



Micro Wire Laser Stripping

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Blueacre Technology

Standard gauge wires used in electrical assemblies can be stripped by mechanical means. For larger gauge wires a small scratch or nick is insubstantial compared to the size of the overall part and will not pose significant quality issues.

However as the diameter of the wire gets smaller and the insulation layers get thinner, there is substantial risk to wire damage from a purely mechanical stripping process.

When mechanical stripping fails, lasers can be used to strip these high end devices. Due to the non-contact nature of the laser process along with the ability to accurately control the laser energy, high quality stripping can be carried out quickly and effectively.

This white paper looks at various laser wire stripping processes and shows the benefits of laser stripping.



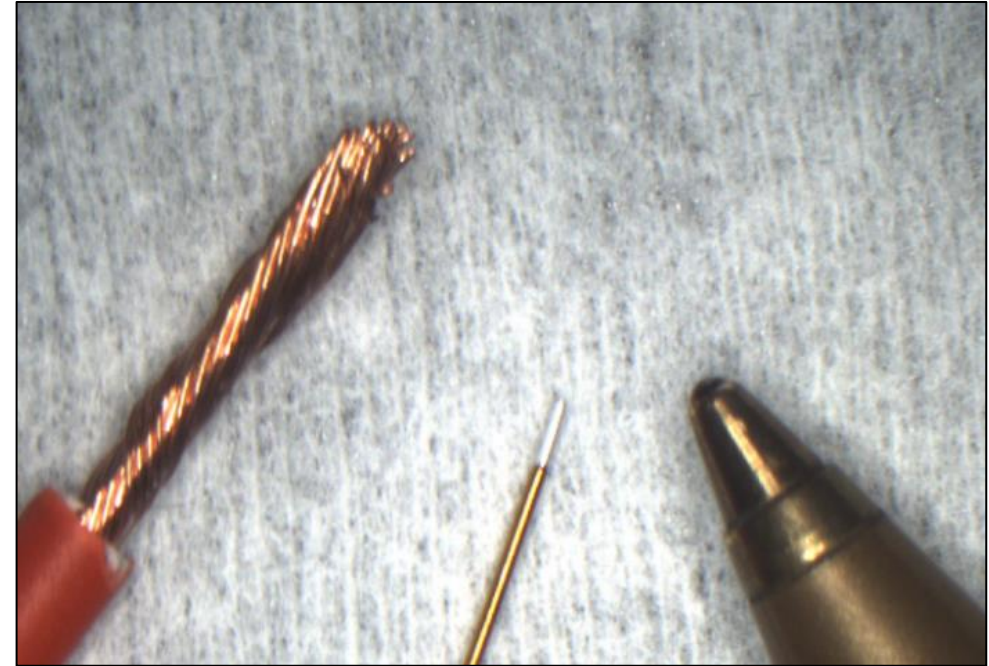
Wire Dimensions

Standard electrical wires are measured in the order of mm as per the table below. Lasers can strip wires that are in the order of 100um to 300um in diameter, which presents specific issues relating to handling and laser beam alignment.

Gauge	Conductor Diameter Inches	Conductor Diameter mm
0	0.3249	8.252
5	0.1819	4.620
10	0.1019	2.588
15	0.0571	1.450
20	0.0320	0.813
25	0.0179	0.455
30	0.0100	0.254
35	0.0056	0.142
40	0.0031	0.079

Blueacre Technology utilise in-line machine vision systems to accurately align the laser beam to the wire. Movement of the wire is controlled by high end linear tables, capable of sub-micron accuracy.

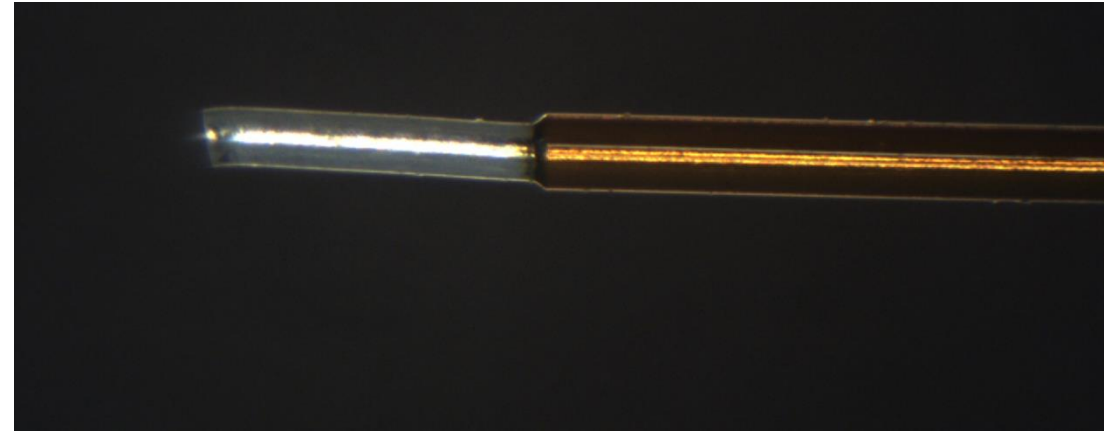
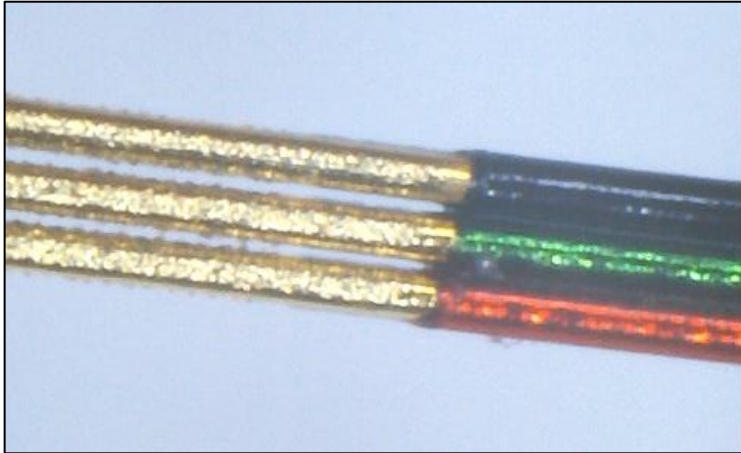
To get an idea of how small a laser machined wire can get, the image on the right compares a laser stripped wire to a standard electrical wire and ball point pen.



Multiple Layers

In addition to being small diameter, high performance wires are normally coated with specialist materials to enhance performance.

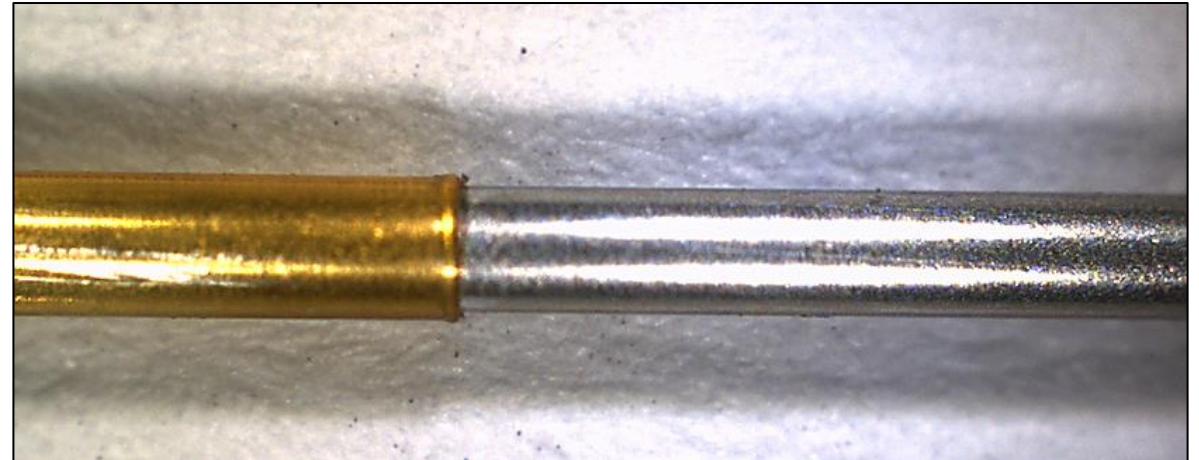
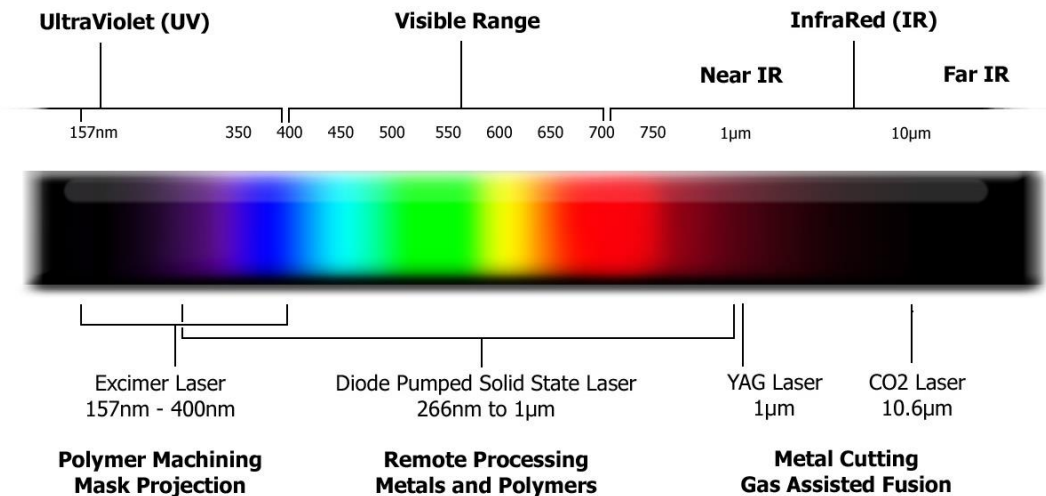
To increase conductivity, thin copper wires can be coated with either silver or gold. These layers can be in the order of 200nm to 1µm in thickness. These multi layer wires can be insulated with engineering polymers such as Kapton.



To successfully strip these wires it is necessary to remove the insulation layer but not damage the thin silver or gold coatings on the copper. The images above show ceramic coated wires and a silver coated copper wire with kapton insulator.

Choosing the right laser

To machine the wires without damage requires the right type of laser choice. Blueacre Technology has lasers that operate in a range of wavelengths from UV to far InfraRed. In general a CO₂ laser operating at the infrared can strip wires, but the process is prone to slight melting as shown on the image on the right.

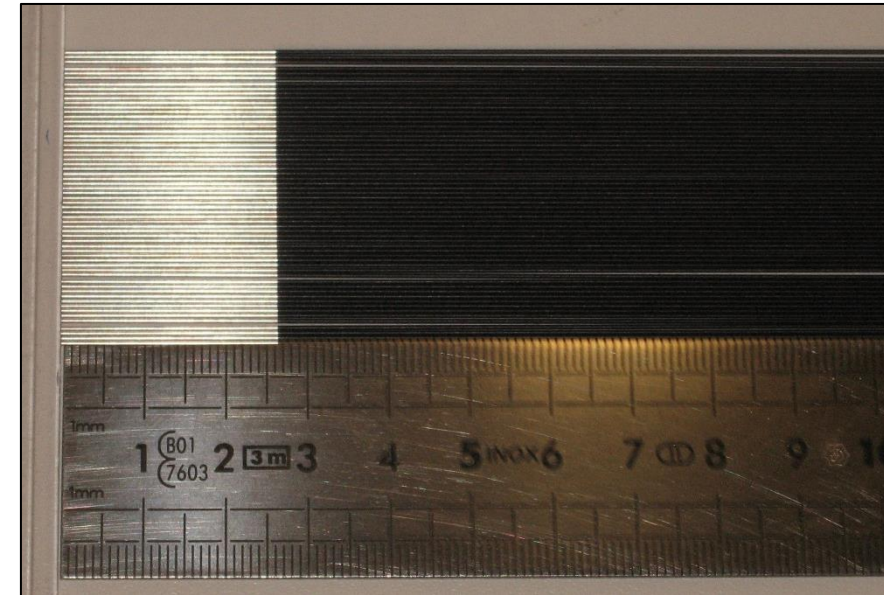
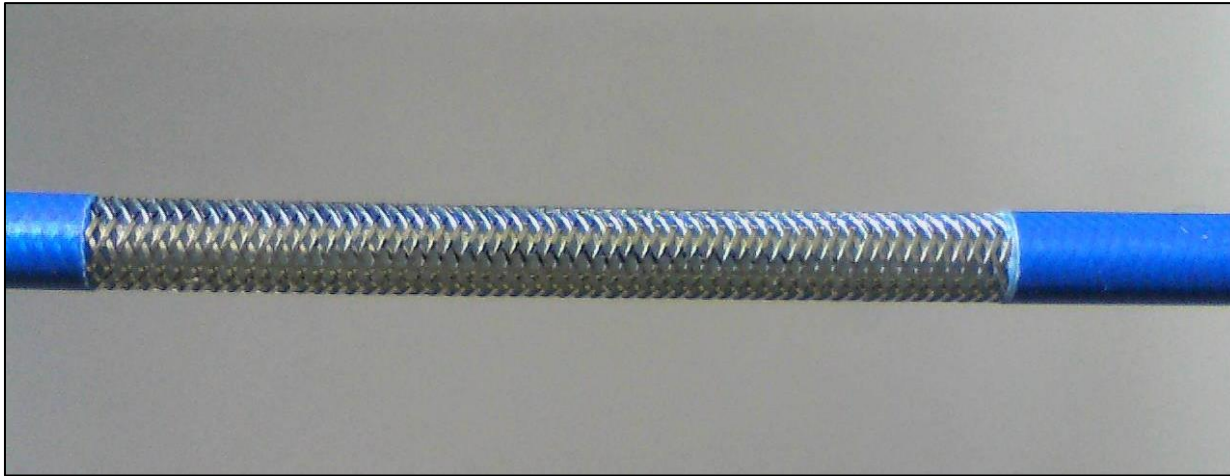


Although this may be acceptable quality for a wide range of processes, better results can be obtained with lasers operating in the UV range of the optical spectrum.

Alternate applications

Wires stripping leads to other applications in the electronic and medical device sectors. One of these is ablation of PTFE coatings from hypotubes and another is stripping the jacket from a catheter.

The coatings are removed for a number of functional reasons, but the key is to prevent any melting of the polymer layer or heat damage to the hypotube itself.



The images above so high quality laser stripping with zero damage to either the PTFE or metal wire.

Conclusion

Wire stripping is an important area in many industrial processes and for micro-wires the issues of quality and material integrity are paramount.

This paper has outlined some of the issues faced when stripping micro wire and how the non-contact nature of lasers enables high quality product.

The choice of laser is key to success and a UV laser offers the best all round solution.

Blueacre Technology offer a range of services for laser stripping of micro-wires.

