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OPTICAL SENSORS INCLUDING BOTH COOLED AND  
UNCOOLED THERMAL CAMERAS



# Silent Sentinel TECH NOTE - PITTING ON GERMANIUM LENSES

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### **Version Control**

<b>Version</b>	<b>Author</b>	<b>Approver</b>	<b>Date</b>
1	Jared Benney	Rob Drewery	28/02/2023

Contents

..... 1

Version Control ..... 2

Introduction ..... 4

Causes of Pitting ..... 5

Consequences of Pitting ..... 5

Prevention and Mitigation ..... 5

Maintenance: ..... 6

1. General Precautions: ..... 6

2. Cleaning: ..... 6

Conclusion ..... 7

## **Introduction**

Germanium lenses are widely used in thermal CCTV cameras due to their excellent optical properties and ability to transmit infrared radiation. However, these lenses are prone to pitting, which can degrade their appearance over time.

Pitting is a type of surface damage that is characterised by the formation of small pits or craters on the lens surface. Pitting can be caused by a variety of factors, including environmental conditions, handling, and cleaning practices.

One of the main challenges associated with pitting on germanium lenses is the impact on the anti-reflective coating. Anti-reflective coatings are applied to germanium lenses to reduce surface reflections and improve image quality.

This technical note will explore the causes and consequences of pitting on germanium lenses.



Typical Germanium Lenses

## **Causes of Pitting**

Pitting on germanium lenses with anti-reflective coating can be caused by a variety of factors, including:

**Environmental conditions:** Pitting can be caused by exposure to harsh environmental conditions, such as saltwater, sand, and dust. These environmental factors can cause abrasion and corrosion on the lens surface, leading to pitting.

**Handling:** Improper handling of the lens, such as dropping or knocking it against a hard surface, can also cause pitting. Even small impacts can cause microscopic damage to the lens surface, leading to pitting over time.

**Cleaning practices:** The use of abrasive cleaning materials or improper cleaning techniques can also cause pitting on germanium lenses. Cleaning the lens with a dry cloth or tissue can cause scratches, while the use of harsh chemicals can corrode the lens surface and cause pitting.

## **Consequences of Pitting**

Pitting on germanium lenses may reduce the lifespan of germanium lenses with anti-reflective coating, as the coating can become compromised over time if not maintained properly.

## **Prevention and Mitigation**

Preventing pitting on germanium lenses requires a combination of proper handling, cleaning, and maintenance practices.

Some best practices include:

**Proper cleaning techniques:** Proper cleaning techniques involve using a soft cloth or tissue and a mild cleaning solution, such as isopropyl alcohol. Harsh chemicals and abrasive cleaning materials should be avoided.

**Regular maintenance:** Regular maintenance can help prevent pitting by identifying and addressing any damage or corrosion on the lens surface before it becomes severe. This can include visual inspections and routine cleaning.

**Maintenance:****1. General Precautions:**

Although the external side of the germanium lens is coated with a durable / erosion resistant coating (according to MIL standards), cleaning dust, sand and other particles might scratch the coating and eventually degrade the performance of the lens.

**2. Cleaning:**

Do not use tools or sharp objects when cleaning the lens.

**A. Removal of hard particles and contaminants**

In a clean room: Use compressed nitrogen to blow off dust and other particles.

In field conditions: Rinse lens with running water or use a wet cloth in order to remove sand, salt and other contaminants (do not apply pressure).

Wipe the lens using a soft tissue paper or lens tissue.

**B. Cleaning with solvent**

Usage of different solvents:

Acetone – removal of grease

Ethanol – removal of fingerprints and other contaminants

Alcohol – final cleaning (before use)

**Harsh chemicals and abrasive cleaning materials should be avoided.**

1. Immerse tissue paper in Alcohol / Propanol / Acetone or Ethanol (reagent grade).
2. Wipe the lens in “S” motion (so that each area of the lens will not be wiped more than once).
3. Repeat stage 2 until the lens is clean. Use a new tissue each time.

## **Conclusion**

Pitting on germanium lenses with anti-reflective coating may eventually degrade the performance of thermal CCTV cameras.

Pitting can be caused by a variety of factors, including environmental conditions, handling, and cleaning practices. Prevention or mitigation of pitting requires a combination of proper handling, cleaning, and maintenance practices.

By following these best practices, thermal CCTV camera users can help ensure the longevity and performance of their germanium lenses.