



 Alleima

EXERA® fine medical wire,  
wire-based components and  
micro-tubes for medical applications

Begin a  
life-changing  
partnership

# Innovation and inspiration to advance your designs

Ready to make a life-changing difference? Choose Exera® medical wire, wire-based components or micro-tubes for your application and let decades of expertise and innovation take your design to the next level.

Alleima develops, manufactures and refines fine medical wire specifically for medical devices. See the trademark Exera® and you can be sure of ultra-high quality across the entire value chain.

## From idea to implementation

Creativity is key to your design. As an integral part of your research and development journey, we can help you imagine and implement innovative solutions to solve tomorrow's medical needs.

Agility matters, too. Our deliberately lean initiatives increase quality and decrease variability throughout the design process. And through a responsive, comprehensive design partnership with you, together we can conceive – and expertly create – utterly unique processes and products.

## Meltshop to medical



Advances. Adaptations. At Alleima they happen fast. And as we have strict control over our entire supply chain, that agility comes hand-in-hand with quality.

## Diamond precision



What makes Exera® fine medical wire products ultra-high quality? The answer starts with the diamond dies. Each one crafted with painstaking attention to detail.

## Value at every step

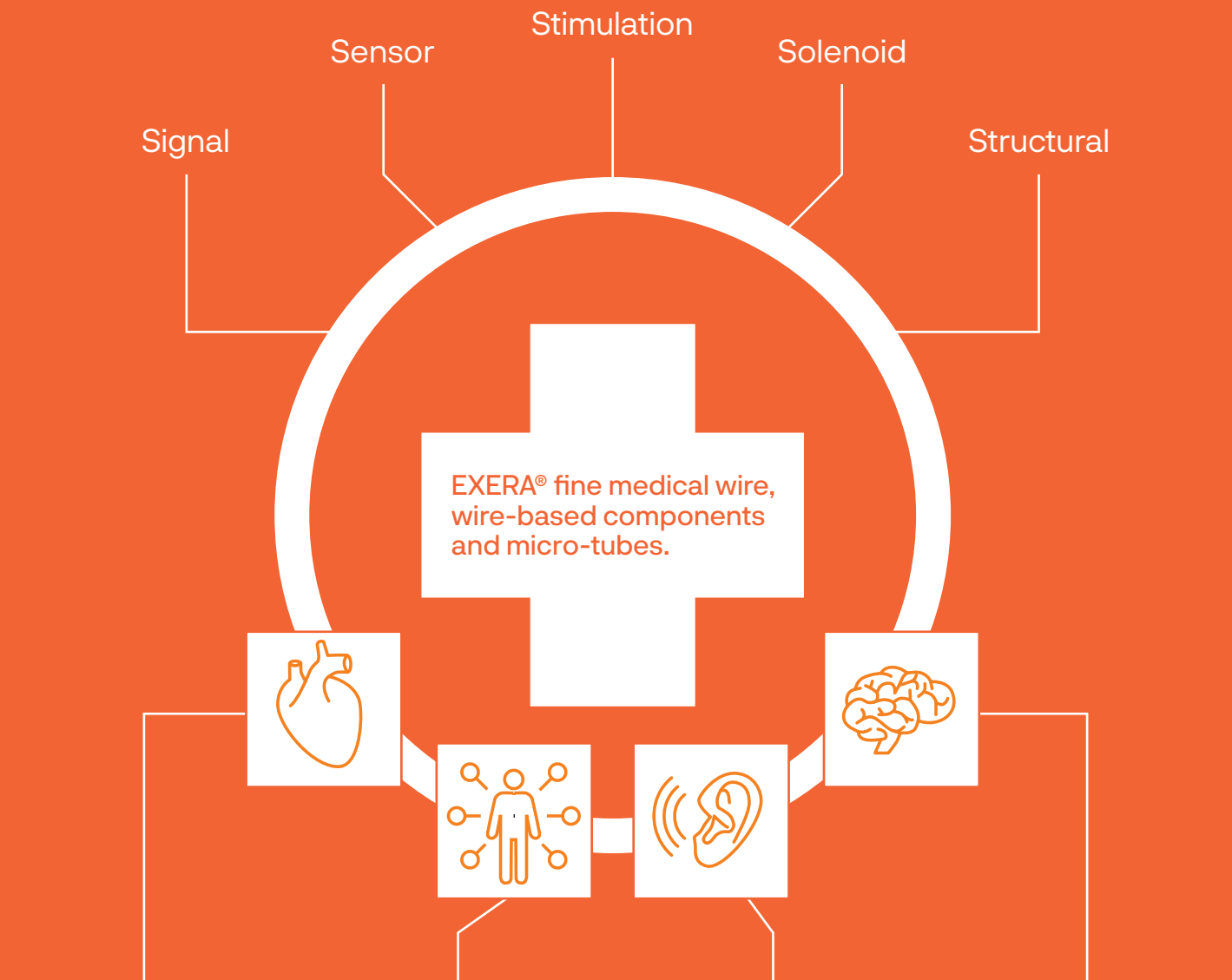


You will notice the same ultra-high standards in our products as in our support. At every step of your design and manufacturing process, we add value. From precision tolerance coating to multi-filar micro cables, our impact doesn't stop with supply. That's just the start.

Examine the medical solutions of the future and you will find Exera® fine medical wire in many of them. Thanks to its unique properties, we are already in close partnership with OEMs and universities, enhancing tomorrow's product development. Bring your vision to us and let's explore the possibilities together.

# Quality of life. Where will you improve it?

Just some of the areas  
we're already adding value



#### Vascular Therapy

Wire for heart solutions, including guide wires, catheter applications and pacing leads.

#### Solutions for information gathering

Typical sensing solutions are used in thermal, pressure or glucose monitors for remote monitoring.

#### Cochlear remediation

Solutions for middle ear implants for sensorineural hearing loss.

#### Stimulation therapy

Wire for deep brain, spine, and other stimulation applications.

# Progressive resources for tomorrow's medical needs

The extensive Exera® medical wire range serves even the most demanding medical challenges. Stainless steels. Precious metals. Biocompatible alloys, such as cobalt-chromium (CoCr) alloys. Over 200 different alloys as standard, as well as custom-made alloys, created on request. To discover our entire material portfolio, visit [www.alleima.com/exera](http://www.alleima.com/exera) or talk to your Alleima contact.

Some of the most commonly used medical application alloys

## Primary Alloys

### Medical grade/stainless steels

MP35N™  
MP35N™ Composite Wire  
304V  
316LV  
Exera® 11R51 / 11R51HV (EN 1.4310)  
Exera® 12R10 / 12R10HV (EN 1.4310)  
Exera® 1RK91 (ASTM A693, F899)

### Exera® precious metals

Gold  
Silver  
Platinum  
Platinum Iridium  
Platinum Tungsten  
Gold Plated Copper  
Platinum Clad Tantalum

### Exera® alloys

Constantan  
Copper

## Kanthal® Resistance Alloys

Nikrothal® 80 80%Ni/20%Cr  
Nikrothal® 60 60%Ni/16%/balance iron  
Nikrothal® 40 35%Ni/20%/2% silicone balance iron  
Nikrothal® LX 20%Cr/75%Ni

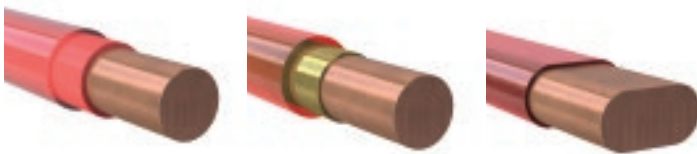
Kanthal® A-1 22%Cr/5,8%Al/balance iron  
Kanthal® AE 22%Cr/5,3%Al/balance iron  
Kanthal® AF 22%Cr/5,3%Al/balance iron  
Kanthal® D 22%Cr/4,8%Al/balance iron  
Alkrothal™ 15%Cr/4,3%Al/balance iron  
Cuprothal® 49 44%Ni balance copper  
Cuprothal® 30 23%Ni balance copper  
Cuprothal® 15 11%Ni balance copper  
Cuprothal® 10 6%Ni balance copper  
Cuprothal® 5 2.2%Ni balance copper  
Nifethal™ 70 30%Ni/balance iron  
Nifethal™ 36 36%Ni/balance iron



# Exera® custom wire for unique applications

## Single Wire Configurations

All alloys can be provided in single strand form, with or without coating, and plated with custom thicknesses of gold or nickel.



Multilayer including Bond Coating

Electroplated and Polymer Finish

Coated Ribbon Wire



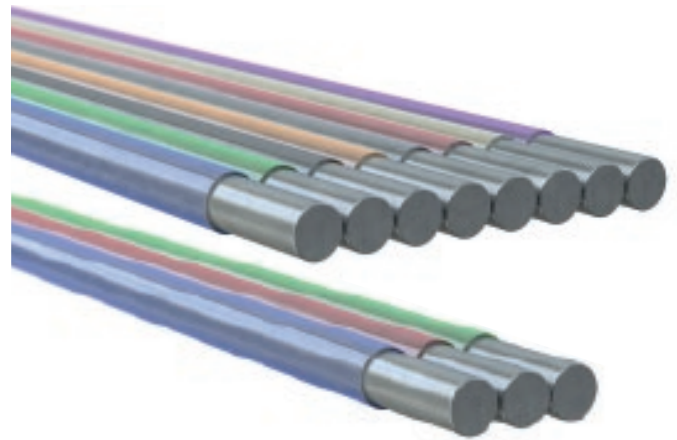
Multilayer including Bond Coating. Round, Flat, Square Wire Configurations.



Pure PTFE Coating

## Multi-Filar Arrangements

Single strand wire configurations can also be formed into multi-filar or microcable arrangements.



Multi-Filar Configurations

## Cable Configurations

Single strand and multi-filar cables can then be manipulated into different cable configurations. Coatings, such as PTFE or polymer can be applied to any cable arrangement.



Stranded Coated Wire

Stranded Coated Wire With Overcoat Finish

Stranded Bare Wire



Coated Finished Cable



Twisted Multi-Filar Cables

## Coils

A vital part of our service is value-added coiling. Take, for example, lead finishing, where wire is both stripped and formed.



Multi-Filar Coils



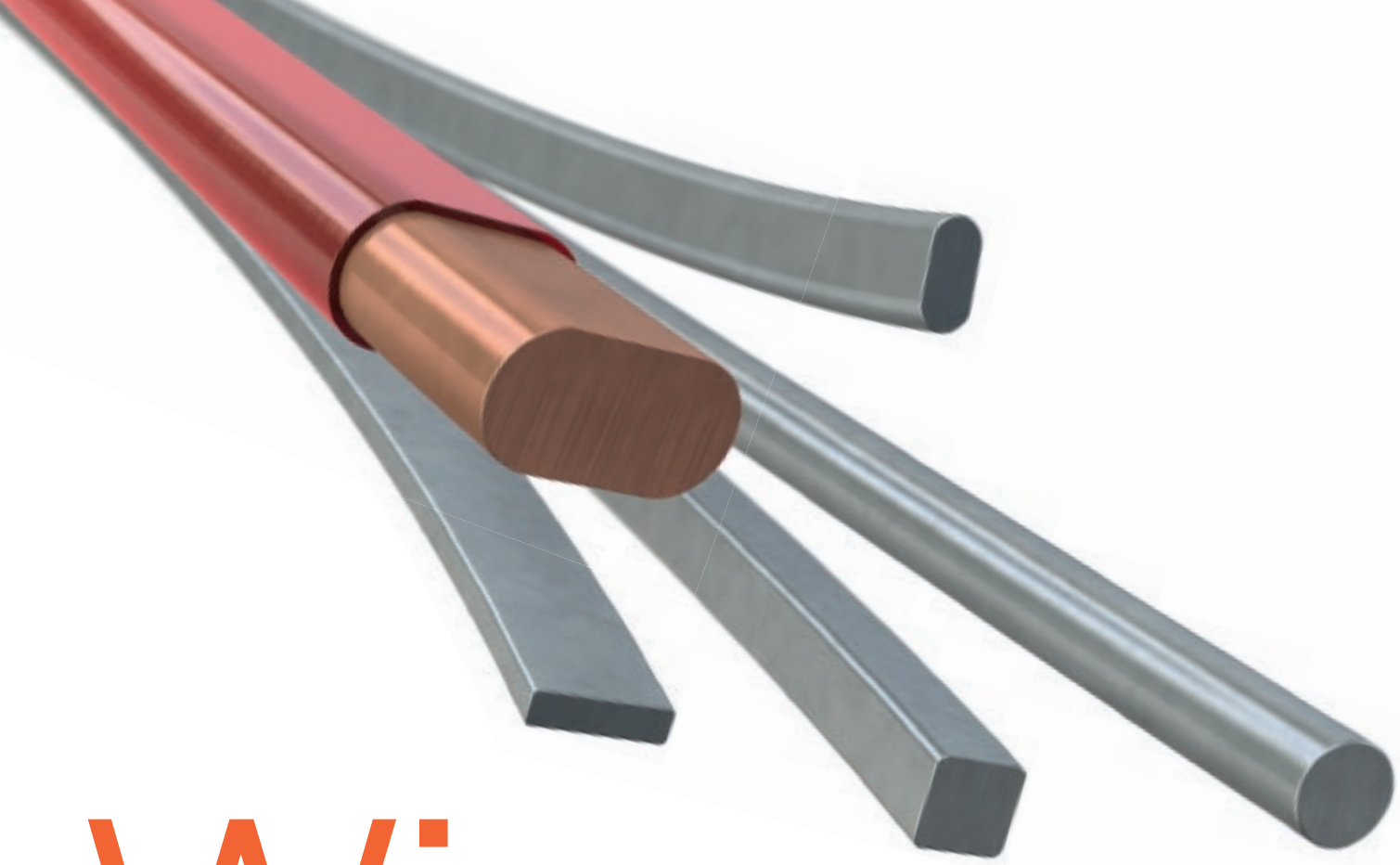
Single Strand Coils



PTFE Coils



Free-Standing Coils



# Wire forms

## Round, flat, square and rectangular wire

Round wire		Sizes		Tolerance	
		inch	mm	inch	mm
Bright Coated Plated	Wire	0.0002 to 0.040	0.100 to 1.0	±0.00005	±0.00127
	Fine wire	0.0004 to 0.004	0.010 to 0.100	±0.000025	±0.000635

Flat wire		Thickness		Tolerance	
		inch	mm	inch	mm
Bright Coated Plated	Square and rectangular, brite or coated, supplied on spools	0.00075 to 0.20	0.019 to 0.510	±0.00005	±0.00127
		0.002 to 0.120	0.051 to 3.05	±0.0005	±0.00127



Electroplating or anodizing are other type of surface treatments that allow us to support our customers in making cutting edge medical products.



#### Electroplating and electro polishing

With our extensive offering of reel-to-reel electroplating, we can apply one or several metallic coatings on wires to improve characteristics such as electrical properties, acid resistance, or even aesthetic appearance. And with our ability to electroplate micro components, we can make state of the art metallic coatings on very small parts. Available electroplating treatments are silver, rhodium, palladium, copper, gold, fine gold, tin, and nickel. The typical deposit thickness range is 5 to 50 micro-in (0.13 to 1.3 microns).



#### Anodizing

Alleima also offers a reel-to-reel electrolytic passivation process for aluminium alloys to increase the natural oxidation layer for enhanced dielectric behaviour. The anodized layer provides the benefit of hardening the surface for better abrasive wear, when necessary for the application. The typical thickness of the anodized layer is 0.0002 to 0.0004" (0.005 to 0.010 mm). The anodization process can be applied to round wire as well as ribbon wire.

We also offer coloured anodization from titanium oxide, which is homogeneously applied all over the piece. Our finishing allows production of several tones and perfect repeatability. Approximately 30 colours are available.

For more information please visit our website [www.alleima.com/exera](http://www.alleima.com/exera).

# Electroplating and anodizing



# Coating.

The key to end-performance success.

The right coating for medical-grade wire can make or break product design. Identifying the best coating is a balancing act of engineering and chemistry, testing even the most experienced design team. And while off-the-shelf solutions exist, they rarely consider downstream impacts, product performance, manufacturability and real costs.

But choose Alleima and you'll be working with coating experts. Our experts are busy developing, testing and manufacturing coatings and surface modifications specifically for cutting-edge medical products and unique functional devices. Day in. Day out.

## PTFE Coating

We offer PTFE coating capabilities. PTFE coating can be applied to any medical grade in the size range 0.001–0.03 in (0.025–0.76 mm). Alleima provides PTFE-coated wire with coating thickness from 0.0001 to 0.0010 in (0.0025–0.025 mm). Clear, Green and Blue finishes are standard. Other colors can be offered on request.

## EXERA® Coating materials

### Coatings for use as permanent and temporary implant

Polyurethanes  
Polyesterimide  
PTFE  
FEP  
Nylon (top coat)  
Polyamide-imide  
Polyesters  
Polyimide  
LARC SI Polyimide

## EXERA® Thermal bondcoats

### Thermoplastic coatings for bonding wires together as multi-filar or free standing coils

Thermoplastic Polyvinyl Butyral  
Thermoplastic Epoxy  
Thermoplastic Polyamide  
Thermoplastic Polyamide-imide



Our long experience in the production of wires allows us an upstanding fine tube manufacturing. In addition to various stainless steels, which are principally used in medical applications, we can process other materials, such as tubes of precious metal alloys likes gold and platinum and non-ferrous metals such as brass, nickel, nickel silver, copper, and copper alloys.

# Fine Tubes

**Fine Tubes sizes**



High-quality precision tubes can be seamless or welded. We supply both versions with an accuracy of up to +/-0.001 mm, straightened in defined lengths or in coils. We follow international standards and customer requirements.

<b>Diameter outer</b>	0.00984" – 0.157"	0.25 – 4 mm
<b>Diameter inner</b>	0.00197" – 0.114"	0.05 – 2.9 mm
<b>Wall thickness</b>	0.00157" – 0.04"	0.04 – 1.0 mm

**Plastic Insulation**



For probes or catheters, it is often important that they are coated with plastics. We can apply different types of insulation or biocompatible materials on the fine tubes. With our multi-layer coating process, a 100% coverage is guaranteed. Pinholes can't emerge with this technology.

Type of Insolation	Temp.	*	Adhesive varnish	
Polyurethan V130*	130C°	L	Polyvinilbutyral	100C° L
Polyurethan V155*	155C°	L	Polyamid	180C° L
Polyesterimid W180*	180C°		* available in various colours, L = solderable	
Polyesterimid W200	200C°			
Polyimid C300	300C°			
Silicon	200C°			

**Electroplating**



**Metals: Gold, Nickel, Platinum, Silver, Tungsten etc**  
 We can apply the same metallic coatings as on the wires. Again, we have the possibility to achieve acid resistance, biocompatibility, or to affect the electrical properties of the tubes. We can electroplate continuous tubes and wires (reel to reel). Our electroplating capabilities are highly efficient and can guarantee coatings to be homogeneous, without porosity (pinholes) or cracks.

**Multi-Lumen Tubes**



**Metals: Gold, Nickel, Platinum, Silver, Tungsten etc**  
 Some applications require that the tube has two or even three different chambers. For this exceptional part, we have developed a special process, that allows us to meet the high requirements of such a product. If desired, the inner conductor can be installed solid or loose in the tube. With the combination of our electroplating and polymeric coating, Alleima has an excellent starting position to realize very complex and sophisticated products. If desired, the inner conductor can be installed solid or loose in the pipe.

**Pipe material**

**Stainless steels**

1.4301/AISI304, 1.4306/AISI304L, 1.4404/AISI316L, 1.4435/AISI316LS, 1.4571/AISI316Ti



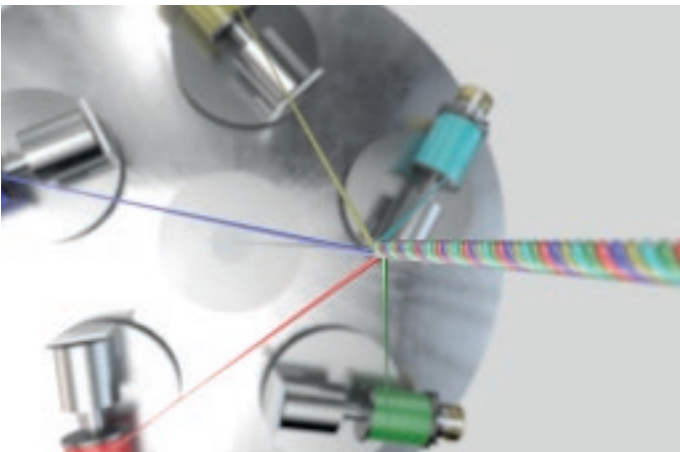
# Challenge yourself. Challenge Exera<sup>®</sup>.

Our manufacturing portfolio is already uniquely diverse. But why stop there? All our partners are invited to collaborate directly with our engineers to modify, manipulate and imagine new capabilities together. Endless opportunities for process, product and possibilities.

### Stranding

The strands are formed by twisting and wrapping together multiple single ended wires or previously joined multifilar wires or cables to form a stranded instead of multifilar entity. The individual single strands that comprise the multifilar cable can be bare or individually coated prior to cabling. The overall stranded cable can also be overcoated with a polymer or PTFE after the cabling operation.

The range for single ended cable diameter is 0.0007 to 0.010 inches (0.018 mm to 0.25 mm).



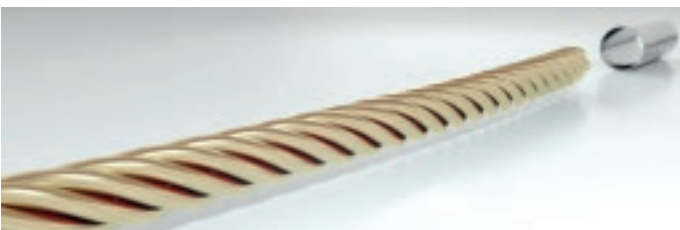
### Lead finishing

We offer stripping and forming of wire ends.



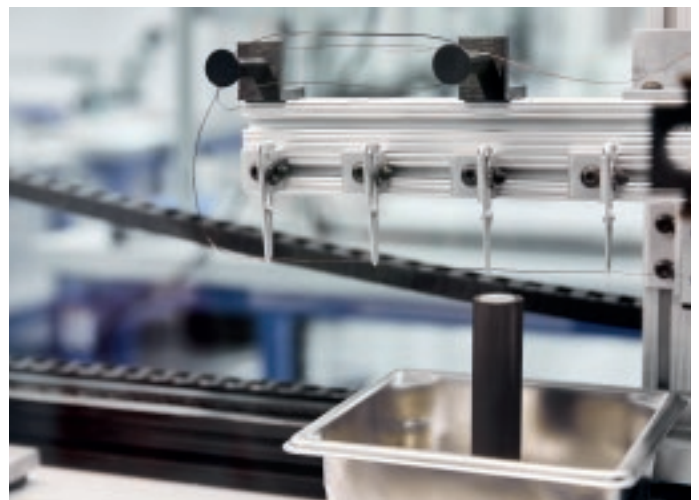
### Mechanical assembly

We support you by assembling single strands and cables according to your requirements. We can also make assemblies in our Class 7 clean room.



### Automating processes

Based on your needs, we can develop and automate your manufacturing process. For example, we offer cut to length, straightening, and packaging services, to mention a few.

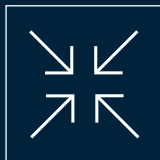


# Realize your ideas faster

Experience and expertise unlock new efficiencies. Like being able to make value-adding suggestions without having to re-start the prototyping stage. Or finding recommendations so innovative they're not even on a customer's radar. Yet. From initial design to refining and validating the final product, your entire Alleima team is committed to optimized development that gets your devices to market. Fast.

An overview of services and value-added operations

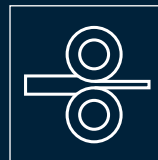
## Wire and Tube refinement



**Reduction**  
Drawing



**Alloy composition**  
Uniform, cored or multi-lumen



**Wire**  
Round and Rectangular

**Tube**  
Seamless or Welded



**Wire**  
Size: 0.0002"–0.040" / 0.100 mm–1.0 mm  
Tolerance up to: 0.00005 in / 0.00127 mm

**Tube**  
Diameter outer: 0.00984"–0.157" / 0.25–4 mm  
Diameter inner: 0.00197"–0.114" / 0.05–2.9 mm  
Wall thickness: 0.00157"–0.04" / 0.04–1.0 mm

## Surface treatment



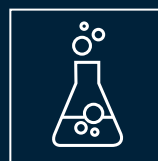
**Coatings**  
Insulation coatings  
Bondable coatings  
ETFE coatings



**Electroplating**  
Reel to reel  
Silver, rhodium, palladium, copper, gold, fine gold, tin, nickel

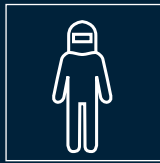


**Anodizing**  
Reel to reel  
Aluminum and titanium oxide

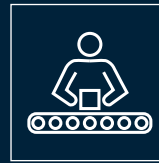


**Electropolishing**  
Premium Surface Finishes

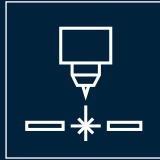
## Value added operations



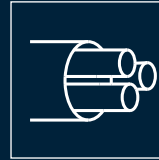
**Special handling**  
Clean Room Processing



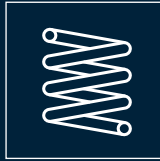
**Mechanical assembly**  
Single Strand and Cable



**Cut to length**  
Single Strand and Cable



**Lead finishing**  
Stripping and Forming



**Coiling**  
Freestanding and Helicoil



**Twisting and stranding**  
Custom Cable Solutions



**Packaging**  
Spools and Bobbins



**Straightening**  
Mechanical or Thermal Treatment

## Operational services



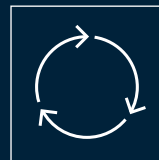
**Research and development**  
Custom Process/  
Product Development



**Lab testing**  
Unique Procedural Competance



**Inventory management**  
Safety Stock Programs



**Lean process optimization**  
Kanban Applications



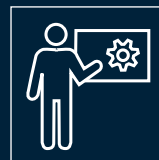
**Metallurgy consulting**  
Materials Selection Assistance



**Rapid prototyping**  
Custom wire and wire-component solutions  
Micro-tube solutions



**New product development**  
Custom process development  
in accordance with customers  
specifications



**Technical training**  
3D Design, 3D Visualization and Printing

## Samples



**Sample package**  
Round and Rectangular



**Developer kit**  
Round and Rectangular



Left to right:  
Brain Aneurysm Device. Neurostimulation. Heart Valve Failure monitor. Catheter coil wire – FFR.





Sacral Nerve stimulation. Deep Brain Stimulation.

# NEMA MW 1000: Dimensional standards

## Insulated round magnet wire

AWG	Bare wire diameter (inches)			Single build insulation			Heavy build insulation			Triple build insulation		
	Minimum	Nominal	Maximum	Min. Increase in Diameter	Nominal Thickness	Maximum Thickness	Min. Increase in Diameter	Nominal Thickness	Maximum Thickness	Min. Increase in Diameter	Nominal Thickness	Maximum Thickness
21	0.0282	0.0285	0.0288	0.0011	0.0298	0.0303	0.0022	0.0309	0.0314	0.0033	0.0321	0.0326
22	0.0250	0.0253	0.0256	0.0011	0.0266	0.0270	0.0021	0.0276	0.0281	0.0032	0.0288	0.0293
23	0.0224	0.0226	0.0228	0.0010	0.0239	0.0243	0.0020	0.0249	0.0253	0.0030	0.0259	0.0264
24	0.0199	0.0201	0.0203	0.0010	0.0213	0.0217	0.0019	0.0223	0.0227	0.0029	0.0233	0.0238
25	0.0177	0.0179	0.0181	0.0009	0.0190	0.0194	0.0018	0.0199	0.0203	0.0027	0.0209	0.0214
26	0.0157	0.0159	0.0161	0.0009	0.0170	0.0173	0.0017	0.0178	0.0182	0.0026	0.0188	0.0193
27	0.0141	0.0142	0.0143	0.0008	0.0153	0.0156	0.0016	0.0161	0.0164	0.0024	0.0169	0.0173
28	0.0125	0.0126	0.0127	0.0008	0.0137	0.0140	0.0016	0.0144	0.0147	0.0023	0.0152	0.0156
29	0.0112	0.0113	0.0114	0.0007	0.0123	0.0126	0.0015	0.0130	0.0133	0.0022	0.0138	0.0142
30	0.0099	0.0100	0.0101	0.0007	0.0109	0.0112	0.0014	0.0116	0.0119	0.0021	0.0124	0.0128
31	0.0088	0.0089	0.0090	0.0006	0.0097	0.0100	0.0013	0.0105	0.0108	0.0017	0.0110	0.0114
32	0.0079	0.0080	0.0081	0.0006	0.0088	0.0091	0.0012	0.0095	0.0098	0.0016	0.0099	0.0103
33	0.0070	0.0071	0.0072	0.0005	0.0078	0.0081	0.0011	0.0085	0.0088	0.0014	0.0088	0.0092
34	0.0062	0.0063	0.0064	0.0005	0.0070	0.0072	0.0010	0.0075	0.0078	0.0013	0.0079	0.0082
35	0.0055	0.0056	0.0057	0.0004	0.0062	0.0064	0.0009	0.0067	0.0070	0.0012	0.0071	0.0074
36	0.0049	0.0050	0.0051	0.0004	0.0056	0.0058	0.0008	0.0060	0.0063	0.0011	0.0064	0.0067
37	0.0044	0.0045	0.0046	0.0003	0.0050	0.0052	0.0008	0.0055	0.0057	0.0010	0.0057	0.0060
38	0.0039	0.0040	0.0041	0.0003	0.0045	0.0047	0.0007	0.0049	0.0051	0.0009	0.0051	0.0054
39	0.0034	0.0035	0.0036	0.0002	0.0039	0.0041	0.0006	0.0043	0.0045	0.0008	0.0045	0.0048
40	0.0030	0.0031	0.0032	0.0002	0.0035	0.0037	0.0006	0.0038	0.0040	0.0008	0.0041	0.0043
41	0.0027	0.0028	0.0029	0.0002	0.0031	0.0033	0.0005	0.0034	0.0036	0.0007	0.0037	0.0039
42	0.0024	0.0025	0.0026	0.0002	0.0028	0.0030	0.0004	0.0030	0.0032	0.0007	0.0033	0.0035
43	0.0021	0.0022	0.0023	0.0002	0.0025	0.0026	0.0004	0.0027	0.0029	0.0006	0.0030	0.0032
44	0.0019	0.0020	0.0021	0.0001	0.0022	0.0024	0.0004	0.0025	0.0027	0.0006	0.0027	0.0029
45	0.00169	0.00176	0.0018	0.00010	0.0019	0.00205	0.00030	0.00215	0.00230			
46	0.00151	0.00157	0.0016	0.00010	0.0017	0.00185	0.00030	0.00196	0.00210			
47	0.00135	0.00140	0.0015	0.00010	0.0016	0.00170	0.00030	0.00178	0.00190			
48	0.00119	0.00124	0.0013	0.00010	0.0014	0.00150	0.00020	0.00155	0.00170			
49	0.00107	0.00111	0.0012	0.00010	0.0012	0.00130	0.00020	0.00139	0.00150			
50	0.00095	0.00099	0.00103	0.00010	0.0011	0.00120	0.00020	0.00128	0.00140			
51	0.00085	0.00088	0.00092	0.00010	0.0010	0.00110	0.00020	0.00117	0.00129			
52	0.00075	0.00078	0.00081	0.00010	0.0009	0.00100	0.00020	0.00105	0.00115			
53	0.00067	0.00070	0.00073	0.00005	0.0008	0.00085	0.00013	0.00092	0.00103			
54	0.00060	0.00062	0.00065	0.00005	0.0007	0.00075	0.00013	0.00084	0.00095			
55	0.00053	0.00055	0.00057	0.00005	0.0006	0.00070	0.00013	0.00077	0.00087			
56	0.00047	0.00049	0.00051	0.00005	0.0006	0.00065	0.00013	0.00071	0.00081			
57	0.00042	0.00044	0.00046	0.00004	0.0005	0.00056						
58	0.00038	0.00039	0.00041	0.00004	0.0005	0.00051						
59	0,00034	0,00035	0,00036									
60	0,00030	0,00031	0,00032									
61	0,00027	0,00028	0,00029									
62	0,00024	0,00025	0,00026									
63	0,00021	0,00022	0,00023									

Sizes finer than 44 AWG based on the theoretical resistance (10.371 Ohms-Circular Mil/foot) of a copper conductor.

The nominal coated wire thickness is based on the average of the minimum coating thickness increase on a minimum bare wire diameter and the maximum coated wire thickness.

### Single build self-bonding wire

AWG	Bare Wire nominal diameter		Maximum increase in diameter insulation		Minimum increase in diameter thermoplastic		Maximum overall diameter	
	Inches	mm	Inches	mm	Inches	mm	Inches	mm
21	0.02850	0.7240	0.0011	0.0280	0.00050	0.0130	0.03140	0.7980
22	0.02530	0.6430	0.0011	0.0280	0.00050	0.0130	0.02810	0.7140
23	0.02260	0.5740	0.0010	0.0250	0.00050	0.0130	0.02530	0.6430
24	0.02010	0.5110	0.0010	0.0250	0.00050	0.0130	0.02270	0.5770
25	0.01790	0.4550	0.0009	0.0230	0.00050	0.0130	0.02030	0.5160
26	0.01590	0.4040	0.0009	0.0230	0.00050	0.0130	0.01820	0.4620
27	0.01420	0.3610	0.0008	0.0200	0.00050	0.0130	0.01640	0.4170
28	0.01260	0.3200	0.0008	0.0200	0.00050	0.0130	0.01470	0.3730
29	0.01130	0.2870	0.0007	0.0180	0.00040	0.0100	0.01330	0.3380
30	0.01000	0.2540	0.0007	0.0180	0.00040	0.0100	0.01190	0.3020
31	0.00890	0.2260	0.0006	0.0150	0.00040	0.0100	0.01080	0.2740
32	0.00800	0.2030	0.0006	0.0150	0.00040	0.0100	0.00980	0.2490
33	0.00710	0.1800	0.0005	0.0130	0.00040	0.0100	0.00880	0.2240
34	0.00630	0.1600	0.0005	0.0130	0.00030	0.0080	0.00780	0.1980
35	0.00560	0.1420	0.0004	0.0100	0.00030	0.0080	0.00700	0.1780
36	0.00500	0.1270	0.0004	0.0100	0.00030	0.0080	0.00630	0.1600
37	0.00450	0.1140	0.0003	0.0080	0.00030	0.0080	0.00570	0.1450
38	0.00400	0.1020	0.0003	0.0080	0.00020	0.0050	0.00510	0.1300
39	0.00350	0.0890	0.0002	0.0050	0.00020	0.0050	0.00450	0.1140
40	0.00310	0.0790	0.0002	0.0050	0.00020	0.0050	0.00400	0.1020
41	0.00280	0.0710	0.0002	0.0050	0.00020	0.0050	0.00360	0.0910
42	0.00250	0.0640	0.0002	0.0050	0.00020	0.0050	0.00320	0.0810
43	0.00220	0.0560	0.0002	0.0050	0.00010	0.0025	0.00290	0.0740
44	0.00200	0.0510	0.0001	0.0025	0.00010	0.0025	0.00270	0.0690
45	0.00176	0.0447	0.0001	0.0025	0.00010	0.0025	0.00230	0.0584
46	0.00157	0.0399	0.0001	0.0025	0.00010	0.0025	0.00210	0.0533
47	0.00140	0.0356	0.0001	0.0025	0.00010	0.0025	0.00190	0.0483
48	0.00124	0.0315	0.0001	0.0025	0.00010	0.0025	0.00170	0.0432
49	0.00111	0.0282	0.0001	0.0025	0.00010	0.0025	0.00150	0.0381
50	0.00099	0.0251	0.0001	0.0025	0.00010	0.0025	0.00140	0.0356
51	0.00088	0.0224	0.0001	0.0025	0.00010	0.0025	0.00130	0.0330
52	0.00078	0.0198	0.0001	0.0025	0.00005	0.0013	0.00115	0.0292
53	0.00070	0.0178	0.0001	0.0025	0.00005	0.0013	0.00107	0.0271
54	0.00060	0.0152	0.0001	0.0025	0.00005	0.0013	0.000995	0.0253
55	0.00050	0.0127	0.0001	0.0025	0.00005	0.0013	0.000985	0.0250
56	0.00040	0.0102	0.0001	0.0025	0.00005	0.0013	0.000975	0.0248

Sizes finer than 44 AWG based on the theoretical resistance (10.371 Ohms-Circular Mil/foot) of a copper conductor.

AWG sizes 53 to 56 are not standard NEMA dimensions.

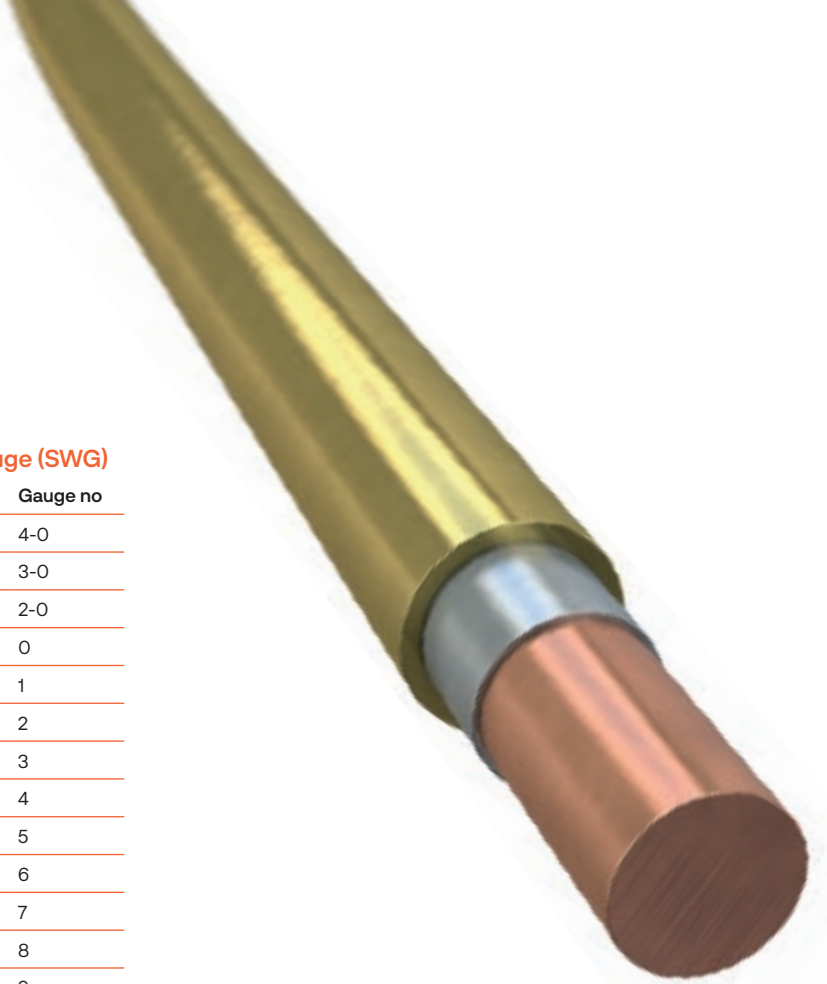
# Wire gauges

## Wire Gauges (AWG or B&S)      Standard Wire Gauge (SWG)

Gauge no	inch	mm	inch	mm	Gauge no
4-0	0.460	11.68	0.400	10.16	4-0
3-0	0.410	10.40	0.372	9.45	3-0
2-0	0.365	9.27	0.348	8.84	2-0
0	0.325	8.25	0.324	8.23	0
1	0.289	7.35	0.300	7.62	1
2	0.258	6.54	0.276	7.01	2
3	0.229	5.83	0.252	6.40	3
4	0.204	5.19	0.232	5.89	4
5	0.182	4.62	0.212	5.38	5
6	0.162	4.11	0.192	4.88	6
7	0.144	3.67	0.176	4.47	7
8	0.129	3.26	0.160	4.06	8
9	0.114	2.91	0.144	3.66	9
10	0.102	2.59	0.128	3.25	10
11	0.0907	2.30	0.116	2.95	11
12	0.0808	2.05	0.104	2.64	12
13	0.0720	1.83	0.0920	2.34	13
14	0.0641	1.63	0.0800	2.03	14
15	0.0571	1.45	0.0720	1.83	15
16	0.0508	1.29	0.0640	1.63	16
17	0.0453	1.15	0.0560	1.42	17
18	0.0403	1.02	0.0480	1.22	18
19	0.0359	0.912	0.0400	1.02	19
20	0.0320	0.812	0.0360	0.914	20
21	0.0285	0.723	0.0320	0.813	21
22	0.0254	0.644	0.0280	0.711	22
23	0.0226	0.573	0.0240	0.610	23
24	0.0201	0.511	0.0220	0.559	24
25	0.0179	0.455	0.0200	0.508	25
26	0.0159	0.405	0.0180	0.457	26
27	0.0142	0.361	0.0164	0.417	27
28	0.0126	0.321	0.0148	0.376	28
29	0.0113	0.286	0.0136	0.345	29
30	0.0100	0.255	0.0124	0.315	30
31	0.00893	0.227	0.0116	0.295	31
32	0.00795	0.202	0.0108	0.274	32
33	0.00708	0.180	0.0100	0.254	33
34	0.00631	0.160	0.00920	0.234	34
35	0.00562	0.143	0.00840	0.213	35
36	0.00500	0.127	0.00760	0.193	36
37	0.00445	0.113	0.00680	0.173	37
38	0.00397	0.101	0.00600	0.152	38

## Wire Gauges (AWG or B&S)      Standard Wire Gauge (SWG)

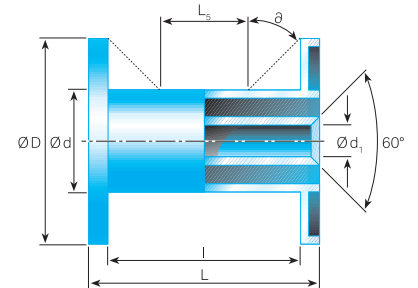
Gauge no	inch	mm	inch	mm	Gauge no
39	0.00353	0.0897	0.00520	0.132	39
40	0.00315	0.0799	0.00480	0.122	40
41	0.00280	0.0711	0.00440	0.112	41
42	0.00249	0.0633	0.00400	0.102	42
43	0.00222	0.0564	0.00360	0.0914	43
44	0.00198	0.0502	0.00320	0.0813	44
45	0.00176	0.0447	0.00280	0.0711	45
46	0.00157	0.0398	0.00240	0.0610	46
47	0.00140	0.0355	0.00200	0.0508	47
48	0.00124	0.0316	0.00160	0.0406	48
49	0.00111	0.0281	0.00120	0.0305	49
50	0.000986	0.0250	0.00100	0.0254	50
51	0.000800	0.0203	0.000878	0.0223	51
52	0.000600	0.0152	0.000782	0.0199	52
53	0.000500	0.0127	0.000697	0.0177	53
54	0.000400	0.0102	0.000620	0.0157	54
55	0.000300	0.00762	0.000552	0.0140	55
56			0.000492	0.0125	56
57			0.000438	0.0111	57
58			0.000390	0.00991	58
59			0.000347	0.00881	59
60			0.000309	0.00785	60



# Spools

## American standard

Spool Type	D in	d in	d1 in	L in	l in	Wire type
2.125" Flange	2.125	1.375	5/8	1.375	1	0.0005 – 0.002
2.5" Flange	2.5	1.76	5/8	3.376	3	0.007 – 0.0031
3.15" Flange	3.15	1.97	5/8	3.15	2.52	0.002 – 0.0063
3.5" Flange	3.5	2.125	2.125	2.438	2.125	
5" Flange	5	3	5/8	4.11	3.5	0.0035 – 0.113
6" Flange	6	3.5	5/8	4.11	3.5	0.005 – 0.0253
PT 4 Tapered	5.5 & 4.875	4.375 & 3.875	1	7.875	6.688	0.003 – 0.008
PT10 Tapered	7.087 X 6.300	4.331 X 3.780	1	9	7.875	0.004 – 0.010
12" Reel	11.75	8	2	3.938	3.62	
Anodized Band Spool	2.24	1.98	1.93	1.1	1	Bonding wire



## Metric

Spool Type	D mm	d mm	d1 mm	L mm	l mm	Wire size, mm $\varnothing$	Normal net weight, kg
C 1/4	64	44	16	61	51	<0.030	0.05 – 0.25
C 1/2	64	44	16	86	76	0.030 – 0.099	0.5
B 1	75	40	16	120	100	0.1 – 0.199	1.0
B 2	90	40	16	120	100	0.20 – 0.25	2.0
B 4	120	50	16	120	100	0.26 – 0.50	4.0

## Standard din spools

Spool Type	D mm	d mm	d1 mm	L mm	l mm	Wire size, mm $\varnothing$	Normal net weight, kg
DIN 50	50	32	11	50	38	0.015 – 0.04	0.10
DIN 63	63	40	11	63	49	0.015 – 0.04	0.20
DIN 80	80	50	16	80	64	0.05 – 0.099	0.75
DIN 100	100	63	16	100	80	0.10 – 0.50	1.5
DIN 125	125	80	16	125	100	0.15 – 0.80	3.0
DIN 160	160	100	22	160	128	0.25 – 0.71	5.0
DIN 200	200	125	36	200	160	0.4 – 0.81	10.0
DIN 250	250	160	22	200	160	0.4 – 1.5	20
DIN 355	355	225	36	200	162	1.0 – 3.0	40
SK 460	460	318	305	105	91	0.25 – 1.8	45

## Steeger bobbins

### Sizes D / d x l

40 / 30 x 26 mm

40 / 16 x 26 mm

43 / 25 x 26 mm

Other spool options available





# Forged from the past. Engineered for the future.

## One partner for all your needs

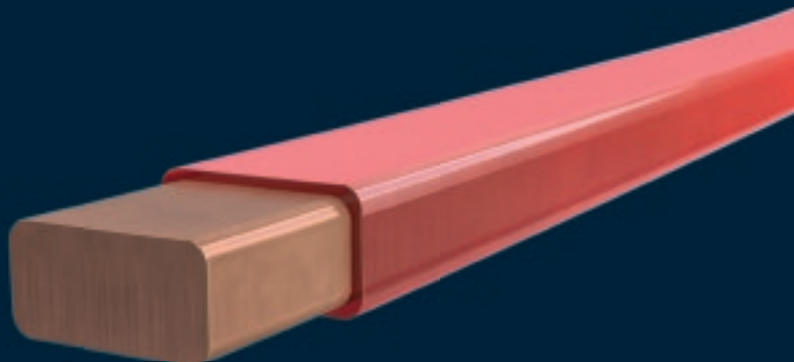
Your sounding board. Your partner. Work with us and take advantage of the finest quality products for medical wire and micro-tubes, a completely controlled value chain and all the time and cost efficiencies of a single, reliable supplier.

- Partnering with world-class OEMs
- Agile lead times
- Expertly responsive customer service
- Exera® fine medical wire and micro-tubes with highest precision and quality
- Highest quality medical coatings

### Certifications

ISO 13485:2016  
ISO 9001:2015  
ISO 14001:2015  
ISO 45001:2018

Our name has changed to Alleima. Yet our long, rich Sandvik history will always burn strong in our hearts. From pioneering malleable steel to perfecting the Bessemer method, ours has always been a story of progress and development. And today, as the world-leader in materials engineering and manipulation, we are committed to advancing industries through materials technology.



# Eight ways you'll advance with Alleima

## 1

### **A truly innovative partner**

Have all our research and development expertise on your side, enhancing your team with innovative thinking and action.

## 2

### **Unmatched material science expertise**

Give each of your projects the benefit of unrivaled metallurgy and medical wire expertise.

## 3

### **New standards in service**

Get the service and flexibility you deserve, with a responsive partner ready to adjust to your design and production schedules, however demanding they might be.

## 4

### **Financial strength**

Achieve long-term sustainable growth by teaming with a financially strong, single-source partner.

## 5

### **Quality assurance to trust**

Know we have control of the entire value chain, from melt shop to the most precise end-product.

## 6

### **Lean processes**

Benefit from our continuous journey to increase quality, improve processes, reduce waste and decrease variability.

## 7

### **Focus and priority**

Know we work closely with every project and order, from development stage to mass production, regardless of size or value.

## 8

### **Value-adding capabilities**

Trust that we'll add value at every stage – not only through cut-to-length orders, twisted leads, micro cables, thermocouple sensors, coils and more – but with our service.



The Alleima advantage: a small, agile, custom, precision wire manufacturer, backed by the globally integrated and resource rich Alleima Group.

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