

Easy IR Window Transmission Measurement

- Gary Orlove

Introduction

This document provides a simple procedure for estimating transmission losses in IR windows. Using this method, it is possible to achieve temperature measurements that are accurate enough for most industrial RCM applications. However, to get the highest possible accuracy and better understand these concepts, it is recommended that inspectors complete at least Level I Thermography coursework prior to taking measurements. FLIR's Infrared Training Center offers regularly scheduled courses. Visit (www.infraredtraining.com).

Things you will need

- Hot reference source (such as a cup of coffee)
- Electrical tape
- Aluminum foil mounted to cardboard or other sturdy flat surface
- IR camera and IR window in question

Tips

- Measure the transmission for at least one window of each size you'll be installing at each site. Make the measurement in the final application environment. This value can typically be used across same-material, same-size windows at that location, provided they were all purchased and installed at the same time and the ambient conditions are the same for all windows at that site. When in doubt, measure the transmission baseline for each window.
- Use the actual camera you will be using for the thermographic inspections, as there CAN be a variance from camera to camera. Position the camera at the angle and distance you plan to use to do the inspections.
- For the hot reference source, use something that is as close as possible to the temperature of a problematic piece of equipment. Typically, a hot cup of coffee is a good example of this. Perform the measurement procedure quickly to avoid the reference source cooling down.
- After measuring, write the transmission value and date on or near each window to which it applies.
- Re-measure the transmission at six-month intervals or if there is a noticeable visual change.
- Follow all instructions and best practices associated with proper use of your camera.
- Using the camera's MAX or AVERAGE function may help reduce error during the procedure.
- The IR window should be at room or ambient temperature for this measurement.

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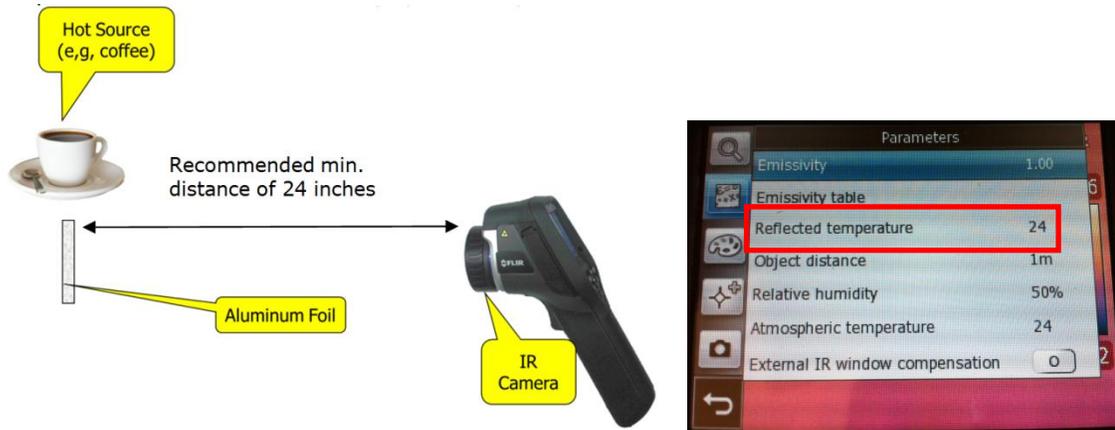
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Transmission Measurement Steps

1. Place a few strips of electrical tape on the outside surface of your hot reference object. Avoid overlapping the tape. Allow to sit for about 1 minute to stabilize in temperature.



2. Meanwhile, set the emissivity in your camera to 1.00 and measure the reflected temperature using your flat aluminum foil surface. This is done by positioning the foil perpendicular to the camera's line of site and at the same distance as the hot object you will be measuring (see diagram below, recommended distance is 24 inches). Measure the temperature of the foil and input this number into your camera's settings menu. The purpose of this step is to account for the temperature effects from the thermographer and camera's reflections in the window.



Make sure the ambient temperature and humidity are also set correctly in the camera.

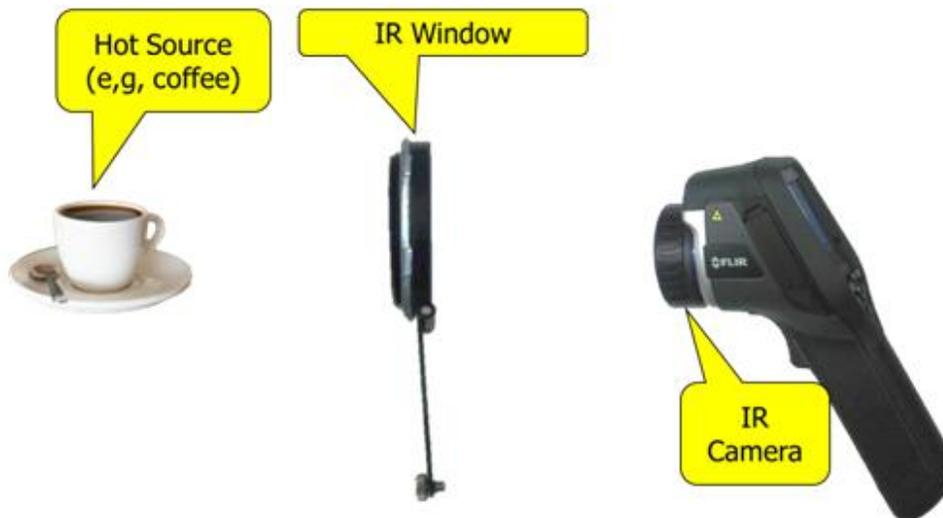
3. Aim the camera directly at the hot reference source and measure the apparent temperature of the electrical tape surface. Write this number down.

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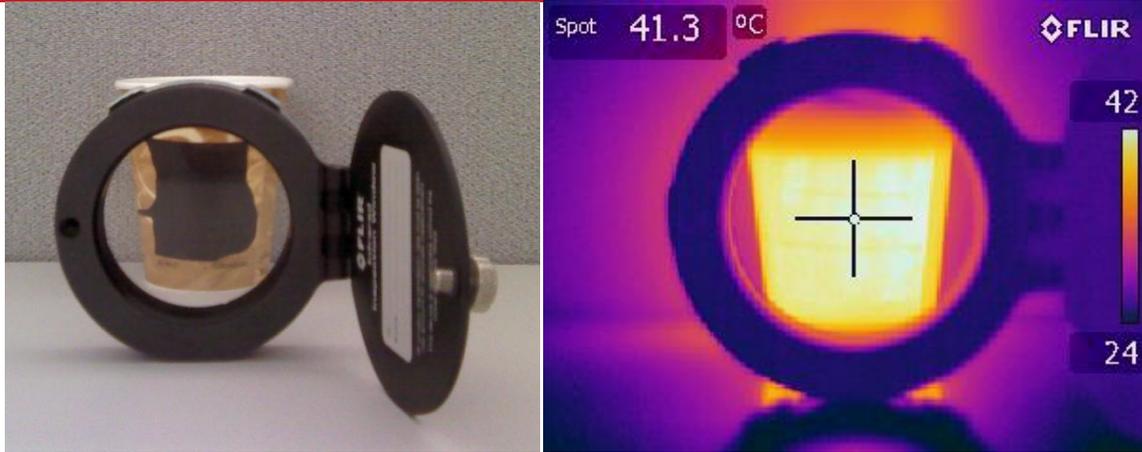


4. Quickly place the IR window between the object and the camera. Aim the camera so it is measuring the electrical tape through the window and freeze the image. If your camera does not have image freezing functionality, perform step 5 as quickly as possible.

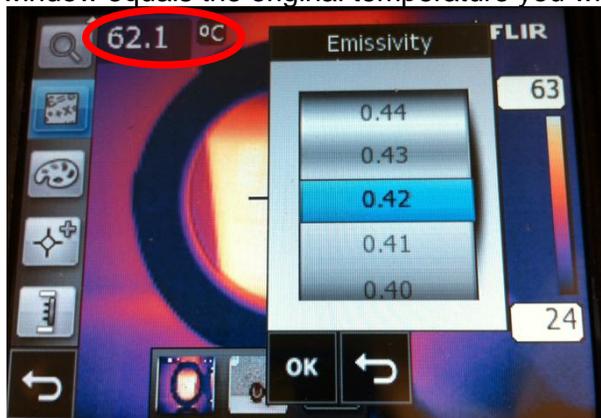


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5. Change the emissivity setting on your camera until the temperature reading through the window equals the original temperature you wrote down.



This emissivity setting is the transmission rate of the window.

After you record your transmission value, it is a good idea to set the emissivity back to a more typical value (i.e. 0.95) to avoid forgetting to reset it.

Using your Measured Transmission Value

For cameras without an “external optics” correction feature

- Multiply the transmission rate times the emissivity of the target surface you are measuring (0.95 for electrical tape). Use the resulting number as the emissivity value in your camera.

For cameras with an “external optics” correction feature

- Simply enter the transmission value into the external optics menu along with the window temperature.