mORPe than a camera
The IMAGE1 S™ platform
mORe than a camera – the IMAGE1 S™ platform

Achieving optimal surgical results is the main goal of every operating surgeon. In order to meet this objective, the visualization and display of important and crucial structures during the surgical procedure is of paramount importance.

The rapid development of camera technology in recent years has resulted in a better view of the surgical field and a much wider treatment spectrum. This ultimately leads to better outcomes for patients.

New standards in resolution as well as technologies form the basis of this trend.
1. November 2013
   + IMAGE1 S™ launch
   + 2D rigid; NIR/ICG; flexible videoendoscopes

2. May 2014
   + FLEX-X® IMAGE1 S™ video uretero-renaloscope

3. March 2015
   + IMAGE1 S™ D3-LINK®/implementation of 3D capability
   + TIPCAM®1 S 3D LAP 0°/30°

4. September 2015
   + IMAGE1 S™ HX/HX-P camera head

5. June 2016
   + TIPCAM®1 S 3D 4 mm ORL

6. August 2016
   + DCI® camera heads for mediastinoscopy

7. December 2016
   + VITOM® 3D (exoscope with 4K sensors and 3D display)

8. June 2017
   + IMAGE1 S™ HX/HX-P FI camera head
   + PDD in FULL HD

9. October 2017
   + IMAGE1 S™ 4U-LINK/IMAGE1 S™ 4U camera head
   + 4K resolution for endoscopy

10. August 2018
    + IMAGE1 S CONNECT® II

11. April 2020
    + POWER LED RUBINA™
    + IMAGE1 S™ 4U RUBINA™
    + TIPCAM®1 RUBINA™
May 2014
+ Expanded preset functionality
+ New languages
+ Enhanced user guidance

March 2015
+ Stand-by function for light sources
+ Temporary display of camera head/ videoendoscope data
+ Increased amount of patient data

August 2015
+ Image rotation in 3D
+ 2D output for 3D signals
+ SCB communication expanded

June 2016
+ S-Technologies in 3D
+ Zoom in 3D
+ SCB control for ENDOFLATOR® 40/50 and CO₂MBI® LED

November 2016
+ Enhanced menu guidance

June 2017
+ Patient data in live menu
+ Enhanced privacy settings

August 2018
+ Integration of new IMAGE1 S CONNECT® II
+ Green color option for ICG fluorescence and integration into the OPAL1® tile

June 2019
+ Adaptive Zoom

April 2020
+ Integration of IMAGE1 S™ RUBINA™
+ Wider range of choices for 2D/3D outputs
+ Implementation of the new communication standard KS HIVE
IMAGE1 S™ – a system that meets all requirements

To meet the greater demands placed on visualization in minimally invasive surgery and to keep step with the growing complexity of such procedures, KARL STORZ launched a unique, modular camera system on the market in 2013: IMAGE1 S™.

This system offers the user maximum flexibility to meet present and future needs.

Benefits of modularity:

1. Needs-based procurement – A specific technology that is required at a particular point in time can be selected from the large number of available technologies.

2. Synergistic effects – all modules have the same control module so that computing power does not need constant and unnecessary adjustment. This eliminates the need to procure peripherals such as monitors, documentation units etc. several times.

3. Gains in efficiency thanks to standardization – all OR rooms have the same technological basis, independent of the surgical discipline and specialty.

4. Future-readiness – whereas stand-alone systems are confined to the technology relevant at a specific point in time, the modularity concept ensures that the platform can be upgraded with new technologies at any time. This leaves room for divergent trends so that the user is never confronted with an either/or option.
Combines all technologies IMAGE1 S CONNECT®

- 2D rigid/flexible IMAGE1 S™ X-LINK
- 4K endoscopy IMAGE1 S™ 4U-LINK
- Near Infrared (NIR/ICG) 4K camera head
- 10 mm 4K 3D videoendoscope
- 10 mm 3D videoendoscope
- 4 mm 3D videoendoscope
- 4K camera head
- Open for future technologies
- Flexible video-endoscopes
- 3-chip camera heads
- Near Infrared (NIR/ICG) 3-chip FI camera head
- Microscopy camera head
- PDD in FULL HD
- 1-chip camera heads
- 3D endoscopy IMAGE1 S™ D3-LINK®

Highlights IMAGE1 S™ Platform | 07/2020
4K Resolution

Resolution is one of the key factors enabling the identification of fine details in endoscopic images. In this context, the terms 4K or UHD are now commonly used in the consumer sector as well as the medical field.

This development offers 4 times the resolution of existing FULL HD standard systems.

With the IMAGE1 S™ 4U-LINK and the IMAGE1 S™ 4U camera heads, the IMAGE1 S™ platform integrates two components that benefit from this system.

With IMAGE1 S CONNECT® II and IMAGE1 S™ 4U-LINK, the new IMAGE1 S™ RUBINA™ imaging technology combines all current imaging standards such as 4K, 3D and fluorescence imaging (NIR/ICG) in one product family.

The platform architecture eliminates the need to choose between individual technologies and helps select the most appropriate technological solution for a specific procedure.
3D Visualization

The stereoscopic system offering 3D in 4K quality is particularly helpful when performing activities that require spatial vision. Thanks to the modular system design, existing IMAGE1 S™ 2D systems can be upgraded to 3D.

Studies show that 3D vision increases accuracy and reduces operating times\textsuperscript{1,2,3}. These effects could be demonstrated for both novices and experienced surgeons\textsuperscript{4}.

The IMAGE1 S D3-LINK\textsuperscript{5} and IMAGE1 S™ 4U-LINK enable 3D endoscopes with diameters of 10 mm and 4 mm to be easily integrated into the IMAGE1 S™ platform and thus utilize the benefits offered by 3D visualization\textsuperscript{4}. Thanks to 3D visualization in 4D, the new TIPCAM\textsuperscript{®} RUBINA™ provides the surgeon with excellent depth perception (further details on the new TIPCAM\textsuperscript{®} RUBINA™ are available on p.16).

Furthermore, VITOM\textsuperscript{®} 3D offers the possibility of three-dimensional visualization in minimally invasive open surgical procedures. In contrast to an operating microscope, the VITOM\textsuperscript{®} 3D features a high depth of focus, small dimensions and an ergonomic working position. Moreover, the system offers enormous flexibility and allows more observers to view the OR field. Ultra-high resolution sensors also ensure a loss-free zoom.
OPAL1® NIR/ICG

Relevant information and structures are often concealed under a layer of tissue or are invisible under white light. Even the highest possible resolution is not able to display these effects.

With the help of illumination with near infrared light, the OPAL1® NIR/ICG technology from KARL STORZ is suitable for multidisciplinary use and allows visualization under the surface of the tissue in endoscopy, laparoscopy and open surgery. The use of indocyanine green (ICG) allows the visualization of anatomical structures. Important information such as, for example, perfusion, the bile duct anatomy or the lymphatic system can thus be obtained.

New modes from IMAGE1 S™ RUBINA™, e.g. the superimposed NIR/ICG signal in the white light image, provide the user with valuable information. In addition, the display intensity of a NIR/ICG signal (Intensity Map) and a pure near infrared mode in monochromatic color display for the clear delineation of structures are also available.
Visualization of the hepatobiliary system

Green overlay vs. blue overlay

*Visualization of the biliary anatomy during laparoscopic cholecystectomy* (Prof. M. Carlini, Rome, Italy)

**Visualization of the vascular system**

NIR/ICG fluorescence imaging presents a clear advantage for determining a resection zone, e.g., in the case of anastomoses.

Overlay (green) vs. monochromatic

*Perfusion control of the bowel for identification of the resection zone* (Prof. L. Boni, Milan, Italy)

NIR/ICG fluorescence imaging seems to have the potential to drastically lower the rate of anastomotic leakage and thus prevent anastomotic insufficiency\(^5, 6, 7, 8\). By reducing associated morbidity and mortality and subsequent cost savings, NIR/ICG fluorescence imaging could offer enormous benefits for the patient and the healthcare system.
Visualization of the lymphatic system

A further field of application for NIR/ICG fluorescence imaging is the visualization of lymph nodes and lymphatics\(^9\). Especially in oncological surgery, locating the Sentinel Lymph Nodes (SLN) is important for appropriate treatment. When injected into the periphery of the tumor\(^9\), ICG follows the same path as the lymph. With fluorescence imaging, the lymph pathway and the location of SLNs can be visualized in real time in a fast and cost-effective manner\(^10\).*

White light vs. Intensity Map

*Please verify for which indication the product is approved in your country.*
IMAGE1 S™ Rubina™ – mORe to discover

IMAGE1 S™ RUBINA™ combines the latest imaging technologies 4K, 3D and fluorescence imaging (NIR/ICG) in one product family. The products impress with 4K image quality in 2D and 3D as well as new NIR/ICG fluorescence modes. The new POWER LED RUBINA™ makes this possible. The new modes, e.g. the superimposed NIR/ICG signal in the white light image, provide the user with valuable information. In addition, IMAGE1 S™ RUBINA™ offers the display intensity of a NIR/ICG signal and a pure near infrared mode in monochromatic color display for the clear delineation of structures.

The following components are included in the IMAGE1 S™ RUBINA™ product family:

• IMAGE1™ S 4U RUBINA™ – 4K camera head with new NIR/ICG functionalities
• TIPCAM®1 RUBINA™ – 4K-3D videoendoscope with automatic horizon control
• POWER LED RUBINA™ – Laser-free LED light source for white light and excitation of NIR/ICG
• HOPKINS® RUBINA™ – Enhanced* NIR/ICG telescopes and new models. The IMAGE1 S™ RUBINA™ technology thus provides new functionalities for the KARL STORZ fluorescence imaging system OPAL1® as well as very good image brightness and richness of color and detail.

* in comparison to previous models
Power LED Rubina™ – The New LED Light Source for White Light and NIR/ICG Applications

Power, efficiency, durability and flexibility are the hallmarks of the POWER LED RUBINA™ cold light source based purely on LED technology. The light source can be used for white light as well as fluorescence applications for displaying NIR/ICG or autofluorescence in the near infrared range. In conjunction with other RUBINA™ components, it allows the use of various new modes for displaying the NIR/ICG signal: A superimposed NIR/ICG signal in the white light image, an intensity display of the NIR/ICG signal as well as a pure near infrared mode in monochromatic color display for clear delineation of structures. Only long-life LEDs are used so no laser protection measures are necessary.

The following components are included in the IMAGE1 S™ RUBINA™ product family:

- Laser-free LED light source for white light and excitation of NIR/ICG
- OPAL1® NIR/ICG technology with new functionalities
- Straightforward user interface thanks to intuitive touch screen
- Constant light intensity maintained throughout the entire service life
- Very low volume
IMAGE1 S™ 4U Rubina™ – The New 4K NIR/ICG Camera Head

IMAGE1 S™ 4U RUBINA™ combines 4K imaging technology with fluorescence imaging for displaying NIR/ICG or autofluorescence in the near infrared range. The technology features very good image quality as well as new NIR/ICG fluorescence modes. The new modes, e.g. the superimposed NIR/ICG signal in the white light image, provide the user with valuable information. In addition, IMAGE1 S™ RUBINA™ offers the display intensity of a NIR/ICG signal and a pure near infrared mode in monochromatic color display for the clear delineation of structures.

- Native 4K image resolution with very good image brightness and richness of color and detail
- OPAL1® NIR/ICG technology with new functionalities
- S-Technologies in white light and the overlay modes Overlay and Intensity Map
- Enhanced* NIR/ICG telescopes and new models
- Laser-free LED light source for white light and excitation of NIR/ICG

* in comparison to previous models
TIPCAM®1 Rubina™ – The New 4K-3D Videoendoscope

TIPCAM®1 RUBINA™ provides surgeons with excellent depth perception. This stereoscopic system offering 3D in 4K quality is particularly helpful when performing activities that require spatial vision. Thanks to the modular system design, existing IMAGE1 S™ 2D systems can be upgraded to 3D. Whether for laparoscopy, gynecology, urology or heart surgery – the new TIPCAM®1 RUBINA™ features a wide range of applications.

- 4K image chain
- Automatic horizon control for better orientation and handling
- 4K-3D videoendoscopes with 10 mm diameter as well as 0° and 30° directions of view
- Easy toggle from 3D to 2D
- Easy integration into the IMAGE1 S™ platform
Hybrid procedures

In modern surgery, the surgical methods used are becoming increasingly complex. These so-called hybrid procedures support surgeons in their work. The simultaneous use of rigid and flexible endoscopes offers great potential, particularly for operations such as choledocholithiasis as well as gastric, bariatric and colorectal surgery. The acquisition of additional information of the organ to be treated by means of laparoscopic and endoscopic visualization, for example, offers the possibility of pre- and postoperative diagnosis or the potential for improved intraoperative management of possible complications (e.g., defining resection boundaries, checking for leakages, correct visualization and identification of the OR site). Conventional systems have major problems in terms of ergonomics, costs and documentation. Consequently, these types of interventions often require the use of two towers. This not only restricts the freedom of movement of all participants in the already confined OR environment, it also contributes to higher costs due to the need to procure both towers. Documentation is also critical as a timely overlap of endoscopic and laparoscopic images with two separate video sources may be important but is difficult to achieve. The modularity of IMAGE1 S™ drastically reduces or eliminates these problems completely.
S-Technologies

In addition to the quantity (amount) of pixels, the quality of the individual pixels is important for the quality of the entire endoscopic image. In this context, KARL STORZ attaches great importance to the correct color display and the best possible sensors. Furthermore, S-Technologies help to overcome the current limitations of endoscopic images.

Structures that are located farther away often appear much darker because light intensity is inversely proportional to the square of the distance from the source. The entire image information for this area is missing. Even increasing the light intensity does not help in this case as this is limited, on the one hand, by the size of the telescope and, on the other hand, it causes overexposed areas in the image. Based on a sophisticated software algorithm, CLARA provides an image with homogenous illumination as it dynamically brightens up dark areas in the background.

Standard image  CLARA

Contrast is also an extremely important factor in endoscopic imaging. To offer the user optimal visualization, electronic contrast enhancement has been a standard feature in all standard camera systems for decades. This contrast enhancement, however, is very non-specific and results in enhanced contrast for structures that are already easily identifiable by shifting brightness values. CHROMA, therefore, is focused on enhancing contrast in areas that are difficult to see.

Standard image  CHROMA
As the wish for greater contrast and a more homogenous illumination often coincide, CLARA + CHROMA offers a combination of both these technologies.

SPECTRA* takes individual needs for improved differentiation of strongly vascularized and other interesting areas into consideration. By modulating the green, blue and red channels, these areas can be highlighted. This offers an alternative to the standard white light image.

* not for sale in the U.S.
Future Readiness

The modular design of the IMAGE1 S™ platform offers the customer the possibility of a needs-based procurement. The customer is able to assemble individual components according to the building block principle. If requirements change, further technologies can be modularly integrated with little additional costs and minimal effort. This offers the best possible protection for the original investment. New technologies can be integrated according to the same principle and with the same benefits.
Peripherals

A famous proverb says that a chain is only as strong as its weakest link. In imaging, many components are responsible for a good image. In addition to the more obvious components that influence the imaging chain (telescope, camera head, image processor, monitor), peripheral units also make a significant contribution to the viewing and user experience. In order to achieve the goal of the best possible visualization, technologies and solutions must also be considered here.

Peripherals from KARL STORZ can communicate with the IMAGE1 S™ camera platform which also enables automated control of these units.
Peripherals – S-PILOT®

An ideal imaging chain and sufficient light ensure the best possible display of in-situ conditions. What happens if the in-situ conditions themselves are poor? The use of HF appliances in particular often generate a lot of smoke in the body and thus greatly obscures the image impression. To counteract this, S-PILOT® from KARL STORZ offers a solution for effective smoke management. The S-PILOT® helps to remove toxic smoke and thus ensures clear vision. In addition to improving image quality, this system also reduces unpleasant odors in the OR.
Peripherals – ENDOFLATOR® 40/50

To be able to perform minimally invasive surgery, a stable cavity is essential. In many cases, this can only be achieved with the introduction of CO₂. Any changes in the cavity can affect the image impression (especially with regard to image brightness) as a result of altered light requirements or a change in the position of the telescope in relation to the boundaries of the cavity. Among other things, powerful insufflators are required to counteract this effect. In this context, powerful performance involves two factors:

1. High flow rate
2. Rapid control/measurements

With a high flow rate, high gas loss can be quickly counteracted, e.g., smoke or gas evacuation. Fast measurement/control with short measurement intervals ensures that the ENDOFLATOR® 40/50 immediately reacts to any changes in pressure conditions and restores pressure. A stable cavity is thus maintained.


3 Feng, X. et al., Surgical Endoscopy. May 2015, Volume 29, Issue 5, pp 1231-1239 “3-Dimensional (3D) laparoscopy improves operating time in small spaces without impact on hemodynamics and psychomental stress parameters of the surgeon”

4 A compatible 3D monitor is required to facilitate display.


7 Carus T, Lienhard H (2009), Meeting Abstracts, 126. Kongress der Deutschen Gesellschaft für Chirurgie, 28.04.–01.05.2009. „Die laparoskopische Fluoreszenzangiografie mit Indocaningrün zur intraoperativen Beurteilung der Perfusion bei kolorektalen Anastomosen.”


9 The approval status of the fluorescent dye may vary. Please inform yourself about it in your hospital/country.

10 Buda A. et al., Impact of Indocyanine Green for Sentinel Lymph Node Mapping in Early Stage Endometrial and Cervical Cancer: Comparison with Conventional Radiotracer 99mTc and/or Blue Dye, 2015

11 In addition to camera components, a special light source and special telescopes are required.
It is recommended to check the suitability of the product for the intended procedure prior to use. Please note that the described products in this medium may not be available yet in all countries due to different regulatory requirements.
75 Years

Shaping the Future of Endoscopy with you