Emergency Responder Thermal Imaging

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• FIRE SERVICE • LAW ENFORCEMENT
• HAZMAT • EMS • HOMELAND SECURITY

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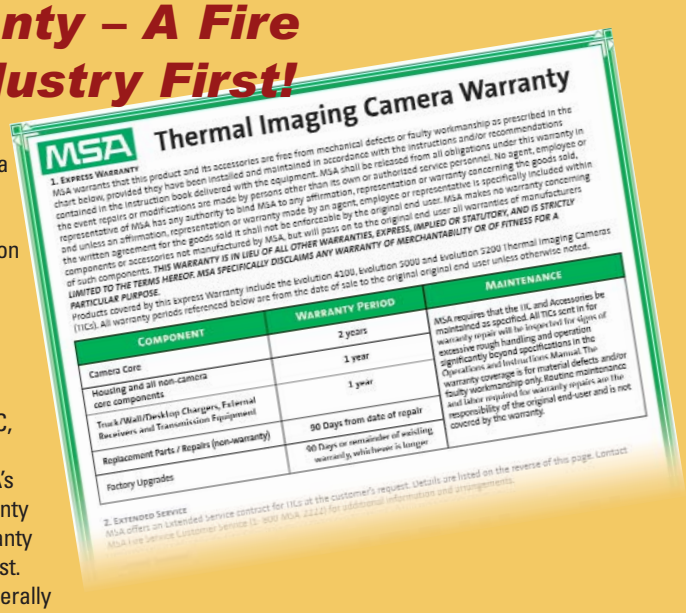


MSA Thermal Imaging Camera Warranty

1. Express Warranty

MSA warrants that this product and its accessories are free from mechanical defects or faulty workmanship as prescribed in the chart below, provided they have been installed and maintained in accordance with the instructions and/or recommendations contained in the instruction book delivered with the equipment. MSA shall be released from all obligations under this warranty in the event repairs or modifications are made by persons other than its own or authorized service personnel. No agent, employee or representative of MSA has any authority to bind MSA to any affirmation, representation or warranty concerning the goods sold, and unless an affirmation, representation or warranty made by an agent, employee or representative is specifically included within the written agreement for the goods sold it shall not be enforceable by the original end user. MSA makes no warranty concerning components or accessories not manufactured by MSA, but will pass on to the original end user all warranties of manufacturers of such components. **THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS, IMPLIED OR STATUTORY, AND IS STRICTLY LIMITED TO THE TERMS HEREOF. MSA SPECIFICALLY DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE.**

Products covered by this express Warranty include the Evolution 4100, Evolution 5000 and Evolution 5200 Thermal Imaging Cameras (TICs). All warranty periods referenced below are from the date of sale to the original original end user unless otherwise noted.

Component	Warranty Period	Maintenance
Camera Core	2 years	MSA requires that the TIC and Accessories be maintained as specified. All TICs sent in for warranty repair will be inspected for signs of excessive rough handling and operation significantly beyond specifications in the Operations and Instructions Manual. The warranty coverage is for material defects and/or faulty workmanship only. Routine maintenance and labor required for warranty repairs are the responsibility of the original end-user and is not covered by the warranty.
Housing and all non-camera core components	1 year	
Truck/Wall/Desktop Chargers, External Receivers and Transmission Equipment	1 year	
Replacement Parts / Repairs (non-warranty)	90 Days from date of repair	
Factory Upgrades	90 Days or remainder of existing warranty, whichever is longer	

2. Extended Service

MSA offers an Extended Service contract for TICs at the customer's request. Details are listed on the reverse of this page. Contact MSA Life Service Customer Service (1-800-MSA-2222) for additional information and arrangements.

The camera core is the most expensive component of any TIC, often accounting for up to 75% of the camera's cost. MSA's new 2-Year Camera Core Warranty gives TIC users additional warranty coverage where it's needed most. The camera core in all TICs generally consists of the camera sensor, lens, and the sensor electronics that convert the infrared energy being detected by the sensor into a visible image. If a sensor stops working properly, the whole camera could be redlined. MSA now provides twice the warranty coverage of other Fire Service TIC manufactures. Contact your local MSA Distributor to see how this new MSA 2-Year Camera Core Warranty can work for you.

What about a NFPA Standard for TICs?

Currently, there is no NFPA Standard for Fire Service TICs. Ongoing research shows that Firefighters want an NFPA TIC Standard. NFPA has begun work on Electronic Standards for the Fire Service:

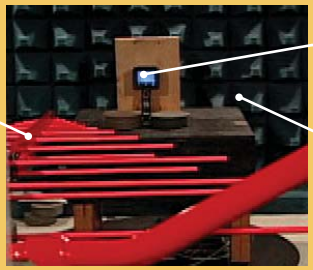
Part 1: covers all Electronic Safety Equipment
- committee has been formed and work has begun
- will be an "umbrella standard" to cover the basics

Part 2: would cover Thermal Imaging Equipment
- committee has not yet been formed
- expected to covers TIC specifics, operation and training

Currently, MSA is applying NFPA and International Standards to the TICs MSA designs and manufactures in anticipation of a upcoming NFPA Standard. These Standards include:

- NFPA 1981–2002 Edition simulated for Direct Flame/ Heat Exposure
- NFPA 1982-1998 Edition simulated for Direct Flame/ Heat Exposure
- NFPA 1901-12, 1.7 simulated for Rollover on the TIC Truck Charger
- CE/EN 50081-2:1992 for Radio Frequency Interference (RFI)
- EN 50082-2:1992 for Radio Frequency Interference (RFI)
- FCC Part 15 for Radio Frequency Interference (RFI)
- International Standard CEI, IEC 529, IP 67 for Water and Dust Ingress
- MIL-STD-810E Category 1 Loose Cargo Transport for Vibration

NFPA 1981–2002 Edition simulated for Direct Flame/ Heat Exposure



RFI Test Chamber

What is the Life Expectancy of a TIC?

In December 2004, the National Institute of Standards and Technology (NIST) sponsored a Fire Service TIC conference entitled *Thermal Imaging Research Needs for First Responders*. At the conference, the American Council for Thermal Imaging (ACTI) made a brief presentation on "The Technology Trade-Offs Faced in Producing a TIC." Several points made during the ACTI presentation and summarized here, providing some answers to the question of the life expectancy of a TIC:

Generally, the development of thermal-imaging sensors is driven by the military and large commercial customers, not the Fire Service. This is because Fire Service TICs are not produced in volumes large enough to justify the cost of a specially designed sensor for the Fire Service. TIC Manufacturers, therefore, have to work with the Sensor Manufacturers, to find ways to enable the sensors to perform and survive the rigors of Firefighting - the "world's harshest environment."

The technological trade-off of using available, lower-cost non-Fire-Service sensors is that TIC Manufacturers must find ways to keep those sensors performing in environments that they were generally never designed to operate in. Also, when Firefighters conduct TIC evaluations, they expect TICs to perform beyond what is normally encountered in most Fire Service TIC applications – therefore pushing TIC Manufacturers to do even more in the areas of performance and durability.

In addition to the sensor, other off-the-shelf TIC components also help keep costs down but hinder technological advances and performance. Most of these components are not designed to meet the rigors of the Fire Service by themselves. Displays for example, have to be further protected with a thick polycarbonate display cover to protect them from high heat, since their 80°C (176°F) operating temperature limit is far below the extreme temperatures of the Fire Service market. Additionally, a Fire Service TIC will go through several manufacturing changes of the same component over the life of the product, due to inconsistent availability of those components. It is not unrealistic for the same TIC model to use as many as four or five new displays over the life of that model.

The technological trade-off for Fire Service TICs is, again, that in the price-sensitive Fire Service TIC market, TIC Manufacturers generally do not have the flexibility to advance the technology beyond what the available components offer.

Fire Service TIC life expectancy therefore is dependent on many factors, including the durability of the components and how the TIC manufacturer is able to protect those components through innovative design. The long term availability of TIC components is a major issue since many electronic components are constantly being upgraded or enhanced to maintain marketability in fast changing commercial markets.

Still, there are many Fire Service TICs still in use today after many years of service, often thanks to the quality and abilities of the TIC manufacturer's repair and service department. There are other TICs, though, that because of repair costs and/or component availability cannot be repaired economically, especially when compared to the lower cost and increased performance offered by today's new TICs. Ultimately, life expectancy will depend on how well the TIC is designed, cared for, and repaired as well as how easy it will be to obtain replacement components.

TIC Care and Maintenance

The proper care and maintenance of TICs is as important as training on how to operate this increasingly important tool. While each manufacturer has its own method for cleaning and maintaining TICs, some common themes can be noted. Ensuring proper working order for your TIC can be broken down into two categories: General Care and Maintenance and Cleaning.

General Care and Maintenance

Once properly trained in how to use and interpret the information provided by the TIC, Firefighters should visually inspect the TIC before and after each use. Some areas that should be inspected include:

- The outer housing (for structural, heat or chemical damage)
- Mechanical hardware (to ensure no screws are loose)
- All lenses (for heat damage, chemical damage, cracks and breaks)
- All warning labels (to ensure they are intact)

Inspections should not be limited to the actual TIC itself. Rather, Firefighters should spend time checking the batteries that power the TICs. The inspection list for batteries should include:

- The entire battery casing (for damage or leakage)
- The battery contacts (for damage or corrosion)
- All batteries and battery chargers are performing as specified

Following these inspection guidelines should prevent Firefighters from learning that their TIC is not functioning properly at the most inopportune times (like when you're in the fire!). Just like other tools and equipment used while fighting fires, TICs should be visually inspected to ensure that they are working properly.

TIC Care and Use Checklist

- ☐ Visually inspect the exterior housing of the TIC. Make sure there are no cracks, deep scratches, holes or burned surfaces of the plastic housing, rubber shrouds, etc.
- ☐ Visually inspect all mechanical hardware to ensure all screws are securely tightened.
- ☐ Check all lenses for heat or chemical damage, as well as for any cracks or breaks.
- ☐ Make sure the battery compartment is clean, all connectors are intact, and any loose material is removed.
- ☐ Remove all loose material, dirt, soot, and water from the housing and rubber shrouds.
- ☐ Using a cloth soaked in a solution of warm water and mild detergent, wipe all external surfaces of the TIC.
- ☐ Never use solvents or paint thinners to clean your TIC.
- ☐ Dry the TIC with a soft, lint-free cloth.
- ☐ Visually inspect all connectors, switches, hinges and latches to make sure they are free of debris and dirt; verify that they are in good working condition.
- ☐ Be sure to wipe the batteries clean, including the contact points.
- ☐ With a fully recharged battery, verify that the TIC is working according to specifications.

Met Labs:

Testing TIC Tolerance

by Eric Buzard, Product Line Manager, MSA Thermal Imaging

Thermal Imaging Cameras need to be able to withstand the rigors of Firefighting – both inside raging infernos as well as during the day-to-day activities that also test these tools. In order to make certain that the TICs can survive the damage caused by extreme heat and water-logged battle fields, Metrology Laboratories (Met Labs) are used to conduct a battery of tests to ensure your TIC will perform when you need it.

Tests conducted in Met Labs include:

- IP tests for water ingress
- IP tests for dust ingress
- Salt-spray tests
- Drop tests

At MSA's TIC manufacturing facility in Cranberry Township, PA engineers who design and test the Evolution® line of TICs have a Met Lab at their disposal. It is here that TICs are bounced, dunked, drenched and powdered to help understand what needs to be done to make this equipment "Firefighter proof."

The Met Lab features several devices instrumental in achieving what have become generally accepted performance criteria for TICs. The first of these is a chamber filled with talcum powder. TICs are set inside this chamber for 30 minutes while talcum powder, kept floating by means of constant airflow, swirls around the TIC. At the conclusion of this test, manufacturers can determine how much dust ingresses into the enclosed housing of the TIC. Under the guidelines of this test, no dust is permitted to find its way inside the TIC. (This test satisfies the IP6X classification as described on page 7.)

The TIC is held 6' from floor

The TIC is dropped

Impact after 6' drop

The TIC still functions after drop

IPX6 Water Ingress Test against stronger jet spray

The next part of the Met Lab tests is relatively primitive and can be set up virtually anywhere. The drop test, which has become one of the more popular tests for TICs, involves releasing a TIC onto concrete from a height of anywhere between 4.5 feet to 6 feet, depending on the size of the TIC. Obviously, if a TIC is going to survive the rigors of the fireground, it will need to withstand torturous treatment that is virtually inevitable when Firefighters rush to aid the victims of a fire's fury. At MSA, Evolution 5000-series TICs are tested to survive three consecutive drops from 6 feet without suffering damages to the outer housing or to the functionality of the TIC.

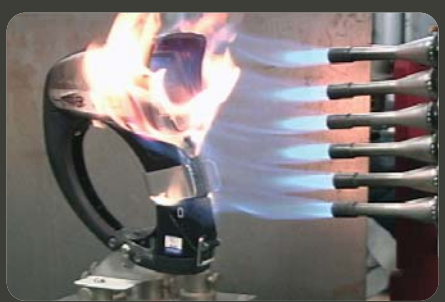
Once the TIC passes the drop test, it is then taken to a large barrel filled with water. The TIC is "dunked" – submerged in 3 meters of water – for 30 minutes to ensure that the housing is watertight. This satisfies the requirements of the IEC's IPX7 classification for protection against water ingress. According to the test specification, in order to pass this standard, no water may ingress into any component of the TIC .

Though most TICs are not required to test beyond those evaluations already described, the Met Lab at MSA is equipped to test TICs beyond what has become "standard" (Note: At the time of publication, no TIC standards are in place outside of basic FCC/EU standards on radio frequency emissions). As noted on page 7, the IEC's standard for water ingress includes levels of protection typically not addressed by current Firefighting TICs. These tests include various water sprays that range from simple drips to forceful streams. MSA's line of Evolution TICs (Evolution 5200, Evolution 5000, Evolution 4100) have all passed the IPX6 test, which involves a water jet sprayed from a 1-inch-diameter hose forcing 100 liters of water per minute for three minutes. What this translates to on the fireground is that this TIC can be battered and drenched, yet still continues to produce the necessary high-quality images needed by Firefighters.

To ensure that TICs are fit to endure duty on seafaring vessels, products can be tested in a salt fog chamber. Much like flame, heat or thermal shock tests conducted on most TICs, the salt fog (or salt spray) test is an environmental evaluation that determines how effective a TIC's housing, as well as the effects of salt deposits on the TIC's electronics. A solution of water and salt is mixed and distributed as a fog throughout this chamber, simulating life at sea for 48 hours. Upon completion of this test, TICs must show no signs of corrosion and should continue to operate as specified. (This test is part of the military standard MIL-STD 810F and ASTM B-117 used for testing a myriad of instruments and tools used throughout our armed forces.)

TIC manufacturers list on their specification sheets the various tests their TICs undergo. Here is a segment from MSA's Evolution 5200 specification sheet. Note the simulated NFPA tests that augment other tests that certify protection against water and dust ingress.

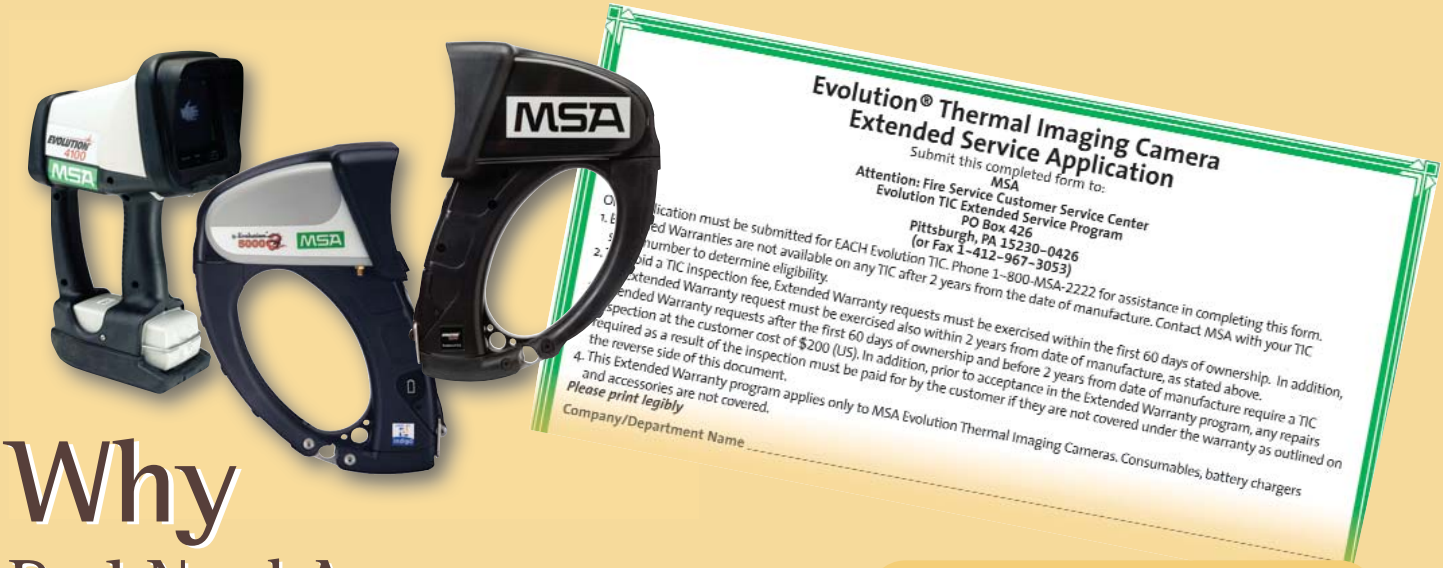
As you can see, TIC testing starts well before the camera is available to the general public. Before these tools reach your hands, they must prove their worthiness in Met Labs, like the one featured at MSA.



Flame and Heat Test

Nozzle used for IPX6 Test

IPX4 tests resistance against heavy rain



Why

Do I Need An Extended Service Agreement on my TIC?

An Extended Service Agreement allows you to extend the warranty on your TIC for an additional year. If your TIC has a 2-year warranty on the camera core and a 1-year warranty on your camera housing and all non-camera core components, purchasing an Extended Service Agreement gives you a full 3 years of coverage on your camera core and a full 2 years on all non-camera core components.

The investment in an Extended Service Agreement is a smart one to consider for the following reasons:

1. Product Life Cost: Any Fire Service product purchase has to consider the true cost of the product over its expected life. A portion of the true cost of any Fire Service product is its up keep to ensure that the product is available and working properly when needed. By extending your warranty with an Extended Service Agreement, you can better manage any additional warranty claims once the initial warranty has expired.

2. Warranty Claims Beyond the Initial Warranty Period: Once a product's initial warranty period has expired, the owner of that product is responsible for any costs to repair that product. Since the initial purchase price of a TIC is a considerable investment, it is understood that, in some cases, a repair could cost as much as half or more of the initial purchase price of the camera.

3. Repair Cost vs. Extended Service Agreement Cost: The heart of any TIC is the sensor. The sensor is the most expensive component in the TIC, accounting for a large percentage of the total cost of the TIC. If a sensor repair or replacement is required after the TIC's initial warranty expires, that repair or replacement would generally cost more than the cost of an Extended Service Agreement.

4. Extended Service Agreement "Insurance": In many ways, an insurance policy, whether for your car, home or medical emergencies, allows you to better manage an unexpected situation both financially and psychologically. TICs have become an indispensable tool in the Fire Service, used on many calls for many more jobs than ever before. The readiness and availability of a Fire Department's TICs are crucial. An Extended Service Agreement is a smart way to better ensure that your TIC is ready when you are.

Three Things to Know regarding Extended Service Agreement

- ✔ **To avoid a TIC inspection fee, Extended Warranty requests should be exercised within the first 60 days of ownership. In addition, the Extended Warranty request must be exercised also within 2 years from date of manufacture.**
- ✔ **Extended Warranty requests after the first 60 days of ownership and before 2 years from date of manufacture may require a TIC inspection. In addition, prior to acceptance in the Extended Warranty program, any repairs required as a result of the inspection must be paid for by the customer if they are not covered under the warranty as outlined in the warranty or extended service agreement.**
- ✔ **Extended Warranty programs apply only to the TIC. Consumables, battery charges and accessories are typically not covered.**

IP67: What Is It?

Virtually every Fire Service TIC boasts an IP-67 rating in its specifications. Most Firefighters understand that this rating refers to two tests: the dunk test and the dust chamber test. In the dunk test, the TIC is submerged in 1 meter of water (about 3 feet) for 30 minutes. Similarly, the dust chamber test subjects the TI C to a 30-minute stint in a chamber of swirling dust. In both tests, a passing mark is issued to those TICs that still operate after undergoing these evaluations, provided that no traces of water or dust are found inside the TIC. But what do the numbers and the tests really mean?

Headquartered in Geneva, Switzerland, the International Electrotechnical Commission (known in the U.S. as the IEC) establishes global standards for electrical and electronic technologies. Its IP codes indicate the degree of ingress protection provided by an enclosure (IP, as you might expect, stands for "Ingress Protection"). In simpler terms, the IP rating refers to the depth of protection against foreign objects (water or dust) into an enclosed object (the TIC). So why are TICs rated as "IP67"?

The numbers following "IP" indicate the level of protection offered by the enclosed object. The first digit refers to the degree of protection against the ingress of "solid foreign objects." The IEC scale starts at zero, which represents an unprotected enclosure. From there, as the number increases, the size of the solid foreign object decreases. The following chart outlines the degrees of protection against solid foreign objects:

IP Rating – Solid Foreign Objects*	Description
IP1X	Could be wire mesh; largest opening does not allow a ball of 50mm diameter to ingress
IP2X	Protective wire mesh has smaller holes that will not allow a ball of 12.5mm to ingress
IP3X	Enclosure must not allow ingress of foreign bodies 2.5mm in diameter
IP4X	Enclosure must not allow ingress of foreign bodies 1.0mm in diameter
IP5X	Allows for some penetration of dust
IP6X	No ingress of dust permitted

**Note: Indication provided by the first numeral implies that the equipment complies with all lower degrees.*

IP Rating – Water Penetration	Description
IPX1	Protection against vertical water drops (simulation of condensation drips from ceiling)
IPX2	Protection against larger- flow water drops up to 15° angle (simulation for equipment on ships)
IPX3	Protection against rain (maximum spray angle is 60° from each side of vertical)
IPX4	Protection against heavy rain and splashes (water flow same as IPX3; nozzles are over 180° and tube of spray oscillates ±180°)
IPX5	Protection against smaller water jet spray
IPX6	Protection against stronger, wider jet spray
IPX7	Protection against temporary immersion
IPX8	Protection against prolonged immersion

The second digit in the IP rating refers to the TIC's ability to withstand water ingress. Like the solid foreign object scale, a zero in this scale refers to a complete lack of protection. The following chart shows degrees of protection against water ingress:

IP6X Dust Test

IPX4 Water Ingress Test

IPX6 Water Ingress Test against stronger jet spray

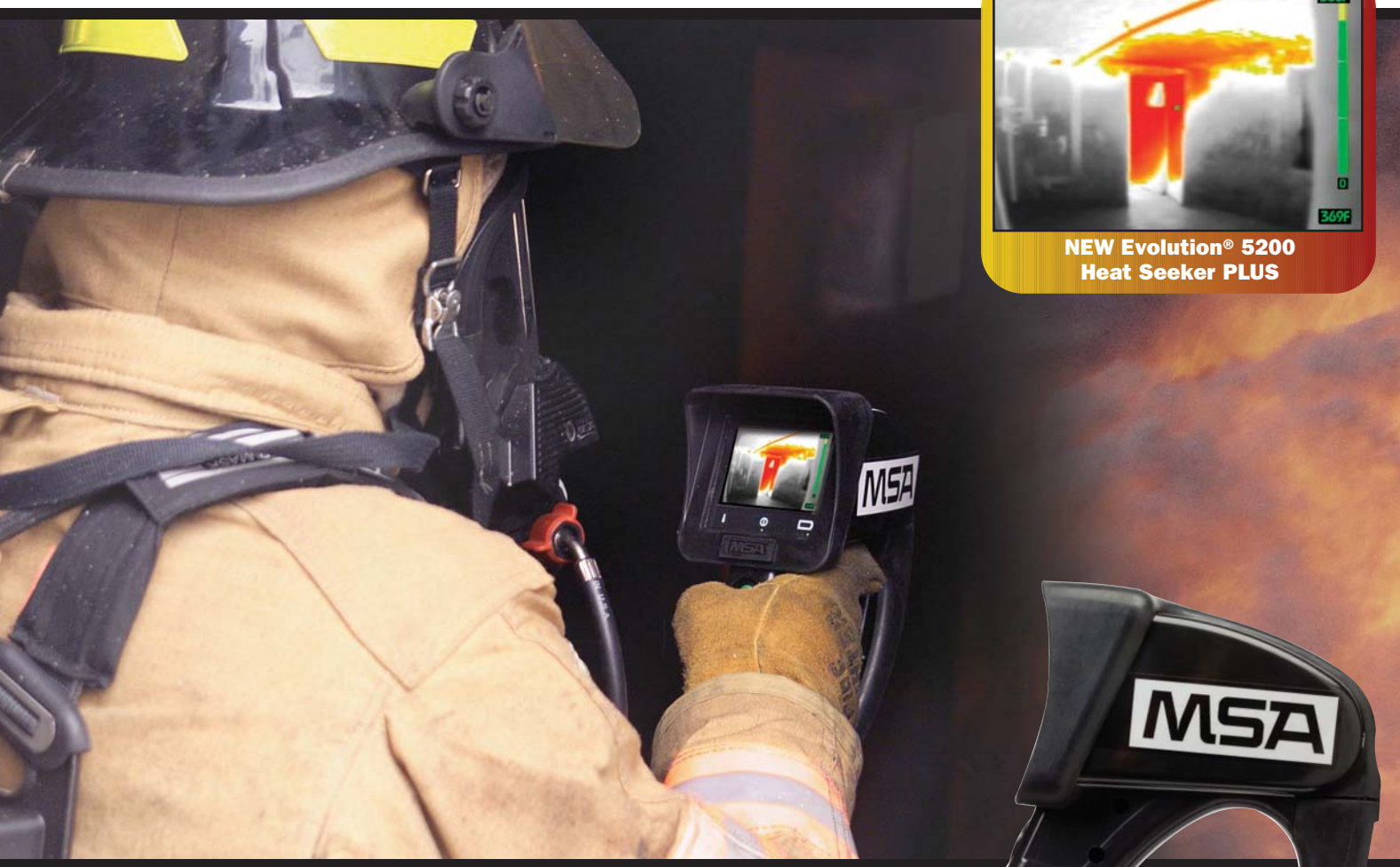
IPX7 Immersion Test

Note that, while an IP-X6 rating includes those ratings preceding it, an IP-X7 rating does not include the preceding levels of protection. Therefore, though it may be able to withstand temporary immersion, a TIC may not keep out water if it is subjected to a streaming jet of water.

As stated earlier, though most Fire Service TICs are rated to at IP-67, this may not be the most applicable rating for these TICs. Each model within MSA's line of Evolution TICs has been subjected to the full scale of IP-testing rigors enforced by the IEC tests for water ingress. These tests included the IP-X6 test, perhaps the toughest level to pass. According to the IEC standard, for a TIC to pass the IP-X6 rating, the TIC must endure water rates of 100 liters per minute for at least three minutes (that's over 25 gallons of water!) without allowing water to breech the TIC's seal. (Note: While the IEC has an IP-X8 rating for prolonged immersion, this rating is not applicable to TICs, as TICs cannot "see" through water, rendering this level of protection unsuitable for this product line).

When evaluating TICs, understanding more about the claims of TIC manufacturers empowers your department, paving the way for making informed decisions about which TIC to choose. In the end, it's all about safety.

Fire. There's a new standard in safety and we are defining it. Every day.



NEW Evolution® 5200 Heat Seeker PLUS

Take the Next Step Up – in TIC Performance and Safety.

The Evolution® 5200 Thermal Imaging Camera delivers *"next generation" performance,* along with ***exclusive features*** available only from MSA.

High Performance Safety:

- 320˚F High Sense mode* range gives **high image definition** over the **widest temperature range** of any Firefighting TIC.
- Twice the Low Sensitivity* in the 320˚ to +1000˚F temperature range, compared to all other Firefighting TICs - for **great Low Sense imaging!**

*Most TICs generate thermal images in either High Sense or Low Sense mode, depending on the temperature of the scene. High Sense mode delivers the best image quality – but has a limited temperature range. Low Sense mode trades image quality for a wider temp range to keep the TIC working in high heat conditions.

MSA Be Sure. Choose MSA.

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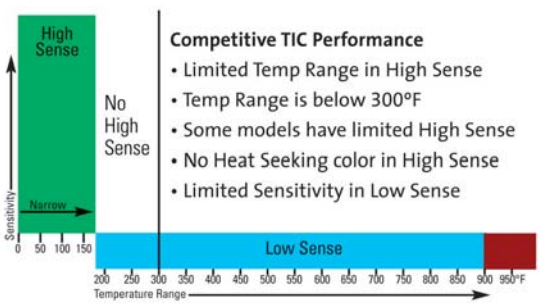
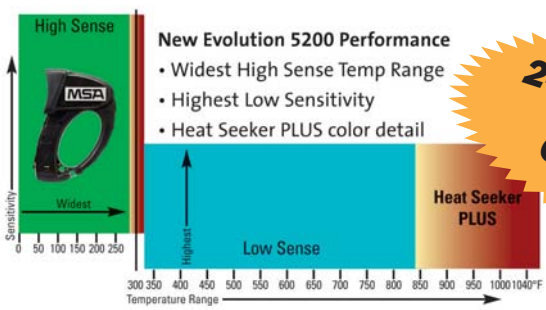
MSAFire.com



Competitive TIC Performance
- Limited Temp Range in High Sense
- Temp Range is below 300°F
- Some models have limited High Sense
- No Heat Seeking color in High Sense
- Limited Sensitivity in Low Sense



New Evolution 5200 Performance
- Widest High Sense Temp Range
- Highest Low Sensitivity
- Heat Seeker PLUS color detail

NEW 2-Year Sensor Warranty Only from MSA!

ID 3400-58-MC / Nov 2005