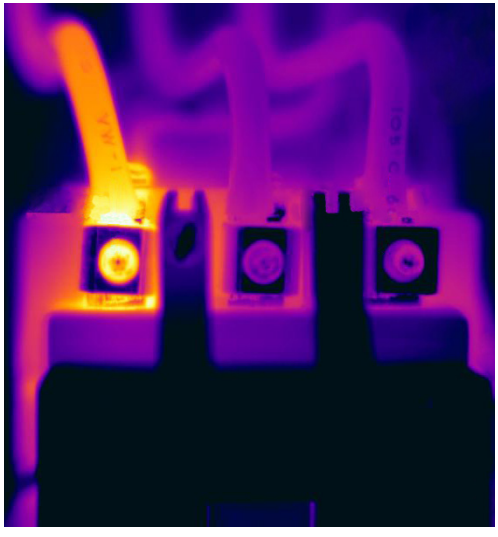
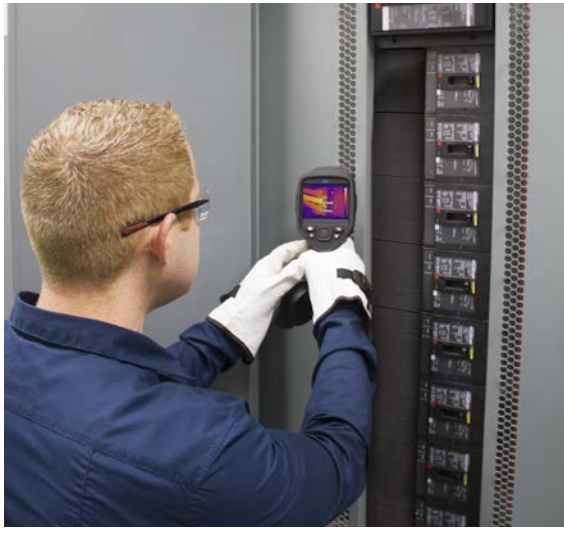
Electrical Maintenance Safety Devices & Solutions





“Condition-Based Maintenance (CBM) is maintenance conducted only when the need arises. This maintenance is performed after one or more indicators show that equipment is going to fail or that equipment performance is deteriorating.”

Introduction to

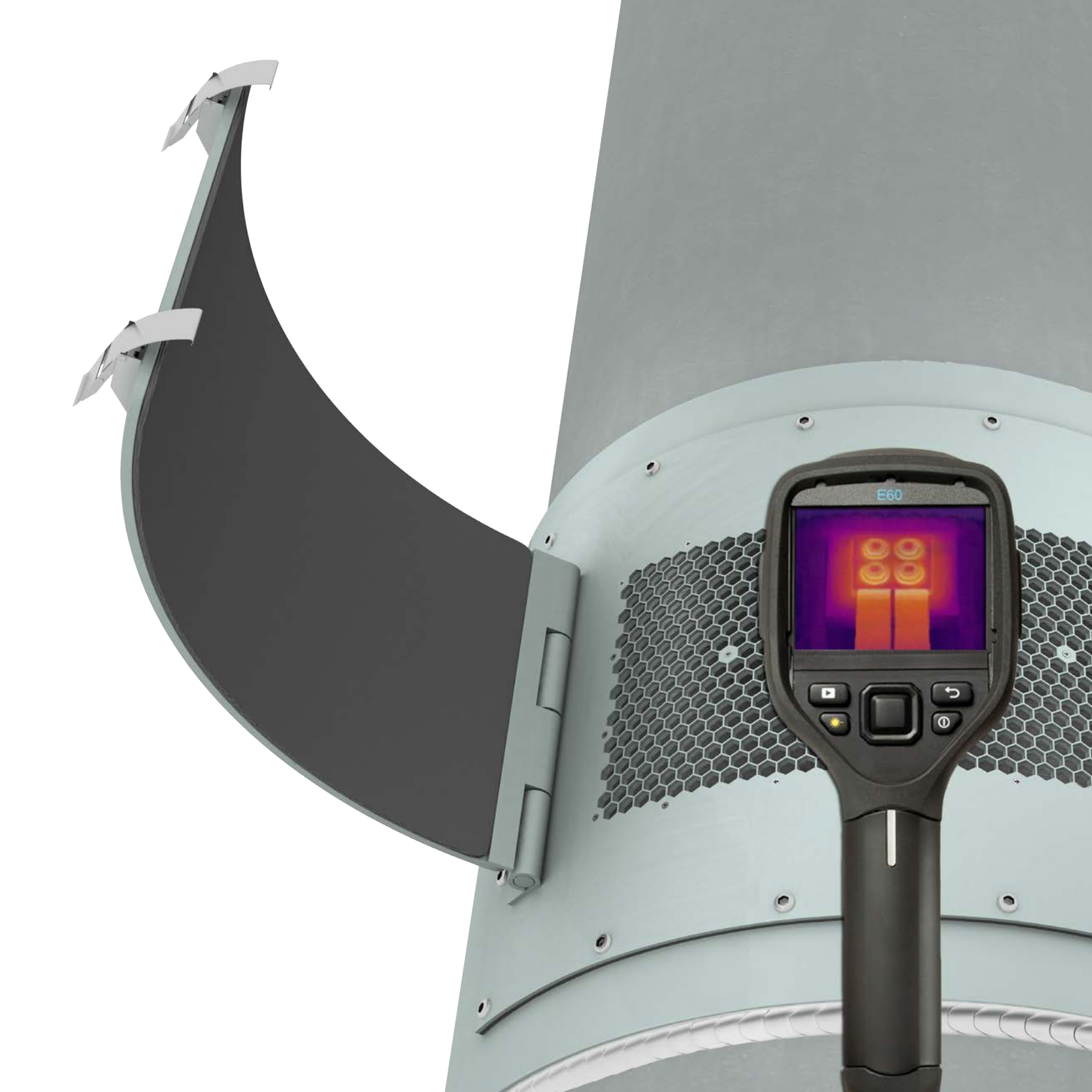
Condition-Based Maintenance (CBM)

Being able to assess the condition of critical electrical assets by observing the state of the energized system under normal load is imperative for continuous reliable operation. It allows maintenance engineers to prioritize and optimize resources by helping them identify what maintenance is required and determine the urgency level of the equipment fault; thus minimizing parts cost, system downtime and time spent on often unnecessary fixed schedule maintenance.

There are many types of equipment used in condition monitoring of electrical assets including:

- Infrared (IR) cameras to monitor temperature
- Ultrasound equipment to listen for arcing, tracking or corona
- Vibration analyzers
- Motor current analyzers (MCA)
- Temperature monitoring via wired or wireless thermocouples and sensors
- Power Quality Monitoring

The above condition monitoring equipment has one thing in common. It allows operators to monitor the actual condition of an electrical distribution system and gives the operator a physical reading of the condition of the asset while operating under normal load and in its duty cycle. These readings are compared against predetermined alarm limits which, when breached, determine what actions are required to bring the asset back into an acceptable operating condition.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Infrared Inspection

Indirect vs. Direct Temperature Measurements

Many engineers use infrared cameras to scan the outside of switchgear, bus bar, etc, in an attempt to determine the condition of internal components; this is known as indirect temperature measurement. The problem with this type of inspection technique is that even if you see a temperature anomaly on the outside of the equipment you are inspecting, it doesn't show you what type of fault you may have (which may not be a fault at all) and what the actual temperature is at the source of the heat.

This type of inspection technique is extremely difficult and is really not ideal for managing critical assets. Nevertheless, in some circumstances, this is all that we have available due to current construction techniques of electrical distribution equipment. Unfortunately, by the time you see any type of temperature profile changes with an IR camera outside of the equipment on the enclosure surface, the damage within the enclosure is probably excessive and beyond repair.

By contrast, direct temperature measurement involves the use of an IR camera taking readings directly on potential sources of heat within the electrical enclosure. However, gaining access to "see" these internal components of the electrical distribution equipment can expose the maintenance personnel to the risk of electrocution and arc flash and is strongly discouraged by many national safety standards such as NFPA 70E as well as most corporate safety policies.

Balancing Safety with Performance:

Electrical Maintenance Safety Devices (EMSD)

As one of the IRISS EMSD offered, IR windows make possible safer, more efficient direct inspection of energized electrical equipment. An IR camera can only measure what it can "see." To inspect energized components inside an enclosure, a thermographer must open the enclosure doors or panels to inspect the electrical components. This is extremely dangerous because when you open the door or remove an access panel, you are changing the environment inside the enclosure. Dust, moisture or debris can come into contact with the electrical components triggering an arc flash.

If the cabinet remains closed, the likelihood of a trigger causing an arc flash event is reduced exponentially. An IR window is a device fitted to the cabinet surface enabling an IR camera to see through an IR transmissive material to directly measure energized electrical components within the enclosure. The IR transmissive material maintains the enclosures sealed state avoiding the possibility of accidentally contaminating the enclosure and triggering an arc flash event.

Three Irrefutable Facts about Infrared Inspections of Electrical Equipment

1. According to accepted electrical maintenance practices, infrared inspections should always be completed on energized electrical equipment while under load to ensure the data is an accurate reflection of the equipment's condition.

2. Infrared inspections can only be completed through specialized IR lens materials. Some of these materials have good IR transmission but are mechanically weak and very susceptable to damage through impact. IRISS polymer lens solutions offer the most durable cost-effective optic options available.

3. The most efficient way to perform a safe infrared inspection of electrical assets is by utilizing EMSDs to ensure that electrical enclosures remain in a closed and guarded condition. This ensures that maintenance personnel are never exposed to the dangers of arc flash or electrocution.


VIVID SUPPLY
D9
LIFT
TL19
D18
D19
LIFT
TL17


IRISS

The IRISS Difference

Mission

IRISS is a business born out of recognition of the need of the global condition based maintenance industry to safely perform energized inspections on electrical assets. It is our mission to exceed client expectations by continuing to set the industry standard for products, services and support for the electrical maintenance market through innovative Electrical Maintenance Safety Devices (EMSD) and solutions, that leverage our unique industry experience.

Vision

To become a driving force and the global leader in Electrical Maintenance Safety Devices (EMSD) and training solutions.

Values

Obsessed with Finding a Better Way:

We design and build quality into all products, services and operational systems. Our clients demand and deserve unsurpassed quality in every aspect of how we interface with them. It is our duty to not just meet their needs but to exceed their requirements on every project.

Great just isn't Good Enough:

It is the daily responsibility of each and every IRISS employee to ensure that our commitment to excellence shows through in every aspect of the company, at all times, in every interaction with every customer both internal and external.

Continuous Improvement:

We consistently leverage our personal, company and client experiences to continually innovate and improve our products, services and processes. We strive to serve as the industry leader in enabling safe electrical maintenance practices.

Employee Involvement is Crucial:

IRISS is a team. As such we will value and support the unique skills and assets which every team member brings to the group. Above all, we demand that each team member consistently demonstrates respect for their team members. Our doors are open to men and women alike without discrimination and without regard to ethnic origin or personal beliefs.

It's not about WHO is right, it's about WHAT is right:

IRISS only employs people with uncompromising integrity. Every IRISS team member will always act with the highest level of integrity when interacting with clients, peers and vendors. We must strive to earn the respect of our clients and our industry with unwavering integrity in a socially responsible manner, making a positive contribution not only to our clients, but to society.

Introducing the VP Series

The IRISS VP Series of IR windows come in 4 standard sizes, ½ , 2 , 3, and 4 inch. They are Industrial-Grade IR Windows with reinforced polymer optics which are the best choice when the client will be placing windows into industrial applications such as switchgear, transformers, MCC's, motor termination boxes or similar applications. These applications are typically in uncontrolled environments (when compared to R&D laboratory environments) where there is the possibility of exposure to moisture, humidity, vibration, high frequency noise (harmonics), or acids and alkalis.

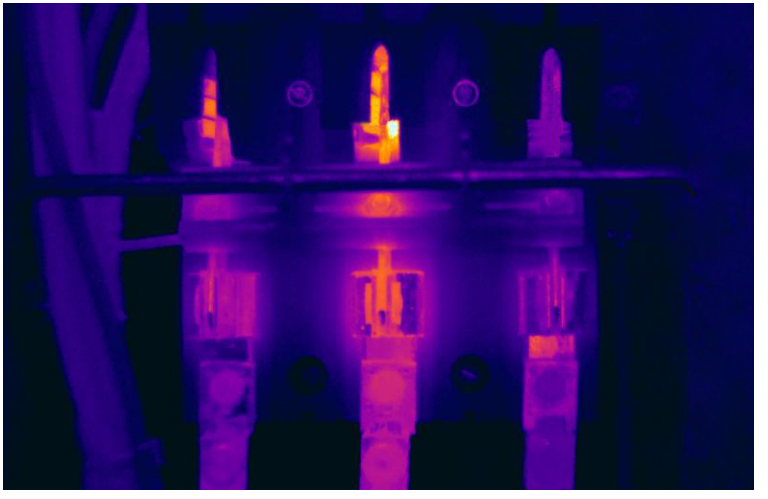
The IR windows may also be subjected to impact when the panels (to which the windows are attached) are removed and placed on the ground or concrete floor. The reinforced polymer optic is impact resistant, and will maintain its transmission rate (for accurate temperature measurements) even when exposed to harsh airborne contaminants.

Rugged and Durable

Polymer based IR windows are far more able to resist the mechanical stresses applied to IR windows that are fitted to electrical distribution equipment. It was IRISS that first came to market with industrial grade IR windows that could meet the mandatory impact and load testing requirements of UL, CSA, IEEE and IEC testing that could never be passed by any crystal based IR window.

Fixed and Stable Transmission (FAST)

Our patented polymer based infrared windows are unaffected by the environmental and mechanical stresses that degrade the transmission of crystal based IR windows which are both highly fragile and hygroscopic (even when coated). Our polymer IR window systems maintain fixed and stable transmission (FAST) for the life of the installation ensuring that the temperature data collected through the IR window is accurate and reliable for the whole life of the installation.



Unconditional Lifetime Warranty

The IRISS Unconditional lifetime warranty is unique in the IR industry as it not only applies not only to the workmanship of the window housing but also applies to the durability and stability of the optic in the proposed environment. No other manufacturer can offer this due to the fact that the crystal optics will fail over time, and are only able to, at best, offer a limited lifetime warranty for manufacturing defects.

The VP Series

VPT Series

An evolutionary step in infrared (IR) windows, the Platinum Series VPT utilizes our exclusive Poly-View System™ technology to allow the use of any thermography camera to monitor energized electrical equipment. The world's only clear polymer IR window optic enables visual inspections, traditional IR inspections utilizing cameras across the entire IR spectrum and allows for UV inspections to be performed with a corona camera. The Platinum Series VPT IR windows are industrial grade with a patented reinforced grill that exceeds high voltage switchgear viewing pane standards.

VPFC Series

VPFC Series (Viewing Pane Fixed Crystal) IR windows are specially coated to reduce the transmission drift due to moisture/humidity. However, industrial users are strongly encouraged to investigate the VPT Series of industrial-grade IR windows which are specifically designed for stability in harsh industrial environments and have an unconditional lifetime warranty. The transmission rate characteristics of CaF2 are suitable for higher temperature applications, shortwave and midwave thermography and for the visual spectrum. Medium to longwave transmission rates (7-14 micron) are typically between 40-50% based on the infrared (IR) camera detector sensitivities at different wavelengths.

VP-12-US Series

A standard and systematic approach to data collection is essential to establishing a repeatable and reproducible condition based monitoring program. VP-12-US standardizes the location and method for accessing consistent and quality acoustic data regardless of the ultrasound technician's experience or enclosure rating. Easily identify potentially hazardous faults such as arcing, tracking and corona in electrical distribution systems and switchgear through the VP-12-US. NEMA rated enclosures require only access through the port where technicians can safely collect data on energized equipment in accordance with NFPA 70E safety mandates. The grill allows ultrasound but prevents objects being pushed into the panel.

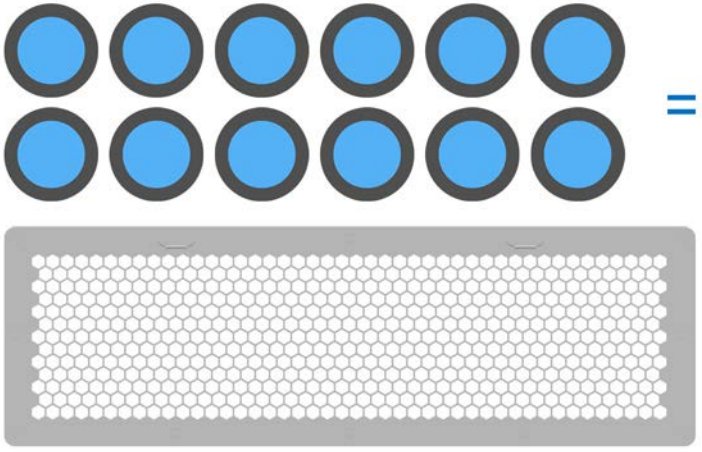
VP-12-IR Series

The VP-12-IR's 12mm viewing area was designed for tight areas or for use with infrared (IR) cameras with smaller, wider angle lens systems. While the VP-12-IR is small in size, it is still big on features. The polymer lens material and switchgear grade plastics assures compliance by maintaining an IP65/ NEMA 4 seal whether open or closed. With the smaller footprint of the VP-12-IR, it could be the answer for providing a thermographer access to more challenging areas. This will allow monitoring of equipment that would not have been possible with a larger window. The durability, flexibility and proven transmission stability of IRISS polymer IR windows continues with the VP-12-IR.

Introducing the CAP Series

The IRISS CAP series of infrared windows are the largest standard sized IR windows available in the marketplace today. The series incorporates a rectangular design available in standard sizes of 4, 6, 12, and 24 inches and allows for more freedom to inspect multiple components through one infrared window. This reduces the number of IR windows required and the installation time and costs associated with multiple round window installations. The IRISS CAP series of infrared windows now include the innovative E Sentry Connect Asset Tracking System.

The E Sentry Connect System utilizes Near Field Communication contactless Smart Card technology that allows smart phone devices with NFC to easily access critical data relating to the equipment being inspected. It also saves up-to-date inspection data directly to the IR Window E Sentry connect tag. E Sentry Connect provides operators with instant access to all critical data relating to the electrical equipment and IR inspection through a free Android based App.



Unparalleled Field of View = Affordable

Unlike the round infrared windows, the large format IRISS CAP series and custom infrared windows have a far superior field of view. Horizontal component spacing and internal barriers and obstructions can severely limit the viewing area of the round windows. The CAP-ENV 24 series has over 12 times the FOV of a 4 inch diameter round window which gives the thermographer infinite viewing angles inside the switchgear through one IR window. Reducing the amount of infrared windows needed typically reduces procurement and installation cost by over 50%.

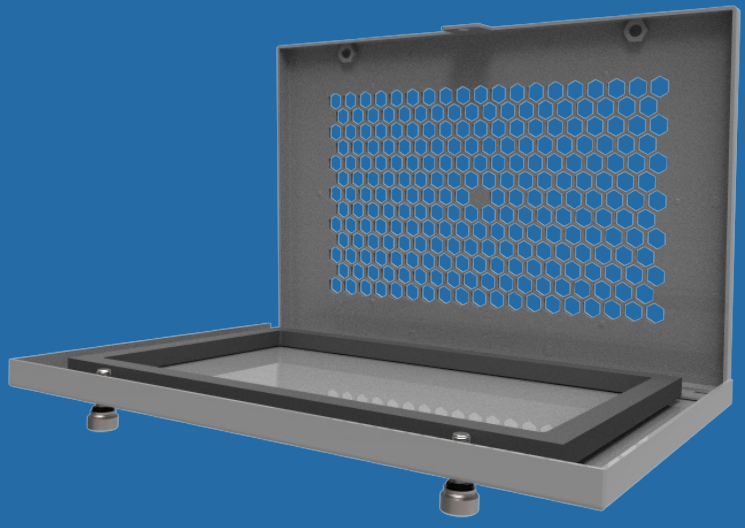
Any Camera - Any Task

The exclusive industrial-grade, patented reinforced polymer optic allows any thermographic camera to monitor completely undisturbed assets inside electrical equipment. The IRISS Polymer optics work with all ranges of Infrared, Ultraviolet and Visual Inspection Cameras.

Tested and Certified to The Highest Industry Standards

IRISS IR windows are the most certified windows in the industry with IEEE (impact & load), UL, cUL, Lloyds and CSA C22.2 14-13 for industrial control equipment. Our marine certifications include Lloyds, DNV and ABS (American Bureau of Shipping) credentials. IRISS IR windows are also Arc Containment tested to IEC 62271-200: Arc Flash Spectest 1.1 Second Duration; IEC 60262271-200: 63kA, IEC 60298 Appendix: 63kA; IEEE C37.20.7 Type 2B: 63kA.

The CAP Series



CAP-ENV Series

The CAP-ENV features a reinforced enviromentally sealed door design while also providing the largest visually clear infrared (IR) transmissive viewing area available on the market today. The exclusive reinforced polymer system allows any thermography camera to monitor completely undisturbed assets inside energized electrical equipment in the visual, UV and shortwave, midwave and longwave IR spectra. The larger rectangular viewing area provides an unparalleled field of view when compared to traditional round IR windows. Constructed completely from stainless steel, the CAP-ENV series is recommended for outdoor applications.

CAP-ENV-US Series

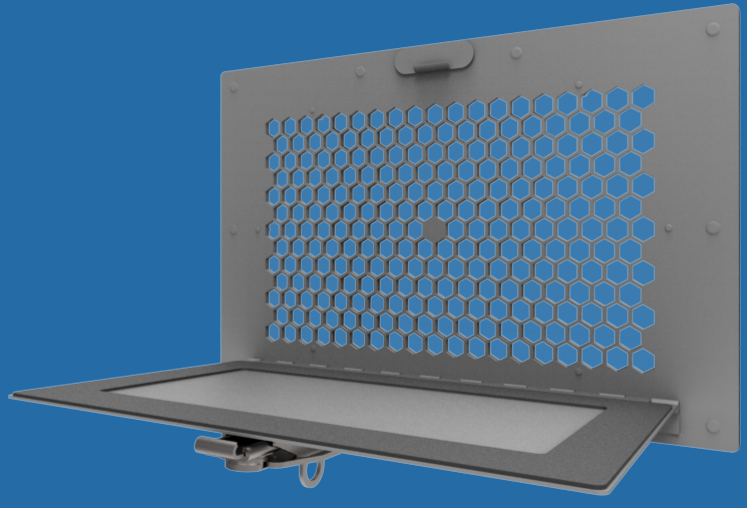
The CAP-ENV-US features a reinforced enviromentally sealed door design while also providing a large visually clear infrared (IR) transmissive viewing area. The CAP-ENV-US also comes equipped with a versatile port for ultrasound inspections - an ideal way to identify electrical faults. Initially developed for MV transformer and switchgear applications. The CAP-ENV-US is a perfect combination solution for medium and high voltage applications where both IR and Ultrasound inspection is desired.

CAP-CT-4-US

The CAP-CT-4-US infrared window equipped with a versatile port for ultrasound inspections is the ideal way to identify electrical faults. Industrial applications require solutions that meet numerous criteria where safety and performance are of the upmost importance. The award-winning, CAP-CT-4-US comes equipped with a square 4" IR window and an ultrasound port both on one easy-to-install panel. The viewing area of the CAP-CT-4-US offers a 30% increase in FOV over round windows but also provides a method for accessing quality acoustics data that easily identifies potentially hazardous faults such as arcing, tracking and corona in electrical distribution systems and switchgear.

CAP-CT Series

Surpassing even the original industrial-grade CAP Series, the Platinum Series CAP-CT has the largest visually clear infrared (IR) transmissive viewing area available. The exclusive reinforced Poly-View System™ polymer allows any thermography camera to monitor completely undisturbed assets inside energized electrical equipment in the visual, UV and shortwave, midwave and longwave IR spectrums.The larger rectangular viewing area provides an unparalleled field of view when compared to traditional round IR windows. Constructed from aluminum, the CAP-CT series is recommended for all indoor applications.



Introducing the Flex-IR Custom Solutions

IRISS is the only global infrared (IR) window manufacturer with solutions for your unique applications. Custom Solutions from IRISS ensure that your IR window meets your needs and applications. IRISS understands that not every application is suitable for a standard IR window. The patented IRISS reinforced optic is flexible and can be manufactured in an infinite number of shapes and sizes.

This allows the IR industry safe access to energized targets previously considered impossible. Direct temperature measurement is now available on those unique applications without the increased risk associated with removing covers or guards. IRISS' state-of-the-art manufacturing facility features a completely vertically integrated production system including metal fabrication, bending, welding, paint & label making. We utilize quick protyping via 3D scanning, modelling & 3D printing techniques which enhances our ability to create custom solutions in record time.

QwikFit-IR

QwikFit-IR is a unique solution for panelboard applications where small frame breaker's load side connections would not be visible for infrared inspection even if a custom deadfront replacement panel had been installed. The QwikFit-IR replaces the small frame breaker's blanking plate providing unparalleled inspection access.

CAP-F Series

The FlexIR CAP-F Series for isophase bus systems is a large format combination infrared, visual and ultraviolet inspection window specifically designed for the power generation and large power user market. The bolted window design also acts as an access port for repairs as it can be easily removed to allow the technician access to repair the fault. Once refitted, the isophase system can be re-energized and the repaired joint can be inspected to confirm that the repair was effective.

CAP-B Series

The FlexIR CAP-B Series for non-segmented bus bar systems is a large format combination infrared, visual and ultraviolet inspection window specifically designed for the power generation and large power user market. The bolted window design also acts as an access port for repairs as it can be easily removed to allow the engineer access to repair the fault. Once refitted, the bus bar system can be re-energized and the repaired joint can be inspected to confirm that the repair was effective.

Product Comparison

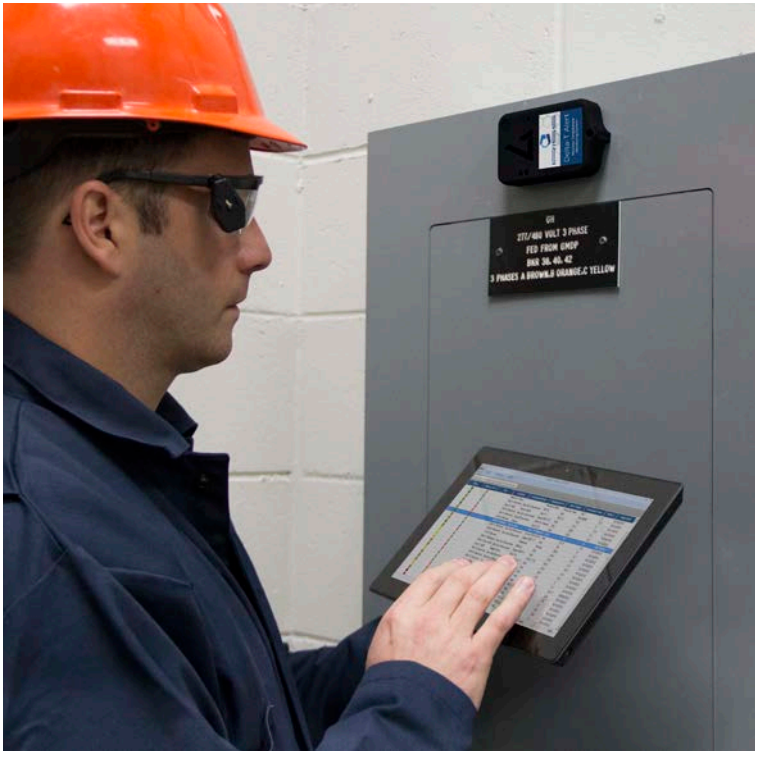
Features	CAP-ENV	CAP-CT	CAP-F	CAP-B-ENV	CAP-CT-4-US	VPT	VPFC	VP-12-US	VP-12-IR
Shape: Square (S), Round (R)	S	S	S	S	S	R	R	R	R
IR Optics: Polymer (P), Calcium Fluoride (CF)	P	P	P	P	P	P	CF	N/A	P
Body Material: Aluminum (A), Nylon 6 Plastic (NP), Stainless Steel (SS)	SS	A	A	A	A	NP	NP	NP	NP
Cover Material: Aluminum (A), Stainless Steel (SS)	SS	A	A	A	A	SS	SS	SS	SS
Lockable Cover	✓	✓	✓	✓	✓	X	X	X	X
Reinforcing Grill (IP22/ IP2x Standard)	✓	✓	✓	✓	✓	✓	X	✓	X
Fixed and Stable Transmission (FAST)	✓	✓	✓	✓	✓	✓	X	N/A	✓
Compatibility with Acids, Alkalis, UV, Moisture, Humidity, Vibration and High Frequency Noise	✓	✓	✓	✓	✓	✓	X	✓	✓
Impact-Resistant	✓	✓	✓	✓	✓	✓	X	✓	✓
E Sentry Connect - Asset Tags Included	✓	✓	✓	✓	✓	O	O	N/A	O

Inspection Capabilities	CAP-ENV	CAP-CT	CAP-F	CAP-B-ENV	CAP-CT-4-US	VPT	VPFC	VP-12-US	VP-12-IR
Longwave IR	✓	✓	✓	✓	✓	✓	✓	N/A	✓
Midwave IR	✓	✓	✓	✓	✓	✓	✓	N/A	✓
Ultraviolet (UV)	✓	✓	✓	✓	✓	✓	✓	N/A	✓
Ultrasound	O	N/A	N/A	N/A	✓	N/A	N/A	✓	N/A
Allows Visual Inspection	✓	✓	✓	✓	✓	✓	✓	N/A	X
Medium/High Voltage Applications	✓	✓	✓	✓	✓	✓	X	✓	✓

Key

✓	Included	N/A	Not Applicable	S	Square	P	Polymer	SS	Stainless Steel	NP	Nylon 6 Plastic
X	Not Included	N/T	Not Tested	R	Round	CF	Calcium Fluoride	A	Aluminum	O	Optional

Certifications	CAP-ENV	CAP-CT	CAP-F	CAP-B-ENV	CAP-CT-4-US	VPT	VPFC	VP-12-US	VP-12-IR
UL 50V & UL 50E	✓	✓	✓	✓	✓	✓	✓	✓	✓
UL 746C & UL 746A-2012	✓	✓	✓	✓	✓	✓	✓	✓	✓
UL 1558	✓	✓	✓	✓	✓	✓	X	✓	✓
UL 508A/ ANSI 508A	✓	✓	✓	✓	✓	✓	✓	✓	✓
CSA C22.2 No. 14-13	✓	✓	✓	✓	✓	✓	✓	✓	✓
CSA C22.2 No. 14-10	✓	✓	✓	✓	✓	✓	X	✓	✓
CSA C22.2 N0. 94-M91	✓	✓	✓	✓	✓	✓	✓	✓	✓
CSA C22.2 N0. 94.1-07	✓	✓	✓	✓	✓	✓	✓	✓	✓
CSA C22.2 N0. 94.2-07	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEEE C37.20.7 Type 2B	✓	N/T	✓	✓	N/T	✓	N/T	✓	✓
IEEE C37 20.2.a.3.6	✓	✓	✓	✓	✓	✓	X	✓	✓
IEC 62271-200	✓	N/T	✓	✓	N/T	✓	N/T	N/T	N/T
IEC 60262271-200	✓	N/T	✓	✓	N/T	✓	N/T	✓	✓
IEC 60298 Appendix A	✓	N/T	✓	✓	N/T	✓	N/T	✓	✓
IEC 60068-2-6:2007	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 60068-2-3	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 60068-2-78:2012	✓	✓	✓	✓	✓	✓	✓	✓	✓
CE Marking	✓	✓	✓	✓	✓	✓	✓	✓	✓
IP67/NEMA 6	✓	X	✓	✓	X	✓	✓	✓	✓
IP65/ NEMA 4	✓	✓	✓	✓	✓	✓	✓	✓	✓
BSI Quality ISO 9001-2008	✓	✓	✓	✓	✓	✓	✓	✓	✓
American Bureau of Shipping (ABS)	✓	✓	✓	✓	✓	✓	✓	✓	✓
DNV P261.1E Maritime, Vessel and Offshore	✓	✓	✓	✓	✓	✓	✓	✓	✓
Lloyds of London Type Approval	✓	✓	✓	✓	✓	✓	✓	✓	✓



Delta T Alert™ Wireless Temperature Monitoring

Delta T Alert ™ is a wireless, self-contained temperature monitoring sensor that attaches to an electrical enclosure. The patented Delta T Alert™ unit is simple to install and comprises of two temperature sensors – one to monitor the electrical enclosure's interior temperature and the second to monitor the ambient room temperature where the enclosure is located.

Delta T Alert™ sensors are configured to collect data on a daily basis at specific time intervals. The data is wirelessly transmitted for analysis and trending and warns the operator of temperature issues within their electrical enclosures – well before more serious problems occur Delta T provides an easier, more effective way to prevent costly electrical damage and system downtime.

Data Transmission:

The Delta T Alert™ sensors are wirelessly networked to the Delta T Alert™ gateway which is connected to your network. The system monitors the temperate readings from the sensors and the health of the sensors themselves including their battery level.

Key Features:

- Battery Operated
- Wireless Connectivity
- Easy to Install
- Receive Emergency Alarm Notifications
- Environmentally Sealed (Optional)
- Custom Scheduling
- Custom Reports

E Sentry Connect™ Intelligent Asset Management

The E Sentry Connect ™ is our next generation intuitive asset information tagging system. The E Sentry Connect system utilizes Near Field Communication (NFC) contactless Smart Card technology that allows smart phone devices with NFC to easily access critical data relating to the equipment being inspected and also save up-to-date inspection data directly to the assets E Sentry Connect tag via a free App from IRISS.

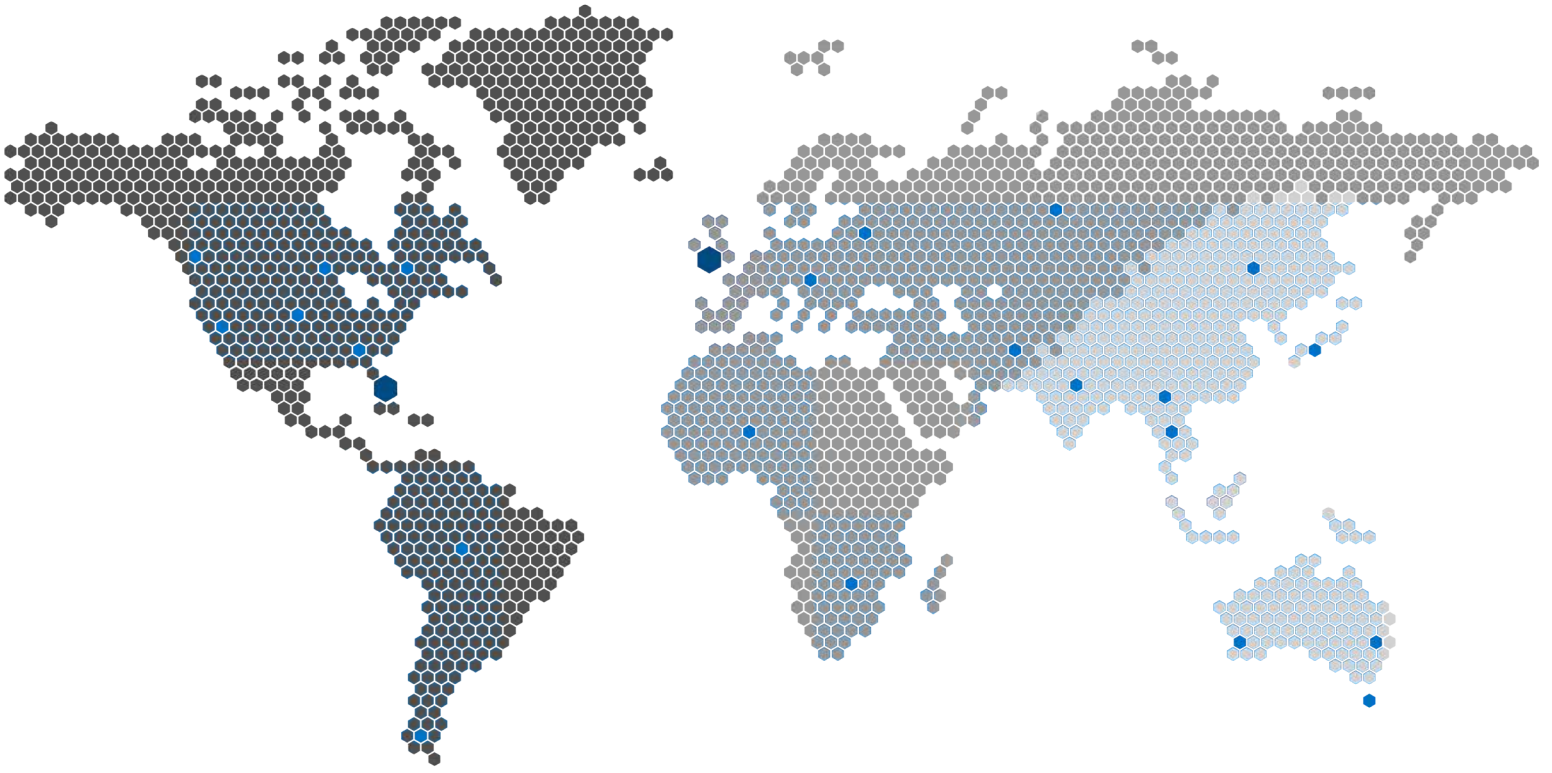
The E Sentry Connect Tagging system has been designed to be operated on 2 platforms: a site based only system and a subscription based cloud system. The subscription based system allows historical data back-up and complete access to the current status of all assets utilizing E Sentry Connect tags.

Site Based System:

- Accessible from any android NFC compatible device
- Provides Inspectors with Important Equipment Data
- Automatically saves the time, date and user information
- Records and Saves Inspection Parameters and Details

Cloud Based System:

- Build and Assign Inspection Routes
- Send and Receive Inspection Notifications
- Designate and Manage Users
- Trigger and Record Alarm Conditions
- Generate Custom Reports
- Analyze Temperature Trends
- Automatic Data Caching



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