

BASLER CAMERAS FOR MEDICAL & LIFE SCIENCES



- Outstanding performance to price ratio
– with CMOS sensors better than ever
- Reliable long-term availability
– through best-in-class quality
- Reduced certification efforts for
medical devices – in compliance
with ISO 13485:2016

WHY BASLER CAMERAS



MOST PRISTINE & COLORFUL PICTURES

Outstanding image quality

- Powerful MED Feature Sets integrated in Basler's MED ace
- True colors, clear contrasts, high resolution, fast live images
- Outstanding performance stability due to high quality standards



CARE-FREE CAMERA LIFE CYCLE

Comprehensive support and services

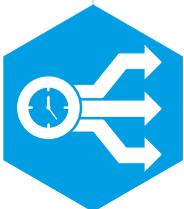
- 3-year warranty on entire camera portfolio
- Ad-hoc service by Basler's technical support
- Point of contact at your site via Basler worldwide network of offices



PURCHASE DECISION WITH MINIMUM RISK

Secure future investment

- Long-lasting camera life and reliability through numerous quality assurance measures
- Long-term availability of cameras
- Outstanding ratio of performance to price



YOUR PARTNER FOR OPTIMUM DESIGN-IN PHASE

Easy system integration

- Compliant to ISO 13485:2016 with Basler's MED ace
- Individual consulting and customized products
- Basler support teams located worldwide



SELECTING YOUR PERFECT CAMERA

Broad portfolio range

- Over 300 camera models provide cost-efficient and high-end performance also for industrial applications
- Resolutions up to 20 MP, high speed with up to 751 fps
- Monochrome or color variants and near-infrared (NIR) enhanced versions



DEFINING YOUR SYSTEM REQUIREMENTS

Supported by experts

- Technology leadership with more than 30 years of vision experience
- Key driver of technology trends and vision standards
- Basler position as most trusted brand in industrial digital cameras

OVERVIEW

Camera Offering for Medical & Life Sciences



Sensor Technology Shift: CMOS Now Better Than CCD

The world-leading manufacturer of CCD sensors Sony decided in 2015 to stop producing and investing in this technology, no major new inventions or developments have been made to expand CCD technology. CMOS technology, on the other hand, has experienced heavy investments. It can now match the high quality of CCD sensors and deliver even better image quality.

The following table contains typical CCD sensors which have been integrated into many cameras in the Medical & Life Sciences domain. The specifications show the advantages of the next-generation CMOS sensors offered when choosing one of Basler's MED ace cameras:

Comparison	CCD	CMOS	CCD	CMOS
Camera Model	Basler Scout	Basler MED ace 2.3 MP 164 mono	Basler pilot	Basler MED ace 5.1 MP 75 mono
Sensor	Sony ICX285	Sony Pregius	Sony ICX625	Sony Pregius
Resolution	1.4 MP	2.3 MP	5.0 MP	5.0 MP
Pixel Size	6.45 μm	5.86 μm	3.45 μm	3.45 μm
Frame Rate	17 fps	164 fps	17 fps	75 fps
Quantum Efficiency	58 %	70 %	47 %	67 %
Temporal Dark Noise	8 e^-	7 e^-	13 e^-	2 e^-
Dynamic Range	68 dB	74 dB	55 dB	73 dB

Specifications are subject to change without prior notice. Latest specifications can be found on our website baslerweb.com/MEDace

BASLER MED ACE



Basler MED ace cameras are Basler's first camera series specifically designed for Medical & Life Sciences and are the perfect answer to the discontinuation of CCD sensors. Equipped with CMOS sensor technology at its best, the MED ace delivers even better image quality at much lower costs than CCD cameras.

With Sony's powerful Pregius sensors and exceptional PYTHON sensors by ON Semiconductor, the Basler MED ace stands out with up to 164 fps and 20 MP, pixel sizes up to 5.86µm, low temporal dark noise down to 2e⁻ and sensor sizes up to 1.1 inch.

Compliant with ISO 13485:2016



With certification according to ISO 13485:2016, Basler has proven its quality standards for production, distribution and service of digital cameras, as well as for placing them on the market.

For you, this means consistency, reliability and quality. Whether you want to operate internationally or expand locally, the ISO 13485 certification helps you to achieve quick time to market. Let Basler assist you with documentation and preparation for the certification of your medical device.

Basler's Powerful MED Feature Sets

Basler's unique and industry-leading MED Feature Sets for Medical & Life Sciences bring it down to what our customers are looking for. They combine market-leading hardware, firmware and pylon software features:

Easy Compliance		Brilliant Image	
Low Light Imaging		High Speed	
Perfect Color		Industrial Excellence	
Dust Protection			

Basler developed these unique features specifically designed to address the high imaging demands in Medical & Life Sciences and to reduce our customers' development efforts.

Basler pylon Camera Software Suite



The pylon Camera Software Suite is a software packet from and for Basler cameras. This lets you activate your Basler MED ace camera via a Mac, Windows or Linux PC - quickly and easily.

Overview of Basler MED ace

Sensor Technology	State-of-the-art CMOS sensors
Sensors	Sony Pregius: IMX174, IMX249, IMX250, IMX264, IMX255, IMX267, IMX253, IMX304, IMX183 ON Semiconductor: PYTHON 5000
Frame Rate	Up to 164 fps
Resolution	Up to 20 MP
Pixel Size	Up to 5.86 µm
Temporal Dark Noise	Down to 2 e ⁻
Sensor Sizes	Up to 1.1 inch
Interface	USB 3.0 Vision, GigE Vision
Benefits	Including high-performance Basler MED Feature Sets designed for Medical & Life Sciences

Specifications are subject to change without prior notice. Latest specifications can be found on our website.

Read more at baslerweb.com/MEDace

POWERPACK FOR MICROSCOPY



The Basler PowerPack for Microscopy is a fully equipped package for image acquisition in microscopy. It consists of a Basler Microscopy camera, as well as professional microscopy software, USB 3.0 cable and quick installation guide. The additional Basler Video Recording Software allows capturing of single images, recording of videos or image sequences for time-lapse microscopy.

Thanks to its plug-and-play setup, the Basler PowerPack for Microscopy allows end users a simple system setup and easy installation.

Basler Microscopy pulse

The Microscopy pulse camera with resolutions between 1.2 MP and 5 MP comes with USB 3.0 as standard interface and USB 2.0 backward compatibility. The camera was specifically designed to be cost-effective and easy to use. High frame rates allow for smooth live viewing, fast focusing and sample screening. The well-established ON Semiconductor CMOS sensors offer accurate and reproducible results for a broad range of standard microscopy applications.



Basler Microscopy ace

The Microscopy ace cameras feature Sony's state-of-the-art IMXCMOS sensors. Thanks to these global shutter sensors, the cameras offer low noise levels down to $2.2 e^-$, a large dynamic range of roughly 73dB, and quantum efficiencies over 70%. Similarly, Basler's Microscopy ace models with resolutions up to 12.2 MP achieve a new level of image quality.

They are the ideal choice for moderate-to-challenging microscopy applications. High frame rates of up to 200 fps allow tracking of fast objects, fast focusing and sample screening even at full resolution.



Overview of Basler's PowerPack for Microscopy

Sensor Technology	Latest CMOS sensors
Frame Rate	Up to 200 fps
Resolution	Up to 12 MP
Pixel Size	Up to 5.86 μm
Temporal Dark Noise	Down to $2e^-$
Sensor Sizes	Up to 1/1.2 inch
Interface	USB 3.0
Benefits	Plug-and-play package for microscopy applications

Specifications are subject to change without prior notice. Latest specifications can be found on our website.

EMBEDDED VISION



The health care and life sciences sector is being deeply transformed by a variety of new requirements and calls for new approaches in technology design. Embedded vision helps medical device manufacturers to achieve the right combination of high performance, low cost, low power and programmability.

Current Trends for Medical Device Manufacturers

- Miniaturization: While devices are getting smaller, the demand for reproducibility and accuracy is growing.
- Reduction of costs: Even with growing technical requirements, pressure to control or reduce costs is also rising.
- Point-of-care-testing: Diagnostic devices are evolving towards the patient's home environment, becoming more portable, flexible, and personalized.

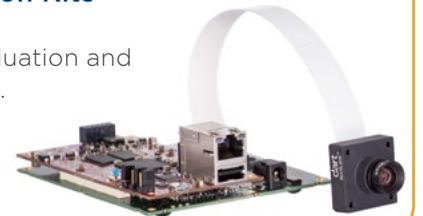
These trends make embedded vision an indispensable key technology for the health sector for many years to come. With a broad range of embedded vision products and extensive experience in industrial camera design, Basler is helping make innovative medical devices more robust, reliable, flexible and cost effective.

Basler dart



Versatile camera modules for embedded applications.

Embedded Vision Kits



User-friendly evaluation and development kits.

Overview of Basler dart

Sensor Technology	Latest CMOS sensors
Sensors	ON Semiconductor: AR0134, AR0521, MT9P031 Sony Pregius: IMX392; Sony Starvis: IMX334; e2v: EV76C570
Frame Rate	Up to 160 fps
Resolution	Up to 13 MP
Pixel Size	Up to 4.5 μm
Temporal Dark Noise	Down to 6 e^-
Sensor Sizes	Up to 1/1.8 inch
Interface	USB 3.0 Vision, BCON for LVDS, BCON for MIPI
Benefits	BCON for MIPI for best price/performance ratio BCON for LVDS for direct FPGA connection USB 3.0 Vision for easy integration

Specifications are subject to change without prior notice. Latest specifications can be found on our website.

BASLER BOOST BUNDLE



The Basler boost camera series combines latest CMOS sensor technology with high bandwidths. Together with the well-tailored Basler CXP-12 interface card 1C, Basler also offers the boost in a bundle and thus as two perfectly harmonized components.

The Basler boost Bundle for Medical & Life Sciences at a Glance

- Basler CXP-12 camera and CXP-12 interface card from one source
- Reduction of system complexity and costs
- Simple installation of camera and interface card through GenTL and the pylon Camera Software Suite (SDK)
- Outstanding image quality thanks to Sony Pregius sensors
- CoaXPress 2.0 interface and standardized Micro-BNC (HD-BNC) cable connection
- High transfer speed up to 12.5 Gbps and high resolution up to 12 MP

Application Example: Surgical Microscopy

The bundle is suitable for applications in Medical & Life Sciences where the priorities are high resolutions, fast data rates and low latency periods, with low integration costs at the same time. Surgical microscopes with an integrated camera are one example. Equipped with the latest Sony Pregius sensors the Basler boost cameras offer excellent image quality and high color fidelity. With a resolution of 4K, the cameras provides images with 60 fps and enables views of the surgical process or the marking of tumors in fluorescence-assisted operations.

Basler boost Bundle

Basler CXP-12 camera with the well-tailored Basler CXP-12 interface card.



Overview of Basler boost

Sensor Technology	Latest CMOS sensors, global shutter
Sensors	Sony Pregius: IMX253, IMX255
Frame Rate	Up to 93 fps
Resolution	Up to 12 MP
Pixel Size	3.45 μm
Temporal Dark Noise	Down to 2 e ⁻
Sensor Sizes	Up to 1.1 inch
Interface	CoaXPress 2.0 (CXP-12)
Benefits	Standardized cable connection: Micro-BNC (HD-BNC) Cable lengths of up to 40 m with max. bandwidth Available for C-mount, F-mount and M42-mount lenses

Specifications are subject to change without prior notice. Latest specifications can be found on our website.

BASLER BLAZE



The Basler blaze industrial 3D camera operates on the Time-of-Flight (ToF) principle and stands out with high precision for 3D imaging in real time. Its laser diodes (VCSEL) work in the NIR range (940 nm), generating 2D and 3D data in one shot with a multipart image, incorporating range, intensity and confidence maps. Typical applications in Medical & Life Sciences include patient positioning, patient monitoring, biometrics or surgical robots.

The Basler blaze for Medical & Life Sciences at a Glance

- Outstanding 3D imaging with the latest Sony DepthSense™ IMX556PLR sensor technology
- Precise, millimeter-accurate optical measurement with the time-of-flight method
- Real-time streaming of 3D point clouds and 2D intensity images
- Large measuring range
- IP67 protection
- Light and contrast independent
- Easy system integration thanks to compact design and GigE Vision
- Invisible and eye-safe NIR illumination

Application Example: Patient Positioning in Radiology

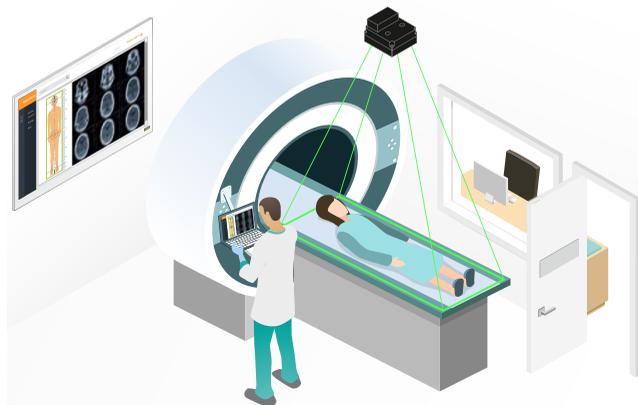
The exact position of the patient has a decisive influence on the quality of an X-ray image. An automatic, almost millimeter-precise positioning enables sharp, exact images, reduces the effort for the medical personnel and minimizes the necessary radiation dose.

Basler blaze

Time-of-flight (ToF) camera with high precision for 3D imaging in real time.



DepthSense™



Overview of Basler blaze

Sensor	Sony DepthSense™ IMX556
Frame Rate	30 fps
Resolution	VGA
Interface	GigE
Field of View	60° × 45°
Working Range	0-10 m
Accuracy	<5 mm @ 0.3-6 m; typical
Protection Class	IP67
Illumination Type	940 nm VCSEL

Specifications are subject to change without prior notice. Latest specifications can be found on our website.

BASLER'S VISION COMPONENTS



An image processing system needs more than just a camera. Only a lens, light source, reliable data transfer and additional components such as frame grabbers, trigger cables, PC cards and power supplies turn a vision system into a functioning unit. Basler offers a large selection of vision components that match each other perfectly.

Basler's Vision Components at a Glance

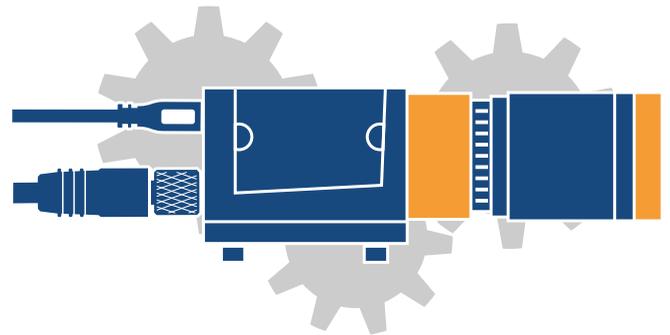
- Compatible with our Basler MED ace cameras
- Broad and harmonized product portfolio
- In-house developments or developments in cooperation with other companies
- Matching, certified and tested vision components
- One-stop shopping (everything from a single source)
- Professional consulting before and after the buying decision with distinctive computer vision know-how

Vision System Configurator: Need Help Selecting the Right Vision Components for Your Application?

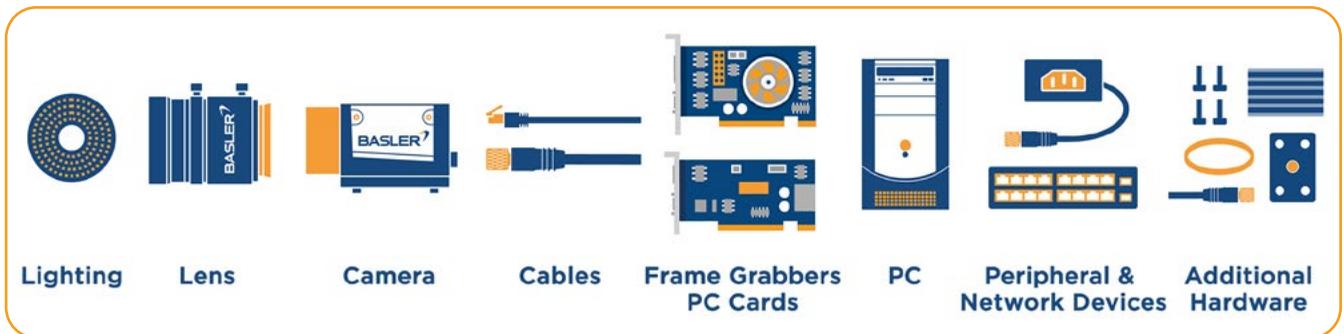
A vision system consists of multiple components, with the camera as the system's centerpiece. If you want to complete your vision system, our Vision System Configurator will help:

baslerweb.com/vision-system-configurator

You can pick cameras, lenses, power and data cables as well as other accessories step by step. We ensure that the selected components fit together.



Typical Set-up of a Camera System



VISION SYSTEMS FOR DEEP LEARNING



Deep learning is rapidly spreading across Medical & Life Sciences applications and helps for example in pathology detection in microscopy. The benefits of artificial neural networks (ANNs) are twofold. ANNs have the potential to improve the accuracy and robustness for applications. At the same time, ANNs have the capability to solve image-based application problems that could not be solved in the past.

The Advantages of Deep Learning Compared to Classical Rule-based Algorithms

- Classification of complex images
- Improved accuracy and robustness
- Automatic feature extraction

Basler products are well suited for inference of ANNs. We are offering a variety of products to choose from when designing a deep learning vision system.

Best performance, fastest inference per second, highest reliability - if your application demands high throughput, the **FPGA frame grabber-based system** is the right fit for you.

Thanks to our plug-and-play hardware and software components **PC-based systems** score with an easy design-in. Our broad camera portfolio and the pylon Camera Software Suite make it easy to deploy your ANN without spending too much integration effort.

The most compact and cost-effective vision systems can be designed using **embedded vision technology**. The combination of board level cameras and embedded processing units ensures the lowest cost per unit.

FPGA Frame Grabber-Based Systems

Fastest inference and highest reliability.



PC-Based Systems

Fast time-to-market with lowest integration costs.

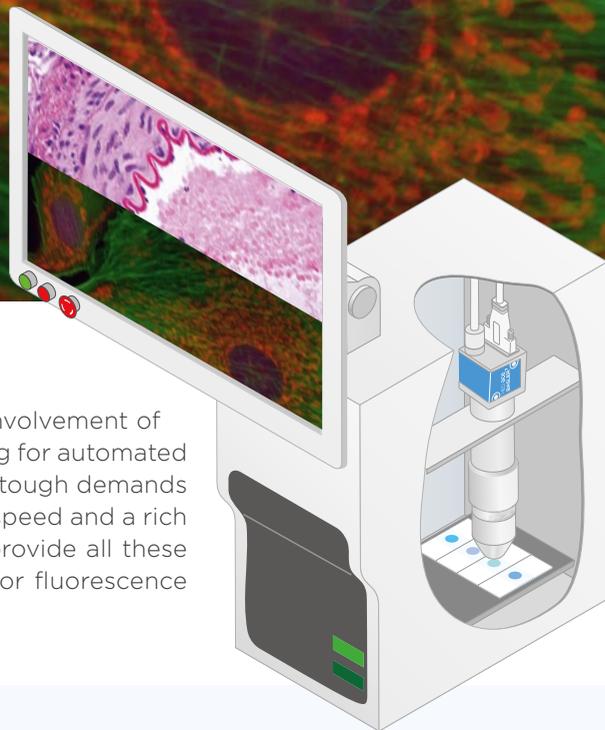


Embedded Vision Technology

Most compact and cost-effective solutions.



AUTOMATED MICROSCOPY



Best Fit for Automated Microscopy

The role of automation in microscopy is increasing rapidly. Involvement of artificial intelligence includes algorithms such as deep learning for automated analysis e.g. in medical diagnostics. These applications have tough demands for digital cameras: excellent image quality, high acquisition speed and a rich set of camera control functions. Basler MED ace cameras provide all these requirements under conventional light conditions but also for fluorescence applications.

RECOMMENDED CAMERAS

Basler MED ace

MED ace 2.3 MP 164 mono / color
MED ace 5.1 MP 75 mono / color
MED ace 12.3 MP 30 mono / color
MED ace 20 MP 17 mono / color



BENEFITS

Unique and powerful MED Feature Sets included in Basler's MED ace:



Brilliant Image

In-camera image optimization such as 5x5 debayering and sharpness enhancement for capturing the most delicate structures; smart auto contrast and quick auto brightness for changing light conditions



Perfect Color

Fully-controllable true 12-bit color pipeline for true color reproduction in slide scanning applications



Low Light Imaging

Basler's innovative long exposure mode for lowest noise, and excellent SNR for low light applications such as in fluorescence



Dust Protection

Meets special cleanliness requirements through the sealing of the sensor room and the separate production of the Basler MED ace in a cleanroom with strict tests for dust and other particles

Basler PowerPack for Microscopy

Microscopy pulse 5.0 MP color
Microscopy ace 2.3 MP mono/color



Plug-and-play bundle for a variety of microscopy tasks, which includes:

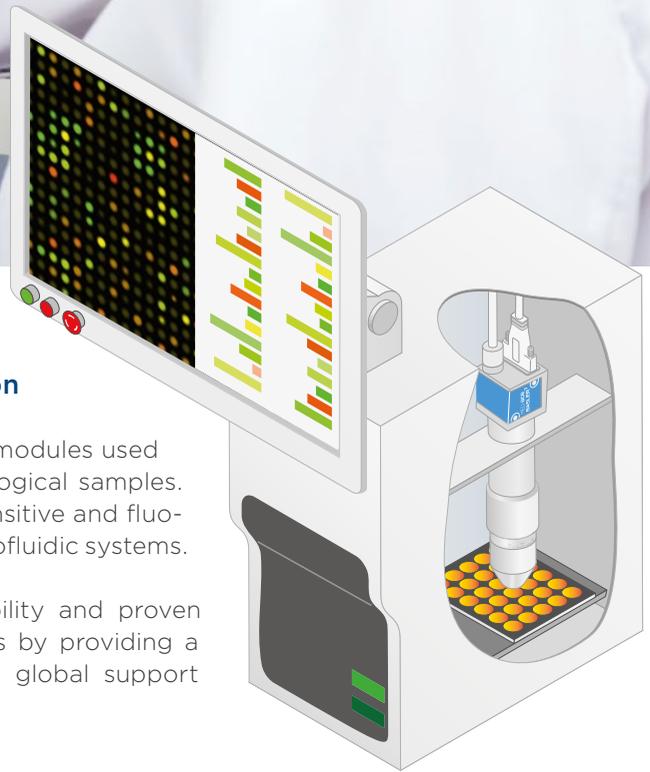
- Basler microscopy camera
- Professional microscopy software
- Video recording software
- USB 3.0 cable
- Quick install guide

MOLECULAR DIAGNOSTICS

Best Fit For Your Molecular Diagnostic Instrumentation

CMOS cameras are integrated into high-sensitivity detection modules used for analysis of proteins and nucleic acids in a variety of biological samples. Modern analyzers for in-vitro diagnostics (IVD) use highly-sensitive and fluorescence-based detection methods e.g. in microarrays or microfluidic systems.

Basler provides long-lasting products of the highest reliability and proven industrial-grade quality. Basler offers short integration times by providing a user-friendly software development kit (SDK). Experienced global support ensures fastest time-to-market for your upcoming products.



RECOMMENDED CAMERAS

Basler MED ace

- MED ace 2.3 MP 164 mono/color
- MED ace 5.1 MP 75 mono/color
- MED ace 12.3 MP 30 mono / color
- MED ace 20.0 MP 17 color



BENEFITS

Unique and powerful MED Feature Sets included in Basler's MED ace:



Low Light Imaging

High sensitivity, low dark noise, as well as Basler's unique long exposure mode for applications with difficult light conditions and weak signals



Easy Compliance

Compliant with ISO 13485:2016 for minimized certification efforts and proven reliability in in-vitro diagnostic instruments



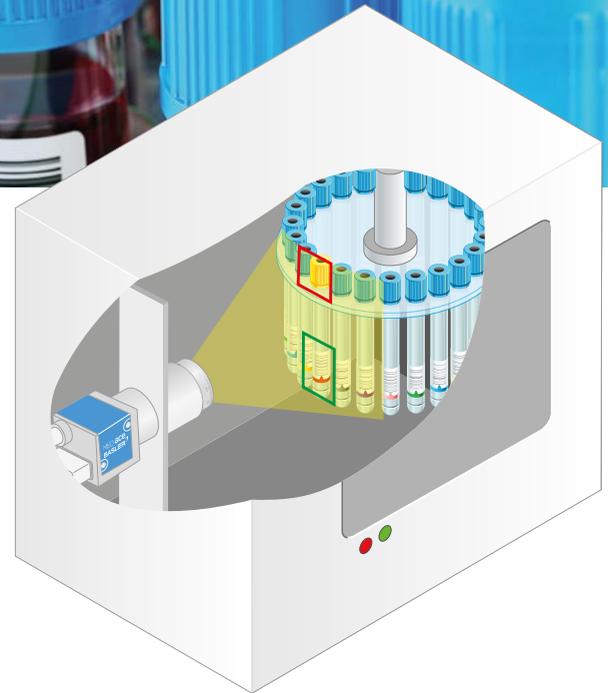
Industrial Excellence

Optimized design together with exceptional price/performance ratio for highest flexibility in use; state-of-the-art USB3 Vision interface for standardized, easy, robust integration

PROCESS AUTOMATION

Best Fit for Process Automation

Trust in your results - Basler cameras identify samples and labware by reading matrix codes and are used for internal quality control. They provide flexibility in use and easy integration in countless lab instrumentation products. In combination with an optimized design and small form factor, Basler cameras grant high speed and resolution, reliability, accuracy and image quality with an exceptional price/performance ratio.



RECOMMENDED CAMERAS

Basler MED ace

MED ace 2.3 MP 164 mono/color
MED ace 5.3 MP 20 mono/color



BENEFITS

Unique and powerful MED Feature Sets included in Basler's MED ace:



Brilliant Image

Outstanding image out-of-the-box; sharp contrasts for reliable and quick barcode reading



High Speed

Fast and yet highly reliable cameras; high frame rates and global shutter sensors for fast image acquisition and maximum throughput



Industrial Excellence

User-optimized, one-for-all SDK ensures fast integration of new camera models and gives access to all camera features thanks to GenICam technology

Basler dart

daA1600-60uc with USB3 Vision Interface
daA2500-60mc with BCON for MIPI



Small form factor of 27 mm × 27 mm; weight of only 5g; variety of mount options combined with different interfaces:

- USB 3.0 for ease of integration
- BCON for MIPI for best price/performance ratio

OPHTHALMOLOGY



Best Fit for Your Ophthalmology Instrumentation

Many diagnostic devices in modern ophthalmology already benefit from vision technology. Applications require superior image quality for visualization of the smallest vessel structures, as well as configurable color pipelines for the camera. Basler offers a wide range of MED ace cameras that are suitable for various applications such as fundus imaging using a fundus or OCT (optical coherence tomography) camera.

For cameras in ophthalmology, highly reliable color rendering as well as the reproducibility of the images is particularly important. Basler's patented 6 Axis Operator and Color Calibrator Tool adjust settings for hue, saturation, brightness and contrast for full control of color space.



RECOMMENDED CAMERAS

Basler MED ace

- MED ace 5.1 MP 35 color
- MED ace 5.1 MP 75 color
- MED ace 12.3 MP 23 color
- MED ace 12.3 MP 30 color
- MED ace 20.0 MP 17 color



BENEFITS

Unique and powerful MED Feature Sets included in Basler's MED ace:



Brilliant Image

Sharp contrasts for visualization of the smallest vessel structures; easy-to-use auto functions for an outstanding image right out-of-the-box



Perfect Color

Basler's patented 6 Axis Operator for high color fidelity and excellent color reproduction supports the precise examination of eye compartments like the fundus; easy color calibration minimizes color errors



Easy Compliance

Compliant with ISO 13485:2016 for minimized certification efforts and proven reliability for ophthalmology applications

Basler dart

- daA1280-54uc with USB3 Vision Interface
- daA1280-54um with USB3 Vision Interface



Perfectly meets the requirements in ophthalmology:

- Small form factor of 27 mm x 27 mm
- weight of only 5g
- variety of mount options
- USB 3.0 for ease of integration

SURGICAL IMAGING



Best Fit for Your Surgical Imaging Needs

Do not compromise in surgical environments – rely on Basler MED ace for light microscopic/stereoscopic visualization, fluorescence-based intraoperative visualization, minimally invasive, computer- and robot-assisted surgery, or intraoperative navigation.

Dependably high resolution up to 4K, plus pin-sharp images with high contrast and exact color fidelity guarantee the precise representation of the most complex and finest anatomical structures in realtime. The increasing trend of digitization makes critical components like cameras a must to achieve the required performance for intraoperative observation, image analysis or simulation.



RECOMMENDED CAMERAS

Basler MED ace

- MED ace 5.1 MP 75 mono/color
- MED ace 8.9 MP 42 color
- MED ace 12.3 MP 30 color



BENEFITS

Unique and powerful MED Feature Sets included in Basler's MED ace:



Easy Compliance

Basler produces and distributes the Basler MED ace cameras under ISO 13485:2016 for minimized certification efforts and proven reliability in the surgical environment



Brilliant Image

Supreme image out-of-the-box for precise representation of the most complex and the finest anatomical structures; fast auto functions for quickly changing light conditions



Perfect Color

Precise color fidelity during surgical interventions due to Basler's configurable color pipeline; easy color calibration in less than one minute based on commonly used reference chart minimizes color errors

OTHER INFORMATION

About Basler

Basler is a leading international manufacturer of imaging components such as cameras, lenses, frame grabbers, software as well as embedded vision solutions, customized products and consulting services. The products are used in a variety of computer vision markets, including factory automation, medical, traffic, logistics, retail, and robotics. Founded in 1988, the Basler Group employs approximately 800 people at its headquarters in Ahrensburg and other locations in Europe, Asia and North America.

Basler cameras are well suited for various vision applications in medicine, diagnostics and life sciences. They can be used in microscopy, laboratory automation and diagnostic equipment, such as in hematology, pathology, ophthalmology and dermatology. Fields such as biomedical research have also become increasingly prevalent sites for cameras.

With more than three decades of experience in image technology, Basler is the world's largest producer of industrial digital CMOS cameras. With in-depth understanding of sensor technology, we shape the transition process from CCD to CMOS and find the most suitable camera for the application.

Trust in State-of-the-Art Vision Technology Made in Germany

Our experience makes Basler's equipment the most reliable and trusted industrial vision technology in the market. As a key driver of technology trends and vision standards, we measure our cameras and their components against the highest standards and offer outstanding quality for reproducible pictures and reliable analysis.

We are constantly developing and improving our products. Already today, we install many cameras into Medical & Life Sciences applications. These digital cameras must provide highest image quality and exceptional color reproduction. New advanced image enhancement and color adjustment algorithms enable consistent and repeatable color fidelity, and perfectly reproduce pictures of challenging samples. Thanks to exhaustive quality assurance measures, long-lasting camera life is a given. We also stand for long-term market availability of our cameras, to make your decision worthwhile and satisfying.



Find our White Papers, Customer Stories and more valuable information on:
baslerweb.com/medical



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the power of sight