

# Wire solutions for the electronics industry

Square and round wire

**bedra**  
intelligent wires

# Quality is a question of precision



## CONTENTS

Alloy diversity	P. 4
Wire geometries	P. 6
Surface refinement	P. 8
Materials / Geometries	P. 10

**bedra**edm



Innovative wire electrodes for all spark erosion applications. From the global market leader, of course.

**bedra**  
intelligent wires



Founded more than 120 years ago, the Berkenhoff GmbH produces innovative high-tech precision wires for electronic components, special applications, spark erosion, welding and brazing technology.

**bedra** is the only manufacturer of precision wire to offer the complete production process from one source: casting, rolling, drawing, annealing and electroplating. More than 30 million kilometres of precision wire in more than 100 alloys are produced annually in two German factories and sold under the umbrella brand **bedra** through representatives and sales companies in more than 50 countries.

The precision and reliability that distinguish Berkenhoff fine wires have made the **bedra** brand a quality and market leader. The high-tech products made of copper, brass, bronze and nickel-silver in the form of coated wires, composite wires and plain wires, are tailored to meet the customer requirements in an optimal way.

As a result of our active participation in joint industry and university research projects, Berkenhoff repeatedly develops product innovations that define the market.

**Welcome to Berkenhoff!**

## **bedra**welding



High-tech wires in several alloys for brazing and welding technology.

## **bedra**electronics



Customised wire solutions for the electronics industry. Competence in materials, shapes and surface coatings.



- Use of the purest metals
- Controlled melting process

# Alloy diversity

**bedra** is a specialist supplier to the processing industry for high quality wire solutions in the electronics and electrical engineering sectors and covers all process steps from melting to surface refinement.

More than 100 alloys, such as tin-bronze, brass and nickel-silver, as well as other special alloys, are produced in its own foundry from the element copper.

With this alloy diversity, it is possible to cover an extensive range of requirements with respect to electrical and mechanical properties. We are able to manufacture small lot sizes upon customer request.

Any deviation from the standard is recognised and corrected by a gapless quality management system. This forms the basis for providing consistent product quality and stable processing.

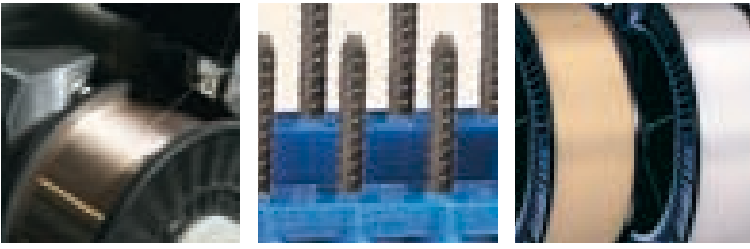
We offer an extensive, high quality product portfolio in order to meet the expectations of automotive, aerospace, telecommunications, information technology, industrial technology and entertainment industries.

1. Own foundry technology
2. Highly conductive and thermosetting alloys
3. Product development

**bedra**  
intelligent wires

## ALLOY DIVERSITY





- Exact layer winding
- Precise knurling

# Wire geometries

**bedra** electronics wires are used worldwide in passive, electro-mechanical and interconnect components. The miniaturisation of the components makes increasingly high demands of materials and processing technologies. Knowledge of materials and processing is the technological edge of **bedra** that makes possible new solutions in the final product for our customers.

**bedra** is a specialist in the manufacture of square, rectangular, octagonal profile, flat and round wire in both plain and knurled versions.

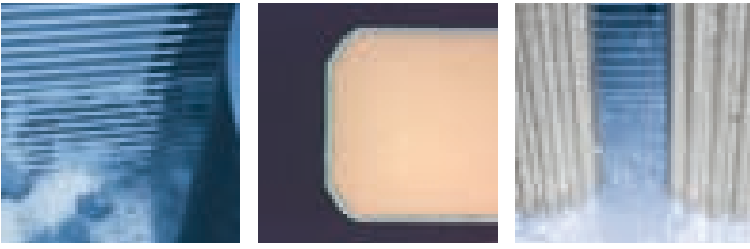
The observance of the most precise tolerances in terms of dimensions, diagonals and edge radius, as well as exact knurling, precision and process stability, support the increased demands for the state of the art processing of the wire.

The fulfilment of optimal straightness requirements and customer-specific product parameters, coupled with exact layer winding, complete the high quality standards of **bedra**.

1. Variety of wire geometries
2. Compliance with the narrowest tolerances
3. Plain and knurled versions

## WIRE GEOMETRIES





- Modern, high performance electrolytes
- Consistent coatings
- Highly pure tin anodes

# Surface refinement

Various galvanic equipment is available for the production of a consistent surface quality for a variety of wire geometries and coating variants. The high quality level of the coatings is ensured through internal inspections in our own laboratory.

The spectrum extends from simple pure tin coatings through variants with nickel or copper barrier layers to multilayer technology. The use of highly pure tin electrolytes ensures the fulfilment of requirements for high brazing temperatures.

The reflow technology used increases the whisker safety of electroplated wires and supports modern processing in the high-tech industry.

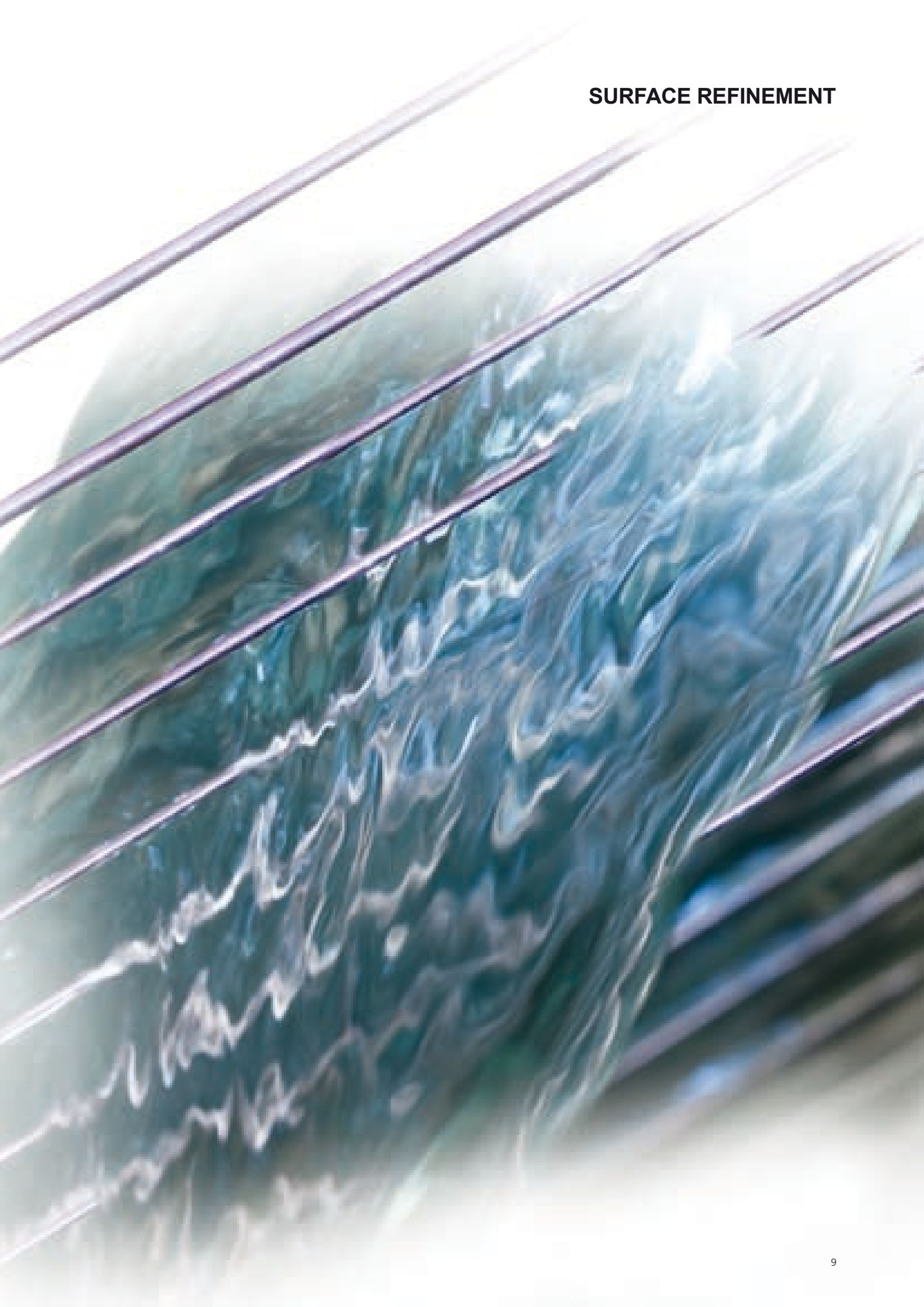
The strict fulfilment of all environmental guidelines and testing for ROHS compliance by certified, external testing institutions completes the production process.

## 1. Electroplating

## 2. Multilayer technology

## 3. Reflow technology

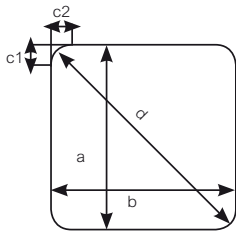
**SURFACE REFINEMENT**



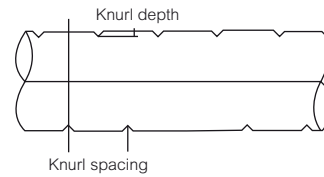
Materials		Standardisation			Physical properties of the materials				
					Electrical conductivity				
	bedra type	EN designation	EN abbreviation	CDA UNS No.	Density kg/dm <sup>3</sup>	Thermal conductivity W/m · K	Coefficient of thermal expansion 10 <sup>-6</sup> /K	S·m/mm <sup>2</sup>	IACS %
Tin-bronze alloys	Bz0.6				8.9	185	17.8	~25	~42
	Bl4	CuSn4	CW 450 K		8.9	90	18.2	12	~20
	Bl5	CuSn5	CW 451 K	C51000	8.8	75	18.5	9.5-10.5	~16-18
	B65	CuSn6	CW 452 K	C51900	8.8	75	18.5	8.0-8.5	~14
	Bl80	CuSn8	CW 453 K	C52100	8.8	67	18.5	7.0-7.5	~12-13
Brass alloys	Ms98				8.9	~300	17.5	~45	~77
	Ms95	CuZn5		C21000	8.9	249	18.0	33.0	~56
	Ms90	CuZn10	CW 501 L	C22000	8.8	184	18.2	~24.0	~41
	Ms85	CuZn15	CW 502 L	C23000	8.8	159	18.5	20.0-22.0	~34-38
	Ms80	CuZn20	CW 503 L	C24000	8.7	142	18.8	17.0-19.0	~29-32
	Ms70	CuZn30	CW 505 L	C26000	8.5	126	19.8	15.5-16.5	~26-28
	Ms64	CuZn36	CW 507 L	C27000	8.4	121	22.2	14.5-15.5	~25-26
Nickel silver alloys	Ns1755	CuNi18Zn27	CW 410 J	C77000	8.7	29	16.7	3.2	~5
	Ns18	CuNi18Zn20	CW 409 J	C76400	8.7	33	17.7	3.3-3.7	~6
Copper materials	E-Cu58	Cu-ETP	CW 004 A	C11000	8.9	394	17.3	58.6	~100
	Cu-OF	Cu-OF	CW 008 A	C10200	8.9	393	17.0	~58	~>99
	CuAg0.1	CuAg0,10 (OF)	CW 019 A	C10700	8.9	380	17.0	54-56	~92-96
Highly conductive alloys	CuAg1				8.9	247	17.0	40-45	~68-77
	CuAg0.5Zn1				8.9	295	17.8	45-47	~77-80
	CuMg0.4				8.9	240	17.6	>36	~>61
	CuMg0.1				8.8	~320	17.5	~47	~81
Special alloys	CuNi3Si	CuNi3Si1	CW 112 C		8.8	59-120	16.0	hardened 16-19	~27-32
	CA725	CuNi9Sn2	CW 351 H	C72500	8.9	48	15.8	6.5	~11
	NIBRODAL116				8.8	33	17.0	hardened 6.2-6.4	~11

# MATERIALS / GEOMETRIES

Surface finishes								
Diffusion barrier layer		Sn100 Matt	Sn100 Bright	Sn100 Reflow	Sn100 Multiple layer	Ag	Au	Ni
	None	•	•	•	•	•		•
	Ni	•	•	•	•		•	
	Cu	•	•	•	•			



Standard parameters:  
dimensions, diagonals, edge radius, knurling



Square wires	Dimensional ranges	Minimum tolerance	Edge radius	Knurling
	0.300 to 1.500 mm	+/- 0.005 mm	Min. of 0.03 mm, increasing dependent upon the cross-section	Standard Knurl spacing: 0.3 and 0.5 mm More upon request Max. knurl depth of 0.06 mm at spacing of 0.3 mm Max. knurl depth of 0.08 mm at spacing of 0.5 mm
Coating	All dimensions			
Reflow	All dimensions			
Flat wires	Dimensional ranges	Minimum tolerance	Edge radius	Knurling
	Height 0.050 – 0.800 mm Special dimensions up to 2.45 mm Width 0.300 – 4.000 mm	Height +/- 0.002 mm Width +/- 0.010 mm	Min. 0.03 mm Increasing dependent upon cross-section	Standard Knurl spacing: 0.3 and 0.5 mm More upon request Max. knurl depth of 0.06 mm at spacing of 0.3 mm Max. knurl depth of 0.08 mm at spacing of 0.5 mm
Coatings	Min. height of 0.300 mm Width 0.400 mm Max. height of 2.450 mm Width 4.000 mm			
Reflow	Min. height of 0.300 mm Width 0.400 mm Max. height of 0.800 mm Width 3.000 mm			
Round wires	Dimensional ranges	Minimum tolerance		Knurling
	0.400 – 3.000 mm	+/- 0.005 mm		Standard Knurl spacing 0.3/0.5/0.6 and 0.8 mm More upon request Max. knurl depth of 0.06 mm at spacing of 0.3 mm Max. knurl depth of 0.08 mm at spacing of 0.5 mm Knurl depth at spacing of 0.6 and 0.8 mm Max. 0.10 mm
Coating	All dimensions			
Reflow	Max. 2.000 mm			

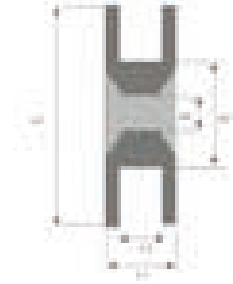
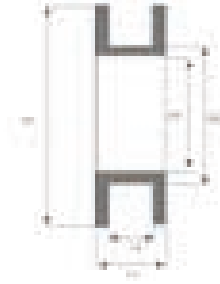
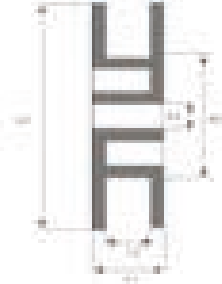
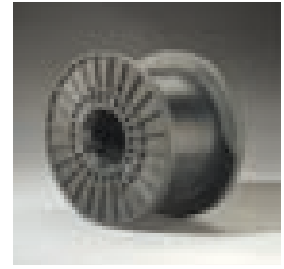


Fig. 1

Fig. 2

Fig. 3

Fig. 4

### Coil types

Type	Max. filling weight [kg]	Figure	d1	d2	d3	d4	L1	L2
K 100	2	1	100	63	16	24	100	80
K 125	3,5	1	125	80	16	24	125	100
K 160	8	1	160	100	22	34	160	128
K 200	16	1	200	125	22	34	200	160
K 250	22	1	250	160	22	34	200	160
K 355	50	1	355	224	36	60	200	160
SD 300 K	16	2	300	212	51,5	-	103	91
SH 370 K	15	3	370	311	305	-	80	70
SH 390 K	20	3	390	310	305	-	89	79
DWF 500/127-350	150	4	500	315	127	136	350	280
VM 630/127x150PS	80	4	630	500	127	-	150	100
VM 710/127-190	120	4	710	500	127	-	190	120
VM 400/127-186	45	4	400	320	127	-	185	150
VM 400/90-186	45	4	400	320	90	-	185	150
VM 400/90-100	20	4	400	320	90	-	100	65

Berkenhoff GmbH  
 An der Landstraße  
 D-35745 Herborn  
[www.bedra.com](http://www.bedra.com)

Tel. +49 (0) 27 72 - 5002 0  
 Fax +49 (0) 27 72 - 5002 550  
 E-Mail: [info@bedra.com](mailto:info@bedra.com)

**bedra**  
 intelligent wires