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IR WINDOW CERTIFICATION GUIDEBOOK

ID 4016 Rev A

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General

IR Windows are installed into electrical equipment to enable thermographers to view inside without removing the panels. IR Windows are installed into host electrical equipment which is then certified as a combined whole. IR Windows are a part of an electrical system and certification represents their status as a “component” as opposed to an “assembly”





Introduction

This guidebook will:



- Introduce thermographers to the certification requirements as applied to IR Windows

- How certification affects installation and responsibility

- Answer common questions including:

  ⇒ Underwriters Laboratories (UL)
  ⇒ Environmental Testing (NEMA Vs IP)
  ⇒ Humidity and Vibration withstand
  ⇒ Arc-Resistance



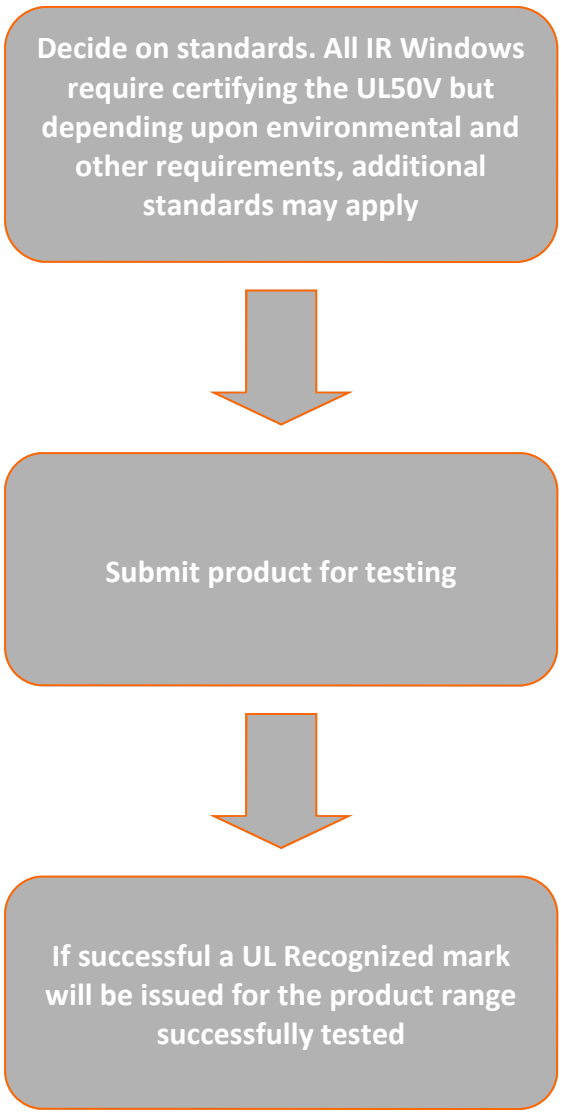
Lets get started

CERTIFICATION REQUIREMENTS

1

UL – Underwriters Laboratories

For an IR Window to be deemed acceptable to OSHA, it must be approved by a Nationally Recognized Testing Laboratory (NRTL). There are many NRTLs including; UL, FM, CSA and Intertek to name just four. Certification from any NRTL would satisfy OSHA. However, the US *market* in general, demands UL Certification.



Simple right .... ?

How does an IR Window obtain UL Recognition?

UL – Basic Requirements for Testing

Indoor Product Certification

The basic requirements to comply to UL for indoor product certification is; (1) metallic parts have to be non-corroding, and (2) polymer parts have to be flame retardant. Finally, (3) the cover must remain in place for the duration of the testing if that cover is used to pass particular tests.

Outdoor Product Certification

As detailed above for indoor product certification, the first three basic requirements to comply to UL for outdoor product certification are exactly the same namely (1) metallic parts have to be non-corroding, (2) polymer parts have to be flame retardant and (3) the cover must remain in place for the duration of the testing if it is required to pass a particular type test.

In addition to the indoor requirements, the gasket/seal material itself has to be tested for its ability to withstand the effects of accelerated ageing and depending upon the level of testing required by the manufacturer additional requirements such as oil resistance and rebound testing must also be undertaken.

Also, the IR Window has to be subjected to environmental testing using pre-aged gaskets. This gasket material is selected by the desired Type Designation and subsequent ageing programme prior to environmental testing.

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UL – Certificate of Compliance CoC

A Typical Certificate of Compliance (also known as CoC), as issued by UL, is shown opposite. This document is issued with all UL Recognized Components, showing product part numbers and the standards tested to. In this CoC, products IW2000, IW3000 and IW4000 IR Windows, are shown to have been certified to UL50V IR Viewport (Window) Standard, UL50E Electrical Equipment Enclosure Standard and UL1558 Metal Enclosed LV Switchgear Standard.



CERTIFICATE OF COMPLIANCE

Certificate Number	20120625-E352489
Report Reference	E352489-20120608
Issue Date	2012-JUNE-25
Issued to:	CORDEX INSTRUMENTS LTD UNIT 1 OWENS ROAD SKIPPERS LANE INDUSTRIAL ESTATE MIDDLESBROUGH CLEVELAND TS6 6HE UNITED KINGDOM
This is to certify that representative samples of	COMPONENT - INFRARED VIEWPORTS USR - IW2000, IW3000 and IW4000
	Have been investigated by UL in accordance with the Standard(s) indicated on this Certificate.
Standard(s) for Safety:	UL 50V, the Standard for Investigation for Infrared Viewports, UL 50E, the Standard for Enclosures For Electrical Equipment, Environmental Considerations, and UL 1558, The Standard for Safety for Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear
Additional Information:	See the UL Online Certifications Directory at www.ul.com/database for additional information

Only those products bearing the UL Recognized Component Mark should be considered as being covered by UL's Recognition and Follow-Up Service.

The UL Recognized Component Mark generally consists of the manufacturer's identification and catalog number, model number or other product designation as specified under "Marking" for the particular Recognition as published in the appropriate UL Directory. As a supplementary means of identifying products that have been produced under UL's Component Recognition Programs, UL's Recognized Component Mark, [illegible], may be used in conjunction with the required Recognized Marks. The Recognized Component Mark is required when specified in the UL Directory preceding the recognitions or under "Markings" for the individual recognitions.

The final acceptance of the component is dependent upon its installation and use in complete equipment submitted to UL LLC.

Look for the UL Recognized Component Mark on the product.

Page 1 of 1

UL CoC does not always show the environmental "Type" designation to which an IR Window is certified to. It is up to the manufacturer to inform the customer of this information.

ENVIRONMENTAL RATINGS:

These devices are rated Type 3 and 12 when installed on a flat surface of a suitably rated enclosure.

Type designation is contained in the UL Report which is typically not made available to end-users. An extract of this is shown above.

NOTE—Installing an IR Window certified by UL for indoor use (Type 1) into outdoor equipment, derates the entire equipment to Type 1

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UL Required Markings

A common misconception is to assume that a UL Recognized IR Window is “UL Listed”. This is a common mistake, primarily made because the host equipment is UL Listed. Therefore, it is understandable that a question often asked is “Is the IR Window UL Listed?”. The answer lies in the marking shown on the IR Window. Since an IR Window is installed into another piece of equipment, it is deemed by UL as a component and is recognized as such. In the picture opposite, the UL Recognized Component mark resembles a reversed UR. In this instance the mark has a C and a US mark on either side of the UR meaning it is UL Recognized for Canada and the U.S.



So, the marking shows that the IR Window is UL Recognized rather than UL Listed. This is correct because the IR Window is a component that forms part of an assembly which is UL Listed as a whole.

Additional UL markings include the six digit UL File number, or “E-Number”. The manufacturer has the option to include either the manufacturers name and/or the E-Number.

UL Required Markings



The IR Window shown here displays the E Number which engineers can use to access further information on the specific IR Window from the UL Online Certification Directory, http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm

There may also be additional markings such as warnings to replace the cover after use, as shown in this example below.



It is normal for an IR Window to have these warnings. Generally for crystal IR Windows the warning appears as the cover protects the crystal from impact, which is acceptable to UL, as long as the cover is closed when the Window is not in use.

IR Windows which do not include a crystal optic, but hold the same warning, may do so for a variety of reasons. This could be anything from requiring the cover to maintain their environmental integrity to the flame retardant nature of the optic. This varies across the specific product design and makeup of the IR Window.

Additional Markings

Additional markings are generally at the discretion of the manufacturer. As previously discussed, the UL Type designation - which instructs the end user as to the environmental withstand capabilities of the IR Window - are not a required marking of UL. Unfortunately, this does not help end users who wish to understand whether or not the IR Window may be installed outdoors or indoors. This leaves the issue of environmental integrity somewhat open to abuse. Reputable manufacturers will state on the IR Window the Type designation requirements, as shown here.



Any IR Window which holds Canadian Standards Association (CSA) Certification, *must* display the Type designation on the IR Window itself.

Markings such as the electric shock hazard, or warning triangle, may be implemented on the IR Window as per the manufacturers policy, but are not a requirement of any particular IR Window standard.

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Ingress Protection (IP) Vs NEMA Ratings

ENVIRONMENTAL TESTING

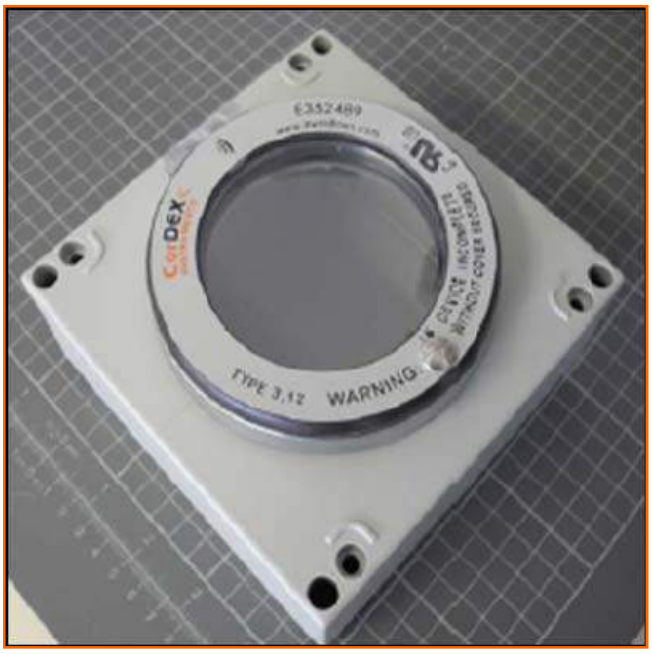
2

Background

There are two types of environmental integrity testing which are commonly in use today. These are Ingress Protection (IP) Rating based on IEC60529, and Type Rating based on NEMA 250 / UL50.

These standards are not harmonized, therefore meaning that there is no direct translation from IP to NEMA as the NEMA Type rating requirements are much more stringent than those of IEC60529.





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Enclosure Type Rating vs. IP Rating

IR Windows are rated by type—NEMA 250/UL50, and/or IP rated—IEC 60529. The rating is based upon the degree of water and dust protection provided by the IR Window.

Type ratings and IP ratings have only three things in common;

1. They have a degree of protection for persons from hazardous components inside the enclosure
2. They have a degree of protection for equipment inside the enclosure from ingress of solid foreign objects, including dust
3. They have a degree of protection for equipment inside the enclosure from ingress of water

NEMA 250 and UL50 Type rating documentation defines any additional requirements that a type-rated enclosure must meet over and above simple water and dust protection. These can include mechanical impact on enclosure walls, gasket aging and oil resistance and corrosion resistance.

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Cross-Reference (Approx) NEMA, UL, CSA vs. IP

Enclosure Rating	IP20	IP22	IP55	IP64	IP65	IP66	IP67
Type 1	•						
Type 3				•			
Type 3R		•					
Type 3S				•			
Type 4						•	
Type 4X						•	
Type 6							•
Type 12			•				
Type 13							

- This table cannot be used to convert IEC Classifications to NEMA Type Numbers,
- IEC 60529 has no equivalent to NEMA enclosure Type 7, 8, 9, 10 and 11,
- "•" indicates compliance,

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Dust and Water Testing Examples – EN60529

Dust





Water





EN60529 requires no accelerated aging of gaskets or seals in order to comply with testing unlike NEMA 250/UL50.

Therefore, it is possible to translate from NEMA250/UL50 to IP but it is not possible to translate in reverse—ie from IP to NEMA250/UL50.

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Humidity Testing Examples – EN60068-2-30



Humidity testing confirms no degradation of device due to increased levels of relative humidity.

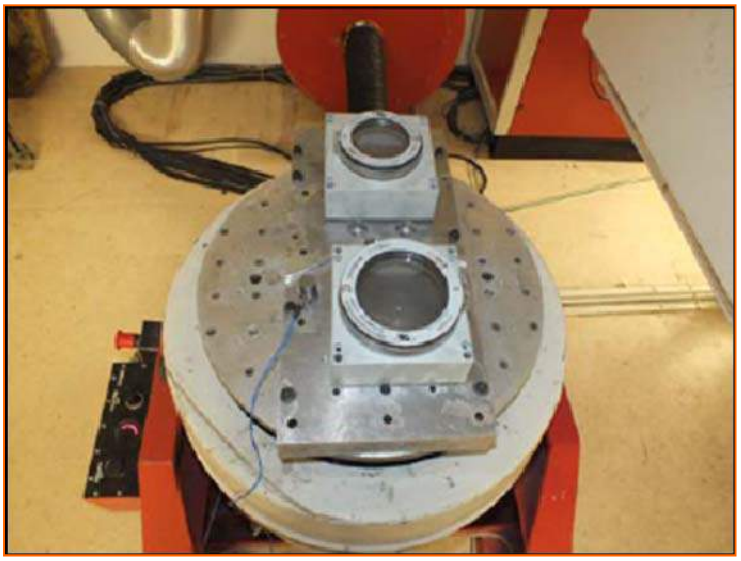


Humidity testing confirms the requirement for shipping and marine approvals.

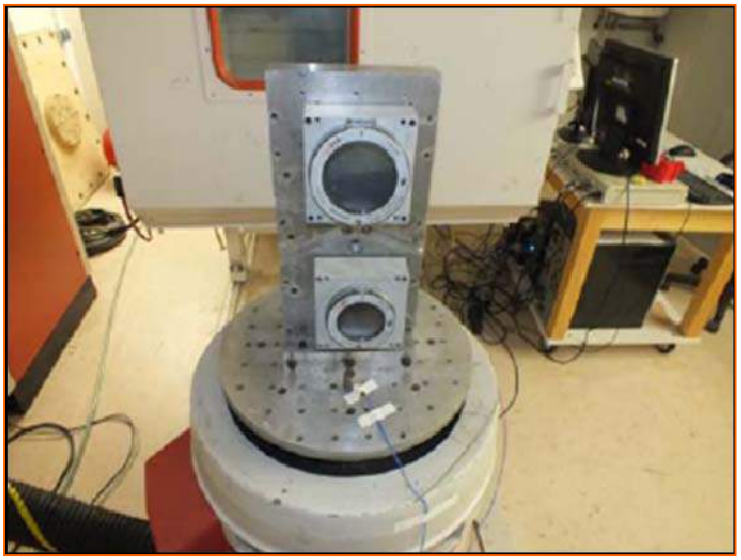
<u>Test information</u>

- 22°C / r.H. 55% / 98kPa
- Tmax +55°C
- Tmin +20°C

Vibration Testing Examples – EN60068-2-6







Vibration testing confirms the device does not disintegrate during severe ongoing vibrations as found in marine engine rooms.

Indicator for seismic withstand important for nuclear industry.

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The Topic of the Hour

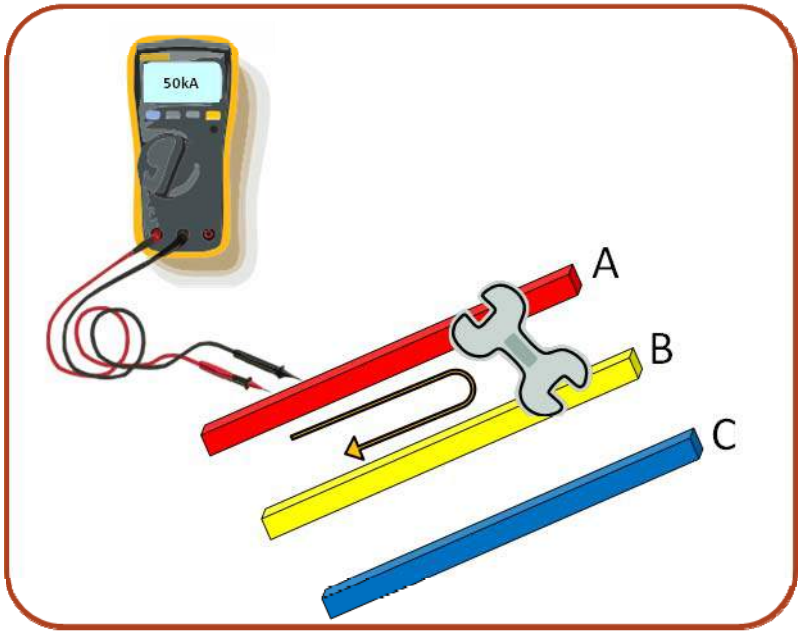
ARC-RESISTANCE

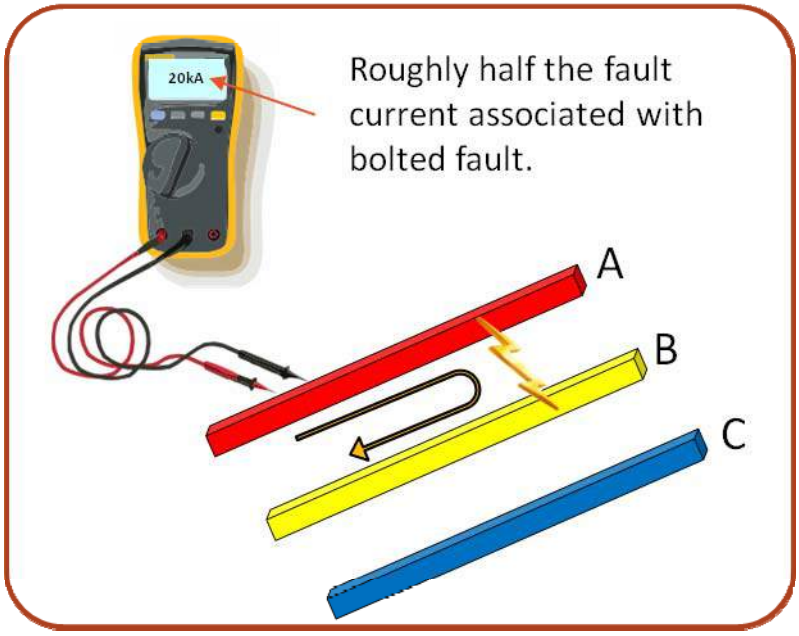
3

The Basics - Terminology

There are two types of faults when it comes to electrical equipment.

There is a bolted fault, which is shown by a low impedance short circuit, a high current and no explosion.

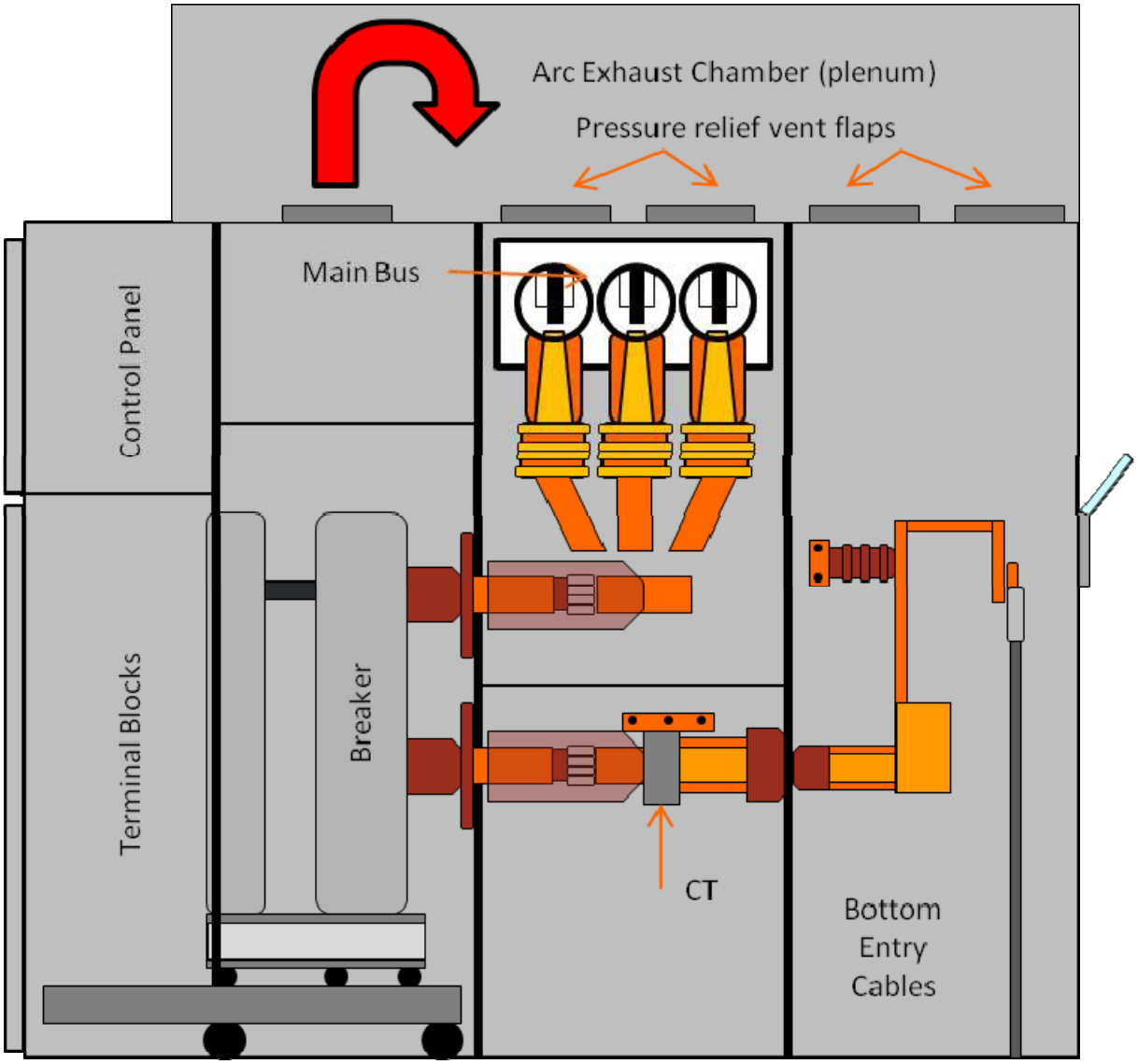




Then there is an arcing fault. This is shown by a High impedance short circuit, a "Low" current and a powerful explosion.

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Switchgear Types – Arc Resistant

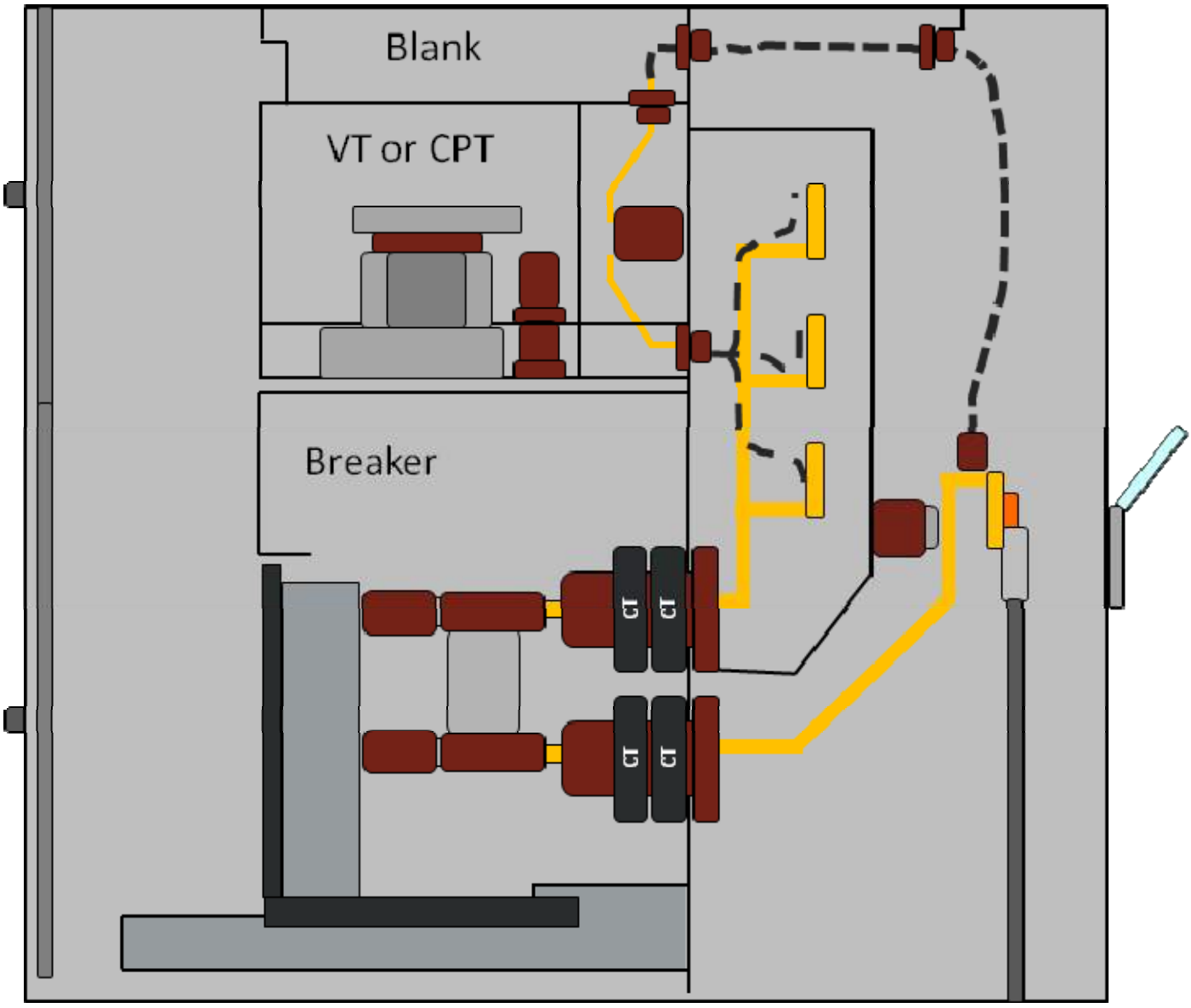


There are two types of switchgear—arc resistant and non-arc resistant.

Firstly, arc resistant. There are three main key features of arc resistant switchgear. Arc resistant switchgear is designed to channel energy upwards, away from personnel, it includes blast vents and plenums to limit internal pressure and it is also type tested in a specific configuration to a specific fault level; **50kA at 15kV for 30 cycles @ 60 Hz**

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Switchgear Types – Non Arc Resistant



Non arc-resistant equipment is far more common. Most older equipment is not arc-resistant and secondary equipment such as motor terminal boxes and transformers are almost never arc-resistant. Non arc-resistant is not designed to “resist” an electric arc and will catastrophically fail under an arc-fault condition.

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Arc-Testing IR Windows

When it comes to arc testing IR Windows, there are several engineering aspects to be taken into consideration. There is no standard for IR Window arc-testing. The IR Window must be tested on Arc Resistant (AR) equipment and the arc testing only applies to the AR equipment it was tested on.

This therefore means that if the host equipment is not AR, an IR window that has been subjected to an electrical arc is no better than one that has not. Why is this the case? Because the switchgear will ultimately fail regardless of how “strong” the IR Window is.

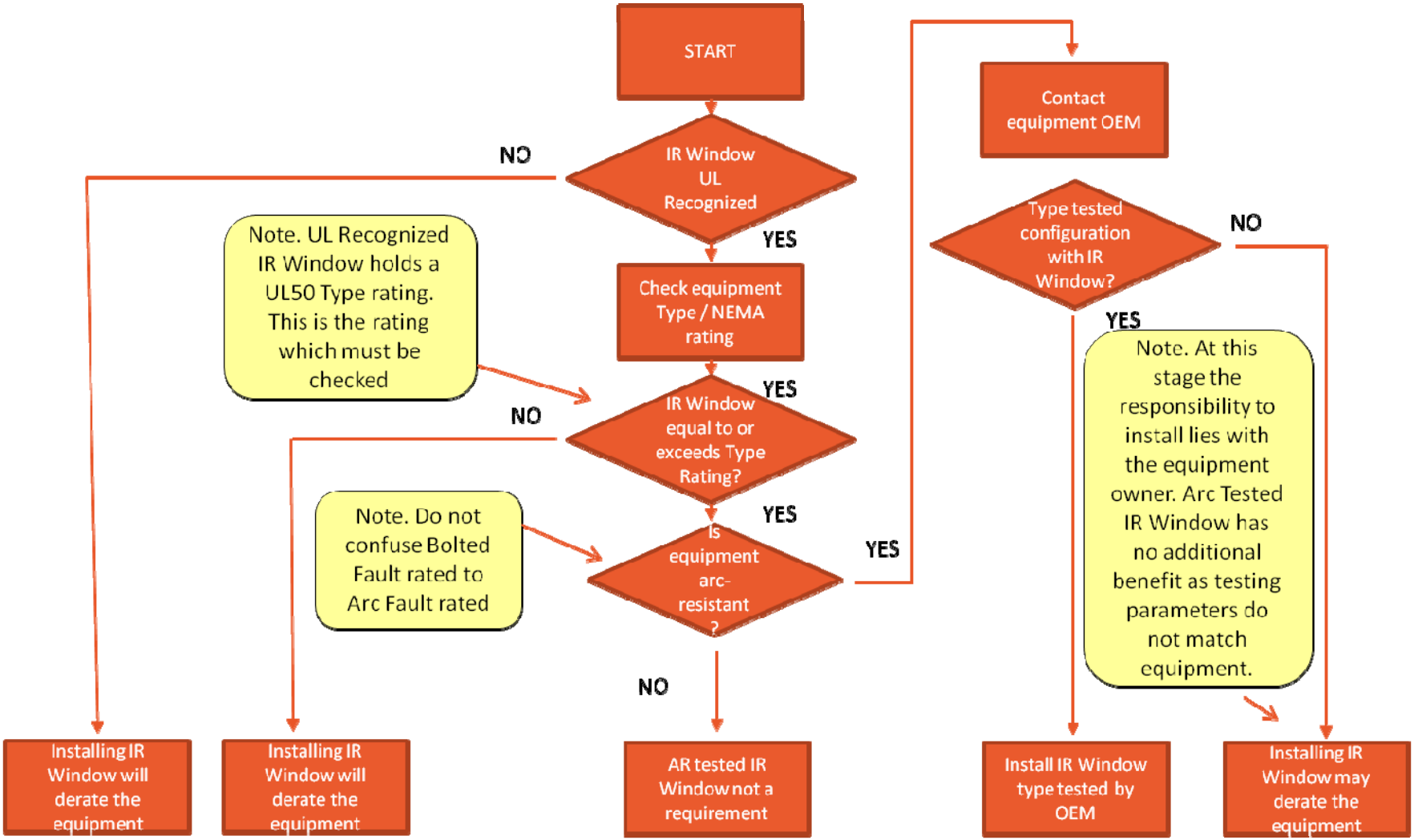
Also, If the host equipment is AR then the equipment OEM must approve the installation of an IR Window that has been tested on that specific panel type. Installing any other IR Window – even one that has passed an arc-test on a different panel – may invalidate that AR rating.

Arc Testing of IR Windows is extremely valuable when installing into AR equipment. However, since it is impossible to test on every configuration of AR switchgear built, then the real practical value is limited

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Selecting IR Windows Based on Testing



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Buyer Beware

Our IR Windows are flameproof because they are UL tested to UL94 5VA

Flameproof is a term used when defining protection concepts for explosive area (Class 1 Div I) equipment. No industrial grade IR Window is flameproof. Polymers used in UL recognized components must be flame ***retardant*** to UL94.

Our IR Windows are IP65 / NEMA 4

IP65 as we have already seen is a European standard and cannot be translated into North American NEMA 250 classification. For North American installations, the UL50 Type certification is required to determine what environmental location the IR Window is certified for installation into.

This quote is misleading the user into thinking that the IR Window is UL recognized Type 4 (outdoor) when in fact it may not be.

Recap



- Selecting IR Windows depends largely on where they will be installed
- Standards do exist for IR Window design and certification (UL) but they are complex to navigate and not well understood
- No IR Window AR standard exists, IR Windows must be tested on each switchgear configuration for total confidence
- Always ask for third party certification to backup manufacturers claims, terms such as “in house testing” or “equivalent to” generally mean no testing has taken place

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