LM ELMNT™ Conducting Ink

UES Excellence in Science & Technology

## Stretchable Conducting Ink

UES, Inc. (UES) has launched ELMNT™ - a new class of conductive, liquid-metal-based, colloidal inks, to address the technical gaps and customer pain points identified for flexible hybrid electronics and wearable technologies. Most conducting materials suffer from significant resistance changes under strain (>30%). Serpentine wires or dynamic voltage control can mask the underlying issues, but wearable electronics require stretchable substrates and inks that do not fail under strain or exhibit hysteresis. Resistance changes as the user moves result in unreliable signal transmission and limit power delivery and data critical applications.

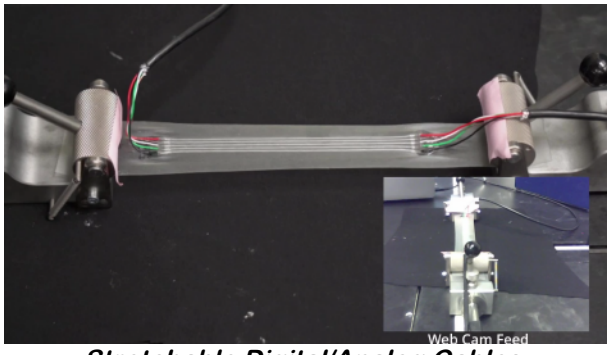
ELMNT ink is based on liquid metal particles polymerized to create highly conductive nanoarchitecture conductors. ELMNT maintains constant conductivity (~20,000 S/cm) even under extreme strains (~700%) with negligible hysteresis.

ELMNT is formulated in a colloidal particle suspension making it easy to pattern traces with screen printing, and variety of other printing approaches, such as blade coating and aerosol jet printing. After deposition, conductive traces are activated and heat-bonded to textiles to create a robust and reliable solution for wearable electronics surpassing conventional carbon or silver ink conductors.


## Wearable Robust Cabling

ELMNT has been integrated into several data cable devices, including, USB cables, RCA Video cables, Capacitive Touch Sensing, heated textiles, and inductive power transfer.

- Devices have been tested with strains up to 100%, and even upwards of 700% in some applications, while reliably maintaining conductivity.
- Lifetime testing under strain has been cycled 10,000 times with negligible hysteresis.
- Click here to see examples of devices fabricated with ELMNT Liquid Metal Inks.




***Stretchable Digital/Analog Cables***


***Heated Textiles***

***Capacitive Touch Sensor***

# ELMNT.BA™

Conducting Ink - Blade Coating

## PRODUCT DESCRIPTION

ELMNT inks are a line of stretchable conductive inks for wearable and flexible electronic applications. ELMNT.BA is the blade coating ink version of the ELMNT family and has high viscosity for coating or patterning through stencil masks. ELMNT.BA has high conductivity and consistent resistance under strain making it ideal for data transmission, joule heating, and RF applications on textiles.


## PRODUCT BENEFITS

- Low hysteresis
- Stretchable with consistent conductivity
- Room temperature processing
- Compatible with polyurethane (TPU) for wearable electronic processing
- Metallic bulk conductivity similar to aluminum

## RECOMMENDED PROCESSING

Deposit ELMNT.BA onto a stretchable substrate with a trace thickness of 0.15 - 0.20 mm. See Compatibility list for appropriate substrates. Once deposited, allow traces to dry for 20 minutes in ambient air.

ELMNT.BA requires no heat to cure but has high resistance until properly activated by subjecting it to >100% strain along its longest axis to achieve maximum conductivity. Compression may also activate conductivity. However, we recommend testing your processing parameters to ensure adequate conductivity is achieved without damaging traces.

## CAUTION ⚠

ELMNT inks contain Gallium which is corrosive to metals like Aluminum. Check compatibility prior to use.

ELMNT is a liquid metal and never full hardens. Proper encapsulation will ensure traces are not damaged. ELMNT does not adhere well to silicone.

Store at room temperature. Do not freeze.

| TEST | TYPICAL PROPERTIES |
|---|---|
| Conductivity | 1700 S/cm |
| Sheet Resistance | 0.05 Ω/sq |
| Resistance change under strain<br>$R/R_0$ at 100% strain<br>$R/R_0$ 150% strain | <br><1.5<br><1.75 |
| Resistivity change with 10k cycles from 0-100% strain | <5% |
| Viscosity @ 200 1/s | 4100 cP |
| Metal Content | 88 wt% (50 vol %) |
| Density | 3.59 g/mL |
| Shelf Life at 20 °C | >180 days |
| Theoretical coverage (100µm film) | 27.9 $cm^2/g$ |

| COMPATIBILITY | |
|---|---|
| Substrate compatibility | TPUs, polyurethane resins, acrylics, SEBS |
| Known metal compatibility | 18-8, 16Cr, Ti, W, Ni, V, Ta Stainless steel (300) |
| Solvent compatibility | aliphatic and aromatic alcohols, glycol ethers, aliphatic esters |