

## I. Warranty

The manufacturer shall warrant the Thermal Imager and all charging systems supplied with the Thermal Imager free of defects in material and workmanship, under normal use and service, for a period of one year effective upon delivery. In addition, the imager's outer shell or housing shall carry a limited lifetime warranty.

## II. Service

The manufacturer must be located in the U.S.A. and provide a full-service repair center in the U.S.A. to ensure timely and efficient processing of any service related issues concerning the imager. Warranty repairs must carry a guaranteed 48-hour turnaround (2 full business days) from the time of receipt at the service center to the time that the manufacturer ships the imager. Non-warranty repairs must carry a guaranteed 48-hour (2 full business days) turnaround from the time the manufacturer receives purchase order authorization to complete the repairs to the time the manufacturer ships the imager. Upon request, the manufacturer must provide the names and contact information for three fire departments that can serve as references, verifying that the manufacturer complies with this requirement.

## III. Standards / Quality

The manufacturer must ensure quality, design and manufacturing methods through third party certification to ISO 9001, or its equivalent. To ensure that the product is of the highest quality, documentation must be presented upon request illustrating a battery of tests that have been conducted to verify water resistance, heat resistance, and shock/impact resistance.

The imager must be suitable for use in Class I, Division 2, Groups C and D hazardous locations.

## IV. Physical Configuration

The imager shall be a hand-held design, having a 4.3-inch LCD display screen and two side straps (one on each side of the imager). A combination wrist/gear strap shall accompany the imager. Total weight of the imager shall not exceed 4 lbs. with the standard battery installed. The imager shall ship in a padded, re-usable delivery case. The imager shall ship standard with two rechargeable batteries, a battery charger and AC adapter. The imager's physical dimensions shall be no more than six (6) inches tall, six (6) inches wide and eight (8) inches long. The imager must contain an integral threaded connector to mount on a standard tripod.

## V. Durability

The imager shall remain operational after being submerged under 3 feet of water for 30 minutes and allow for battery change while the unit is submerged in water. The imager shall withstand a 6-foot drop in any orientation and sustain no operational damage. The imager shall remain operational after being subjected to 300° F for a minimum of 15 minutes. The manufacturer must perform these tests in front of designated department representatives at a mutually determined time and location. Failure to perform these tests in front of designated department representatives shall constitute non-compliance with this portion of the specification.

## VI. Technology

The imaging technology shall be 320x240 pixel uncooled amorphous silicon. To ensure reliability, the detector must be designed and manufactured by a company that has provided, for at least ten years, detectors used in the fire service. The Noise Equivalent Temperature Difference (NETD) shall be less than 50 mK. The imager shall exhibit an ability to evade whiteout when pointed directly at flames. The imager's electronics shall remain operational and functionally useful within the temperature range of -20°C to 85°C. The dynamic range of the detector and associated electronics shall be 600°C ( $\pm 25^\circ\text{C}$ ). The imager shall provide surface temperature measurement taken directly from the detector. The detector shall operate in the infrared spectrum of 7.5 to 14 microns. Mid-wave or short-wave infrared products that operate below this portion of the infrared spectrum (below 7.5 microns) are not acceptable due to unreliable performance in smoky conditions.

## VII Image Colorization

In order to provide a greater degree of safety, image colorization shall utilize a tri-color method of yellow/orange/red and shall offer no additional automatic image colorization options.

The display will show yellow colorization at temperatures of 500 degrees F to 799 degrees F, orange colorization at temperatures of 800 degrees F to 999 degrees F and red colorization at temperatures of 1000 degrees F or hotter.

Such colorization shall be gradient in nature so as to be able to discern scene details through the color.

Multiple user selectable color pallets are not acceptable as they can confuse users in fire attack situations resulting in hazardous situations. Color pallets which activate automatically and colorize objects that are below 500 degrees F are not acceptable (this requirement does not apply to manually engaged colorization).

## VIII. Outer Housing

The imager shall be ergonomically designed and the outer shell or housing must be manufactured from heat resistant Ultem<sup>®</sup> thermoplastic given its superior heat performance and chemical resistance. Due to the likelihood of rigorous use, the Ultem must be molded with color pigment throughout to mask small surface scratches. Outer shells or housings that are painted or otherwise lack consistent color through their entire thickness are not acceptable. The interior surfaces of the outer shell or housing shall be coated with a conductive electromagnetic interference (EMI) shielding material.

## IX. Colors

The imager should be available in no less than seven scratch resistant colors to allow for color-coding as needed by the department. Colors shall include, at a minimum: Black, Red, Yellow, White, Orange, Blue, and Lime-Yellow.

## X. Monitor/Screen

The imager shall have a 4.3" diagonal backlit Liquid Crystal Display (LCD) screen. It shall have a minimum of 130,560 pixels for high quality resolution. The screen must be visible in thick smoke to both the operator and nearby firefighters from a variety of distances from the face, including arms-length. In addition, a clear polycarbonate cover must protect the display screen. This cover must be field replaceable and watertight.

## XI. Lens

The imager shall possess an f/1.0 lens fabricated of germanium and have no less than a 32° (V) x 50° (H) field of view. The lens shall be protected with a watertight, sealed 2 mm thick germanium cover window.

## XII. Battery Mechanism

The imager must have a battery locking mechanism whereby a tool is required to lock and unlock the mechanism for insertion and removal of the imager's battery. The mechanism must allow the user to insert and remove a battery in an unlocked position without the use of any tools. To ensure reliability and battery security, the imager must have a separate battery retention mechanism in addition to the locking mechanism. An imager that relies solely on a locking mechanism to secure the battery is unacceptable.

## XIII. Switches

The imager shall use only one switch to activate the unit. The switch must be protected to avoid accidental shut-off. The imager shall have a manual colorization mode, which helps the user identify the hottest objects in a scene. This colorization mode shall be activated utilizing a pair of switches on the top of the unit and must be manually adjustable by the user, colorizing the hottest objects in a scene with a color that is unique to this mode. Thermal imagers that use yellow, orange, or red to identify hot objects for a manual colorization mode are not acceptable as they can easily be confused with the automatic colorization modes which typically use such colors to designate fire and high heat conditions.





#### XIV. Strap Systems

The imager must be equipped with side straps, one on each side of the imager and these straps shall be made primarily of Kevlar®. The side straps must be adjustable and must include a metal D-ring for secure lanyard attachment. To improve safety, the side straps must have reflective trim. The combination wrist and gear strap shall be made primarily of Kevlar. This strap shall include two metal carabineers and a quick-release buckle that frees the imager from the strap. An optional self-retracting strap must also be available for the imager. This self-retracting gear keeper must hold the unit to the firefighters chest with the full weight of the imager (with battery) hanging unsupported from the gear keeper. All straps must be field replaceable.

#### XV. Power Supply

A minimum of 2 rechargeable batteries and 1 battery charger shall accompany each imager. Each battery shall be a 10-volt nickel metal hydride (NiMH) cell, providing a minimum of 2 hours of continuous use with all standard functions and features. The battery shall have an Ultem® outer shell. The battery shall eject from the imager only when two opposing battery release buttons are pressed simultaneously. The battery must be capable of being loaded into the housing only one way and must be easily inserted and removed by a person wearing standard firefighting gloves.

An optional AA alkaline battery case must also be available for the imager. The case must load and secure into the imager in the same manner as the standard NiMH battery. The alkaline case must also be constructed from Ultem.

#### XVI. Operation

The imager shall display a usable image no more than 4 seconds after activating the power switch. The imager must not have a standby switch or mode.

#### XVII. Wireless Transmission

The manufacturer shall offer an optional wireless remote transmitter compliant with FCC part 90 while operating at a range of 2.4 GHz. The wireless transmitter must come as a two (2) or four (4) channel unit. The transmitter shall be housed inside an attachable handle, protecting the transmitter and antenna from possible damage while giving the department the option to disengage the transmitter. Attaching the transmitter handle must not increase the width of the imager by more than one (1) inch.

Each wireless unit must have a receiver and antenna able to receive a signal from at least 600 feet through common Type V construction. The transmitter must carry a one year warranty.

#### XVIII. Wireless Receivers and Video Recorders

The manufacturer must offer the following receiver and recorder options:

A handheld, self-contained receiver / monitor system that uses the same batteries as the thermal imager. The handheld receiver / monitor system must operate for a minimum of 2 hours on the standard battery and must utilize a minimum 3.5" diagonal viewable display. The receiver must be equipped with video out capability and have a field replaceable display cover. The receiver must carry a one year warranty.

A digital image and video recorder (DVR), housed in an attachable handle, capable of recording 5 hours of video and over 300 still images. Stored digital video shall download to the user's computer via USB connection. Continuous time and date stamp shall be displayed on recorded video or still images for documentation purposes. If so configured, the DVR shall work seamlessly with the transmission system and allow the user the ability to operate the transmitter and DVR separately or both simultaneously. The DVR must carry a one year warranty.

#### XIX. Truck Mount

The manufacturer must offer a truck mounted charging system to mount the imager and internal charging system in a vehicle or fire apparatus or on the wall of a fire station. The charging system shall come standard with all necessary mounting hardware, a direct charge system, and power cords that enable the use of a DC power supply. The system must charge the battery in the imager at the same time it charges a spare battery utilizing separate charging systems. The battery in the imager must be charged through contacts on the imager. No cables or wires connecting the imager to the charging system are acceptable, nor are straps or other connecting devices to hold the imager to the truck mounting system. The truck mount charger system must include a separate storage compartment large enough to hold a spare battery or AA alkaline battery case. The truck mount must carry a one year warranty.

#### XX. Training

A product familiarization class will be available through the manufacturer's authorized distributor. To ensure the highest quality training materials, the manufacturer must have at least one full-time employee dedicated to developing and delivering thermal imaging training. To qualify, the employee must have at least ten years of active firefighting experience and must be certified as a thermal imaging instructor by an internationally recognized organization that specializes in thermal imaging for public safety organizations. The employee must also spend at least 75% of his/her time on thermal imaging training programs.

#### XXI. Delivery

The manufacturer shall deliver the thermal imager in 30 days or less after receiving the purchase order.

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