

Heraeus



Bonding Wires for Semiconductor Technology

Contents

History	4
Superior Bonding Wire Technology	5
Research & Development	6
Bonding Wire Technology Laboratory & Applications	7
Commitment to Product and Service Excellence	8
General Bonding Wire Characteristics	9
Gold Bonding Wires	10
Aluminum Bonding Wires	14
Copper Bonding Wires	17
Aluminum Bonding Ribbons	20
Gold, Silver and Platinum Bonding Ribbons	21
Special Wire Products	22





Heraeus

Heraeus is a family-owned, global company active in the business areas of precious metals, sensors, dental and medical products, quartz glass and specialty lighting sources. Heraeus has been one of the leading companies in precious metals and materials technology for 160 years.

We develop, manufacture and supply bonding wires made of gold, copper and aluminum as well as gold and aluminum ribbons and specialties for contacts in discrete and integrated components.

In addition, we supply all kinds of materials for surface mount technology in the semiconductor, electronics, communications and computer industries.

History

From the Melting of Precious Metals to Micro-Joining Technology

Electrically conducting connections have to be manufactured for integrated and highly integrated circuits to join the connection pad of the chip to the system carrier of the semiconductor component.

Fine and ultra-fine wires of precisely doped and alloyed metals having diameters ranging from 8 μm to 500 μm are used for this purpose. Highest demands are made on reliability and quality of these bonding wire connections.

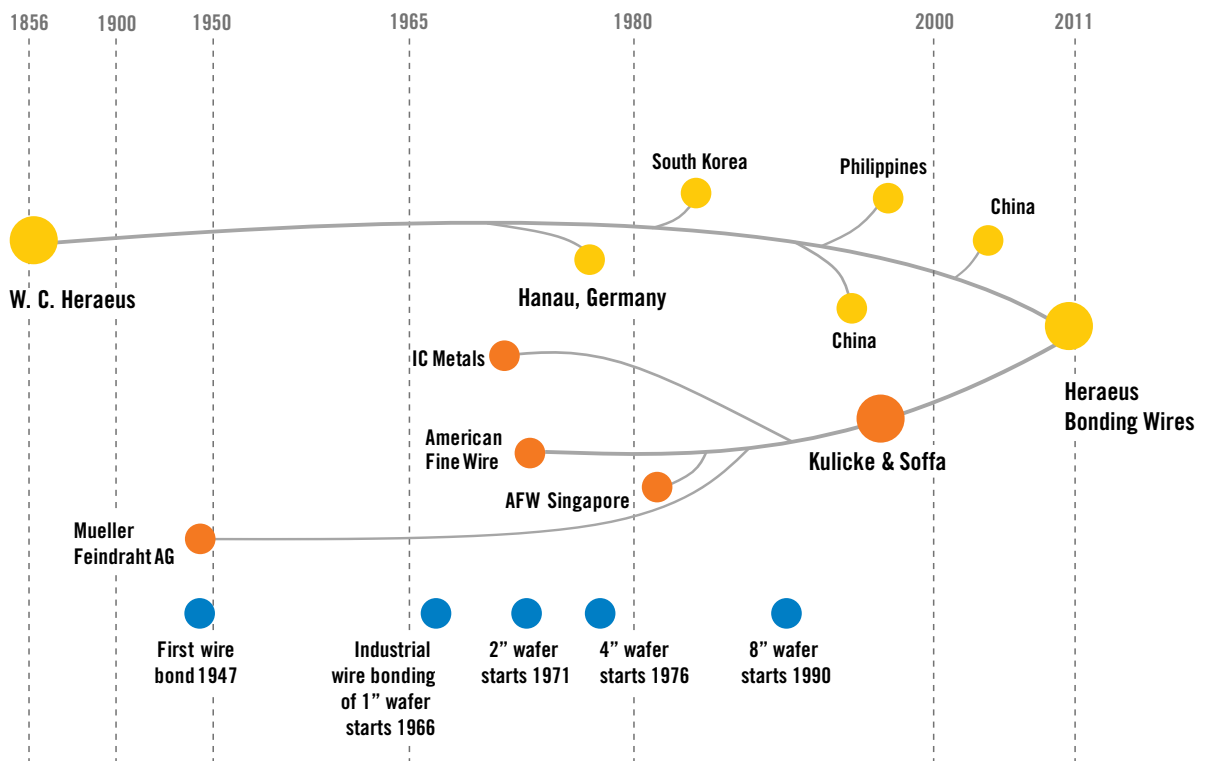
The experience of decades, the high technical competence and the continual integration of the wide variety of customer requirements into our production expertise guarantee the high quality of Heraeus products.

Worldwide activities and an intensive interchange of technology and information between our production sites throughout the world permit optimum supplies and best possible prompt service.

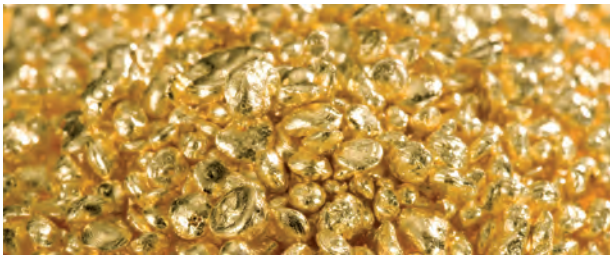
Heraeus established bonding wire production in the early 1970s at the headquarters in Hanau, Germany. For more than 25 years bonding wires made by Heraeus have been available in Korea. Between 1992 and 2002 production sites were set up in China and the Philippines. With this strategic decision Heraeus was able to offer its excellent service and technological advances to the local customers.

With the acquisition of the bonding wire business of Kulicke & Soffa Inc. Heraeus subsequently combined its own knowledge with over 40 years experience from the companies formerly known as "Mueller Feindraht AG" and "American Fine Wire".

Today Heraeus is a leading provider of technological solutions for gold, aluminum and copper bonding wires, serving our customers locally with a global perspective.



Superior Bonding Wire Technology



99.999% Pure Raw Materials

Heraeus uses raw materials of highest purity for maximum uniformity and consistency in all gold wire products.



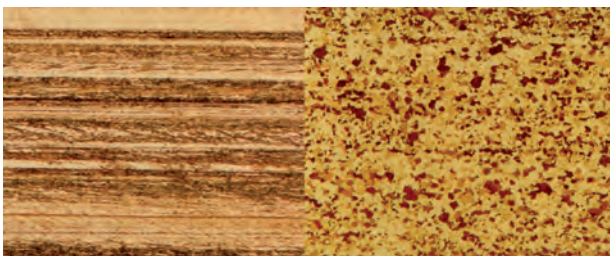
Doping and Casting

Advanced doping and casting techniques enable precise definition of bonding wire characteristics.



Wire Drawing

High performance technology is used to draw wire to the finest diameters and in extreme lengths.



Annealing

Grain structure and wire properties are controlled through precise thermo-mechanical processing.

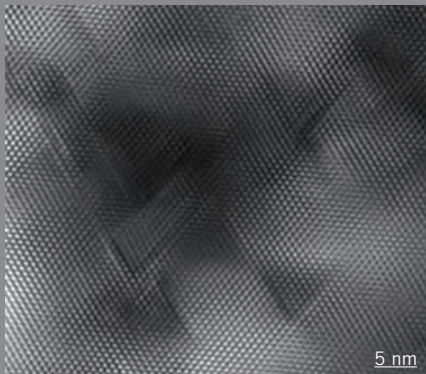


Spooling

Precision winding systems ensure optimal despooling.

Resulting in finished products of the highest quality!

Research & Development



The electronics and semiconductor industries can be characterized by perpetual change and technological advancement. In response to the demands of this volatile market, our researchers are continually looking for new and improved solutions for advanced materials.

Through the close cooperation with our customers, we ensure the function, quality and long-term supply of products. The laboratory and analysis departments of Heraeus help our customers to improve the process and increase yields; they support R&D in designing new products and implementing new material products into customers' assembly concepts.

We are driven by the needs of the market particularly

- Moore's law and the ongoing device feature size reduction
- Ongoing end product miniaturization which in turn drives tighter bond pitches, stacked die and complex bond loops
- Demanding bond-reliability requirements especially with finer wires
- Demanding cost-performance solutions driving the need for alternative metallurgies including copper
- Unique solutions required in power applications
- Overall performance improvements

Long-term experiences in the areas of materials and defect-analysis, as well as close contact with the world's leading international research institutes, industrial partners and universities, are good reasons to have confidence in Heraeus' technology.

All of the above results in Heraeus' researchers working on industry leading products on a market tailored roadmap.

Bonding Wire Technology Laboratory

Our research and development teams are staffed by recognized experts in the fields of metallurgical science and interconnect technologies. Highly-skilled staff utilize advanced materials analytical systems, including high performance optical and electron microscopes, as well as X-ray diffraction and spectroscopic equipment, thus providing experienced and comprehensive metallographic capabilities. Our application engineers bring together their industrial experience with full process knowledge of bonding equipment, bonding tools and bonding wire.

Our products are developed with state of the art tools and our labs are equipped with most of the instruments our customers use in their qualification or production processes.

This enables us to simulate the customer's environment and provide application services which support our customer's in reducing time to market with their products.

We work closely with equipment and tool providers enabling synergy between the equipment and materials, resulting in robust processes for our customers.

Applications

The increasing miniaturization in electronics has resulted in bonding wires becoming important constituents of electronic assemblies.

For this purpose fine and ultrafine bonding wires of gold, aluminum, copper and palladium are used. Highest demands are made on their quality, especially with regard to the uniformity of the wire properties.

Depending on their chemical composition and specific properties, the bonding wires are adapted to the bonding technique selected and to automatic bonding machines as well as to the various challenges in assembly technologies.

Heraeus Electronics offers a wide product range for various applications of the

- Automotive industry
- Telecommunications
- Semiconductor manufacturers
- Consumer goods industry

Heraeus Bonding Wire product groups are:

- Bonding wires for applications in plastic filled electronic components
- Aluminum and aluminum alloy bonding wires for applications which require low processing temperature
- Copper bonding wires as a technical and economical alternative to gold wires
- Precious and non-precious metal bonding ribbons for electrical connections with large contact areas

Product and Service Excellence

We Care about our Environment



Complete Quality Systems

Heraeus meets and exceeds all of the industry's most advanced quality system standards including ISO 9001 certification and TS 16949. As an integral part of our corporate philosophy, we adhere to strict procedures for material control, product identification and traceability, process control, inspection and testing, as well as product handling, storage, packaging and delivery. Employee training, the maintenance of quality records, and the use of statistical data analysis ensure product excellence and continuous improvement.

Measurement and Traceability

All equipment used to inspect, measure, test and certify that a product meets its stated quality and specification is subject to regularly scheduled maintenance and calibration procedures, which are continually reviewed through periodic quality auditing. Traceability to verifiable standards, both internal and external, is guaranteed through meticulous record keeping and documentation.

Service and Support

We at Heraeus are committed to providing our customers with the best service and support available. Our manufacturing operations are designed for quick ramp-up capability and short cycle-times. This allows our customer service to develop ideal supply solutions and to manage your orders and inventories for on-time delivery.

Precious Metal Trading

Precious metals play a special role in many areas at Heraeus. With the help of four precious metal trading units in Hanau, Hong Kong, New York and Shanghai our company assists customers in professionally managing the risks associated with physical acquisition, price fluctuations and financing.

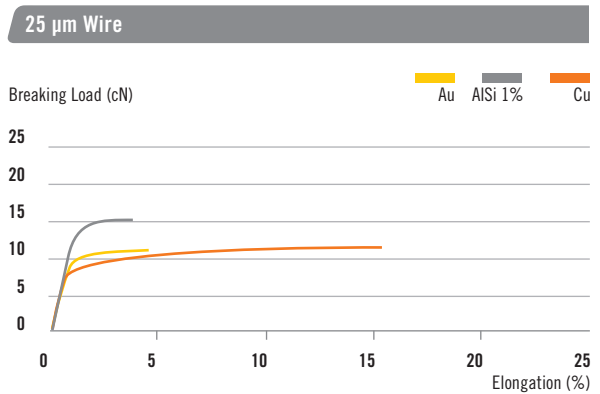
Logistics

Together with our in-house logistics partner Logwin, Heraeus offers a transportation and pickup service all over the globe. We ensure correct and competent handling of your valuable material during transport.

General Bonding Wire Characteristics

Typical Tensile Behavior

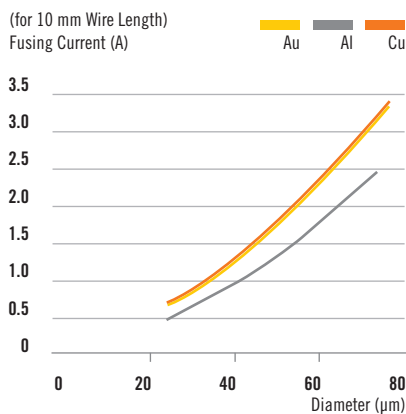
Elongation and breaking load data derived from tensile testing are the most important wire characteristics. Tensile tests are performed in accordance with ASTM F72 using state-of-the-art tensile test equipment.



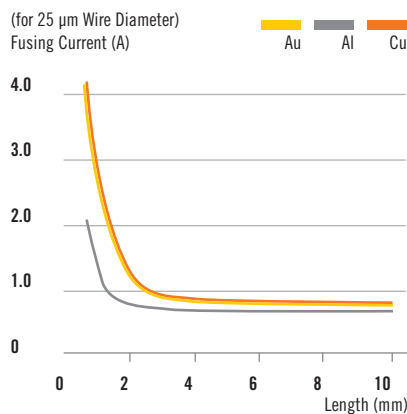
Bulk Properties of Pure Metals

Properties	Units	Gold	Copper	Aluminum
Melting Point	°C	1063	1083	658
Density	g/cm ³	19.3	8.9	2.7
Lattice Constant (@20 °C)	10 ⁻¹⁰ m (Å)	4.079	3.615	4.049
Lattice Structure	–	FCC	FCC	FCC
Specific Heat (@20 °C)	J/g K	0.126	0.386	0.900
Thermal Conductance	kW/m ² K	31.1	39.4	22.2
Coefficient of Linear Thermal Expansion	ppm/K	14.2	16.5	23.1
Electrical Resistivity (@20 °C)	10 ⁻⁸ Ω m	2.2	1.7	2.7
Electrical Conductivity (@20 °C)	10 ⁷ / Ω m	4.55	5.88	3.65
Vickers Hardness	MN/m ²	216	369	167
Youngs Modulus	GPa	78	130	70
Modulus of Elasticity	GPa	79	123	71
Tensile Strength	N/mm ²	120 – 220	210 – 370	100 – 200

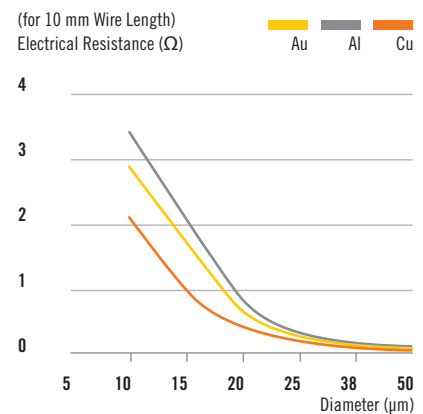
Fusing Current vs. Wire Diameter



Fusing Current vs. Wire Length



Electrical Resistance vs. Wire Diameter



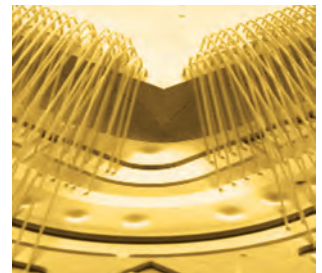
Gold Bonding Wires



Heraeus gold bonding wires are manufactured from high-purity starting materials (99.999%) with doping additions. New applications and their increased requirements led to the development of alloyed gold bonding wires. All wires are corrosion resistant and display a homogeneous chemical composition and stable mechanical properties. The wire surfaces are very clean and of high quality. Gold bonding wires are principally used in the production of plastic packaged components. The highest processing rates are achieved by using the ball / wedge bonding process.

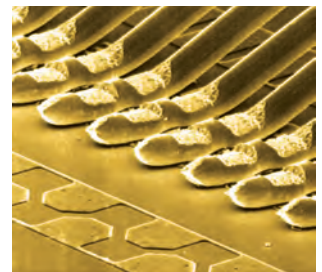
Ball Bonding Gold Wires

Heraeus offers a wide selection of gold ball bonding wires in a full range of diameters to suit your applications, from high-power and discrete components to high pin-count, ultra-fine pitch devices.



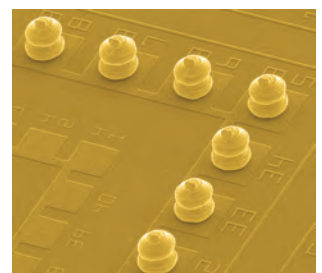
Wedge Bonding Gold Wires

Our wedge bonding gold wires are optimized for tail and loop consistency and provide excellent bondability for high-frequency and opto-electronic applications.



Stud Bumping Gold Wires

Heraeus has developed gold wire products specifically for advanced stud bumping of wafers and other materials used in flip-chip and chip-to-chip applications.

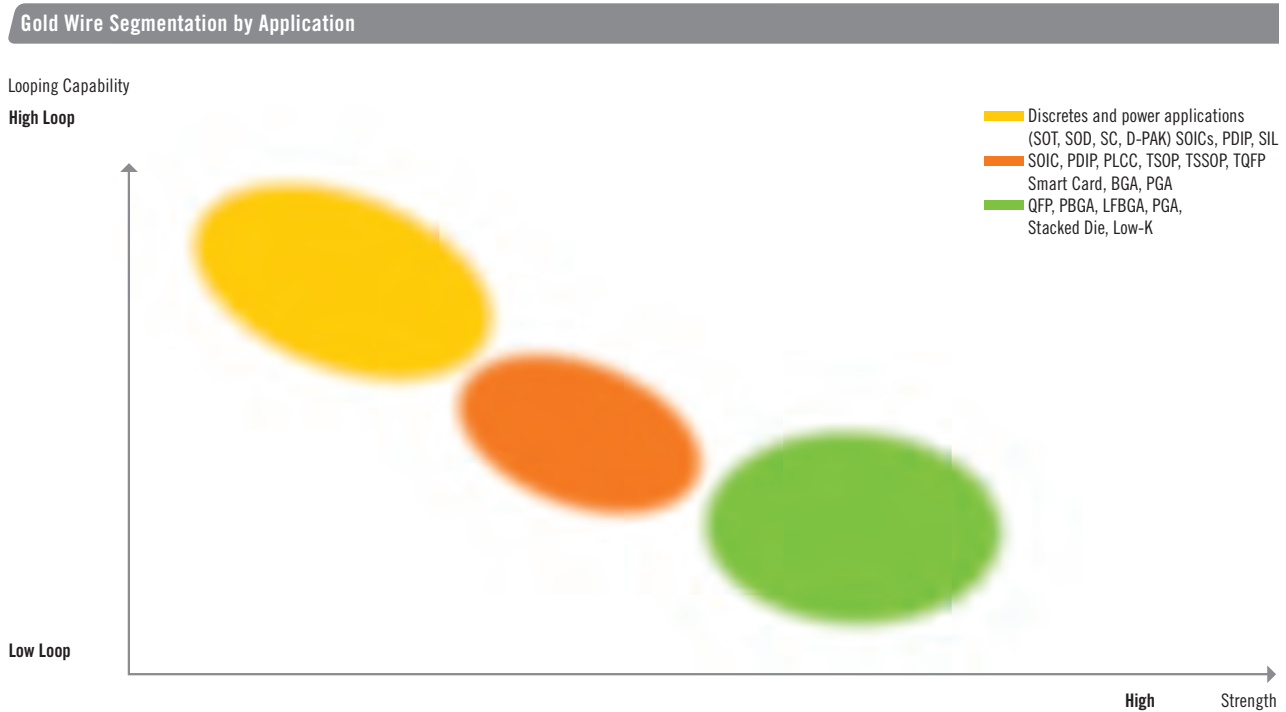


Ball Bonding Gold Wires

Wire Guidelines

Within three major classifications of Heraeus gold ball bonding wires, the right wire can be found for any ball bonding application.

These groups take into account mechanical strength and looping characteristics.



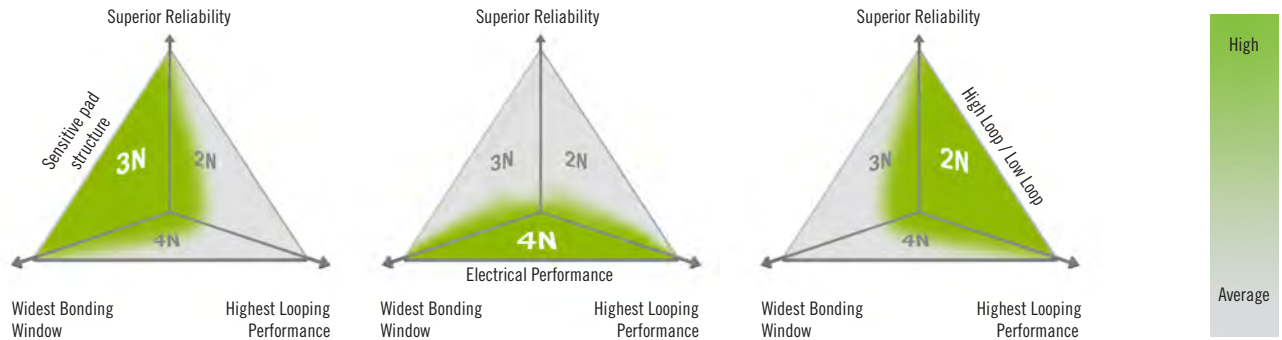
Standard Mechanical Properties

	Diameter	15	18	20	23	25	28	30	32	33	35	38	50
	μm ($\pm 1 \mu\text{m}$) mils ($\pm 0.04 \text{ mil}$)	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.25	1.30	1.40	1.50	2.00
Au Wire Series	Breaking Load (cN)	n.a.	>2.5	>3	4-9	6-11	8-14	9-16	11-19	13-20	14-22	15-25	28-45
	Breaking Load (cN)	n.a.	3-8	4-9	5-11	8-14	9-17	11-20	13-22	14-23	16-23	18-27	28-52
	Breaking Load (cN)	3-7	4-9	6-12	8-15	10-18	13-22	15-25	13-26	13-28	15-35	17-41	29-64
	Elongation (%)	2-5	2-5	2-6	2-6	2-6	2-6	2-6	2-6	3-7	3-7	3-7	3-7

■ Discretes and power applications (SOT, SOD, SC, D-PAK) SOICs, PDIP, SIL
 ■ SOIC, PDIP, PLCC, TSOP, TSSOP, TQFP Smart Card, BGA, PGA
 ■ QFP, PBGA, LFBGA, PGA, Stacked Die, Low-K

Ball Bonding Gold Wires

Gold Wire Segmentation by Properties



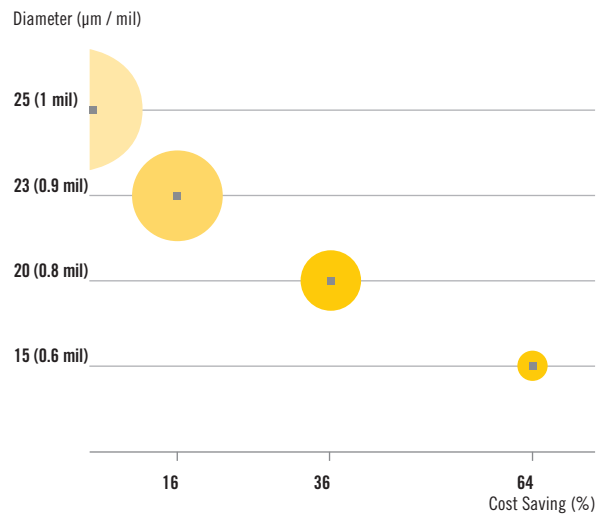
Physical Properties

Properties	Units	4N (99.99% Au)	3N (99.9% Au)	2N (99% Au)
Resistivity	uOhms cm	2.2 – 2.4	2.4 – 2.7	3.0 – 3.3
Elastic Modulus	GPa	80 – 95	85 – 100	85 – 100
Tensile Strength	N/mm ²	> 240	> 250	> 260
Heat Affect Zone Length		Normal	Shorter	Shortest
Neck Strength	% Tensile strength	85 – 90	85 – 95	90 – 95
Reliability Performance		Low	Medium	High
Looping Performance		Good	Excellent	Excellent
Bondability		Excellent	Excellent	Good
Moulding performance		Good	Excellent	Excellent

Gold Wire Cost

As the gold content accounts for the majority of bonding wire expense, wire diameter reduction is an effective way to reduce cost. Drawing on our extensive experience in the industry, Heraeus provides solutions for aggressive wire diameter reduction.

Gold Wire Cost Saving



Heat Affected Zone (HAZ) in Ball Bonding

During the ball formation (EFO), the properties of the wire adjacent to the ball (the heat affected zone) are altered. The HAZ is mechanically weaker than the original wire and influences loop formation and loop stability. A shorter HAZ with a fine grain structure provides lower loop formation capability and contributes to the pull-strength. A long HAZ assists in naturally higher loop shapes without reliance on the bonder trajectory.

HAZ is a function of:

- Free air ball (FAB) size
- Electronic flame-off (EFO) conditions (I, t)
- Wire diameter
- Thermal conductivity
- Recrystallization temperature

Stud Bumping Gold Wires

Heraeus gold stud bumping wires provide versatility for all types of bumping applications including standard stud, coined, and stacked bumps.

Available in either 2N or 4N compositions, it delivers consistent bump height and long-term bond stability.

Stud Bumping Gold Wire Selection Matrix

Attribute	4N (99.99% Au)	2N (99% Au)
Tail Height	Low	Low
Tail Consistency	Excellent	Excellent
Bondability	Excellent	Good
Shear Strength Level	High	Higher
Sensitive Pad Applications	Excellent	Good
Long Term Bond Stability	Good	Good
Use as Conventional Ball Bond Wire	Yes	No
Conductivity ($\mu\Omega$ cm)	2.3	3.2

Wedge Bonding Gold Wires

Heraeus wedge bonding wires have been engineered to achieve low, consistent loop profiles for consistent impedance in high frequency applications. They exhibit excellent bondability on the widest range of semiconductor

materials and contact metallization as well as substrate metallization. Superior tail consistency rounds out the capabilities of this very versatile bonding wire.

Aluminum Bonding Wires

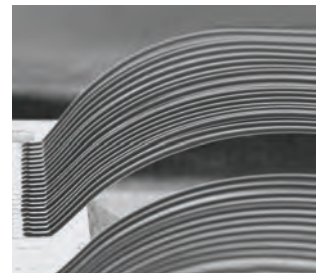


Bonding wires made of aluminum and aluminum alloys are used wherever low processing temperatures are needed. Economics also play a role because there is a saving on precious metals. The wires are mainly processed by the wedge / wedge process.

Heraeus aluminum bonding wires are manufactured from high purity alloy constituents (99.999%). Their chemical composition is homogeneous, their mechanical properties are stable and the wire surfaces are smooth and clean. This explains their excellent bondability.

Fine Aluminum Wires (0.7 – 4 mil; 18 – 100 µm)

Only the highest purity materials are used to manufacture Heraeus fine aluminum wires. These products exhibit excellent mechanical stability and are available in both standard (AlSi 1%) and corrosion resistant (AlMg) types.



Heavy Aluminum Wires (> 4 mil; > 100 µm)

Our large diameter aluminum wires are an outstanding choice for power packages and discrete devices. Available in both corrosion resistant and standard types, they are bondable at low temperatures and low energy levels.



Aluminum Thick Wires

Properties

- High strength
- Good bending fatigue properties
- Excellent loop stability
- Outstanding bonding properties

Areas of application

- Automotive components
- Power components
- Hybrid components
- Transistors / thyristors

Aluminum Fine Wires

Properties

- Best mechanical properties
- Constant wedge broadening
- Good processability
- Corrosion resistance (CR)
- Exact loop guiding

Areas of application

- Automotive components
- IC cards
- Hybrid components
- Hermetically encapsulated components

Heavy Aluminum Wires Typical Dimensions and Specifications

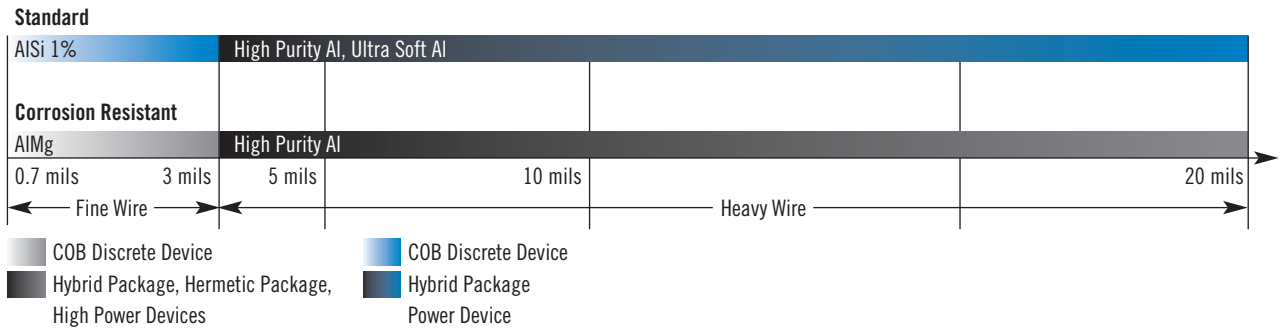
Type	Diameter	µm	125	150	200	250	300	380	500
		mils	5	6	8	10	12	15	20
Standard	Standard	Elongation (%)	5 – 15	5 – 15	8 – 20	10 – 25	10 – 25	10 – 25	10 – 30
		Breaking Load (cN)	50 – 150	80 – 190	150 – 350	200 – 450	280 – 750	450 – 1000	850 – 2000
Corrosion Resistant	Standard	Elongation (%)	5 – 15	5 – 15	8 – 20	10 – 25	10 – 25	10 – 25	10 – 25
		Breaking Load (cN)	100 – 150	150 – 230	250 – 350	450 – 550	600 – 750	900 – 1200	1600 – 2200
	Soft	Elongation (%)	5 – 30	5 – 30	10 – 30	10 – 30	10 – 30	10 – 30	10 – 30
		Breaking Load (cN)	75 – 120	110 – 180	200 – 260	300 – 450	400 – 600	600 – 950	900 – 1600

Fine Aluminum Wires Typical Dimensions and Specifications

Type	Diameter	µm	18	25	30	32	38	50	75
		mils	0.7	1.0	1.2	1.25	1.5	2.0	3.0
Standard	Hard	Elongation (%)	1 – 4	1 – 4	1 – 4	1 – 4	1 – 4	1 – 6	1 – 6
		Breaking Load (cN)	8 – 9	14 – 21	21 – 24	21 – 27	30 – 38	52 – 65	90 – 150
	Medium	Elongation (%)	1 – 4	1 – 4	1 – 4	1 – 4	1 – 4	1 – 6	1 – 6
		Breaking Load (cN)	7 – 8	15 – 18	19 – 21	21 – 24	28 – 32	45 – 55	100 – 120
	Soft	Elongation (%)	1 – 4	1 – 4	1 – 4	1 – 4	1 – 4	1 – 6	1 – 6
		Breaking Load (cN)	6 – 7	11 – 15	16 – 21	16 – 21	21 – 30	39 – 52	70 – 100
Corrosion Resistant	Hard	Elongation (%)	–	0.5 – 3	–	0.5 – 4	0.5 – 4	0.5 – 4	1 – 6
		Breaking Load (cN)	–	14 – 18	–	23 – 27	30 – 40	50 – 70	100 – 180
	Soft	Elongation (%)	–	–	–	–	2 – 7	2 – 7	5 – 15
		Breaking Load (cN)	–	–	–	–	17 – 21	28 – 33	80 – 150

Aluminum Bonding Wires

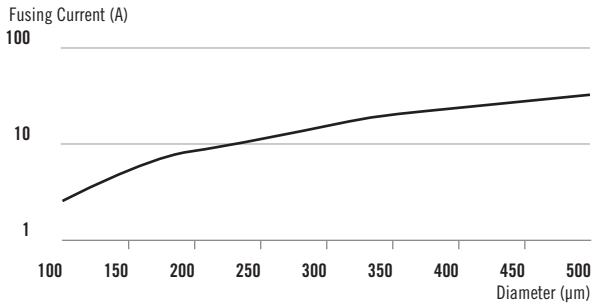
Aluminum Wire Selection Chart



Electrical Properties of Heavy Aluminum Wires

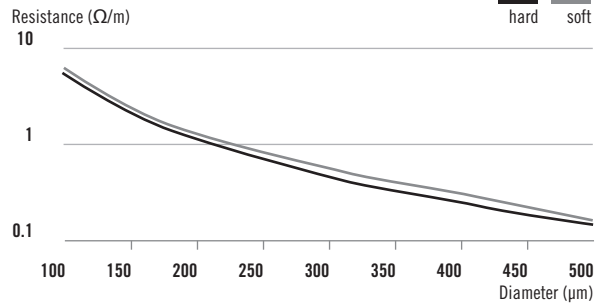
Fusing Current vs Wire Diameter

Pure Al Wire, 10 mm length, measured in air



Electrical Resistance vs Wire Diameter

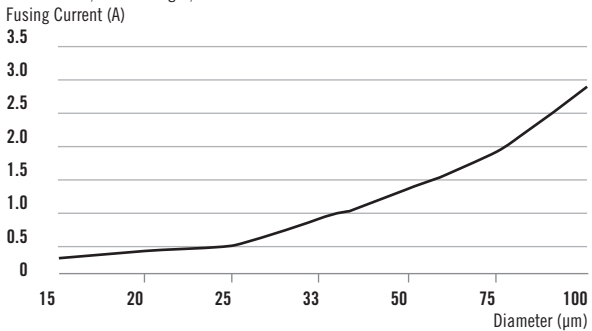
Pure Al Wire, 10 mm length, measured in air



Electrical Properties of Fine Aluminum Wires

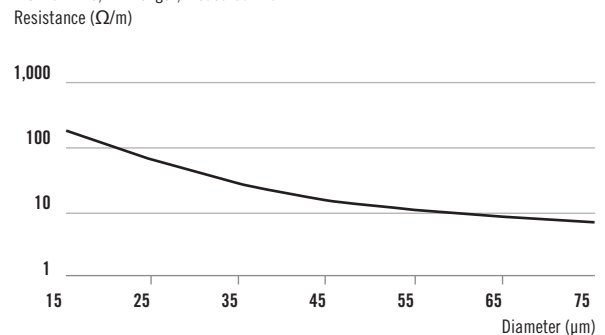
Fusing Current vs Wire Diameter

AISI 1% Wire, 10 mm length, measured in air



Electrical Resistance vs Wire Diameter

AISI 1% Wire, 1 m length, measured in air



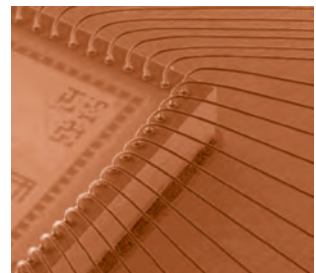
Copper Bonding Wires



Copper bonding wires have a high purity Cu matrix and achieve their excellent processing properties by means of defined addition elements. They distinguish themselves by stable mechanical properties and the high reliability of the bonding joint, in particular as regards the reduced formation of intermetallic phases in comparison with the usual Au-Al system. They are excellent for bonding with the ball / wedge process when using a reducing protective gas atmosphere. Processing is also possible in the wedge / wedge bonding process. Copper bonding wires are, therefore, both technically and economically an alternative to gold wires. A packaging concept tailor-made for Cu wires ensures that even after storage times of up to six months the wires can be readily processed.

Fine Copper Wires (< 1.3 mil; $< 33 \mu\text{m}$)

Excellent mechanical and electrical properties allow our ultra-fine copper wires to be used in a variety of high-end, fine-pitch devices with higher lead counts and smaller pad sizes.



Copper Wires (1.3 – 4 mil; 33 – 100 μm)

In addition to the significantly lower cost of copper wires, slower intermetallic growth in copper bonds provides superior reliability in high-power and discrete packages.



Copper Bonding Wires

Characteristics

- High conductivity
- High tensile strength with high elongation
- Good loop stability
- Significantly reduced formation of intermetallic phases
- Very good ball formation under protective gas

Areas of application

- Discrete components
- Semiconductor components

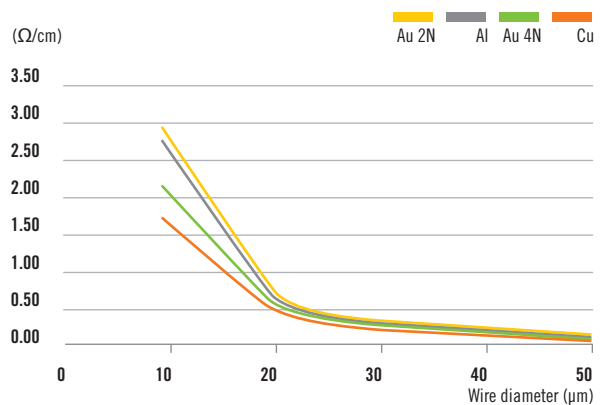
Copper Wire Cost Savings

The relatively low cost of copper is one of the reasons for its appeal as an alternative interconnect material. By replacing gold wires with copper material, thus replacing the precious metal part, significant cost savings are possible. In applications that require increased wire diameters, the usage of copper bears a disproportionately high impact on the saving effect.

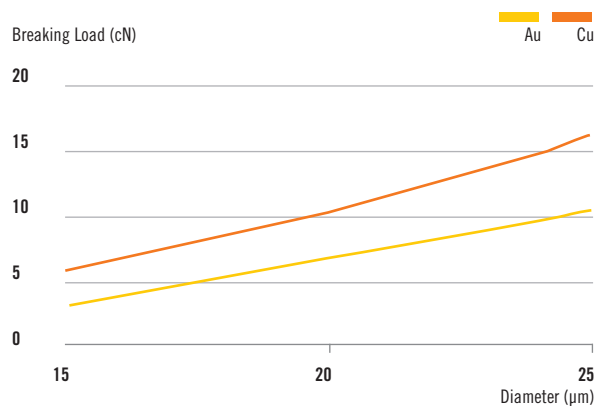
Superior Performance of Copper Wires

Copper exhibits significantly better conductivity than gold or aluminum. Therefore better heat dissipation and increased power ratings are attainable with thinner wire diameters. Copper possesses higher mechanical properties compared to gold. Therefore it displays excellent ball neck strength and high loop stability during molding or encapsulation.

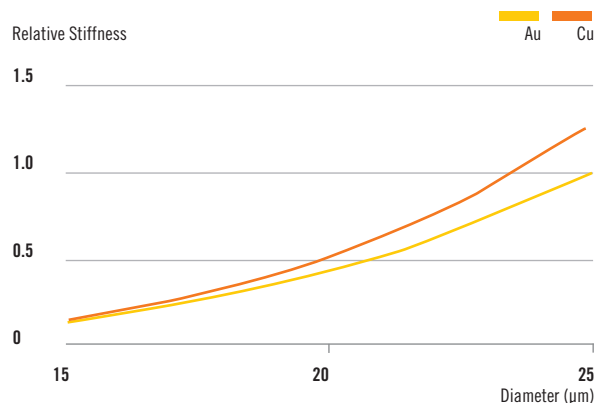
Resistance vs Wire Diameter



Relative Breaking Load by Diameter



Relative Stiffness by Diameter



Copper Wire Typical Dimensions and Standard Mechanical Specifications

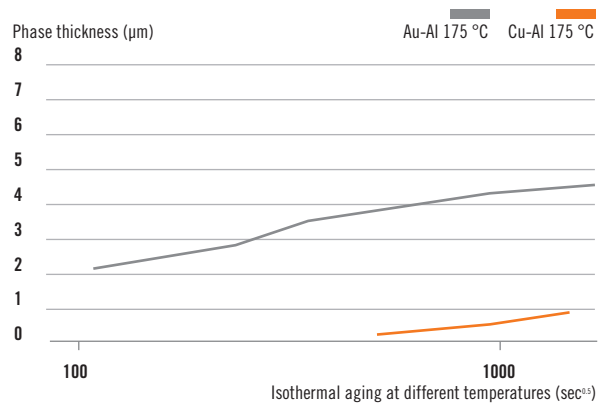
Diameter		Elongation (%)	Breaking Load (cN)
µm	mils		
20	0.8	8 – 16	5 – 10
25	1.0	8 – 16	8 – 15
28	1.1	10 – 20	10 – 20
30	1.2	10 – 20	12 – 22
38	1.5	10 – 20	20 – 30
50	2.0	15 – 25	40 – 55
65	2.5	15 – 25	60 – 80
75	3.0	15 – 30	80 – 120

Slower Intermetallic Growth for Increased Reliability

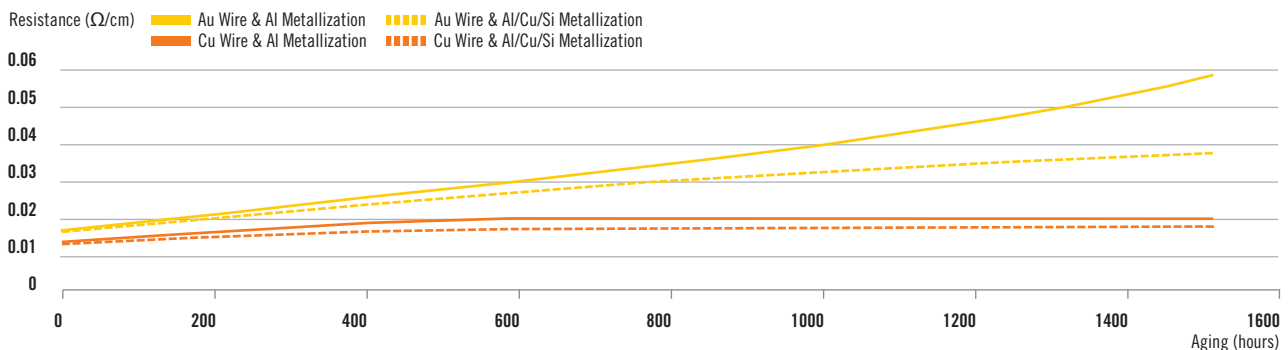
Intermetallic growth in copper bonds is significantly slower than in gold wire bonds. This results in lower electrical resistance, lower heat generation and, ultimately, increased bond reliability and device performance.

The reduced rate of intermetallic growth, lower resistance and lower heat generation in copper wires in comparison with gold wire result in a lower increase in resistance over time and slower aging.

Phase growth comparison Au-Al vs Cu-Al



Effect of Wire Material & Substrate Metallization on Electrical Resistance after aging



Aluminum Bonding Ribbons



Precious and non-precious metal bonding ribbons are used for electrical connections when dimensional accuracy, good heat dissipation and a low apparent resistance (impedance) are required with sufficiently large connector surfaces. Very pure precursor metals (99.999%) and special dopant additions form the basis for ribbons of high precision with good processing qualities. Ribbons display a homogeneous chemical composition, stable mechanical properties and clean, smooth surfaces.

The increasing demands for transmitting high currents in electronic power devices have driven the industry to investigate alternative interconnect solutions. Ultimate reliability and high robustness, together with improvements in produc-

tivity are always considered to be the main objectives of such technical enhancements.

With its aluminum ribbon types for power applications, Heraeus is providing an evolutionary extension to its well proven aluminum thick wire program – pushing the strength of thick wire technology beyond present limits.

Heraeus aluminum ribbons for power electronic applications carry high electrical loads, can replace a significant number of wires, and are a key to cost and space saving in future electronic housing concepts. Heraeus decided to transfer the advantages of its enhanced aluminum materials, already successfully used in today's automotive electronic devices, to the manufacture of aluminum ribbons.

Dimension Table

Al ribbon dimensions	Equivalent numbers of wires (mil)				
	8	10	12	15	20
30 mil x 3 mil	1.8	1.1			
40 mil x 4 mil	3.2	2.0	1.4		
60 mil x 6 mil	7.2	4.6	3.2	2.0	1.1
60 mil x 8 mil	9.5	6.1	4.2	2.7	1.5
80 mil x 8 mil	12.7	8.1	5.7	3.6	2.0
80 mil x 12 mil	19.1	12.2	8.6	5.4	3.0

Please contact us for alternative dimensions.

Al ribbon dimensions	Equivalent numbers of wires (µm)				
	200	250	300	375	500
750 µm x 75 µm	1.8	1.1			
1000 µm x 100 µm	3.2	2.0	1.4		
1500 µm x 150 µm	7.2	4.6	3.2	2.0	1.1
1500 µm x 200 µm	9.5	6.1	4.2	2.7	1.5
2000 µm x 200 µm	12.7	8.1	5.7	3.6	2.0
2000 µm x 300 µm	19.1	12.2	8.6	5.4	3.0

Gold, Silver and Platinum Bonding Ribbons



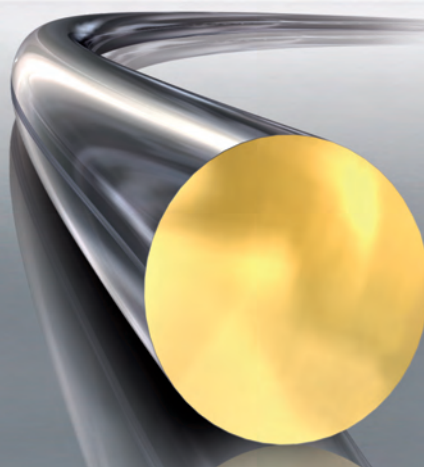
Precious metal bonding ribbons of gold, silver and platinum are used for electrical interconnections in high frequency and microwave devices.

Controlled high purity and defined additives provide the basis for ribbons of high precision in dimensional and mechanical characteristics and looping behavior.

Typical Ribbon Dimensions																										
Nominal	in	max	25	30	35	45	55	65	80	85	95	105	130	135	160	185	220	270	320	370	420	525	625	775	825	1025
µm (mils)	Width	20	25	30	40	50	60	75	80	90	100	120	125	150	175	200	250	300	350	400	500	600	750	800	1000	
max	Thickness	min	15	20	25	35	45	55	70	75	85	95	110	115	140	165	180	230	280	330	380	475	575	725	775	95
7	6	5																								
11	10	9																								
14	13	12																								
	(0.5 mil)																									
16	15	14																								
21	20	19																								
26	25	24																								
	(1 mil)																									
32	30	28																								
42	40	38																								
52	50	48																								
	(2 mil)																									
62	60	58																								
77	75	73																								
	(3 mil)																									
82	80	78																								
103	100	97																								
	(4 mil)																									

Sizes Available

Special Wire Products



Wire Products for Special Applications:

- Aluminum Coated Gold Bonding Wires
- Palladium Bonding Wires
- Low-cost Bonding Wires
- Custom Products

Aluminum Coated Gold Bonding Wires

For special applications in which the reliability of gold is a “must”, and where bonding at room temperature is obligatory, Heraeus offers aluminum coated gold wires. The aluminum coating comes as an extremely thin layer. Aluminum coated bonding wires are a superior solution in order to improve the resistance in cycling tests, e. g. for automotive applications.

Palladium Bonding Wires

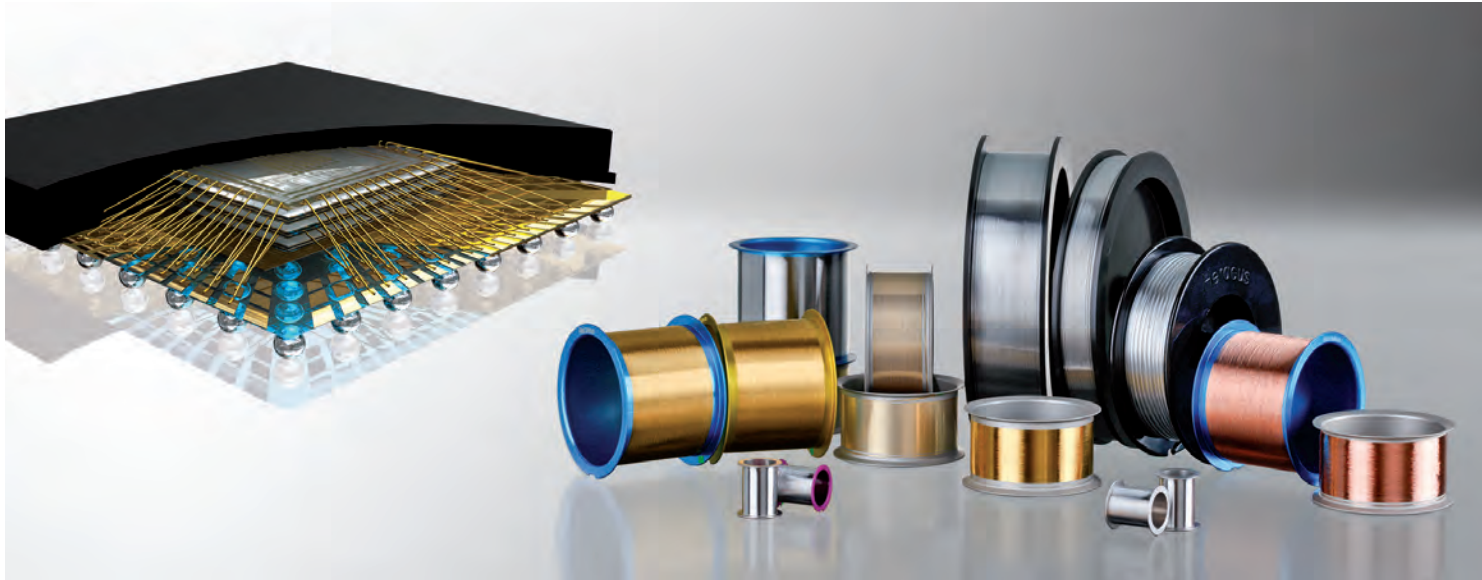
Palladium bonding wires show their advantage in applications at high exposure temperatures, along with requirements for good loop stiffness and hardness. Compared with gold and aluminum bonding wires, palladium bonding wires have considerably higher cold and warm hardness combined with a lower electrical conductivity. Palladium bonding wires made by Heraeus have a homogeneous chemical composition and stable mechanical properties. The use of protective gas in ball bonding improves the ball roundness and constancy of the ball size.

Low-Cost Bonding Wires

The substitution of gold with silver permit cost savings. The resulting properties are different from conventional gold wires and therefore the applicability of these wires is not universal. In certain applications the cost saving potential can be fully exploited. Please discuss with your Heraeus wire expert the viability of such wires for your application.

Custom Products

Heraeus works with customers who need interconnect materials with special chemical, mechanical, or electrical properties. Take advantage of our vast wealth of technical expertise and resources. We can help you develop solutions that precisely meet your specifications.



Visit our website at
www.heraeus-electronics.com

About Heraeus Electronics

Heraeus Electronics is your expert for materials and matched materials solutions for the electronics packaging.

We enable our customers to reach key targets for the development of their innovations:

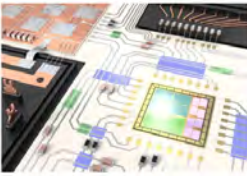
- to shorten their development cycles, lower costs and bring next generation products faster to market
- to market smaller devices and end-products with enhanced functionalities
- to equip their products with electronic devices that provide higher power density and longer lifetime in harsh conditions
- to concentrate on forward integration

Our innovative product portfolio, our application knowhow and our expertise in matching materials are qualifying us to support our customers in a unique way. We do not only have the knowhow to integrate materials in a system, but also have a deep understanding of optimizing materials and material combinations and the possibility to test them under real conditions.

This leads to higher speed, lower costs and – above all – to better devices.

Close to your development centers and factories we have experts located in Asia, USA and Europe in order to grant fast reaction and easy access without language barriers.

Trust and reliability have been the basis of our cooperation for more than 160 years, founded on leading compliance and environmental standards, transparency, and our financial stability.










Heraeus Electronics

HERAEUS

HOME
 About Heraeus Electronics
 Corporate Website
 Technical Challenges
 Products and Solutions
 A+ Center
 Working Sites
 Locations
 Contact Us
 Group Companies
 Thin Film Materials
 Metal Substrates
 Metal Coatings / Electroplating
 Adhesive Systems
 Special Glass and Ceramics
 Wire and Wires
 Contact

Products and Solutions

 Bonding wires
 Adhesives
 Metal materials
 Thin Film Materials
 Metal Substrates
 Metal Coatings
 Adhesive Systems
 Special Glasses and Ceramics
 Wire and Wires

Heraeus Electronics

Heraeus Deutschland GmbH & Co. KG
Heraeusstraße 12-14
63450 Hanau, Germany
www.heraeus-electronics.com

Americas

Phone +1 610 825 6050
electronics.americas@heraeus.com

Asia Pacific

Phone +65 6571 7677
electronics.apac@heraeus.com

China

Phone +86 21 3357 5457
electronics.china@heraeus.com

Europe, Middle East and Africa

Phone +49 6181 35 3069
+49 6181 35 3627
electronics.emea@heraeus.com