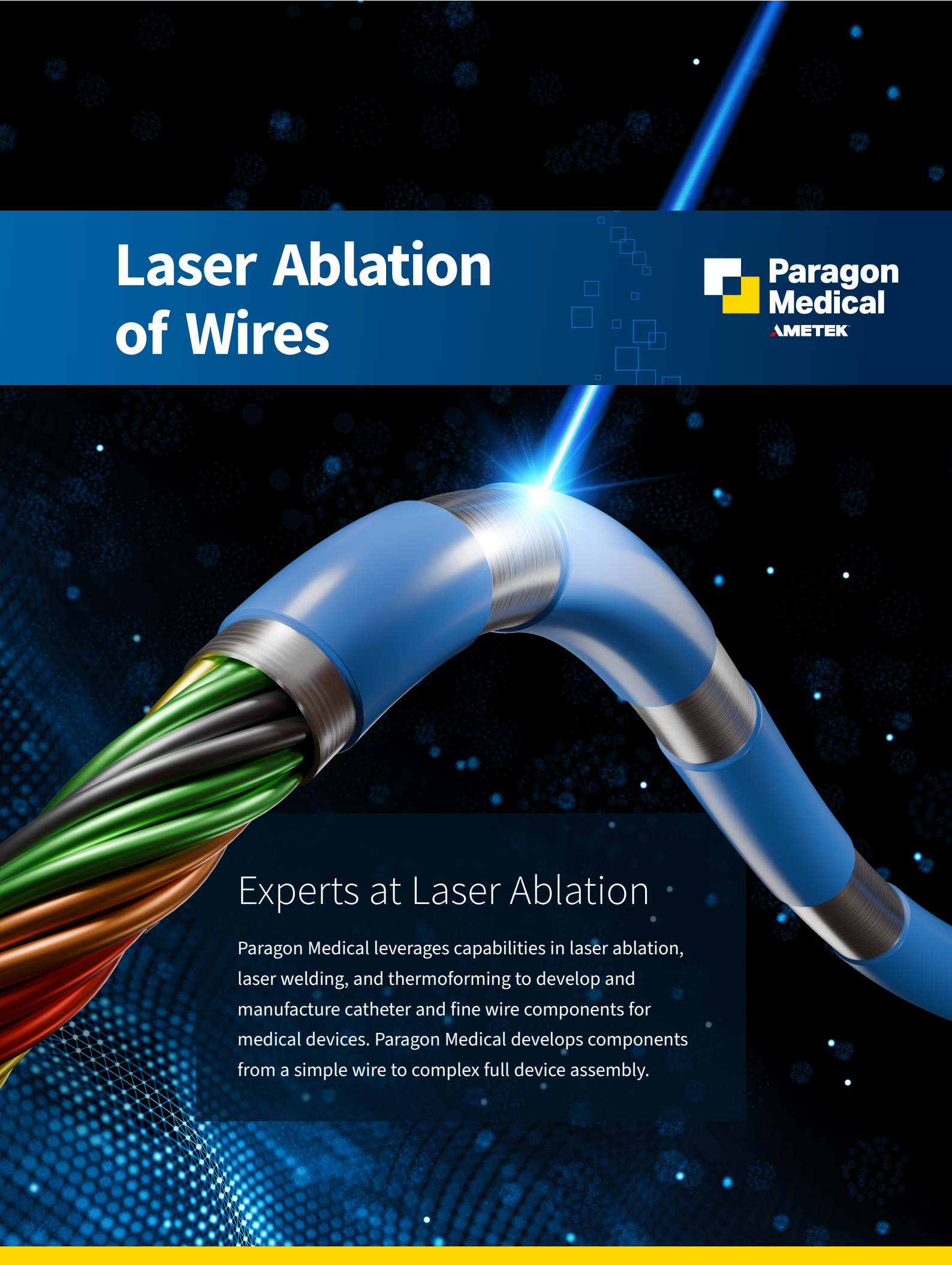
Laser Ablation of Wires

Paragon Medical
AMETEK



Experts at Laser Ablation

Paragon Medical leverages capabilities in laser ablation, laser welding, and thermoforming to develop and manufacture catheter and fine wire components for medical devices. Paragon Medical develops components from a simple wire to complex full device assembly.

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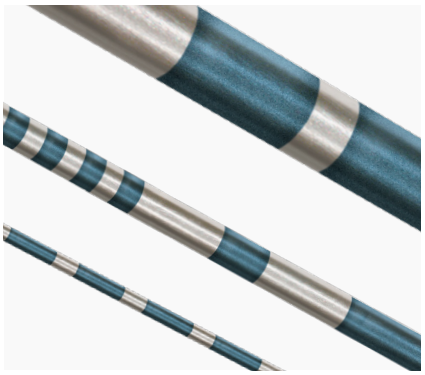
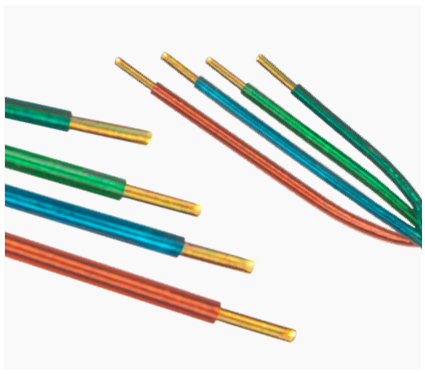






Quick Overview

The ablation of fine wires by laser technology is a precise technique that involves the controlled removal of material from conductive wires for a variety of applications across different industries. Laser wire ablation removes insulation or coatings around fine electrical wires, exposing wire conductors, and it can create intricate patterns. This is a high-precision process that requires both expertise and cutting-edge equipment.

Capabilities include:

- Laser welding fine wire to precious metal electrodes
- Laser machining polymer tube extrusions
- Fine wire cabling and shielding
- Fine wire termination to PCB and flex circuits

Materials for laser ablation:

At Paragon Medical, a wide range of materials can be used for wire ablation, including plastics like

- Polyamide
- Urethane
- PTFE, and other polymers

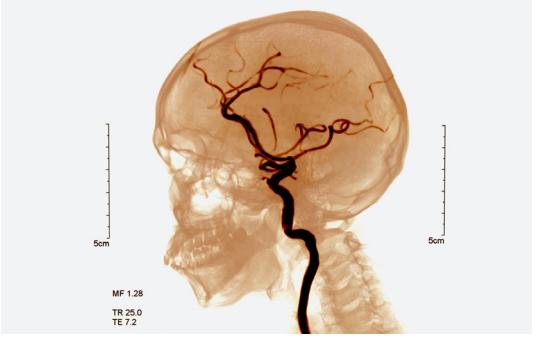
These materials are mostly insulations on a metal conductor.

Laser Ablation of Wires

Applications for Laser Ablated Wires

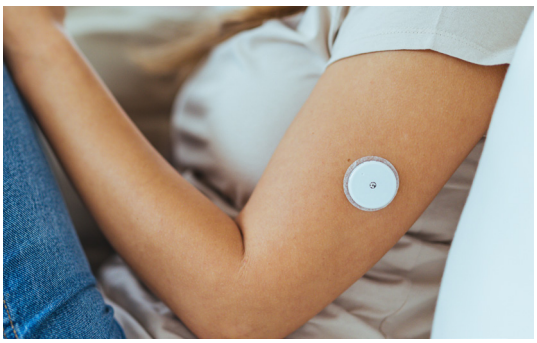
Neuro Aneurysm Filling

Laser ablated wire can be used to make components for complex medical procedures like neuro aneurysm filling. Paragon Medical's ablation capabilities involve removing insulation on conductors, ensuring precision and accuracy in all operations.



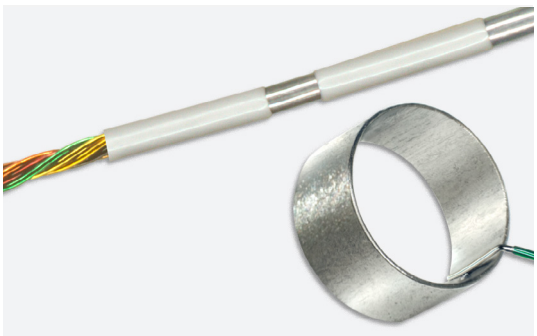
Glucose Monitoring Devices

It is also used for constant glucose monitoring devices. These devices rely on the integration of sensors that require wire ablation to ensure optimal functionality. The tiny wires are vital components of these devices. They undergo laser ablation within a controlled environment that adheres to stringent specifications.



Heart Mapping Catheters

Paragon Medical has intricate and precise laser ablation processes involved in the production of wires for high volume electrodes. Fine wires can be welded to electrodes in assemblies for electrophysiology devices, such as heart mapping catheters that capture the electrical signals in the heart.



Our Expertise for Custom Products

Our focus on customization allows us to tailor wire ablation solutions to the unique requirements of each project. We understand that every application is different, and we strive to provide a personalized experience that results in superior outcomes.

By actively involving our clients in the design and development process, we create prototypes that not only meet their specifications but also undergo rigorous testing to ensure reliability and performance.

Laser Ablation of Wires

Additional Laser Machining Capabilities

General Laser Ablation

Critical is the **precise depth control** and **amount of material** to be removed during laser ablating of insulation, especially where not the entire insulation needs to be removed.

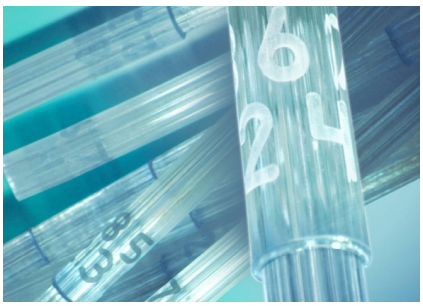
High-precision control allows for **high flexibility** in design and manufacture of fine wire conductors.



Pebax ablated away from spiral and braided wire



Polyimide with various controlled depth ablations



9 lumen polyurethane tubing, controlled depth ablation & serialization

Technical Details

- Laser input energy is greater than ablation threshold energy
- Phase change from solid to gas (directly or through liquid state) – photo-thermal



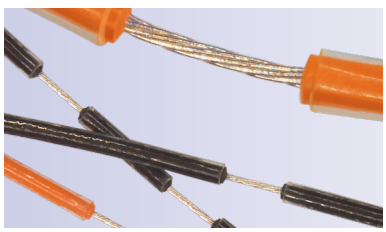
Ablation / engraving of Teflon® PFA tubing

Typical laser system: CO2 laser with Galvo mirror

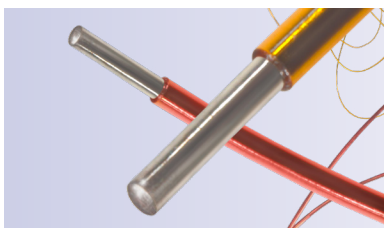
- Material absorption characteristics
  - Chemical structure – polymer type
  - Pigments
  - Surface finish – gloss
- Feature size
- Aspect ratio of feature to wall thickness
- Amount of material to be removed
- Depth control

Insulation Stripping

For insulation stripping the entire section of a much thicker insulation is removed for much higher power wires.



Multi-layer insulation silicone over PTFE



Polyimide insulation on fine wire

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Laser Ablation of Wires

Automated Dynamic Feedback

- Core competency of ablating coatings from metal wire components
- In-line electrical testing
- In-line dimensional checks

Advantages of Paragon Medical's Automated Wire Ablation process

- Elimination of manual labor reducing the time required for wire ablation processes, hence increasing efficiency.
- Improved overall safety & precision of the procedure.
- Enhanced workforce safety by reducing manual handling of materials and exposure to potentially hazardous processes.
- High precision and accuracy, ensuring consistent and repeatable results.
- Customization of wire ablation processes to meet specific customer requirements.
- Incorporation of quality control measures such as in-line inspection, monitoring, and feedback mechanisms to ensure integrity of wire ablation process.

PARAGON MEDICAL AT A GLANCE

For more than 40 years, Paragon Medical has partnered with medical device companies to develop and manufacture complex products and components.

Our expertise spans product design and development, precision engineering, pre-production through commercial manufacturing, supply chain management, and quality assurance. Specialized capabilities include cable assemblies and custom interconnects, laser-processed polymers, catheter assemblies and subcomponents, laser-processed metals including nitinol (NiTi), and metal post-processing.

Paragon Medical is a business of AMETEK, Inc., a leading global provider of industrial technology solutions serving a diverse set of niche markets.

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