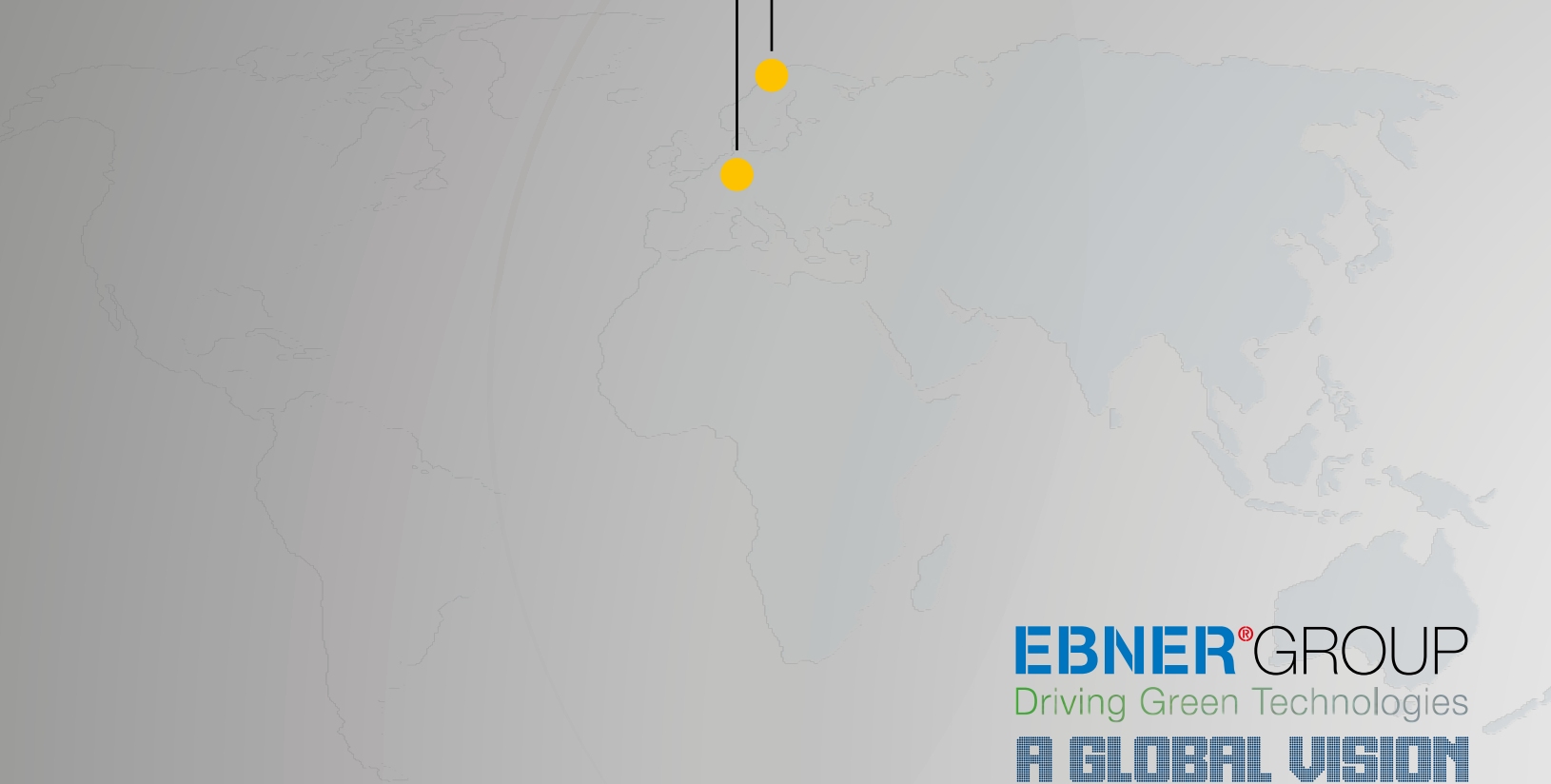


FAMETEC



ARCTICSapphire



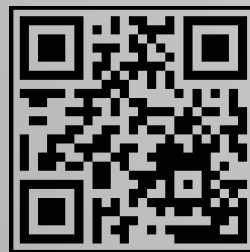
EBNER GROUP
Driving Green Technologies
A GLOBAL VISION

WORLD

ENLARGE
YOUR
VISION

ENLARGE YOUR VISION.

GET IN TOUCH



Explore
www.fametec.co



Mail
sales@fametec.co

LEAPING FROM 50 MM TO 100 MM

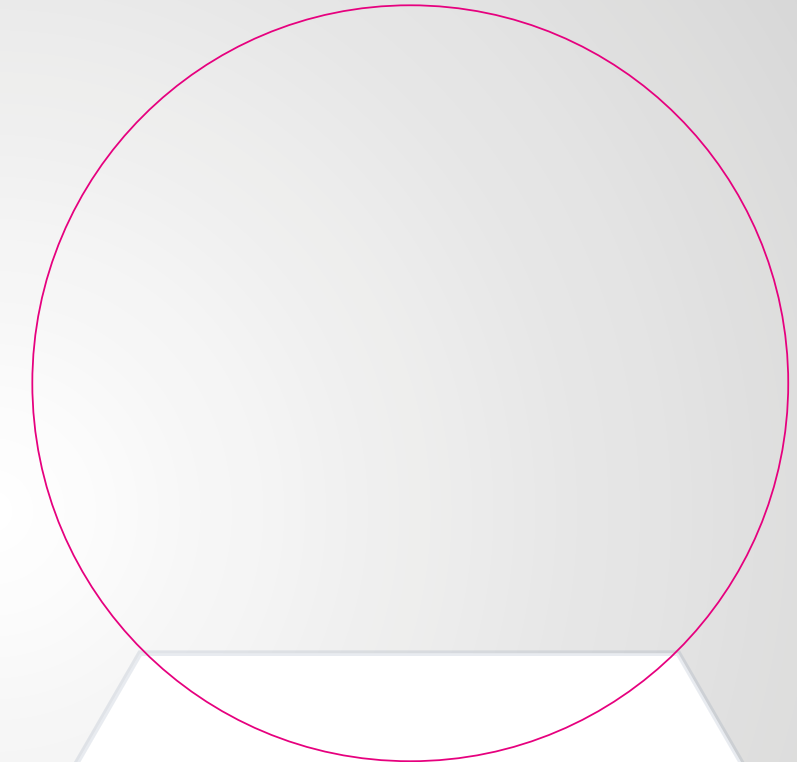
THE REASONS TO GO BIGGER

Transitioning from small to large sapphire wafers, i.e. moving from wafers with a diameter of 50 mm to those with a diameter of 100, 150, 200 or even 300 mm, offers significant advantages for chip processing. Larger wafers directly reduce handling, improve economies of scale and increase the usable surface area by reducing the edge exclusion zone. This translates into higher yields and a lower cost per chip. Moreover, larger wafers enable the use of advanced automation and process control tools, minimizing errors and further enhancing cost-effectiveness. Ultimately, this makes chip production, including that for LEDs, more efficient and affordable.

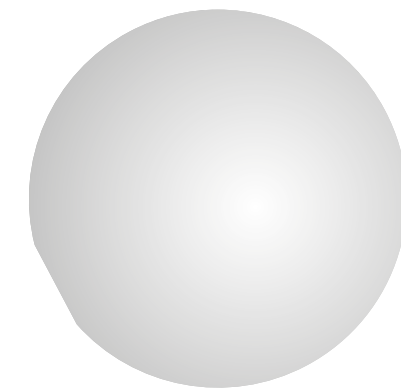
However, the benefits of large sizes can only be achieved by making a technological leap beyond the limits of the traditional methods of crystal growth. These have typically included both the heat exchanger (HEM) and Kyropoulos methods.

HEM was invented in the 1960s. It employs melt growth, with growth taking place upwards, and heat is exchanged with helium gas. The method is fast and economical but produces crystal of low quality and consumes crucibles.

The Kyropoulos method was invented in the 1970s. It also employs melt growth, combined with top seeding, pulling and natural cooling. This method consumes a large amount of power and seeding is carried out manually, which can be time-consuming. However, it produces crystals of good quality and coring has enabled the production of sapphire wafers with diameters of 50 and 100 mm.



50  100 mm



3 x the usable area

WAFER

EMERALD

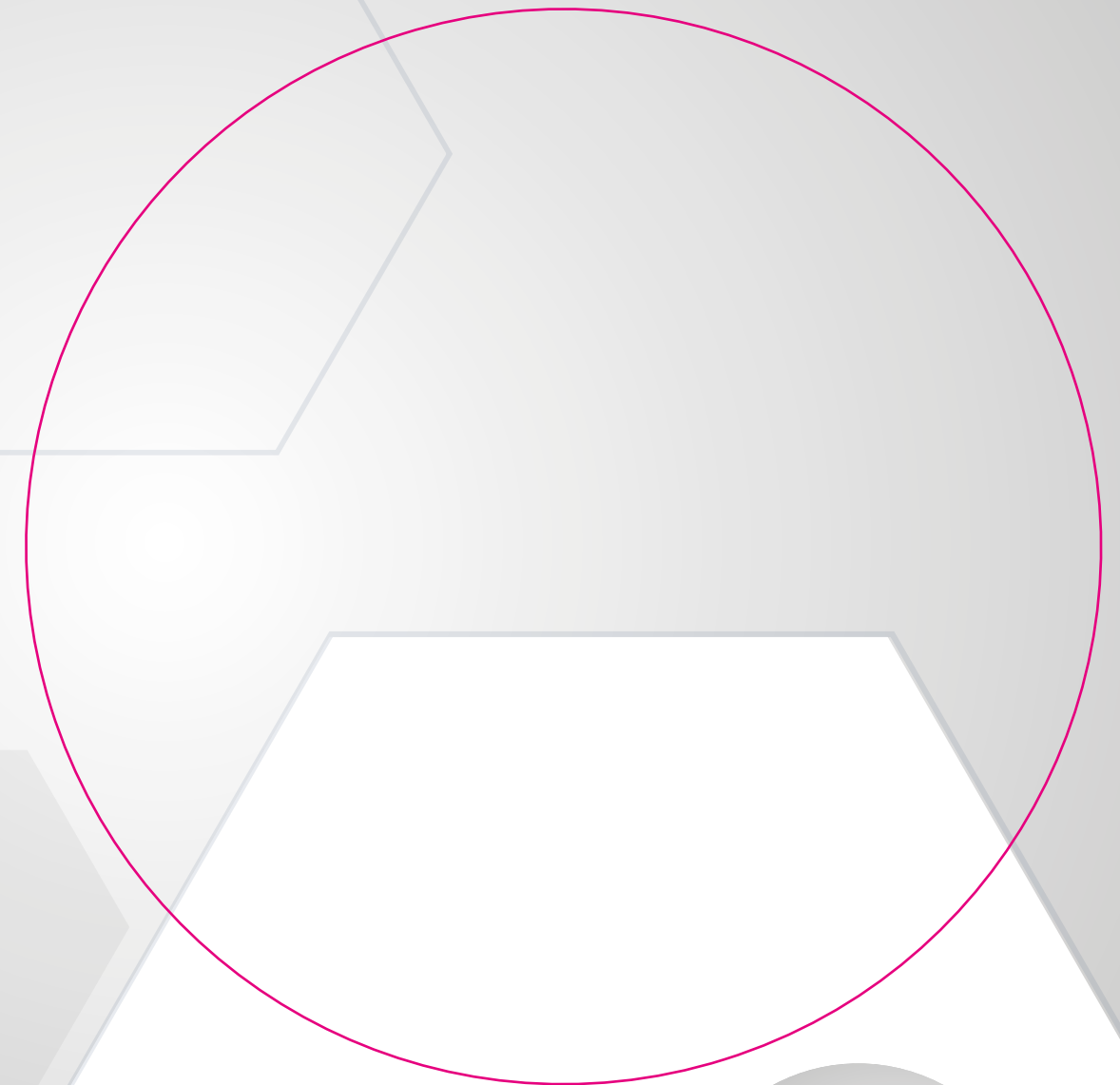
FAMETEC's McSAP, a modified HEM method introduced in 2012, offers low power consumption, high productivity, semi-automatic growth, and crystal growth along any axis. This directly translates into high-yield ingots, enabling 150, 200, and even 300 mm wafers without the need for perpendicular coring.

**FOR MONOLITHIC
SAPPHIRE INGOTS**



McSAP technology revolutionizes sapphire production with zero-emission sapphire semiconductor substrates (ZESS) that boast superior qualities and yields. These large-diameter ingots are ideal for the semiconductor sapphire substrates employed in applications such as LEDs, miniLEDs, microLEDs and PowerGaN products.

With our location ARCTICSapphire in Norway we offer significant advantages in terms of supply chain stability and potential for close collaboration in both European, North American and Asian markets. Our commitment to traceability including product carbon footprint and robust quality management systems further ensures the consistent reliability of our sapphire materials.



50  **150 MM**

8 x the usable area



THE McSAP ADVANTAGE

LARGE WAFERS MADE POSSIBLE

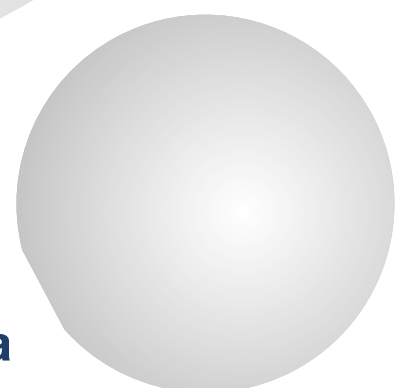
McSAP's ability to grow high-quality crystals along the c-axis, combined with its high yield and minimal waste, makes it the ideal solution for large-scale sapphire wafer production.

This translates directly to FAMETEC's ability to offer:

- > 150 mm sapphire wafers: currently available and in production
- > 200 mm sapphire wafers: available and ready for integration into customer processes

50  200 MM

15 x the usable area



DREAM BIGGER

Future-proof technology: McSAP paves the way for the development of even larger wafers up to 300 mm in diameter, further maximizing the benefits in economy and efficiency for chip manufacturers.

IF YOU CAN DREAM IT
WE CAN DO IT

50  300 mm

35 x the usable area

BEYOND LEDS THE RISE OF MICROLED DISPLAYS

LED technology has revolutionized displays, offering energy efficiency alongside excellent image quality. However, advances continue to test its limits.

MicroLED technology has emerged as the next step, promising superior pixel density, contrast ratio, and brightness while maintaining low power consumption. These advantages translate into crystal clear images across various applications, from high-definition TVs to automotive lighting and commercial displays.

FAMETEC's McSAP technology does not just meet industry needs: it also leads to a significant reduction in CO₂ emissions throughout the supply chain, due to its energy-efficient production process. This environmental benefit complements the inherent energy savings of microLED displays themselves.



OPTICAL APPLICATIONS

FAMETEC offers a comprehensive selection of a- and c-axis sapphire materials, catering to the diverse needs of the optical market. Our high-purity boules impress by reaching diameters of 210 mm and heights of 220 mm, providing an economical basis for various optical components.

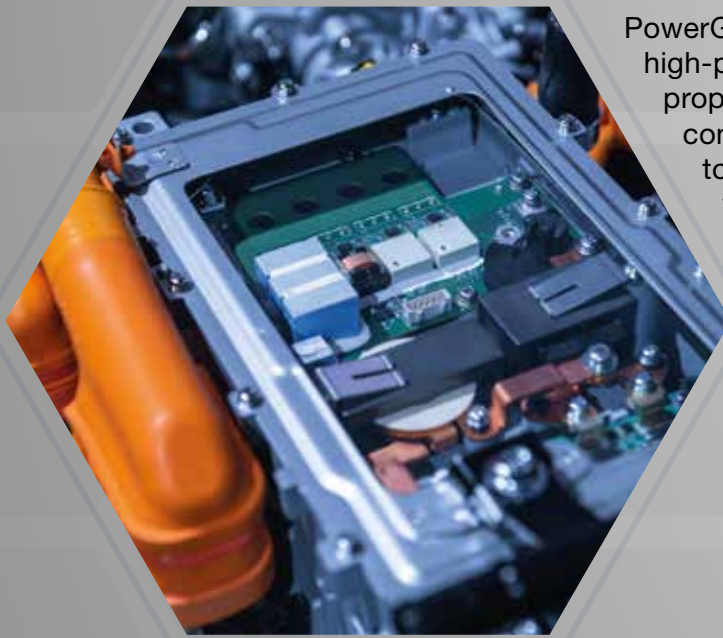
Our large-diameter boules are ideal for the demanding requirements of optical applications. With fully customizable furnaces we can engineer solutions to match any scale you envision, delivering precisely the specifications you need.



POWER ELECTRONICS

PowerGaN technology is experiencing significant growth in high-power electronics applications due to its superior properties, such as high voltage handling and thermal conductivity. This shift is evident as companies move towards GaN-on-sapphire for power devices, particularly with the increasing demand for electric vehicles (EV/HEV) that require efficient power converters and inverters.

FAMETEC is well-positioned to support this transition by providing large-diameter ingots and the essential sapphire substrates used in power electronics.

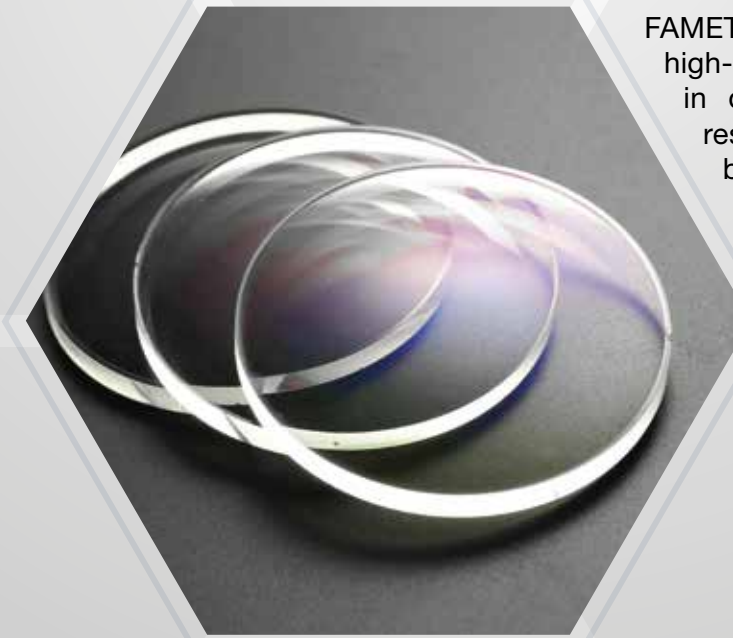


WINDOWS AND GLASSES

FAMETEC's McSAP technology allows the production of high-purity sapphire, ideal for watch glasses or windows used in defense and other applications due to its scratch resistance and clarity. Its semiconductor grade material is bubble and fog free.

The simultaneous growth of multiple crystals with McSAP leads to a higher yield of usable sapphire material, improving overall production efficiency.

FAMETEC's expertise in both crystal growth and furnace design allows us to collaborate closely with watch glass or window manufacturers, developing customized solutions for their specific needs.



McSAP

A REVOLUTIONARY APPROACH TO SAPPHIRE CRYSTAL GROWTH

McSAP, or “Multi-c-axis sapphire”, is a patented crystal growth technology that offers a significant improvement over traditional approaches like the Kyropoulos method. McSAP has many features that set it apart:

- > McSAP is based on a modified version of the Heat Exchanger Method (HEM), optimizing heat flow within the furnace to control crystal growth.
- > Unlike traditional methods limited to single-crystal growth, McSAP facilitates the simultaneous growth of multiple sapphire crystals along any desired crystal axis.
- > This eliminates the need for the wasteful coring and grinding steps typically required in traditional growth methods, significantly increasing the yield of usable, high-quality sapphire material.
- > Input resources such as seeding material and crucibles are of high value and can be reused as recycling material



In sum, FAMETEC's award-winning McSAP technology is a more productive and efficient process than any other method. Capable of growing large diameter crystals, this process is more energy-efficient and environmentally friendly than traditional methods and reduces carbon footprints.

McSAP FURNACES

THE ENGINE BEHIND THE REVOLUTION IN CRYSTAL GROWTH



FAMETEC's McSAP technology achieves superior sapphire crystal growth through its innovative furnaces, specifically designed to optimize the Heat Exchanger Method (HEM). With their advanced heat exchange systems, these furnaces guarantee precise temperature control within the growth chamber. This precision is essential for growing high-quality crystals along any axis. McSAP furnaces also support the simultaneous growth of multiple sapphire ingots, maximizing yield and minimizing waste compared to traditional techniques.

Building on the EBNER GROUP's 75+ years of furnace expertise, McSAP furnaces seamlessly merge deep knowledge of crystal growth methodology with sophisticated design. This ensures a homogeneous thermal environment for consistent, high-quality crystal production.

McSAP's high level of automation includes process control systems, robots for loading/unloading, advanced conveying/handling systems and offers a closed-loop data model. FAMETEC further leverages machine learning for crystal growth optimization. This commitment to cutting-edge solutions underpins McSAP's scalability, currently enabling the production of wafers up to 200 mm in diameter - with even larger sizes (300 mm) in development.

FAMETEC®

A EUROPEAN LEADER IN GREEN SAPPHIRE CRYSTAL GROWTH

From a legacy of pioneering furnace technology to sapphire crystal growth

FAMETEC is a European company born from the innovation and expertise of the EBNER Group, a leader in industrial plant engineering with over 75 years of experience in furnace design. FAMETEC's story began in 2012, when EBNER's research and development efforts led to the successful development of a unique furnace specifically designed for growing high-quality sapphire single crystals.

McSAP: revolutionizing sapphire production

Following this breakthrough, FAMETEC spun off from EBNER in 2020. FAMETEC leverages EBNER's extensive knowledge in furnace design and crystal growth methods to continuously develop McSAP furnaces, allowing us to focus on cutting-edge technology while benefiting from EBNER's established production capabilities.

Sustainability at the core

FAMETEC prioritizes sustainability throughout its operations. This is exemplified by its key role in ARCTICSapphire, Europe's pioneering zero-emission sapphire crystal production facility founded in 2019. The facility, located in Norway, relies entirely on hydropower for its energy needs - drastically minimizing its environmental impact.

Our operations underscore our dedication to the mission of providing zero-emission sapphire material. We aim to reduce dependence on sapphire suppliers within jurisdictions of concern while significantly contributing to CO₂ reduction goals. With their innovative approach and commitment to sustainability, FAMETEC and its operating partners are shaping the future of the sapphire market.

european and zero
emission sapphire
crystal growth

enabling green
wafers and
semifinished parts

a more sustainable
product

VISION

Driving European green technology

MISSION

Providing Zero-Emission Sapphire Semiconductor Substrates (ZESSS) using Multi-C-axis SAPphire (McSAP) technology.

START HERE

WE ARE SAPPHIRE

FAMETEC as European supplier is significantly reducing dependency on Chinese suppliers and contributing substantially to CO₂ reduction goals.