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Find the *FLIR Systems / Indigo Systems Merlin NIR* at our website: *Click HERE*

Merlin®

The ultimate combination of flexibility and value in high-performance Infrared Cameras



M E R L I N

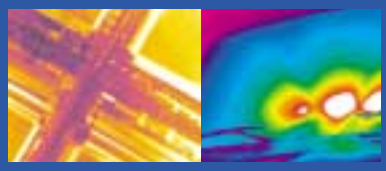
NIR MID UNCOOLED

> Merlin® Camera Family
> Talon® Data Acquisition
> ThermaGRAM® Data Acquisition
> Infrared Optics

indigo™

brighter.

Merlin® Advantages



- > 320 x 256 FPA for high resolution images
- > Complete range of FPA options for NIR, MWIR, or LWIR
- > Variable integration time avoids image saturation problems
- > 60 Hz frame rate for real-time applications
- > Low-noise electronics design for high-sensitivity applications
- > Common electrical and software interface between cameras
- > Choice of radiometric or imaging camera systems

Indigo Systems provides all of this and more. From near infrared spectroscopy, to process control using long wavelength IR, the amazing diversity of infrared imaging applications means that a single IR camera can't provide the optimum performance needed for every application. That's why Indigo designed the **Merlin**® family of cameras with more options and flexibility than any other commercial high-performance infrared camera. In fact, Merlin provides an unparalleled combination of factory-optimized and field-customizable features, including wavelength band, imaging optics, variable integration time, and data processing software. This means that Merlin can be perfectly matched to your application.

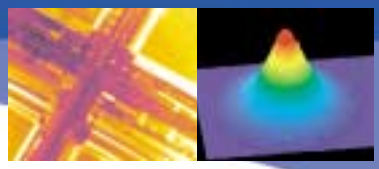
Merlin is offered with a complete choice of low-noise focal plane arrays (FPAs) covering all IR spectral bands. This includes InGaAs, InSb, and Uncooled Microbolometer arrays. These FPAs are supported by a full spectrum of cooling options: TE stabilization (InGaAs & Microbolometers); and liquid nitrogen or Stirling cryogenic cooling (InSb). A broad range of interchangeable IR lenses is available for each wavelength range, including microscope and telescope optics.

All Merlin cameras operate at a 60 Hz (50 Hz PAL) frame rate with software adjustable integration time, or electronic iris, to accommodate a wide range of flux levels. Both radiometric and non-radiometric models are available, with a choice of **ThermaGRAM**® radiometric software or **Talon**® digital data processing software. Digital data is generated and processed at full 12-bit resolution.

This combination of flexibility and high-performance is a direct result of Indigo's commitment to total vertical integration. We design, manufacture and assemble all critical components in-house, from the readout integrated circuits (ROICs), to the focal plane arrays, and final Merlin camera assembly.

Merlin NIR
InGaAs





> Image through silicon and other semiconductor materials

> Precision analysis of NIR lasers

APPLICATIONS

Telecom Laser Beam Profiling
Silicon Inspection
Forensic Science
Spectroscopy
Food Inspection

BENEFITS / FEATURES

> **Precision analysis of NIR lasers (e.g., S-, C-, or L-band telecom lasers).** Greater than 99% linearity across the dynamic range makes Merlin NIR a must-have tool.

> **A single system for measurement of signal levels across a very wide intensity range without the use of neutral-density filters.** The NIR camera's adjustable integration time (1 μs - 16.5 ms) expands the dynamic range by four orders of magnitude (a factor of 10,000). Two gain modes provide an additional order of magnitude of dynamic range.

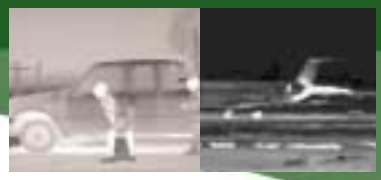
> **High resistance to laser damage.** Solid-state InGaAs detectors withstand energy intensities greater than 10 W/cm^2 with no image retention.

> **The ability to image through semiconductor materials, for applications such as silicon wafer inspection from the back side.** Unlike CCD cameras, Merlin NIR permits imaging well beyond the cutoff wavelength of 1100 nm in silicon.

> **Radiometric measurement through glass windows.** Merlin NIR can be used for radiometric imaging through materials that are opaque to MWIR and LWIR light. The InGaAs waveband offers significant enhancement in sensitivity over silicon CCD cameras.

Merlin MID
InSb





> Long-range detection and surveillance

> Detection of chemical signatures in aircraft exhaust

APPLICATIONS

Long Range Surveillance
Military FLIR
R&D Labs
Non-Destructive Testing

BENEFITS / FEATURES

> **Detection of minute temperature changes within a scene.** Temperature differences as small as 0.018 °C are easily distinguished by the indium antimonide sensor in the Merlin Mid. For the ultimate in sensitivity and temperature measurement, ThermaGRAM and Talon both enable post-processing analysis tools including signal averaging, background subtraction, and emissivity correction.

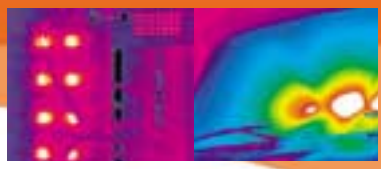
> **Higher signal-to-noise ratio.** In reduced frame rate modes of 30 or 15 Hz, integration times as long as 33 and 66 ms, respectively, can be achieved.

> **Long-range detection and surveillance, particularly in marine environments.** The Merlin Mid with our dual field-of-view (50/250 mm) or triple field-of-view (60/180/500 mm) telescopes provides a powerful, integrated imaging solution at long standoff distances.

> **Detection of chemical signatures in aircraft, rocket and missile exhaust.** CO_2 spectral lines fall within the 3-5 μm waveband. The filter wheel option available for the Merlin Lab camera permits wavelength selectivity for spectroscopy and signature analysis.

Merlin Uncooled Microbolometer





> High thermal contrast process control and condition monitoring

APPLICATIONS

Smoke/Haze Penetration
Security
Process Control
Mine Detection
Gas Detection

BENEFITS / FEATURES

> **Economical radiometric solution for high thermal contrast process control and condition monitoring.**
Uncooled sensor operating in the LWIR waveband permits measurement of temperatures in the 0-500 °C range (500-1000 °C with optional ND filter).

> **High-reliability, low-cost, fast time to imaging.**
Long-life thermoelectric cooler enables time to image of less than 1 minute.

> **Immune to sunlight reflections.**
Eliminates sun glints and "clutter" in landmine detections and other outdoor applications.

> **Ability to image through smoke.**
The LWIR band is uniquely suited to observation through smoke particles, which are smaller than the wavelength of LWIR light.

Talon® Data Acquisition

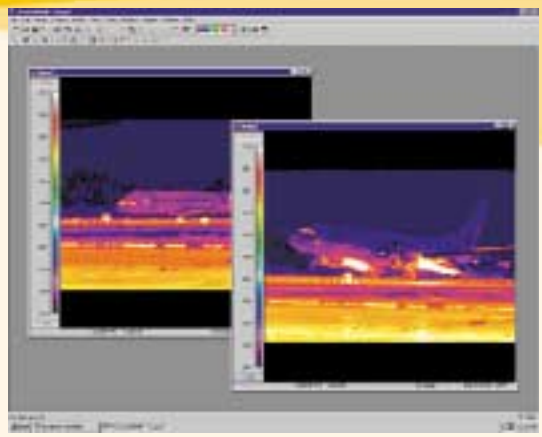


> **Indigo offers Talon Ultra, a digital acquisition and analysis system** consisting of a digital grab board, 10-foot interface cable, and all software required for image acquisition and analysis. The 12-bit digital data is available from the Merlin camera for transfer to the frame grabber board. These components are configured and delivered in a Pentium-class computer.

> **The Talon Ultra software is based on a licensed copy of Image Pro® software with custom extensions.** The software provides a full range of utilities for processing, measurement, and analysis. Talon Ultra is ideally suited for any research professional using Indigo's Merlin IR cameras to capture, study, manipulate, and store images and data.

> **Talon Lite Option,** a simplified version, available for basic data acquisition only.

ThermaGRAM®
Data Acquisition



DEVELOPED BY

Thermoteknix Systems Ltd

ThermaGRAM is a real-time infrared image processing system. When combined with Indigo radiometric and non-radiometric cameras, ThermaGRAM provides high-precision thermal image analysis with a wide array of tools and utilities. ThermaGRAM provides all temperature measurements in user selectable units, or in luminance for non-radiometric Merlin cameras.

Real-Time Radiometric Data Acquisition & Analysis

Analysis tools include:

> Spot temperature tools to display the temperature at a point in the image.

> Isotherm tools to color areas of the image lying within a defined temperature band.

> Line tools to be used as graphic objects or rulers, or to display the maximum, minimum and mean temperatures along a line, or with the profile tool to display the temperature profile along the line in a separate window.

> On-screen profile tools, which superimpose the display of a temperature profile over the image itself.

> Rectangle, ellipse and polygon tools to be used as graphic objects, or to display the maximum, minimum and mean temperatures in a region, and, with the histogram tool, to display a bar or pie chart showing the temperature distribution within the region.

> Differencer tools to display differences between the temperatures measured by other tools.

> Labels to identify points within the image.

> PosiTrak® tool is used for distance measurements by imposing a coordinate system via alignment marks.

ThermaGRAM Pro Option

ThermaGRAM Pro extends the standard ThermaGRAM with additional modules.

> ThermaGRAM Plot module allows data from a live image to be captured and plotted as Time versus Temperature graphs. Once the data is plotted, you can extrapolate to determine temperatures at future (or past) times, using a choice of models.

> The PosiTrak Pack module extends the PosiTrak tool, allowing you to straighten aligned images so that they appear the same as the original. You can also build a mosaic of overlapping images to create a single image; subtract one image from an image series; and create images showing the average, maximum, and minimum temperature of a group of images. PosiTrak uses a patented method of multi-image alignment and reorientation using quick and simple on-screen markers positioned on common features in the images.

Dynamite IR Option

The Dynamite IR program is a software accessory for ThermaGRAM Pro that enables real-time thermal image sequences to be captured. Dynamite IR controls the capture process and allows you to replay, edit, and save individual images or sequences; or to create .AVI files. Acquisitions may be triggered at any point from the beginning to end of an event, as image data is continuously streamed to the host computer's hard drive. Sequences can be initiated by digital signal input or keyboard, and user-defined time delays if desired. The length of sequences is limited only by available hard disk space. Dynamite IR uses proprietary technology to save onto standard PC hard disks, without the need to install disk arrays or SCSI interfaces.

Flame Kernel Growth in an Internal Combustion Engine



Courtesy of: Ford Motor Company

> **Dynamite IR option allows users to record and analyze sequences of images.**

TheraGRAM is a registered trademark of Thermoteknix Systems, Ltd.

Optics/Camera Specs



Standard Infrared Optics

Indigo offers a variety of lenses and accessories for Merlin cameras. These optics have been selected to match the wavelength response and back working distance of the FPAs in our cameras. Lens Extender Rings available for MWIR and LWIR lenses.







Optics

NIR	MWIR	LWIR Uncooled
Microscope: 0.7x-22.5x (not shown)	Microscope: 1x, 2.5x, and/or 4x (not shown)	
	13 mm (41 x 31 degrees FoV)	13 mm (64 x 50 degrees FoV)
25 mm (22 x 16 degrees FoV)	25 mm (22 x 16 degrees FoV)	25 mm (36 x 27 degrees FoV)
50 mm (11 x 8 degrees FoV)	50 mm (11 x 8 degrees FoV)	50 mm (18 x 14 degrees FoV)
	100 mm (5.5 x 4.1 degrees FoV)	100 mm (9 x 7 degrees FoV)
12.5 mm - 75 mm Zoom	50/250 mm Dual Field of View 50 mm (11x 8 degrees FoV) 250 mm (2.2 x 1.8 degrees FoV) (not shown)	200 mm (4.7 x 3.5 degrees FoV) (not shown)
	60/180/500 Triple Field of View: 60 mm (9.1 x 7.3 degrees FoV) 180 mm (3.1 x 2.4 degrees FoV) 500 mm (1.1 x 0.9 degrees FoV)	

Camera Specifications

	Merlin NIR	Merlin MID	Merlin Uncooled
Detector Type	InGaAs	InSb	Microbolometer
Spectral Range	0.9 - 1.7 μm	1 - 5.4 μm (3 - 5 μm set by cold filter)	7.5 - 13.5 μm
Detector Size	30 x 30 μm	30 x 30 μm	51 x 51 μm
Array Format	320 x 256	320 x 256	320 x 240
Integration Time	1 μs - 16.5 ms	5 μs - 16.5 ms	N/A
Camera f/#	(set by lens iris)	2.5 or 4.1	1.3
Cooling Type	TE stabilization	Integral Stirling or LN_2	TE stabilization
NEdT [NEI]	[≤1E10 ph/cm² - sec, low gain] [≤5E9 ph/cm² - sec, high gain]	< 25 mK (< 18 mK typical)	< 100 mK
Analog Video	NTSC @ 30 Hz (PAL @ 25 Hz optional); S-Video		
Digital Video	60, 30*, 15* Hz (50 Hz PAL), 12-bit corrected/uncorrected (*Reduced frame rate option disables analog video. This option not available for Merlin Uncooled.)		
Remote Control	Button Pannel & RS-232	Button Pannel & RS-232	Button Pannel & RS-232
Size	4.0 "H x 4.5 "W x 8.0 "L	5.5 "H x 5.0 "W x 9.8 "L	4.0 "H x 4.5 "W x 8.0 "L
Weight	3.5 lbs	9 lbs	3.5 lbs
Standard Temp Measurement	250 - 1,000 °C	0 - 350 °C	0 - 500 °C
Extended Temp Measurement	1,000 - 2,000 °C	300 - 2,000 °C	500 - 1,000 °C
Temp Accuracy	2° or 2%	2° or 2%	2° or 2%

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