

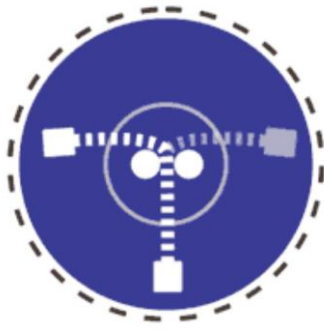


# Maeden Innovation

**FOR: Wearable Application**



## High Reliability & Technical Services



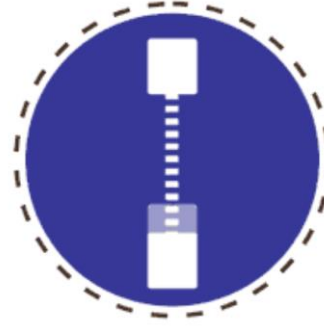
Bending



Twisting



Circling



Pulling



Pushing

### Application



Speaker



Earphone



Data Cable



Security Cable



Medical



Robot



Smart Wear

Used in various fields

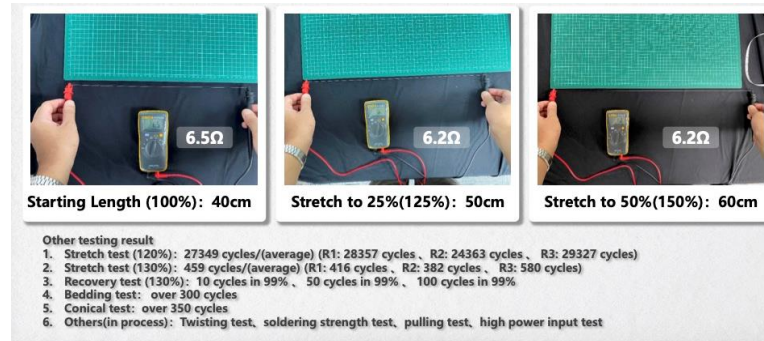
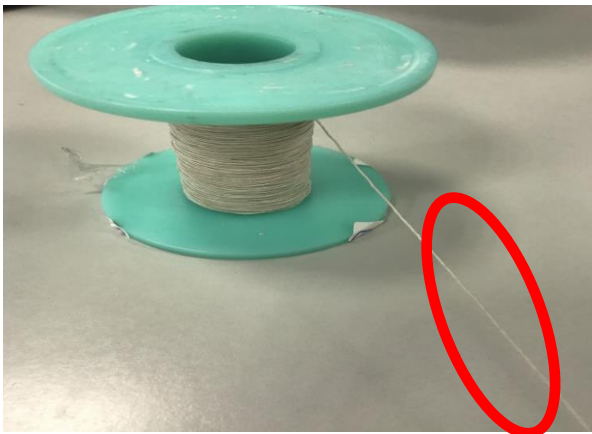


# Advantages

**MAEDEN**  
Dynamic Conductor

maeden

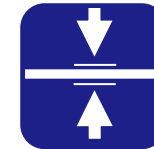
- Product can be washed
- Conductor resistance remain unchanged when stretch
- High durability test
- Conductor resistance can be modified
- Works well with stretchable and recovery adhesives
- Direct line design to reduce conductor resistance and
- Thin outside diameter



**Stretch up to 40%**



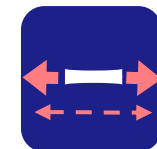
Temperature



OD



Soldering

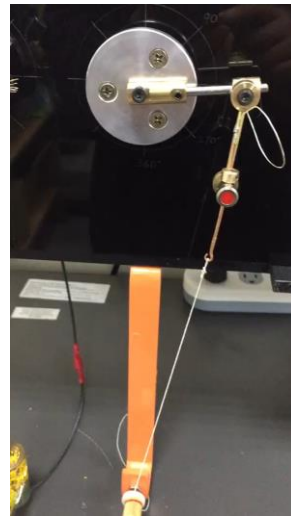


Stretching



Bending

maeden

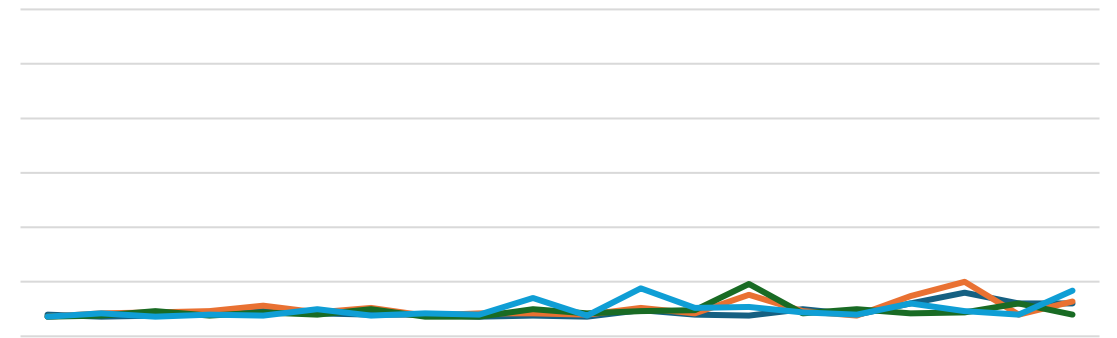


- At Maeden, durability and performance are our top priorities. Our goal is not only to create innovative products but also to ensure they can endure extensive use and rigorous testing. To achieve this, we have developed numerous testing equipment specifically for stretch conductors, allowing us to continually refine and enhance our products.

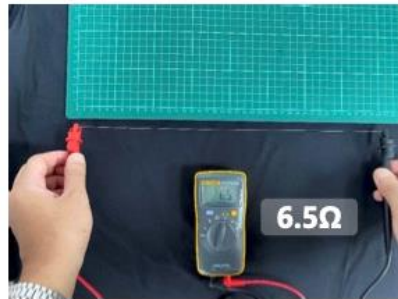


# Washing TEST AATCC135

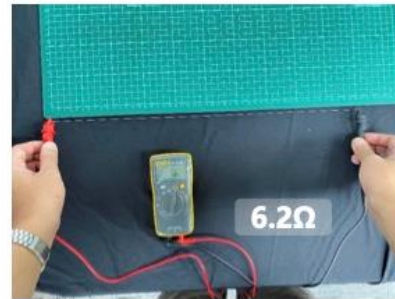
MAEDEN  
Dynamic Conductor



— 線包覆1 — 線包覆2 — 線外露1 — 線外露2



**Starting Length (100%): 40cm**



**Stretch to 25%(125%): 50cm**



**Stretch to 50%(150%): 60cm**

**Other testing result**

1. Stretch test (120%): 27349 cycles/(average) (R1: 28357 cycles 、 R2: 24363 cycles 、 R3: 29327 cycles)
2. Stretch test (130%): 459 cycles/(average) (R1: 416 cycles 、 R2: 382 cycles 、 R3: 580 cycles)
3. Recovery test (130%): 10 cycles in 99% 、 50 cycles in 99% 、 100 cycles in 99%
4. Bedding test: over 300 cycles
5. Conical test: over 350 cycles
6. Others(in process): Twisting test, soldering strength test, pulling test, high power input test

Model	OD(mm)	DCR (1M)	DCR(1.5M)	DCR(2M)	Strength(1)	Strength(2)	Average Strength(KG)	Bending	Bending	Bending	Bending
CAG0216JA(SZ)	0.43~0.51	14.98	15.08	15.19	0.6	0.55	0.575	401	359	297	352
CG0216JJ(SZ)	0.38~0.45	14.8	14.91	15.1	0.5	0.55	0.525	318	426	156	300
CG0216JK(SZ)	0.55~0.72	29.1	30.9	33.5	1.05	1.1	1.075	1692	2751	1795	2079
CAG0216JC(SZ)	0.6~0.75	28.4	28.4	28.5	1.1	1.2	1.15	2752	3109	4083	3315

# Testing Data

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Dynamic Conductor

*maeden*

CG02XXJL(SZ)&CG02XXJK(SZ) non-insulated

## • Pulling Fatigue Testing

	Customer	Maeden JK	Maeden JL
Test 1	189	16,883	**9,000
Test 2	383	*117,546	5,639
Test 3	355	5,128	19,507
Test 4	199	-	-
Average reps	277	46,519	11,382

\*The reps are a sum of two counts which is considered too high and untrustable

\*\*The reps are underestimated because the counting system shut down at some point in time after this number was checked3




# Testing data-cont'



## • Tension and Elongation Testing

-5 cm

variable 	Customer	Maeden JK	Maeden JL
Breaking force	12 N	8.4 N	11.2 N
Breaking length	19 cm	24 cm	21 cm
Breaking elongation	280%	380%	320%

-10 cm

variable	Customer	Maeden JK	Maeden JL
Breaking force	11.9 N	15.2 N	17.2 N
Breaking length	33 cm	46 cm	41 cm
Breaking elongation	230%	360%	310%

-15 cm

variable	Customer	Maeden JK	Maeden JL
Breaking force	11.1 N	12.3 N	19.3 N
Breaking length	35 cm	57 cm	54 cm
Breaking elongation	133%	280%	260%

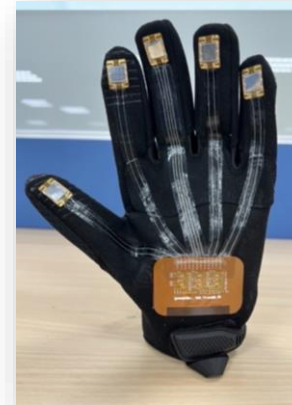
-20 cm

variable	Customer	Maeden JK	Maeden JL
Breaking force	12.8 N	10.8 N	18.8 N
Breaking length	56 cm	74 cm	75 cm
Breaking elongation	180%	270%	275%





Motion Tracking



Gloves

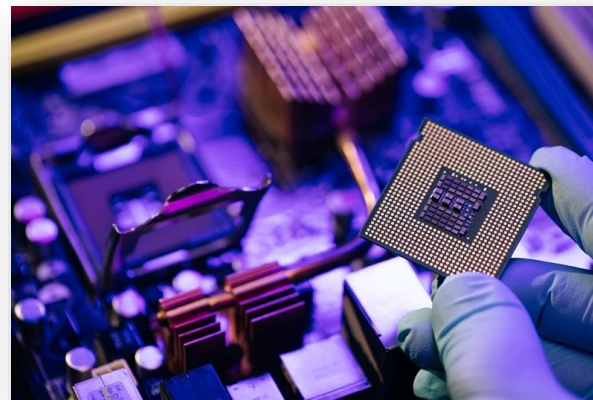
EMS



Motion Tracking

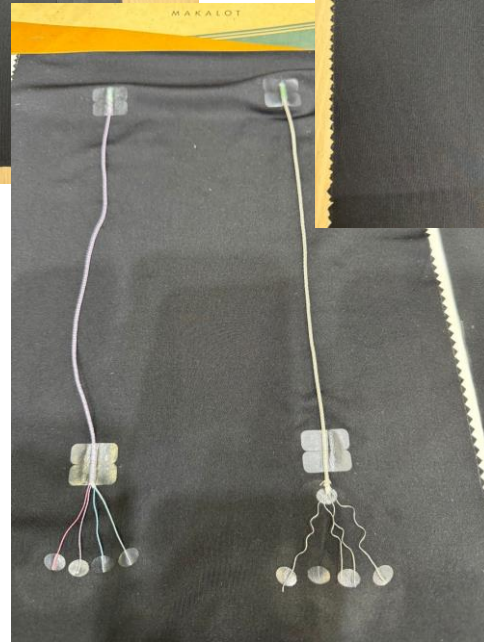
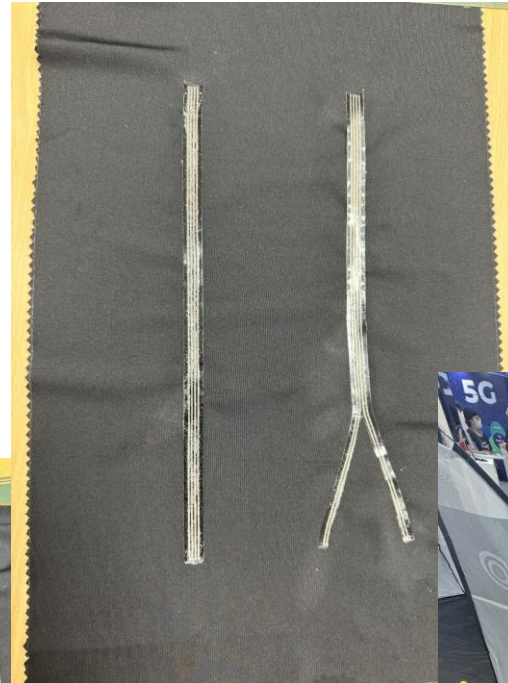


Semi-Con



# Best Choice Award at Computex 2024

**MAEDEN**  
Dynamic Conductor





經濟日報 > 商情 > 國際現場

## 全球首創：前電科創研發出專為智慧服飾 打造的彈性導體

本文共1805字



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MediaOutReach 媒體拓展/贊助 讚 0

世界第一大導線製造廠，成功創造出全球唯一，伸縮也不會改變電阻的的  
彈性導體

台北，台灣 - Media OutReach Newswire - 2024年1月3日 - 智慧穿戴裝置  
是未來發展趨勢的重點項目，近幾年人們對於監控自身生理資訊的意識高  
漲，智慧型手錶、穿戴式監測器在市場上的熱度不減。

儘管智慧衣物受到關注，但在面對人體運動與衣物水洗的需求時，維持導  
體訊號的穩定傳遞成為製造商的挑戰之一。然而，前電科創股份有限公司

onto a commercial helmet liner as a football helmet equipped with an impact sensor. They aimed to detect potentially severe head impacts to alert the wearer of a potential concussion with a real-time warning system. Such wearables can prevent and manage traumatic brain injury prevalent in collision sports, for the early detection and treatment of potential head impacts or concussions.

The measurement setup contained a football helmet equipped with an accelerometer, microcontroller, relay and power supplier. The structure also maintained a stretchable helmet liner with light-emitting pixels, for real-time detection of impact severity.

The team applied mechanical impacts to a mannequin head with a dumbbell and classified the severity as mild, moderate or severe. The experiments showed how the mechanical impact on the head could be visualised to detect early concussion management in sports or in situations that include the risk of danger in daily life.

### Outlook

In this study, the researchers present a versatile concept for crafting light-emitting textiles with multicolour EL threads and transparent conductive fibres that are compatible with standard embroidery machines.

These threads were thinner and more durable for machine embroidery with adjustable colours, luminescent intensities and pixel positions to attain higher versatility and creative potential to meet a range of applications.

The proof-of-concept, light-emitting textiles emphasise the integration of safer power mechanisms and insulation strategies to ensure the safety and practicality of the wearable electronics.

The team suggests the inclusion of a circuit driver specifically tailored for power supply to meticulously regulate the voltage, frequency and waveform. This setup can be used to display real-time measurements of collisions as an ideal solution for health-related applications and to visualise data.

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LOTHING

the elastic conductor  
clothing

仁寶  
袋、較

on smart clothing, especially  
biological data, manufacturers face  
stable signal transmission in  
human movement and the

manufacturer says it has now  
achieved stable resistance even



Image: Maeden

when stretched.

After two years of research and development (R&D), Maeden has created an elastic wire capable of enduring washing in water and stretching without altering its resistance.

In the early stages of technical development, the research team encountered impediments related to the washing requirements of smart clothing, facing issues where stretching the wire led to resistance variations, resulting in unstable signal reception.

Products offering vibrational haptic feedback, such as virtual reality wear or gloves, faced similar challenges. If the conductor could not withstand vibrations or stretching in such equipment, it posed a risk of malfunction during usage.

Maeden's chief operating officer Ian Ko said overcoming these technical hurdles would result in a highly differentiated product in the market.

### Aesthetics for user comfort

Ultimately, the company was able to develop elastic wires in clothing that can withstand water exposure and stretching, at the same time maintaining aesthetics for user comfort.

Maeden achieved its first technological breakthrough, ensuring its elastic wire meets smart apparel standards. Additionally, it passed the ISO 6330 100 washes and AATCC 135 200 washes tests, proving its ability to withstand human movement, ease of cleaning and functionality while also assisting clients in obtaining US Food and Drug Administration certification.

The second breakthrough lies in the fact that many conductors in the market fail to return to their original state after stretching. Ko said: "With Maeden's current technical specifications, these ultra-fine elastic conductors, with a diameter of approximately 0.2 mm, exhibit a resistance of 6.5  $\Omega$  /m. They can be stretched up to 50%, and once reaching maximum stretch, not only do they not slacken, but they also completely revert to their initial length."

As a result, the company has effectively achieved conductor elongation and stretching while maintaining stable resistance.

Ko added that the company is advancing towards developing conductors of varying thicknesses and stretch rates to meet the diverse demands of the market. Moreover, Maeden's reliability tests have received accreditation from numerous renowned international giants.

Presently, efforts are underway to develop new verification

### 編輯精選

外媒解析 2024

德國、美國、日本



# Thank You

*Innovated Wire Technology*