



Technical brochure



- ① **What is Textile Wire?**
- ② **Typical applications**
- ③ **Delivery and finishing**
- ④ **Environmental protection**
- ⑤ **Contact**

1

What is Textile Wire?

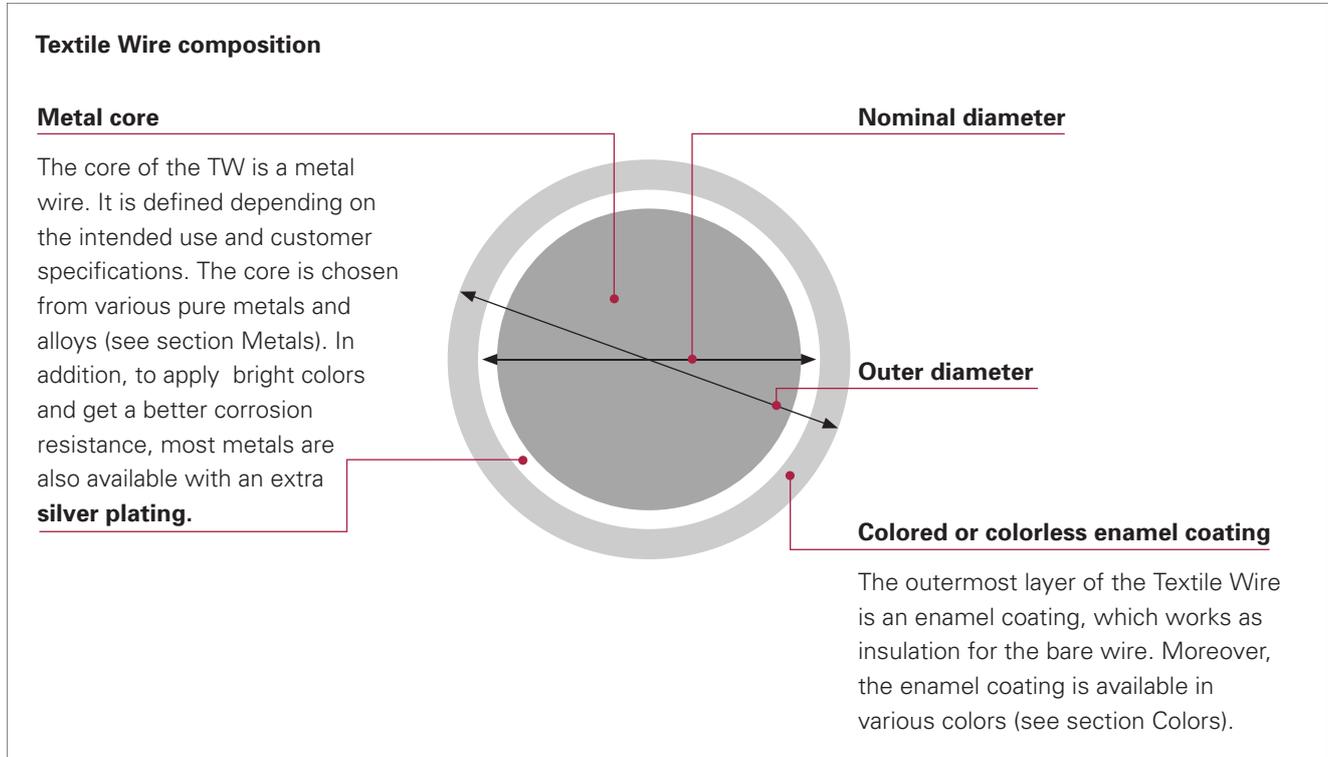


For more than 40 years, ELEKTRISOLA FEINDRAHT AG (EF) has been producing ultra-thin enameled wires. The ELEKTRISOLA-Group is world market leader for diameters below 0.150 mm.

Thanks to the huge experience and know-how when it comes to drawing and enameling extra-fine wires made of various metals, EF is able to produce special wires that cannot only be used in electrical engineering – for more than ten years, EF has been producing wires for textile applications.

Components

Textile Wire (TW) is defined by three components that make it unique. These are the type of metal (pure, alloyed or plated), diameter and enameling. These components are selected according to intended use and customer specifications.



Diameter range

ELEKTRISOLA FEINDRAHT AG produces enameled and bare metal wires with a diameter between **0.010 and 0.500 mm**.

In the list below, you will find the most commonly used dimensions including outer diameter and yarn count.

Nominal diameter [mm]	Outer diameter* [mm]	Yarn count [dtex]
0.020	0.022 – 0.030	30
0.025	0.028 – 0.038	48
0.028	0.031 – 0.043	59
0.032	0.035 – 0.048	77
0.036	0.040 – 0.054	98
0.040	0.044 – 0.059	120
0.045	0.050 – 0.067	152
0.050	0.055 – 0.072	186
0.056	0.062 – 0.080	233
0.063	0.069 – 0.089	296
0.071	0.078 – 0.097	374
0.080	0.087 – 0.108	473
0.100	0.108 – 0.132	736
0.112	0.121 – 0.147	921
0.125	0.135 – 0.163	1'145
0.140	0.151 – 0.181	1'432
0.160	0.172 – 0.205	1'869
0.180	0.193 – 0.229	2'363
0.224	0.239 – 0.280	3'651
0.250	0.267 – 0.312	4'542
0.280	0.298 – 0.345	5'682
0.315	0.334 – 0.384	7'179
0.355	0.375 – 0.428	9'093
0.400	0.421 – 0.478	11'525
0.450	0.472 – 0.533	14'552
0.500	0.524 – 0.587	17'955

* The outer diameters given are reference values. The outer diameter can vary according to specification and customer requests, in order to exactly match the desired color.

Information

It goes without saying that all diameters between 0.010 and 0.500 mm are available. If you are interested in information about yarn count (dtex) for in-between diameters, please visit our homepage for more information and calculations.

Metal types suitable for textile applications

Copper (Cu)

Since the beginning of the electrical age, copper has been recognized for its unique and excellent qualities in electrical applications. Copper is a malleable and ductile material with excellent conductivity. ELEKTRISOLA's electrolytic copper is of high purity (99.95%), which enables us to produce ultra-fine wire down to a diameter of 10 microns.

Diameter range

Copper magnet wire is available in diameters between 0.010 mm and 0.500 mm and is available with different types of insulation enamels. Besides enameled and plated copper wire, we also produce bare copper wire with the same diameters.

Features

- Very high electrical and thermal conductivity
- Good solderability for electrical contacts

Silver-plated copper wire (Cu/Ag)

ELEKTRISOLA's silver-plated copper wire is composed of a copper core covered by concentric silver plating. This material combines the advantages of copper, such as the conductivity, with the bright and shiny surface of silver. In addition, the silver coating provides high corrosion resistance. All these advantages make silver plated copper the favorite choice for colored textile wire. Silver-plated copper wire is available in different coating thicknesses, e.g. 5, 10, 20, 50, 100 and 200 grams of silver per kilogram wire.

Diameter range

Silver-plated wire as well as bare wire is available in diameters between 0.020 mm and 0.500 mm with all types of insulation enamels.

Features

- High electrical and thermal conductivity
- Bright and shiny surface
- High corrosion resistance of silver layer
- Good solderability for electrical contacts
- Antibacterial and antifungal properties

Silver (Ag99.99)

Silver TW has a cleanness of 99.99% and has the highest possible conductivity of all metals. Because of its low resistance, pure silver wire is used in electrotechnical applications with the highest requirements. Other advantages of pure silver wire include electrochemical potential, corrosion resistance, antibacterial and antifungal properties. These features are also very important in electrochemical applications. The high cleanness leads to a bright and shiny surface which gives the wire an extraordinary look.

Diameter range

Pure silver Ag99.99 wire is available in diameters between 0.020 mm and 0.500 mm with all types of insulation and self-bonding enamels. Besides enameled silver-plated brass wire, ELEKTRISOLA also produces bare wire in the same diameter range.

Features

- High corrosion resistance
- Highest possible electrical and thermal conductivity
- Antibacterial and antifungal properties
- Bright and shiny surface

Silver copper alloy (AgCu1)

Silver AgCu1 TW consists of 99% silver and a maximum of 1% copper. The high silver content leads to a bright and shiny surface which gives the wire an extraordinary look. This makes it the first choice for colored wires used in jewelry. Compared with pure silver, silver copper has a higher tensile strength.

Diameter range

Silver copper alloy (AgCu1) TW is available in diameters between 0.030 mm and 0.500 mm with all insulation enamels. ELEKTRISOLA also produces bare wire in the same diameter range.

Features

- High corrosion resistance
- Higher strength than pure silver
- Antibacterial and antifungal properties
- Bright and shiny surface

Brass (copper zinc alloy)

In the core, brass TW consists of a copper zinc alloy. The product features very good mechanical properties and corrosion behavior compared with copper. Its lower conductivity and outstanding reversed bending resistance make it the favorite choice, e.g. for heatable textiles. Brass TW is available with different alloy contents, e.g. Ms63 (CuZn37), Ms70 (CuZn30), Ms80 (CuZn20) and Ms90 (CuZn10).

Diameter range

Brass TW is available in diameters between 0.020 mm and 0.500 mm with all types of insulation enamels. ELEKTRISOLA also produces bare wire in the same diameter range.

Features

- Very good mechanical properties
- Outstanding reversed bending resistance
- Lower electrical conductivity
- Golden color

Silber-plated brass (Ms/Ag)

Silver-plated brass TW is composed of a brass core covered by concentric silver plating. This material combines the excellent mechanical properties and reverse bending resistance of brass with the bright and shiny surface of silver. In addition, the silver coating provides a higher corrosion resistance and multiple color options. Silver-plated brass wire is available with a coating thickness of 20 grams of silver per kilo of wire.

Diameter range

Silver-plated brass wire is available in diameters between 0.030 mm and 0.500 mm with all types of insulation enamels. ELEKTRISOLA also produces bare wire in the same diameter range.

Features

- Very good mechanical properties
- Outstanding reverse bending resistance
- Bright and shiny surface
- High corrosion resistance

**Bronze (copper tin alloy)
CuSn6**

Bronze (CuSn6) TW has very good mechanical and chemical properties. This binary alloy is made of copper alloyed with 6% tin. Advantages of this product include high corrosion resistance and good solderability.

Diameter range

Bronze – copper tin alloy (CuSn6) is available in diameters between 0.020 mm and 0.500 mm with all types of insulation enamels. ELEKTRISOLA also produces bare wire in the same diameter range.

Features

- Very good mechanical properties
- Good reverse bending resistance
- Very high corrosion resistance
- Good solderability for electrical contacts

Stainless steel – 304 (EN 1.4301) and 316 L (EN 1.4404)

Stainless steel TW is suitable for various textile applications. We also offer enameling for steel wire with a variety of colors. In addition to electrical insulation and different colors, enameled steel wire also offers a less aggressive surface than bare steel. This significantly reduces the abrasion of textile units. Steel 316 L has a slightly higher corrosion resistance.

Diameter range

Stainless steel is available in diameters between 0.025 mm and 0.500 mm with all types of insulation enamels.

Features

- Very High tensile strength
- High corrosion resistance

Overview of metal properties

Metal	Electrical properties					
	Conductivity [S*m/mm ²]	Resistivity [Ω*mm ² /m]	Thermal coefficient of resistance [10E-6/K]			IACS [%]
			Min	Typ	Max	
Cu	58.5	0.0171	3'900	3'930	4'000	100
Cu/Ag	58.5	0.0171	3'900	4'100	4'300	100
Ag99.99	62.5	0.0160	3'800	3'950	4'100	108
Ms70	16.0	0.0625	1'400	1'500	1'600	28
Ms/Ag	16.0	0.0625	1'400	1'500	1'600	28
AgCu1	57.5	0.0174	3'800	3'950	4'100	99
Bronze	7.5	0.1333	600	650	700	13
Steel 304	1.4	0.7300		1'020		2
Steel 316 L	1.3	0.7500		1'020		2

Electrical properties of TW-metals

Metal	Mechanical properties								
	Tensile strength [N/mm ²]			Elongation [%]			Yield strength at 1% elongation [N/mm ²]		
	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max
Cu	220	270	300	10	25	40	120	160	200
Cu/Ag	220	270	300	15	25	35	120	160	180
Ag99.99	170	200	220	15	30	40	100	130	150
Ms70	440	490	540	15	25	35	320	370	420
Ms/Ag	440	490	540	15	25	35	320	370	420
AgCu1	220	270	320	15	30	40	150	200	210
Bronze	470	500	530	20	35	45	380	420	460
Steel 304	750	950	1'150	15	30	40	400	600	800
Steel 316 L	750	950	1'150	15	30	40	400	600	800

Mechanical properties of TW-metals

Information

We also use many other conducting materials, most often for electrical applications. Please do not hesitate to contact us if you are interested in other metals or alloys, we will be happy to assist you.

Colors

Individual color requests can be met according to sample patterns or information from the RAL or Pantone color chart. Over the years, we have established a wide range of colors. Please let us know what you are looking for, perhaps we already have that color in our product range; otherwise, we will produce it according to your requirements.

ELEKTRISOLA FEINDRAHT AG has measuring instruments that allow saving color values digitally. This guarantees the exact reproduction of customer-specified colors at any time.

With a transparent coating, the color of the base metal can be widely maintained. **Moreover, thanks to the coating, the metal is protected against oxidation.**



Wide range of colors

Insulation enamels and their properties

In addition to the metal's properties, the insulation enamel plays an important role when it comes to the ideal application for the TW. ELEKTRISOLA FEINDRAHT AG offers a wide range of insulation enamels. Depending on the intended

use, other properties are important, e.g. fastness to light or UV stability. Below, the insulation enamels and their properties are listed.

Enamel type	TW-0	TW-A	TW-C
Description	bare wire	mod. Polyurethane	mod. Polyurethane
Characteristics	Bare wire without protecting enamel layer.	Wire with mechanically and chemically limited resistance. Large variety of colors.	Wire with mechanically and chemically good resistance, raised thermal properties. Large variety of colors.
Colors	Metal colors.	Standard colors, customized colors possible.	Standard colors, customized colors possible.
Light fastness 1)	••••	•	••
UV stability 1)	••••	•	••
Solderability	••••	••••	•••
Finishing / pre-treatment boil with alkaline chlorine bleach hydrogen peroxide bleach	2) 2) 2)	• ••• •••	•• ••• ••••
Finishing / dyeing processing reactive dyestuff Acid dyestuff vat dyestuff	2) 2) 2)	•• •• dyeable • dyeable	•••• ••• weakly dyeable ••• weakly dyeable
dry cleaning	2)	••• may bleed slightly depending on dye	•••• may bleed slightly depending on dye
Cave characters	2)		

•••• very well suited / ••• well suitable / •• moderately suitable / • less suitable /

2) not tested / 1) only the enamels, no pigments or color dyes were tested (ISO 105-B02: 1994(E), 50 h Xenon Light)

Guarantee:

We guarantee consistent quality and reproducibility of selected colors. The suitability for textile finishing processes as well as light fastness and UV stability is according to the above table.

Individual advice:

The process parameters and chemical composition for textile finishing may differ widely as well as the exposure of the product (sunlight, humidity or heat). We therefore recommend that you conduct initial tests. You can count on our experience and our professional technical support for these tests.

TW-D	TW-F	TW-H
Polyesterimide	Polyamidimid	mod. Polyester
Wire with mechanically and chemically high resistance, raised thermal properties. Enamel has a certain yellowish self-color.	Wire with mechanically and chemically very high resistance, very good thermal properties. Enamel has a certain yellowish self-color.	Wire with mechanically and chemically very good properties, good thermal resistance. Large variety of colors.
Standard colors, customized colors only on request.	Standard colors, customized colors only on request.	Standard colors, customized colors possible.
•••	•	••••
•••	•••	•••
•	–	–
••• •••• ••••	••• •••• ••••	••• •••• ••••
•••• •••• not dyeable ••• weakly dyeable	•••• •••• not dyeable ••• weakly dyeable	•••• •••• not dyeable ••• weakly dyeable
•••• will not bleed	•••• will not bleed	•••• will not bleed
		

Table of enamel types

2

Typical applications of Textile Wire



TW is suitable for technical and fashionable applications. Thanks to its metallic properties, TW can in technical applications be used in fabric for protection against electrosmog (EMV), for electrostatic discharge (ESD), as well as data transmission in clothes. In addition, metal has a unique optical component, which makes it very interesting for use in fashion and decoration, e.g. for clothes, jewelry and decoration elements.

Technical applications

The core competence of ELEKTRISOLA FEINDRAHT AG is the production of thin enameled wires for electrotechnical applications. Over the years, we have been able to accumulate great expertise which helped us develop TW. The engineers at ELEKTRISOLA FEINDRAHT AG are specialists in their field and are happy to assist you.

Below, some technical applications are presented in more detail.

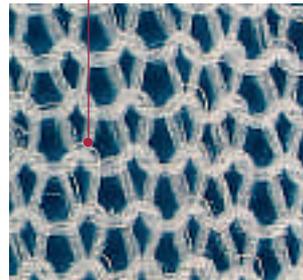
ESD applications

When clothes or components get electrically charged, the differences in voltage can lead to extremely strong electrical discharge, which can damage sensitive electrical devices.

Electrostatic charge can be prevented by using conductive materials and implementing grounding measures, or by using antistatic materials. TW is highly conductive and can therefore be used for ESD applications.

For ESD applications, TW is incorporated in the yarn.

Single Jersey silver-plated copper (Cu/Ag)



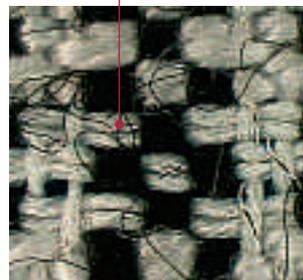
Twist: dtex 100, 600 Trs / m

Blended yarn: PES textured dtex 50f24 and silver-plated copper, Ø 0,027 mm, TW-0 (dtex 58)

Blend: 46% PES / 54% metal

Charging: 0 – 100 V → surface resistance. < 1 kΩ

ESD fabric silver-plated copper (Cu/Ag)



Twist: dtex 570, 200 Trs / m

Blended yarn: PES dtex 167f34 and silver-plated copper, Ø 0,071 mm, TW-0 (dtex 385) and

Yarn: PES dtex 167f34

Blend: 93% PES / 7% metal

Charging: 100 – 200 V, → surface resistance: 85 GΩ
→ quick discharge

Fabric against electrosmog (EMV)

In today's world, people are increasingly concerned about electrosmog. Fabrics containing our textile wires offer excellent protection against electromagnetic radiation. In the frequency range of mobile communication, for example, protection values of approx. 40 dB (99%) can be achieved.

There is a wide range of applications:

Lining fabrics

- For pockets and jackets

Underwear

Men's and women's clothing

- Shirts and blouses
- Jackets
- Protective clothing

Tent fabric / awning

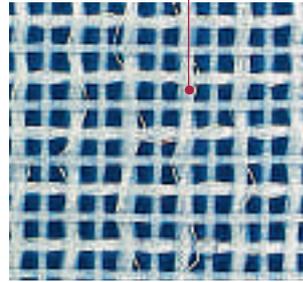
- For protection of measuring instruments and sensitive field instruments
- Awning for roofs and facades

Curtain material

- For apartments and offices near mobile communication antennas
- For protection of sensitive medical devices in hospitals
- For high-security buildings to increase protection against eavesdropping

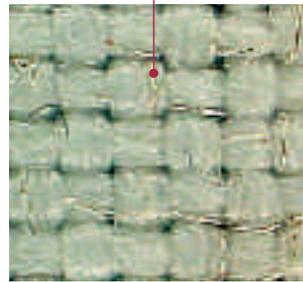
Curtain material

PES endless / silver-plated copper monofilament (thread) and PES-monofil



Tent fabric

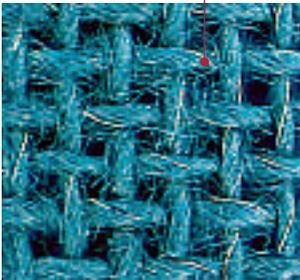
PES / silver-plated copper air textured



Below three examples are given.

Lining fabric for pockets

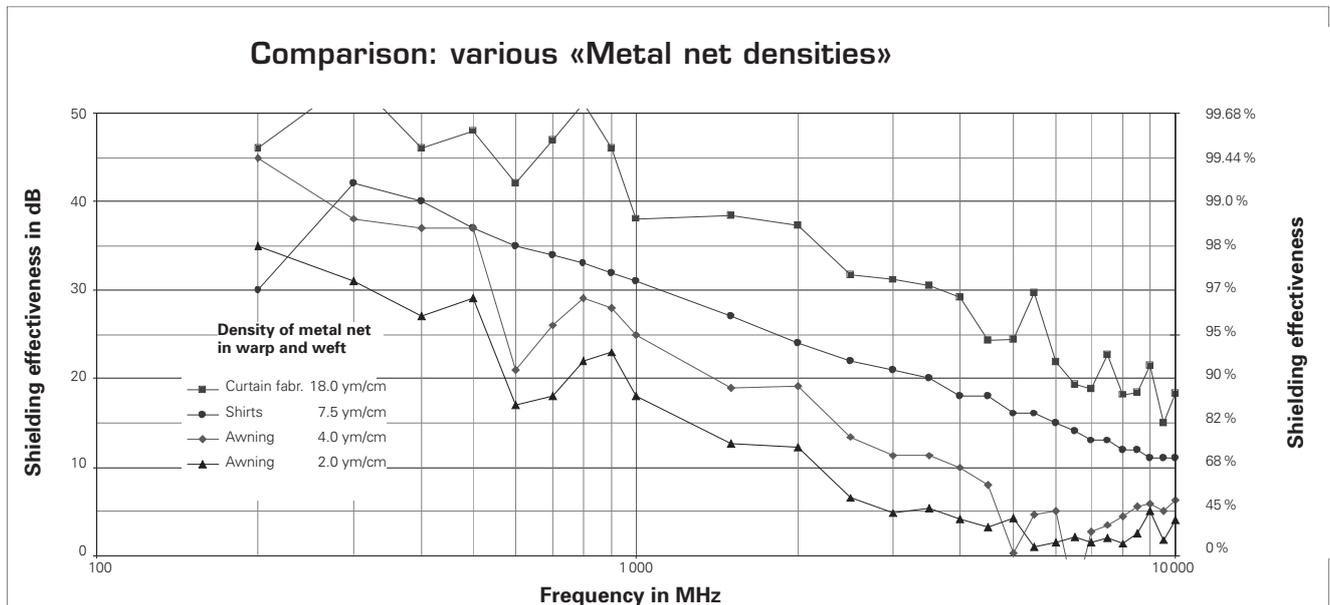
Cotton / silver-plated monofilament in Corespun



Shielding effectiveness

All three fabrics have 18 threads per cm (in warp and weft) of blended yarn from a silver-plated copper monofilament Ø 0.020 mm, TW-D, silver-colored. Due to the identical metal density (18 yarns per cm), all fabrics have the same shielding effectiveness. Therefore, the thickness of the single yarns is irrelevant. The decisive factor is the distance of the identical silver-plated copper monofilaments in warp and weft.

The diagram below shows the influence of longer and shorter distances of the metal monofilaments in warp and weft.



Data transmission

TW is particularly suitable for the transfer of data or electric current in fabrics (smart textiles).



Jacket with integrated data transmission for mobile devices.

Applications in fashion and decoration

Fashionable! Our TW offers brilliant perspectives for fashion designers. If you are looking for new, surprising fabric variations, our micro-fine metal wires offer limitless possibilities, particularly in the world of fashion, such as material creations with metal or creasing effects. Our experience will help you to show your creative input in a professional light.

Decoration elements

Textiles with incorporated TW have become very popular with interior designers and decorators because of their metallic look. They are most often used as curtains or room dividers.



Room divider



Angel hair

However, TW is also used for decorations, e.g. for the presentation of products. This creation is called angel hair and offers a unique way of showcasing products.

Fashion and jewelry



Bracelet

The best proof of its versatility is that TW is also used for jewelry. TW gives bracelets or necklaces a precious and elegant touch. Thanks to the careful manufacturing process, TW can be worn directly on the skin (see section 4, Environmental protection).

Information

Just let us know how you would like to use the wire. We are dedicated to find the most suitable material for your requirements, based on your needs and our expertise.

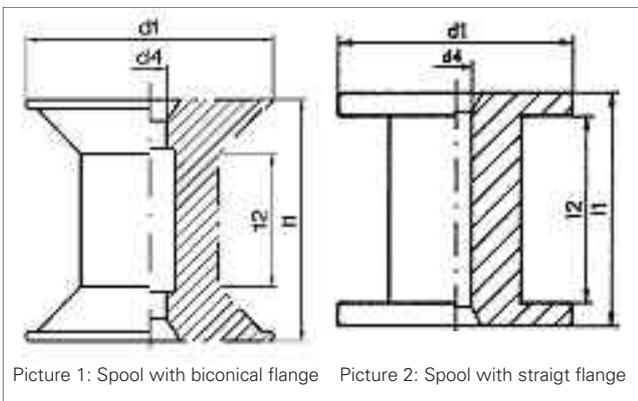
3

Delivery and finishing



Spools

Textile wires are supplied on spools with a biconical or straight flange. We select the spool depending on the diameter and weight.



Available types of spools from ELEKTRISOLA FEINDRAHT AG

Type of spool	Picture	d1 [mm]	d4 [mm]	l1 [mm]	l2 [mm]	Nominal fill weight	Diameter range [mm]
79/45	1	80	16	100	70	ca. 0.6 kg	0.020 – 0.030
124/45R	1	125	16	125	65	ca. 2.5 kg	0.025 – 0.063
125K	2	125	16	125	100	ca. 2.5 kg	0.050 – 0.060
159/45R	1	160	22	160	85	ca. 6 kg	0.040 – 0.080
160K	2	160	22	160	128	ca. 6 kg	0.050 – 0.071
199/45R	1	200	22	200	106	ca. 10 kg	0.050 – 0.080
200K	2	200	22	200	160	ca. 10 kg	0.060 – 0.120
250 KK	2	250	22	200	160	ca. 20.5 kg	0.100 – 0.500

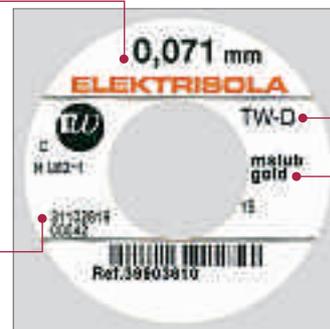
Spool dimensions

Spool labels

Each TW spool is labeled with a special label. This label guarantees traceability on production processes. The label indicates the most important information and TW properties.

Nominal diameter

Number of Operation order



Enamel

Color

Information

The TW logo on the spool label is a guarantee for originality of the product. The customer can therefore rely on having a first-class product from ELEKTRISOLA FEINDRAHT AG.

Finishing and processing

Our metal monofilaments can be used with all types of fiber. It is important in the twisting, weaving, embroidering and finishing process that neither the silver layer nor the enamel layer on the wire becomes damaged. The product therefore needs to be checked after each process stage. We willingly support you with analysis.

All piece goods with metal content have to be finished with care.

Washing

Washing of piece goods with TW is possible if the construction of the piece goods takes into consideration the properties of metal yarns and if the metal monofilaments did not become damaged. Therefore, the quality should be tested periodically by the manufacturer with washing tests.

Guarantee

ELEKTRISOLA FEINDRAHT AG guarantees the sample-conforming supply of metal monofilaments. We have no influence on the properties of the final products.

ELEKTRISOLA FEINDRAHT AG is your partner for

- **innovations:** we can support you in the development of your products with more than 40 years of experience
- **quality:** standardized and certified processes guarantee (re)production of your TW in consistently high quality
- **technology:** it is our goal to continuously improve our products and processes and to keep up to date with the latest technologies
- **trouble shooting:** our efficient team of engineers can give you practical tips and competent advice regarding the application of TW
- **service:** our above-average logistics service guarantees delivery reliability



ELEKTRISOLA FEINDRAHT AG

4

Environmental protection



Located in the heart of Switzerland and in the untouched UNESCO biosphere reserve Entlebuch, ELEKTRISOLA FEINDRAHT AG has a particular obligation towards the environment. Not only do we meet the legal environmental protection requirements, we also meet regulations such as WEEE, RoHS or REACH. ELEKTRISOLA FEINDRAHT AG products do not contain harmful substances.

For the production of TW, ELEKTRISOLA FEINDRAHT AG meets the latest environmental management standards – waste heat that arises during production, for example, is re-used by means of a heat recovery system to heat our buildings. Therefore, we stay well under the maximum value stipulated by the strict legal ordinances.

TW is pollutant-free

ELEKTRISOLA FEINDRAHT AG only uses pollution-free materials; therefore, TW is certified according to the Oeko-Tex Standard 100.

Information

Textile Wire is suitable for skin contact, even for sensitive baby skin.



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*Connecting our expertise
with your innovation*

