

**Photonics for Medical Applications:**  
**Health in a new light.**

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BERLINER GLAS GROUP

# We make light useable.

## For the benefit of mankind.

Light has radically revolutionized medical technology. Today optical solutions provide innovative diagnoses and treatment procedures which would have been unthinkable just a few years ago. And progress is continuing. New technical possibilities flow into components, assemblies and systems which are becoming ever more precise and powerful. The Berliner Glas Group makes a significant contribution to this development.

### We have experience. And we keep our promises.

We specialize in opto-mechanical components and systems and have a good understanding of all light applications. Based on these core competencies we develop and produce crucial optical key components, assemblies and systems for international medical equipment manufacturers, which we assemble in our clean rooms. If you require opto-mechanical camera systems for high-precision 3D measurements, powerful camera heads for endoscopes in HD quality, optics for laser applications or fluorescent diagnostics, the Berliner Glas Group offers you tailor-made solutions which are state-of-the-art and conform to your market requirements. The only limits on feasibility are those of the laws of physics. On this basis, we implement the requests of our customers in specifications – and work closely with you until the desired product is ready for the market.

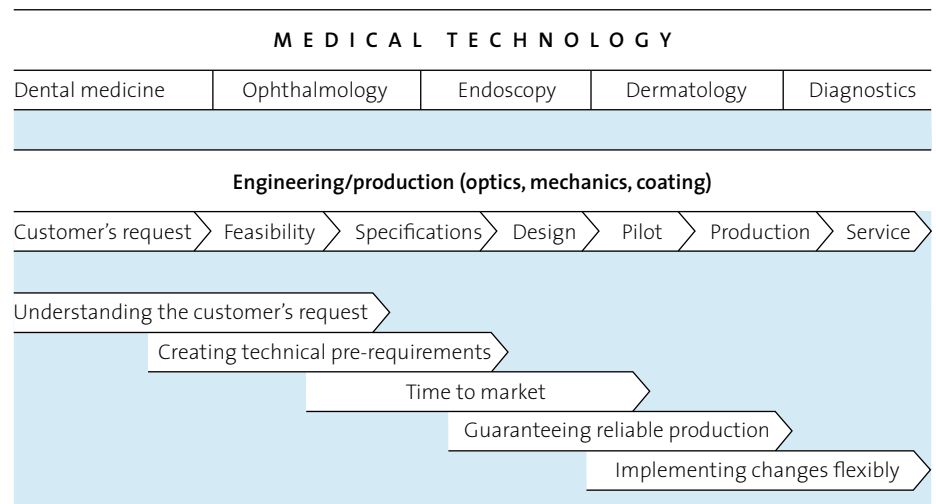
### Listening, thinking and implementing.

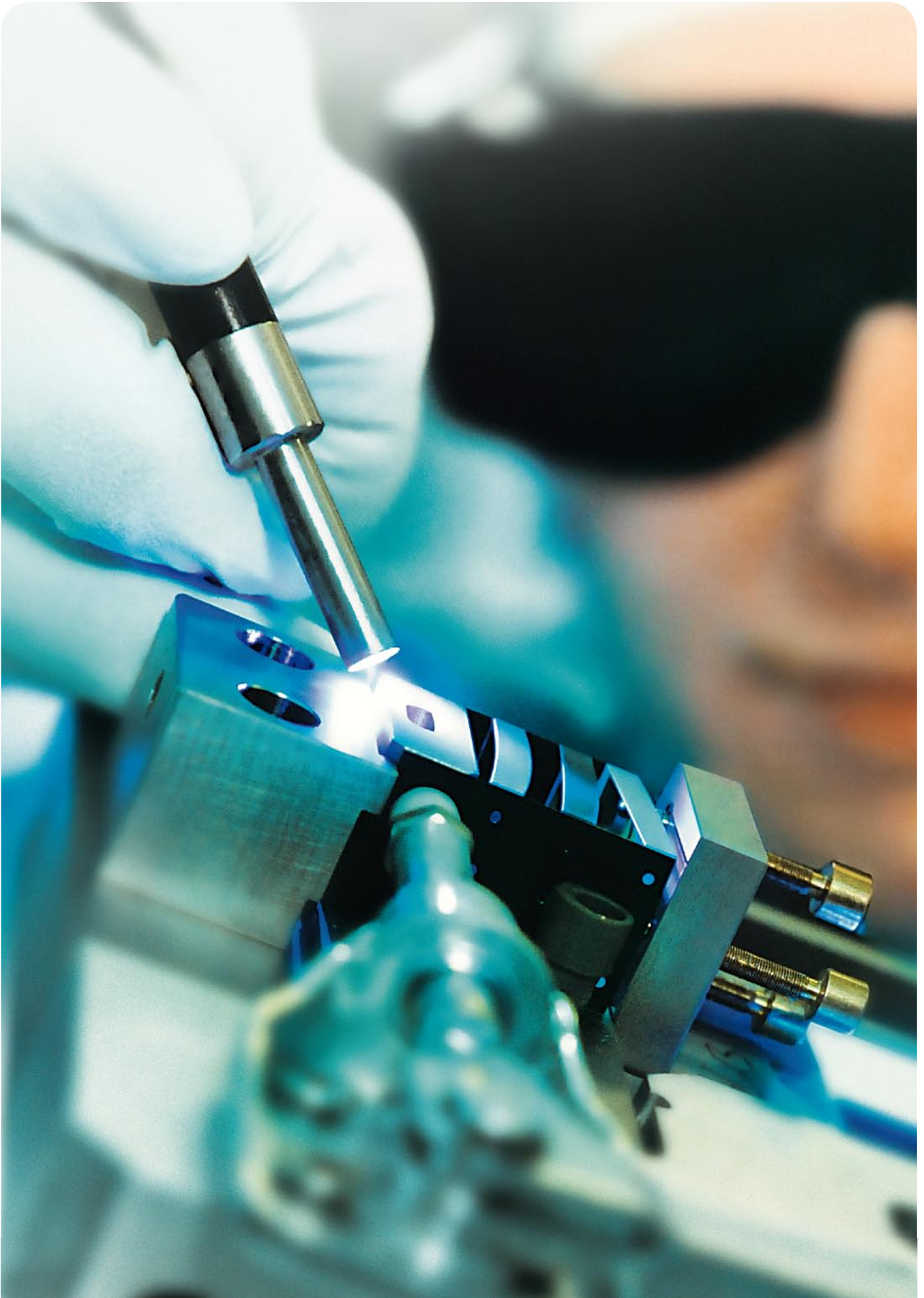
As part of the internationally-orientated Berliner Glas Group, which specializes in optical solutions, you profit from the experience and innovative creativity of a strong company. Due to the high level of education and training of our engineers, scientists and specialists, our large development team and network of selected suppliers, we can react quickly and flexibly to virtually any market requirement. In doing so our focus is always on our customers. We understand their applications, listen carefully to what they have to say, develop a prototype in close cooperation with them and perfect it so that it is ready for series production. At the end of this process there is always a solution which meets the highest quality demands and brings the development of light-based medical technology an important step further.

#### Medical applications at a glance:

- ◆ Engineering and production of optical key components, assemblies and systems
- ◆ Supplier for international OEMs in the medical and analyzing technology sectors
- ◆ Tailor-made solutions which are state-of-the-art and support market requirements
- ◆ Fast development at the highest quality
- ◆ Production in clean rooms using the latest metrology techniques
- ◆ Flexibility with regards to batch sizes, technology, vertical integration and changes to the specifications
- ◆ Traceability at batch level
- ◆ Biocompatibility

#### This is how we work for you.



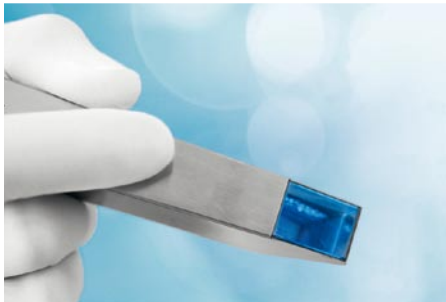


# You determine the requirements.

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## We develop customer-specific solutions.

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We provide optical solutions for complex requirements, which allow our customers to perform high-precision measurements on difficult surfaces such as teeth, e.g. a 3D teeth model (top) created using a 3D dental camera Cerec Bluecam (below).

Source: Sirona

### Dental medicine: perfect dental prostheses using 3D measurements.

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Using either structured light projection or confocal measurements, the advantages of light-based medical devices are evident for both the dentist and the patients. For example, in dental medicine dental prostheses can be created not just in a more precise way, but also much quicker using the three-dimensional optical imaging of teeth with the aid of a camera. The patient discomfort associated with a normal dental cast, is thereby avoided. The camera measuring systems required for this are developed and produced by Berliner Glas. They have high resolution at low distortion as well as external strong-contrast imaging of the depicted elements. The camera systems themselves are equipped with CCD sensors and impress with their extraordinarily precise imaging as well as automatic pixel correction.

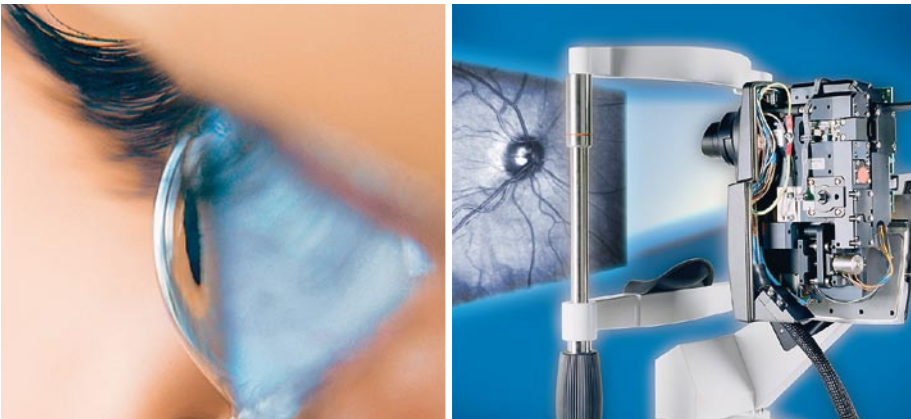
#### Simply impressive and versatile.

Our camera measuring systems are not just limited to dental medicine. On the contrary: the area of application is extremely diverse. Anywhere that the human body has to be measured, we can provide optimum results – be it for example in orthopedics or in surgery. Regardless of the area of application, our camera measuring systems convince with for example plug-and-play, their intuitive easy handling, extremely precise data, high resolution images and long life-span.

### Dermatology: protective treatment.

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Complex diagnostic assemblies in ophthalmology.

## Ophthalmology: technology which impresses.

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Today, short-sightedness, long-sightedness as well as astigmatism can be corrected thanks to modern medical technology. We develop and produce innovative optical assemblies and systems for ophthalmology. In addition to precision objectives with fixed focal length and motorized zoom objectives with minimum spot sizes, our product portfolio also comprises beam ex-

panders for increasing the scope of the laser beam. In addition we also produce flexible optical systems in the form of articulated mirror arms and use polygon and resonance scanners for beam deflection. As a result we are not just the ideal partner for high-quality optical key components, but also for complete electro-optical-mechanical assemblies.



The latest medical technology is gaining increasing significance in dermatology. We support this development with customer-specific opto-mechanical components and assemblies.

Our solutions are, for example, used in commercial systems for hair removal, skin rejuvenation or also in imaging systems for documenting and for follow-up checks of surgeries.

The Berliner Glas Group develops and produces complete light sources for their customers.



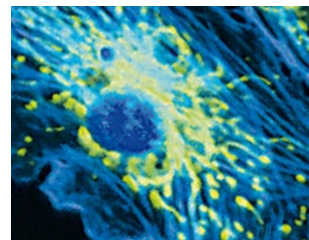
## Fluorescence diagnostics: on the trail of cell changes.

Fluorescence diagnostics can make an important contribution to the examining of microscopic tissue and cell samples. We can develop and produce the required optical system solutions at the highest quality.

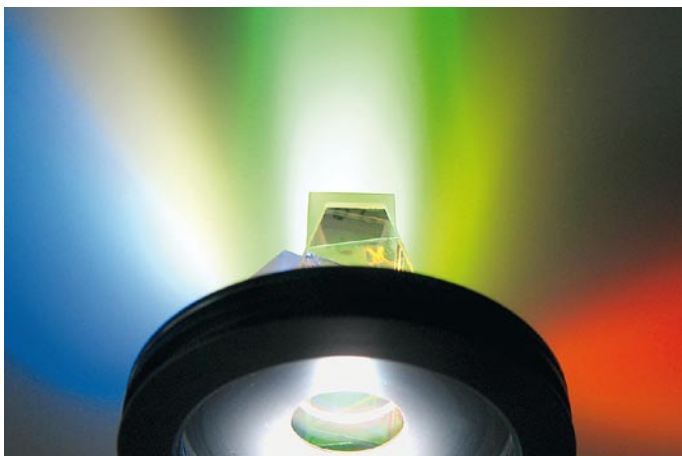
This includes light sources with excitation light from infrared to ultraviolet wave-

lengths, which are linked together, e.g. by white light.

At the same time we separate fluorescent light at the necessary points from normal lighting using multi-chip camera systems, in order to provide the doctor with optimum evaluation options.



## Endoscopy: deep insights in the highest resolution.



We know what we are talking about. As a result we create very high-quality optical assemblies and systems for our customers.

Due to the development of smaller and more flexible devices, along with cameras which are even more powerful, the spectrum of applications in endoscopy has increased considerably. Just as much to the benefit of the patient as to provide an effective and cheap alternative to classical surgery. Our camera heads make an important contribution to this development. Equipped with three CCD chips they impress with brilliant images and excellent color rendering. On the request of the customer they can also be developed and produced in HD.

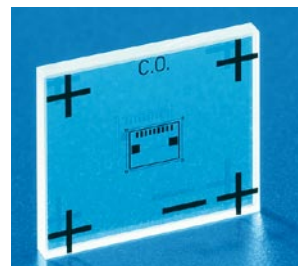
### **Autoclavable to 134°C.**

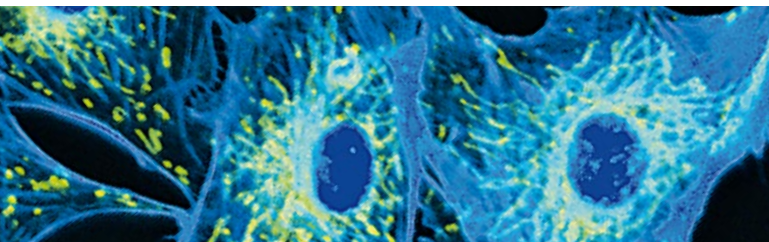
In order to meet the high hygienic requirements, as well as the technical specifications during a surgery, we have developed our camera inserts so that they can be fully autoclaved. We have mastered the necessary joining technology, so that the whole module

## Microscopy: making the smallest things visible.

The smaller the objects to be examined, the more precise optics are required. We also offer, particularly for microscopes, impressive solutions with which we again demonstrate our capabilities. The best examples of this are our precision optics for laboratory and operation microscopes, especially the multifunctional monolithic optics, where mechanical functions –

for example attachment functions – are applied directly into the glass. In addition we develop and produce the necessary lighting systems, special glass filters as well as precision guidelines.





can be heated to 134 °C, without causing any damage. This allows maximum sterility at minimum effort.

#### Let there be light.

In order to ensure the optimum representation of the insides of the body during an endoscope, correct lighting is of great importance. As a result the Berliner Glas Group offers the development and production of special LED light sources, which are considerably above-average with regards to brightness and intensity. Depending on the type, cold light sources offer a light output of up to 900 lumens at a color temperature of approx. 6,000 Kelvin. The LED construction guarantees maintenance-free operation and allows compact dimensions, so that the light source cannot just be adjusted as a complete system, but also as a module for customer applications and can be integrated into existing systems.



## Our services, your benefits.

### Engineering

- ◆ System engineering
- ◆ Optical and mechanical design
- ◆ Coating design
- ◆ Customer-specific metrology

### Key components

- ◆ Lenses: spherical, aspherical, cylindrical, cemented lenses
- ◆ Plano optics: mirrors, filters, prisms and prism systems
- ◆ Microstructuring: gradient filters, reticules, target markers
- ◆ Coating: AR, HR, PR for DUV, UV, VIS, NIR 190-6,000 nm

### Assemblies

- ◆ Optical assemblies
- ◆ Opto-mechanical assemblies
- ◆ Lens systems
- ◆ Objectives, zoom objectives
- ◆ Autoclavable assemblies and systems

### Systems

- ◆ Opto-mechanical systems
- ◆ Electro-optical systems
- ◆ Measuring systems for medical and industrial applications
- ◆ Cameras, including autoclavable cameras
- ◆ Measurable optical systems
- ◆ Laser systems for medical applications
- ◆ Light sources

### Metrology

Wavefront	Interferometer, 4-24" Shack-Hartmann-Wavefront-Sensor (UV, DUV, VIS, NIR)
Form deviation	3D-coordinate measurement, Caliper, CCD-Micrometer, Stitching interferometer
Angle precision	Goniometer, interferometer
Transmission/reflection	Spectrophotometer, diode array
Surface defects	Automatic traveling microscope
Micro roughness	White light interferometer, AFM
Imaging performance/resolution	Computer-supported MTF-measurement, microscope picture resolution test
Centering	Objective metrology station, laser centering station
Additional functional	Assembly-specific metrology station

# Solutions in Optics. Hightech in Glass.

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The Berliner Glas Group is one of the leading European providers of optical key components, assemblies and systems as well as high-quality refined technical glass. With our understanding of optical systems and optical production techniques, we develop and integrate optics, mechanics and electronics into innovative system solutions. These solutions are applied worldwide across the whole spectrum of the light-using industry – from medicine to semiconductors, metrology and analysis to defense or as displays, for example in offices, televisions, monitors or navigation systems.

The Berliner Glas Group consists of companies which have been developing and producing optical solutions for over 100 years. As an owner-managed medium-sized company with around 950 employees, we can offer our customers tailor-made, market-driven solutions of the highest quality anywhere and at any time.



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