Yearly Report 2021 / 2022

SCHOTT
glass made of ideas

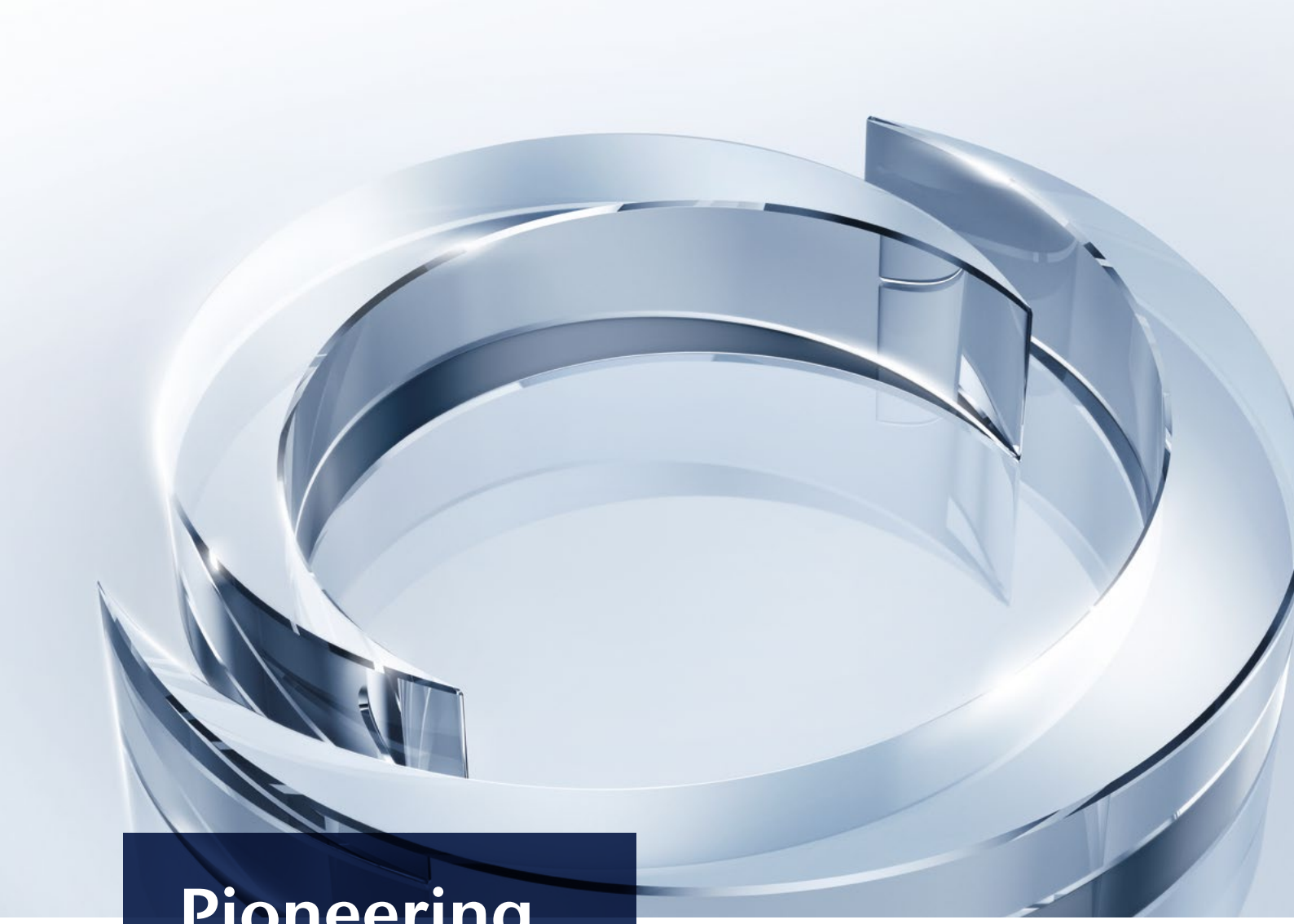
Key Figures SCHOTT Group

From October 1 2021 to September 30 2022

(in million euros, unless stated otherwise)	2021/2022	2020/2021	Change in %
SALES	**2,775**	**2,524**	**10**
Domestic	**364**	**317**	15
Abroad	**2,411**	**2,207**	9
EBITDA	**631**	**565**	**12**
as a percentage of sales	**23**	**22**	
EBIT	**422**	**390**	**8**
as a percentage of sales	**15**	**15**	
Income from continuing operations before income taxes	**399**	**373**	**7**
Group earnings	**269**	**289**	**–7**
Cash flow from operating activities	**444**	**494**	**–10**
Capital expenditure on property, plant and equipment	**431**	**333**	**29**
Total assets	**3,727**	**3,269**	**14**
Equity	**1,897**	**1,351**	**40**
Equity ratio (%)	**51**	**41**	
Long-term funds available[1]	**2,843**	**2,555**	**11**
as a percentage of total assets	**76**	**78**	
Net financial assets[2]	**69**	**79**	
Expenditure on research and development	**99**	**93**	**6**
as a percentage of sales	**4**	**4**	
Employees as of the balance sheet date (number)	**17,213**	**17,313**	**–1**

For computational reasons, rounding differences of +/– one unit (EUR millions) may occur in the table.

[1] Equity, long-term provisions and long-term liabilities.
[2] Cash and cash equivalents and funds less financial liabilities.



Pioneering. Responsibly. Together.

These attributes characterize SCHOTT, a company that manufactures trendsetting materials and specialty glass. The company founder Otto Schott is considered the inventor of specialty glass and became the pioneer of an entire industry. With a pioneering spirit, insatiable curiosity, and a passion for innovation, the company has been conquering new markets and applications for almost 140 years. Represented in more than 30 countries, the company is an expert partner for high-tech industries such as Healthcare, Home Appliances & Living, Consumer Electronics, Semiconductors & Datacom, Optics, Industry & Energy, Automotive, Astronomy and Aerospace.

In fiscal year 2021/2022, 17,200 employees generated sales of €2.8 billion. With the best teams supported by the best digital tools, the Group is looking to continue its growth.

SCHOTT AG is owned by the Carl Zeiss Foundation, one of the oldest foundations in Germany, which uses the Group's dividends to promote the sciences. As a foundation company, SCHOTT has responsibility for employees, society and the environment anchored deeply in its DNA. The goal is to become a climate-neutral company by 2030.

Good fiscal year despite a difficult environment

Fiscal Year Facts

2.8

billion

in revenue

422

million

in consolidated net profit for the year

431

million

capital expenditure on property, plants and equipment

51

percent

equity ratio

A world subjected to a continuous stress test due to war, the coronavirus, and climate change posed a strong challenge for SCHOTT in fiscal year 2022. Nevertheless, we managed to grow organically despite a difficult economic environment, with massively increased energy, raw material, and transportation costs, unstable supply chains, and geopolitical upheavals. Sales increased by 10% to €2.8 billion and operating profit rose to €422 million. An equity ratio of over 51% was achieved for the first time.

The reasons for this positive development are the growth and investment strategy of recent years, good cost management, increased efficiency, and price adjustments that enabled us to absorb the enormous cost increases. With the investments we made in the past year, we have further expanded our international production network by opening a new plant for polymer syringes in Müllheim, Germany, and a modern flat glass production facility for home appliances in Turkey. We were also able to counter an impending gas emergency in Europe by investing in an alternative supply of propane gas at our important melting sites at an early stage.

Growth drivers included, independently of the pandemic, glass and polymer products for the healthcare and pharmaceutical markets. Components such as ZERODUR® glass-ceramic, high-tech optical glasses, and glass fibers, which are used in chip manufacturing and ensure precision in the generation of nanometer-fine conductor paths, also had a particularly positive impact on earnings.

All areas of the business and a strong international team of employees, whose commitment deserves our special thanks, contributed to this success. At the end of the fiscal year, we employed 17,200 people, two-thirds of them outside Germany, and helped create 700 new jobs. Qualified and motivated employees are an important basis for further growth. We are responding to changes in the world of work and the shortage of skilled labor by engaging in innovative recruiting and continuously developing working time conditions and models.

As an energy-intensive company, we also demonstrate corporate responsibility in the area of climate protection, and we reached the initial milestone in our Climate Neutral 2030 program launched in 2018 with 100% of our global energy requirements now covered by green electricity. We have also driven the technology shift forward by working on ambitious projects involving the electrification of the melting tanks and the use of hydrogen.

The potential of glass as a material is far from exhausted. For example, we are working on developing our ultra-thin glass, which is already successfully used in foldable smartphones, for larger formats such as foldable tablets, notebooks, and even televisions. In addition, specialty glasses are creating new possibilities in the exploration of Earth and space: for example, glass powder for generating oxygen in a Mars 2020 Perserverance Rover experiment, glass-ceramic mirror substrates for space telescopes, thin glasses as protective glazing for solar modules in space, laser glasses for laser communication in ground stations, and fiber-optic light guides for tank and propulsion monitoring of transport rockets. We are particularly proud to have delivered the 500th mirror substrate made of ZERODUR® glass-ceramic for the world's largest optical telescope, the European Southern Observatory's ELT (Extremely Large Telescope), which is scheduled to see its first light in 2027.

Dr. Jens Schulte

Member of the Board of Management since 2016

Dr. Heinz Kaiser

Member of the Board of Management since 2016

Dr. Frank Heinricht

Chairman of the Board of Management and Labor Director since 2013

Hermann Ditz

Member of the Board of Management since 2016

We will continue to invest in growth and innovation in the new fiscal year, with €500 million of investments planned. The current highlight is the inauguration of a new diagnostics plant in the US. The products manufactured there address the future market of microfluidics, and the technology will enable diagnostic tests to be performed faster, more flexibly, and more precisely.

The courage to invest in a volatile environment also benefits our customers, who we work with in a spirit of trust. What they expect from us in times of crisis is a resilient partner who delivers reliably and continues to invest in growth. We have lived up to this expectation and will continue to do so in the future.

We would like to thank all our customers for their strong confidence and hope that the geopolitical conflicts and economic crises will soon be overcome.

December 2022

SCHOTT AG
The Board of Management

Dr. Frank Heinricht spoke about the significant contribution glass makes to our daily lives at the opening conference of the International Year of Glass.

Welcome to the age of glass

SCHOTT and the United Nations celebrated this highly versatile material in the International Year of Glass 2022.

Our modern world would not be what it is without glass. The United Nations celebrated the International Year of Glass (IYOG) in 2022 to give the versatile material the attention it deserves. The highlight was the opening conference on February 10 and 11 at the Palais des Nations in Geneva. SCHOTT played an important role in this event.

"Glass is a fascinating material. Over the years, glass has enabled numerous breakthroughs in the healthcare sector, the sciences, and medicine," said Dr. Frank Heinricht, Chairman of the Board of Management of SCHOTT, in summarizing the importance of glass for our society today. At the opening conference of the IYOG in Geneva, Heinricht spoke to representatives of the glass industry, policymakers, and glass enthusiasts worldwide about the crucial role glass plays, especially in the life sciences and pharmaceutical industries.

“Glass is a fascinating material and has enabled major breakthroughs, especially in healthcare, the sciences, and medicine.”

Dr. Frank Heinricht, Chairman of the Board of Management of SCHOTT, at the opening conference of the International Year of Glass in Geneva.

As one of the main sponsors of the IYOG, the specialty glass manufacturer SCHOTT has developed groundbreaking glass innovations over the past decades, and so joined the international community to celebrate glass as a material.

SCHOTT shared its enthusiasm for glass with the entire world in 2022 by launching its “Finding the Perfect Solution” campaign on social media. The internationally positioned Group was able to highlight its contributions to science and technology while helping to promote sustainable production in the glass industry. The #glasslovers at SCHOTT have a long history of developing innovative products such as ultra-thin flexible glass, glass-ceramic, pharmaceutical glass packaging, and optical glass. The company has also committed to technically transforming its energy-intensive production to become carbon neutral by 2030, among other initiatives.

“SCHOTT has been passionately driving the development of glass for more than 130 years. We were pleased to sponsor several events at once for the International Year of Glass. After all, it is important to bring the international community together and make clear how significant the contribution that glass makes in our lives is,” Heinricht said. In addition to speaking at the opening ceremony, SCHOTT also participated in the U.S. National Day of Glass in Washington, D.C., as well as the International Congress on Glass in Berlin.

The UN has proclaimed International Years since 1959 to draw attention to key issues and encourage international action, as well as advance causes of global importance. For 2022, the UN decided for the first time to promote a material that has advanced society in a variety of ways. The focus for one year was mainly on the contribution glass makes to technological development and sustainability.

The inaugural IYOG conference was held at the Palais des Nations in Geneva.

Expansion in Turkey

SCHOTT has invested €9 million in a new flat glass plant at its site in Bolu, Turkey. By inaugurating it in June 2022 and increasing capacities on site by 50%, the specialty glass manufacturer has reached another milestone in the expansion of its flat glass business.

The company manufactures advanced glass solutions for the household appliance industry at its sites in Bolu and Çerkezköy. Processed flat glass is exported to 14 countries from here, mainly to Western and Central Europe.

SCHOTT has been present in Turkey since 1988 and employs a total of around 700 people there. The latest investment in state-of-the-art production technology will create additional jobs. The company has invested close to €15 million in Turkey over the past five years. "We are interested in continuing the Turkish success story and investing further," said Dr. Heinz Kaiser, member of the Board of Management of SCHOTT.

SCHOTT sites in Turkey

Pharmaceutical tubing: Capacities expanded in Mainz

SCHOTT doubled its production capacities for pharmaceutical tubing in Mainz in June 2022 by putting a new melting tank into operation. The €40 million investment will create 100 new jobs. "The Expansion will help to secure the production base of pharmaceutical glass for the German and European pharmaceutical industry in the long term," explains Chairman of the Board of Management, Dr. Frank Heinricht. During production, the quality of every piece of tubing is thoroughly checked using the latest inspection technology and all data is recorded in detail. As a result, only perfect tubing leaves the plant.

Guests at the inauguration: Rhineland-Palatinate Minister President Malu Dreyer (center) and Mainz Mayor Michael Ebling (left)

New plant in Müllheim, Germany

SCHOTT Pharma inaugurated its new production facility for prefillable syringes made of high-grade polymer in Müllheim, Germany in May 2022. "The newly built plant will supply pharmaceutical companies worldwide with high-end polymer syringes from Müllheim," says Andreas Reisse, CEO of SCHOTT Pharma. The three-digit million euro investment in state-of-the-art infrastructure also includes a research and development center as well as a logistics and administration area. The new site is designed to provide 100 additional jobs.

Prefillable polymer syringes are manufactured at the production facility in Müllheim.

Photo: IE Group

Professor Alicia Durán (second from right) and Professor Daniel Neuville (center) were awarded the 17th Otto Schott Research Award.

Outstanding research

The 2022 Otto Schott Research Award has gone to a Spanish scientist for the first time. Professor Alicia Durán from the Institute of Ceramics and Glass (CSIC) in Madrid is considered one of the most important and experienced researchers in the field of functional glass coatings. Durán is a former President of the International Commission on Glass (ICG) and Chairwoman of the United Nations International Year of Glass (IYOG) 2022. The second laureate is Professor Daniel Neuville from the Institut de Physique du Globe de Paris at the University of Paris. He is internationally known for various types of spectroscopy that he uses in his work. These make it possible to develop new structural concepts for inorganic glass, especially at the interface between geomaterials, physics, and chemistry.

The Otto Schott Research Award has been presented since 1991 to recognize outstanding scientific and technological contributions in the fields of glass, glass-ceramic, and other high-performance materials, and includes prize money of €25,000. The award was presented to the two glass scientists on July 4, 2022 at the 26th International Congress on Glass in Berlin.

Compliments for pioneers in climate protection

The Vice President of the German Bundestag Katrin Göring-Eckardt and Dr. Heiko Knopf, Deputy Federal Chairman of B90/Die Grünen and member of the Jena City Council, got an understanding of the innovative strength of "Made in Thuringia" during a visit to SCHOTT. Three years ago, SCHOTT set itself the goal of becoming climate neutral in its own production by 2030. This ambitious climate goal was well received. "Consistent climate protection is becoming a new locational advantage. This is all the more true in uncertain times. It is good that SCHOTT is the first company from the energy-intensive glass industry to set out on this path and continue on this course," Göring-Eckardt emphasized. For example, experts at SCHOTT are working on several development projects, some of which are being funded by the federal government, to determine how the energy-intensive units used to melt glass can be operated with green electricity and hydrogen instead of gas in the future.

Katrin Göring-Eckardt (third from left), Vice President of the German Bundestag, and Dr. Heiko Knopf (second from right), Deputy Federal Chairman of B90/Die Grünen, learn more about climate-friendly melting technologies.

With new energy into the future

The current energy crisis confirms SCHOTT's decision to become climate neutral by 2030. Among other initiatives, the Group is currently testing how specialty glass can be manufactured using electricity and hydrogen.

Efforts to achieve climate neutral production by 2030 continue unabated at SCHOTT. "We are surrounded by many different economic uncertainties all over the world. Nevertheless, this cannot lead us to slacken our activities in the fight against climate change. After all, this is one of the most important challenges of our time," says Dr. Jens Schulte, member of the Board of Management of SCHOTT and responsible for the Zero Carbon strategy program. The company had already reduced its climate-damaging emissions by 60% by 2022. This was primarily achieved by switching to 100% green electricity.

Having completed this transformation in just two years, research into new melting technologies is a long-term project. "In the years to come, we will set further ambitious interim targets on the road to achieving climate neutrality, working intensively to reduce our carbon emissions. Even the current gas crisis will not change this," says Schulte.

What this intensive work looks like can be seen at the plant site in Mainz: A 21-meter-high tower has been rising into the air there since the fall of 2022. The hydrogen tank symbolizes SCHOTT's spirit of research and is an example of the technological change that the company is pursuing working on. In a funded pilot project, SCHOTT wants to test the large-scale use of hydrogen in glass production for the first time. For this purpose, the natural gas that is currently used to operate the melting tanks will be successively replaced by up to 35% hydrogen. This is no easy task, as the tanks for specialty

More information

Would you like to know more about SCHOTT's climate neutral strategy? You can find more info at **https://www.schott.com/en-us/about-us/sustainability/environmental-responsibility**

glass production require temperatures of up to 1,700 degrees Celsius. If the research project is successful, a large share of the carbon emissions can be reduced in the future.

Initial tests are also underway in terms of electrifying the melting tanks with green electricity. “Our research is showing very promising initial results,” explains Dr. Matthias Müller, Head of Research and Development at SCHOTT. “We are convinced that we can provide important impetus for the entire glass industry. We will therefore continue to intensify our activities.” SCHOTT is investing a mid-double-digit million euro amount to achieving its climate goal. This will flow into the purchase of high-quality green electricity, and also into research to develop future technologies for decarbonized production.

SCHOTT is planning the widespread use of sustainable technologies by following Technology Roadmaps. They show how the research results will be implemented in production in the long term. The Roadmaps envision that the first pilot plants for decarbonized production can start as early as 2025. “We need staying power for the technology shift. Therefore, we are working intensively on innovations and investing large sums to ensure that our complex production is ready for takeoff as soon as sustainable energy sources are available on an industrial scale,” explains Dr. Jens Schulte.

The 21-meter hydrogen tower on the plant site in Mainz is needed for large-scale industrial tests on a melting tank. It is symbolic of the technology shift.

SCHOTT's climate neutral strategy

On the way to climate neutrality, SCHOTT acts according to the strategy “Avoid – Reduce – Compensate.” The company has defined four fields of action for the path to climate neutrality:

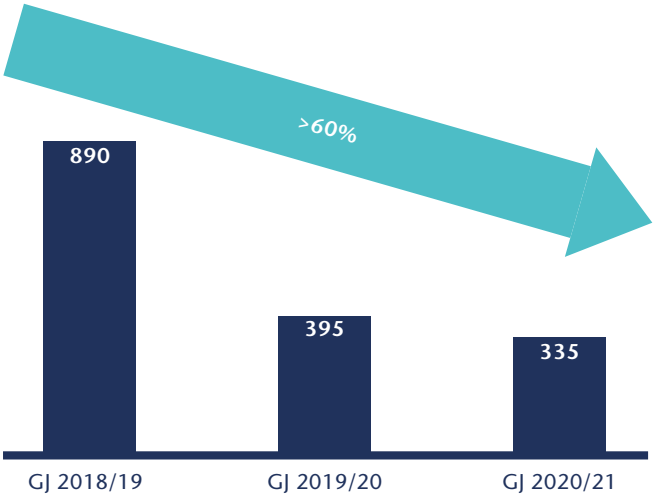
Technological change: This requires a massive upheaval in the glass industry. As far as technologically feasible, SCHOTT wants to abandon the use of fossil fuels.

Improving energy efficiency: Reducing energy consumption is an ongoing task for SCHOTT. The company has been working on becoming more energy efficient for decades.

100% green electricity: By switching to 100% green electricity, SCHOTT has successfully mastered the first stage of the transformation marathon.

Compensation of remaining emissions: Despite all its efforts, SCHOTT cannot completely avoid all emissions. The Group will therefore compensate for them by engaging in climate protection projects.

CO_2 emissions in Scope 1 and Scope 2 in kilotons (kt) of CO_2 equivalents (CO_2e)*.



From 2019 to 2021, SCHOTT reduced its Corporate Carbon Footprint (CCF) from its own production and energy purchased by more than 60%.

* Calculations according to the market-based method of the Greenhouse Gas (GHG) Protocol. The site-based carbon footprint was 641 kt CO_2e in fiscal year 2019, 620 kt CO_2e in fiscal year 2020, and 671 kt CO_2e in fiscal year 2021. The carbon footprint was reviewed by independent consultants in fiscal year 2019 and fiscal year 2020 for compliance with the GHG Protocol. The carbon footprint in fiscal year 2021 was verified with reasonable assurance by the certification company GUTcert. Verification was performed in accordance with the requirements of ISO 14064-3 and certifies compliance with the requirements of the GHG Protocol.

Hello, SCHOTT Pharma!

SCHOTT has legally established a stand-alone company for its pharma business to take even greater advantage of the positive and dynamic developments in the global pharmaceuticals market.

SCHOTT has made its pharmaceutical business legally independent in order to further advance its growth strategy. As a pioneer in pharma drug containment and delivery solutions, the pharmaceutical division of the international technology group has grown faster than the market in recent years. As part of the carve-out, the pharma business operates under the new name SCHOTT Pharma AG & Co. KGaA since August 2022. By creating a separate legal entity for its pharma business, SCHOTT is generating new opportunities to expedite profitable growth. At the same time, this step allows for new financing options to be considered, including a possible IPO of SCHOTT Pharma.

Pharma is to remain an integral part of SCHOTT in the future. However, the Group is creating more scope for organic and inorganic growth as well as for further potential investments in the Group's goal of climate neutrality by 2030. In a dynamic market with high barriers to entry, SCHOTT Pharma is optimally positioned to tap into new potential. After all, how a medication is packaged and administered is an inte-

SCHOTT Pharma produces

13 billion

pharmaceutical containment solutions

every year.

The syringe systems made of high-end polymer are break-resistant, have optimal barrier properties, and are biologically inert.

gral part of the development of a pharmaceutical product and subject to the strictest regulations. SCHOTT Pharma's portfolio includes prefillable syringes made of glass and polymer, cartridges, vials, and ampoules. The company produces around 13 billion of these every year and also serves modern pharmaceutical categories such as mRNA-based drugs and biopharmaceuticals. Approximately every minute, more than 25,000 people worldwide receive an injection with a drug that has been filled in one of SCHOTT Pharma's products.

Sales of the pharmaceutical division have risen steadily in recent years, most recently with double-digit growth to €650 million in fiscal year 2021 – although the share of sales related to COVID-19 was only around 3%. The company is investing a three-digit million euro amount to meet the high demand from customers worldwide. A new production facility for prefillable polymer syringes has been put into operation in Müllheim, Germany, while a new plant for glass syringes is under construction in Hungary. In China, ground was broken for new production expansions, and the company plans to triple capacity for high-quality sterile vials in the US.

On average,
more than

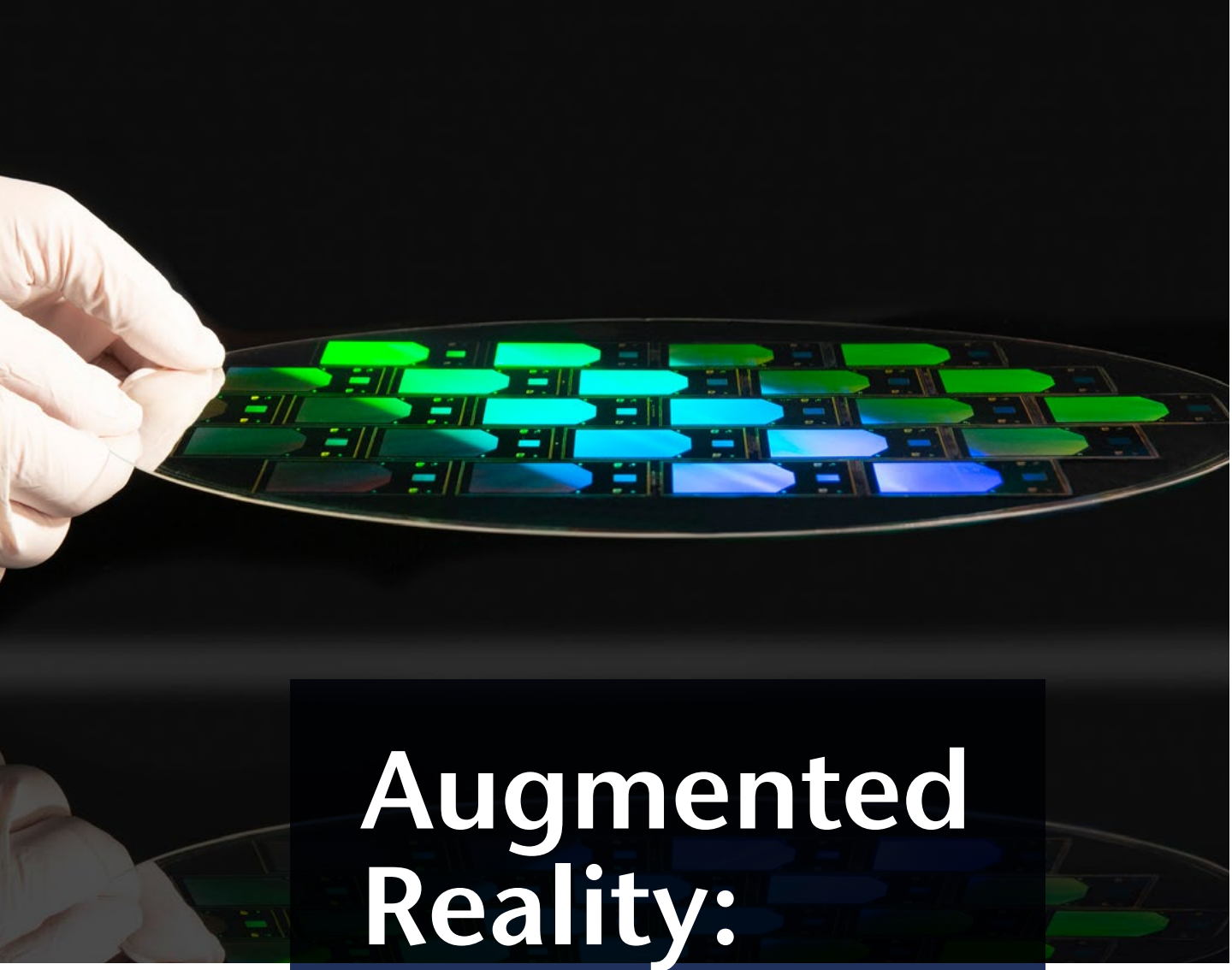
25,000

injections

are administered to patients every minute with the help of a product from SCHOTT Pharma.

SCHOTT Pharma at a glance

SCHOTT Pharma designs solutions grounded in science to ensure that medications are safe and easy to use for people around the world - because human health matters. The portfolio comprises drug containment and delivery solutions for injectable drugs ranging from prefillable glass and polymer syringes, to cartridges, vials, and ampoules. Every day, a team of around 4,700 people from over 65 nations works at SCHOTT Pharma to contribute to global healthcare. The company is represented in all main pharmaceutical hubs with 17 manufacturing sites in Europe, North and South America, and Asia. With over 900 patents and technologies developed in-house, a state-of-the-art R&D center in Switzerland, and around 130 employees in R&D, the company is focused on developing innovations for the future. SCHOTT Pharma AG & Co. KGaA, headquartered in Mainz, Germany, is part of SCHOTT AG that is owned by the Carl Zeiss Foundation. In light of this spirit, SCHOTT Pharma is committed to sustainable development for society and the environment and has the strategic goal of becoming climate-neutral by 2030. Currently, SCHOTT Pharma has over 1,700 customers including the top 30 leading pharma manufacturers for injectable drugs and generated sales of EUR 650 million in the fiscal year 2021.



Augmented Reality: The next big thing

Data glasses are the gateway to new parallel worlds. The substrate material with special optical and physical properties that simultaneously act as a display and a lens is at the heart of the optical systems of these powerful devices.

Data glasses transmit digital information to the eye via light waves. As a result, the virtual content merges with the natural image of the environment that passes through the transparent glass. Waveguides are needed to guide the bits and bytes translated into waves directly to the user's eyes to achieve a smooth blend of digital and real content. This is where optical glass plays a crucial role as a substrate material. "In order to attract broader interest, the devices have to offer an immersive experience with a large field of view and at the same time be comfortable to wear," says Matthias Jotz, Head of Product Management for Augmented Reality (AR) at SCHOTT. He says it's a balancing act between providing the most immersive experience possible and being comfortable while wearing the device.

He explains that a large field of view is mainly related to a high refractive index of the waveguide material. The higher the refractive index of an optical glass, the heavier the product, thanks to increased amounts of heavy elements in the glass

formulation. “Our glass scientists have met this challenge and managed to keep the refractive index high while cutting the final weight in half,” he says. This was made possible by a completely new glass formulation for augmented reality that contains fewer heavy metal ions while allowing the thickness to be reduced through an ultra-precise (RealView® Ultra) post-processing step.”

With a high refractive index, SCHOTT RealView® glass wafers are key components of the next generation of augmented and mixed reality (AR/MR) data glasses. The glass wafers are the basis for our customers’ waveguides and an essential part of the AR/MR display unit that enables the immersive user experience.

It all starts with the glass mixture, a combination of various metal oxides and semi-metal or non-metal oxides. This mixture is heated until it melts at around 1,600 degrees Celsius. A molten glass ribbon is then formed that is cooled in a controlled manner. As well as the raw ingredients and melting parameters such as the exact temperature and oxygen content, the optical quality of the glass is also influenced by the cooling process itself.

1.9

Refractive index

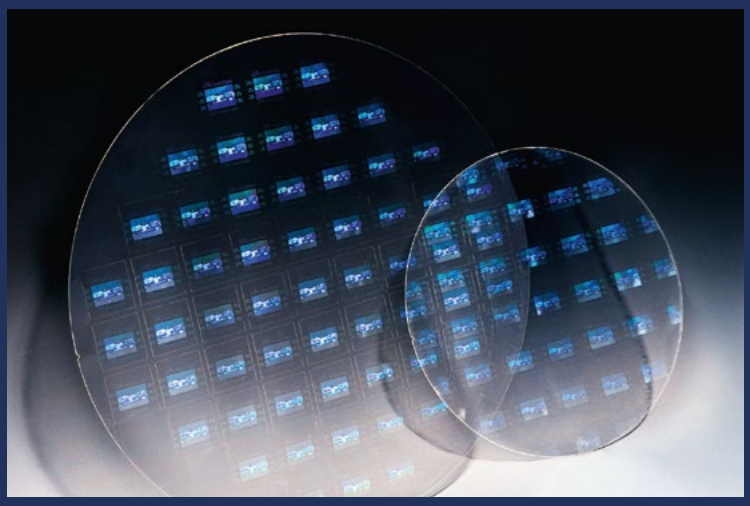
SCHOTT RealView® glass wafers are known for their high refractive index with light weight. This leads to a particularly immersive experience.

In addition to diffractive waveguides, which are based on glass wafers with a high refractive index and light diffraction on optical gratings, the alternative technology of reflective waveguides was developed by the Israeli company Lumus. Unlike diffractive waveguides, reflective waveguides use a cascade of partially reflective mirrors inside the glass. These mirrors direct some of the light out of the waveguide into the user’s eyes without having to bend the light waves.

But how does a waveguide work? A reflective waveguide mainly consists of very pure optical glass, advanced coatings, and some processing steps that are protected by patents. Lumus licenses the technology to partners who are responsible for scaling it up to mass production. SCHOTT and Lumus entered into a strategic partnership in 2020. As part of this partnership, SCHOTT will take over all steps of the production of the reflective waveguides, from the manufacture of the optical glass and all subsequent processing steps to the finished waveguides and eyeglass lenses.

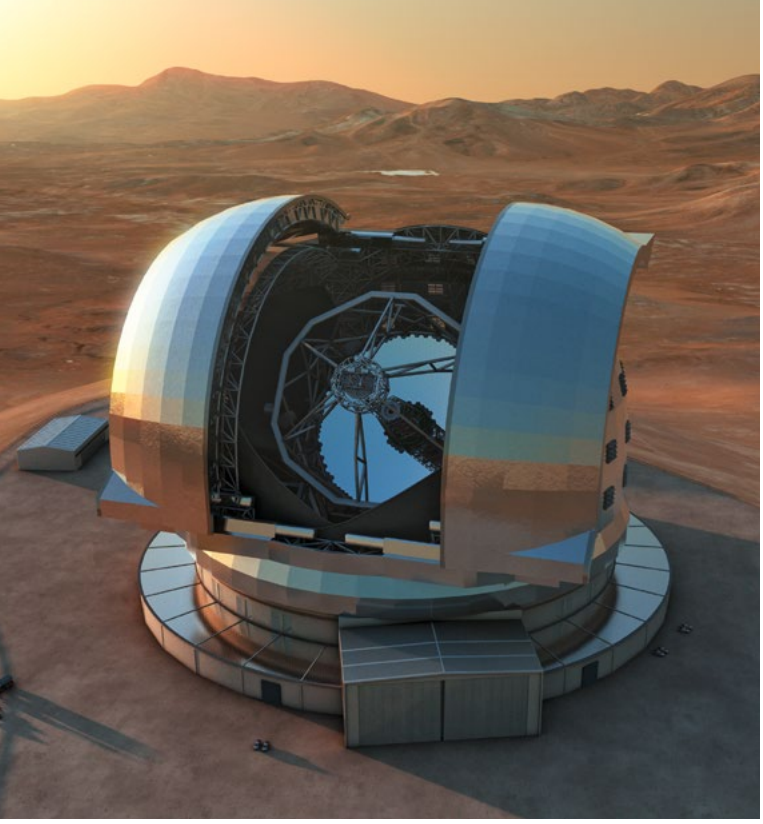
“As glass experts, we support innovators in AR and MR at all corners of the supply and manufacturing chain,” explains Rüdiger Sprengard, Vice President of Augmented Reality at SCHOTT. According to Sprengard, the market, innovative companies, software, and ultimately the end users will decide which waveguide technology will prevail.

“The bottom line is ultimately, all major steps to bring AR to the mass market will be driven and enabled by one key component: glass. Our heritage defines our commitment to the future because we believe our vision can move the world forward,” Sprengard concludes.



How waveguide technology works in diffractive AR/MR wearables

1. The projector emits the light waves of the digital image in the direction of the waveguides.
2. The light waves from the projector are coupled into the waveguide at a defined point with the aid of a grating (diffraction grating).
3. Light waves of each color are coupled out n times in the defined grid area. Since each human eye is individually shaped, the light waves must be coupled out n times. Waveguide technology usually uses three glass panes, each of which serves as a waveguide for one color in the red-green-blue (RGB) color space. Only one RGB image is shown in this simplified representation.
4. The mobile, moving human eye perceives both the digital and the real images. This creates the impression of augmented reality.



The eye awakens

SCHOTT is on board whenever history is made in space research. After all, specialty glass has been helping scientists to unlock new secrets from the universe time and again for many decades. If extraterrestrial life is discovered using the Extremely Large Telescope (ELT), this would not have been possible without ZERODUR® glass-ceramic.

The ELT will be mankind's largest eye on the sky when construction is complete. Currently being built by the European Southern Observatory (ESO) in the Chilean Atacama Desert on the 3,046-meter Cerro Armazones, the engineering masterpiece is expected to see its first light in 2027. Scientists predict a paradigm shift in the perception of the universe from the world's largest visible and infrared light telescope, similar to Galileo's telescope 400 years ago. "The ELT's primary mirror will allow us to penetrate into depths of space that have never been reached before," explains Marc Cayrel from ESO's ELT project team. And SCHOTT plays a decisive role in making this possible.

An important milestone along the way was reached in Mainz, Germany in July 2022. By completing the 500th mirror substrate for the ELT's M1 main mirror, the ZERODUR® team at Advanced Optics has successfully finished more than half of the mammoth task (see photo above). Due to its near-zero coefficient of expansion, the material is considered the gold standard for telescope mirror substrates.

SCHOTT is supplying a total of 949 round disks for the primary mirror with a diameter of 39 meters, each one polished and converted into hexagonal segments by Safran Reosc in France. While 798 of the disks will be used directly in the M1, 133 will be available as spare parts and 18 delivered in advance as prototypes. In addition, SCHOTT has already manufactured the mirror substrates for the secondary (M2) and tertiary mirrors (M3), as well as round disks for the segments of the fourth mirror (M4). This is the company's largest single order for an astronomy project. "We are very proud to help shape the future of astronomy by supporting ESO in their important work on the ELT," Thomas Werner, Head of the ELT project at SCHOTT, stated in celebrating the milestone. He can be seen next to the 500th mirror substrate in the photo, left.

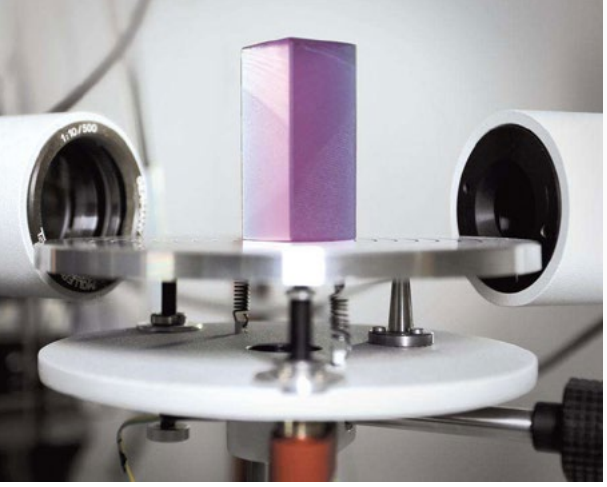
The M1 main mirror of the ELT is

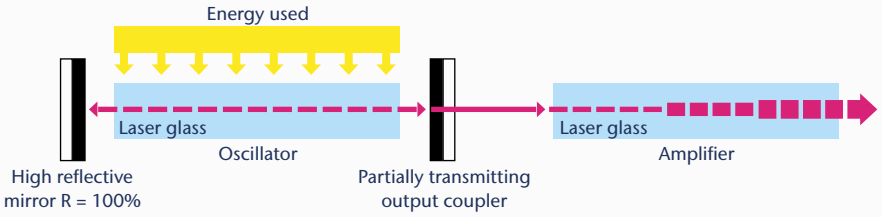
39 meters

in diameter.

Science eagerly awaits first light

The building construction for the ELT on the Cerro Armazones mountain in Chile is already taking shape. The first foundations were poured in 2018, and the enormous dimensions of the gigantic telescope can now be clearly seen. Series production of the 949 round disks has been underway at SCHOTT since the end of 2020 and will be completed in the first quarter of 2024. In the next few years, the other mirrors will be polished and finished in parallel. The telescope structure and dome construction should be complete in 2025, and the main mirror will be installed in 2026.





Laser glass makes laser pulses much more intense. This makes it an indispensable component of many future technologies.

Green solar power from the laboratory

The sun is the largest inexhaustible source of energy on Earth, which is why scientists want to replicate its nuclear fusion processes. Bill James, Vice President of R&D, explains why laser glasses from SCHOTT are a key component in this.

Why is laser fusion considered the energy source of the future?
Extreme energies are generated during laser fusion. The interaction of laser light and matter can even mimic temperatures and pressures similar to those inside the sun, and can be used to generate cheap green energy without fossil fuels. At present, the experiments still require many times the energy produced by the fusion processes, which makes it all the more important that one of our partner institutes, the National Ignition Facility (NIF) at Lawrence Livermore National Laboratories, succeeded in generating burning plasma in 2021 (see box below). This could be a game-changer that will greatly accelerate the development of fusion reactors with a positive energy balance.

To what extent is SCHOTT involved in the research?
We supply to the NIF, as well as the Laboratory for Laser Energetics at the University of Rochester. Laser systems are being created there in which laser glass from SCHOTT helps to accelerate innovations in fusion energy. However, our own work in the research and development laboratories in Duryea, Pennsylvania, and Germany also make an important contribution. After all, sophisticated laser glasses offer promising solutions and are the core components for replicating the sun's nuclear fusion processes.

How exactly does laser glass work?
Laser glass amplifies laser light by generating radiation emissions. It is first irradiated with light from a flash lamp or diode, storing the energy in the process. When a laser pulse passes through the glass, the energy is released again, making the laser beam significantly more intense.

Is laser glass used in many areas?
There are a number of markets for which laser glass is important. For example, dermatologists work with medical lasers to remove scar tissue, hair, and tattoos. As laser glass provides a pulse of light that is needed in high-precision measurements of distances, it is also used in advanced measurement systems and satellite communications. Various laser glasses with very specific properties are used, and the material will continue to be a groundbreaking technology for research and many industrial applications in the future.

What is laser fusion?

Laser fusion uses high-intensity laser radiation from glass-based systems to trigger nuclear fusion. The lasers generate X-rays that heat hydrogen isotopes to such an extent that their nuclei fuse to form helium nuclei. This produces temperatures of up to 50 million degrees Celsius. An important breakthrough in the field was made by researchers at the National Ignition Facility at Lawrence Livermore National Laboratory in 2021. Using laser fusion, they were able to generate burning plasma from hydrogen that heats itself. In the process, a two-millimeter capsule produced 70% of the energy needed to operate the 192 lasers. Until now, fusion experiments have succeeded in generating just 3% of the energy used.

Successfully merged

SCHOTT entered the diagnostics and biotech industry 20 years ago – around the same time as the Australian company MINIFAB, which specializes in microfluidics. Today, they are celebrating joint success as SCHOTT MINIFAB.

Plastic and specialty glass are a good fit for applications in the fields of diagnostics and life sciences, and SCHOTT MINIFAB is the best proof of this. SCHOTT's diagnostics division, which develops glass microarray substrates in Jena, Germany, and MINIFAB, an Australian specialist in plastic microfluidic solutions, were independent companies for a long time. This changed when SCHOTT acquired MINIFAB in 2019. Since then, the two divisions have been working together as SCHOTT MINIFAB, offering customers a unique complete range of microfluidic tests and components made of glass and plastic from a single source.

Fast, efficient, and precise diagnostics are indispensable for the health of people all over the world. A strong partner who can accompany the complete process from the development of diagnostic products to series production is therefore vital. "By combining our expertise in the field of specialty glass, polymers, and microfluidics, SCHOTT MINIFAB is ideally positioned to support our customers with new impulses and highly efficient solutions," says Dr. Heinz Kaiser, the member of the Board of Management of SCHOTT responsible for the diagnostics business. The portfolio includes solutions for customers in the areas of point-of-care diagnostics, clinical diagnostics, and life sciences.

Over 20 years of concentrated expertise is behind this range, and over 1,000 customer-specific solutions for diagnostic tests have been developed in Melbourne since 2002. In addition, a range of glass substrates plus products with functional coatings and structuring have been developed in SCHOTT's laboratories in Jena, Germany. SCHOTT offers its customers another innovative solution to facilitate chip handling and drastically reduce costs with NEXTERION® PreScora, featuring glass substrates prescored into the final chip format.

Together, the two sites work on the development of approaches for complex customer-specific requirements for virtually any diagnostic platform. This expertise was expanded even further when Applied Microarray Inc. (AMI) was acquired in 2021. The US company contributes its expertise in bio-printing and high-density microarrays for research and biosensing. SCHOTT MINIFAB is investing several million dollars at its site in Phoenix, Arizona, to strengthen it further, with a center of excellence for the areas of life sciences and bio-printing being built there. The three locations ideally complement each other to make SCHOTT MINIFAB a leading provider of diagnostic products.

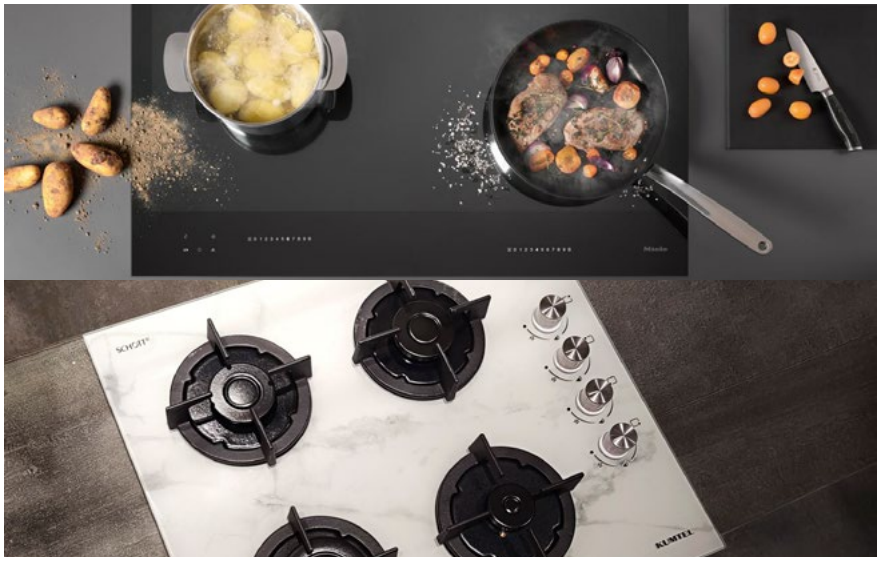
From a single source: SCHOTT MINIFAB offers customers a complete package for microfluidic chips.

Smart applications

SCHOTT customers are experts in turning our products into innovative applications

Make smart calls

A world record in terms of flexibility: SCHOTT UTG® made many foldable displays possible in 2022, including devices by Samsung, vivo, and Xiaomi. The display of the Xiaomi MIX Fold 2, for instance, is equipped with Xensation® Flex. In June 2022, a foldable phone with SCHOTT UTG® set also a new Guinness World Record in June 2022 by surviving more than 300,000 foldings without any problems. The vivo X Fold smartphone is also packed with specialty glass.



Smart kitchen design

As robust as a diamond and more translucent than any cooktop before: the premium household appliance manufacturer Miele is the first brand to use CERAN Miradur® and CERAN Luminoir™ in its new DiamondFinish cooktop surface. The former provides improved scratch resistance, while the latter offers brilliant light in cooktops. SCHOTT® Duo Design continues to be visually appealing. Virtually any idea can be implemented on glass with it: The Turkish kitchen appliance manufacturer Kumtel uses the technology for its cooktop panels. By printing a special ceramic color on both sides, the glass is given the look and feel of natural materials.

Smart architecture

As well as online in the Google search results SCHOTT can now be found in the world's first Google Store in New York. The designers relied on new SCHOTT CONTURAX® Tough and DURAN® Tough glass tubing, combining aesthetics, high strength, and safety thanks to an innovative polymer coating.

Smart throughput

Shows only the beautiful sides of a fireplace fire: The new semi-transparent black fire-viewing panel ROBAX® NightFlame provides an incomparable fire experience and prevents the combustion residues and dirt from being seen once the flames have gone out. It is featured in the "Dream" pellet stove from the Italian manufacturer Moretti Design, among others.

Consolidated Statement of Income

From October 1 2021 to September 30 2022

(in EUR thousands)	2021/2022	2020/2021
Sales	**2,774,821**	**2,523,909**
Cost of sales	–1,765,798	–1,648,346
Gross profit	**1,009,023**	**875,563**
Selling expenses	–317,809	–269,060
Research and development expenses	–98,523	–92,590
General administrative expenses	–188,060	–159,697
Other operating income	52,206	42,561
Other operating expenses	–48,194	–21,407
Income from investments accounted for using the equity method	13,257	14,241
Result from operating activities	**421,900**	**389,611**
Interest income	5,862	1,457
Interest expense	–15,336	–14,719
Other net financial income/expense	–13,850	–3,413
Financial result	**–23,324**	**–16,675**
Result from continuing operations before income taxes	**398,576**	**372,936**
Income tax expenses	–130,061	–86,086
Result from continuing operations	**268,515**	**286,850**
Result from discontinued operations (after taxes)	369	2,335
Consolidated profit for the period	**268,884**	**289,185**
of which attributable to non-controlling interests	–1,110	13,989
of which attributable to the owner of SCHOTT AG	269,994	275,196

Consolidated Statement of Financial Position

As of 30 September 2022

Assets

(in EUR thousands)	Sept. 30, 2022	Sept. 30, 2021
Non-current assets		
Intangible assets	142,530	124,621
Property, plant and equipment	1,660,098	1,375,713
Investments accounted for using the equity method	108,286	89,258
Deferred tax assets	166,610	287,679
Other financial assets	10,756	12,838
Other non-financial assets	3,820	2,530
	2,092,100	1,892,639
Current assets		
Inventories	607,168	433,227
Contract assets	102,586	82,134
Trade receivables	497,755	420,269
Income tax refund claims	14,996	6,952
Other financial assets	57,423	28,015
Other non-financial assets	96,233	68,786
Cash and cash equivalents	258,958	280,781
	1,635,119	1,320,164
Assets held for sale	**0**	**56,212**
Total assets	**3,727,219**	**3,269,015**

Equity and liabilities

(in EUR thousands)	Sept. 30, 2022	Sept. 30, 2021
Equity		
Subscribed capital	150,000	150,000
Capital reserve	322,214	322,214
Generated Group capital	1,298,501	846,372
Accumulated other Group capital	63,090	–51,360
Non-controlling interests	63,525	83,614
	1,897,330	1,350,840
Non-current liabilities		
Provisions for pensions and similar commitments	546,618	876,794
Provisions for income taxes	72,486	43,428
Other provisions	77,707	83,453
Deferred tax liabilities	59,610	36,640
Other financial liabilities	124,553	143,580
Other non-financial liabilities	65,171	20,378
	946,145	1,204,273
Current liabilities		
Provisions for income taxes	16,882	15,900
Other provisions	63,120	61,516
Accrued liabilities	229,999	207,806
Trade payables	341,942	247,963
Tax liabilities	14,297	15,520
Other financial liabilities	153,465	93,602
Other non-financial liabilities	64,039	54,317
	883,744	696,624
Liabilities in connection with assets held for sale	**0**	**17,278**
Total equity and liabilities	**3,727,219**	**3,269,015**

Consolidated Statement of Cash Flows

From October 1 2021 to September 30 2022

(in EUR thousands)	2021/2022	2020/2021
Group earnings after taxes	268,884	289,185
Depreciation and amortization/impairment reversals on non-current assets	208,937	174,827
Increase/decrease in provisions and accrued liabilities	33,256	45,582
Other non-cash expenses and income	–5,230	–19,436
Gain/loss on the disposal of intangible assets and property, plant and equipment	–4,735	1,434
Gain/loss from financial assets	–913	1,900
Increase/decrease in inventories and prepayments made on inventories	–145,726	–19,424
Increase/decrease in contract assets (IFRS 15)	–20,452	2,788
Increase/decrease in trade receivables	–58,496	–62,699
Increase/decrease in other assets	–41,500	–13,454
Increase/decrease in prepayments received	52,112	21,902
Increase/decrease in trade payables	91,905	30,830
Increase/decrease in other liabilities	18,941	16,836
Increase/decrease in deferred taxes	47,216	24,032
Cash flow from operating activities (A)	**444,199**	**494,303**
Cash inflow from the disposal of property, plant and equipment/intangible assets	14,489	2,722
Cash outflow for investments in property, plant and equipment/intangible assets	–401,024	–321,057
Cash inflow from the disposal of financial assets	61	630
Cash outflow for the acquisition of consolidated companies and other business divisions	–18,281	–9,283
Cash outflow for investments in financial assets	–3,140	–1,349
Dividends received	820	6,278
Cash flow from investing activities (B)	**–378,614**	**–322,059**
Dividends paid	–33,337	–11,935
Increase/decrease of non-controlling interests in the capital reserve	0	–10,867
Raising of loans	49,005	5,654
Repayment of loans	–55,550	–44,281
Allocation of plan assets	–18,843	–27,515
Increase/decrease in financial receivables	–27,962	–3,148
Raising/repayment of financial liabilities	3,183	–5,077
Payment of principal portion of lease liabilities	–17,219	–19,290
Cash flow from financing activities (C)	**–100,723**	**–116,459**
Change in cash and cash equivalents (A+B+C)	**–35,138**	**55,785**
Opening balance of cash and cash equivalents	**280,781**	**233,784**
– Checks, cash on hand	50	252
– Deposits with banks	280,731	233,532
Change in cash and cash equivalents due to exchange rates*	7,285	1,819
Change in cash and cash equivalents due to changes in the scope of consolidation and recognition	6,030	–10,607
Closing balance of cash and cash equivalents	**258,958**	**280,781**
– Checks, cash on hand	441	50
– Deposits with banks	258,517	280,731
Additional notes to the Consolidates Statement of Cash Flows**		
Interest paid	–5,103	–4,446
Interest received	6,307	1,457
Income taxes paid	–61,077	–44,407

* Restricted cash and cash equivalents have been reported under other assets since fiscal year 2020/2021

** Included in cash flow from operating activities

Discover SCHOTT's latest glass innovations in Solutions magazine

SCHOTT has been writing great stories for almost 140 years, stories about people who change the world through their passion for glass. In the new online magazine Solutions, SCHOTT tells these stories with entertainment and flair, in the process reaching new heights in corporate communication.
"In order to successfully communicate our fascination for specialty glass and other high-tech materials to the world, we have to keep breaking new ground," says Michael Müller, Head of Innovation PR & Storytelling. Solutions replaces the printed technology magazine of the same title, as well as the company's Innovation Blog, while following a entirely new journalistic concept.

As a counterpoint to the rapid, fast-moving communication of social media, the magazine's informative background reports and visually stunning in-depth reportage bring the reader closer to SCHOTT's materials and technologies. "We want to focus on the people behind our developments and encourage third parties such as customers and partners to share their comments," Müller adds.
Since we celebrated the UN's International Year of Glass in 2022, the first issue of the magazine focuses on glass as a material and its potential to reach the limits of what is physically possible. The new online magazine is aimed at a broad audience, which includes journalists and influencers, as well as customers, partners, job applicants, and employees.

"We want to use unusual storytelling approaches to inspire our readers so they will pass on our stories and passion," says Lea Kaiser, who is in charge of the project. A targeted online campaign under the hashtag #solutionsmag helps to reach them and turn readers into #glasslovers and influencers.

Are you interested in the many exciting stories?
Find all issues of Solutions magazine at **schott.com/en/solutions-magazine**

Great stories deserve to be shared.

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