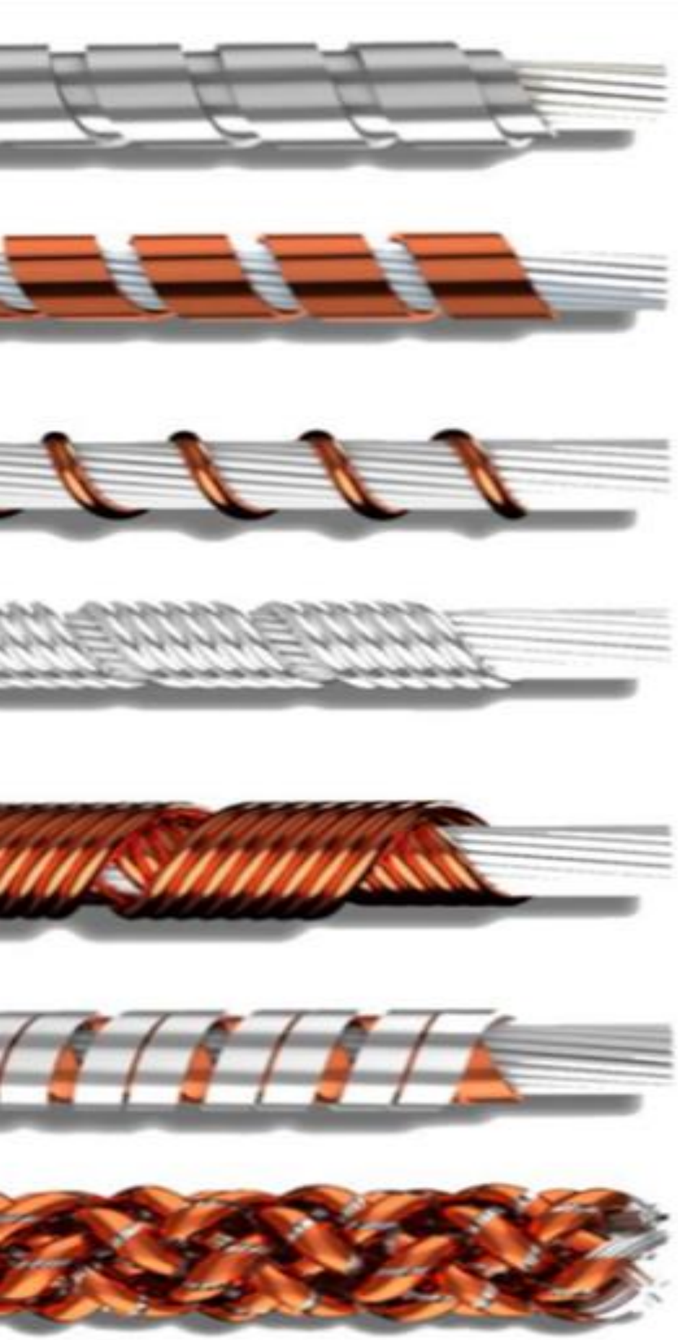
Maeden Innovation

Robot & Robotic Arm Application

MAEDEN Dynamic Conductor



at a glance

40+
Years

180
Employees

4
Locations

active

30+
Patents

600+
SKU

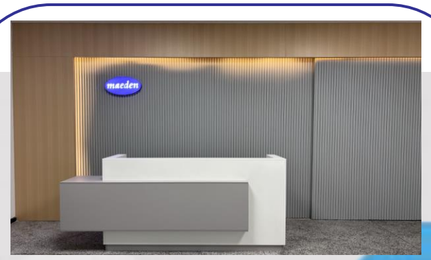
300+
Clients

achievement

5
Global Top 10 Companies

75%+
Automotive Speaker Market Share

GLOBAL PRESENCE



Dongguan
Branch office

Since 1999

- Sales 1
- Additional Process

Taipei
HQ & R&D Center

Since 2004

- R & D
- Sales 2
- Sales 3
- Sales 4
- Sales 5
- Customer service
- General affairs
- Accounting

NEW

Hai Duong
Manufacturing base

Since 2023

- Production
- Additional Process

TS-16949 in May 2024

Taoyung
Manufacturing base

Since 2015

- Production
- Reliability Lab

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- Company Intro
- Context: Robotic Shielding & Robotic Cable
- Robotic Arm
- Comparison chart with competitor
- What is Tinsel Conductor?
- Maeden’s Difference

Company Introduction

1981

Established in Taiwan

1999

Established China Donguan office

ISO 9001:2015

ISO 14001

ISO TS 16949

2016

Started operating Longtan Factory

2024

Vietnam Factory Start running

NOW

発展の歴史

CONTEXT

MAEDEN INNOVATION is a leading manufacturer of flexible conductors, specializing in dynamic applications and trusted by industry leaders for over 40 years. Our expertise spans five key categories: Automotive, Consumer Goods, Aerospace, Wearables, and RFID. Our products are integrated into a diverse range of applications, including speakers, wires & cables, silicone sensor tubes, antennas, robotic cables, and super flexible shielding tubes.
In the Robotic industry, we focus on two critical areas:

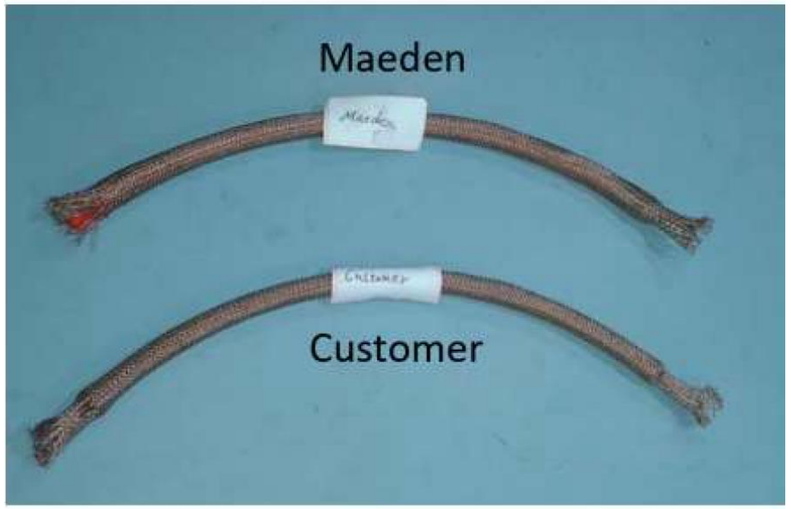
1. **Robotic Shielding:** Traditional copper shielding is heavy, prone to breakage, and can easily penetrate cables, leading to short circuits. Maeden's robotic shielding is 30-40% lighter, offers superior bending performance, and features break-resistant properties that prevent further damage upon breakage. This material is widely adopted for ultrasound and robotic cable shielding.

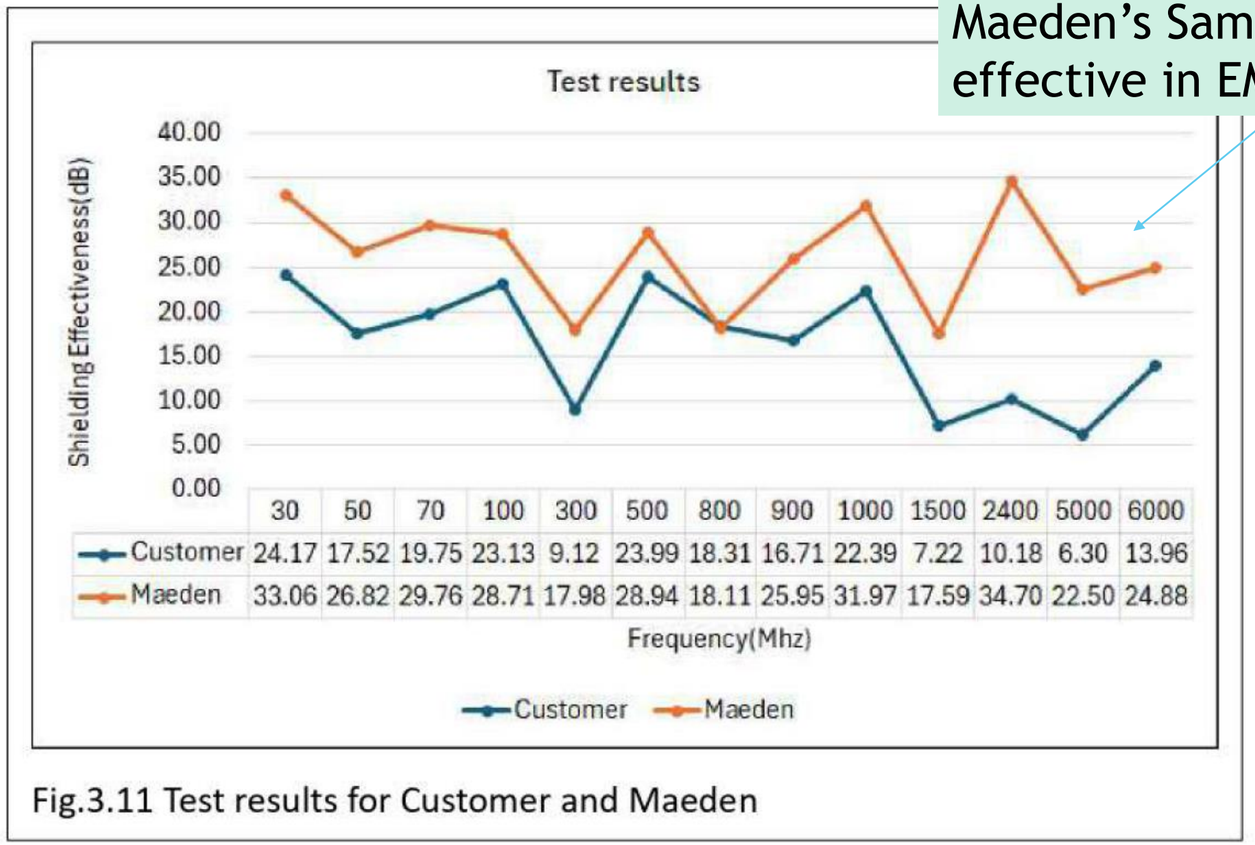
2. **Advanced Robotic Cables:** The next-generation robotic cables are designed to be thinner, lighter, and more durable. Maeden's flexible conductors are ideally suited for this sector, meeting customer demands for cables that withstand bending cycles ranging from 10 to 100 million cycles. Maeden has achieved exceptional performance scores in meeting these rigorous standards.

Maeden Robotic Shielding

Quality, Service, Solution

Why customer choose Maeden shielding material?





	30	50	70	100	300	500	800	900	1000	1500	2400	5000	6000
Customer	24.17	17.52	19.75	23.13	9.12	23.99	18.31	16.71	22.39	7.22	10.18	6.30	13.96
Maeden	33.06	26.82	29.76	28.71	17.98	28.94	18.11	25.95	31.97	17.59	34.70	22.50	24.88

Fig.3.11 Test results for Customer and Maeden

Maeden's Sample is more effective in EMI shielding

Maeden's product not only perform better in shielding effectiveness, but also save at least 30% of weight.

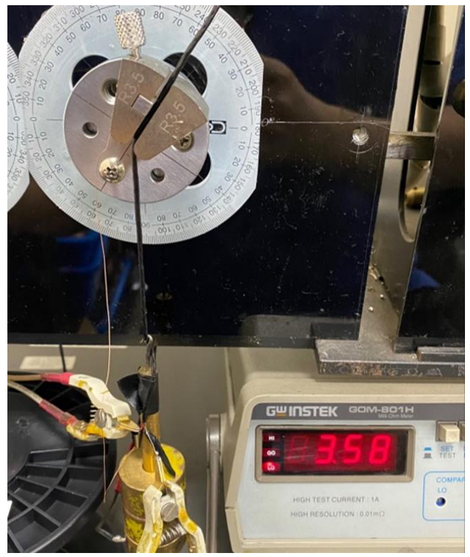
Test method	Copper tube												
Frequency(Hz)	30M	50M	70M	100M	300M	500M	800M	900M	1G	1.5G	2.4G	5G	6G
SE-customer(dB)	24.17	17.52	19.75	23.13	9.12	23.99	18.31	16.71	22.39	7.22	10.18	6.30	13.96
SE-Maedes(dB)	33.06	26.82	29.76	28.71	17.98	28.94	18.11	25.95	31.97	17.59	34.70	22.50	24.88

Maeden Advanced Robotic Cables

Quality, Service, Solution

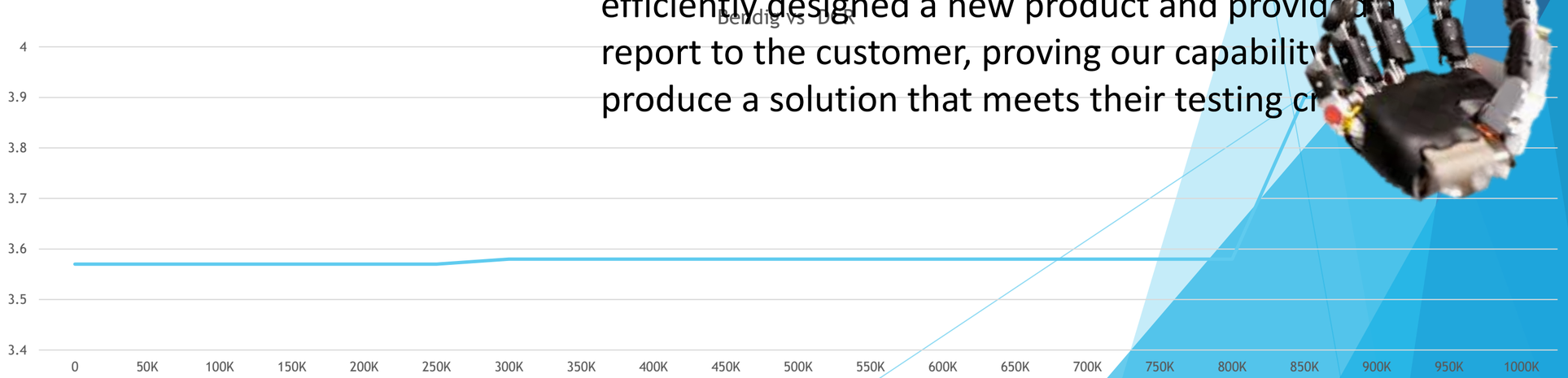
Conditions:
1.Bending radii: 3.5mm
2.Bending frequency:2 sec/cycle
3.Bending angle:90 degrees
4.bending load:300g

0	3.57
50K	3.57
100K	3.57
150K	3.57
200K	3.57
250K	3.57
300K	3.58
350K	3.58
400K	3.58
450K	3.58
500K	3.58
550K	3.58
600K	3.58
650K	3.58
700K	3.58
750K	3.58
800K	3.58
850K	3.9
900K	3.9
950K	3.9
1000K	3.9

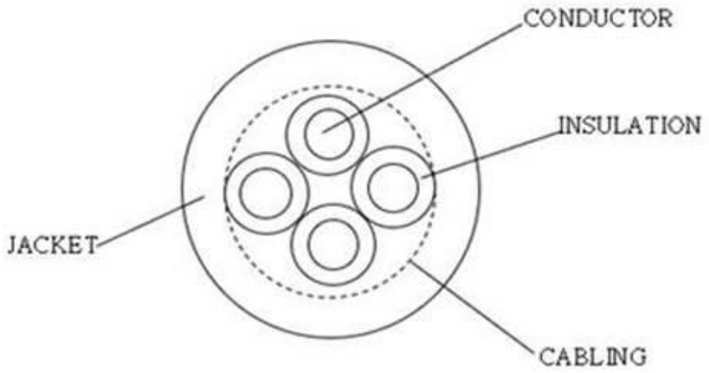


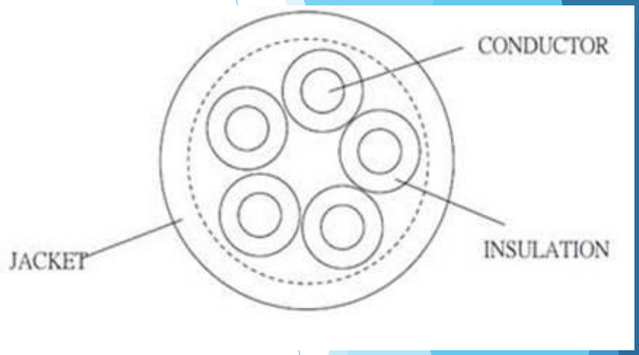
Many customers approach Maeden due to issues with wire breakage. We can configure our testing equipment based on customer requirements to demonstrate the performance differences compared to their current products.

For one particular customer, their existing robotic cable could not exceed 100,000 cycles, while their target performance was to reach 1,000,000 cycles. Maeden efficiently designed a new product and provided a report to the customer, proving our capability to produce a solution that meets their testing cr



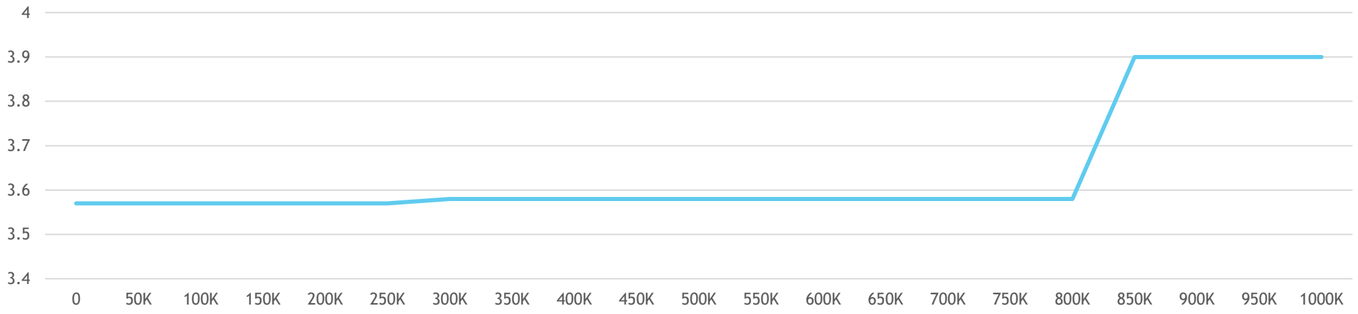
Robot Cable - unbreakable conductor wire





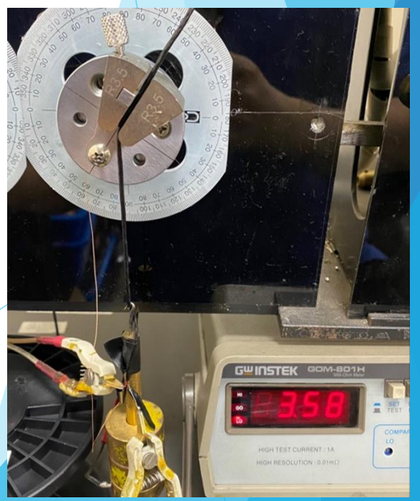
Finished Cable OC：under 2mm

Bendig vs DCR



Conditions:
1.Bending radius: 3.5mm
2.Bending frequency:2 sec/cycle
3.Bending angle:90 degrees
4.Bending load:300g

Resistance	Before	3.57 ohm
	After	3.9 ohm



Robotic Arm - tinsel as shields in cable

maeden
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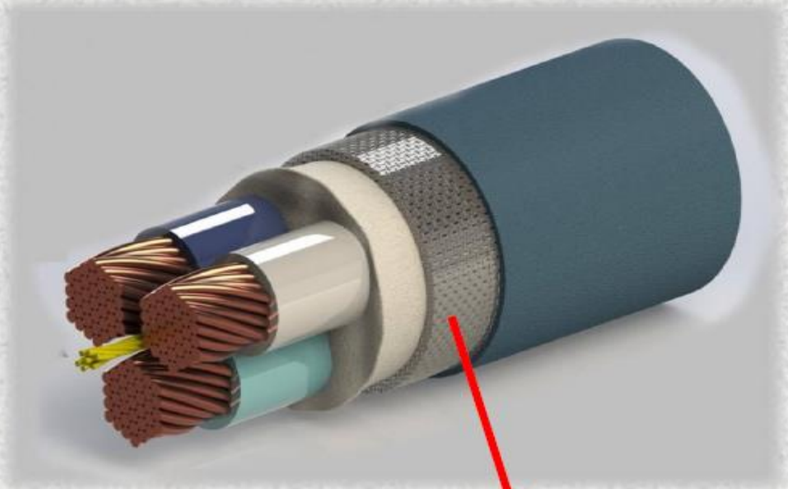
Dynamic Conductor

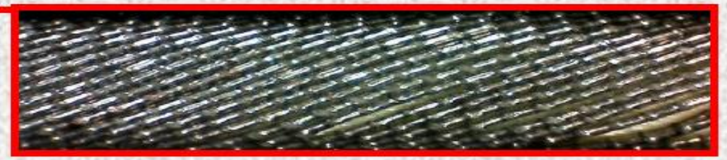
MAEDEN TINSEL WIRE SHIELDING

A type of shielding has maximum flexibility that no other type of shielding method can offer



Following are the merits of Maeden tinsel wire shielding :

- In the case shielding breakage, the tinsel wire shielding will not damage the inner structure of cable like the traditional spiral or braided copper shielding will, because each individual unit that forms tinsel wire shielding is made by thin tinsel foil strip and it will not form sharp edge when breaks.
- With the High tenacity textile that applied in the center of each individual tinsel core, the tinsel wire shielding offers long lasting durability and great tensile endurance, it also dramatic increase cable's softness and bending characteristic.
- Maeden's tinsel shielding is especially unique that can be made in various size with the smallest size down to 0.07mm. And we can customize with different materials to choose.
- With different material combination, even if the outside diameter is smaller, the performance can remain the same, or even better.
- Maeden's shielding can process without crimp while soldering. So it can improve the efficiency and also reduce the occurrence of lost.



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Robotic Arm - tinsel as shields in cable

Maeden Tinsel Wire - performance in different combination

		O.D	DCR	Broken	Elongation(%)	Soldering	Soldering	Soldering	Bending
		(mm)	(Ohm/M)	Load (Kg)		Pull Test (Kg) （250℃）	Pull Test (Kg) （300℃）	Pull Test (Kg) （350℃）	
Tinsel Wire	0.05mm 銀銅合金素線+ ポリエステル50D	0.11	17.1	0.38	7.06	0.272	0.051	0.049	1,306
0.11	0.05mm 銀銅合金素線+ 高張力繊維50D	0.12	17.4	0.83	4.4	0.075	0.067	0.061	1,727
	0.05mm 銀銅合金素線+ 耐高温高強力繊維50D	0.11	17.3	1.47	2.62	1.41	1.388	1.375	2,073
		O.D	DCR	Broken	Elongation(%)	Soldering	Soldering	Soldering	Bending
		(mm)	(Ohm/M)	Load (Kg)		Pull Test (Kg) （250℃）	Pull Test (Kg) （300℃）	Pull Test (Kg) （350℃）	
Tinsel Wire	0.05mm TA銅合金素線+ ポリエステル50D	0.11	14.75	0.38	7.53	0.222	0.043	0.04	626
0.11	0.05mm TA銅合金素線+ 高張力繊維50D	0.12	15.45	0.85	4.67	0.04	0.04	0.038	1,014
	0.05mm TA銅合金素線+ 耐高温高強力繊維50D	0.11	14.7	1.48	2.45	1.38	1.323	1.33	1,198
		O.D	DCR	Broken	Elongation(%)	Soldering	Soldering	Soldering	Bending
		(mm)	(Ohm/M)	Load (Kg)		Pull Test (Kg) （250℃）	Pull Test (Kg) （300℃）	Pull Test (Kg) （350℃）	
Tinsel Wire	0.05mm 錫銅合金素線+ ポリエステル50D	0.11	20.5	0.4	7.62	0.23	0.04	0.043	581
0.11	0.05mm 錫銅合金素線+ 高張力繊維50D	0.12	22.1	0.87	4.19	0.045	0.04	0.042	976
	0.05mm 錫銅合金素線+ 耐高温高強力繊維50D	0.11	21.2	1.52	2.74	1.43	1.385	1.35	1,104

Robotic Arm - tinsel as shields in cable

SHIELD MATERIAL COMPARISON								
Shield Material	Shield Effectiveness (Low Frequency)	Shield Effectiveness (High Frequency)	Flexibility	Strength	Soldering Ability	Weight	M /KG (Mylar as base)	Price
Copper	Good	Good	Fair	Fair	OK	Medium	6 times	Cheap
Aluminum Mylar	Good	Good	Poor	Poor	Bad	Medium	1time	Cheap
Aracon®	Excellent	Excellent	Good	Excellent	OK	Light	2.5 times	Expensive
Maeden Tinsel Wire	Excellent	Excellent	Excellent	Good	OK	Lightest	12 times	Competitive

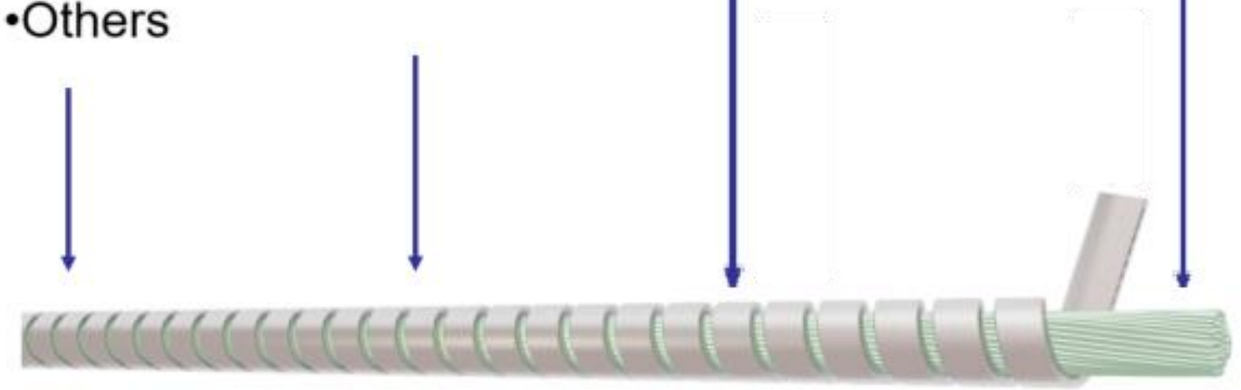
WHAT IS TINSEL CONDUCTOR ?

METALS
- Pure copper
- Copper alloy
- Ohno Continuous Cast
- Others

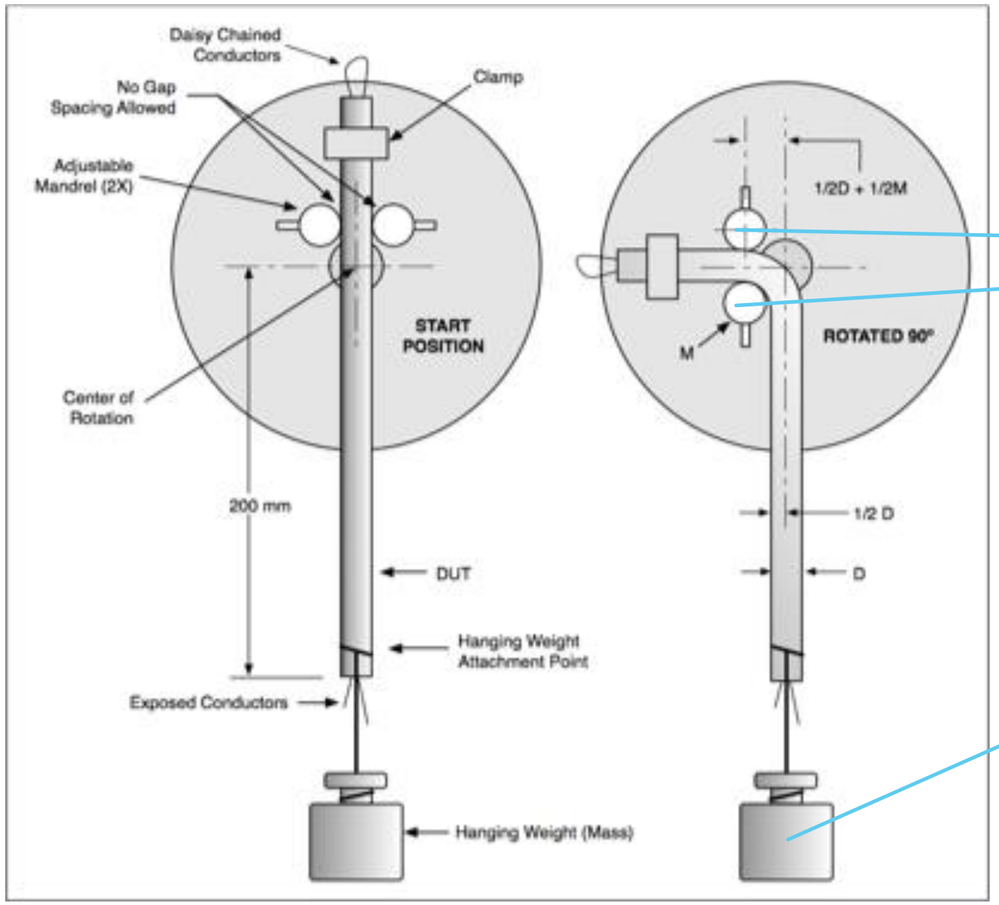
PLATING
- Tin
- Silver
- Nickel
- BG

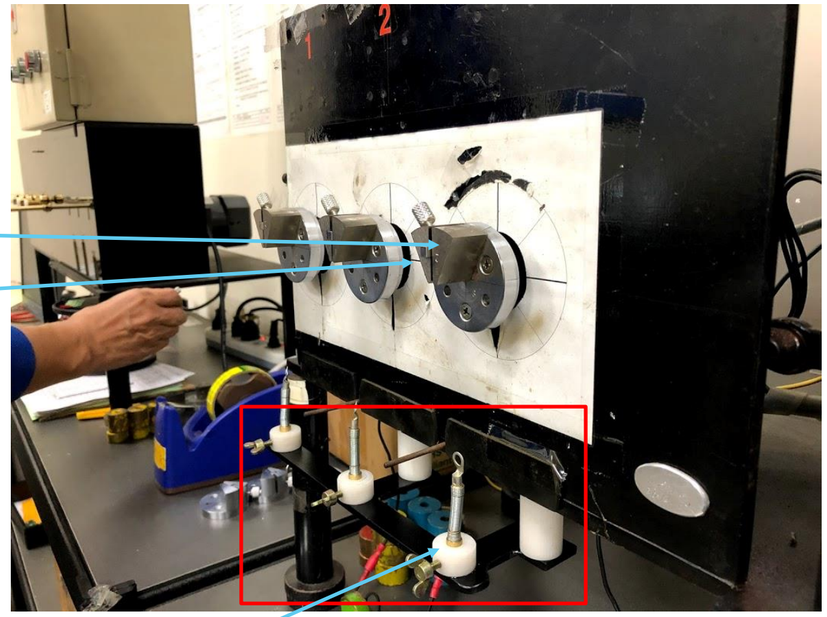
TREATMENT
- Anti-Corrosion
- Non-inflammable
- Others

FIBERS
- Kevlar®
- Technora®
- Zxion®
- Vectran®



90 deg Bending Test (100g load/ 1mm mandrel radius)





Upgrade to use spring instead of weight for more stable pulling result.
Bending: 30 RPM

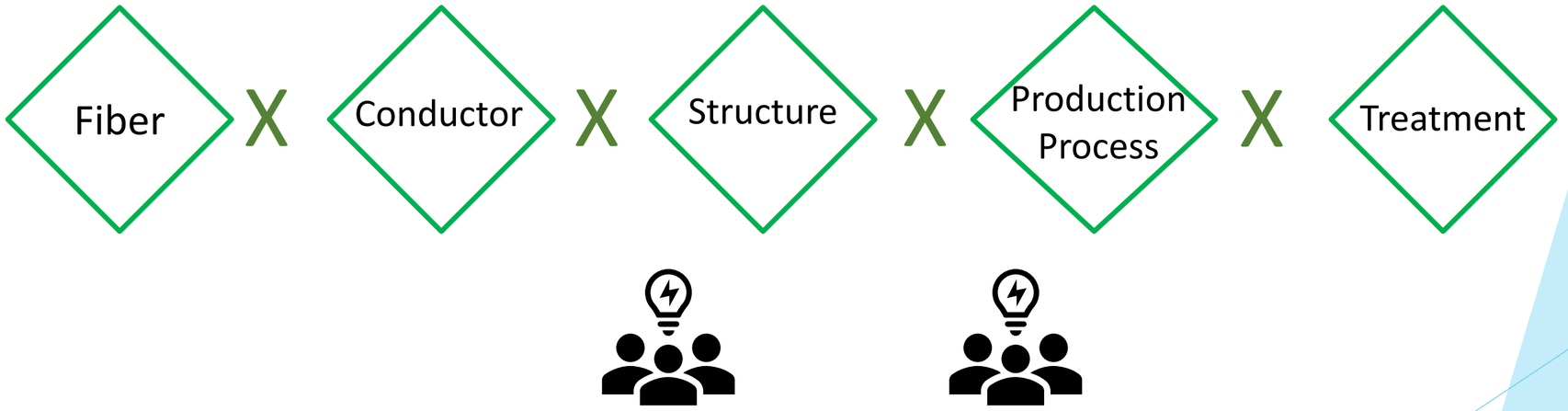
Maeden's Difference

MAEDEN
Dynamic Conductor

Value and Features

Offering Total Solutions of Technological Development

- New proposal with new design and technology to meet customers' request
- Reliability Test
- Improvement proposal for current spec, quality, lead time



Avg. more than 20 years experience R&D team X Basic and Advanced research engineers

Maeden's Difference

Business

MAEDEN
Dynamic Conductor

High Reliability & Technical Services

Bending | Twisting | Circling | Pulling | Pushing

Application

Speaker | Earphone | Data Cable | Security Cable | Medical | Robot | Smart Wear

Used in various fields

Thank You

Innovated Wire Technology