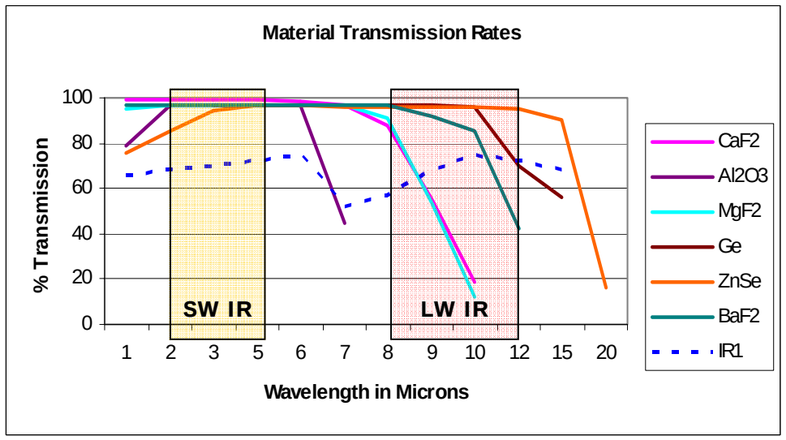
INFRA RED WINDOWS

The Principal of using infrared (IR) viewing ports has been well established for many years. IR thermography is a proven, well tested, safe and efficient method of checking the serviceability of electrical components, and because it is a non-contact measurement it allows the test to be completed live, that is of course if the risk assessment carried out to the local health and safety regulations allows us to.

We do at times have to remove fixed covers when possible, to allow access to the components that require inspection, as we can only measure the temperature of components that we can see. This can cause problems when the components that you want to inspect are behind covers that cannot be removed or require the power to be shut off, due to switched interlocks, etc, this may be impossible to do during the Inspection as we will very rarely be able to isolate a panel due to the power loss to the systems being fed. Currently we check the temperature measurement of such panels by monitoring the surface temperature and cable temperatures from the panel, this is an indirect measurement and will show that there are issues within the panel being inspected, but does not give any indication to the actual problem and temperature of the components within the panel.

By using IR viewing ports we are able to see the component and take direct temperature measurements to check the serviceability of the component live and safely without having to remove the cover, this then makes the inspection of your electrical systems faster, safer and removes the manpower requirement for the removal of covers during the inspection, thus making it less expensive to carry out your thermographic inspections.

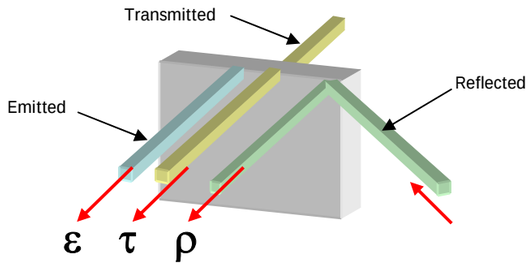
TRANSMISSION RATES



The above graph demonstrates the transmission rates of the chosen materials and where they fall into the LW and SW infrared wavelengths, it can be seen that it is imperative that full consideration is given to the type of equipment being used as some materials will be unsuitable for use with a LW camera as is the case for Sapphire Al2O3, and SW cameras such as Germanium Ge, some materials are however suitable for use with both LW and SW cameras i.e. Zinc Selenide ZnSe, though these materials tend to be more expensive for that reason, and consideration must be given to the budget available as well as the technical and physical requirements of the required IR window.

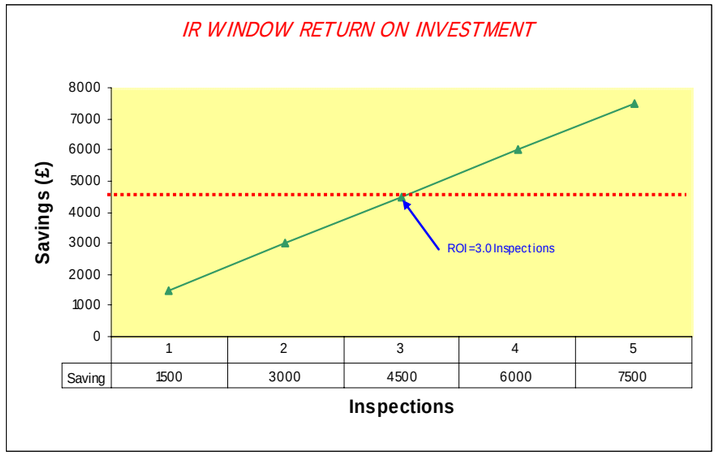
WHAT MAKES A GOOD IR WINDOW?

Kirchhoff's Law states "the sum of the radiation leaving the surface of an object = 1"



The ideal IR window is one that would allow all the infrared radiation to pass through it with zero losses i.e. **t** = 1, unfortunately, this is not possible to achieve at present and we therefore have to try to keep emmitance and reflectance values as low as possible to achieve as high a transmittance as possible. This can be achieved in a number of ways; coating materials with an anti reflectance coating can reduce reflectance and choosing the correct material for the IR wavelength suitable for your camera.

IR WINDOW RETURN ON INVESTMENT



The above graph is based on fitting 100 IR windows and reducing labour costs by one day for thermographic survey team and 2 days for additional site attendees.

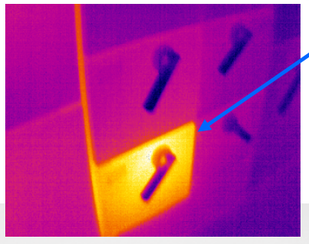
Case Study

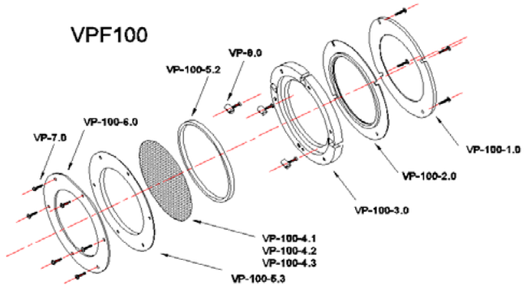
A client had his building LV substation inspected four times a year, due to the live working regulations the inspection required two men to remove each panel and one man to stand by the substation supply isolator switch during the whole inspection process. The thermographic survey team stood in a safety area whilst each panel was removed; once the panel cover was removed the survey team inspected the components and returned to the safety area until the next cover was removed. This was a long process and took two days to complete the cover removal and inspection of 100 panels.

We decided to fit 100 IR windows to improve safety and reduce the time taken and hence the cost of the inspection. By fitting the IR windows it enabled the inspection to be completed in one day and the thermographic survey team only required an escort, thus reducing the manpower costs to the client by five man-days and thermographic survey team costs by one day, a significant saving.

The client was delighted with the resultant cost savings and safer working environment, he seen a return on his investment by recouping his capital expenditure after the third inspection and subsequently installed IR windows in the remainder of his buildings.

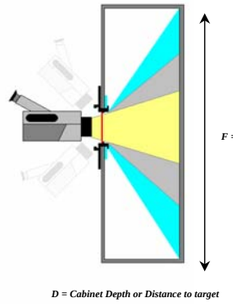
IS THIS A PROBLEM?



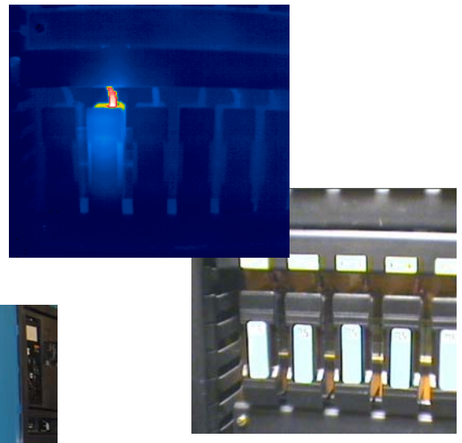


IR WINDOW FIELD OF VIEW (FOV)

Field of view through an IR window
Equal to six times cabinet depth or target distance (F+Dx6)



During an inspection a thermographer does not hold a camera at a fixed angle and can manipulate a camera to various angles whilst looking through an IR window therefore the field of view is substantially increased. This can be calculated by adding the Field of View to the distance and multiplying this figure by up to 6 can calculate this



SURFACE 'V' DIRECT TEMPERATURE MEASUREMENT

Below are images taken from an electrical test panel, which was used to try and gather data on an panel cover temperature rise with a heat source placed inside. (In this case a soldering Iron).

The heat source was left on for 4 hours and an image was taken of the front cover, the temperature had increased to 13.3°C above the local ambient temperature, which in the majority of cases may have easily been viewed as a low priority fault, and not warrant a closer inspection because of the difficulty some companies experience in opening panels. However the image taken through the fitted IR window shows a direct temperature reading of 281.6°C, which certainly would have warranted an immediate shutdown and repair.