

High Performance Medical Solutions

A Division of Proterial Cable America, Inc.



Proterial Cable America, Inc.

A Proterial Company

Ownership Change:

- Formerly Hitachi Cable America (Hitachi Metals) Proterial Cable America, Inc. since January 4, 2023

Why did we change ownership?

- To accelerate our transformation growth
- Access to capital investing into growth sectors
- To gain support/guidance in growing the business
-

Proterial Meaning

- **Pro**fessional
- **Pro**gressive
- **Pro**active

PRO × MATERIAL

Corporate Philosophy

Mission

Make the best quality available to everyone

Striving for the highest standards in our original technologies, products, processes, and people, we will bring new levels of value to customers all around the world.

Vision

Leading sustainability by high performance

Through the creation of best-in-class materials, to be a company that solves individual customer issues and contributes to the prosperity and vitality of all.

Values

Unflinching integrity

We earn the trust of our customers and other stakeholders by being honest and sincere in our daily activities and by understanding our obligation to the people and communities we serve.

United by respect

Across our organization, we respect diversity and the free and independent exchange of opinions, learn from each other, and collaborate to achieve our common goal.

Date of Establishment

April 10, 1956

Capital

310 million yen (as of January 5, 2023)

Representative

Sean M. Stack - Representative Director, President and CEO

Number of Employees

Proterial, Ltd., Non-consolidated: 5,889 (as of end of March 2022)
Proterial Group, Consolidated: 27,771 (as of end of March 2022)

Revenues

Proterial Group, Consolidated: 942.7 billion yen (FY2021)

Headquarters: Tokyo

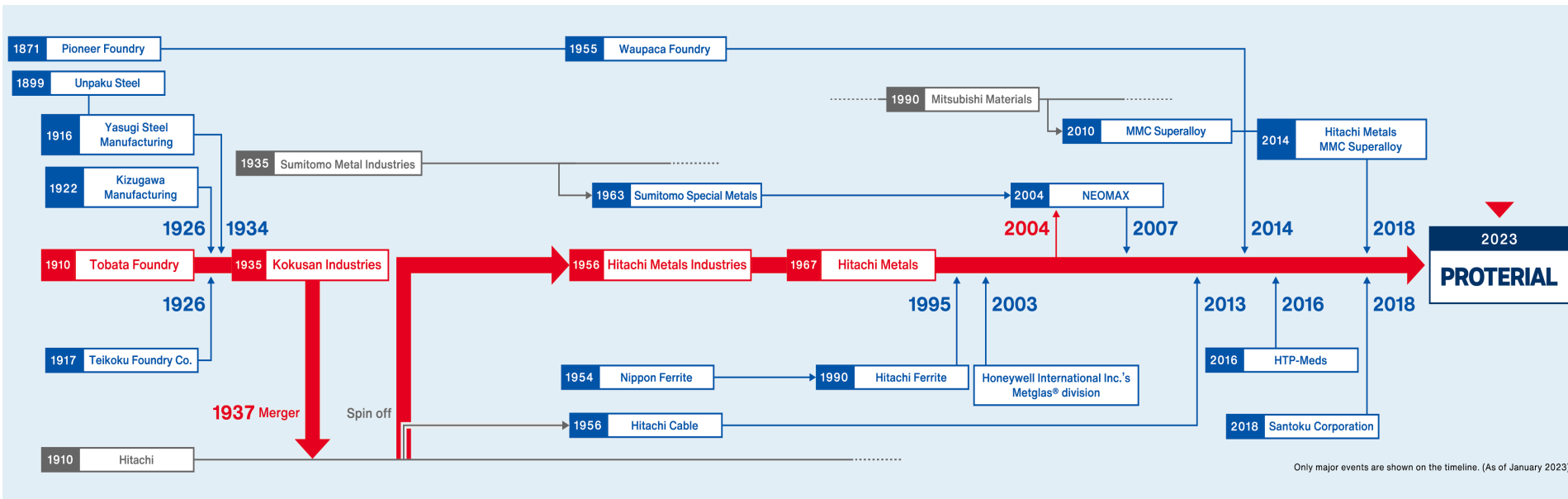
Sales Offices & Outlets: Osaka, Nagoya, Fukuoka and other major cities

Offices and Facilities

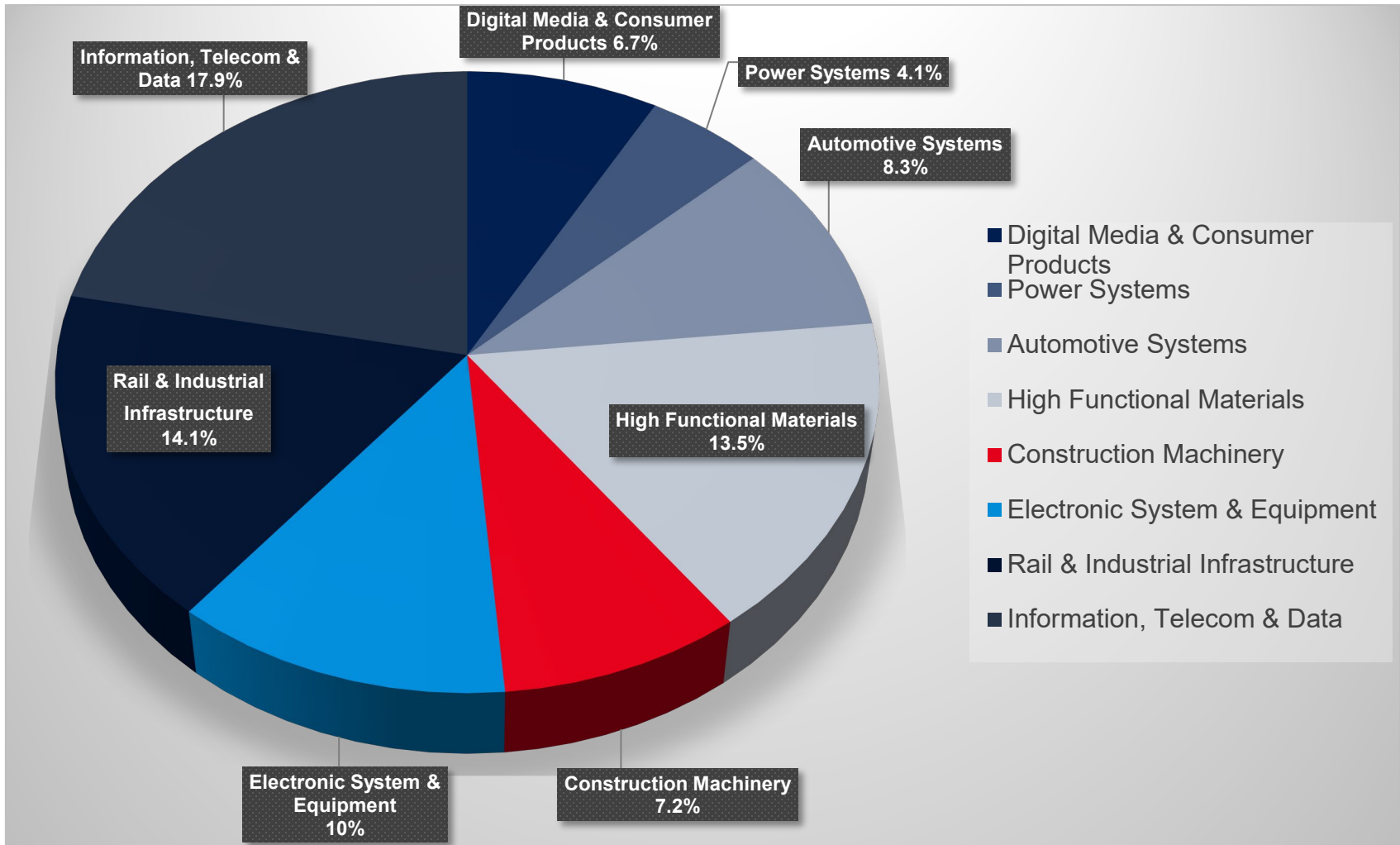
Plants and R&D Facilities: 8 works and 3 R&D bases in Shimane, Tottori, Osaka, Mie, Saitama, Tochigi and Ibaraki

Overseas Offices: New York, Dusseldorf, London, Paris, Shanghai, Hong Kong, Singapore and other cities

Over our more than 100-year history, the Proterial Group has continued to grow through a succession of mergers and acquisitions. Through this process, we created the diverse technologies, products, and business portfolios that are the source of our competitiveness, and this diversity is the embodiment of “Proterial’s uniqueness.” Operating in the field of materials, which is undergoing drastic technological change, we will build on and strengthen the diversity that we have cultivated throughout our history, to continue to be a company that is indispensable to customers and society.



The Proterial Group is a materials manufacturer that possesses competitive core technologies in the high-performance materials field.



Specialty Steel Products & Materials

Specialty Steel | Rolls
Soft Magnetic Components and Materials



DAC-MAGIC™
Die Cast Tool Steel



Piston Ring Materials



Rolls for Steel Mills



Amorphous Alloys
Metglas®



FINEMET®
[EMC components]

Magnetic Materials & Applications

Magnets and Applied Products



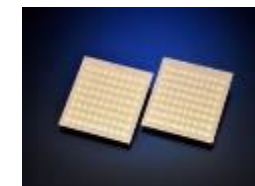
NEOMAX®
Nd-Fe-B Sintered Magnets



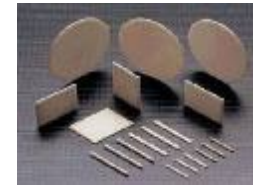
NMF™ Series
Sintered Ferrite Magnets



Linear Motors/
Linear Stages



LTCC (Low
Temperature Co-fired
Ceramics) Substrate



Thermal Conductive
AlTiC Substrates for
Thin Film Magnetic
Heads

Functional Components & Equipment

Casting Components for Automotive
Piping Components



Ductile Cast
Iron Products



HERCUNITE™
Heat-Resistant Cast
Components



Aluminum Wheel
SCUBA™



Polyethylene Gas
Piping Systems



Threaded Pipe Fittings
for General Use

Wires, Cables, Medical & Related Products

Electrical Wire & Cable
High Performance Components
Specialty Medical Materials



Wires and Cables for
Rolling Stock



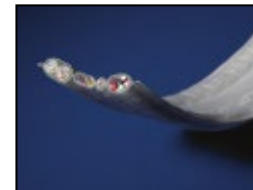
Probe Cables for
Ultrasound Diagnostic
Equipment



High Performance
Medical Tubing & Device
Assembly

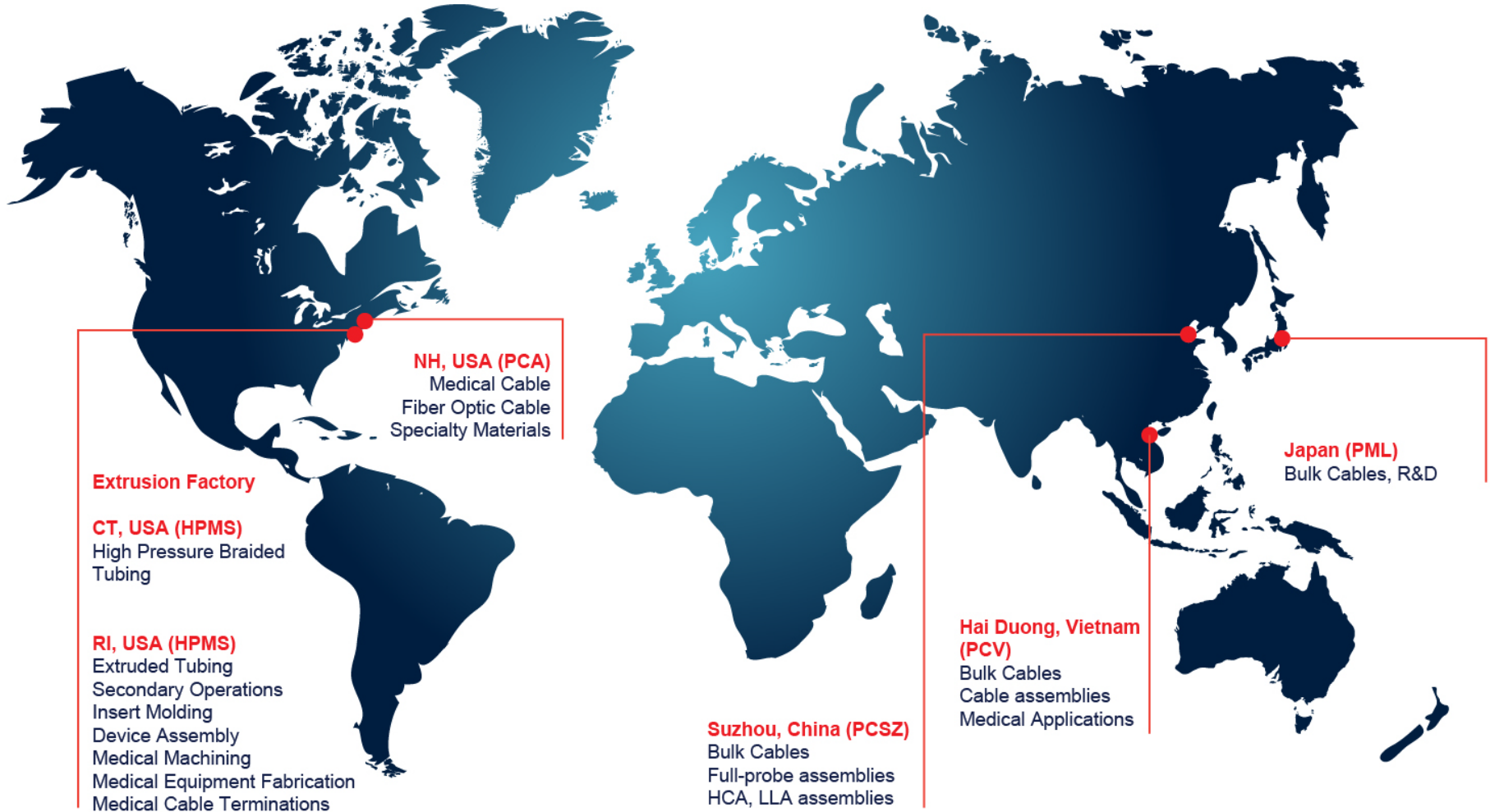


Harness for
Electric Parking
Brakes



Hi-Flex Industrial
Cleanroom Cabling

We are dedicated to providing complete in-house medical tubing and cable solutions for surgical, catheter, endoscopy and ultrasound markets.





HPMS is a Global Contract Manufacturer for OEMs

Dedicated to providing complete in-house medical tubing and cable solutions for surgical, catheter, endoscopy and ultrasound markets. Medical wire and tubing are vital components to many critical, life-saving devices.

High Performance Medical Solutions (HPMS), a Proterial Group Company provides in-house secondary operations, sub-assembly for catheters, medical machining and custom tooling in our vertically integrated ISO Class 8 and Class 9 Cleanrooms.

With over 30,000 ft² of clean room space, we're able to fully assemble devices and package product for faster turnaround times. Improve quality control and cost savings by choosing us for your next project.

Our Market & Product Focus



SURGICAL



CATHETER



VASCULAR



ENDOSCOPY



ULTRASOUND



HPMS products are designed to improve the quality of life for individuals in need of medical care. From premature infants to elderly patients, our products provide vital support for a wide range of individuals. Our commitment to quality extends to our strict adherence to industry regulations, in accordance with ISO 13485:2016 standards and the FDA 21 CFR part 820 regulations.

By following these regulations, we are able to consistently produce products that are manufactured to the highest possible standards which meet the needs of our customers and the individuals they serve. We are proud to foster an environment in which we encourage continuous improvement as we strive to innovate the medical device manufacturing sector.

Our commitment to excellence extends beyond the manufacturing process, as we also provide in-process validation and support for our customers. As a result, we are proud to manufacture lifesaving tools that have a positive impact on people's lives across the globe.



Material Development

- High Performance Materials
- Specialty Alloy Wire
- 3DAM Powders

Extruded Tubing

- Precision Catheter Tubing
- High Pressure Braided Tubing
- Full Device Assembly & Packaging

Machining & Fabrication

- Extrusion Tooling
- Medical Machining
- Medical Fabrication

Discrete Wire & Bundle Cable

- Fine Wire & Cable Production
- Cable Preparation Services
- Cable Assembly

Ultrasound



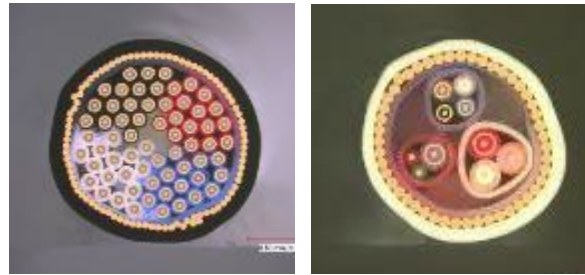
Endoscope



Surgical / Catheter

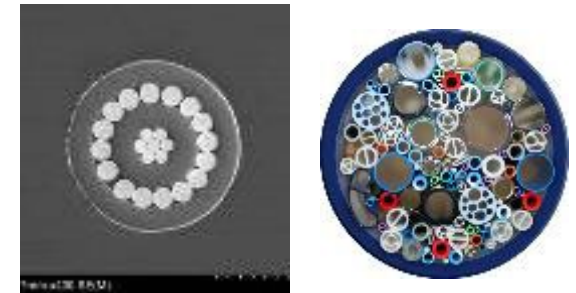


Probe Cable and
Probe Cable Assembly

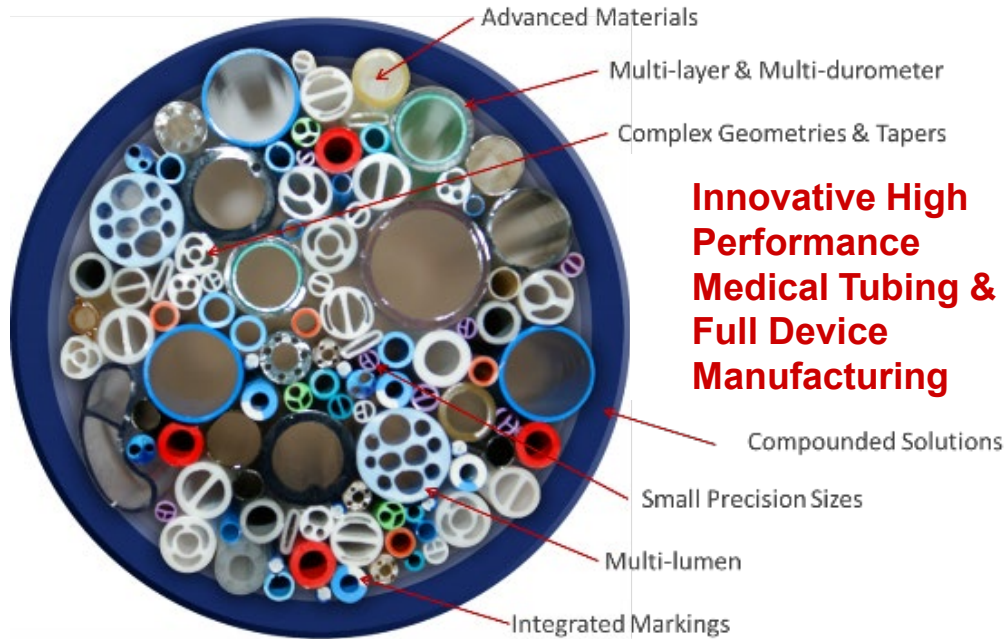


64cores 50AWG Cables and
Composite Cables
Camera Cable / Assemblies

50AWG Coaxial Cables
Twist Pair
Extrusion Tubing & Assembly





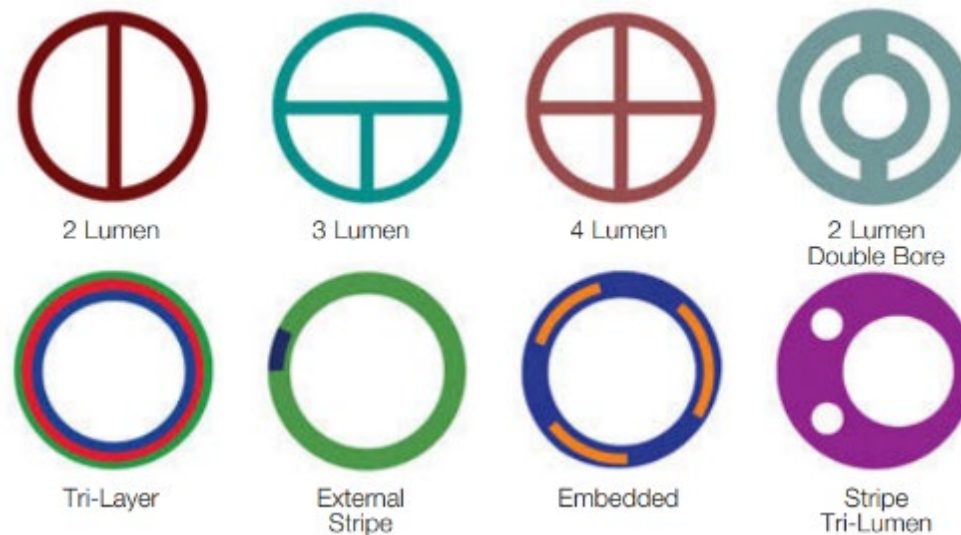


Medical Tubing Options:

- Single-lumen, multi-lumen, multi-layer, profile tubing
- High-pressure braided tubing, reinforced tubing
- Taper / Bump tubing
- Balloon tubing
- Core Mandrel, beading tubing
- Embedded / Encapsulated wire and cable tubing
- Integrated markings, radiopaque fillers, color striping tubing
- Specialty additives and compounded materials

Standard Materials

ABS	LDPE	Polypropelene	TPU
Carbothane™	LLDPE	Polysulfone	Ultem™
ECTFE	Nylon	POM	
EFEP	PBT	PVC	
ETFE	Pebax™	PCDF	
EVA	PEEK	Quadraflex™	
FEP	Pellethane®	Quadrathane™	
HDPE	PET	Tecoflex®	
Hytrel®	PFA	Tecothane®	
LCP	Polyimide	TPE	



- **Outer Diameter:**

- 0.005 in. (0.12 mm) minimum, based on construction
- 0.875 in. (22 mm) maximum, based on construction

- **Inner Diameter:**

- 0.003 in. (0.08 mm) minimum, based on construction

- **Wall Thickness:**

- 0.001 in. (0.025 mm) minimum

- **Outer Diameter:**

- 0.005 in. (0.12 mm) minimum, based on construction
- 0.875 in. (22 mm) maximum, based on construction

- **HPBT Braid Diameter:**

- 0.006 in. (0.15 mm) with variable pitch
- Nylon monofilament and SS flat/round wire

- **Maximum Number of Lumen:** Up to 24

- **Number of Layers:** Up to 3

- **Number of Durometer Changes:** Multiple via secondary bonding

- **Number of Taper Transitions:** Up to 3

Multi-Lumen

- Complicated geometry
- In-house tooling fabrication

Multi-Layer

- Multi-color, multi-material

Braided

- SS Braiding
- Nylon Braiding

Tapered / Bump Tubing

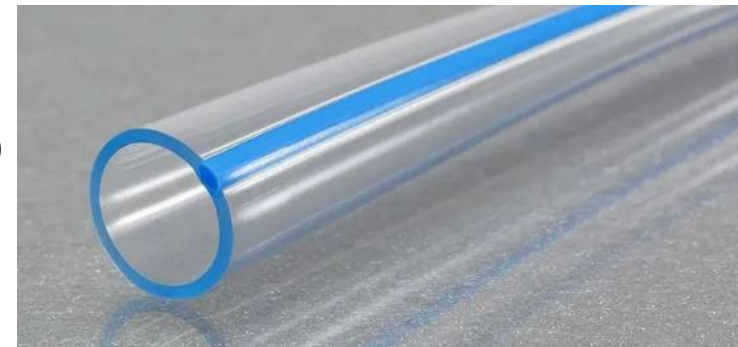
- Maximum 2.75 by ratio of OD, Minimum 21mm transition length
- Various material selection (Urethane, Nylon, PP , PE and so on)
- Able to apply to Multi Lumen tube

Balloon

- Maximum thickness 0.003inch

High Pressure Tubing – Custom Sizes Available

- Clamps
- Caps and covers
- Spikes
- Drip Chambers
- Syringes
- Rotating Male Lures
- Valves
- Manifolds
- Fixed Male and Female Leur Locks



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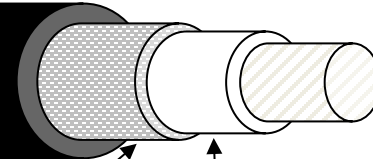
(5) Pad Printing

(3) Outer Layer

(2) Braid Layer

(1) Inner Layer

(1)(4) Mandrel Core
(to be removed after manufacturing)



• 1) Extrude the inner layer over the core

• 2) Braid SS wires

• 3) Outer layer extrusion, in-line cut to pieces

• 4) Core removal / Trim

• 5) Pad printing + Any other value add requested

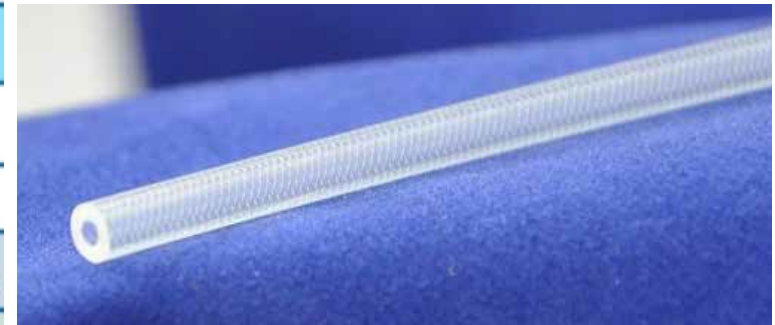
• 6) Final inspection



NOTE: Above is one of the examples of how we manufacture braided tubes.

Standard Products	HPBT		HPCE	
Description	High Pressure Braided Tubing		High Pressure Co-Extrusion	
Pressure Rating	1,200 psi (82.73 bar)		1,200 psi (82.73 bar)	
Standard Sizes* ID/OD Inches (ID/OD mm)	DESIGN 1	0.071 x 0.142 (1.80 x 3.61 mm)	DESIGN 1	0.071 x 0.142 (1.80 x 3.61 mm)
	DESIGN 2	0.088 x 0.188 (2.24 x 4.78 mm)	DESIGN 2	0.088 x 0.188 (2.24 x 4.78 mm)
Material	Polyurethane with Nylon Braid		Polyurethane / Nylon Co-extrusion	
Standard Length* Inches (mm)	10, 20, 24, 30, 48, 60, 72 (254, 508, 762, 1219, 1524, 1829 mm)		10, 20, 24, 30, 48, 60, 72 (254, 508, 762, 1219, 1524, 1829 mm)	
Flexibility	High		Medium	
Clarity	Medium		High	

*Diethylhexyl Phthalate, DEHP is the most common member of the class of plasticizers and have been deemed harmful to humans. All materials mentioned



HPBT 1,200 psi
High Pressure
Braided Tubing

HPCE 1,200 psi
High Pressure
Co-Extrusion Tubing

Reflow Process:

- Inner/Braid: Make braided core in cut pieces.
- Outer: Multiple different materials to be extruded, bonded, and reflowed over the braided core.

Benefits:

- Abrupt change of durometers. Easy to control the length of each durometer.
- Bonding strength is relatively strong compared with buttwelding multiple braided tubes.

AESNO (Nylon 12)

Pebax 7233

Pebax 5533

Pebax 4533

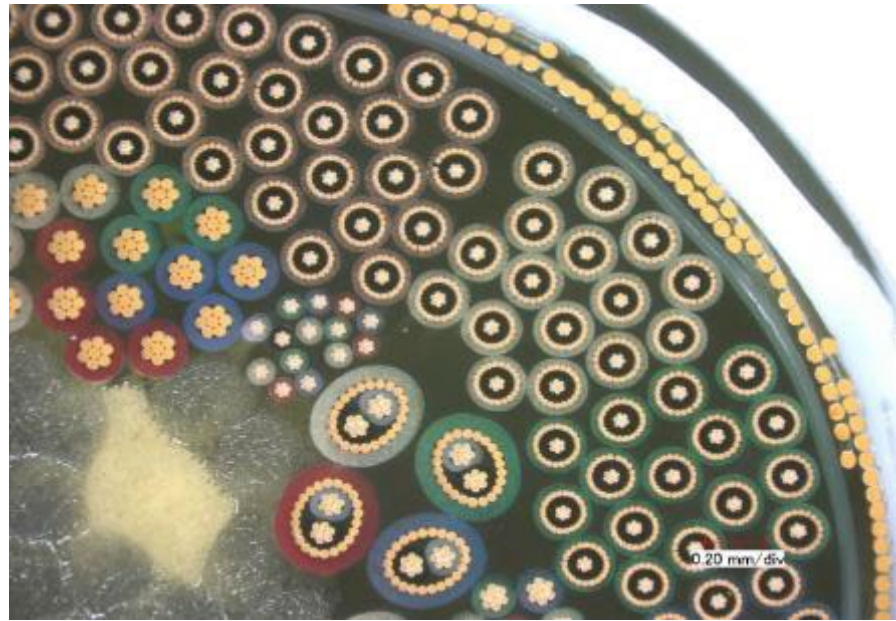


Inner: AESNO

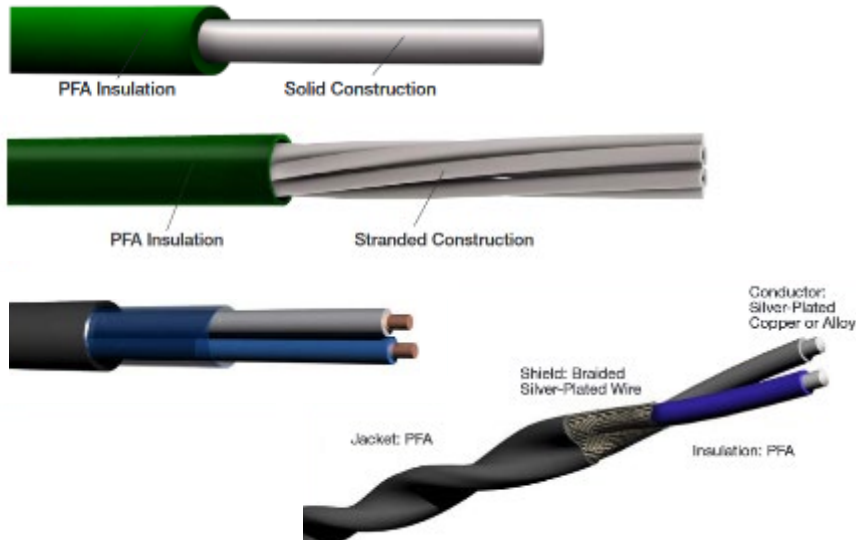
Braid: SS braid wires

Outer: AESNO and Various Pebax durometers





Size Compared to a Penny

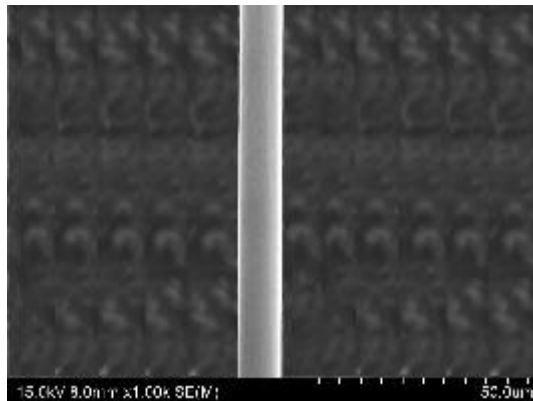
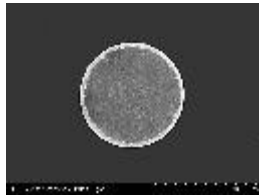


Singles, STP, UTP, Twinax, Micro-coax, Bundles & Hybrids

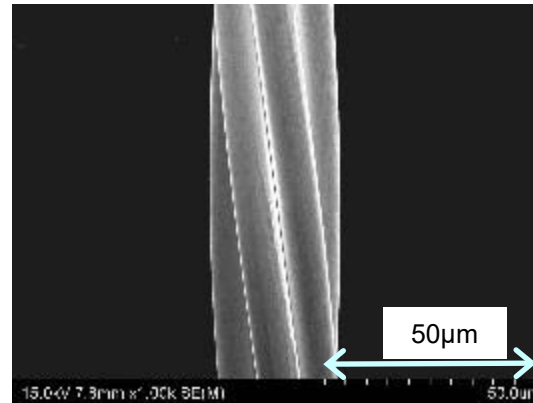
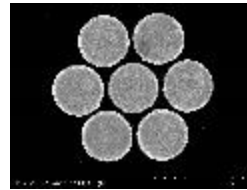


We use the finest conductor of copper alloy in the world
with High Conductivity, Tensile Strength and Heat Resistance (900MPa, 85% IACS)

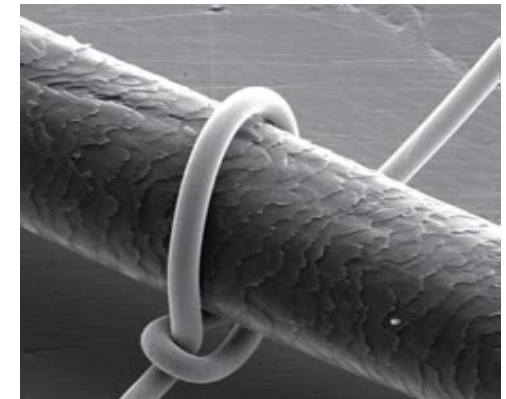
Finer Copper Alloy Conductor for 50AWG (7/0.010)



Single Wire
(OD 10mm)



Stranded Conductor
(10 mm / 7 wires)

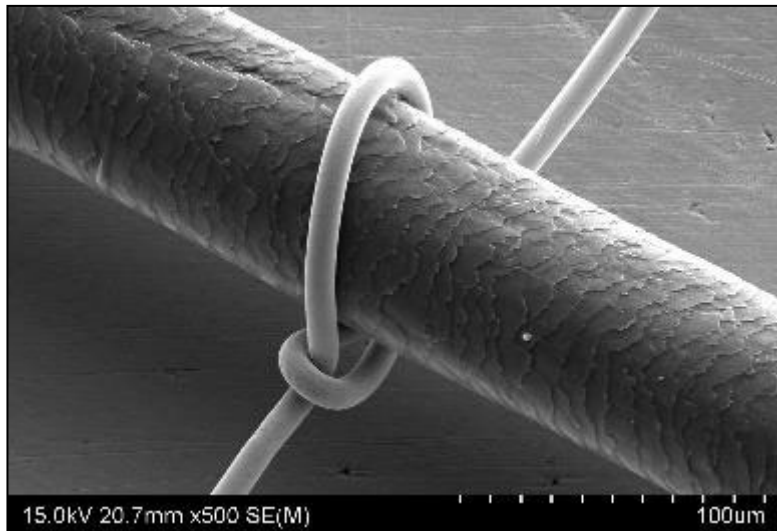


Reference
(Human Hair)

Improved tensile strength without sacrificing conductance

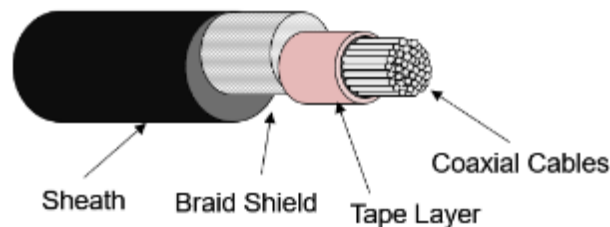
	Composition	Breakdown Tensile Strength (MPa)	Electrical Conductivity (% IACS)	Bending Repetitions (# Times)	AWG size	Conductor (Strands / Wire Dia. um)	Standard conductor resistance (ohm/km)	
							NN	S-MF-AG *
NN (Proterial Standard)	Cu-0.19%Sn -0.20%In	890	76	1.2x10 ⁴	43	7 / 0.023	7,500	6,700
					44	7 / 0.020	9,800	8,900
S-MF-AG * Hitachi High-performance	Cu-2.0%Ag	950	85	1.2x10 ⁴	45	7 / 0.018	12,300	11,000
					46	7 / 0.016	15,500	14,000
Conventional Industry Alloy A	Cu-0.3%Sn	875	73	1.1x10 ⁴	48	7 / 0.013	23,700	21,500
Conventional Industry Alloy B	Cu-0.8%Cr	460	90	6.0x10 ³	50	7 / 0.010	-	35,500
Conventional Industry Alloy C	Cu-Be-Ni-Co	895	40	8.5x10 ³				

58 AWG copper alloy wire wrapped around human hair (80µm)



We build complex fine wire bundles, used in ultrasound probes, catheters, endoscopy, oximetry systems, sensors, robotics and industrial automation and inspection.

Bundled Cable

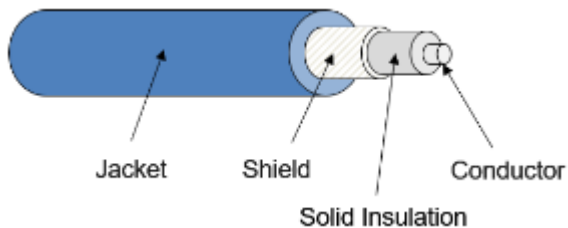


High Capacitance

36 to 50 AWG
50 & 60 Ohm impedance

Benefits:

Lower Cost
Lower impedance

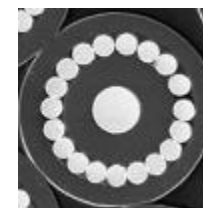
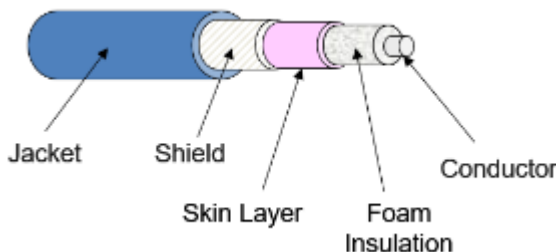


Low Capacitance

38 to 48 AWG
70, 75 & 85 Ohm impedance

Benefits:

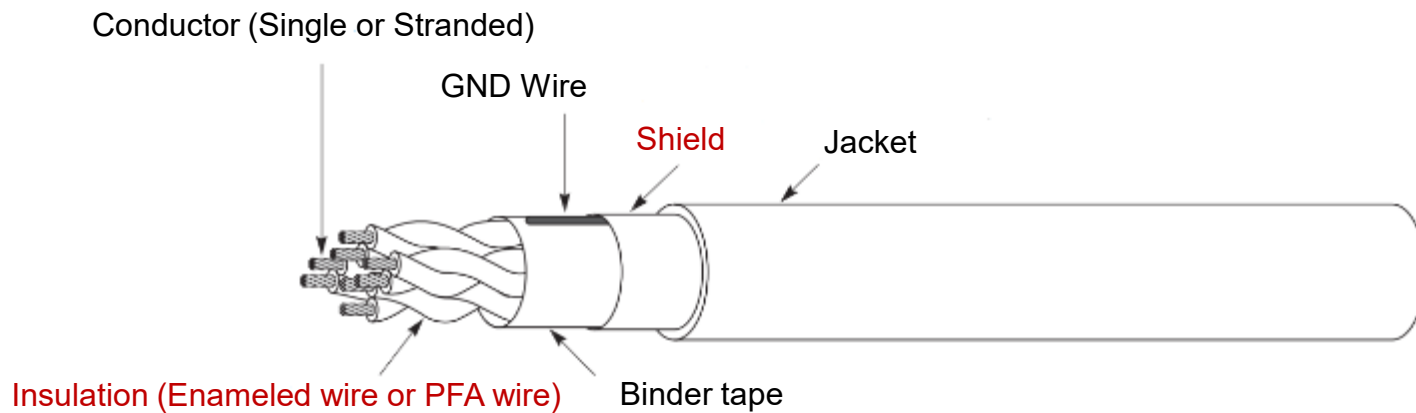
Raises impedance if needed
Smaller diameter than solid



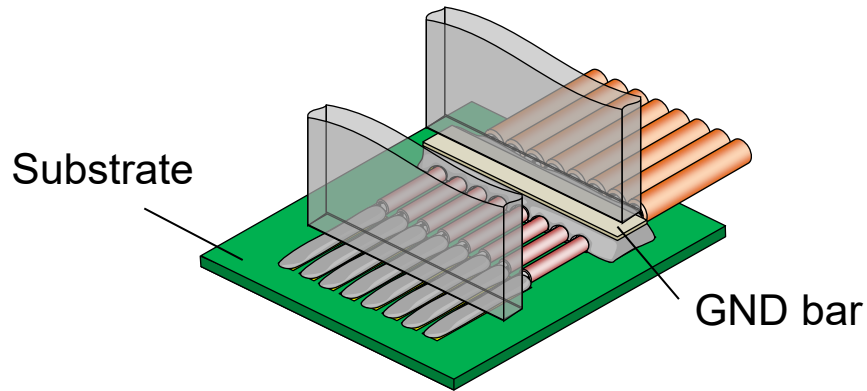
Solid Conductor

40- 50 AWG

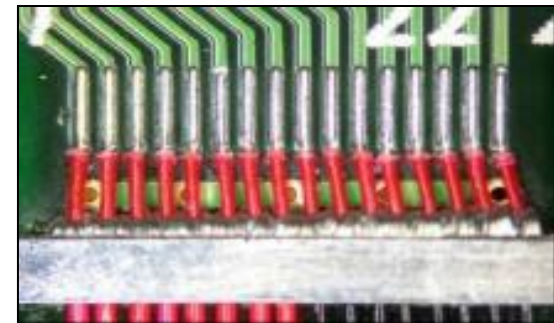
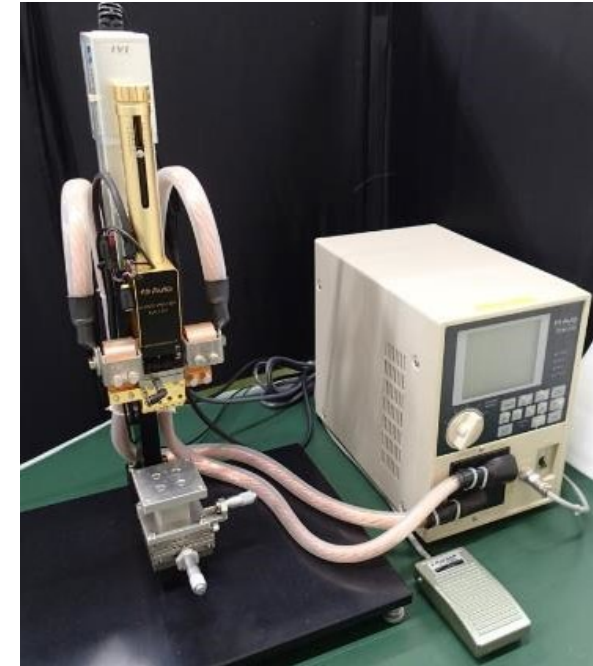
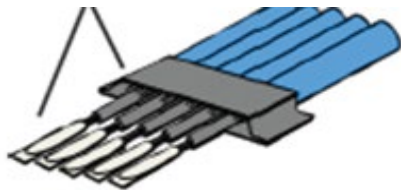
- Conventional enameled wire & PFA insulation wire
- As small as 52AWG
- Tight twisting pitch – such as 0.5mm (in case of 48AWG)
- Impedance/Capacitance controlled



Heater head
For pulse heat to outer and
inner conductor

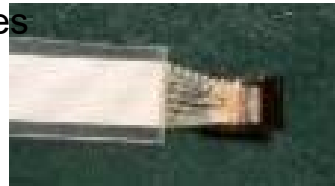


Soldering



Precision Soldering

- Cable pitch 150um in production
- Currently developing finer pitch techniques

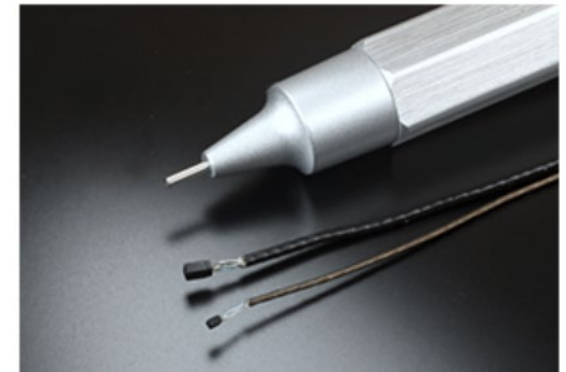
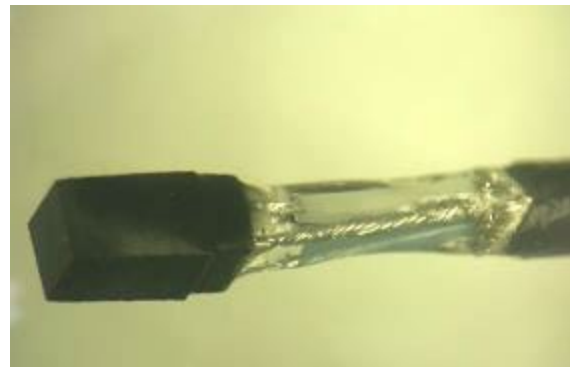


21 x 48AWG Coaxial
100 um pitch

Vertical Soldering

Camera sensor size:

- 1 mm x 1 mm
- 0.63 mm x 0.63 mm
- Cable OD that fit within the profile





OV/OVM6946

DIM.: 1.1mm X 1.1mm X 2.26mm

Resolution 400x400

OV/OVM6948

DIM.: 0.65mm X 0.65mm X 1.2mm

Resolution 200x200



OCHTA

DIM.: 0.65mm X 0.65mm X 1.2mm

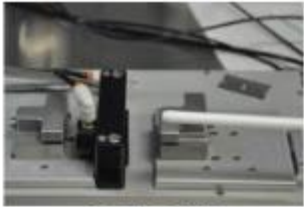
Resolution 400x400

Discussions

- Application (Single use, reusable)
- OD and other mechanical constraints
- Cable length
- Number of wires for LED power
- Proximal end board design / Test set up







RF TIPPING



THERMAL FORMING



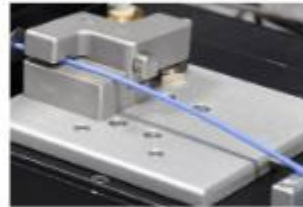
PRECISION CUTTING



PAD PRINTING



BRAIDING



RF BONDING



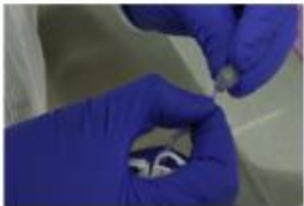
SKIVVING



KITTING & ASSEMBLY



INJECTION MOLDING



ADHESIVE BONDING



RF FLARING



DRILLING / PUNCHING

- **Component Molding & Over-molding**
- **Subassemblies, Full Devices & Packaging**
- **Product Identification (Pad Printing)**
- **Package Sealing (Pouch, Tray / Tyvec, & Heat Shrink)**
- **Contract Manufacturing**

Reflow



Molding



Punching



Printing



Tipping



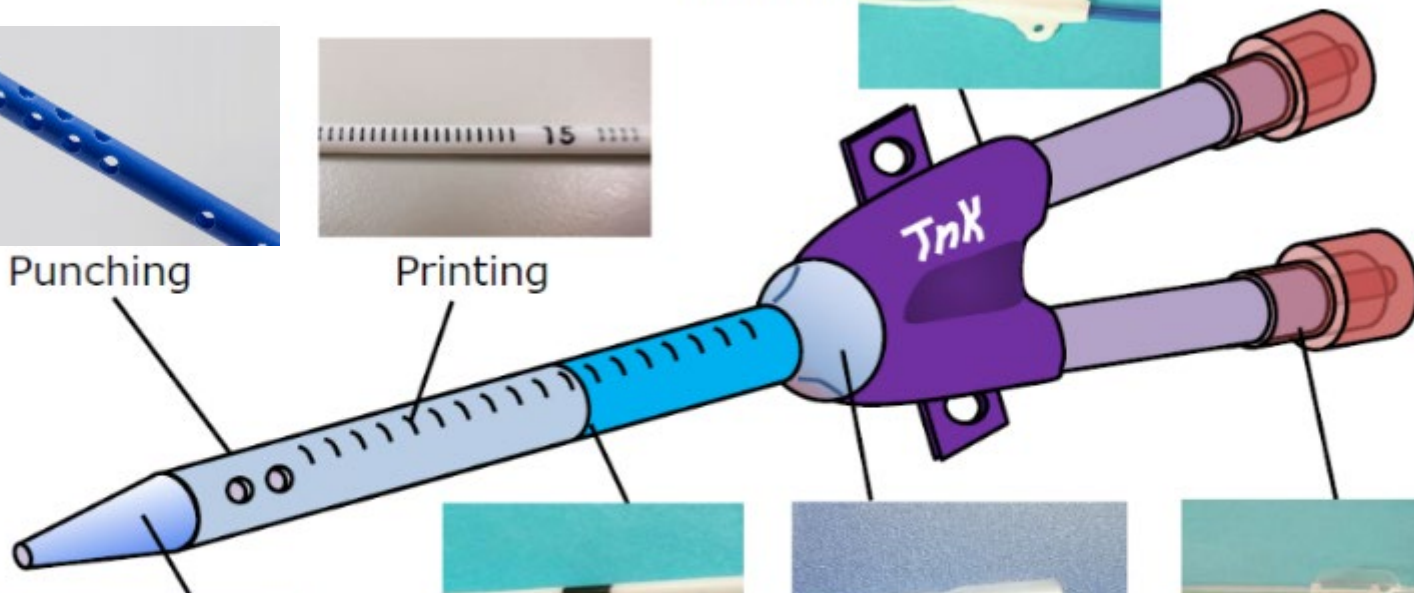
Bonding



Forming



Attaching

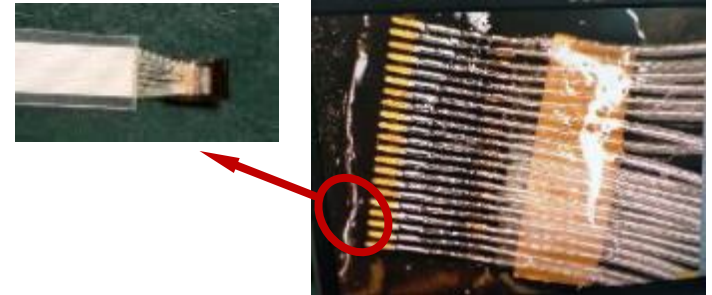


Full Device Manufacturing is also available.
(Customer Provided Sterilization)



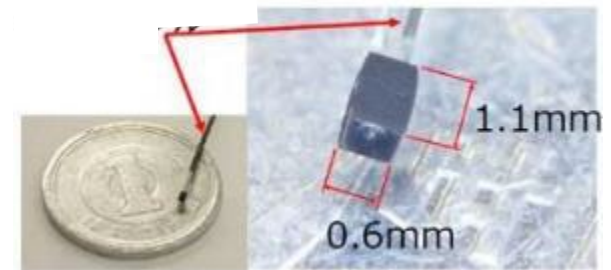
Fine Pitch Soldering

Shown: 21 x 48AWG Coaxial



Vertical Soldering

100um Fine pitch termination (center to center)



Prevision Soldering

- Cable pitch 250um in production
- Currently developing finer pitch techniques

In-house Design & Manufacture

- Extrusion Tooling
- Tips & Dies

Services

- Full State of the Art Machine Shop
- Contract Manufacturing
- Full Inspection Suite with CMM

Medical Component Machining

- In-house Extrusion Tooling Design and Manufacture
- Medical and Defense Markets
- Tool Maintenance & Repair

Tool Maintenance & Repair





Machining Services:

- Full Suite of 3,4, & 5 Axis CNC Machining Centers
- Metal 3D Printing (3DAM)
- Capable of rapid manufacturing for low volume runs, high volume or prototype runs

Fabrication Services:

- Water jet cutting (8' x 13' Omax)
- Welding (MIG, TIG, Arc)
- Brazing, Plasma Cutting, & Basic Fabrication
- Optical/CMM Inspection
- Finishing / Polishing & Ultrasonic Part Cleaning

Engineering Services:

- Part & Tool Design (CAD Support With SolidWorks)
- Material Selection Support
- Design For Manufacturability Services
- Inspection Services

External Partner Services:

- Surface Enhancements (Engineered, Lubricative, & Protective Coatings)
- Heat Treating, Stress Relieving & Hardness Testing
- Non-Destructive Testing (Die Penetrate, Ultrasound, Etc.)
- Sheet Metal Bending & Finishing

Metal Materials:

- Tool Steels (S7, M2, D2, O1)
- Stainless Steel (302,304,316,416,420,440, 17-4, 15-5)
- Alloy Steels (4140, 4140)
- Carbon Steels (10xx, Low-Medium-High Carbon Content)
- Aluminum (5052,6061,7075, Alumec 99)
- Beryllium Copper

Machined Plastics:

- ABS
- Acrylic
- G10 (A.K.A. FR4)
- Delrin

High Performance Materials:

- MONEL (400, K500)
- INCONEL (600, 625, 718, X-750)
- Titanium (Grade 2, 5)
- Hastelloy (C-276, X)
- Nitralloy (135)
- Aluminum Bronze (C63000,C63200)
- HY80 Leaded Steel
- CPM (S90V, S30V)

Made to Order, Precision Machined Components for Medical, Industrial and Defense Industries.

ISO 9001-2015 Certified

ITAR Compliant

Department of Defense Contract Manufacturer

High and Low Volume Capabilities

Wide Variety of Manufacturing Capability, including:

- 3,4, & 5 Axis CNC Machining Centers
- Wire & Sinker EDM Services
- MIG/TIG Welding, Fabricating, Waterjet & Finishing Capabilities.
- 3D Additive Manufacturing
- Automated CMM Inspection
- Full Assembly (Electro/Mechanical) Manufacturing

Primary NAICS Codes:

332710 – Machine Shop

332721 – Precision Turned Components

332994 – Small Arms and Ordnance Accessories Manufacturing

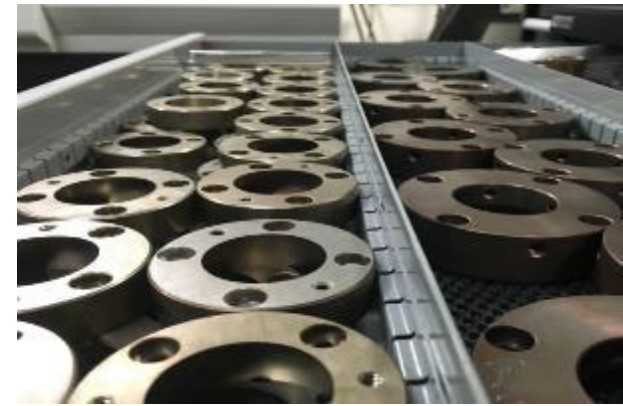
335999 – Miscellaneous Electrical Component Manufacturing

332313 – Plate Work Manufacturing

339113 – Surgical Appliance and Supplies Manufacturing

333511 – Industrial Mold Manufacturing

333514 – Special Die and Tool, Die Set, Jig, and Fixture Manufacturing





TWO 5 AXIS MAZAK CNC MACHINES

Both of our Mazak Machines bring together extreme speed and accuracy for small, medium and large complex components.



WIRE EDM MACHINES

Our Wire EDM Machines provide a high speed, high precision, and high quality cutting for a wide range of applications.



PRECISION SMALL HOLE WIRE EDM

Our precision EDM with integrated rotating spindle allows automated erosion of holes at multiple locations.



HAAS VM-2

These are designed specifically for mold makers, the VM-2 is a high-performance machine with high-speed control.



HAAS VM-3

These are designed for large mold makers, the VM-3 is a high-performance machine with high-speed control.



MAXIEM 2040 WATERJET

Our waterjet is faster, smoother, more precise, and is ideal for a wide range of modern machining needs.



HAAS SL-30

Our high performance turning centers were designed to provide heavy cutting ability, extreme rigidity, and high thermal stability.



HAAS VF-1

The HAAS VF 1 is a rugged, small footprint VMC that yields reliability and accuracy in a small-framed machine.



HAAS VF-3

The HAAS VF 3 is a rugged, medium sized VMC that yields full reliability and accuracy in a moderately-sized machine.



MAZAK DUAL 5-AXIS CNC

Both of our Mazak CNC machines bring together extreme speed and accuracy for small, medium and large complex components.



HAAS SL40 LARGE CAPACITY CNC LATHE

The HAAS SL40 CNC Turning Center has a 25.5" x 44" (648 x 1118 mm) max capacity, 40" (1016 mm) swing, 40 hp (30 kW)



AV350+ OPTICAL MEASURING MACHINE

These systems are multi-purpose CNC measurement systems, ideal for quality assurance, manufacturing, and assembly.




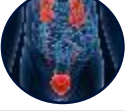


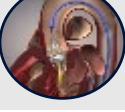
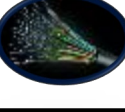
Why Proterial High Performance Medical Solutions?

Advanced Technology Wire, Cable & Tubing	<ul style="list-style-type: none"> - Ultra fine high-performance wire & cable (~ 52AWG) - Fine wire termination and automated assembly technology - Advanced catheter medical tubing & secondary operations
Quality & Reliability	<ul style="list-style-type: none"> - Over 20 years of development history with medical components - Service OEMs endoscopy, surgical, catheter and ultrasound fields - ISO 13485:2016 (RI & CT – USA); (Suzhou – China) - FDA 21 CFR part 820 regulation
Vertically Integrated Manufacturing	<ul style="list-style-type: none"> - In-house Machining and Custom Tooling - Global sales network - Secondary operations & subassembly for catheters - Camera & PCB & soldering terminations - Fine wire and cable from 52 AWG to 2 AWG
Compliance	<ul style="list-style-type: none"> - ISO Class 9 Cleanrooms - ISO Class 8 Cleanrooms – Secondary Ops, Packaging, Inspection
Clean Room Space	<ul style="list-style-type: none"> - 22,000 ft2 clean room space – RI facility - 8,000 ft2 clean room space – CT facility
Global Support	<ul style="list-style-type: none"> - US, Japan, EU and Asia including China, ASEAN and India

Thank You

PROTERIAL



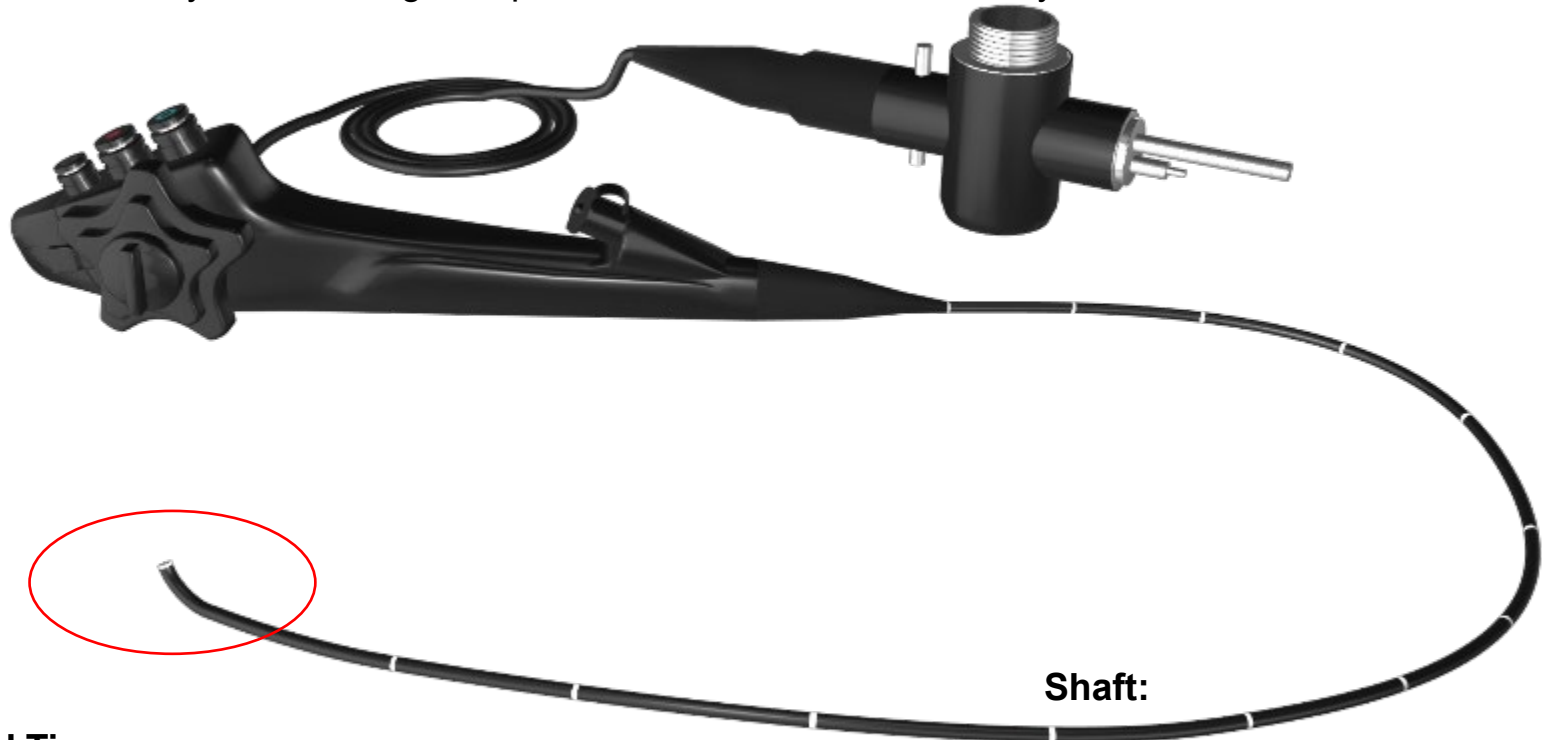
	Market Segment	Technologies Used
	Cardiology & Peripheral Vascular	Braiding, co-extrusion, RF tipping, multi-lumen, tight-tolerance single lumen
	Vascular Access	Specialty polyurethane, tapered / bump, multi-lumen, RF tipping
	Gastroenterology	Co-extrusion, precision single lumens, multi-lumen, RF tipping
	Urology	Single lumen, multi-lumen, RF forming, Skiving and punching
	Surgery	High temperature materials, multi-lumen, precision single lumen
	Neurovascular	Braiding, co-extrusion, micro-extrusion, striping
	Structural Heart	RF tipping, over-jacketing extrusion, single lumen extrusion
	Fiber Optic	Telephone, internet, television, lasers, aerospace, submarine or watercraft

Control Section:

- Termination with PCB
- Assembly with Molding Components

Umbilical:

- Complex Cable
- Assembly with Strain Relief



Distal Tip:

- Vertical or fine pitch soldering for camera modules

Shaft:

- Micro coaxial cable (52AWG)
- Optical Fiber for lighting
- Working channel tubes

Safely Run Cables/Hoses in Flat Pods from Point A to Point B Without Kinking

- Self supporting design reduces install time, minimizes cable related downtime, endure maximum performance of the applications operating over it.
- Lower cost alternative to existing designs (meant for operating temperatures from < 80 deg. C)
- Ideal for short lengths (up to 5 meters)
- Quickly configure short runs and development trials
- Laminated option for high volume production
- Able to use lower cost inner core cabling due to PTFE seal

