V Technical Textiles Interconnect

PRESENTED BY V TECHNICAL TEXTILES, INC.

V Technical Textiles Inc.

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Introduction

- Flexible conductive fabrics are taking the place of thin film technologies for sensing, heating, and flexible circuit applications. Advances in chemical etching technology are providing integrated components for these applications utilizing conductive fabrics. The physical nature of these new products present a challenge for durable mechanical connections to existing interface components. Existing mechanical methods utilizing wire, solder, snaps, or other mechanical connection methods do not lend themselves to reliability, flexibility, or durability.
- V Technical Textiles has developed a solution to produce flexible, reliable, and durable interconnection components and methods. Utilizing our TPU wire constructed of silver plated yarns and a TPU overcoat; we have pioneered a solution to replace rigid wires and connections. Our TPU wire can be ultrasonically welded to our conductive fabrics, and traditional interface components; eliminating the use of rigid wires and mechanical interconnections.

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Details

- Our TPU Wire is available in two sizes offering a range of available conductivity and size. The TPU wire can be ultrasonically welded to our conductive fabrics, printed circuit boards, conductor pins for connectors, any other conductive or thermoplastic surface.
- This innovative new product can therefore provide as the interconnection method for transmitting data, low voltage electrical signals, and power to integrated devices such as sensors.
- Utilizing our etched conductive fabrics as a sensor, and ultrasonically connecting to them with our TPU wire; provides a total solution for sensing, signal communication, and power distribution.

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Background

- A **sensor** is a transducer whose purpose is to sense (that is, to detect) some characteristic of its environment. It detects events or changes in quantities and provides a corresponding output, generally as an electrical or optical signal; for example, a thermocouple converts temperature to an output voltage.
- Sensors are used in everyday objects such as touch-sensitive elevator buttons and lamps which dim or brighten by touching the base, besides innumerable applications of which most people are never aware. The uses of sensors have expanded beyond the more traditional fields of temperature, pressure or flow measurement. Moreover, analog sensors such as potentiometers and force-sensing resistors are still widely used.
- Applications include manufacturing and machinery, airplanes and aerospace, cars, medicine and robotics.

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Background

- The ECG device detects and amplifies the tiny electrical changes on the skin that are caused when the heart muscle depolarizes during each heartbeat. At rest, each heart muscle cell has a negative charge, called the membrane potential, across its cell membrane. Decreasing this negative charge toward zero, this is called depolarization, which activates the mechanisms in the cell that cause it to contract.
- During each heartbeat, a healthy heart will have an orderly progression of a wave of depolarization that is triggered by the cells. This is detected as tiny rises and falls in the voltage between two electrodes placed either side of the heart, which is displayed as a wavy line either on a screen or on paper. This display indicates the overall rhythm of the heart and weaknesses in different parts of the heart muscle.

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Background

- Silver chloride electrodes are also used by many applications of biological electrode systems such as bio monitoring sensors as part of electrocardiography (ECG) and electroencephalography (EEG), and in transcutaneous electrical nerve stimulation (TENS) to deliver current.
- Historically, the electrodes were fabricated from solid materials such as silver, brass coated with silver, tin and nickel. In today's applications, most bio monitoring electrodes are silver/silver chloride sensors which are fabricated by coating a thin layer of silver onto substrates and the outer layer of silver is converted to silver chloride.

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Background

- The principle of silver/silver chloride sensors operation is the conversion of ion current at the surface of human tissues to electron current to be delivered through the lead wire to the instrument to read. When the ion current exists, the silver atoms in the electrode oxidize and discharge cations to the electrolyte and the electrons carry charge through the lead wire. At the same time, the chloride ions which are anions in the electrolyte travel toward the electrode and they are reduced as they bond with silver of the electrode resulting in silver chloride and free electrons to deliver to the lead wire.
- The reaction allows current to pass from electrolyte to electrode and the electron current passes through the lead wire for the instrument to read.

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Ultrasonic Welding

- In ultrasonic welding, high-frequency vibrations are applied to two parts or layers of material by a vibrating tool, commonly called a “horn or sonotrode.” Welding occurs as the result of heat generated at the interface between the parts or surfaces.
- This technique is fast, efficient, non-contaminating and requires no consumables. In addition to welding, ultrasonic processes can be used to insert, stake, stud weld, degate, and spot weld thermoplastics as well as seal, slit, and laminate thermoplastic films and fabrics. Ultrasonic components can be easily integrated into automated systems.

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Specifications

Shieldex® 235/34 2-Ply + TPU

Material: Polyamide 6.6 filament yarn round

Base Material + Metal Plated: 235/34 2-Ply + 99% Pure Silver

Yarn Count Silverized (without coating): average 520 dtex

Resistivity (base material): < 100 Ω / m

Coating: TPU (medium soft/tightness: 1.16 g / cm^3

Total Thickness: 0.51 mm ± 10% / 0.02" ± 10%

Tensile Strength: about 17cN / tex

Elongation (break): average 18%

Color TPU: available in white & colorless

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Specifications

Shieldex® 117/17 2-Ply HC + TPU

Material: Polyamide 6.6 filament yarn round

Base Material + Metal Plated: 117/17 2-Ply + 99% Pure Silver

Yarn Count Silverized (without coating): 293 ± 2 dtex

Resistivity (base material): < 300 Ω / m

Coating: TPU (medium soft/tightness: 1.16 g / cm^3

Total Thickness: 0.51 mm ± 5% / 0.02" ± 5%

Tensile Strength: about 5cN / tex

Elongation (break): average 13%

Color TPU: white

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Traditional Methods

- Traditional methods used to perform interconnection between sensing components (Sensors), their power sources (batteries or other power source), and their data recording or sensing devices include but are not limited to the following means:
  - Solid wire connected with snaps, lugs, ring terminals, or solder.
  - Thin film components connected with either solder or mechanical components.
  - Embedded wires and rigid sensors sandwiched between fabrics; connected using mechanical connectors, solder & wire.

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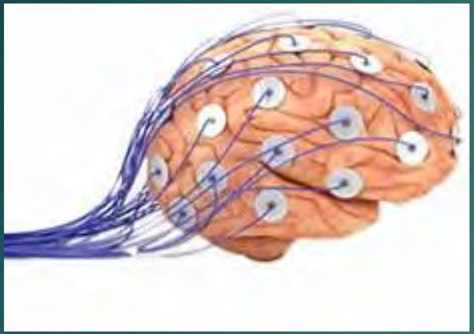
Traditional Method Examples



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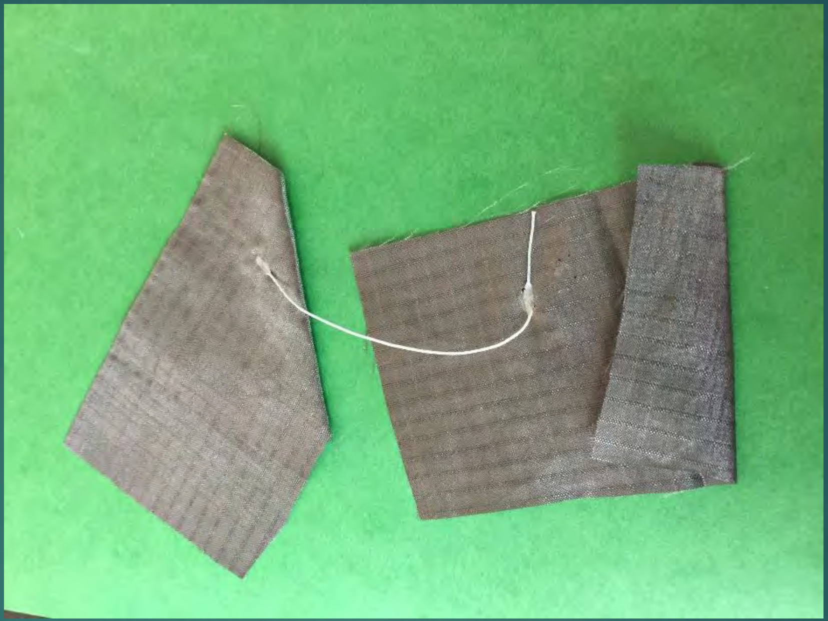
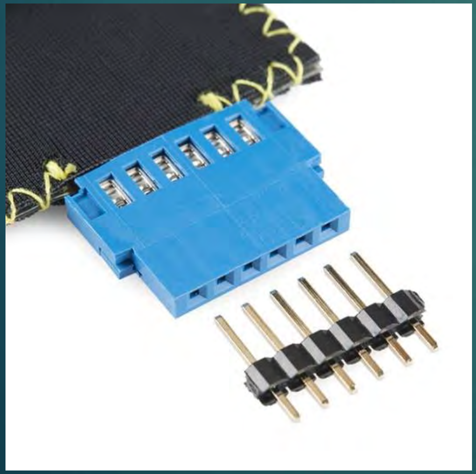
Flexible Method Examples





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V Technical Textiles Developed Method

- V Technical Textiles has developed a method to ultrasonically weld our conductive highly flexible TPU wire, to our conductive materials and other rigid components.
- This results in a solid mechanical and electrical connection between our TPU wire and its mating conductive surface.
- This method eliminates the need for solder or other rigid mechanic connections.

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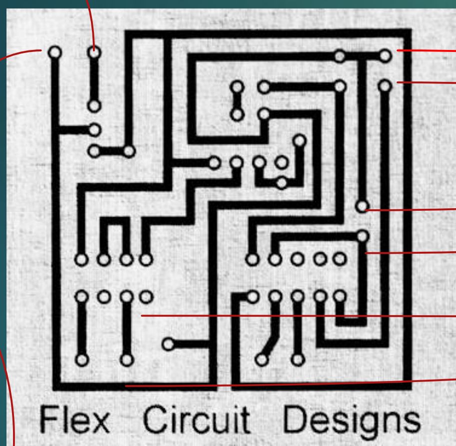
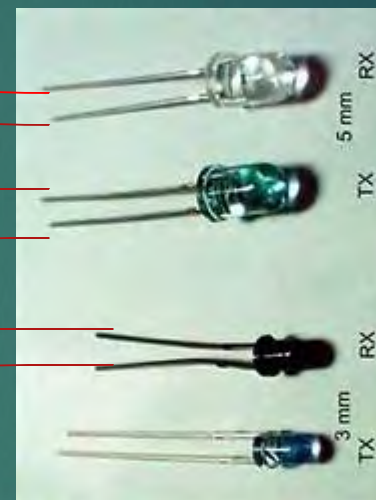
TPU/Ultrasonic Method Examples

TPU Wire



TPU Wire



Power source

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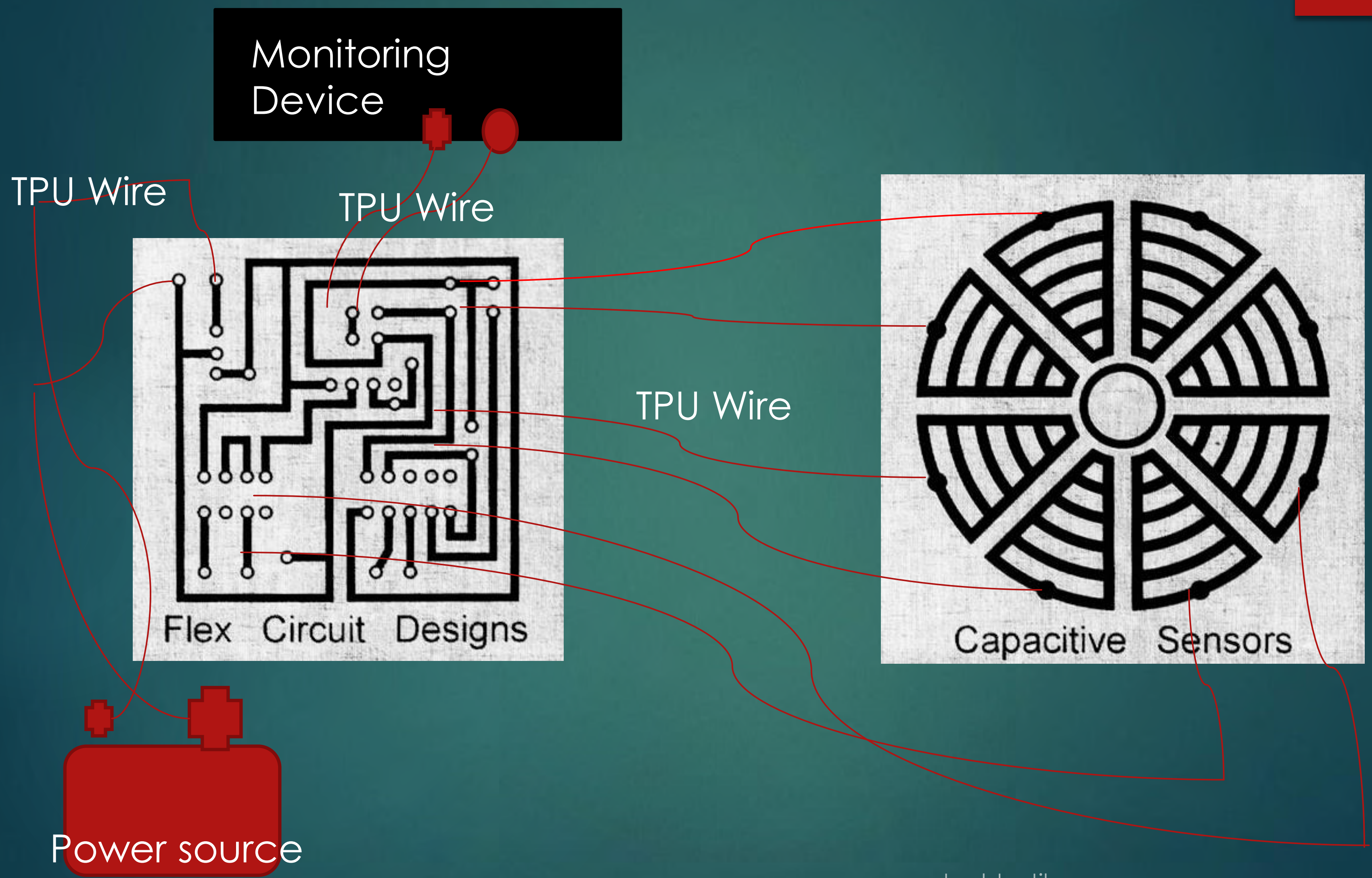
TPU/Ultrasonic Method Examples



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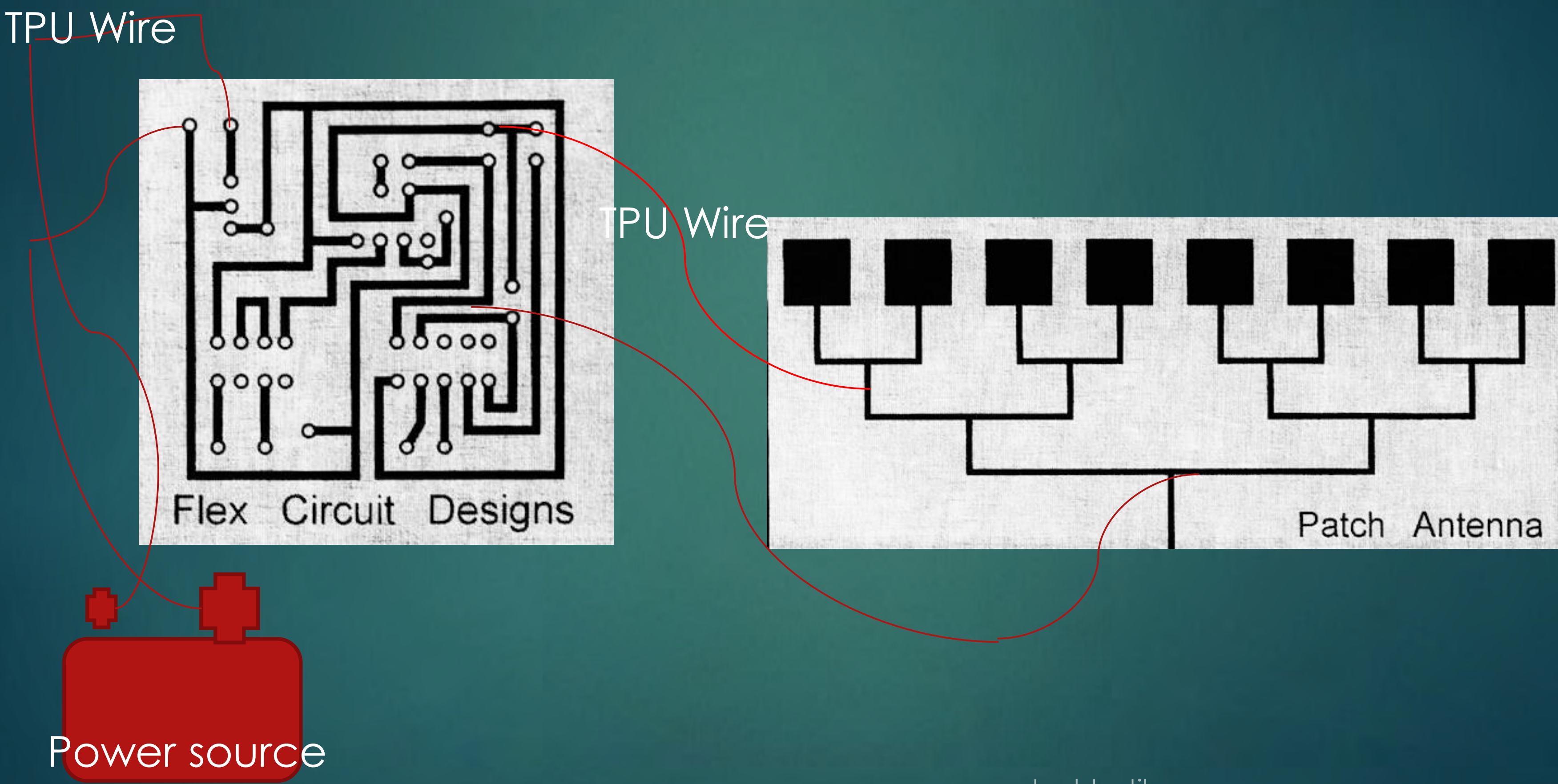

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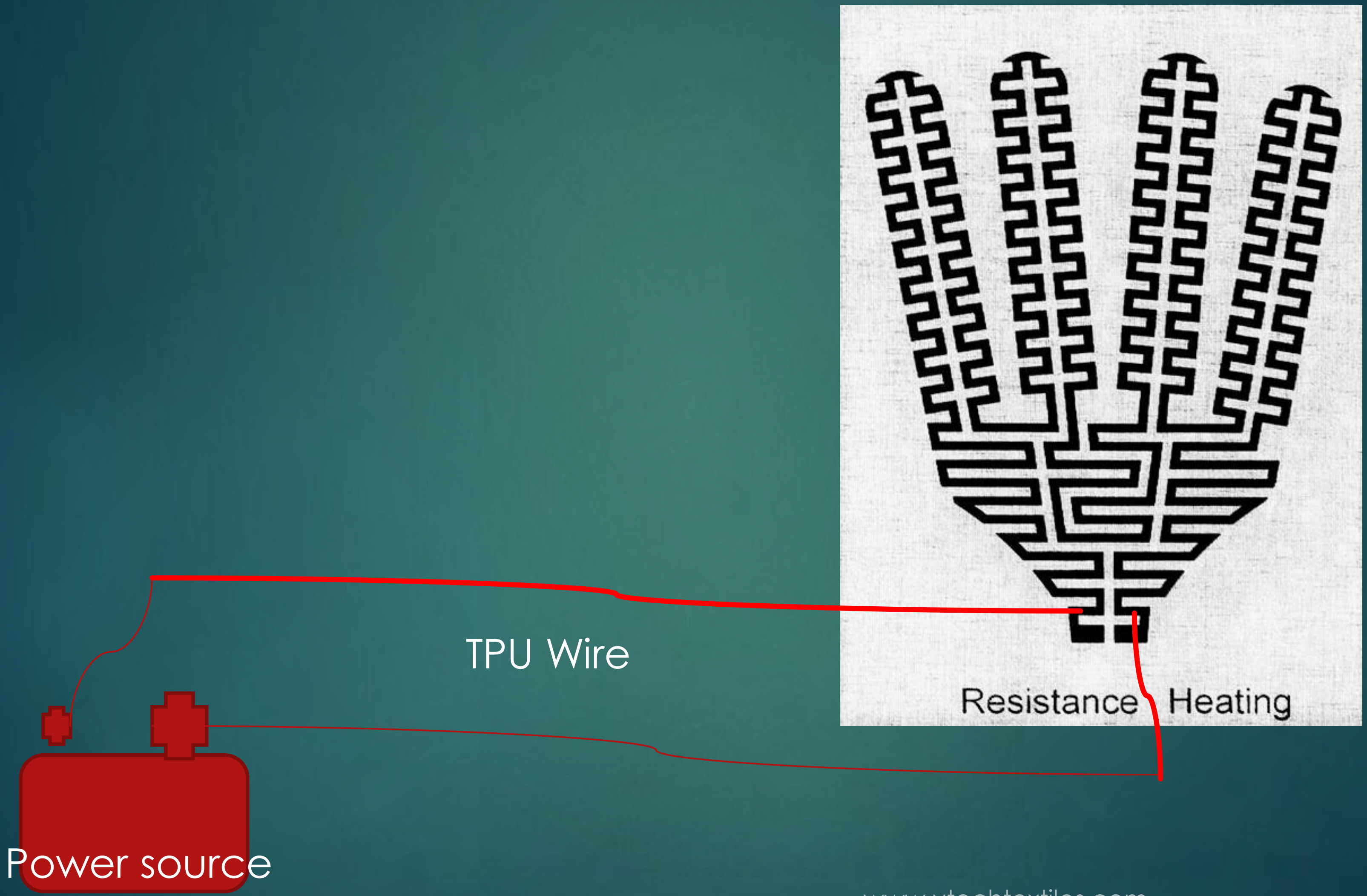

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Available Shieldex Materials

- Optional Materials:
  - All of our woven goods
    - Zell & Zell CR (Ag/Cu/Sn)
    - Nora Dell & Nora Dell CR (Ag/Cu/Ni)
    - Nora (Ag/Cu/Ni)
    - Nora LX (Cu/Ni)
    - Bremen (Ag)
    - Kassel (Ag/Cu)
    - Nanking (Ag/Ni)

Mesh and Non-Woven Materials

also available

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Q & A

- Questions & Answers

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