



HIGH PERFORMANCE SENSOR POINTING TECHNOLOGIES

RobotEye RE01 Imaging Two-Axis High Performance Vision System

Product Datasheet



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The RobotEye RE01 Imaging System is a two-axis high performance vision system with unprecedented motion bandwidth. It is conceptually similar to a conventional pan-tilt or gimbaled system, however Ocular Robotics' proprietary RobotEye technology allows aperture velocities and accelerations that are an order of magnitude (or better) than other competing systems.

The RE01 is ideally suited for use on ground vehicles, surface craft, aircraft and static installations. The incredible motion bandwidth of the RE01 allows applications such as inertial stabilisation, object tracking, telepresence/teleoperation, environment mapping, rapid disparate point data acquisition and persistent surveillance to be easily achieved.

The following points provide a sample of the applications that can be achieved with an RE01 system enabled by its unique motion characteristics:

- *Stabilisation* - The RE01 has speed and acceleration characteristics that enable the view of a camera to be mechanically stabilised whilst simultaneously tracking rapidly moving targets (if desired). This capability ensures that stable, well registered imagery can be obtained from an RE01 Imaging System regardless of the motion of the platform to which it is affixed, even in the most demanding environments.
- *Telepresence* - The RobotEye RE01 Imaging System has motion bandwidth that significantly exceeds the ability of a human to move their field of view. This enables head-tracking telepresence applications to be developed which can match a human's motion one-to-one. In other words, there is no lag between the human motion, and the imagery returned by the RE01 Imaging System. This provides a much more immersive experience than with similar systems which significantly lag behind the human motion. The RE01 System therefore allows the operator to more effectively control a platform, quickly scan the remote environment for threats or follow rapidly moving objects. The inertially slaved RE01 option provides a ready made off the shelf implementation of this behaviour for immediate integration into your system.
- *Rapid Sampling* - The ability of the RobotEye RE01 Imaging System to move rapidly and accurately between points with accelerations exceeding $50,000^\circ/s^2$ and slew speeds of up to $10,000^\circ/s$ provides an unprecedented capability to quickly build high resolution maps of the environment around a sensor or rapidly acquire high resolution imagery from points of interest within the field of regard of the RE01. This capability provides a leap in system performance in applications ranging from autonomous vehicle navigation to identifying subjects of interest in crowds.
- *High Performance Tracking* - The motion bandwidth of the RobotEye RE01 Imaging System allows objects moving with high acceleration and high velocity to be reliably tracked even when in close proximity to the sensor. A wide array of applications benefit from the tracking capabilities of the RE01, ranging from ballistic trajectory tracking, countermeasures, unmanned vehicles and intelligent security systems, through to sports training and broadcasting.

Implementation of these behaviours is straightforward using the RobotEye C++ class library supplied as standard with the RobotEye RE01 Imaging System, allowing quick and easy integration into the target system.

A feature of the RE01 is the freedom to use any C-mount camera of your choice. Ocular Robotics can supply a range of imaging options mounted and integrated into the RE01 system, or the user may simply screw their camera to the RE01 C-mount optical port.

RE01 Imaging Specifications

<i>Mechanical</i>		<i>Optical</i>	
Maximum Azimuth Rate	10,000°/s	Optical Field of View (diagonal)	40°
Maximum Elevation Rate	4,000°/s	Optical Port	C-mount
Maximum Aperture Acceleration	>50,000°/s		
Azimuth Axis Resolution	0.010°	<i>Software</i>	
Elevation Axis Resolution	0.004°	RobotEye Class Library Support	Windows/Linux
Azimuth Range	360° Continuous		
Elevation Range	70° (±35°)	<i>Environmental</i>	
Accuracy	0.05°	Operating Temperature Range (Head)	-20°C - +70°C
Weight	2.5kg	Operating Temperature Range (Control Unit)	0°C - +70°C
		IP Class Rating	65
<i>Electrical</i>		<i>Note: IP Rating valid only when both supplied power & optionally supplied weatherproof Ethernet cable connectors are fitted.</i>	
Communication	Ethernet		
Supply Voltage	24VDC		
Power Consumption — Typical (average)	<1.5 A		
— Maximum (peak)	10.0 A		

Specifications are subject to change without notice



Software

RobotEye C++ Class Library — The RE01 ships with a fully documented C++ class library for both Windows and Linux that can be used to simply and quickly interface to the RE01 device. This enables rapid application development for users of the RE01. The library provides access to the entire range of RE01 features. The RobotEye Class Library Reference Manual is available for download from the Downloads tab, and contains a full description of the library and its use.

RobotEye Inertial slaving application — The RE01 (inertially slaved variant) ships with an application that allows plug-and-play integration with a variety of [Intersense](#) inertial Attitude Heading Reference Systems (AHRS). This application, in conjunction with the RobotEye Class Library allows a wide variety of applications to be developed. See the Head Mounted Display on the RE01 Videos page for a demonstration of the use of this application.

Custom Application Development — Ocular Robotics Pty. Ltd. provides a full range of custom development services for users who have specific application requirements for the RobotEye RE01 Imaging System. These services range from custom firmware development for the RE01 through to large scale software development for applications of the RE01. Please contact Ocular Robotics for more information if required.

Imaging Options

Apart from the motion bandwidth benefits of the RobotEye RE01 Imaging System, a particular feature of the RE01 when compared to gimballed camera systems is the freedom to use any C-mount camera of your choice. Ocular Robotics can supply a range of imaging options mounted and integrated into the RE01 system (see the ordering information tab on the [RE01 Imaging product page](#) of our website), or the user may simply screw their camera to the RE01 C-mount optical port. The image to the right shows a camera mounted to the RobotEye RE01 Imaging System's optical port.

Environmental

The RobotEye RE01 Imaging System has been designed to operate in the harshest environments with an environmental protection rating of IP65 and an operating temperature range of -20°C up to 70°C . All system components have been designed or selected to meet the performance and operational requirements of the demanding environments in the defence, resources and homeland security sectors.

As with all of our systems, the RE01 system gains its robust nature from the fact that the sensor, all drive components and control electronics remain stationary and inside the system enclosure or within the housing of the platform to which the system is mounted leaving only the RobotEye head exposed. The low mechanical stress operation of the RobotEye technology ensures extended operation at high levels of performance. All of this results in a system that can be relied on to operate in harsh environments for long periods without attention.



Control & Communication

The RE01 system requires a 24VDC power connection, a 100 Megabit Ethernet connection and whatever connection is required for the imaging sensor. Communication and control of the RobotEye RE01 Imaging System is achieved via the system's Ethernet port, full control of the system aperture and system feedback including current aperture orientation is enabled through the RobotEye C++ Class Library. The connection to the imaging sensor whether GigE, FireWire or other is normally made to the computer which is controlling the RE01 aperture so that application software can efficiently fuse images and aperture positions to produce registered image data.

System Customisation

All RobotEye systems can be customised to meet the needs of an application or operating environment. Whether it is tailoring for operation in a particular service environment, component material changes, enhancing performance specifications, altering the optical path characteristics or a range of other possible modifications, all of these things can be achieved while retaining the dynamic performance and other benefits of the RobotEye technology. Please contact Ocular Robotics for more information if required.

System components

The RobotEye RE01 Imaging System is supplied as standard with the following components:

- RobotEye RE01 Imaging Head
- RobotEye RE01 Imaging Control Unit
- 2 Metre Interconnecting System Cables
- 3 Metre System Power Cable
- RobotEye C++ Class Library

Optional system components are:

- Inertially Slaved RobotEye System Upgrade
- Choice from a range of possible camera options, mounted and integrated into the RE01 System (see our website for details)
- Extended Interconnecting System Cables
- RobotEye Imaging Head Enclosure
- Weatherproof Ethernet Cable
- System Case

The RE01 Imaging field of view specification assumes a camera with a 2/3" CCD. The table below shows approximate diagonal fields of view for cameras with different (4:3 aspect ratio) CCD's

CCD Size	Diagonal FOV
1/4"	15°
1/3"	22°
1/2"	29°
2/3"	40°

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