RoboticScope

Head Gesture Controlled
3D Visualization

From Microscope to RoboticScope

The evolution of surgical visualization began with microscopes, advanced through exoscopes, and now reaches a new pinnacle with the RoboticScope from BHS Technologies. Traditional microscopes, with their limited field of view and ergonomic challenges, often interrupted surgeries for manual adjustments and couldn't connect with other devices. The exoscope improved ergonomics and offered a shared external 3D view but still required manual adjustments. The RoboticScope, however, provides real-time 3D imagery directly controlled by the surgeon, integrating seamlessly with other devices and enhancing both precision and collaboration in the operating room.

Visualization & Robotics in the OR

47%

shorter operating times, saving 16 minutes on average, can be achieved with the RoboticScope.[1]

64.94%

error reduction per anastomosis with robotic-assisted surgery.[2]

10 mins.

average time savings for robot-assisted anastomosis during training.[2]

29%

faster visualization adjustment if hands are not used for adjustment.[3]

References: [1]: Rossini Z, Tropeano MP, Franzini A, Bresciani E, Doneddu PE, Pensato U, Pessina F. Microvascular decompression in trigeminal neuralgia using a robot-assisted exoscope and head-mounted display. Neurosurg Focus. 2024 Dec 1;57(6):E9. doi: 10.3171/2024.9.FOCUS24373. PMID: 39616645. [2]: Stögner VA, Wessel KJ, Yu CT, Bohdan P, Hirsch T, Kueckelhaus M, Ayyala HS. Preclinical Performance of the Combined Application of Two Robotic Systems in Microsurgery – a Two-Center Study. Plast Reconstr Surg Glob Open. 2024 Jan 8;12(1 Suppl):60. doi: 10.1097/01.GOX.0001006176.73377.49. PMCID: PMC10775306. [3]: You, F., Khakhar, R., Picht, T., Dobbelstein, D. (2020). VR Simulation of Novel Hands-Free Interaction Concepts for Surgical Robotic Visualization Systems. In: Martel, A.L., et al. Medical Image Computing and Computer Assisted Intervention – MICCAI 2020. MICCAI 2020. Lecture Notes in Computer Science(), vol 12263. Springer, Cham. https://doi.org/10.1007/978-3-030-59716-0_42

RoboticScope: Head Gesture Controlled 3D Visualization

The RoboticScope integrates traditional microscope benefits with advanced robotics and digital systems to enhance both the visual field and device control. This cutting-edge system offers unparalleled precision and flexibility, allowing surgeons to control it efficiently and intuitively through head gestures. Its state-of-the-art Head-Mounted Display provides real-time 3D imagery directly to the surgeon's eyes, ensuring ergonomic freedom and a clear view of the surgical field.

Optimized Visualization in the OR

Benefits of the RoboticScope

Head-Mounted Display

The Head-Mounted Display provides real-time 3D images of the surgical field directly in front of the surgeon's eyes for a clear and natural view. It enables easy switching between micro- and macroscopic tasks.

Head Gesture Control

The complete functionality of the RoboticScope can be controlled via the Head-Mounted Display via intuitive head gestures, without putting down surgical tools.

Seamless Connectivity

Several inputs can be integrated and displayed in the Head-Mounted Display. It connects effortlessly with other OR devices, enhancing surgical efficiency and precision.

Ease of Perspectives

Surgeons can switch perspectives and work at hard to reach angles without changing their posture and losing their comfortable working position.

Enhanced Ergonomics

The RoboticScope liberates surgeons from fixed positions of traditional microscopes, allowing them to choose the most comfortable working posture. This creates a flexible working environment that eliminates cumbersome and painful working positions.

Scan to find all detailed technical data online.

RoboticScope

ArcView

Additional optical redirection system (+ 45 °)

Extended range of viewing angles

Camera Unit

Merged 4K resolution (4928 x 2056 px)

High quality 3D live image from surgical field to HMD

2x LED lighting

11x zoom lens

Absolute magnification 2.7 - 30.1 x

3D-Joystick

To position or fine-tune viewing angle of the camera head over the surgical field

6-Axis Robotic Arm

Precision ± 0.03 mm

Max. range 1840 mm

Enables exact movements of the camera, even viewing the smallest structures

Digital System

Enables latest state of the system

Enables optimized troubleshooting via remote support

Touch Screen

User Interface for unsterile device control

For displaying the surgical field for the OR staff

For preparing the RoboticScope along an easy to follow guide

Connection Panel

Interface for input and output of the RoboticScope

2x HMD, 2x HDMI IN, 1x Footswitch

1x LAN, 1x DisplayPort OUT

1x Microphone IN, 1x USB

1x Power- & 1x Earth connection

Connect with external screens for effortless observation by OR staff;
standard 3D displays are supported

Footswitch

Single button footswitch to activate User Interface for control input

Head-Mounted Display

Presents a live view of the surgical field

Integrated eyepiece lifting mechanism,
switches between micro- and macroscopic views

Well balanced, with two 4:3 displays (2x 1600 x 1200 px) –
matching human discernible visual acuity

Head-Mounted Display

01

The Head-Mounted Display (HMD) provides a direct view of the surgical field directly in front of the surgeon's eyes and serves as the main control device for the RoboticScope. Surgeons can intuitively adjust the RoboticScope's camera using simple head movements, eliminating the need for manual adjustments with hands. This facilitates a seamless transition between micro- and macroscopic tasks, enhancing the efficiency of the surgical workflow.

High-Resolution Imaging

The HMD offers high-resolution imaging through real-time 3D visuals displayed on dual digital micro displays within the oculars. This advanced imaging system delivers a resolution that matches the clarity of the human eye, ensuring a natural and exceptionally clear view of the surgical field.

Customizable for Individual Needs

The HMD offers customization options to suit each surgeon's preferences:

- Various pad sets for comfort
- Adjustable to fit different head sizes
- Customizable eye distance & diopter settings

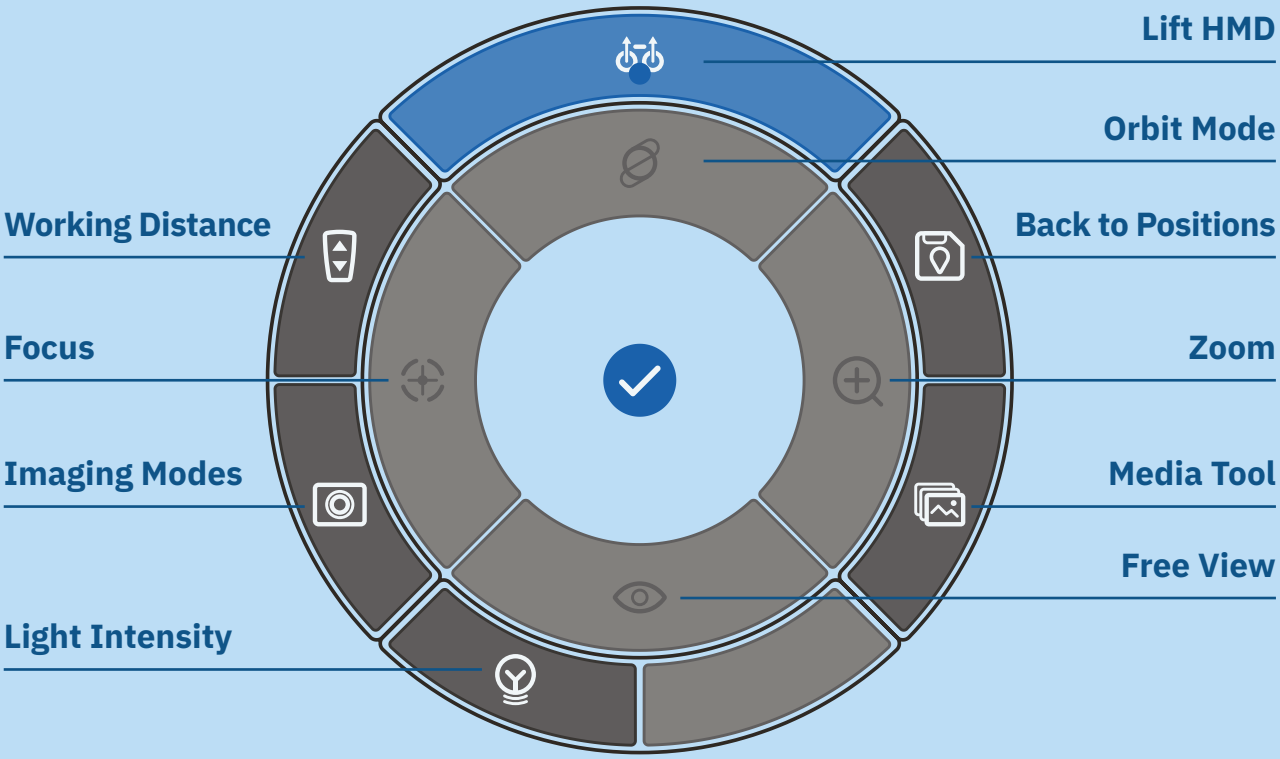
Head Gesture Control

02

Head Gesture Control distinguishes the RoboticScope from conventional surgical microscopes by enabling intuitive control of all functions. Surgeons adjust settings by raising, lowering or turning their head, maintaining focus on the surgical field while navigating the user interface. This robotic control allows precise management of direction and speed, facilitating seamless perspective changes.

User Interface

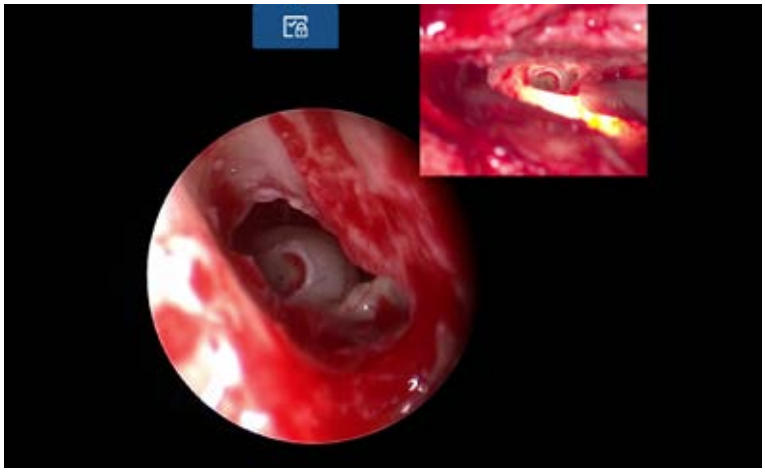
The RoboticScope features an intuitive User Interface that simplifies function selection and control. Designed to enhance workflow efficiency, primary operating tools are located in the inner function ring, with secondary functions in the outer ring. Surgeons can seamlessly manage all settings and functions using intuitive head movements, ensuring smooth operation procedures.



Seamless Connectivity

03

The Head-Mounted Display (HMD) integrates effortlessly with various OR devices and external systems, enhancing surgical precision and efficiency. It can seamlessly display multiple inputs, including navigation data, neuro-monitoring results and preoperative CT scans. This capability allows surgeons to access critical information in real time, providing a comprehensive view of the surgical field and supporting informed decision-making throughout the procedure.



Endoscope image during CI Implantation / during removal of cholesteatomas (Canton Hospital Luzern, Prof. Linder)

VideoIn: Enhancing Surgical Efficiency

VideoIn allows important external information to be seamlessly transmitted to the Head-Mounted Display. Surgeons can choose between a full-screen view with the surgical field in a corner or a small overlay of the external source. This flexibility ensures that the complete functionality of the RoboticScope is maintained while integrating vital data such as pre-operative visuals, endoscope feeds or nerve monitoring (e.g. hypoglossal nerve, electrocochleography).

Synergy of RoboticScope and Robotic Platforms

The synergy between the RoboticScope and advanced robotic platforms transforms microsurgery with its intuitive and user-friendly interface. By integrating seamlessly with systems such as the MMI Symani® Surgical System or the MUSA from Microsure, the RoboticScope achieves unparalleled efficiency in the operating room. This connectivity enhances surgical precision and workflow, allowing surgeons to leverage the full capabilities of robotic microsurgery.

Ease of Perspectives

04

Our 6-axis robotic arm ensures precise positioning with +/-0.03 mm accuracy, offering unparalleled freedom in selecting perspectives. Surgeons can switch between views and achieve hard to reach angles without altering their ergonomic position. This flexibility allows surgeons to easily attain the optimal viewing angle required for each procedure.

ArcView: Visualizing Hard-to-Reach Angles

ArcView is an optical redirection system that allows surgeons to reach 45° angles during surgery. Designed specifically for otolaryngology and cranial neurosurgery, ArcView enables easy visualization of hard-to-reach areas. This optical redirection system provides a solution for procedures via the transcranial, retro-sigmoid or mastoid approach, as well as for cranial neurosurgery. ArcView easily connects to the RoboticScope's camera head, allowing surgeons to select required angles for visualization through the User Interface.

DualView: Enhancing Teamwork & Training

DualView revolutionizes surgical teamwork by providing new insights during teaching and optimized supervision. While the lead surgeon controls the RoboticScope and the view of the surgical field, the assisting surgeon shares the same field of view through the second Head-Mounted Display. DualView allows the assisting surgeon to independently switch between microscopic and macroscopic views, enhancing flexibility and collaboration.

With DualView, the assisting surgeon benefits from the same advantages as the lead surgeon:

Ergonomic Freedom

Both surgeons can maintain ergonomic working postures.

Selectable Working Posture

Freedom to choose the most suitable working position.

High-Quality Images

Access to the same high-resolution visuals, ensuring clarity and precision.

DualView also provides new possibilities for teaching and training, enabling instructors to provide real-time guidance and insights to trainees.

Enhanced Ergonomics

05

The RoboticScope enables surgeons to work comfortably in their preferred posture while maintaining an immersed view of the surgical field. Freed from the constraints of a traditional microscope, surgeons can flexibly sit, stand or move between positions. The Head-Mounted Display provides the image of the surgical site directly in front of the surgeon's eyes, creating an ergonomic and flexible working environment that eliminates cumbersome and painful working positions.

Empowering Surgical Excellence

Precision & Accuracy	Visualization tools are essential for achieving high precision in surgical procedures. Clear and detailed images of the surgical field enable greater accuracy.
Technological Integration	Effective visualization systems integrate seamlessly with other surgical technologies to support a smooth workflow, without the distraction of switching between different devices and displays.
Enhanced Collaboration	Superior visualization promotes better collaboration among the surgical team. Communication and coordination is improved with high-quality images of the surgical field.
Surgeon Ergonomics	Improved ergonomic solutions can help maintain surgeon health and efficiency over long procedures.
Versatile Viewing Angles	Flexible viewing options allow surgeons to get the best possible view of the surgical field.

How a Hospital benefits from the RoboticScope

Less Downtime

Better ergonomics at the operating table can reduce physical strain on surgeons, potentially lowering sick leave due to back pain.

One Device for Different Departments

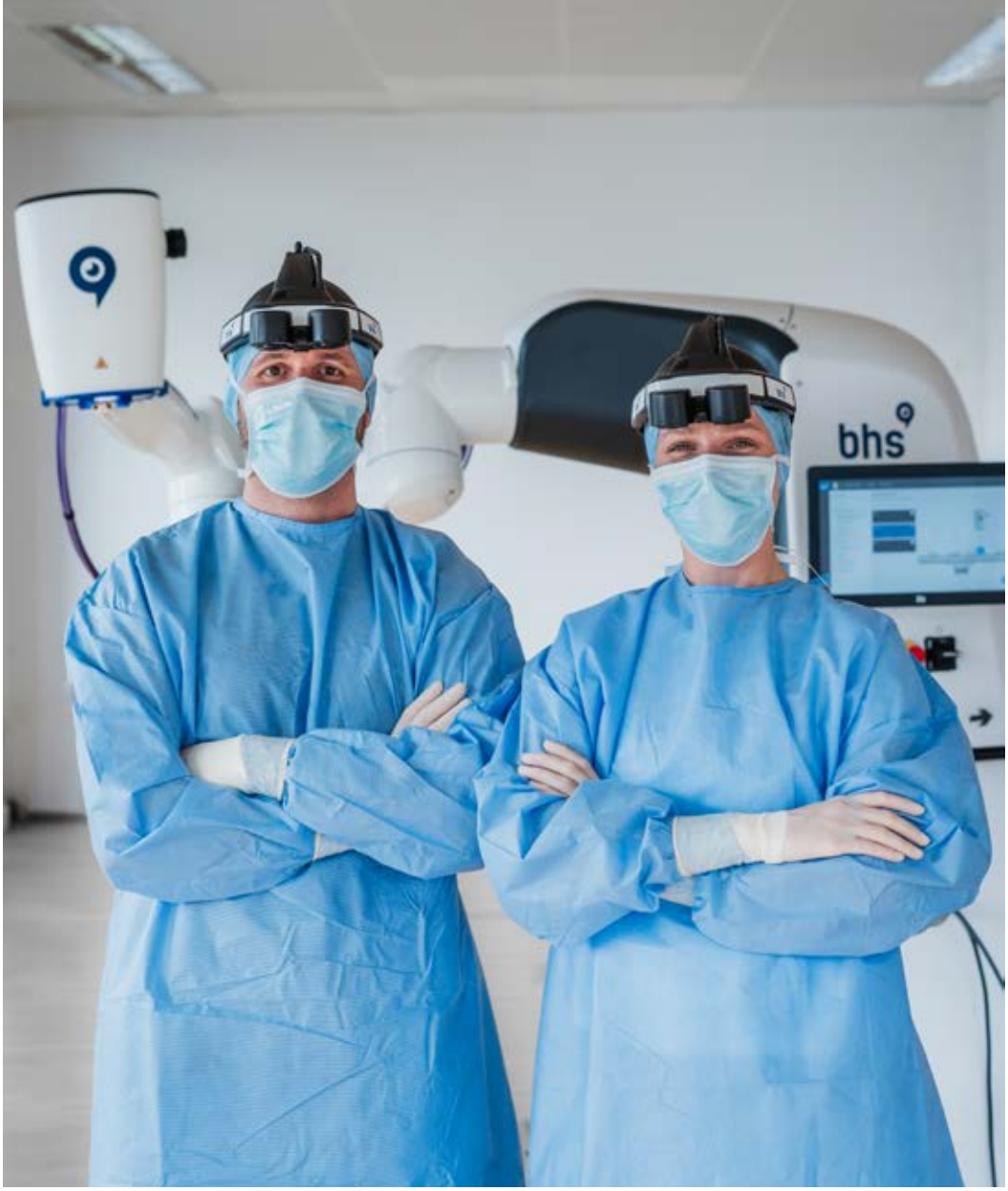
The RoboticScope is designed for multidisciplinary use, making it suitable for ENT, plastic, and neurosurgical needs.

Latest Technology & Always Up-To-Date

Our Software Maintenance package keeps the RoboticScope updated with the latest features, ensuring continuous improvement.

Optimized Service Procedures

Remote analysis simplifies and minimizes service processes, maintaining the RoboticScope in optimal condition.



Disciplines where Surgeons already Benefit from the RoboticScope

The RoboticScope is designed for various surgical procedures. It can be used in a range of disciplines in the operating room, including ENT surgery, plastic surgery, and neurosurgery.

In middle ear and cochlear implant surgery, the RoboticScope not only provides the surgeon with a precise high-resolution view, it also allows intraoperative measurements to be directly visible to the surgeon during electrode insertion and importing of an endoscopic image. More visual information is not possible. In temporal bone and skull base surgery, it allows the surgeon to sit ergonomically and position the visual field “hands-free”.

Professor Dr. med. Thomas Linder
Otorhinolaringologie, Canton Hospital Luzern

In neurosurgery, the RoboticScope is an exceptional tool because it lets you perform surgical procedures with a high level of visualization, enhancing ergonomics and reducing surgical interventions thanks to the ability to use the visualization system without ever removing your hands from the operative field. Additionally, due to its capability to integrate with other digital systems and machinery, it enables you to control various feedback from intraoperative machines or monitoring systems without ever losing control of the surgical field.

Dr. Zefferino Rossini
Neurosurgery, Humanitas Research Hospital Milano

The essential innovation of the technology is that it‘s possible to navigate intuitively and quickly without using your hands, thus making fine microsurgical procedures more flexible, faster, and safer.

Professor Dr. Maximilian Kueckelhaus
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Meet RoboticScope

Experience RoboticScope in action
and feel the freedom of perspectives yourself.
Book a Demo: bhs-technologies.com/book-a-demo/

BHS Technologies

BHS Technologies was founded in Innsbruck, Austria, in 2017 with the aim of revolutionizing microsurgery with innovative products. BHS Technologies is committed to developing and offering products that help microsurgeons and users of microscopes work in more ergonomic postures.

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