OCULAR ROBOTICS

HIGH PERFORMANCE VISION SYSTEMS

RobotEye RELW60 Thermal

Two-Axis High Performance LWIR Thermal Vision System

Product Datasheet

RobotEye RELW60 Thermal Two-Axis High Performance LWIR Thermal Vision System

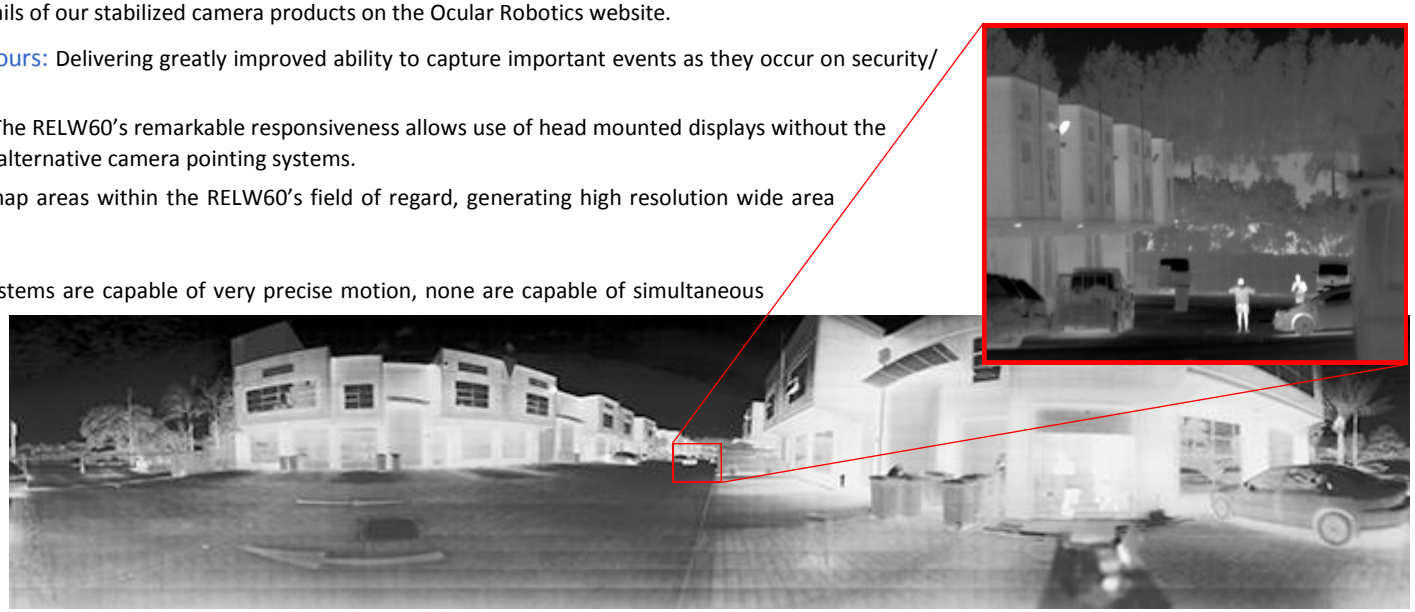
The RobotEye RELW60 Thermal is a two-axis high performance thermal vision system with unprecedented motion bandwidth. RobotEye Thermal Vision systems are conceptually similar to conventional pan-tilt or gimballed systems in that they both effect the pointing of cameras about two axes, but that is where the similarity ends. When applied to thermal cameras with their high cost and low resolution the benefits of the fast and precise camera pointing delivered by RobotEye is amplified.

The RobotEye technology core on which the RELW60 is based enables the view of the camera to be steered while both motors and the camera itself remain completely stationary, delivering very high slew rates and precision simultaneously. The implications of this are manifold and it means RobotEye Thermal Vision systems exhibit a number of properties that set them apart from alternative systems. In particular the following characteristics have significant impact on a wide range of common applications for directable thermal camera systems, and the enabling of new applications not previously possible.

Motion Bandwidth - The most obvious way in which RobotEye systems differ from alternative systems is the motion bandwidth available to the user. RobotEye Thermal Vision systems significantly exceed, often by orders of magnitude the capabilities of alternatives in terms of speed and acceleration of the system aperture all while maintaining excellent precision. With aperture accelerations up to 60,000°/s^2 and very high aperture slew rates, not only are common behaviours currently undertaken by pan-tilt and gimbals systems able to be completed much more rapidly and efficiently but a whole new range of applications become possible, including:

- High Performance and Multiple Object Tracking: Track very fast and erratically moving objects or any number of more slowly moving objects.
- Extreme Performance Stabilization: See details of our stabilized camera products on the Ocular Robotics website.
- Advanced Security and Surveillance Behaviours: Delivering greatly improved ability to capture important events as they occur on security/ surveillance networks.
- Nausea Free Telepresence/Teleoperation: The RELW60's remarkable responsiveness allows use of head mounted displays without the usually associated nausea caused by latency in alternative camera pointing systems.
- Mapping and Panorama Capture: Rapidly map areas within the RELW60's field of regard, generating high resolution wide area images.

Precision - While some pan-tilt and gimbals systems are capable of very precise motion, none are capable of simultaneous precision and high speed. In contrast to this, RobotEye based systems are capable of moving with very high speed and accelerations while simultaneously delivering precision pointing of a camera's field of view. This is because the RobotEye technology core addresses the central issue that limits the motion dynamics of alternative systems, the mass required to be moved to redirect the view of the camera.



RobotEye RELW60 Thermal Specifications

Mechanical		Optical	
Maximum Aperture Slew Rate	5,400°/s*	See Table on page 5	
Maximum Aperture Acceleration	60,000°/s^2	**Software**	
Azimuth Axis Resolution	0.0025°	RobotEye Thermal C++ Development Library	Windows/Linux
Elevation Axis Resolution	0.0025°	**Environmental**	
Azimuth Range	360° Continuous	Operating Temperature Range	-20°C - +70°C
Elevation Range	70° (±35°)	IP Class Rating	65
Accuracy	≤0.01°		
Weight	7.8 kg		
Electrical			
Communication	Ethernet		
Supply Voltage	24 VDC		
Power Consumption — Typical (average)	< 75 W		
— Maximum (transient**)	600 W		

* At the maximum acceleration rate of 60,000°/s^2 more than a full rotation is required to reach 5,400°/s aperture slew rate.

** High Current transients typically less than 2 ms

Standard System Components

- RobotEye RELW60 Thermal Vision System
  (Pictured Adjacent)
- RobotEye Thermal C++ Library SDK
- 2 metre power/communication cable

Software

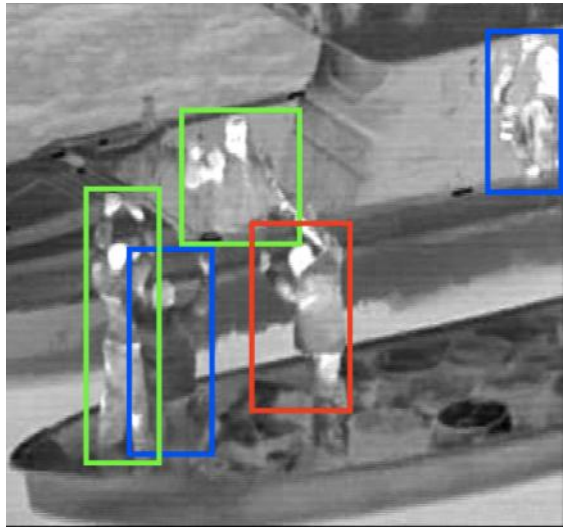
RobotEye Thermal C++ Development Library — The RELW60 ships with a fully documented C++ class library for both Windows and Linux that can be used to simply and quickly interface to the vision system enabling rapid application development for RobotEye Thermal Systems users.

The RobotEye Thermal Library delivers complete system control through the API with a simple path for image acquisition from the embedded thermal camera. The RobotEyeThermal driver class is a single API providing software access to both the motion and image acquisition capabilities of the RELW60. This single-point-of-contact reduces dependencies and accelerates software development.

The RobotEye Thermal C++ Development Library supports a range of motion commands, two of which are the building blocks for most RobotEye motion behaviours relevant to RobotEye Thermal systems.

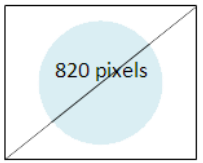
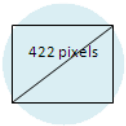
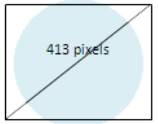
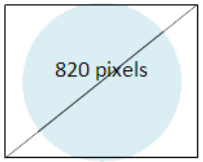
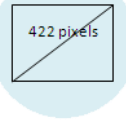
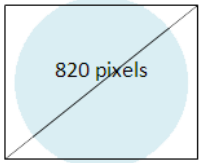
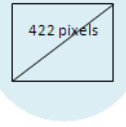
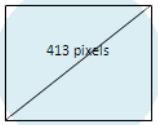
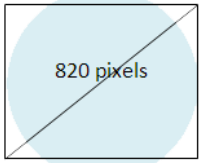
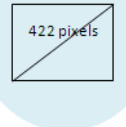
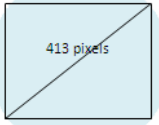
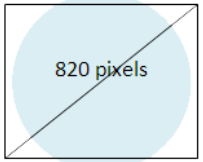
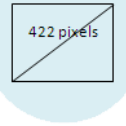
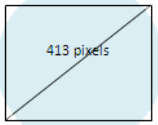
SetApertureAngles - The SetApertureAngles command is used where it is required that the system aperture move accurately to point in a specific direction. Using the SetApertureAngles command it is possible to move the system aperture to over 8 distinct locations randomly distributed within the RELW60's 360° x 70° field of regard every second. If the pointing locations are compactly distributed such as in a grid formation rates exceeding 15 locations per second can be achieved. The motion enabled by SetApertureAngles is important for mapping such as when building panoramas, monitoring several distinct locations with a single camera system, tracking multiple objects and many more.

TrackApertureAngles - The TrackApertureAngles command provides extremely high bandwidth control. It is most commonly used where the system aperture is required to follow a path or moving object. TrackApertureAngles commands can be streamed to the RELW60 at up to 1kHz ensuring complex paths can be followed at high speeds. Typical uses for the TrackApertureAngles command are high performance tracking of a single object, stabilization using inertial or visual information and slaving for telepresence.



Knowing where the system aperture is at any point is also important to many applications. The RobotEye C++ Development Library also provides two low latency methods for accessing the current system aperture direction. GetApertureAngles provides low latency access to the current system aperture position on request, while streaming is available to access the current position of the system aperture at rates of up to 1kHz.

Camera/Lens Options - The RELW60 offers a range of embedded FLIR TAU2 thermal camera core and lens combination options, the available options are detailed in the table on the following page. In addition to the resolution, FOV, frame rate and communication protocol options the table shows the view that can be expected through the RELW60 aperture with different camera and lens combinations.

Camera / Focal Length	TAU 640 640 x 512 Pixel Pitch: 17µm	TAU 336 336 x 256 Pixel Pitch: 17µm	TAU 324 324 x 256 Pixel Pitch: 25µm
13mm	 Aperture Image: 51% diagonal Usable pixels: 137,360 (42%) MOD: 10mm FOV: 30° x 30° (H x V)	 Aperture Image: 97% diagonal Usable pixels: 85,689 (99%) MOD: 10mm FOV: 25° x 19° (H x V)	 Aperture Image: 70% diagonal Usable pixels: 62,624 (76%) MOD: 10mm FOV: 30° x 26° (H x V)
19mm	 Aperture Image: 65% diagonal Usable pixels: 221,727 (68%) MOD: 55mm FOV: 27° x 26° (H x V)	 Aperture Image: 118% diagonal Usable pixels: 86,016 (100%) MOD: 55mm FOV: 17° x 13° (H x V)	 Aperture Image: 85% diagonal Usable pixels: 78,547 (95%) MOD: 55mm FOV: 24° x 18° (H x V)
25mm	 Aperture Image: 71% diagonal Usable pixels: 253,089 (77%) MOD: 200mm FOV: 22.7° x 20° (H x V)	 Aperture Image: 127% diagonal Usable pixels: 86,016 (100%) MOD: 200mm FOV: 13° x 10° (H x V)	 Aperture Image: 92% diagonal Usable pixels: 81,776 (99%) MOD: 200mm FOV: 18° x 14° (H x V)
35mm	 Aperture Image: 78% diagonal Usable pixels: 287,935 (88%) MOD: 500mm FOV: 18° x 14° (H x V)	 Aperture Image: 138% diagonal Usable pixels: 86,016 (100%) MOD: 500mm FOV: 9.3° x 7.1° (H x V)	 Aperture Image: 99% diagonal Usable pixels: 82,944 (100%) MOD: 500mm FOV: 13° x 10° (H x V)
60mm	 Aperture Image: 73% diagonal Usable pixels: 263,281 (80%) MOD: 2200mm FOV: 9.7° x 8.3° (H x V)	 Aperture Image: 127% diagonal Usable pixels: 86,016 (100%) MOD: 2200mm FOV: 5.5° x 4.2° (H x V)	 Aperture Image: 91% diagonal Usable pixels: 81,438 (98%) MOD: 2200mm FOV: 7.6° x 5.7° (H x V)

Frame Rates	Fast Video - TAU 336, TAU 324 - 30/60Hz(NTSC), 25/50Hz(PAL) TAU 640 – 30/60Hz(NTSC), 25Hz(PAL)	Slow Video – 7.5Hz(NTSC), 8.3Hz (PAL)	Communication Protocols	GigE	C-Link	Analog/USB

Note: Fast Video camera options may be subject to export licensing to some countries, end-users and end-uses, please contact Ocular Robotics for further information.

Ocular Robotics Ltd
Unit F1, 13-15 Forrester Street
Kingsgrove
NSW 2208 Australia

phone: + 61 2 9090 2630
fax: + 61 2 8094 9135
email: sales@ocularrobotics.com
web: www.ocularrobotics.com
twitter: @OcularRobotics