



## A-TRODE™

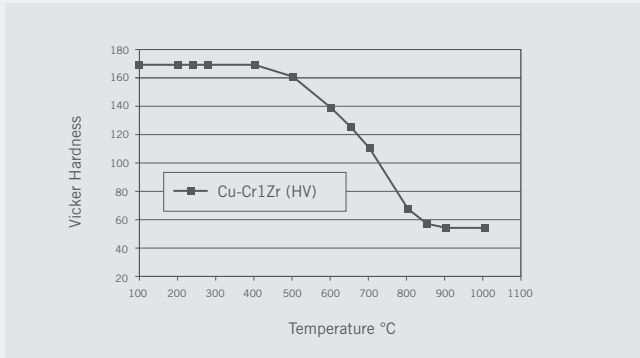
The universal cap electrode for reliable resistance welding at minimum piece price.

By combining Luvata's copper alloying, cold forming expertise and resistance welding expertise, we have developed this Chromium Zirconium Copper electrode as the reliable, consistent electrode at minimum price per part.

Specification - Quality															
Alloy	C18150 CuCrZr, EN ISO 5182 A2/2, DIN 17666 Wn 2.1293														
Chemical Composition	Cr 0.7% to 1.2%, Zr 0.06% to 0.15%. Others max. 0.2%, Cu remainder														
Physical Material Properties at 20°C	<table> <tr> <td>Mass</td> <td>8.9g/cm<sup>3</sup></td> </tr> <tr> <td>Specific heat</td> <td>0.376 J/kg.K</td> </tr> <tr> <td>Thermal conductivity</td> <td>320 W/m.K</td> </tr> <tr> <td>Expansion coefficient (20-300°C)</td> <td>17.0 x 10<sup>-6</sup> m/mK</td> </tr> <tr> <td>Electric Conductivity (solution-annealed and hardened)</td> <td>min. 43 S/m</td> </tr> <tr> <td>Softening temperature</td> <td>min. 74% IACS</td> </tr> <tr> <td></td> <td>min. 500°C</td> </tr> </table>	Mass	8.9g/cm <sup>3</sup>	Specific heat	0.376 J/kg.K	Thermal conductivity	320 W/m.K	Expansion coefficient (20-300°C)	17.0 x 10 <sup>-6</sup> m/mK	Electric Conductivity (solution-annealed and hardened)	min. 43 S/m	Softening temperature	min. 74% IACS		min. 500°C
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Dimensions and Tolerances	To ISO 5821 or other standards as required. Special electrodes to customer drawing.														
Packaging	Most items in cartons of 500 pieces.														
Documentation	Acceptance test certificate EN 10204 3.1 B possible if desired against a charge.														
Area of Application	Male and female resistance welding electrodes. Backing dies. Series welding backing dies Indirect welding backing dies.														

Errors and omissions excepted. Values given are industry standards.

Form of supply	Electrodes
Tensile Strength [N/mm <sup>2</sup> ]	≥ 490
0.2% Offset Yield Strength [N/mm <sup>2</sup> ]	≥ 430
Elongation AS [%]	≥ 15
Hardness HB	≥ 165
Hardness HV	≥ 172



A-TRODE Metallurgy

**A-Trode Production**

Produced by Luvata’s proprietary billet casting process, A-Trode’s freedom from oxygen allows us to alloy the copper with the optimum levels of chrome and zirconium. Electrodes are cold headed or machined to suit the required shape.

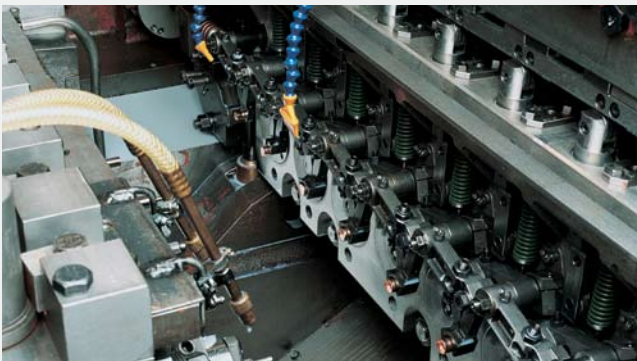
**Luvata’s Other Resistance Welding Products**

- Nitrode
- Z-trode
- Dispersion Strengthened Copper
- Zirconium Copper

Backing dies adaptors and other resistance welding accessories.

**Traceability**

All Luvata materials are fully traceable and quality assured. A-trode can be recognised by the distinctive taper design that helps water cooling in service.



Cold Heading of Electrodes



Conventional CuCrZr Grain Structure



Luvata CuCrZr Fine Grain Structure

**About Luvata**

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For more information about the Luvata A-Trode™ please contact:

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## NITRODE™

No other cap electrode can match Nitrode for its cost-effective, high quality performance in resistance-welding applications

Luvata's Nitrode™ cap is a cold-formed alloy of copper dispersion strengthened with Aluminium Oxide. It consistently outperforms copper chrome and copper chrome zirconium electrodes in resistance to annealing, consistent electrical conductivity, electrode life and maintenance costs. Benefits include:

### **Longer Weld Life**

Nitrode caps last longer than conventional electrodes by resisting annealing.

### **Non-Stick**

Nitrode caps reduce sticking of electrodes on galvanized steel and other coated metals. The refractory qualities of Al<sub>2</sub>O<sub>3</sub> reduce the infusion of liquid and gaseous zinc into the copper matrix.

### **Resists Mushrooming**

Nitrode's resistance to mushrooming minimizes its dressing frequency to one-fourth that of conventional electrodes, significantly reducing line downtime and re-welds.

### **Reduces Maintenance Downtime**

Nitrode caps require less overall maintenance than conventional CuCrZr and CuCr electrodes, increasing welding process and production efficiencies.

### **Reduces Energy Requirements**

Nitrode requires lower current when used on both sides of the weldment. Current settings on your welder can be reduced by up to 10% from conventional settings, with no loss of weld quality.

### **Smoother Start-ups**

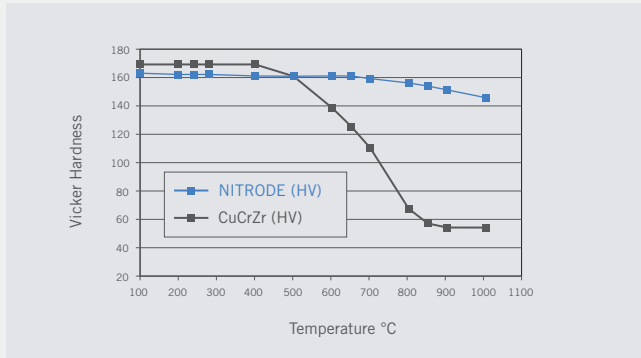
Nitrode caps require no warm-up, conditioning time or initial preparation following electrode changes. If you use automatic step-up controls, the incremental settings can be varied to minimize current adjustments with no loss of weld integrity. The results are fewer electrode changes, fewer interruptions for dressing and smoother start-ups.

### **Works On All Steels**

Nitrode has demonstrated superior welding performance for a variety of steels, including HSS, HSLA, micro-alloyed, nitrogenized, low-carbon, electrolytically zinc-coated, galvanized and many others.

### **Nitrode Cuts Your Company's Costs**

Improved up-time from reduced tip changes, maintenance savings, less tip-dressing, improved weld quality, and lower current settings will increase your company's productivity, and cut your costs compared to conventional electrodes.



Hardness at high temperature



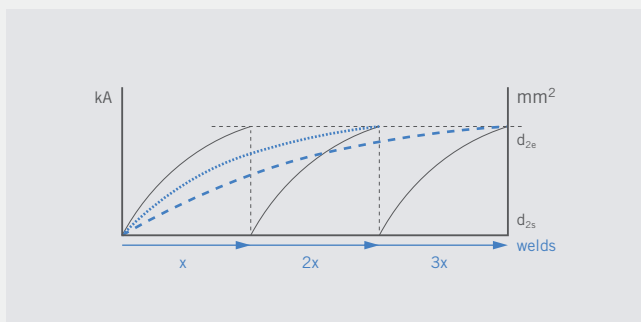
CuCrZr before and after annealing at 900°

CuCrZr after 1200 welds



Nitrode before and after annealing at 900°

Nitrode after 1200 welds



Heat stepping

**Nitrode Metallurgy**

Nitrode is a composite alloy of copper and Al<sub>2</sub>O<sub>3</sub> to become CDA alloy 15760. Conventional copper alloys anneal at temperatures over 500°C. Nitrode does not suffer significant loss of properties till nearly the melting point of 1083°C.

**Nitrode's Physical Properties**

- **Hardness at ambient temperature:**  
Minimum 75 HRB
- **Conductivity:**  
Minimum 75% IACS

**Nitrode's Longer Weld Life**

The contact surface of a resistance welding electrode reaches temperatures of up to 900°C during the welding process. As the contact surface on a CuCrZr or CuCr electrode anneals, it softens and the contact surface grows, limiting the electrode life. Nitrode electrodes resist annealing and slow the mushrooming effect on the contact surface of the electrode, allowing more welds before tip dressing, heat stepping, or tip change.

**Heat Stepping**

Nitrode electrodes allow more welds per heat step than conventional alloys. Adjusting heat-programs allows you to take advantage of the longer life of Nitrode electrodes.

**Traceability**

All Luvata materials are fully traceable. Nitrode electrodes can be recognized by their single knurls.

**About Luvata**

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For more information about the Luvata Nitrode™ please contact:

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Luvata welding electrodes are available in all industry sizes, geometries and tapers.

## Z-TRODE™

The ideal cap electrode for resistance welding of light-to-medium gauge coated and uncoated steels

The Luvata Z-Trode™ cap electrode is cold-formed from CDA Alloy 15000 zirconium copper. The combination of advanced copper metallurgy and our cold-forming technology gives you an electrode that outperforms conventional electrodes in most areas. Benefits include:

### **Prevents sticking**

It's inevitable when you weld galvanized steel with conventional electrodes. The chrome in conventional electrodes encourages the alloying of the zinc and copper to create a brass alloy surface that stops the welding dead. But Z-Trode is an alloy of zirconium and oxygen-free copper. The irconium discourages the alloying effect on the electrode face and prevents sticking. This increases productivity without special dressings or increased power requirements to weld coated materials.

### **Resists mushrooming**

When compared to CuCrZr and CuCr alloys, the zirconium-copper alloy resists mushrooming and wear due to its

superior conductivity. Z-trode's conductivity allows it to be used with lower current settings and less heat, greatly improving the alloy's resistance to mushrooming.

### **Requires less energy**

In comparison to CuCrZr and CuCr alloys, Z-trode requires lower current due to its higher electrical conductivity, when used on both sides of the weldment. This results in longer electrode life, more consistent welds and energy savings. Welder current settings can be reduced up to 20% from the conventional CuCrZr and CuCr settings, with no loss in weld integrity.

### **Reduces downtime**

Overall maintenance of Z-Trode caps is much less than with conventional electrodes, increasing welding process and production efficiencies.

### **Produces smooth start-ups**

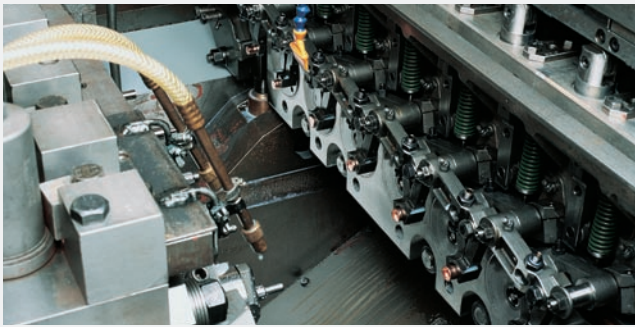
Z-Trode caps require no warm-up, conditioning time or initial preparation following electrode changes.

### **Most cost-effective electrode**

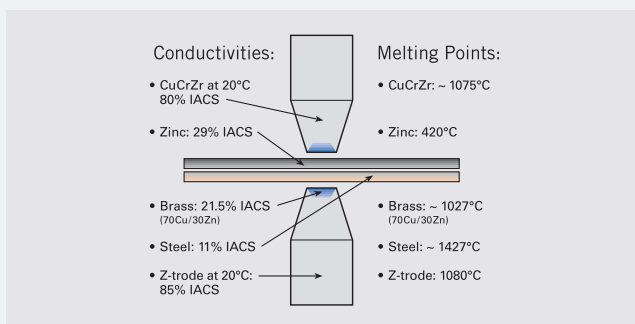
Z-Trode's increased life expectancy, maintenance savings, lower energy requirements and consistent quality welds assure you the most return on your investment.



Oxygen free copper casting



Cold heading



Electrical and physical constants

### Z-Trode production

Z-Trode's freedom from oxygen allows us to alloy the copper with the optimum level of zirconium; that's what gives excellent conductivity, and that's what gives you the ability to reduce current settings.

### Z-Trode's physical properties

All Z-trode electrodes are cold worked and most items are fully cold formed to ensure the maximum possible amount of cold work. Result; mechanical properties equivalent to conventional CuCrZr and CuCr electrodes, but with better electrical conductivity.

- **Hardness at ambient temperature:**  
Minimum 65 HRB
- **Conductivity:**  
Minimum 85% IACS

### Z-Trode's non-stick properties

A resistance weld forms where the electrical resistance in an assembly is highest. Z-Trode's superior conductivity means that the maximum electrical resistance in an assembly is always clearly between the steel or aluminum sheet. This reduces heat generated between the sheet and electrode, which in turn reduces sticking.

### Traceability

All Luvata materials are fully traceable. Z-Trode electrodes can be recognized by their flats.

### About Luvata

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For more information about the Luvata Z-Trode™ please contact:

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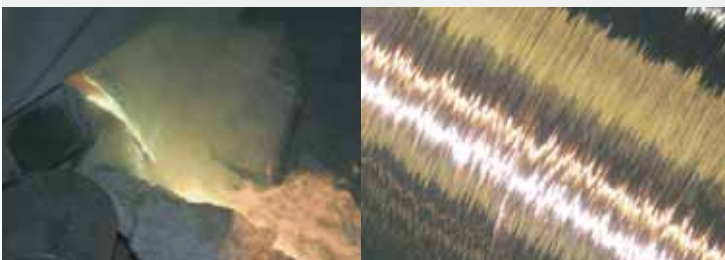
## Copper for Welding

### **Copper alloys for welding and brazing**

At Luvata, we have extensive expertise in metallurgy and wire drawing. This enables us to produce the high quality copper alloy wires with a constant composition and a surface, which is free of defects, which are needed for various welding applications.

We offer a wide range of copper alloy wires as standard, and we also regularly work closely with our customers to create bespoke, customer-specific wires to meet exact specifications.

We always use pure raw materials, which guarantees that our products have excellent mechanical properties. Combined with our excellent processes, packaging and strong customer focus, we take pride in a first class end product.



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## Specifications

<b>Din 1733</b>	SG-CuSi3
<b>Material No.</b>	2.1461
<b>BS2901 part 3</b>	C 9
<b>AWS A 5.7</b>	ER CuSi-A
Electrical conductivity (S*m/mm <sup>2</sup> )	3-4
Density (kg/dm <sup>3</sup> )	8,5
Solidus-Temperature (°C)	910
Liquidus-Temperature (°C)	1025
Tensile strenght Rm (Mpa)	330-370
Hardness (HB)	80-90

<b>Din 1733</b>	SG-CuAl8
<b>Material No.</b>	2.0921
<b>BS2901 part 3</b>	C 28
<b>AWS A 5.7</b>	ER CuAl-A1
Electrical conductivity (S*m/mm <sup>2</sup> )	8
Density (kg/dm <sup>3</sup> )	7,7
Solidus-Temperature (°C)	1030
Liquidus-Temperature (°C)	1040
Tensile strenght Rm (Mpa)	390-450
Hardness (HB)	140

<b>Din 1733</b>	SG-CuSn
<b>Material No.</b>	2.1006
<b>BS2901 part 3</b>	C 7
<b>AWS A 5.7</b>	ER Cu
Electrical conductivity (S*m/mm <sup>2</sup> )	15-20
Density (kg/dm <sup>3</sup> )	8,9
Solidus-Temperature (oC)	1020
Liquidus-Temperature (oC)	1050
Tensile strenght Rm (Mpa)	210-245
Hardness (HB)	60-80

<b>Din 1733</b>	SG-CuSn6
<b>Material No.</b>	2.1022
<b>BS2901 part 3</b>	C 11
<b>AWS A 5.7</b>	ER CuSn-A
Electrical conductivity (S*m/mm <sup>2</sup> )	9
Density (kg/dm <sup>3</sup> )	8,7
Solidus-Temperature (°C)	910
Liquidus-Temperature (°C)	1040
Tensile strenght Rm (Mpa)	320-360
Hardness (HB)	80-90

<b>Dimensions</b>	Standard diameters 0,8 1,00 1,20 1,60 mm. Diameter range 0,50 - 8,00mm
<b>Temper</b>	Hard, soft or as required
<b>Package</b>	Reels, coils or drums

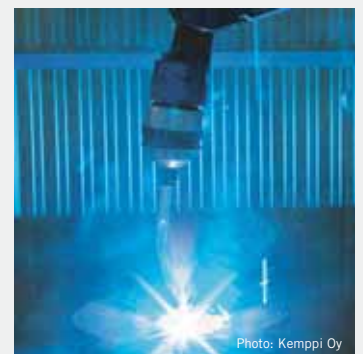
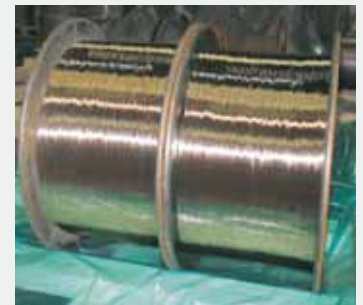
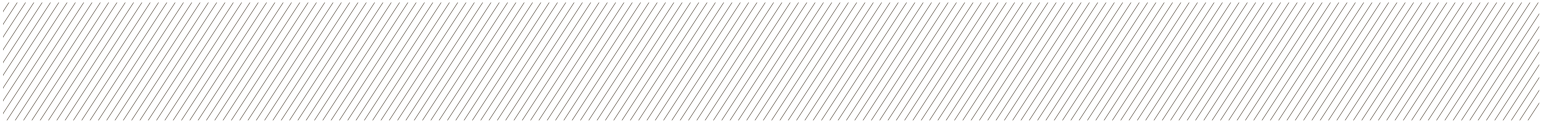


Photo: Kemppi Oy



## Luvaweld™ MIG & Braze Welding Wire

### Our Wire

- Seamless
- Tangle Free
- Consistent roundness, diameter and helix
- Homogeneous
- Contaminate free

### Our Service

- Experienced technical support and on site assistance
- Single integrated global supply chain
- Customer-specific wire to meet exact specifications
- Strong customer focus with outstanding customer service
- One stop shopping for wire, mig brazing tips and resistance welding electrodes



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### Specifications

Din 1733	SG-CuSi3Mn	SG-CuAl8	SG-CuSn1	SG-CuSn6P
Material No.	2.1461	2.0921	2.1006	2.1022
En 14640	CuSi3Mn	CuAl8	CuSn1	CuSn6P
BS2901 part 3	C 9	C 28	C 7	C 11
AWS A 5.7	ER CuSi-A	ER CuAl-A1	ER Cu	ER CuSn-A
Electrical conductivity (S*m/mm <sup>2</sup> )	3-4	8	15-20	9
Density (kg/dm <sup>3</sup> )	8,5	7,7	8,9	8,7
Solidus-Temperature (°C)	910	1030	1020	910
Liquidus-Temperature (°C)	1025	1040	1050	1040
Tensile strength Rm (MPa)	330-370	390-450	210-245	320-360
Hardness (HB)	80-90	140	60-80	80-90

### Product Dimensions

Diameter range 0,50 - 3,2 mm (0.030" - 0.125")

Spools, drums up to 550 kg (1,000 lbs) or sticks in tubes up to 10 kg (20 lbs)

Other package types available upon request

## Fully Integrated Production for a Complete Welding Solution



Photo by Kemppi Oy



For more information please contact:



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## Contact Tips

### Performance, Quality and Reliability

For years deoxidized phosphorus copper has been the material of choice for contact tips due to its low cost and availability. Most Original Equipment Manufacturers (OEMs) have settled on this material for the manufacture of their tips. Luvata has developed a line of dispersion strengthened copper tips for more demanding applications requiring high wear characteristics and resistance to softening.

Choice of alloys tailored to your application:

- **Dispersion Strengthened Copper (DSC)**
- Copper Chrome Zirconium (CuCrZr)
- Silver Bearing Copper (CuAg)
- Deoxidized Phosphorus Copper (DHP)



#### About Luvata

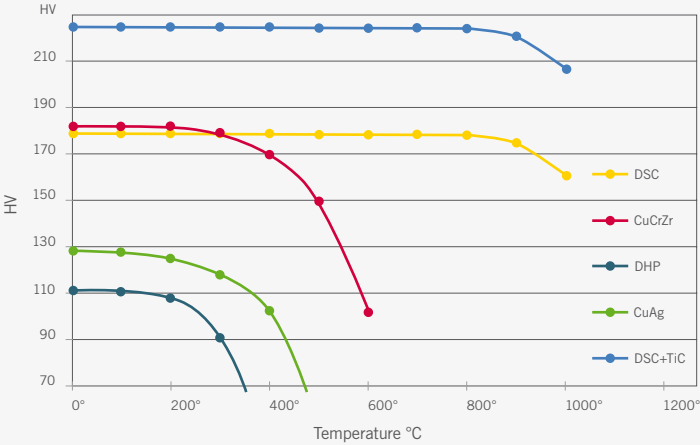
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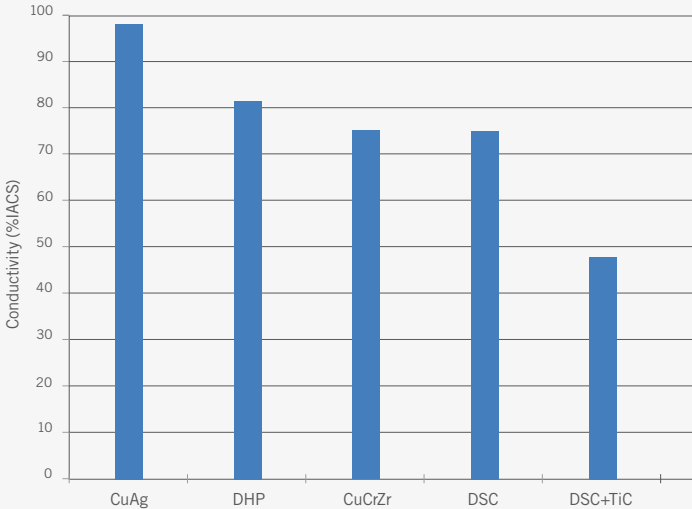
### Comparison of alloys

For those who require performance in a contact tip, our dispersion strengthened copper (DSC) tips are unsurpassed in quality and reliability. In controlled applications our DSC tips have provided up to 5X the life of a standard DHP contact tip. The DSC tip maintains its hardness at elevated temperatures and has excellent wear characteristics.

Hardness Loss after 1 Hour



Contact Tip Conductivity Comparison at 20°C



**Material Options:**

- (E) Dispersion Strengthened Copper (DSC)
- (A) Copper Chrome Zirconium (CuCrZr)
- (S) Copper Silver (CuAg)
- (D) Deoxidized High Phosphorus Copper (DHP)
- (T) Dispersion Strengthened Copper w/ Titanium Carbide

**Typical part No. for material identification and size**

MTXXX.X-XX-XXX  
 | Material  
 | Tip Length (mm)  
 | Wire Size (mm)

