - 36,2	≥ 35.85
Chemical	Set value	Actual value (typ.)
Pencil hardness		
Storage in standard solvent ½ h / 60 °C	min. H	3H - 5H
Storage in alcohol ½ h / 60 °C	min. H	3H - 5H
Resistance to commercial		
Impregnants ⁽¹⁾	/	yes
Refrigerants ⁽¹⁾	/	yes
Dry transformer oils ⁽¹⁾	/	yes
Hydraulic oils ⁽¹⁾	/	yes

⁽¹⁾ Due to the variety of individual applications we cannot make any generally binding commitments regarding the compatibility. We recommend testing compatibility with the materials being used.

SHTherm® 220

Technical data

- Enamelled round copper wire, thermoresistant
- Insulated with polyamide-imide
- Class 220
- IEC / DIN EN 60317-26
- UL approved

Production range

Grade 1: 0.200 - 1.200 mm
(> 1.200 mm on request)
Grade 2: on request

Properties

SHTherm® 220 is a highly thermoresistant enamelled copper wire of heat performance class R with superior thermal, chemical and mechanical resistance.

It is used for special applications requiring the following criteria:

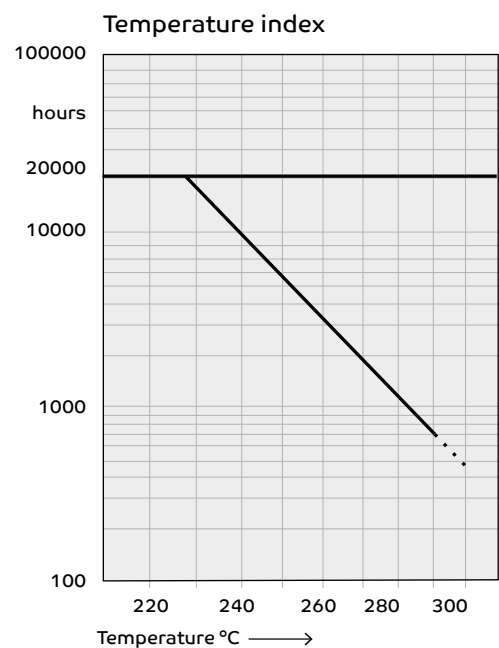
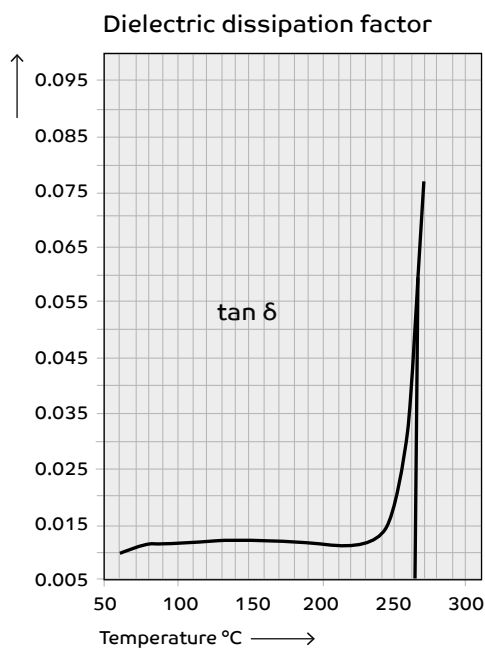
- very high permanent thermal resistance and short-time thermal overload
- very good resistance to aggressive mediums in liquid or gas form

SHTherm® 220 is ideally suited for use in special safety-relevant and electrical life support equipment. Sophisticated process technology and process setting ensure easy mouldability, good elongation and constant insulation properties of these wires.

Application

E-Mobility, control gears, electric motors, power tools, pump drives, refrigerators, special drives, special applications in the medical field

Temperature diagrams



Typical properties of enamelled round copper wire 0.500 mm, with insulation film grade 1

Mechanical	Set value	Actual value (typ.)
Bare wire diameter (mm)	0.495 - 0.505	as set value
Overall diameter (mm)	min. 0.524 - max. 0.544	as set value
Adhesion (no cracks in film after winding)	mandrel diameter 0.500 mm	1 x d / 10 % pre-elongation
Scrape resistance (N)	≥ 3.950	≥ 7.500
Pencil hardness	H	5H - 6H
Elongation at break (%)	≥ 28	≥ 38
Coefficient of friction μ	/	≤ 0.140
Thermal	Set value	Actual value (typ.)
Temperature index TI	220	220
Cut trough temperature (°C) (pre-heated block)	350	≥ 400
Dielectric loss factor (°C) (tan δ)	/	≥ 240
Heat shock at 240 °C (no cracks in varnish coat after winding)	mandrel diameter 1.120 mm	1 x d / 10 % pre-elongation
Solderability	no	no
Electrical	Set value	Actual value (typ.)
Dielectrical strength at RT (kV)	≥ 2.4 (twist)	≥ 5 (cylinder)
High voltage discontinuities test voltage 750 V	≤ 10 on 30 m	≤ 7 on 100 m
Electrical conductivity of CU conductor (MS/m)	58 - 59	≥ 58.5
Chemical	Set value	Actual value (typ.)
Pencil hardness		
Storage in standard solvent ½ h / 60 °C	min. H	4H - 6H
Storage in alcohol ½ h / 60 °C	min. H	4H - 6H
Resistance to commercial		
Impregnants ⁽¹⁾	/	yes
Refrigerants ⁽¹⁾	/	yes
Dry transformer oils ⁽¹⁾	/	yes
Hydraulic oils ⁽¹⁾	/	yes

⁽¹⁾ Due to the variety of individual applications we cannot make any generally binding commitments regarding the compatibility. We recommend testing compatibility with the materials being used.

SHTherm® 220 Glide

Technical data

- Enamelled round copper wire, thermoresistant and self lubricating
- Insulated with polyamide-imide
- Class 220
- IEC / DIN EN 60317-26
- UL approved

Production range

Grade 1: 0.200 - 1.200 mm
(>1.200 mm on request)
Grade 2: on request

Properties

SHTherm® 220 Glide is a highly thermoresistant enamelled copper wire of heat performance class R with superior thermal, chemical and mechanical resistance.

It is used for special applications requiring the following criteria:

- very high permanent thermal resistance and short-time thermal overload
- very good resistance to aggressive mediums in liquid or gas form

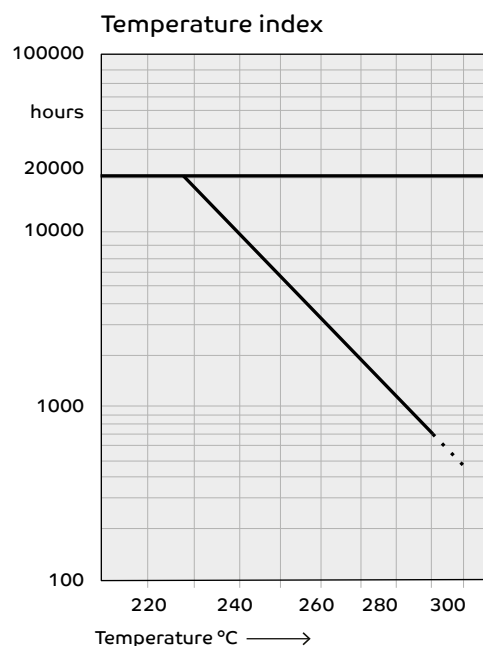
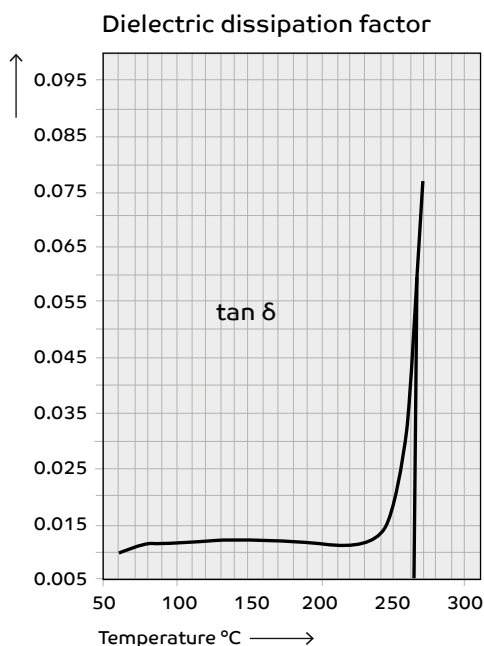
SHTherm® 220 is ideally suited for use in special safety-relevant and electrical life support equipment. Sophisticated process technology and process setting ensure easy mouldability, good elongation and constant insulation properties of these wires.

The final layer of varnish serves the purpose of providing a superior gliding surface, giving the wire excellent windability features at higher speeds, and enabling a higher filling factor plus reduced soiling of the winding machines. The reduced coefficient of friction helps to avoid damage to the wire during winding and thus maintains the insulation properties of the wire.

Application

E-Mobility, control gears, electric motors, power tools, pump drives, refrigerators, special drives, special applications in the medical field

Temperature diagrams



Typical properties of enamelled round copper wire 0.500 mm, with insulation film grade 1

Mechanical	Set value	Actual value (typ.)
Bare wire diameter (mm)	0.495 - 0.505	as set value
Overall diameter (mm)	min. 0.524 - max. 0.544	as set value
Adhesion (no cracks in film after winding)	mandrel diameter 0.500 mm	1 x d / 10 % pre-elongation
Scrape resistance (N)	≥ 3.950	≥ 7.500
Pencil hardness	H	5H - 6H
Elongation at break (%)	≥ 28	≥ 38
Coefficient of friction μ	/	≤ 0.110
Thermal	Set value	Actual value (typ.)
Temperature index TI	220	220
Cut trough temperature (°C) (pre-heated block)	350	≥ 400
Dielectric loss factor (°C) (tan δ)	/	≥ 240
Heat shock at 240 °C (no cracks in varnish coat after winding)	mandrel diameter 1.120 mm	1 x d / 10 % pre-elongation
Solderability	no	no
Electrical	Set value	Actual value (typ.)
Dielectrical strength at RT (kV)	≥ 2.4 (twist)	≥ 5 (cylinder)
High voltage discontinuities test voltage 750 V	≤ 10 on 30 m	≤ 7 on 100 m
Electrical conductivity of CU conductor (MS/m)	58 - 59	≥ 58.5
Chemical	Set value	Actual value (typ.)
Pencil hardness		
Storage in standard solvent ½ h / 60 °C	min. H	4H - 6H
Storage in alcohol ½ h / 60 °C	min. H	4H - 6H
Resistance to commercial		
Impregnants ⁽¹⁾	/	yes
Refrigerants ⁽¹⁾	/	yes
Dry transformer oils ⁽¹⁾	/	yes
Hydraulic oils ⁽¹⁾	/	yes

⁽¹⁾ Due to the variety of individual applications we cannot make any generally binding commitments regarding the compatibility. We recommend testing compatibility with the materials being used.

SHTherm® 210 Flat

Technical data

- Enamelled flat copper wire, thermoresistant
- Polyesterimide overcoated with polyamide-imide enamel
- Class 200/220
- IEC / DIN EN 60317-29
- NEMA MW 36-C/MW 38-C
- UL approved

Production range

Grade 1: on request

Grade 2: thickness: 2.000 - 20.000 mm
width: 0.800 - 5.000 mm

Properties

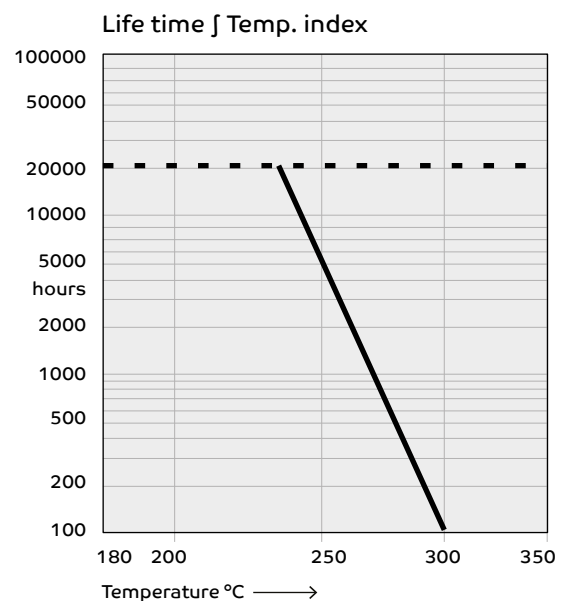
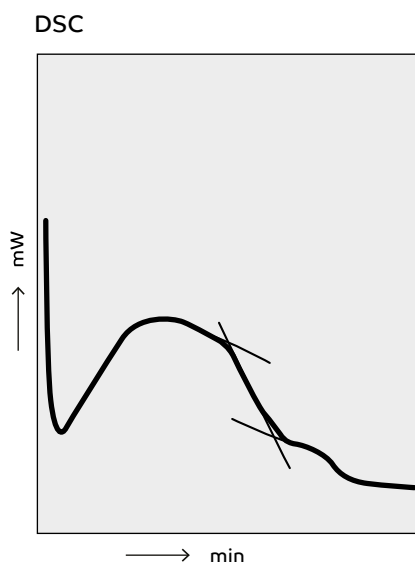
SHTherm® 210 Flat is a highly thermoresistant rectangular enamelled copper wire of heat performance class N with a wide range of excellent quality features. Its insulation film consists of 2 different coatings on top of one another. These ensure a very good permanent thermal and overload resistance, excellent resistance against mechanical stress, as well as an excellent resistance to chemical attacks of commercial washing and cleaning agents, impregnating varnishes and resins, sealing compounds, thinners, solvents and refrigerants, oils as well as their vapours. This range of excellent features make SHTherm® 210 Flat an all-round wire meeting the requirements of all applications with above average requirements to processing and operational features or operational safety in electrical systems.

The consistent further developments carried out by our R&D team allow this excellent “all-round” wire to be optimised to take into account specific customer requirements (e.g. improved adhesion after ageing, workability, electrical characteristics).

Application

E-Mobility, electric motors, generators, transformers, hybrid constructions

Temperature diagrams



Typical properties of enamelled flat copper wire 5.60 x 3.55 mm, with insulation film grade 2

Mechanical	Set value	Actual value (typ.)
Bare wire width (mm)	5.55 - 5.65	as set value
Bare wire thickness (mm)	3.50 - 3.60	as set value
Width with varnish (mm)	5.67 - 5.82	as set value
Thickness with varnish (mm)	3.62 - 3.77	as set value
Varnish increase	120 - 170 µm	as set value
Adhesion (no cracks in film after winding)	mandrel diameter	
Bend over width	4 x width	3 x width
Bend over thickness	4 x thickness	3 x thickness
Elongation	15 % with cracks < 1 x width	32 % without cracks
Pencil hardness	H	4H - 5H
Elongation at break (%)	≥ 32	≥ 38
Thermal	Set value	Actual value (typ.)
Temperature index TI	200/220	210/220
Heat shock at 220 °C (no cracks in varnish coat after winding)	mandrel diameter 6 x thickness	mandrel diameter 4 x thickness
Solderability	no	no
Electrical	Set value	Actual value (typ.)
Dielectrical strength at RT (kV)	≥ 2.0 (ball pit)	≥ 3 (ball pit)
High voltage discontinuities test voltage 2,5 kV	/	≤ 7 on 100 m
Electrical conductivity of CU conductor (MS/m)	58 - 59	≥ 58.5
Chemical	Set value	Actual value (typ.)
Pencil hardness		
Storage in standard solvent ½ h / 60 °C	min. H	3H - 5H
Storage in alcohol ½ h / 60 °C	min. H	3H - 5H
Resistance to commercial		
Impregnants ⁽¹⁾	/	yes
Refrigerants ⁽¹⁾	/	yes
Dry transformer oils ⁽¹⁾	/	yes
Hydraulic oils ⁽¹⁾	/	yes

⁽¹⁾ Due to the variety of individual applications we cannot make any generally binding commitments regarding the compatibility. We recommend testing compatibility with the materials being used.

SHTherm® 210 Flat Alu

Technical data

- Enamelled flat aluminium wire, thermoresistant
- insulated with THEIC mod. polyesterimide with polyamide-imide topcoat
- Class 200
- IEC / DIN EN 60317-73
- NEMA MW 36-A
- UL approved

Production range

Grade 1: on request

Grade 2: on request

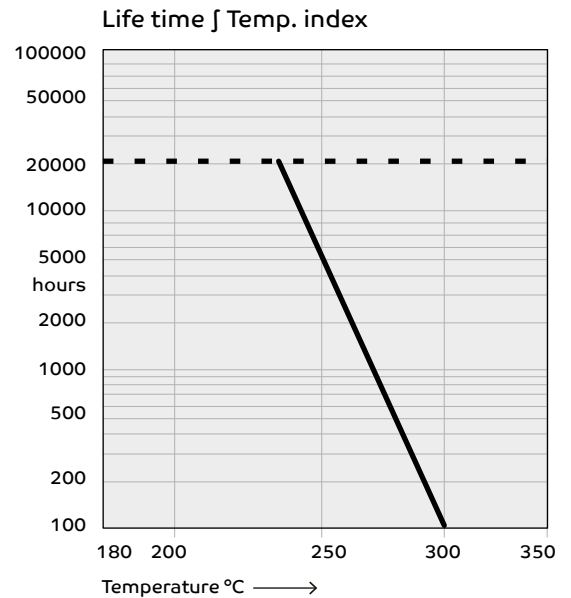
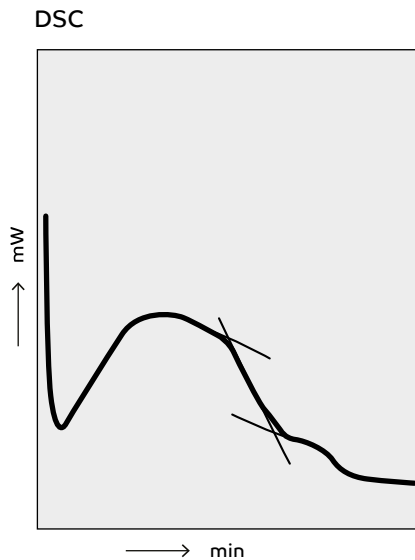
Properties

SHTherm® 210 Flat Alu is a highly thermoresistant rectangular enamelled aluminium wire of heat performance class N with a wide range of good to very good quality features. Its insulation film consists of 2 different coatings on top of one another. These ensure a very good permanent thermal and overload resistance, excellent resistance against mechanical stress, as well as an excellent resistance to chemical attacks of commercial washing and cleaning agents, impregnating varnishes and resins, sealing compounds, thinners, solvents and refrigerants, oils as well as their vapours. This range of excellent features make SHTherm® 210 Flat Alu an all-round wire meeting the requirements of all applications with above average requirements to processing and operational features or operational safety in electrical systems.

Application

Generators, transformers

Temperature diagrams



Typical properties of enamelled flat aluminium wire 5.60 x 3.55 mm, with insulation film grade 2

Mechanical	Set value	Actual value (typ.)
Bare wire width (mm)	5.55 - 5.65	as set value
Bare wire thickness (mm)	3.50 - 3.60	as set value
Width with varnish (mm)	5.67 - 5.82	as set value
Thickness with varnish (mm)	3.62 - 3.77	as set value
Varnish increase	120 - 170 µm	as set value
Adhesion (no cracks in film after winding)	mandrel diameter	
Bend over width	4 x width	3 x width
Bend over thickness	4 x thickness	3 x thickness
Elongation	15 % with cracks < 1 x width	32 % without cracks
Pencil hardness	H	4H - 5H
Elongation at break (%)	≥ 15	≥ 32
Thermal	Set value	Actual value (typ.)
Temperature index TI	200	210
Heat shock at 220 °C (no cracks in varnish coat after winding)	mandrel diameter 6 x thickness	mandrel diameter 4 x thickness
Solderability	no	no
Electrical	Set value	Actual value (typ.)
Dielectrical strength at RT (kV)	≥ 2.0 (ball pit)	≥ 3 (ball pit)
High voltage discontinuities test voltage 2,5 kV	/	≤ 7 on 100 m
Electrical conductivity of AL conductor (MS/m)	35.5 - 36.2	≥ 35.85
Chemical	Set value	Actual value (typ.)
Pencil hardness		
Storage in standard solvent ½ h / 60 °C	min. H	3H - 5H
Storage in alcohol ½ h / 60 °C	min. H	3H - 5H
Resistance to commercial		
Impregnants ⁽¹⁾	/	yes
Refrigerants ⁽¹⁾	/	yes
Dry transformer oils ⁽¹⁾	/	yes
Hydraulic oils ⁽¹⁾	/	yes

⁽¹⁾ Due to the variety of individual applications we cannot make any generally binding commitments regarding the compatibility. We recommend testing compatibility with the materials being used.

SHTherm® 220 Flat

Technical data

- Enamelled flat copper wire, thermoresistant
- Insulated with polyamide-imide
- Class 220
- IEC / DIN EN 60317-58
- NEMA MW 84-C

Production range

Grade 1: on request

Grade 2: on request

Properties

SHTherm® 220 Flat is a highly thermoresistant enamelled copper wire of heat performance class R with superior thermal, chemical and mechanical resistance.

It is used for special applications requiring the following criteria:

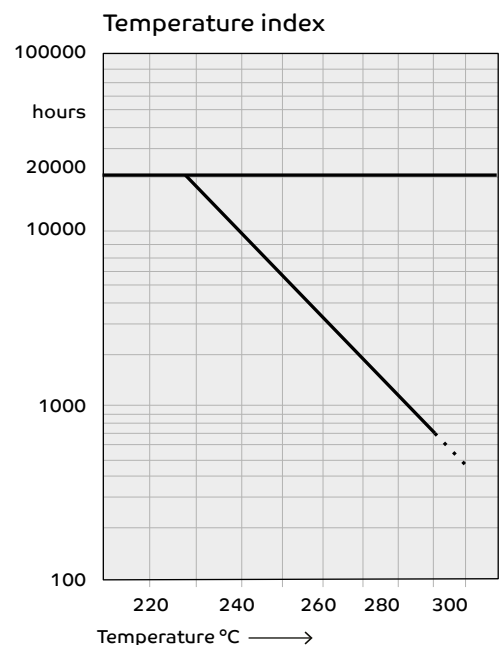
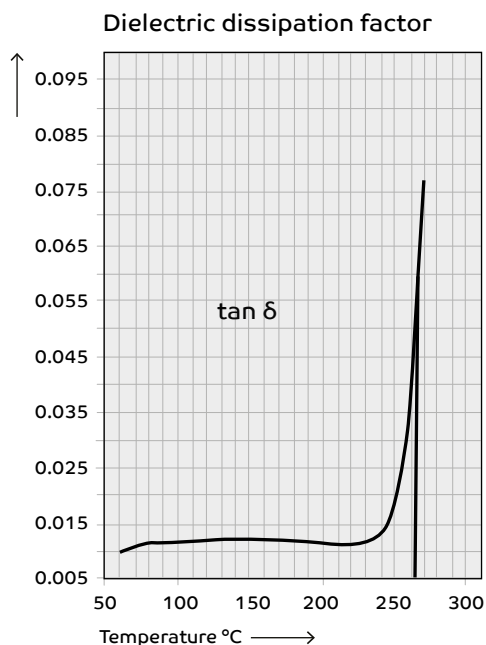
- very high permanent thermal resistance and short-time thermal overload
- very good resistance to aggressive mediums in liquid or gas form

SHTherm® 220 Flat is ideally suited for use in special safety-relevant and electrical life support equipment. Sophisticated process technology and process setting ensure easy mouldability, good elongation and constant insulation properties of these wires.

Application

E-Mobility, hybrid constructions

Temperature diagrams



Typical properties of enamelled flat copper wire 5.60 x 3.55 mm, with insulation film grade 2

Mechanical	Set value	Actual value (typ.)
Bare wire width (mm)	5.55 - 5.65	as set value
Bare wire thickness (mm)	3.50 - 3.60	as set value
Width with varnish (mm)	5.67 - 5.82	as set value
Thickness with varnish (mm)	3.62 - 3.77	as set value
Varnish increase	120 - 170 µm	as set value
Adhesion (no cracks in film after winding)	mandrel diameter	
Bend over width	4 x width	3 x width
Bend over thickness	4 x thickness	3 x thickness
Elongation	15 % with cracks < 1 x width	32 % without cracks
Pencil hardness	H	4H - 5H
Elongation at break (%)	≥ 32	≥ 38
Thermal	Set value	Actual value (typ.)
Temperature index TI	220	220
Heat shock at 240 °C (no cracks in varnish coat after winding)	mandrel diameter 6 x thickness	mandrel diameter 4 x thickness
Solderability	no	no
Electrical	Set value	Actual value (typ.)
Dielectrical strength at RT (kV)	≥ 2.0 (ball pit)	≥ 3 (ball pit)
High voltage discontinuities test voltage 2,5 kV	/	≤ 7 on 100 m
Electrical conductivity of CU conductor (MS/m)	58 - 59	≥ 58.5
Chemical	Set value	Actual value (typ.)
Pencil hardness		
Storage in standard solvent ½ h / 60 °C	min. H	3H - 5H
Storage in alcohol ½ h / 60 °C	min. H	3H - 5H
Resistance to commercial		
Impregnants ⁽¹⁾	/	yes
Refrigerants ⁽¹⁾	/	yes
Dry transformer oils ⁽¹⁾	/	yes
Hydraulic oils ⁽¹⁾	/	yes

⁽¹⁾ Due to the variety of individual applications we cannot make any generally binding commitments regarding the compatibility. We recommend testing compatibility with the materials being used.

SHSold® V155

Technical data

- Enamelled round copper wire, solderable
- Insulated with polyurethane
- Class 155
- IEC /DIN EN 60317-20
- NEMA MW 79-C
- UL approved

Production range

Grade 1: from 0.050 - 0.100 mm
(> 0.100 mm on request)

Grade 2: on request

Properties

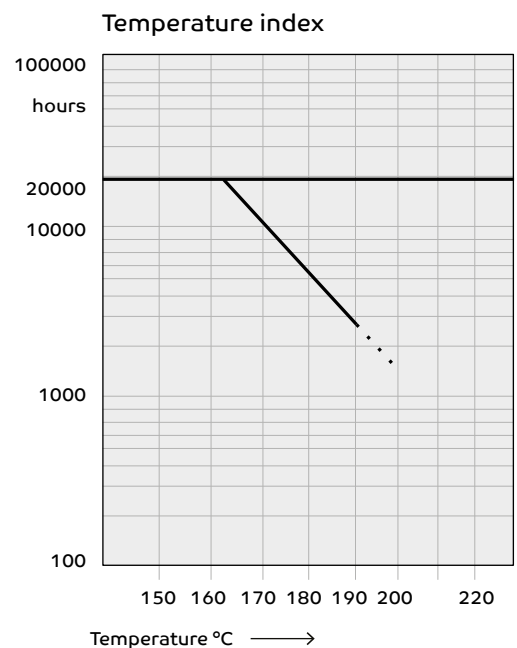
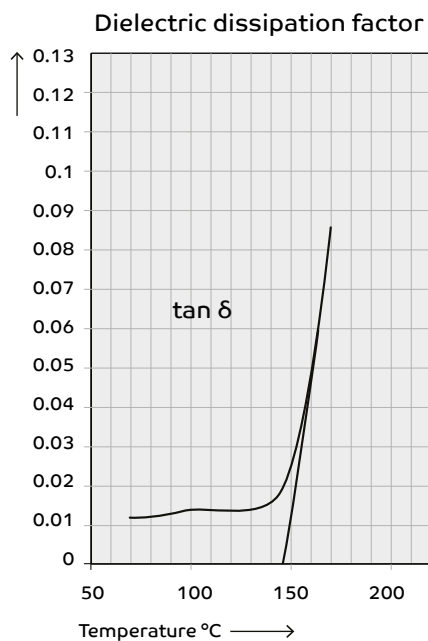
SHSold® V155 is a self-fluxing enamelled copper wire of thermal performance class F. The most outstanding characteristic of this wire is the possibility of having an efficient and safe contact of the wire ends by fast and easy solderability with a solder bath temperature from 390 °C upwards without prior mechanical removal of the insulation film.

This type of enamelled copper wire fulfills the requirements of modern winding technology. In accordance with the manufacturer's instructions SHSold® V155 can be impregnated and cast with compounds. Chemical resistance to aggressive, liquid or gaseous mediums is limited, and therefore we recommend that you carry out compatibility tests before using this enamelled copper wire. SHSold® V155 can be easily welded and mechanically connected. Sophisticated process technology and process setting ensure easy mouldability, best elongation plus constant and good insulation characteristics of these wires.

Application

Contactors, magnetic coils, relays, small motors, transformers

Temperature diagrams



Typical properties of enamelled round copper wire 0.160 mm, with insulation film grade 1

Mechanical	Set value	Actual value (typ.)
Bare wire diameter (mm)	0.157 - 0.163	as set value
Overall diameter (mm)	min. 0.172 - max. 0.182	as set value
Adhesion (no cracks in film after winding)	mandrel diameter 0.160 mm	1 x d / 10 % pre-elongation
Scrape resistance (N)	/	/
Pencil hardness	H	2H - 4H
Elongation at break (%)	≥ 22	≥ 28
Coefficient of friction μ	/	≤ 0.140
Thermal	Set value	Actual value (typ.)
Temperature index TI	155	160
Cut trough temperature (°C) (pre-heated block)	200	≥ 220
Dielectric loss factor (°C) (tan δ)	/	≥ 140
Heat shock at 175 °C (no cracks in varnish coat after winding)	mandrel diameter 0.250 mm	1 x d / 10 % pre-elongation
Solderability at 390 °C (s)	≤ 2	≤ 1
Electrical	Set value	Actual value (typ.)
Dielectrical strength at RT (kV)	≥ 1.7 (twist)	≥ 2.5 (cylinder)
High voltage discontinuities test voltage 500 V	≤ 10 on 30 m	≤ 7 on 100 m
Electrical conductivity of CU conductor (MS/m)	58 - 59	≥ 58.5
Chemical	Set value	Actual value (typ.)
Pencil hardness		
Storage in standard solvent ½ h / 60 °C	min. H	2H - 4H
Storage in alcohol ½ h / 60 °C	min. H	H
Resistance to commercial		
Impregnants ⁽¹⁾	/	yes
Refrigerants ⁽¹⁾	/	no
Dry transformer oils ⁽¹⁾	/	not recommended
Hydraulic oils ⁽¹⁾	/	no

⁽¹⁾ Due to the variety of individual applications we cannot make any generally binding commitments regarding the compatibility. We recommend testing compatibility with the materials being used.

SHSold® V180

Technical data

- Enamelled round copper wire, solderable
- Insulated with polyurethane
- Class 180
- IEC / DIN EN 60317-51
- NEMA MW 82-C
- UL approved

Production range

Grade 1: 0.050 - 1.600 mm
(> 1.600 mm on request)
Grade 2: on request

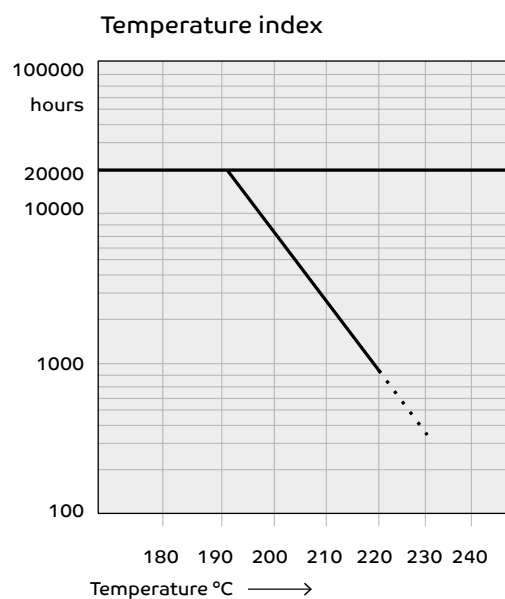
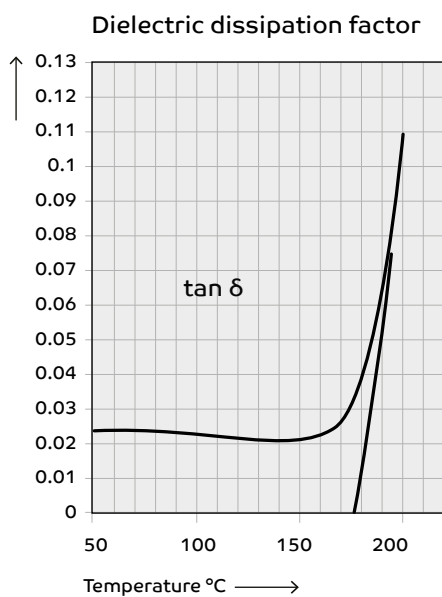
Properties

SHSold® V180 is an enamelled copper wire of thermal performance class H and allows quick and direct soldering. The most outstanding characteristics of the wire is the possibility of efficient and safe contacting of the wire ends by quick and exact soldering at solder bath temperatures from 390 °C upwards without prior mechanical removal of the insulation film. This type of enamelled copper wires fulfills the technical requirements of modern winding techniques and can be well impregnated and cast with compounds in accordance with the manufacturer's instructions. The excellent thermal resistance characteristics offer protection when wire-wound coils have to be compound cast and when subject to shorttime overloads. The chemical resistance to aggressive liquid and gaseous mediums is limited, and therefore we recommend that you carry out compatibility tests before using this enamelled copper wire. SHSold® V180 can be easily welded and mechanically connected. Sophisticated process technology and process setting ensure easy mouldability, good elongation plus constant and good insulation characteristics of these wires.

Application

Contactors, magnetic coils, relays, small motors, transformers, inverters

Temperature diagrams



Typical properties of enamelled round copper wire 0.500 mm, with insulation film grade 1

Mechanical	Set value	Actual value (typ.)
Bare wire diameter (mm)	0.495 - 0.505	as set value
Overall diameter (mm)	min. 0.524 - max. 0.544	as set value
Adhesion (no cracks in film after winding)	mandrel diameter 0.500 mm	1 x d / 10 % pre-elongation
Scrape resistance (N)	≥ 3.100	≥ 6.000
Pencil hardness	H	2H - 3H
Elongation at break (%)	≥ 28	≥ 37
Coefficient of friction μ	/	≤ 0.140
Thermal	Set value	Actual value (typ.)
Temperature index TI	180	185
Cut trough temperature (°C) (pre-heated block)	230	≥ 230
Dielectric loss factor (°C) (tan δ)	/	≥ 140
Heat shock at 200 °C (no cracks in varnish coat after winding)	mandrel diameter 1.120 mm	1 x d / 10 % pre-elongation
Solderability at 390 °C (s)	≤ 4	≤ 2.5
Electrical	Set value	Actual value (typ.)
Dielectrical strength at RT (kV)	≥ 2.4 (twist)	≥ 3 (cylinder)
High voltage discontinuities test voltage 750 V	≤ 10 on 30 m	≤ 7 on 100 m
Electrical conductivity of CU conductor (MS/m)	58 - 59	≥ 58.5
Chemical	Set value	Actual value (typ.)
Pencil hardness		
Storage in standard solvent ½ h / 60 °C	min. H	2H - 3H
Storage in alcohol ½ h / 60 °C	min. H	H
Resistance to commercial		
Impregnants ⁽¹⁾	/	yes
Refrigerants ⁽¹⁾	/	no
Dry transformer oils ⁽¹⁾	/	not recommended
Hydraulic oils ⁽¹⁾	/	no

⁽¹⁾ Due to the variety of individual applications we cannot make any generally binding commitments regarding the compatibility. We recommend testing compatibility with the materials being used.

SHSold® V180 Glide

Technical data

- Enamelled round copper wire, solderable and self lubricating
- Insulated with polyurethane
- Class 180
- IEC / DIN EN 60317-51
- NEMA MW 82-C
- UL approved

Production range

Grade 1: 0.112 - 0.710 mm
(> 0.710 mm on request)
Grade 2: on request

Properties

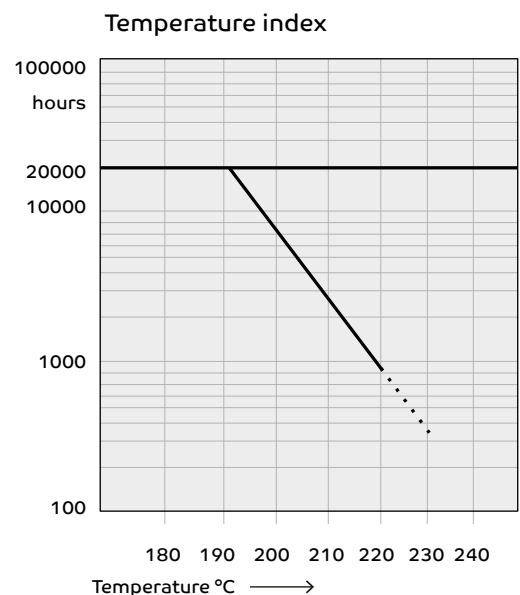
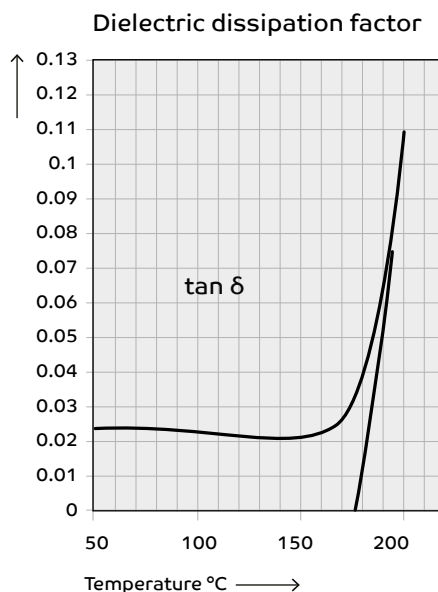
SHSold® V180 Glide is an enamelled copper wire of thermal performance class H and allows quick and direct soldering. The most outstanding characteristics of the wire is the possibility of efficient and safe contacting of the wire ends by quick and exact soldering at solder bath temperatures from 390 °C upwards without prior mechanical removal of the insulation film. This type of enamelled copper wires fulfills the technical requirements of modern winding techniques and can be well impregnated and cast with compounds in accordance with the manufacturer's instructions. The excellent thermal resistance characteristics offer protection when wire-wound coils have to be compound cast and when subject to shorttime overloads. The chemical resistance to aggressive liquid and gaseous mediums is limited, and therefore we recommend that you carry out compatibility tests before using this enamelled copper wire. SHSold® V180 Glide can be easily welded and mechanically connected. Sophisticated process technology and process setting ensure easy mouldability, good elongation plus constant and good insulation characteristics of these wires.

The final layer of varnish serves the purpose of providing a superior gliding surface, giving the wire excellent windability features at higher speeds, and enabling a higher filling factor plus reduced soiling of the winding machines. The reduced coefficient of friction helps to avoid damage to the wire during winding and thus maintains the insulation properties of the wire.

Application

Contactors, magnetic coils, relays, small motors, transformers, inverters

Temperature diagrams



Typical properties of enamelled round copper wire 0.500 mm, with insulation film grade 1

Mechanical	Set value	Actual value (typ.)
Bare wire diameter (mm)	0.495 - 0.505	as set value
Overall diameter (mm)	min. 0.524 - max. 0.544	as set value
Adhesion (no cracks in film after winding)	mandrel diameter 0.500 mm	1 x d / 10 % pre-elongation
Scrape resistance (N)	≥ 3.100	≥ 6.000
Pencil hardness	H	2H - 3H
Elongation at break (%)	≥ 28	≥ 37
Coefficient of friction μ	/	≤ 0.110
Thermal	Set value	Actual value (typ.)
Temperature index TI	180	185
Cut trough temperature (°C) (pre-heated block)	230	≥ 230
Dielectric loss factor (°C) (tan δ)	/	≥ 140
Heat shock at 200 °C (no cracks in varnish coat after winding)	mandrel diameter 1.120 mm	1 x d / 10 % pre-elongation
Solderability at 390 °C (s)	≤ 4	≤ 2.5
Electrical	Set value	Actual value (typ.)
Dielectrical strength at RT (kV)	≥ 2.4 (twist)	≥ 3 (cylinder)
High voltage discontinuities test voltage 750 V	≤ 10 on 30 m	≤ 7 on 100 m
Electrical conductivity of CU conductor (MS/m)	58 - 59	≥ 58.5
Chemical	Set value	Actual value (typ.)
Pencil hardness		
Storage in standard solvent ½ h / 60 °C	min. H	2H - 3H
Storage in alcohol ½ h / 60 °C	min. H	H
Resistance to commercial		
Impregnants ⁽¹⁾	/	yes
Refrigerants ⁽¹⁾	/	no
Dry transformer oils ⁽¹⁾	/	not recommended
Hydraulic oils ⁽¹⁾	/	no

⁽¹⁾ Due to the variety of individual applications we cannot make any generally binding commitments regarding the compatibility. We recommend testing compatibility with the materials being used.

SHBond® WD210

Technical data

- Enamelled round copper wire, thermoresistant, self bonding
- Insulated with THEIC mod. polyesterimide plus polyamide-imide overcoat plus bonding layer
- Class 200
- IEC / DIN EN 60317-38
- NEMA MW 102-C
- UL approved

Production range

Grade 1: 0.150 - 1.250 mm

Grade 2: 0.300 - 1.250 mm

> 1.250 mm on request

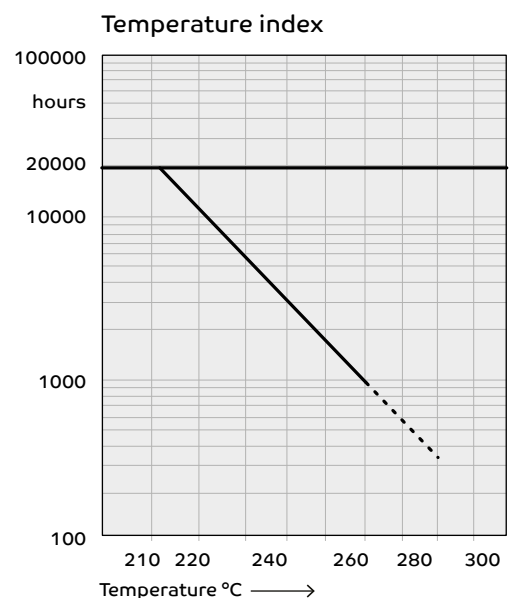
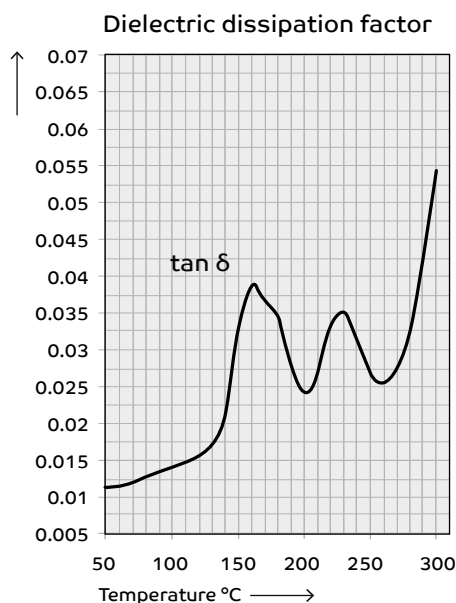
Properties

SHBond® WD210 is a highly thermoresistant self-bonding enamelled copper wire of heat performance class N. With this wire the excellent resistance and insulation properties of SHTherm® 210 – Dualcoat are combined with the special application possibilities of an additional bonding layer which is based on mod. aromat. Polyamide and which enables the production of heat bonded wire windings. Using this type of thermo-setting wire the heat bonding process is economic, as it can be executed within seconds and can support automatic processing. It is not harmful to the environment. Heat bonded windings show excellent thermal and mechanical stability and high resistance to climatic demands and many chemical agents. Sophisticated process technology and process setting ensure easy mouldability, good elongation and excellent insulation properties.

Application

Drives for household appliances, pole windings, wire wound coils, power tools

Temperature diagrams



Typical properties of enamelled round copper wire 0.500 mm, with insulation film grade 1B

Mechanical	Set value	Actual value (typ.)
Bare wire diameter (mm)	0.495 - 0.505	as set value
Overall diameter (mm)	min. 0.541 - max. 0.568	as set value
Adhesion (no cracks in film after winding)	mandrel diameter 0.500 mm	1 x d / 10 % pre-elongation
Scrape resistance (N)	≥ 3.950	≥ 7.500
Pencil hardness	H	3H - 5H
Elongation at break (%)	≥ 28	≥ 38
Coefficient of friction μ	/	≤ 0.140
Thermal	Set value	Actual value (typ.)
Temperature index TI	200	210
Cut trough temperature (°C) (pre-heated block)	320	≥ 360
Dielectric loss factor (°C) (tan δ)	/	≥ 140/185/240
Heat shock at 220 °C (no cracks in varnish coat after winding)	mandrel diameter 1.120 mm	1 x d / 10 % pre-elongation
Bonding temperature °C	200 +/-2	≥ 180
Electrical	Set value	Actual value (typ.)
Dielectrical strength at RT (kV)	≥ 2.4 (twist)	≥ 3 (cylinder)
High voltage discontinuities test voltage 750 V	≤ 10 on 30 m	≤ 7 on 100 m
Electrical conductivity of CU conductor (MS/m)	58 - 59	≥ 58.5
Chemical	Set value	Actual value (typ.)
Pencil hardness		
Storage in standard solvent ½ h / 60 °C	test methods unsuitable	/
Storage in alcohol ½ h / 60 °C	test methods unsuitable	/
Resistance to commercial		
Impregnants ⁽¹⁾	/	not applicabled
Refrigerants ⁽¹⁾	/	limited
Dry transformer oils ⁽¹⁾	/	not recommended
Hydraulic oils ⁽¹⁾	/	no

⁽¹⁾ Due to the variety of individual applications we cannot make any generally binding commitments regarding the compatibility. We recommend testing compatibility with the materials being used.

SHBond® WD210 Glide

Technical data

- Enamelled round copper wire, thermoresistant, selfbonding and self lubricating
- Insulated with THEIC mod. polyesterimide plus polyamide-imide overcoat plus bonding layer
- Klasse 200
- IEC / DIN EN 60317-38
- NEMA MW 102-C

Production range

Grade 1: on request

Grade 2: on request

Properties

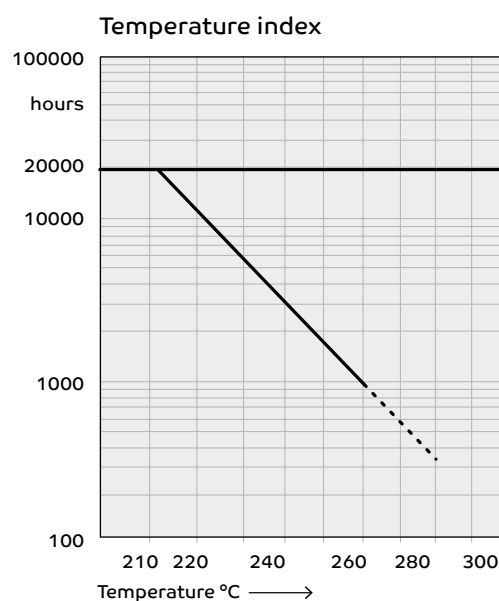
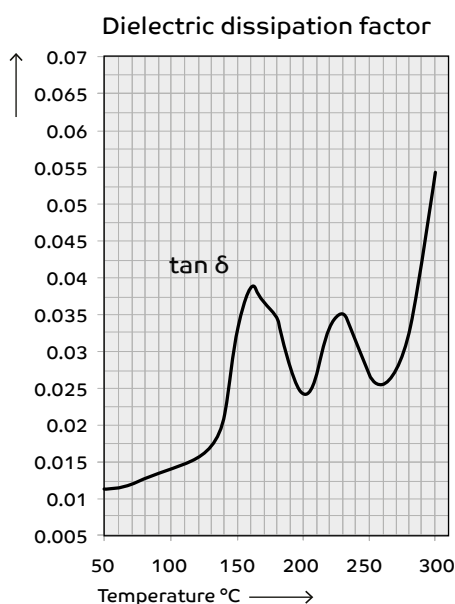
SHBond® WD210 Glide is a highly thermoresistant self-bonding enamelled copper wire of heat performance class N. With this wire the excellent resistance and insulation properties of SHTherm® 210 – Dualcoat are combined with the special application possibilities of an additional bonding layer which is based on mod. aromat. Polyamide and which enables the production of heat bonded wire windings. Using this type of thermo-setting wire the heat bonding process is economic, as it can be executed within seconds and can support automatic processing. It is not harmful to the environment. Heat bonded windings show excellent thermal and mechanical stability and high resistance to climatic demands and many chemical agents. Sophisticated process technology and process setting ensure easy mouldability, good elongation and excellent insulation properties.

The final layer of varnish serves the purpose of providing a superior gliding surface, giving the wire excellent windability features at higher speeds, and enabling a higher filling factor plus reduced soiling of the winding machines. The reduced coefficient of friction helps to avoid damage to the wire during winding and thus maintains the insulation properties of the wire.

Application

Drives for household appliances, pole windings, wire wound coils, power tools

Temperature diagrams



Typical properties of enamelled round copper wire 0.500 mm, with insulation film grade 1B

Mechanical	Set value	Actual value (typ.)
Bare wire diameter (mm)	0.495 - 0.505	as set value
Overall diameter (mm)	min. 0.541 - max. 0.568	as set value
Adhesion (no cracks in film after winding)	mandrel diameter 0.500 mm	1 x d / 10 % pre-elongation
Scrape resistance (N)	≥ 3.950	≥ 7.500
Pencil hardness	H	3H - 5H
Elongation at break (%)	≥ 28	≥ 38
Coefficient of friction μ	/	≤ 0.110
Thermal	Set value	Actual value (typ.)
Temperature index TI	200	210
Cut trough temperature (°C) (pre-heated block)	320	≥ 360
Dielectric loss factor (°C) (tan δ)	/	≥ 140/185/240
Heat shock at 220 °C (no cracks in varnish coat after winding)	mandrel diameter 1.120 mm	1 x d / 10 % pre-elongation
Bonding temperature °C	200 +/-2	≥ 210
Electrical	Set value	Actual value (typ.)
Dielectrical strength at RT (kV)	≥ 2.4 (twist)	≥ 3 (cylinder)
High voltage discontinuities test voltage 750 V	≤ 10 on 30 m	≤ 7 on 100 m
Electrical conductivity of CU conductor (MS/m)	58 - 59	≥ 58.5
Chemical	Set value	Actual value (typ.)
Pencil hardness		
Storage in standard solvent ½ h / 60 °C	test methods unsuitable	/
Storage in alcohol ½ h / 60 °C	test methods unsuitable	/
Resistance to commercial		
Impregnants ⁽¹⁾	/	not applicabled
Refrigerants ⁽¹⁾	/	limited
Dry transformer oils ⁽¹⁾	/	not recommended
Hydraulic oils ⁽¹⁾	/	no

⁽¹⁾ Due to the variety of individual applications we cannot make any generally binding commitments regarding the compatibility. We recommend testing compatibility with the materials being used.

SHBond® WD210 Alu

Technical data

- Enamelled round aluminium wire, thermoresistant, selfbonding
- Insulated with THEIC mod. polyesterimide plus polyamide-imide overcoat plus bonding layer
- Klasse 200
- IEC / DIN EN 60317-38
- NEMA MW 102-C

Production range

Grade 1: on request

Grade 2: on request

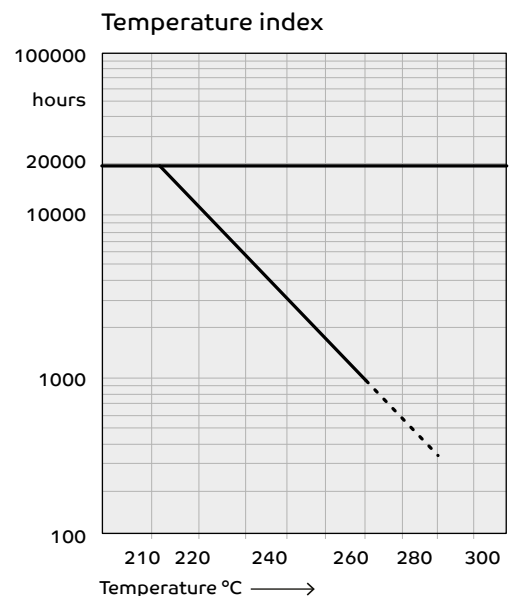
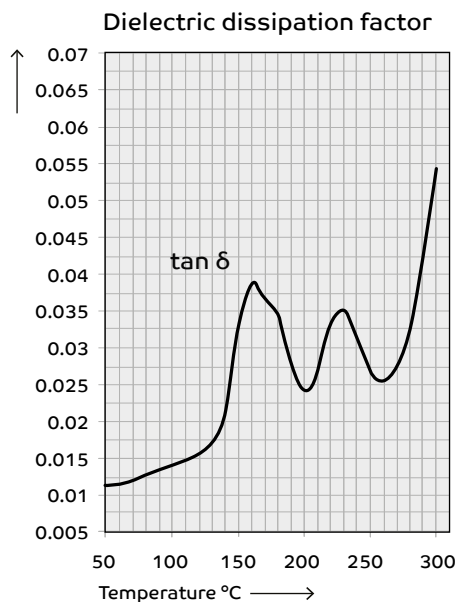
Properties

SHBond® WD210 Alu is a highly thermoresistant self-bonding enamelled aluminium wire of heat performance class N. With this wire the excellent resistance and insulation properties of SHTherm® 210 – Dualcoat are combined with the special application possibilities of an additional bonding layer which is based on mod. aromat. Polyamide and which enables the production of heat bonded wire windings. Using this type of thermo-setting wire the heat bonding process is economic, as it can be executed within seconds and can support automatic processing. It is not harmful to the environment. Heat bonded windings show excellent thermal and mechanical stability and high resistance to climatic demands and many chemical agents. Sophisticated process technology and process setting ensure easy mouldability, good elongation and excellent insulation properties.

Application

Drives for household appliances, pole windings, wire wound coils, power tools

Temperature diagrams



Typical properties of enamelled round aluminium wire 0.500 mm, with insulation film grade 1B

Mechanical	Set value	Actual value (typ.)
Bare wire diameter (mm)	0.495 - 0.505	as set value
Overall diameter (mm)	min. 0.541 - max. 0.568	as set value
Adhesion (no cracks in film after winding)	3 x d	2 x d
Scrape resistance (N)	≥ 3.950	≥ 7.500
Pencil hardness	H	3H - 5H
Elongation at break (%)	≥ 12	≥ 20
Coefficient of friction μ	/	≤ 0.140
Thermal	Set value	Actual value (typ.)
Temperature index TI	200	210
Cut trough temperature (°C) (pre-heated block)	320	≥ 360
Steilanstieg des dielektr. Verlustfaktors (°C) (tan δ)	/	≥ 140/185/240
Heat shock at 220 °C (no cracks in varnish coat after winding)	3 x d	3 x d
Bonding temperature °C	200 +/-2	≥ 180
Electrical	Set value	Actual value (typ.)
Dielectrical strength at RT (kV)	≥ 2.4 (twist)	≥ 3 (cylinder)
High voltage discontinuities test voltage 750 V	≤ 25 on 30 m	≤ 7 on 100 m
Electrical conductivity of AL conductor (MS/m)	35.5 - 36.2	≥ 35.85
Chemical	Set value	Actual value (typ.)
Pencil hardness		
Storage in standard solvent ½ h / 60 °C	test methods unsuitable	/
Storage in alcohol ½ h / 60 °C	test methods unsuitable	/
Resistance to commercial		
Impregnants ⁽¹⁾	/	not applicabled
Refrigerants ⁽¹⁾	/	limited
Dry transformer oils ⁽¹⁾	/	not recommended
Hydraulic oils ⁽¹⁾	/	no

⁽¹⁾ Due to the variety of individual applications we cannot make any generally binding commitments regarding the compatibility. We recommend testing compatibility with the materials being used.

SHBare[®]

SHBare[®] Flat

Technical data

Production range

Preferred round diameters:

0.70 mm; 0.90 mm; 1.20 mm; 1.80 mm; 2.40 mm and 4.50 mm.

Further diameters on request.

Preferred flat diameters:

2.50 - 100.00 mm²

Properties

SHBare[®], round or flat, is available as ETP, ETP1, OF or OF1. The quality is specified according to DIN EN 1977. The surface of the copper is treated to provide best possible compatibility with insulating materials, such as varnish, papers, foils or glass yarn.

The properties of the copper are ideal for the production of enamelled copper wires according to the IEC 60317-series. Specific requirements caused by further treatment of the wire or individual applications should be agreed upon.

Application

Conductor requiring further insulation, copper bars for rotors in asynchronous motors

General terms and conditions of delivery

General terms and conditions

This price list is valid until revoked. In case the requested delivery period exceeds two months, we reserve the right to change the processing prices. In all other cases our terms and conditions of delivery and payment apply.

Transactions inside Germany

Transactions with our customers residing in Germany are processed exclusively in accordance with our General Terms and Conditions of Sales. These Terms are available on our homepage www.sh-wire.de. You can download these Terms or we can send them to you on request free of charge. We are not obliged to accept your opposing or differing business conditions, even if we do not expressly confirm our refusal, even if we render our services/effect deliveries without reserve or accept services from your side.

Transactions outside Germany

For legal relations to customers residing outside Germany, our International Terms and Conditions of Sales apply. These Terms are available on our homepage www.sh-wire.de. You can download these Terms or we can send them to you on request free of charge. We are not obliged to accept your opposing or differing business conditions, even if we do not expressly confirm our refusal, even if we render our services/effect deliveries without reserve or accept services from your side.

Metal terms

Copper

In case of no copper provision, copper is charged as follows: DEL quotation (upper DEL) + 2 % procurement costs, plus 6.5 % processing costs at day of delivery.

Provided copper must be in form of electrolyte copper cathodes, LME registered branded copper, grade A. It has to be freely fungible, without commitment to copper rod, and available 6 weeks prior to requested delivery date, or along with the order. Shipment and place of provision has to be agreed with us. Copper accounts are constantly monitored for the adherence to above mentioned conditions. Account holders are regularly informed about balances.

Minimum provision quantity is 5,000 kg. Lots below 5,000 kg are not accepted. In case of copper provision, our charges for covering expenses of account-management amount to € 2.50 per 100 kg provided copper. Billing is based on copper quantities per shipment.

In case of insufficient copper balance on the day of delivery, any missing quantities are charged at full price transaction, however, limited to the actual shortage.

Aluminium

Aluminum will be calculated as follows: LME Aluminum cash Settlement + applicable premium per to +5 % financing costs.

Conversion in EUR: BFIX

Minimum quantity per order

The minimum standard quantity for deliveries ex works and per delivery date and item is one pallet. Per delivery 10 t copper, 4 t aluminium of assorted dimensions.

Based on experience and depending on the reel sizes the average weight per pallet is approx. 450 kg (copper)/150 kg (aluminium). Depending on reel-type and dimension it may differ.

Dimensions (mm)	Minimum quantity Cu	Minimum quantity Al
up to 0.060	250 kg	-
up to 0.140	900 kg	-
up to 0.400	1800 kg	-
up to 0.600	2400 kg	750 kg
up to 1.180	3600 kg	1200 kg
> 1.180	7200 kg	2400 kg
rectangular wire	3000 kg	on request

In case the above mentioned minimum order quantities cannot be taken, individual minimum quantities and a set-up/installation lump sum with a minimum of € 500.- per article for round wire and minimum of € 2,000.- per article for flat wire has to be agreed upon. The same applies to articles not included in our standard production program or dimensions not included in the norm.

Reel sizes

Standard reels are shown in the table below. Differing reel sizes on request.

Type of reel	Copper		Aluminium	
	from (mm)	to (mm)	from (mm)	to (mm)
HKV200	0.050	0.100		
K200	0.050	0.250		
K250	0.050	0.700		
K355	0.710	2.000		
K500	1.060	4.500	1.060	4.500
	rectangular wire		rectangular wire	
K630	1.060	4.500	1.060	4.500
	rectangular wire		rectangular wire	
K710	1.060	4.500	1.060	4.500
	rectangular wire		rectangular wire	
A250	0.100	1.000		
A315	0.180	1.400	1.250	1.400
A400	0.250	2.000	1.250	4.000
A500	0.250	4.500	1.250	4.000
A630	0.710	4.500		
M800	1.800	4.500	1.800	4.500

Dimensions & Filling weights of reels

Cone-shaped reels (IEC 60264-5-1)

Type of reel	SHWire item no.	D1	H1	B/D3	Magnet wire nominal ϕ mm		Tare weight	Filling weight	Reels per pallet
		mm	mm	mm	min	max	kg	ca. kg	
HKV160	9950	160	160	22	0.050	0.100	0.32	5	48
HKV200	9951	200	200	22	0.050	0.100	0.58	11	30
HKV250	9910	250	250	22	0.080	0.100	2.65	22	11

D1=diameter, H1=height, B=diameter of hole

Cylindrical reels (IEC 60264-2-2)

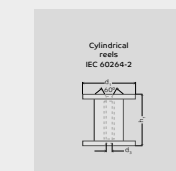
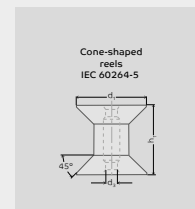
Type of reel	SHWire item no.	D1	H1	B/D3	Magnet wire nominal ϕ mm		Tare weight	Filling weight Cu	Filling weight Al	Reels per pallet
		mm	mm	mm	min	max	kg	ca. kg	ca. kg	
K160	9952	160	160	22	0.050	0.100	0.35	5		48
K200	9955	200	200	22	0.050	0.250	0.60	11		48
K250	9958	250	200	22	0.050	0.700	1.05	22		28
K355	9959	355	200	36	0.710	2.000	3.20	45		12
K500	9971	500	250	36	rectangular/round wire		7.65	90	30	6
K630	9928	630	230	40	rectangular/round wire		9.60	180	60	4
K710	9970	710	250	47	rectangular/round wire		18.40	200	65	4

D1=diameter, H1=height, B=diameter of hole

Oblong reels (IEC 60264-3) with cover (IEC 60264-3-5)

Type of reel	SHWire item no.	D1	H1	B/D3	Magnet wire nominal ϕ mm		Tare weight	Filling weight Cu	Filling weight Al	Reels per pallet
		mm	mm	mm	min	max	kg	ca. kg	ca. kg	
A200	9961	265	400	100	0.080	0.150	2.65	22		12
A250	9962	315	500	100	0.100	1.000	4.70	45		11
A315	9963	400	630	100	0.180	1.400	9.10	90	30	6
A400	9964	500	800	100	0.250	2.000	16.00	180	60	3

D1=diameter, H1=height, B=diameter of hole



Oblong reels (IEC 60264-3) without cover

Type of reel	SHWire item no.	D1	D2	H1	B/D3	Magnet wire nominal ϕ mm		Tare weight	Filling weight Cu	Filling weight Al	Reels per pallet
		mm	mm	mm	mm	min	max	kg	ca. kg	ca. kg	
A200 ¹	9966	190	200	315	100	0.080	0.150	1.25	22		12
A250	9967	236	250	400	100	0.100	1.000	2.25	45		11
A315	9968	300	315	500	100	0.180	1.400	4.35	90	30	6
A400	9969	375	400	630	100	0.250	2.000	7.30	180	60	5
A500	9979	475	500	800	100	0.250	4.000	23.70	360	120	2
A630	9985	630	630	900	100	0.710	4.000	92.00	720		1

D1=diameter top, D2=diameter bottom, H1=height, B=diameter of hole

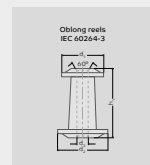
Cover (IEC 60264-3-5)

Type of reel	SHWire item no.	D1	H1	B/D3	Tare weight
		mm	mm	mm	kg
A200	9981	265	400	100	1.40
A250	9982	315	500	100	2.45
A315	9983	400	630	100	4.75
A400	9984	500	800	100	8.70

D1=diameter top, D2=diameter bottom, H1=height, B=diameter of hole
¹These reels can not be delivered without cover.

Wooden barrel M800

Type of reel	SHWire item no.	D1	H1	Magnet wire nominal ϕ mm		Tare weight	Filling weight Cu	Reels per pallet
		mm	mm	min	max	kg	ca. kg	
M800	9972	790	800	1.800	4.000	42.00	750	1



Deposits for reels, covers and packaging

Type of reel	SHWire item no.	Empties tare kg	Filling weight Copper ca. kg	Filling weight Aluminium ca. kg	quantity/pallet (layer)	Deposit €	Credit €
Cone-shaped reels acc. to IEC 60264-4-1 (dimensions see „Reel sizes“)							
HKV160 (plus 9333 2)	9950	0.32	5		48 (2)	2.80	2.52
HKV200	9951	0.60	11		30 (2)	5.20	4.68
HKV250 with cover	9910	2.65	22		11	32.00	28.80
Cylindrical reels acc. to IEC 60264-2-2 (dimensions see „Reel sizes“)							
K160 ¹	9952	0.35	5		48 (2)	2.50	2.25
K200 ¹	9955	0.60	11		48 (2)	5.90	5.31
K250 ¹	9958	1.05	22		28 (2)	9.10	8.19
K355 ¹	9959	3.20	45		12 (2)	22.80	20.52
K500	9971	7.65	90	30	6	54.50	49.05
K630	9928	9.60	180	60	4	96.00	86.40
K710	9970	18.60	200	65	4	200.00	180.00
Oblong reels acc. to IEC 60264-3 (dimensions see „Reel sizes“)							
A400 without cover plus 9927 plus 9353 4	9969	7.30	180	60	5	45.50	40.95
A500 without cover plus 9909	9976	23.70	360	120	2	350.00	315.00
A630 without cover plus 9979	9985	92.00	720		1	500.00	450.00
Wooden barrel (dimensions see „Reel sizes“)							
M800 plus 9979	9972	42.00	750		1	300.00	270.00
Oblong reels with cover acc. to IEC 60264-3-5							
A200 with cover	9961	2.63	22		12	21.20	19.08
A250 with cover	9962	4.70	45	15	11	28.50	25.65
A315 with cover	9963	9.15	90	30	6	56.90	51.21
A400 with cover	9964	16.00	180	60	3	95.60	86.04
Stacking frames for pallets (plastic transit support for reels without cover)							
Stacking frames for pallets 160K	9916	4.50			1 - 2	50.00	45.00
Stacking frames for pallets 200K	9916	4.50			1 - 2	50.00	45.00
Stacking frames for pallets 250K	9917	4.10			1 - 2	50.00	45.00
Stacking frames for pallets A400	9927	4.30			1	50.00	45.00
Pallet							
Euro pallet wood	9991	25.00				14.30	12.87
Euro pallet plastic	9908	29.30				72.00	64.80
Steel pallet (for A630/M800)	9979	25.00				120.00	108.00
Pallet covers with strapping							
Wooden lid	9353 4	5.00			1	13.00	11.70
Wooden lid A500	9909	8.00			1	13.00	11.70
Cardboard packaging							
Paper board cover euro-dim.						1.00	without
Box individual reels (HKV200/K200)	9332 7	0.20				1.00	without
Box four reels (HKV160/K160)	9333 0	1.05				1.00	without
Plastic insert HKV160	9333 2	0.2				3.10	2.79

¹rewinding costs

Recommendations for return of empties

Empties must be handed over to the carrier, packed and secured, in accordance with the current regulations on securing loads in accordance with VDI 2700. In this, you should follow our recommendations listed below.

Take care to ensure that:

- empties are stored clean and dry
- to place an intermediate layer of cardboard between each layer and one on top for better stability of reels K160 to A250.
- to finish, place an inverted Europallet onto the empties and secure using at least two straps.
- in the case of packaging for K reels K160 / K200, it is expedient to additionally secure these using plastic sheeting.
- if possible, no reels should protrude beyond the outer edge of the pallet, as they could be damaged on loading and unloading.
- reels delivered in cardboard boxes should be returned in their original packaging, with only one type per pallet.

Address for all returned empties:

KM-Logistik GmbH
Abt. Leergut SH
Brunnenstraße 15
D-32676 Lügde

Conditions for credit

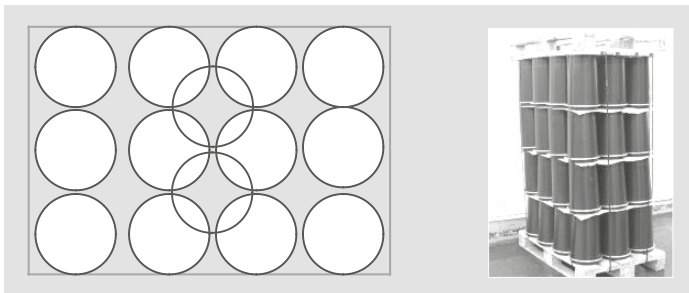
Take care to ensure that:

- only empties that can be identified by their label as SHWire EMPTIES will be credited.
- damaged reels will not be credited. Types damage may be:
 - reels / containers written on using a marker pen or felt pen
 - cuts to the reel core or reel edge that can easily occur when removing wire residue.
 - Adhesive tape used for securing the reel during transport and cannot be cleanly removed.
- Faulty deliveries (damage to empties) must be reported to SHWire immediately.

Recommendation for pallet stacking

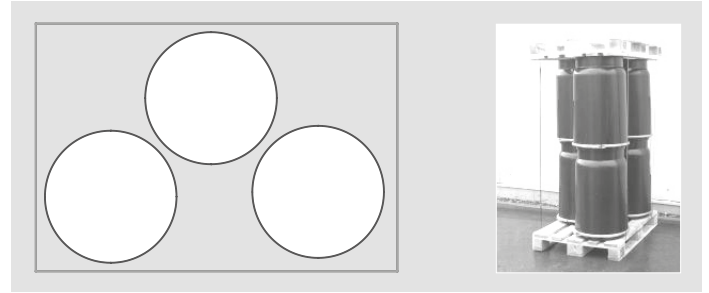
Pallet stacking for A200

- 1 layer = 14 items
- a total of 4 layers = 56 items
- 2 items turned round in center



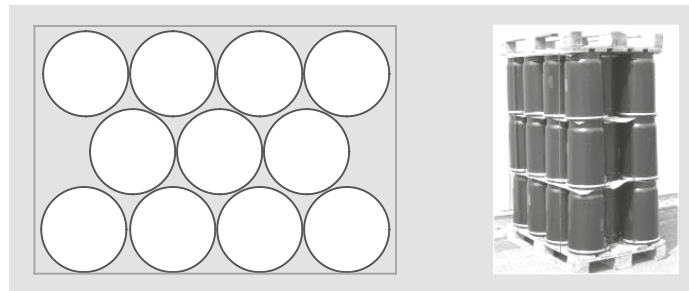
Pallet stacking for A400

- 1 layer = 3 items
- a total of 2 layers = 6 items



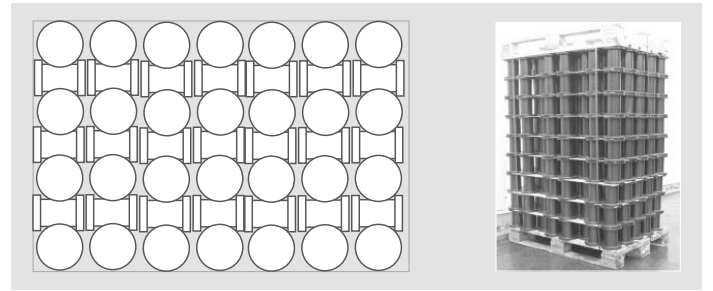
Pallet stacking for A250

- 1 layer = 11 items
- a total of 3 layers = 33 items
- central layer turned round, so A250s come closer together



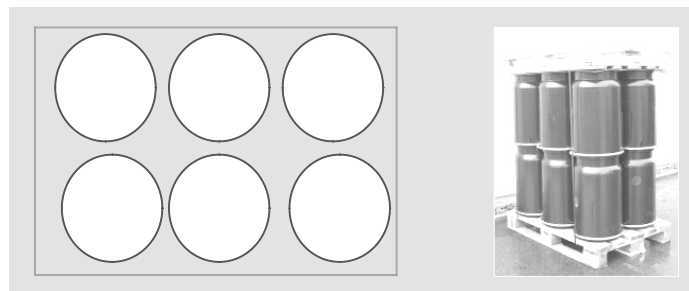
Pallet stacking for K160

- 1 layer = 49 items
- a total of 10 layers = 490 items



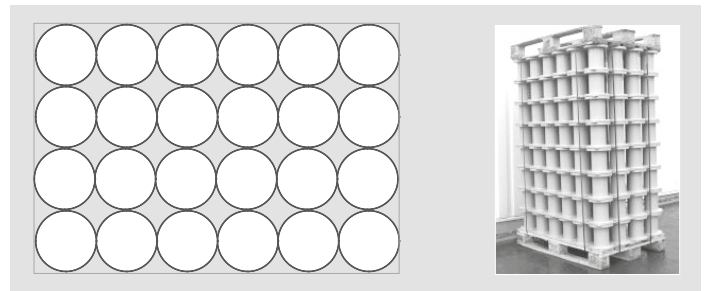
Pallet stacking for A315

- 1 layer = 6 items
- a total of 2 layers = 12 items



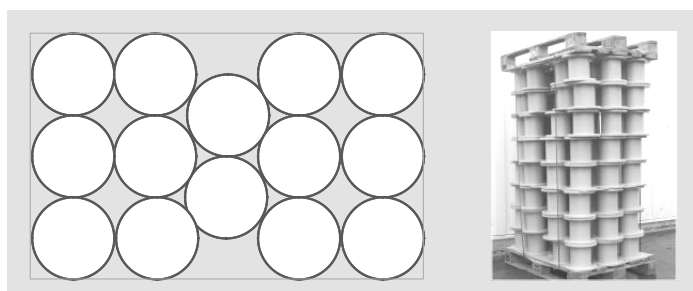
Pallet stacking for K200

- 1 layer = 24 items
- a total of 8 layers = 192 items



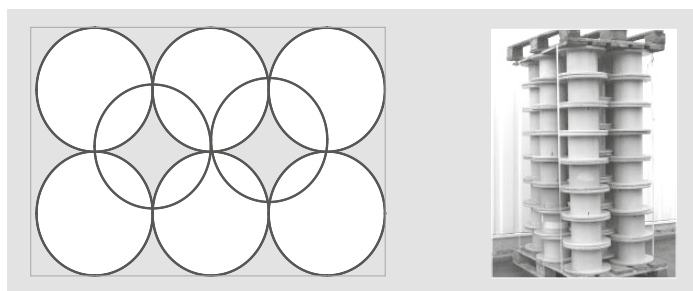
Pallet stacking for K250

- 1 layer = 14 items
- a total of 8 layers = 112 items



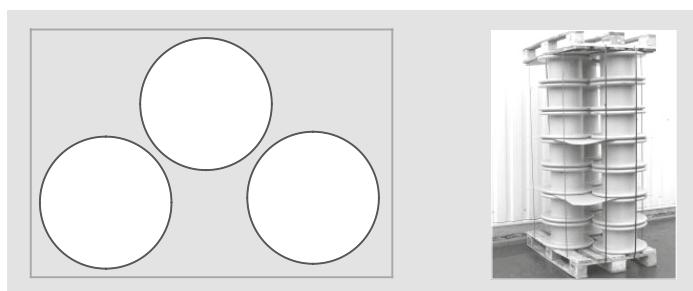
Pallet stacking for K355

- 1 layer = 6 items + 2 in the centre
- a total of 8 layers = 62 items
- central layer 7 high



Pallet stacking for K500

- 1 layer = 3 items
- a total of 7 layers = 21 items



SHWire

Know-how network

Production

We produce enamelled copper and aluminium wires in an inline process involving drawing, coating and winding in one continuous operation. Due to the complicated thermal and physicochemical processes combined with very tight tolerances we operate with a continuous 5-shift system. The whole production process is monitored via a production data acquisition system developed in-house.



Laboratory

The thematic coverage of all areas of analysis necessary in the wire winding industry provides a complete overview of the technical correlations. The embedding of this in the product and process knowledge of SHWire, allows us to not only react in a competent manner to complex questions generated from the market but also to pursue innovative new developments.



FIT / Production Data Acquisition at SHWire

The IT based fully automatic operational and machine data acquisition system permanently measures, controls, documents and saves all quality relevant process and production parameters on every production line. We use this data to good effect and are in a position to intervene in and adjust the processes.

A further step towards Industry 4.0!

Logistics

We ensure total transparency of each order from production to delivery to the customer. This in cooperation with our affiliated company SynFlex Elektro GmbH. We pool the logistics skills of both companies at the SynFlex high-bay warehouse with more than 20,000 pallet bays and other locations in Europe and Asia.



In addition to the company-specific product ranges of SHWire, SynFlex and Iso-Tek, 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 **SHWire** product range.

SHSold®
Series

SHSold® V155
SHSold® V180
SHSold® V180 Glide

SHTherm®
Series

SHTherm® V180
SHTherm® 200
SHTherm® 210
SHTherm® 210 Glide
SHTherm® 210 TE
SHTherm® 210 Alu
SHTherm® 220
SHTherm® 220 Glide
SHTherm® 210 Flat
SHTherm® 210 Flat Alu
SHTherm® 220 Flat

SHBond®
Series

SHBond® WD 210
SHBond® WD 210 Glide
SHBond® WD 210 Alu

SHBare®
Series

SHBare®
SHBare® Flat

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