



Artash
Composite



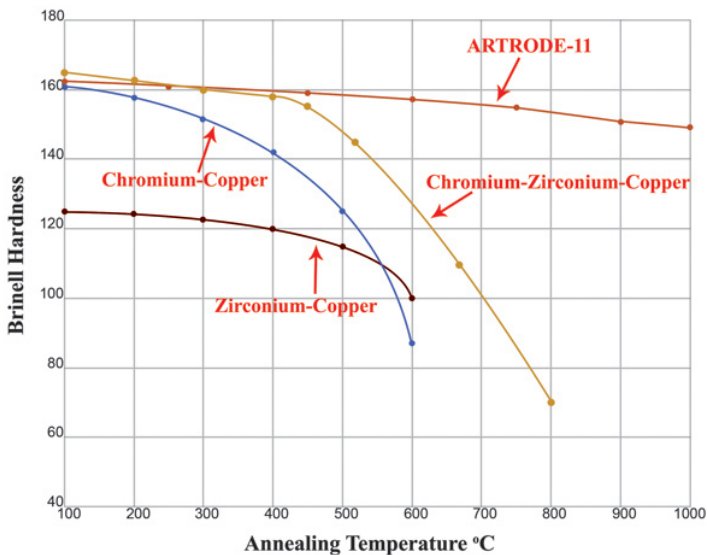
ARTRODE

(Alumina Dispersion Strengthened Copper)

This material consists of pure copper containing ultrafine particles of aluminum oxide (10 nm ave size) which are uniformly dispersed in copper matrix. Aluminum oxide is produced by a process during which oxygen reacts with aluminum in copper lattice in the solid state.

Al_2O_3 is very hard and thermally stable. It has no solubility in copper and no Al_2O_3 growth or diffusion occurs at elevated temperatures. These particles strengthen the copper while minimally reduce its electrical and thermal conductivity.

Thus high hardness and tensile strength are inherent properties of ARTRODE and unlike any other copper alloy; it exhibits unique hardness retention after being exposed to elevated temperatures.



This property is caused by the pinning of dislocations by Al_2O_3 particles and retarding of recrystallization, as a consequence significant softening does not occur due to annealing of ARTRODE even at temperatures close to the melting point of copper.

The salient properties of ARTRODE are created by sacrificing little of its electrical conductivity (maintains 78-85% IACS), still its conductivity is comparable to copper and tensile strength to steel.

Artash Composite Co. has developed the production technology of this material all by its own research and development and independent of any other sources.

All production phases, from melting to atomizing of molten metal to metal powder to consolidated bar and even the cold forming of caps used in resistance spot welding are carried out within the company. Contact tips used in submerged arc welding and contact bars in cable train are other products presently made from ARTRODE .

Currently, one grade of this material (ARTRODE-11) is produced. Other grades may be supplied on request.

Properties of ARTRODE-11 are as follows:

ARTRODE-11

- Material Number: UNS C15760
- Classification: R.W.M.A Class-20
- Chemical Composition: Al_2O_3 (1.1%) by wt. , Copper (balance)

PROPERTIES (as extruded)			
PHYSICAL		MECHANICAL	
Density	8.81 g/Cm ³ at 20 °C		
Melting Point	1083 °C	Hardness	160 HB
Electrical Conductivity	80 % IACS	Tensile Strngth	540 Mpa
Thermal Conductivity	320 W/m.°K at 20°C	Yield Strength	510 Mpa
Electrical Resistivity	2.15 $\mu\Omega$ -Cm at 20 °C	Elongation	20% in 50 mm
Modulus of Elasticity	125 Gpa		

APPLICATIONS:

- Spot Welding Electrodes and Wheels
- Contact tips in MIG and Submerged Arc Welding
- Solder Gun Tips
- Electrical Contacts

AVAILABLE FORMS:

- Round bar 10-20 mm in diameter
- Rectangular bar max cross-sectional area 320 mm²

MACHINING:

Use carbide tools with chip breaker
 Vc: 70-90 m/min
 Feeding rate: 0.07-0.15 mm/rev



SPOT WELDING ELECTRODE TIPS:

ARTRODE can be used in RWMA class 1, 2 and some class 3 applications. According to table 1 ARTRODE-11 exceeds all the requirements needed for class 2 type material.

Table 1 Room-temperature properties of ARTRODE-11 (C15760) compared to RWMA class 2 standard

Material	Hardness, HRB	Ultimate tensile strength		Elongation %	Electrical conductivity, %IACS
		Mpa	Ksi		
ARTRODE-11 (C15760)	80	540	79	20	80
RWMA class 2 standard (min)	75	448	65	13	75

ARTRODE works on all types of bare and coated steels and aluminum. It is especially suitable for welding of galvanized sheet metal and readily outperforms other alloys such as Cu-Cr-Zr.

Electrode tips are made from ARTRODE in different male and female types mainly by cold forging and in some cases by machining. Dimensional accuracy and consistency are guaranteed by using high precision carbide dies.

The outstanding properties such as excellent hardness retention at elevated temperature, high electrical conductivity, low alloying effect, non-sticking characteristics on coated steel and good formability make it a suitable electrode for spot welding of all types of steel sheets in car body assembly lines and similar applications.

Extensive testing carried out on galvanized sheet metal showed that zinc pick up by ARTRODE-11 is negligible as compared to copper-chromium-zirconium alloy. The low mushrooming rate which is an outstanding property of ARTRODE-11 minimizes costly interruptions associated with tip dressing and tip changing.

Cap tips made from ARTRODE offer many advantages over class 2 type electrodes and affect the economy of the production in following ways:

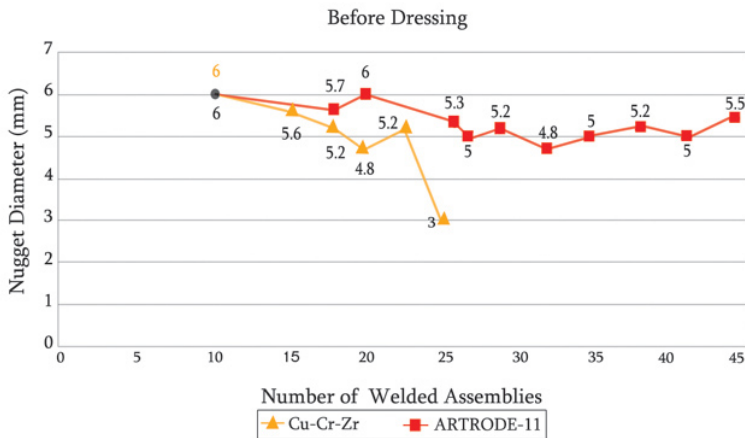


Spot Welding Tips

- Minimizing downtime due to reshaping and change of tips.
- Non sticking characteristics on coated steel.
- Improved life time.
- Stability of the weld quality
- Reducing energy requirements
- Smoother start up
- Longer life of shanks and holders due to less tip changing
- Increasing production rate

Test results of welding galvanized steel sheet by electrodes made from ARTRODE-11 and Cu-Cr-Zr using the same welding parameters are shown for comparison.

In this test the weld nugget diameter was measured periodically after destructive testing of the weld assembly. According to the test results electrodes made from ARTRODE exhibit weld nugget stability and double life time as compared to Cu-Cr-Zr electrodes



ELECTRICAL AND WEAR PARTS:

The uniform dispersion of ultra fine Al_2O_3 particles makes ARTRODE a suitable choice for serving in severe conditions. When high conductivity and wear resistance are required (especially at elevated temperatures) ARTRODE exhibits outstanding performance. For example contact tips in submerged arc welding need to have low electrical resistance, high thermal conductivity, wear resistance and structure stability at high temperatures.

ARTRODE fulfills all of these requirements and can be an excellent substitute for the well established alloys such as Beryllium-Copper or Chromium-Zirconium-Copper. It shows at least double lifetime as compared to Cu-Cr-Zr. Contact tips made from Beryllium-Copper have been successfully replaced by ARTRODE-11 in submerged arc welding of pipes for oil and gas industry resulting in lower cost and longer lifetime.

Another parts made from ARTRODE are MIG welding contact tips. These tips are produced with precise and high finish bore. When welding, the temperature of the tip is raised due to the radiation of the weld pool and the weld current.

ARTRODE's unique resistance to annealing and wear leads to maintaining the original bore dimensions.

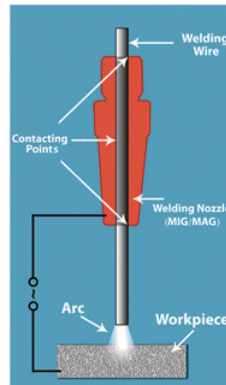
Moreover, ARTRODE exhibits a Non-stick behavior to weld spatters which minimizes interruptions associated with metal build up at the tip end.

The overall effect of the above-mentioned facts would be smooth and steady welding which is essential in automatic processes.

A similar application of ARTRODE is the rectangular bar mounted on the top of the control cabin in cable train. These bars must transfer a high current and are exposed to continuous abrasion.

Other applications of ARTRODE are; contact supports, relay blades, lead wire in lamps and high current connectors.

Samples for testing of each case can be provided on customers' requests.



HIGH CONDUCTIVITY COPPER STRIPS:

Strips are made from copper rod by cold forming methods such as rolling and drawing followed by bright annealing.

High electrical conductivity and dimensional accuracy make this product suitable for transformers, conductors and many other electrical applications. It can be supplied over a wide range of mechanical properties depending on client's request. Typical properties are shown in Table 2.

CHEMICAL COMPOSITION

Cu 99.9% O 0.04% max.

Typical mechanical properties of copper strips

Temper	Tensile strength (N/mm ²)	Yield strength (N/mm ²)	Elongation %	Hardness HV
Hard	345	310	6	100
Half hard	290	250	14	85
Quarter hard	260	206	25	70
Soft annealed	220	80	40	55

Table 2

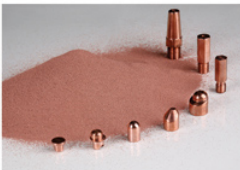
AVAILABLE SIZES: (LEVEL WOUND & PANCAKE COIL)

Thickness (mm)	Width (mm)
Up to 2	<14
2-3	<13
3-4	<11
4-5	<10



Table 3

COPPER AND COPPER ALLOYS POWDER:



Copper powder is produced by water atomizing method and can be supplied in different mesh numbers. The irregular shape of the particles causes good mechanical locking and high strength of green compacts. Due to the high purity of the powder it can be used for fabrication of electric parts.

Typical specifications and size distribution of copper powder are given in tables 4 and 5.

PROPERTIES OF WATER ATOMIZED POWDER

Composition % (by weight)	Particle shape	Apparent density (gr/cm ³)	Oxygen (ppm)	Surface area
99.9% min	Irregular-spherical	2.7	<800	low

* Low oxygen grade is also available.

Table 4

PARTICLE SIZE DISTRIBUTION % (APPROXIMATE)

+100	-100+150	-150+200	-200
Trace	5	10	85

* Copper alloys powder may be produced on customers' request.

Table 5

Machinery & Tooling

Our expertise in metallurgy helps us to develop our own technology and manufacture the machinery and tooling within the company including:

- Atomizing plant
- Heat treatment furnaces
- Compaction presses
- Hot extrusion
- Cold drawing bench
- Precision die making section
- Precision cutters
- Double action-high speed forging presses

On-Site Laboratory

Every and each batch of product is carefully tested in our on-site laboratory for quality and consistency prior to further processing .

Standard tests are as follows:

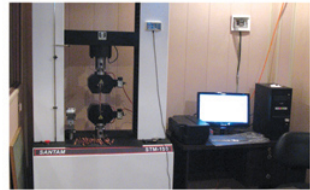
- 1- Density test
- 2- Electrical conductivity test
- 3- Hardness test
- 4- Tension test for mechanical properties
- 5- Metallography

Know-How

Artash Composite has developed its own know-how and registered it.

Using the latest Nano technology and powder metallurgy techniques we managed to produce ARTRODE which is one of the highest quality grades of this category.

It is noteworthy that all machinery and tooling is made by the company engineers.



CERTIFICATES:

Maintaining high standards is our top priority. Artash composite is ISO 9001:2008 registered and has achieved Certificate of Compliance according to EN ISO 5182 and EN ISO 5821.

The certificate is framed in a light blue border. At the top right is the ACS REGISTRARS logo. The title 'Certificate of Registration' is written in a large, elegant script font. The background features a large, faint watermark of the Artash Composite logo. The text is centered and includes the certificate number, the company name, address, and the ISO 9001:2008 standard. A signature is present, along with dates for assessment, registration, and expiry. A small circular seal is located at the bottom right of the certificate area.

ACS
REGISTRARS

Certificate of Registration

Certificate Number: IR/11/1130487925

This is to certify that the Management System of:

Artash Composite Co.

Address to which this certificate refers:

First Floor, No. 450, Mirdamad Blvd, Tehran, Iran

Has been assessed and registered by ACS Registrars Ltd against the following Quality Management System Requirements:

ISO 9001: 2008

The scope of registration is:

"Production of Copper Alloys & Composites, e.g., Alumina Dispersion Strengthened Copper; and Manufacturing Parts and Components from Copper and Copper Alloys, Such as, Spot Welding Electrode Tips, Nozzles, etc."

Signed by: 

Date of initial assessment: 02.02.2012
Date of registration: 08.02.2012
Date reissued: n/a
Date of expiry: 01.02.2015

Whilst all due care was exercised in carrying out this assessment, ACS Registrars Ltd accepts responsibility only for proven gross negligence. This is not a legal document and cannot be used as such. This certificate remains the property of ACS Registrars Ltd to whom it must be returned upon request. Certificate validity may be verified at the address below.

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Tel. 0121-241-2299 fax. 0121-241-4623
www.acsregistrars.com

A circular seal with a yellow border and a blue center, containing the text 'ACS REGISTRARS' and 'REGISTERED'.




Certificate Of Compliance

No.13-48257L04

Hereby we certify that our applicant,

ARTASH COMPOSITE Co.

Address:
First floor, No. 450, Mirdamad Ave., Tehran-Iran

Product:
ALUMINA DISPERSION STRENGTHENED COPPER
"Trade Name ARTRODE-11"

*Has been under our surveillance in Product Line and Quality Control process.
All Obligated Tests according to EN ISO 5182: 2009 and EN ISO 5821: 2009 were
performed and found in full compliance with above mentioned standards.*

*SGS Product Quality Logo is hereafter applicable for aforementioned Alumina
Dispersion Strengthened Copper according to the SGS General Condition*

Date of Issue: May 6, 2013

Validity Date: May 6, 2016

*This certificate is valid for three years from May 6, 2013 to May 6, 2016 and must be re-approved
every year based on annually audit.*

TEHRAN / Consumer Testing Services Division (CTS) / JOB NO. 13-59724L04
Consumer Testing Services (CTS)
Executive Manager
Farshad Kianfar





SGS (Iran) Limited
Managing Director
Ali Ebrahimzadeh



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