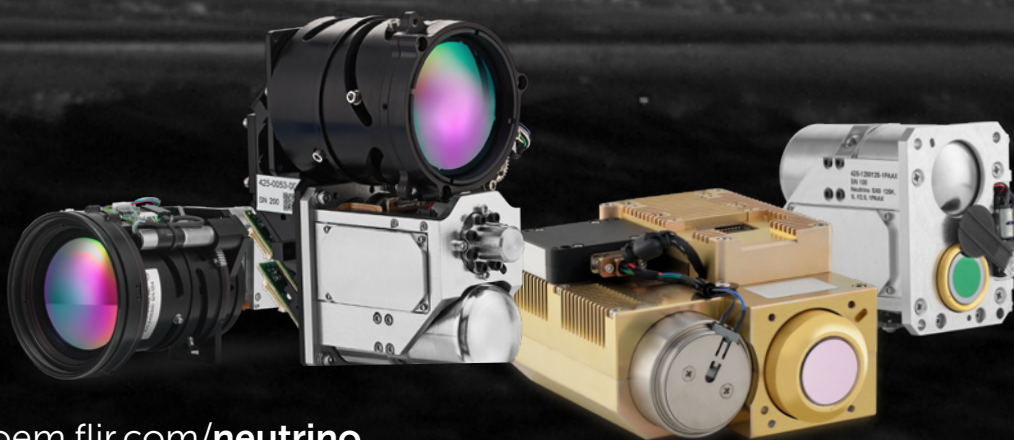


# NEUTRINO<sup>®</sup> SERIES

High Performance SWAP Optimized MWIR Camera Modules  
and Integrated Continuous Zoom Optical Solutions



[oem.flir.com/neutrino](http://oem.flir.com/neutrino)

 **TELEDYNE**  
FLIR OEM

# COOLED MWIR SOLUTIONS FOR ALL YOUR APPLICATION

NDA-compliant and ITAR-free, Neutrino high-performance and SWaP+C cooled mid-wavelength infrared (MWIR) OEM camera modules and continuous zoom (CZ) lenses provide an optimized imaging solution for missions demanding performance and reliability.

Offering size, weight, power, and cost optimized VGA, SXGA, and QXGA resolution camera modules with long-life and low-vibration linear coolers, common camera interfaces, and various continuous zoom lens combinations, the Neutrino portfolio provides the best technical solution available. And with near off-the-shelf delivery, real price competitiveness and best-in-class product development support and reliability, the Neutrino portfolio is also the lowest risk solution. Teledyne FLIR OEM also offers the industry-leading two-year warranty for Neutrino SWaP and IS series.

See what solution is best for you.

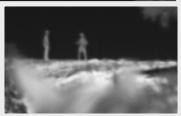


Image captured with Neutrino Ground ISR



UNMANNED AERIAL SYSTEMS (UAS)



MILITARY DISMOUNT SYSTEMS



AIRBORNE ISR

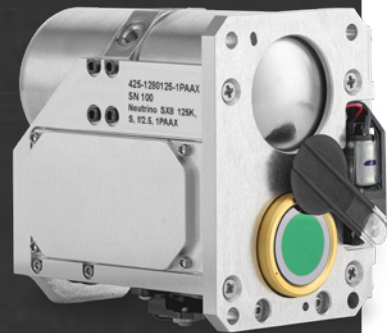


COUNTER-UAS (C-UAS)



GROUND ISR & SECURITY

# MEET THE NEUTRINO FAMILY



## Neutrino SWaP Series

HOT FPA SWAP+C Optimized MWIR Camera Modules

The Neutrino LC and Neutrino SX8 provide best-in-class MWIR imagery and data in a small, lightweight package. Based on Teledyne FLIR OEM's High Operating Temperature (HOT) FPA technology, they are designed for ruggedized products requiring long life, low-power consumption, and quiet, low-vibration operation. Both are ideal for small gimbals and airframes, handheld devices, security cameras, targeting devices, and asset monitoring applications.

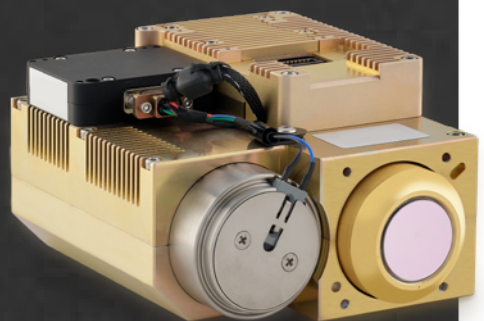
- VGA and SXGA formats in a SWaP envelope
- NDAA compliant and ITAR-free
- Low-power linear micro-cooler provides quick cool-down time
- Industry-leading two-year warranty

## Neutrino Performance Series

High Definition Resolution MWIR Camera Modules

With high resolution and fast frame rates, the Neutrino QX and SX12 are ideal for ground or airborne ISR, targeting, C-UAS, and wide area motion imagery (WAMI) applications. The Neutrino Performance series offers a range of FPA types and optical interface options.

- Flexible detector type, FPA window size, frame rate, and interface
- NDAA compliant and ITAR-free
- Mature infrared image processing architecture and robust SDK



## Neutrino IS Series

HOT MWIR Camera Modules + Continuous Zoom (CZ) Lenses

Multiple affordable mid-wavelength infrared (MWIR) camera resolution and continuous zoom lens combinations can shave months and thousands of development dollars from camera lens integration projects. Not only does the Neutrino IS lower development risk and improve time-to-market, since each camera and lens are designed for each other, users also gain optimal performance not achievable when integrating cameras and lenses from multiple sources.

- VGA and SXGA formats in a SWaP envelope
- NDAA compliant and ITAR-free
- Factory-integrated Teledyne FLIR OEM MWIR camera and CZ lens
- Industry-leading two-year warranty



## Neutrino ISR Series

MWIR Camera Module + Continuous Zoom (CZ) Lens

NDAA compliant and ITAR free, the Neutrino ISR series provides turnkey solutions for integrators developing intelligence, surveillance, and reconnaissance (ISR) systems. The cameras combine Teledyne FLIR OEM's world-class mid-wavelength infrared (MWIR) camera modules and continuous zoom (CZ) lenses with market-leading image processing and control electronics from InVeo Designs LLC. Each camera offers high-performance imaging, a reliable long-life linear cooler, and a low switching cost to upgrade existing systems. The factory-integrated and optimized MWIR imaging systems from a single source provide market-leading performance while reducing development risk, cost, and time to market.

- MWIR VGA (640x512) or SXGA (1280x1024) resolution
- NDAA compliant and ITAR-free
- Factory-integrated Teledyne FLIR MWIR camera and CZ lens

# CORE TO INNOVATION

## Neutrino SWaP Series



|                                          | Neutrino SX8                                       | Neutrino LC                                                |
|------------------------------------------|----------------------------------------------------|------------------------------------------------------------|
| Sensor Technology                        | HOT MWIR                                           |                                                            |
| Resolution & Pixel Pitch                 | 1280 x 1024, 8 µm pitch                            | 640 x 512, 15 µm pitch                                     |
| Spectral Band                            | 3.4 to ≥ 5.1 µm Standard                           | 3.4 to ≥ 5.0 µm Standard                                   |
| Sensitivity (NEΔT)                       | <38mK,f/4, 50% well                                | 30mK (25mK typical), f/4, 50% well                         |
| Frame Rate                               | up to 60 Hz                                        |                                                            |
| Time to Image                            | <5 min 23°C ambient (goal)                         | <4 min 23 °C ambient (goal)                                |
| PHYSICAL ATTRIBUTES                      |                                                    |                                                            |
| Size (L x W x H)                         | 7.9 x 5.3 x 6.1 cm (3.1 x 2.1 x 2.4 in.)           | 7.4 x 4.6 x 6.1 cm (2.9 x 1.8 x 2.4 in.)                   |
| f number                                 | f/4, f/3, and f/2.5                                | f/5.5 Standard, f/4, & f/2.5 options                       |
| Cold Aperture Height                     | 19.4 mm from FPA                                   | 19.4 mm from FPA (f/2.5, f/4)<br>19.7 mm from FPA (f/5.5)  |
| Weight                                   | < 420 grams (<15 oz)                               | <380 grams (<13.4 oz)                                      |
| FPA CONTROL                              |                                                    |                                                            |
| ROIC                                     | ISC1601                                            | ISC0403                                                    |
| Direct Injections, Snapshot, Progressive | Yes                                                |                                                            |
| Programmable Integration Time            | Yes (.01ms - 16ms) at 60 Hz                        |                                                            |
| Well Capacity                            | 2.6 x 10 <sup>6</sup> electrons                    | 7 x 10 <sup>6</sup> electrons                              |
| ROIC Modes                               | Free Run, Readout Priority, & Integration Priority |                                                            |
| External Sync                            | Master or Slave                                    |                                                            |
| IMAGE PROCESSING & DISPLAY CONTROLS      |                                                    |                                                            |
| NTSC/PAL                                 | N/A                                                | Yes (accessory board required)                             |
| Image Optimization/AGC                   | Linear, Histogram Equalization, DDE                |                                                            |
| Invert/Revert                            | Yes                                                |                                                            |
| Color Palettes/LUTs                      | Yes, RGB888 mode                                   |                                                            |
| Symbology                                | Yes, RGB888 mode                                   |                                                            |
| Digital Zoom                             | Yes, up to 8x                                      |                                                            |
| DIGITAL VIDEO                            |                                                    |                                                            |
| Parallel (24-bit/16-bit/8-bit)           | Yes                                                |                                                            |
| Camera Link                              | Yes                                                | Yes (accessory board required)                             |
| USB                                      | Yes                                                |                                                            |
| INTERFACING                              |                                                    |                                                            |
| Primary Electrical Connector             | 80-pin SAMTEC, ST4-40-2.50-L-D-P-TR                | 80-pin Hirose, DF40C-80DS                                  |
| Input Voltage                            | +5.0 VDC Camera, +12 VDC Cryocooler                | +3.3 VDC Camera, +12 VDC Cryocooler                        |
| Power Consumption                        | <12 W cooldown, <8 W steady state @ 23 °C          | <8 W cooldown, <4 W steady state @ 23 °C                   |
| Communication                            | UART (115.2K baud)                                 | USB or UART (921.6k baud)                                  |
| Discrete I/O Control                     | Yes, Three available                               | One Discrete, custom configurable at factory               |
| User Configurability via SDK & GUI       | Yes                                                | Yes                                                        |
| ENVIRONMENTAL                            |                                                    |                                                            |
| Operating Temperature Range              | -40 °C to +71 °C (-40 °F to +160 °F)               |                                                            |
| Non-Operating Temperature Range          | -57 °C to +80 °C (-70.6 °F to +176 °F)             | -54 °C to +80 °C (-65 °F to +176 °F)                       |
| Operational Altitude                     | ~12 km (40,000 ft)                                 |                                                            |
| Humidity                                 | Non-condensing between 5% – 95%                    |                                                            |
| Vibration                                | 5.8 grms, 3-axis, 1 hr each                        |                                                            |
| Shock (goal)                             | Lateral<br>Vertical<br>Axial                       | 190 Grms @ .55 ms<br>320 Grms @ .55 ms<br>550 Grms @ .8 ms |

## Neutrino Performance Series



| Neutrino QX                              |                                                              | Neutrino SX12                                    |
|------------------------------------------|--------------------------------------------------------------|--------------------------------------------------|
| Sensor Technology                        | MWIR                                                         | MWIR                                             |
| Resolution & Pixel Pitch                 | 2048 x 1536, 10 µm pitch                                     | 1280 x 1024, 12 µm pitch                         |
| Spectral Band                            | 3.4 to ≥ 5.0 µm Standard                                     | 3.4 to ≥ 5.0 µm Standard, CO2 notch available    |
| Sensitivity (NEdT)                       | <30 mk, f/4, 50% well                                        | <25 mk, f/4, 50% well                            |
| Frame Rate                               | 60 Hz (1080P), >30 Hz (QXGA)                                 | 120 Hz (720P), >60 Hz (SXGA)                     |
| Time to Image                            | <7 min @ 22 °C ambient                                       |                                                  |
| PHYSICAL ATTRIBUTES                      |                                                              |                                                  |
| Size (L x W x H)                         | 13.4 x 7.0 x 10.3 cm (5.26 x 2.76 x 4.05 in.)                | 12.0 x 7.0 x 10.3 cm (4.732x 2.76 x 4.05 in.)    |
| f number                                 | f/2, custom available                                        | f/2.5, f/4, and f/5                              |
| Cold Aperture Height                     | 38.1 mm from FPA                                             | 25.0 mm from FPA                                 |
| Weight                                   | 1.97 kg (4.34 lb)                                            |                                                  |
| FPA CONTROL                              |                                                              |                                                  |
| ROIC                                     | ISC1901                                                      | ISC1308                                          |
| Direct Injections, Snapshot, Progressive | Direct Injection, Snapshot                                   | Direct Injection, Snapshot, Integrate While Read |
| Programmable Integration Time            | Yes (.01-16 ms)                                              |                                                  |
| Well Capacity                            | 3 x 10 <sup>6</sup> electrons                                | >11 x 10 <sup>6</sup> electrons                  |
| ROIC Modes                               | Free Run, Readout Priority, & Integration Priority           |                                                  |
| External Sync                            | Free run, external sync with readout or integration priority |                                                  |
| IMAGE PROCESSING & DISPLAY CONTROLS      |                                                              |                                                  |
| NTSC/PAL                                 | N/A                                                          |                                                  |
| Image Optimization/AGC                   | Yes                                                          |                                                  |
| Invert/Revert                            | Yes                                                          |                                                  |
| Color Palettes/LUTs                      | N/A                                                          |                                                  |
| Symbology                                | N/A                                                          |                                                  |
| Continuous Zoom                          | N/A                                                          |                                                  |
| DIGITAL VIDEO                            |                                                              |                                                  |
| Parallel (24-bit/16-bit/8-bit)           | No                                                           |                                                  |
| Camera Link                              | Yes (base or medium)                                         |                                                  |
| USB                                      | No                                                           |                                                  |
| INTERFACING                              |                                                              |                                                  |
| Primary Electrical Connector             | 40-pin Samtec                                                |                                                  |
| Input Voltage                            | 5 VDC Camera, 28 VDC Cryocooler                              |                                                  |
| Power Consumption                        | <20 W Steady State                                           |                                                  |
| Communication                            | RS-422, selectable BAUD rate                                 |                                                  |
| Discrete I/O Control                     | No                                                           |                                                  |
| User Configurability via SDK & GUI       | Yes                                                          |                                                  |
| ENVIRONMENTAL                            |                                                              |                                                  |
| Operating Temperature Range              | -40 °C to +71 °C (-40 °F to +160 °F)                         |                                                  |
| Non-Operating Temperature Range          | -54 °C to +80 °C (-65 °F to +176 °F)                         |                                                  |
| Operational Altitude                     | 12,190 m (40,000 ft)                                         |                                                  |
| Humidity                                 | Non-condensing between 5% – 95%                              |                                                  |
| Vibration                                | 3.4 grms, 3-axis, 1 hr each                                  |                                                  |
| Shock (goal)                             | 20 G Shock Pulse W/11 ms Half Sine                           |                                                  |

# CHALLENGES WITH MWIR INTEGRATION

## TIME TO MARKET

The typical project timeline for a system integrator to develop a MWIR imaging platform averages 12 to 28 months when buying and integrating third party commercial-off-the-shelf (COTS) components. It can require even longer for programs where developers need to design to specific customer requirements, such as with traditional government contract programs.

## MULTIPLE COMPLEX SUBSYSTEMS

An MWIR imaging system consists of multiple subsystems. The optics collect and focus the MWIR energy onto the detector. Zoom optics provide the field of view or optical magnification to the camera. The detector includes a focal plane array (FPA), readout integrated circuit (ROIC), and integrated detector cooler assembly (IDCA). Imaging electronics control the FPA, cooler and create an image. A development team has to consider multiple variables, including pixel size, frame rate, vacuum packaging, and much more.

## MULTIPLE COMPONENT PROVIDERS

Development teams are challenged when acquiring and integrating subsystems from two or more providers. Reduced system performance and reliability are likely when integrating “stand-alone” components due to compatibility tradeoffs. This can also lead to efficiency loss and added complexity in the system development process, procurement, manufacturing, and eventual system support.

# BOLD PERFORMANCE AND INTEGRATION SUPPORT

## SWAP+C OPTIMIZED SENSOR ENGINE

SWaP+C optimized design saves space, weight, and power, resulting in operational and cost benefits and the ability to integrate into smaller spaces.

- T2SL HOT FPA provides superb MWIR imagery
- Tight optics-to-camera tolerances minimize optics size and mass
- Best-in-class power consumption

## RELIABLE LINEAR COOLER

Designed from the ground up for optimum performance and reliability minimize cost of ownership and maximize operational uptime.

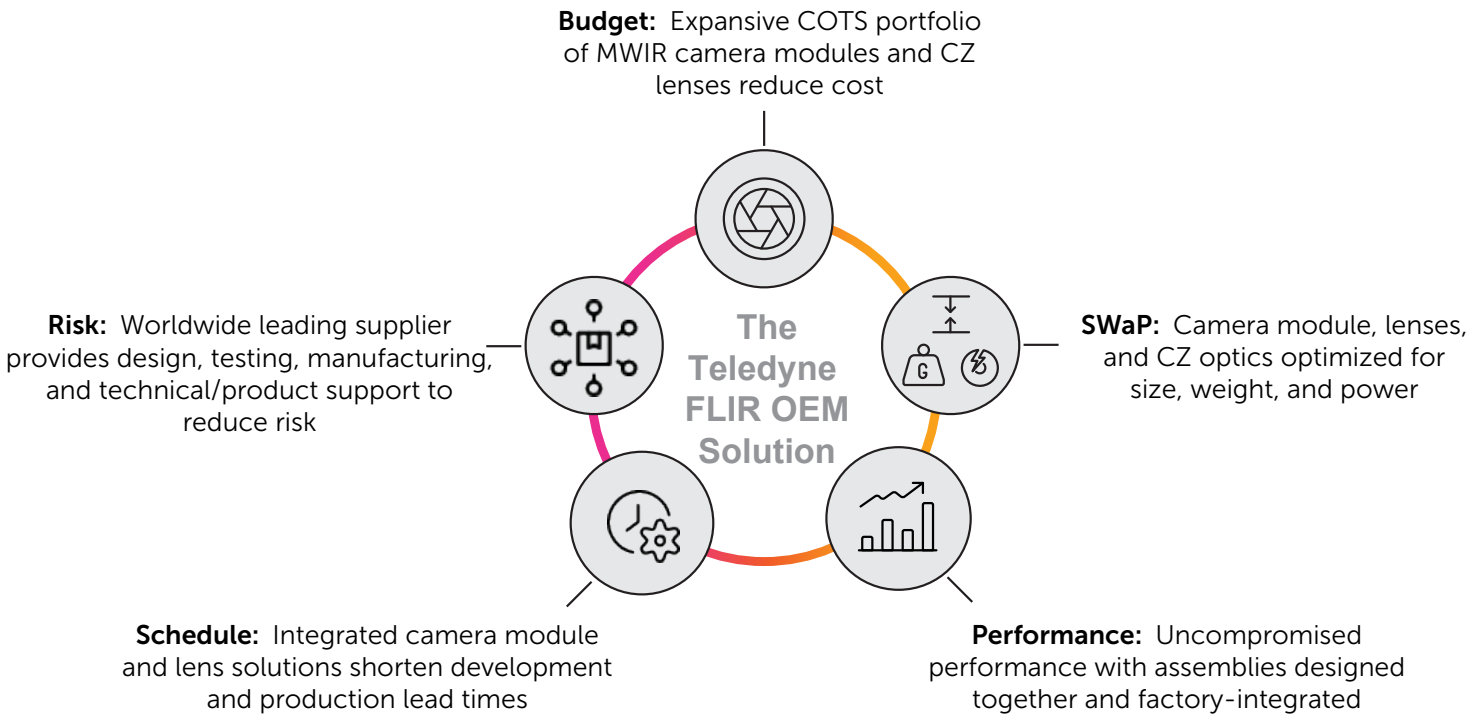
- Increased reliability and low-vibration
- 2x faster time to image
- Reduce user fatigue and operate for longer periods
- Comprehensive product documentation

## MARKET LEADING THERMAL OPTICS

Integrated SWaP optimized lens provides instant clear imaging able to withstand every rugged environment.

- Smooth continuous zoom
- Precision aligned camera and lens with a collimator and sophisticated test equipment
- Highly qualified Teledyne FLIR OEM Technical Services team available to support integration

# ADVANTAGES OF MWIR INTEGRATION WITH TELEDYNE FLIR OEM



# THE COST-EFFECTIVE TOTAL PACKAGE REVOLUTIONIZING MWIR IMAGING

Teledyne FLIR OEM is the first integrated solutions provider capable of supplying high-performance MWIR camera modules and continuous zoom optic assemblies. Teledyne FLIR OEM accelerates time to market for MWIR imaging platform developers with vertically integrated, size-weight-and-power (SWaP)-optimized camera modules and zoom optics. When developers can work with a single solutions provider to produce all of the subsystems necessary for a complete platform—including the IR detector, zoom optics, electronics and packaging—the results are shorter design cycles, streamlined procurement, increased reliability, and reduced end-item lead time.



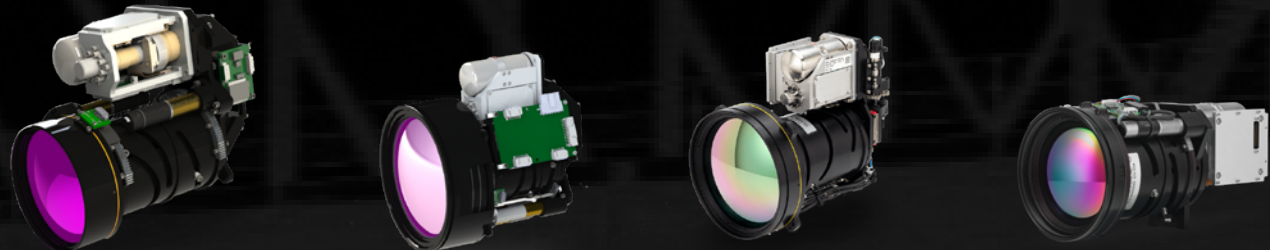
# BOUNDLESS VERSATILITY WITH INTEGRATED SOLUTIONS



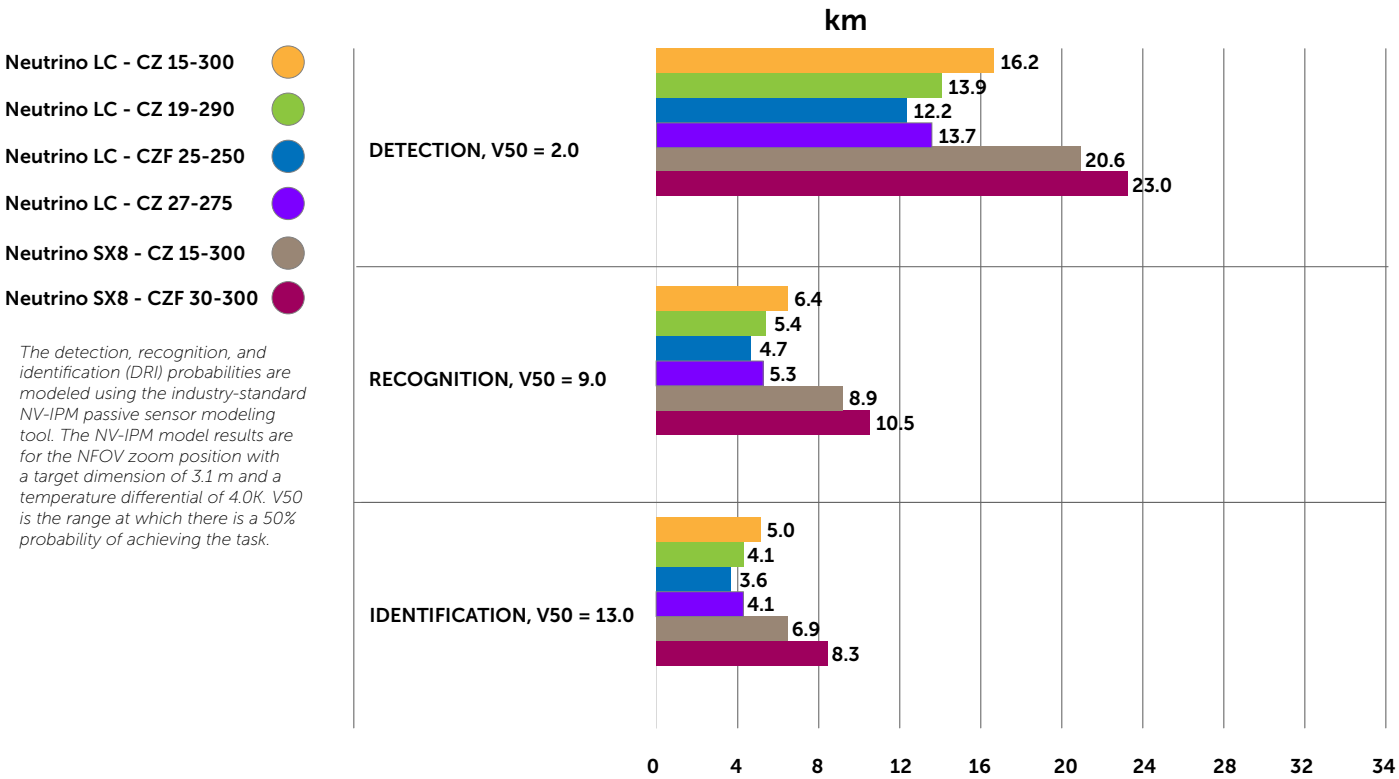
|                     | Neutrino LC<br>CZ 19-290                          | Neutrino LC<br>CZF 25-250                     | Neutrino LC<br>CZ 27-275                           | Neutrino LC<br>CZ 15-300                            |
|---------------------|---------------------------------------------------|-----------------------------------------------|----------------------------------------------------|-----------------------------------------------------|
| Resolution          | 640 x 512, (15 µm pitch) HOT MWIR                 |                                               |                                                    |                                                     |
| f-number            | f/5.5                                             | f/5.5                                         | f/5.5                                              | f/4.0                                               |
| Lens Config.        | Straight                                          | Folded                                        | Straight                                           | Straight                                            |
| HFOV                | 1.9° to 27.4°                                     | 2.2° to 21.7°                                 | 2.0° to 20.4°                                      | 1.8° to 35.5°                                       |
| Focal Length        | 19 to 290 mm                                      | 25 to 250 mm                                  | 27 to 275 mm                                       | 15 to 300 mm                                        |
| Size<br>(L x W x H) | 15.6 x 7.88 x 10.0 cm<br>(6.20 x 3.09 x 3.94 in.) | 11.4 x 7.1 x 12.1 cm<br>(4.5 x 2.8 x 4.7 in.) | 15.16 x 6.84 x 9.18 cm<br>(5.97 x 2.69 x 3.62 in.) | 19.25 x 9.91 x 10.59 cm<br>(7.58 x 3.90 x 4.17 in.) |
| Weight              | 725 grams (1.60 lb)                               | 741 grams (1.63 lb)                           | 595 grams (1.31 lb)                                | 1324 grams (2.92 lb)                                |
| Volume              | 1237 cm <sup>3</sup> (76 in <sup>3</sup> )        | 920 cm <sup>3</sup> (56 in <sup>3</sup> )     | 745 cm <sup>3</sup> (45.4 in <sup>3</sup> )        | 2020 cm <sup>3</sup> (123 in <sup>3</sup> )         |

Save time and money with Teledyne FLIR OEM’s integrated MWIR cooled camera module and continuous zoom lens solutions. The Neutrino IS models are cost-effective, swap-optimized, reliable, and can erase weeks of precision engineering getting you to market faster than ever. FLIR engineered specific zoom lens and camera combinations guarantee simplified opto-mechanical integration and user interface while providing smooth continuous zoom with a common and simplified user interface in a variety of FOV options. These solutions are fully athermalized over a wide operating temperature range and are autofocus capable.

- Optimized SWaP, usability, and image performance in demanding environments
- Tight optics-to-camera tolerances minimize optics size and mass
- Simplified and common electrical interface and software controls
- Fewer connectors, cables, and software SDKs to manage
- Precision aligned camera and lens for optimized co-boresight performance



|                     | Neutrino LC<br>CZF 25-375                           | Neutrino LC<br>CZF 30-600                            | Neutrino SX8<br>CZF 30-300                    | Neutrino SX8<br>CZ 15-300                          |
|---------------------|-----------------------------------------------------|------------------------------------------------------|-----------------------------------------------|----------------------------------------------------|
| Resolution          | 640 x 512, (15 µm pitch) HOT MWIR                   |                                                      | 1280 x 1024, (8 µm pitch) HOT MWIR            |                                                    |
| f-number            | f/5.5                                               | f/5.5                                                | f/3.0                                         | f/4.0                                              |
| Lens Config.        | Folded                                              | Folded                                               | Folded                                        | Straight                                           |
| HFOV                | 1.5° to 21.9°                                       | 0.9° to 18.2°                                        | 1.96° to 19.37°                               | 1.9° to 37.6°                                      |
| Focal Length        | 25 to 375 mm                                        | 30 to 600 mm                                         | 30 to 300 mm                                  | 15 to 300 mm                                       |
| Size<br>(L x W x H) | 15.42 x 8.53 x 12.65 cm<br>(6.07 x 3.36 x 4.98 in.) | 16.89 x 13.21 x 14.99 cm<br>(6.65 x 5.20 x 5.90 in.) | 17 x 13.5 x 19 cm<br>(6.69 x 5.31 x 7.48 in.) | 19.25 x 9.91 x 9.96 cm<br>(7.58 x 3.90 x 3.92 in.) |
| Weight              | 1140 grams (2.51 lb)                                | 1980 grams (4.37 lb)                                 | 1770 grams (3.90 lb)                          | 1337 grams (2.95 lb)                               |
| Volume              | 1663 cm <sup>3</sup> (102 in <sup>3</sup> )         | 3344 cm <sup>3</sup> (204 in <sup>3</sup> )          | 4361 cm <sup>3</sup> (266 in <sup>3</sup> )   | 1900 cm <sup>3</sup> (116 in <sup>3</sup> )        |



# MORE COVERAGE THAN EVER BEFORE



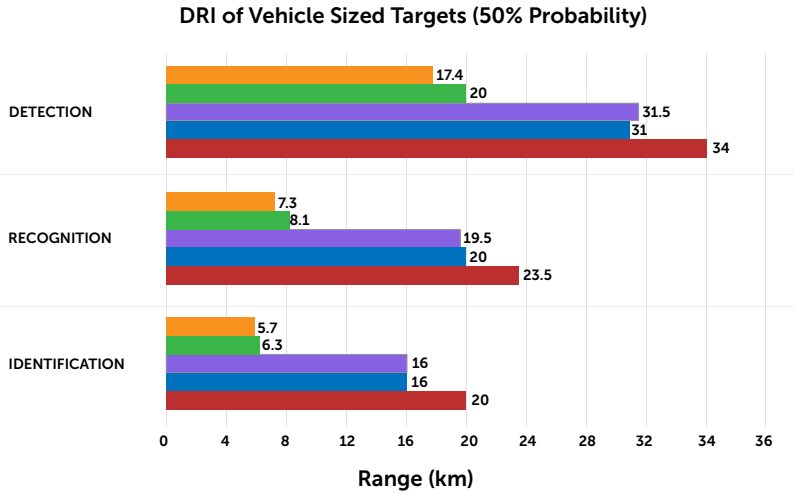
NDAA compliant and ITAR free, the Neutrino Ground ISR series provides turnkey solutions for integrators developing intelligence, surveillance, and reconnaissance (ISR) systems. The cameras combine Teledyne FLIR’s world-class mid-wavelength infrared (MWIR) camera modules and continuous zoom (CZ) lenses with market-leading image processing and control electronics from InVeo Designs LLC. Each camera offers high-performance imaging, a reliable long-life linear cooler, and a low switching cost to upgrade existing systems. The factory-integrated and optimized MWIR imaging systems from a single source provide market-leading performance while reducing development risk, cost, and time to market.

They incorporate multiple focal plane array (FPA) resolutions and CZ lens options with industry standard image processing and interface electronics, allowing for differing detection recognition and identification (DRI) requirements and affordability. With four configurations today and more coming soon, the ITAR-free cameras provide the imaging performance required for short, mid, and long-range ISR, perimeter surveillance, border surveillance, and counter-UAS (CUAS) applications.

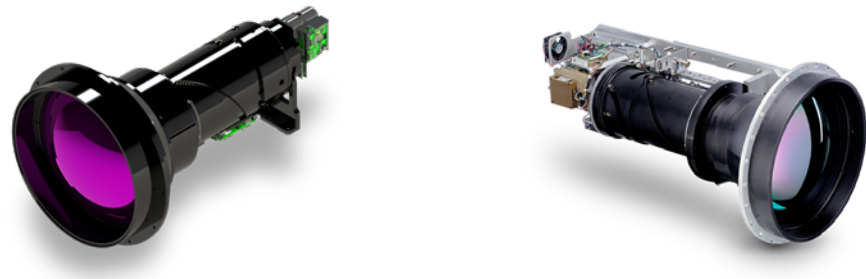
All Neutrino Ground ISR cameras can run Teledyne FLIR OEM’s Prism™ AI detection, tracking, and classification models and Prism ISP libraries for super-resolution, turbulence mitigation, contrast enhancement, and more.

- Neutrino SX8 ISR 15-300
- Neutrino LC ISR 20-420
- Neutrino SX8 ISR 35-700
- Neutrino SX12 ISR 1200
- Neutrino SX8 ISR 50-1000

Performance modeled using industry standard NV-IPM software and associated parameters for thermal imaging of tracked vehicles



| Overview                        | LC ISR 20-420                                                                                                                                                                                                                                                                           | SX8 ISR 15-300                                                                                                                                                           | SX8 ISR 35-700                                                    |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| Size (L x W x H)                | Length: 20.3 cm (8 in.)<br>Lens Diameter: 8.9cm (3.5 in.)                                                                                                                                                                                                                               | Length: 20.3 cm (8 in.)<br>Lens Diameter: 9.65 cm (3.8 in.)                                                                                                              | Length: 47.5 cm (18.70 in.)<br>Lens Diameter: 21.72 cm (8.55 in.) |
| Weight                          | 1.2 kg (2.65 lb)                                                                                                                                                                                                                                                                        | 1.5 kg (3.31 lb)                                                                                                                                                         | 8.55 kg (18.85 lb)                                                |
| Spectral Band                   | 3.4 to 5.1 μm Standard                                                                                                                                                                                                                                                                  | 3.4 to 5.1 μm Standard                                                                                                                                                   | 3.4 to 5.1 μm Standard                                            |
| Resolution                      | 640 x 512                                                                                                                                                                                                                                                                               | 1280 x 1024                                                                                                                                                              | 1280 x 1024                                                       |
| Pixel Pitch                     | 15 μm                                                                                                                                                                                                                                                                                   | 8 μm                                                                                                                                                                     | 8 μm                                                              |
| Lens Specifications             |                                                                                                                                                                                                                                                                                         |                                                                                                                                                                          |                                                                   |
| Lens Type                       | 21x Continuous Zoom<br>Maintain Focus Through Zoom                                                                                                                                                                                                                                      | 20x Continuous Zoom<br>Maintain Focus Through Zoom                                                                                                                       | 20x Continuous Zoom<br>Maintain Focus Through Zoom                |
| Focal Length                    | 20-420 mm,<br>HFOV 27.50° to 1.30°                                                                                                                                                                                                                                                      | 15-300 mm,<br>HFOV 39.1° to 2.0°                                                                                                                                         | 35-700mm,<br>HFOV 16.65° to 0.84°                                 |
| Zoom and Focus Controls         | Motorized, Zoom to Specified Angle, Preset FOV (Infinity Focus)                                                                                                                                                                                                                         |                                                                                                                                                                          |                                                                   |
| F-number                        | f/5.5                                                                                                                                                                                                                                                                                   | f/4.0                                                                                                                                                                    | f/4.0                                                             |
| Focus                           | Motorized, Focus to Specified Distance, Focus to Infinity, Commanded / Continuous Autofocus                                                                                                                                                                                             |                                                                                                                                                                          |                                                                   |
| Shutter                         | Integrated Shutter for 1-Point Flat Field Correction (FFC)                                                                                                                                                                                                                              |                                                                                                                                                                          |                                                                   |
| Connections & Communications    |                                                                                                                                                                                                                                                                                         |                                                                                                                                                                          |                                                                   |
| Communication                   | RS-422 UART COM, up to 921,600 Baud                                                                                                                                                                                                                                                     |                                                                                                                                                                          |                                                                   |
| Dual Simultaneous Outputs       | Camera Link (Base) Output (14-bit NUC Corrected at Full Frame Format): 30 Hz, Optional Gigabit Ethernet                                                                                                                                                                                 |                                                                                                                                                                          |                                                                   |
|                                 | Display Output Options (10-bit (14 optional) fully processed video) <ul style="list-style-type: none"><li>NTSC</li><li>PAL</li></ul>                                                                                                                                                    | Display Output Options (10-bit (14 optional) fully processed video) <ul style="list-style-type: none"><li>720p60 HD-SDI (SMPTE)</li><li>1080p30 HD-SDI (SMPTE)</li></ul> |                                                                   |
| Electrical & Mechanical         |                                                                                                                                                                                                                                                                                         |                                                                                                                                                                          |                                                                   |
| Input Voltage                   | 12.5 VDC a@ 0.7 A nominal, 1.1 A peak at cooldown                                                                                                                                                                                                                                       |                                                                                                                                                                          |                                                                   |
| Environmental & Approvals       |                                                                                                                                                                                                                                                                                         |                                                                                                                                                                          |                                                                   |
| Operating Temperature Range     | -40 °C to +71 °C (-40 °F to 160 °F)                                                                                                                                                                                                                                                     |                                                                                                                                                                          |                                                                   |
| Storage Temperature Range       | -57 °C to +80 °C (-65 °F to 176 °F)                                                                                                                                                                                                                                                     |                                                                                                                                                                          |                                                                   |
| Imaging & Optical               |                                                                                                                                                                                                                                                                                         |                                                                                                                                                                          |                                                                   |
| Sensor Material                 | HOT MWIR                                                                                                                                                                                                                                                                                |                                                                                                                                                                          |                                                                   |
| Cooler                          | Teledyne FLIR FL-100 Linear Stirling                                                                                                                                                                                                                                                    |                                                                                                                                                                          |                                                                   |
| Cooler MTTF                     | Up to 27,000 Hours                                                                                                                                                                                                                                                                      |                                                                                                                                                                          |                                                                   |
| FPA Full Frame Rate             | 30 Hz                                                                                                                                                                                                                                                                                   |                                                                                                                                                                          |                                                                   |
| Boresight Drift Through Zoom    | <0.15 mm                                                                                                                                                                                                                                                                                |                                                                                                                                                                          |                                                                   |
| Min to Max Zoom Time            | <2 Seconds                                                                                                                                                                                                                                                                              |                                                                                                                                                                          |                                                                   |
| Non Uniformity Correction [NUC] | Factory Calibrations: <ul style="list-style-type: none"><li>Two point (gain/offset)</li><li>One-point update (optimizes offset)</li><li>Defective / noisy pixel detection</li><li>8 Op Modes with 2 NUC tables each</li></ul><br>Operational (Run-Time) Calibrations: One-point refresh |                                                                                                                                                                          |                                                                   |



| Overview                        |                                                                                                                                                                                                                                                                                      | SX8 ISR 50-1000 | SX12 ISR 1200                                                  |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------------------------------------------------------------|
| Size (L x W x H)                | Length: 48.18 cm (18.97 in.)<br>Lens diameter: 30.48 cm (12 in.)                                                                                                                                                                                                                     |                 | Length: 63.75 cm (25.1 in.)<br>Lens Diameter: 29 cm (11.4 in.) |
| Weight                          | 12.2 kg (26.90 lb)                                                                                                                                                                                                                                                                   |                 | 14.51 kg (32 lb)                                               |
| Spectral Band                   | 3.4 to 5.1 μm Standard                                                                                                                                                                                                                                                               |                 | 3.4 to 5.0 μm                                                  |
| Resolution                      | 1280 x 1024                                                                                                                                                                                                                                                                          |                 | 1280 x 1024                                                    |
| Pixel Pitch                     | 8 μm                                                                                                                                                                                                                                                                                 |                 | 12 μm                                                          |
| Lens Specifications             |                                                                                                                                                                                                                                                                                      |                 |                                                                |
| Lens Type                       | 20x Continuous Zoom<br>Maintain Focus Through Zoom                                                                                                                                                                                                                                   |                 | 10x Continuous Zoom<br>Maintain Focus Through Zoom             |
| Focal Length                    | 50-1000 mm,<br>HFOV 11.69° to 0.59°                                                                                                                                                                                                                                                  |                 | 120-1200 mm,<br>HFOV 7.2° to 0.72°                             |
| Zoom and Focus Controls         | Motorized, Zoom and Focus                                                                                                                                                                                                                                                            |                 |                                                                |
| F-number                        | f/4.0                                                                                                                                                                                                                                                                                |                 | f/5.0                                                          |
| Focus                           | Motorized, Focus to Specified Distance, Focus to Infinity, Commanded / Continuous Autofocus                                                                                                                                                                                          |                 |                                                                |
| Shutter                         | Integrated Shutter for 1-Point Flat Field Correction (FFC)                                                                                                                                                                                                                           |                 |                                                                |
| Connections & Communications    |                                                                                                                                                                                                                                                                                      |                 |                                                                |
| Communication                   | RS-422 UART COM, up to 921,600 Baud                                                                                                                                                                                                                                                  |                 |                                                                |
| Dual Simultaneous Outputs       | Camera Link (Base) Output (14-bit NUC Corrected at Full Frame Format): 30 Hz, Optional Gigabit Ethernet                                                                                                                                                                              |                 |                                                                |
|                                 | Display Output Options (10-bit (14 optional) fully processed video) (Select One): <ul style="list-style-type: none"><li>720P60 HD-SDI (SMPTE)</li><li>1080P30 HD-SDI (SMPTE)</li></ul>                                                                                               |                 |                                                                |
| Electrical & Mechanical         |                                                                                                                                                                                                                                                                                      |                 |                                                                |
| Input Voltage                   | 12.5 VDC a@ 0.7 A nominal, 1.1 A peak at cooldown                                                                                                                                                                                                                                    |                 | 24 VDC @0.8 A nominal, 2.2 A peak at cooldown, 23 °C           |
| Environmental & Approvals       |                                                                                                                                                                                                                                                                                      |                 |                                                                |
| Operating Temperature Range     | -40 °C to +71 °C (-40 °F to 160 °F)                                                                                                                                                                                                                                                  |                 | -30 °C to +70 °C (-22 °F to 158 °F)                            |
| Storage Temperature Range       | -57 °C to +80 °C (-65 °F to 176 °F)                                                                                                                                                                                                                                                  |                 |                                                                |
| Imaging & Optical               |                                                                                                                                                                                                                                                                                      |                 |                                                                |
| Sensor Material                 | HOT MWIR                                                                                                                                                                                                                                                                             |                 | InSb                                                           |
| Cooler                          | Teledyne FLIR FL-100 Linear Stirling                                                                                                                                                                                                                                                 |                 | Cobham Carleton LC1062 Linear Stirling                         |
| Cooler MTTF                     | Up to 27,000 Hours                                                                                                                                                                                                                                                                   |                 | Up to 25,000 Hours                                             |
| FPA Full Frame Rate             | 30 Hz                                                                                                                                                                                                                                                                                |                 |                                                                |
| Boresight Drift Through Zoom    | <0.10 mm Radially from Co-Boresight Location                                                                                                                                                                                                                                         |                 | 9 Pixels (0.10 mm) + plus alignment tolerance of 10 Pixels     |
| Min to Max Zoom Time            | <2 Seconds                                                                                                                                                                                                                                                                           |                 | 4 Seconds                                                      |
| Non Uniformity Correction [NUC] | Factory Calibrations: <ul style="list-style-type: none"><li>Two point (gain/offset)</li><li>One-point update (optimizes offset)</li><li>Defective / noisy pixel detection</li><li>8 Op Modes with 2 NUC tables each</li></ul> Operational (Run-Time) Calibrations: One-point refresh |                 |                                                                |

## NEUTRINO ACCESSORIES



**Neutrino LC USB VPC Kit** (421-0061-01)  
The USB Video Power Connector (VPC) kit turns the Neutrino LC camera into a webcam. Power, digital video, and comm are all via USB2. The kit includes a USB-A to USB-C cable.



**Neutrino LC USB/Analog VPC Kit** (421-0062-01)  
The USB VPC kit with an additional custom 6-foot cable with a BNC pigtail provides an additional analog video signal (NTSC-compliant).



**Neutrino LC Camera Link Accessory** (250-0609-00)  
The Camera Link accessory converts CMOS video signal into a Camera-Link-compliant output via SDR-26 receptacle. Communication and power are provided via a standard USB-3 micro-B.



**Neutrino LC Utility Kit** (421-0074-00)  
Provides all output options on a single PCB. Includes a wire harness to the cooler interface. The accessory board converts video signal into a Camera-Link-compliant output via a SDR-26 receptacle.



**Neutrino LC Demonstration Lens** (322-0487-00)  
A 22 mm fixed focal length, f/5.5 lens provides a 25° horizontal field of view (HFOV). Includes a mechanical housing for the lens and allows for focus capability via keyed lens barrel and threaded barrel/housing.



**Neutrino SX8 Utility Kit 1** (421-0085-00)  
The Utility Kit provides Camera link and HDMI video output to a single development electronics board. The kit includes a wire harness for camera and cooler power. Communication and power to the Neutrino SX8 camera electronics is provided via a USB driver to a virtual COM port. External sync input/output signals are provided with standard MCX connectors. A header connector is provided for RS-422 lens control. Lens control cable not included.



**Neutrino SX8 Utility Kit 2** (421-0093-00)  
The Utility Kit provides Camera link and HDMI video output to a single development electronics board. The kit includes a wire harness for camera and cooler power. Communication and power to the Neutrino SX8 camera electronics is provided via a USB driver to a virtual COM port. External sync input/output signals are provided with standard MCX connectors. A molex picoblade 6-pin connector is provided for RS-422 lens control. Lens control cable not included. Fits NIS SX8 30-300mm CZF.



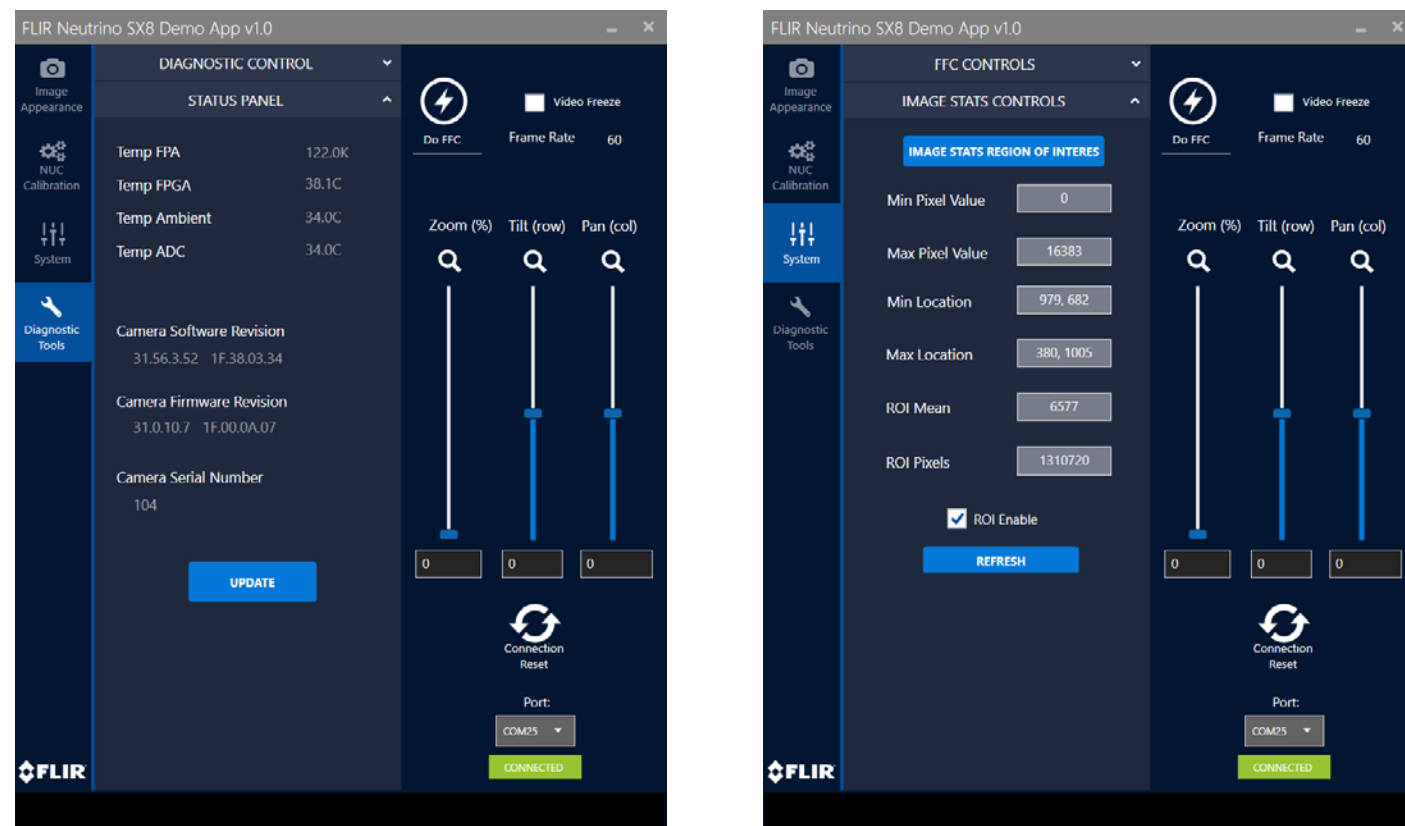
**Neutrino SX8 Demonstration Lens** (2402-300)  
A 30 mm fixed focal length, f/2.5 lens provides a 19° HFOV. Includes a mechanical housing for the lens and allows for focus capability via keyed lens barrel and threaded barrel/housing.



NEUTRINO SOFTWARE GUI

The Neutrino Demo Application or graphical user interface (GUI) allows developers to quickly start streaming video from the Neutrino LC or the Neutrino SX8. The GUI provides access to functions available within the SDK and uses a x64 Windows 10 program. It connects to the camera module via an accessory board and provides access to a number of image appearance, NUC calibration, and system settings to help with development. Example interfaces include and are not limited to CMOS and HDMI video mode, LVDS/Camera Link, NUC threshold, NUC gain, image stats controls, and FFC controls.

The interface also provides access to a wide range of diagnostic features such as diagnostic control and the status panel useful for quick troubleshooting. It can load and save configuration files to and from the Neutrino camera module.



INTEGRATION SUPPORT

Highly qualified Teledyne FLIR OEM Technical Services team is available to support integration. Various schematic and BOM references are available upon request.

Please visit [oem.flir.com/neutrino](http://oem.flir.com/neutrino) to connect with a representative.

## NOTES

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## About Teledyne FLIR OEM

Teledyne FLIR OEM is the premier partner for advanced infrared (IR) sensing solutions, offering a fully integrated ecosystem that combines cutting-edge thermal hardware and AI-driven decision support software. As the world's largest volume manufacturer of ITAR-free IR sensors and modules, we deliver thousands of IR modules daily for defense, professional, automotive, and uncrewed applications. A robust and mature supply chain, backed by 25 years of experience as a merchant supplier, ensures predictable, volume production and delivery. True vertical integration allows us to support developers at any level, from sensor to optic to complete system, ensuring quality, value, performance, and reliability all from the lowest-risk IR supply chain partner.

Our innovative hardware stack includes ROICs and detectors to NDAA-compliant midwave IR (MWIR) and longwave IR (LWIR) thermal camera modules and continuous zoom (CZ) lenses. Our end-to-end computational imaging platform delivers fully integrated image processing and AI capabilities at the edge on low-power processors. As a flexible development partner, we offer custom solutions for defense programs using COTS building blocks, supported by industry-recognized technical experts and a qualified application engineering team. With 30 years as an ISO-certified manufacturer delivering ASIL-B automotive and military-qualified systems, Teledyne FLIR OEM exceeds quality commitments on time and at scale.

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