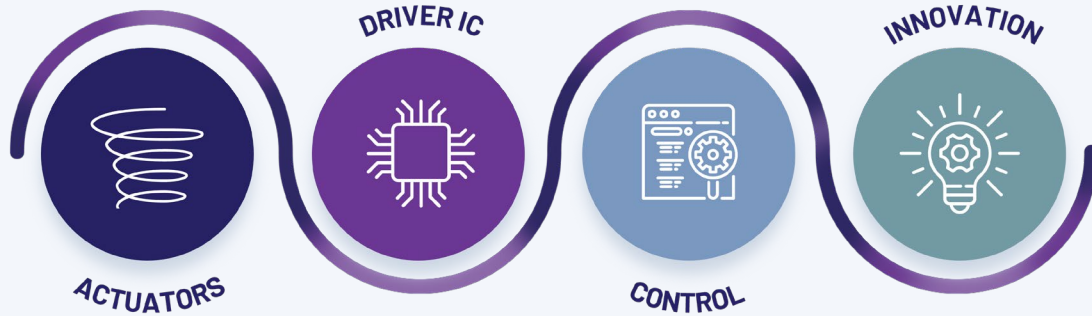




INTRODUCTION TO CAMBRIDGE MECHATRONICS

WORLD LEADER IN SMA ACTUATOR DESIGN AND CONTROL

This booklet provides an introduction to the company, its leadership team, the technology & products as well as the people that make up our community.



ABOUT CAMBRIDGE MECHATRONICS

Cambridge Mechatronics Limited is the world leader in the development of mechanical, optical, electrical, controller silicon and software designs for system-level actuator solutions, using its Shape Memory Alloy (SMA) platform technology. Based on its patented technology, compact SMA actuators can be controlled to sub-micron accuracy. These actuators are particularly suited to applications that require high levels of precision and force, in a fast, compact and lightweight design.

Cambridge Mechatronics is the only company in the world to master the precise control of SMA wire and has developed a variety of SMA-based actuator solutions and dedicated controller chips for use across a variety of markets, including smartphones, AR/VR, medical devices and more.

Welcome messages from our Managing Directors



Andy Osmant, Co-Managing Director

"Welcome to the Cambridge Mechatronics company brochure, which I hope gives you a great insight into our company, the potential of SMA actuator technology, and the products we have developed. We are especially proud of our history of innovation and successes with all our customers and are looking forward to continued growth and opportunities."



Andrew Bickley, Co-Managing Director: Global Sales & Marketing

"Cambridge Mechatronics offers its customers a total system solution comprising actuator design and control software & hardware. We have very dedicated and talented teams of engineers across our global offices who support our growing customer base, and we are excited about our current and future product offerings."

COMPANY HISTORY

1995:

Cambridge Mechatronics was founded by Cambridge academic Tony Hooley as **1...Limited**, with the aim of creating the world's best first digital sound projector.

2008:

The company name was changed to **Cambridge Mechatronics Ltd.**, reflecting its new focus on developing smartphone camera autofocus (AF) and optical image stabilisation (OIS) actuator designs and control.

2017-2019:

Cambridge Mechatronics signs **four license agreements** for SMA actuator production in China.

2024:

Cambridge Mechatronics achieves **>800** pending & granted patents, **>80 million** SMA actuators shipped in **>55 unique products**.

2015:

Foxconn International Holdings launches first smartphones using **CML's OIS actuator** technology under the InFocus brand.



2019:

Huawei uses **SMA Lens Shift OIS** in the P30 Pro - the first high-volume handset to feature SMA.



2021:

Huawei Mate 40 Pro Porsche is the first handset launched with the **SMA Lens Shift AF+OIS** product.



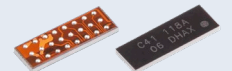
2021/2022:

First **SMA product launches** with Honor, Xiaomi, Oppo, Meizu, ASUS and Fairphone.



2023:

CM824 driver IC samples become available.



TECHNOLOGY AND PRODUCTS

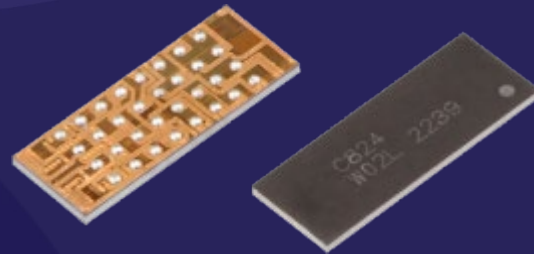
CAMBRIDGE MECHATRONICS' SMA PLATFORM TECHNOLOGY

Smartphone customers want high-quality image and video capture, free from motion blur, distortion and noise.

Cambridge Mechatronics' SMA actuators and controller ICs enable the highest performance autofocus (AF), optical image stabilisation (OIS) and continuous variable aperture (CVA) in leading smartphone cameras.



SMA LENS SHIFT AF+OIS



CM824 SMA CONTROLLER IC

SMA actuator technology offers **significant benefits** through an unparalleled combination of high force-to-mass ratio and precision, in a compact, low-power design, free of EMI.



HIGH
FORCE



ABILITY TO MOVE
HEAVIER CAMERA ELEMENTS



COMPACT AND
LOW MASS



OCCUPIES LESS SPACE
IN THE END PRODUCT



LOW POWER AND
LOW VOLTAGE



LONGER BATTERY LIFE



PRECISE AND SILENT
POSITIONING



ACCURATE MOVEMENT
WITHOUT DISTRACTING
NOISES



NO ELECTROMAGNETIC
INTERFERENCE (EMI)



NO IMPACT TO EMI
SENSITIVE AND MAGNETIC
COMPONENTS

SMA TECHNOLOGIES

Cambridge Mechatronics has developed a number of fundamental actuator designs with associated control algorithms. These form the basis of our current product range.

All Cambridge Mechatronics' fundamental designs enjoy extensive IP protection, and our SMA products may comprise a combination of these technologies.

TECHNOLOGY

DESIGN

KEY ATTRIBUTES

4-Wire



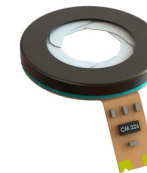
- 4 SMA wires in a flat and square configuration
- X, Y shift and roll motion (Rz) can be achieved
- Very mature (10s of millions shipped)

8-Wire



- Comprises 2 wires on each side of a square configuration, in a shallow 'X' shape, to make up 8 SMA wires in total
- Ability to control all 6 degrees of freedom, including XYZ translation and tilt
- Very economical use of components and manufacturing steps

Zero Hold Power



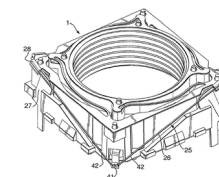
- Enables designs where power is only applied when a positional change is required
- For applications where intermittent position adjustment is required, the ZHP technology substantially reduces the average power consumption

Helical



- Low height design using 2 horizontal SMA wires
- The opposing SMA wire configuration allows for fast step transitions

Angled V

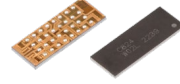




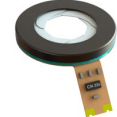



- Uses an SMA wire hooked around the moving portion of the actuator at one corner to form an angled 'V'
- The design maximises the SMA wire length ensuring that the range of motion of the lens meets industry requirements for infinity and macro focus

SMA HANDSET CAMERA PRODUCTS

Smartphone cameras are getting larger and capable of more functionality.

Larger, heavier lenses and other components, such as a variable aperture, drive the demand for a high-force technology like the SMA products provided by Cambridge Mechatronics.















PRODUCT	KEY FEATURES	DESIGN	KEY ATTRIBUTES
<u>CM824 DRIVER IC</u>	Developed by SMA experts		<ul style="list-style-type: none"> ▪ Ultimate system control and performance ▪ Fastest system integration & support
<u>SMA LENS SHIFT AF+OIS</u>	World's first AF + OIS integrated single actuator		<ul style="list-style-type: none"> ▪ Cost-effective & simpler design ▪ Unified AF & OIS control & integration. ▪ Z-Height Efficiency
<u>SMA LENS SHIFT OIS</u>	Tried and tested mature, high force, non-magnetic OIS actuator		<ul style="list-style-type: none"> ▪ Product maturity & proven track record ▪ Simplicity of design ▪ Compatibility with new cameras
<u>SMA MODULE TILT OIS</u>	High angle suppression for a new era of high-quality movies		<ul style="list-style-type: none"> ▪ Higher compensation angles ▪ Uniform suppression across the image ▪ Roll Capability
<u>SMA SENSOR SHIFT OIS</u>	Flagship camera spec, including roll suppression .		<ul style="list-style-type: none"> ▪ Extra compensation axis: roll motion ▪ Well suited for larger format sensors ▪ Integration compatibility for telephoto
<u>SMA VARIABLE APERTURE</u>	Very low mass, low power actuator delivering depth of field control		<ul style="list-style-type: none"> ▪ Energy efficient ▪ No lens heating ▪ Compact and lightweight design
<u>SMA AF</u>	Lowest Z-height product available		<ul style="list-style-type: none"> ▪ Design flexibility ▪ Integration compatibility

DXOMARK #1 RANK



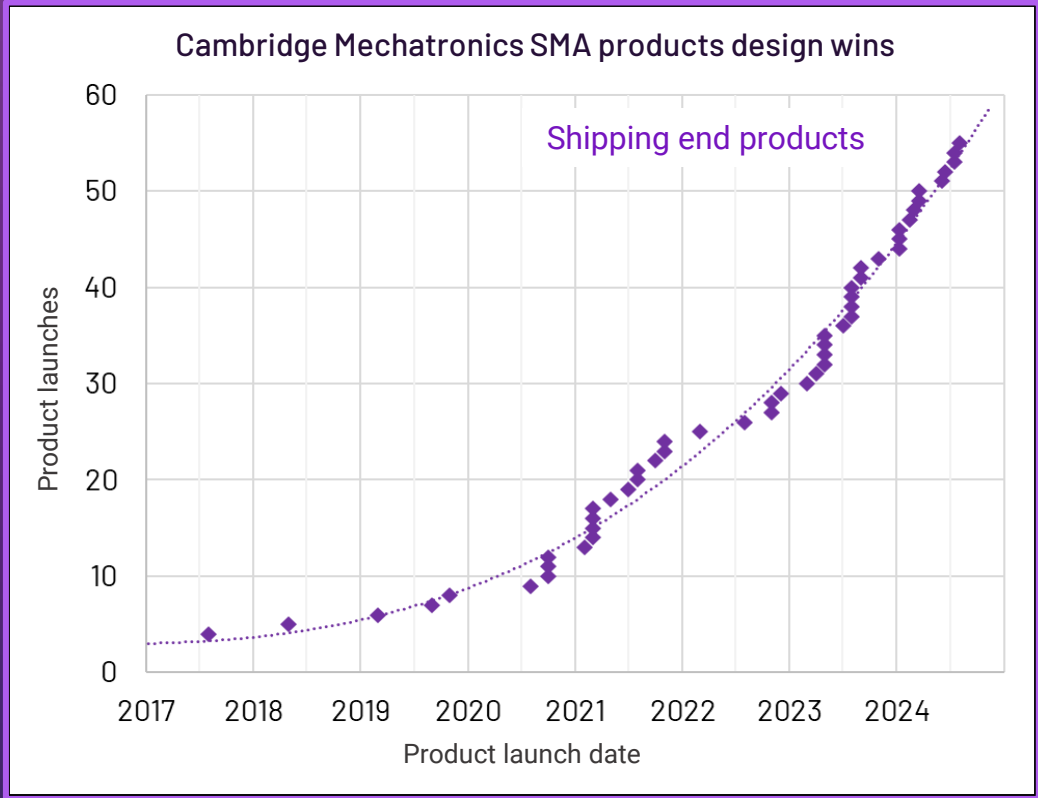
DXOMARK is an internationally recognised independent agency which tests and ranks smartphone cameras based on their performance. The DXOMARK scores, backed up by exhaustive protocols that gather hundreds of measurements run in DXOMARK's state-of-the-art laboratories, reflect the handset's performance and the quality of the user experience.

SMA-enabled smartphone cameras are regularly achieving the **#1 DXOMARK global ranking**.

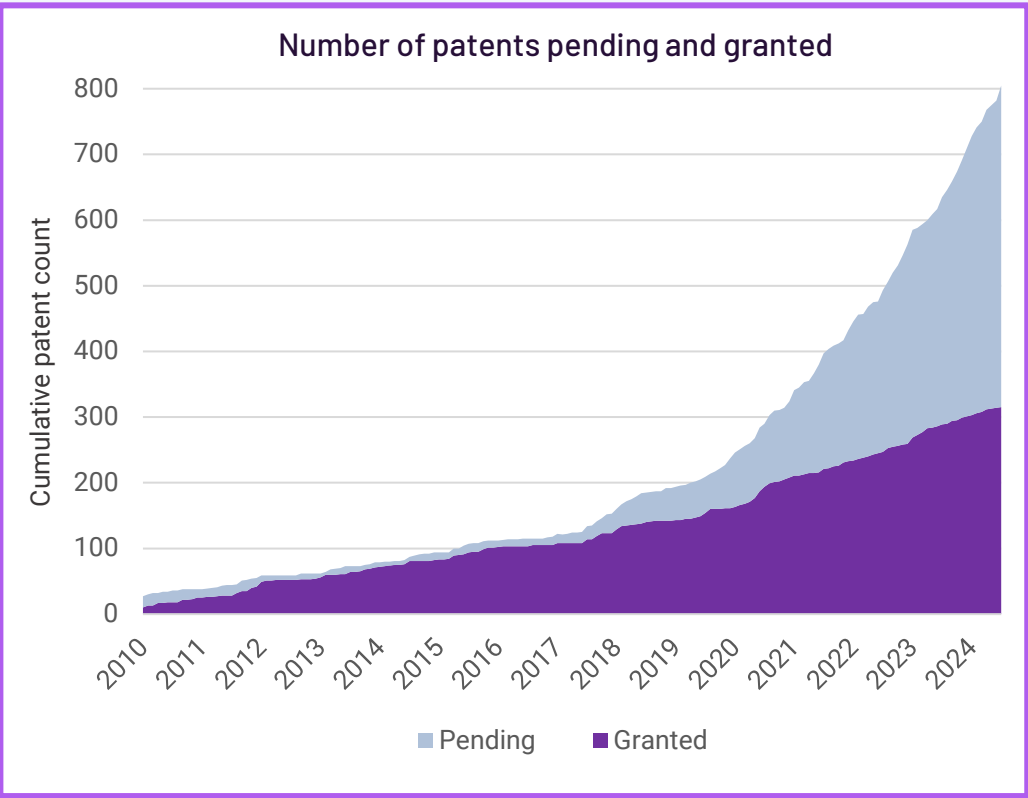
HANDSET	SMA PRODUCT	#1 RANK DATE	SCORE
Honor Magic6 Pro	LENS SHIFT AF+OIS	February 2024	 158 CAMERA  GOLD 2024
Huawei Mate 60 Pro+	LENS SHIFT AF+OIS	September 2023	 157 CAMERA  GOLD 2024
Huawei P60 Pro	LENS SHIFT AF+OIS	March 2023	 156 CAMERA  GOLD 2023
Huawei Mate 50 Pro	LENS SHIFT AF+OIS	September 2022	 149 CAMERA  GOLD 2022
Huawei P50 Pro	LENS SHIFT OIS	July 2021	 143 CAMERA  GOLD 2021
Huawei Mate 40 Pro+	LENS SHIFT OIS	October 2020	 139 CAMERA  GOLD 2020
Huawei P30 Pro	LENS SHIFT OIS	March 2019	 116 CAMERA  GOLD 2019

CAMBRIDGE MECHATRONICS FACTS AND FIGURES

Cambridge Mechatronics’ licensees have shipped over 80 million SMA actuators in the past 5 years in over 55 end-products. The majority of these are smartphone handsets, but also include wearables.



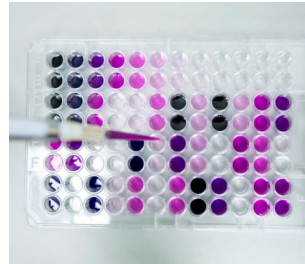
Developing Intellectual Property is at the heart of our DNA. Cambridge Mechatronics consistently features in the UK Patent Office top 50 companies for patents filed and submitted.



OTHER INDUSTRIES

Cambridge Mechatronics is diversifying its product range to extend beyond smartphone and camera applications.

Medical, XR and haptics are just some of the application areas where CML has recognised commercial opportunities based on the technological advantages of SMA.



Medical pump applications

Insulin patch pumps - SMA enables smaller and lighter patch pumps with higher precision and control, allowing for a high dynamic range of insulin delivery that can support the accurate dosage of ultra-concentrated insulin.

Medical optics applications

SMA can be used to enhance and automate microscopy imaging and provide stable footage for head-worn cameras during surgery.

Extended Reality

Applications include solutions for display resolution enhancement and dynamic focal adjustments with Zero Hold Power technology solutions.

Haptics

SMA can deliver localised haptic feedback, providing a range of realistic and immersive localised tactile sensations, while also lowering energy consumption.



LEADERSHIP TEAM

With a strong emphasis on innovation and strategic growth, the leadership team at Cambridge Mechatronics, drives the company's success, fostering a culture of creativity, collaboration and excellence in SMA technology development.



Jörgen Lantto
Chairman



Andy Osmant
Co-Managing Director



Andrew Bickley
Co-Managing Director



Ben Brown
Chief Technology Officer



Dominic Webber
Senior Director Business Development



Edwin Shiu
Strategic Planning
Director and General
Manager Greater China

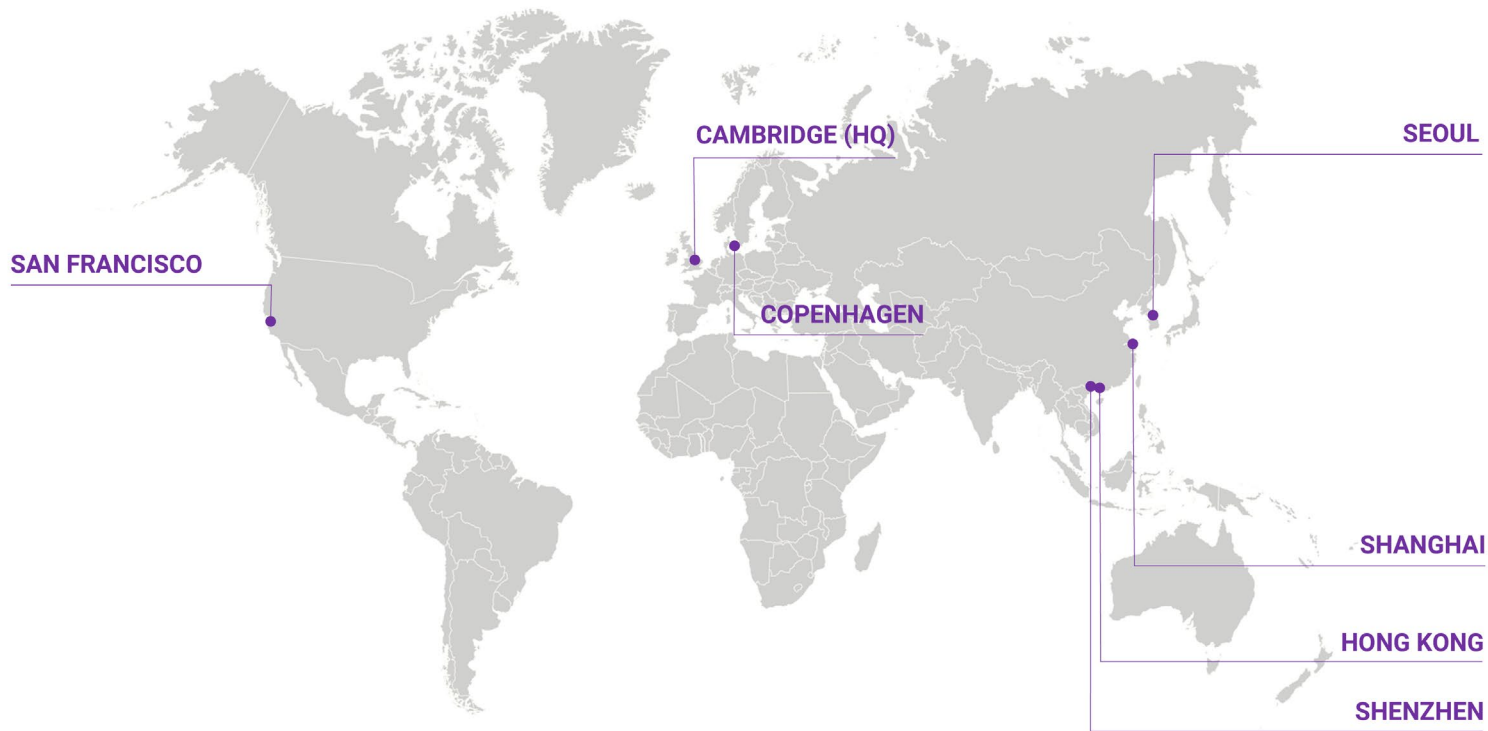


Steve Ede
Director of Silicon and
Commercial Partnerships

GLOBAL PRESENCE

Whilst the HQ for Cambridge Mechatronics is firmly rooted in Cambridge, UK, the company has global office locations in order to best support its customer base.

Having local specialist expertise is critical to provide optimal customer support.



LOCATION	FUNCTIONS
Cambridge HQ	R&D, Customer Support, Administrative, IP, Sales & Marketing
Copenhagen	R&D
Shenzhen	Customer Support, Administrative, Sales
Shanghai	Customer Support, Sales
Hong Kong	Sales, Logistics Support
Seoul	Business Development, Customer Support
San Francisco	Business Development

LIFE AT CAMBRIDGE MECHATRONICS

Working at Cambridge Mechatronics encompasses everything from fundamental R&D, innovation and product design & testing, to customer support, problem-solving, competitor analysis and sales & marketing.

But we also know how to have fun. We enjoy team dinners and participate in a number of company sports teams, company outings and festive traditions.

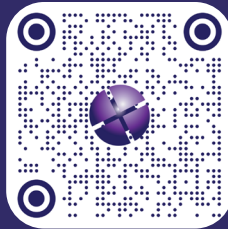


**CAMBRIDGE
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