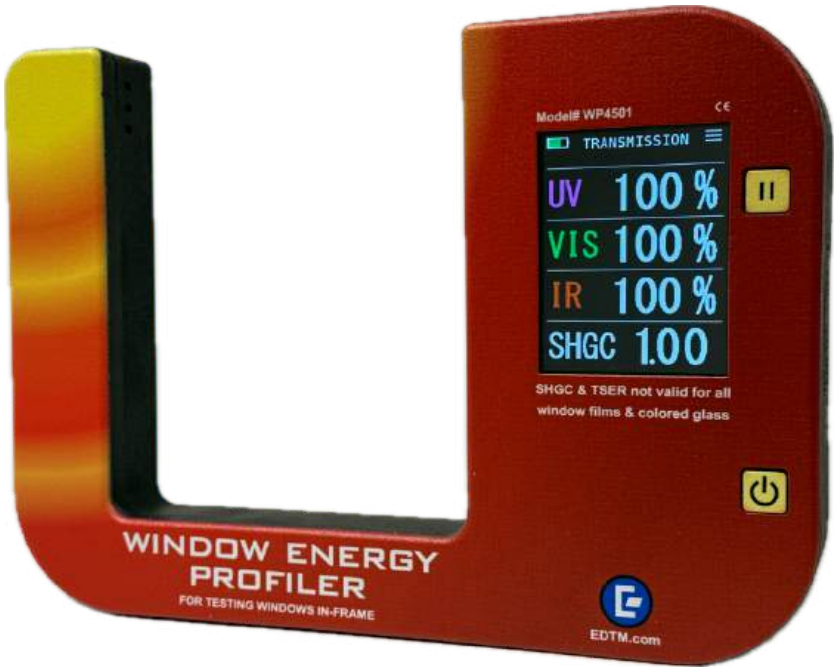
WINDOW ENERGY PROFILER

Energy Transmission Meter
for Testing Operable Windows In-Frame

MODEL# WP4501



FEATURES:

- Easy-to-read Touch Screen Display
- UV, Visible and Near IR Transmission & Rejection Measurements along with estimated SHGC and TSER values
- Battery life indicator
- Adjustable screen brightness
- Informational screens with definitions and operating parameters
- Single, double or triple pane testing easily accomplished
- Test sample widths up to 4” thick with a sash/spacer/frame depth up to 4”
- No additional light sources needed
- HOLD feature to freeze the display for hard-to-reach/view measurements
- Auto-calibration at start-up: NO manual adjustments required
- Battery operated (9-volt alkaline): no power cord required
- Automatic power-off feature for extended battery life
- Continuous measurements
- Professional image complimented by simple operation
- Convenient push-on/push-off power switch
- Protective, custom carrying case
- Convenient finger grips for single hand operation

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Glass, Window & Film Test Equipment

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GENERAL DESCRIPTION

Expanding our line of energy performance products, the WP4501 Window Energy Profiler allows you to test actual windows that have already had the sash or frame attached to the window. The instrument can test windows in the factory, but more importantly it can test operable windows in the field that have already been installed. Simply open the window and slide the WP4501 around the profile of the window to conduct your performance measurement. The opening of the instrument is large enough to fit around the entire frame of most replacement windows before or after they are installed.

The WP4501 measures the UV(A) (ultraviolet), Visible Light (VLT) and Near Infrared (NEAR IR) transmission/rejection values for a given window. The instrument also estimates the Solar Heat Gain Coefficient (SHGC) and Total Solar Energy Rejected (TSER) values for transparent Low-E and clear windows. The SHGC/TSER calibration of this instrument is NOT intended for use with tinted, colored, or reflective (mirrored) surfaces that absorb energy/heat. This includes colored glass and window film products. The WP4501 only measures the radiant gain portion of the window, so any energy that is re-radiated into the building after warming up the glass, is not accounted for in the calculations.

Being a self-contained system, there are no additional light sources or power cords necessary, and no adjustments to make. Simply slide the instrument around the profile of the window and watch the resulting performance data appear on the display.

APPLICATIONS

There are numerous applications for this product. For the replacement window market, the WP4501 can be used as a CONVINCING sales tool to evaluate the poor performance of a homeowner's existing windows, showing the need for replacement windows. You can test the customer's poor performing existing windows, and then use the same instrument to show the excellent performance of the ENERGY EFFICIENT window product you are selling. This provides a great BEFORE-and-AFTER comparison showing the customer where they are currently, versus where your window will take them. This is a powerful way to build value through your selling process!!!

For window film applications, you can conduct very quick and easy before and after demonstrations by adding a piece of film to the window to show the results.

For job site inspections in the field, you can confirm the performance of windows when they arrive at the job-site to ensure the correct product was received. In the field, the WP4501 can be used to differentiate different types of Low-E coatings. By comparing the measurement results from the WP4501 to the performance data sheet figures of various Low-E coatings (included with this meter), you can roughly identify the type of Low-E used in the window. This is a great aid for those troublesome customer complaints that are challenging whether they received the correct Low-E windows.

In the factory, double-check windows in the production environment to make sure the correct Low-E was used in assembling the window. The WP4501 can be very helpful in identifying windows that are mislabeled or not marked at all.

BASIC OPERATION

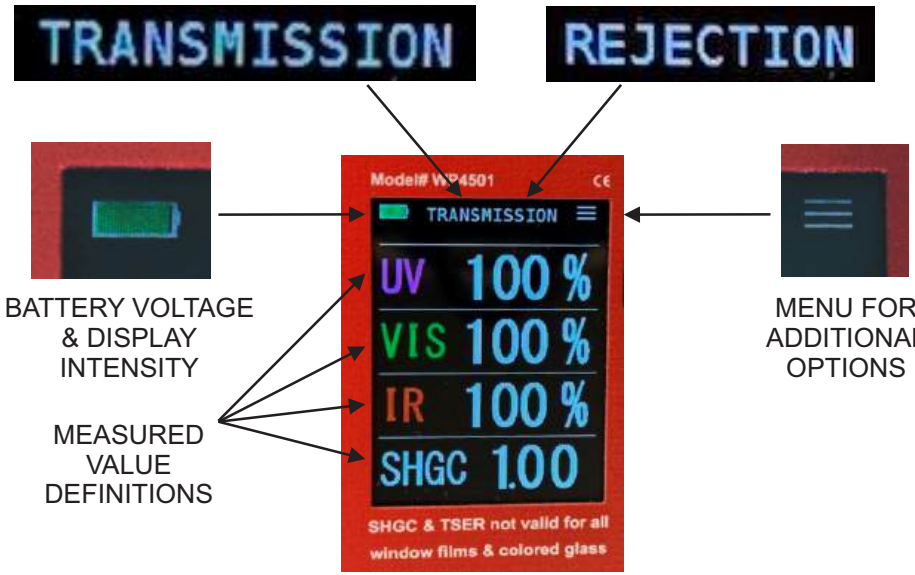
Remove all glass and window samples from the opening of the instrument and turn it on by momentarily pressing the power button. Wait for the system to power up and perform a self-calibration. After each of the displays show 100%, you are ready to begin testing windows. If there is an obstruction in the measurement area of the instrument, or if damage has occurred to the electronics, the displays will show 0 and eventually power the unit back off. Clear away any obstructions from the testing area and turn the instrument on again. With all the displays showing 100%, slide the instrument around the profile of the window you want to test. When you slide the glass into position, move the glass all the way into the opening, resting against the stop location in the back of the opening. Pay attention to the spacer/sash of your window. Make sure the glass is slid far enough into the opening so the spacer/sash is not blocking one of the sensors. If there are muntin bars/grids in the window, make sure the sensor area of the meter is not being blocked by the grids.

**ALWAYS HOLD THE GLASS PERPENDICULAR TO THE OPENING. ** Do not tilt the glass at angles. For the most accurate transmission measurements, the glass should be held perpendicular to the sensors. If you are having trouble holding the instrument opening perpendicular to the window, slide the instrument toward one of the sides so the edge of the instrument is resting against the frame or sash. This should help stabilize your hand during measurements. Be aware that fingerprints on the glass can affect the measured values. For the most accurate measurements, clean the area of the window you will be testing before conducting your measurements.

The instrument will continually monitor its calibration during measurements. If the instrument detects any problems with the calibration, it will reset itself in between measurements. If the instrument ever shows values other than 100 in the display when there is no glass present, pause for a few seconds and watch as the instrument re-calibrates itself. If you mistakenly turn the instrument on with a piece of glass already in position, the displays will calibrate to read 100% with the glass in place. Simply remove the glass sample and wait a few moments. The instrument will re-calibrate itself shortly after the glass is removed. After the displays have returned to 100%, you may continue with your measurements.

If the frame of your window sample is blocking one of the sensors from receiving a signal, that corresponding display will register a “0” value. Make sure the frame of your window sample is not blocking any of the three sensor locations.

TOUCH SCREEN OPTIONS ON THE HOME SCREEN



HOME SCREEN OPTIONS

To operate the touch screen, touch the screen in one of the designated locations shown above. These are the active areas that will take you to a new screen.

--BATTERY ICON (& DISPLAY INTENSITY)

The battery icon is an actively updated icon that shows the current battery level. Touching the small battery icon in the top left corner of the screen will display a larger battery indicator and the battery life %. There is also a slider to adjust the screen brightness. Lower intensity will increase the battery life.

--TRANSMISSION / REJECTION

Touching the word "TRANSMISSION" or "REJECTION" on the top of the screen will enable the switching between the two reading types. When the screen is displaying the word "TRANSMISSION", the meter is measuring the amount of UV, VIS, & IR energy being transmitted through the sample, along with the estimated SHGC value of the window. When the word "REJECTION" is displayed, the meter is measuring the amount of UV, VIS, & IR energy that did not get transmitted through the window, along with the TSER value. The REJECTION values can include absorption and reflected energy.

--UV, VIS, IR, SHGC, & TSER DEFINITIONS

Touching any of one of the words on the left side of the screen will open up information on the that particular word/value, providing a quick definition and background information.

--MENU

Touching the MENU icon in the upper right hand corner of the main screen will open up the menu system, providing additional user options and definitions.

MENU TOUCH SCREEN

To make a selection on the MENU screen, gently touch the screen in the desired location.

--BRIGHTNESS / VERSION

Touching this button will load a screen with a slider to adjust the brightness of the display. Simply touch and slide your finger on the slider bar at the bottom to adjust the brightness to the desired amount. Keep in mind that a dimmer display will result in longer battery life. This screen will also display the version of software that is running in the instrument.

--SOLAR SPECTRUM

Touching this button loads a screen that will load the solar spectrum of the sun and show the division of Ultraviolet, Visible and Infrared ranges. It will also display the wavelengths of energy that are measured by this instrument.

--INSTRUCTIONS

Touching this button will load a screen with short instructions on how to properly operate the instrument.

--FADING PIE CHART

Touching this button will load a screen with a pie chart that shows what contributes to fading of textiles and materials inside a home or building.

--SHGC / TSER

Touching this button will load a screen with information on the SHGC and TSER calculations. It also addresses the limitation of measuring some types of colored glass, window film, or substrates that absorb energy, instead of reflecting it.

--CENTER OF GLASS

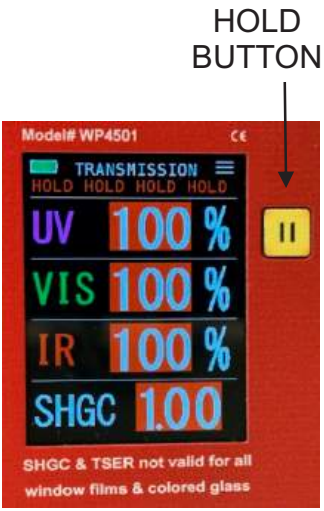
Touching this button will load a screen with an explanation of why the measurements of this instrument will not exactly match the NFRC stickers that are applied to new windows.

EXIT ICON

When you have completed your task on a given screen, you can simply press the EXIT button in the upper right hand corner. Touching this icon will exit the current screen, and return you to the previous screen. It should be noted that all extra screens are on a timer. After viewing the selected screens for a time, the instrument will automatically return to the previous screen.

HOLD FEATURE

The WP4501 is equipped with a HOLD feature. Any time the HOLD button is pressed, the measurements that appear on the display at that moment will be locked on the display until the HOLD button is pressed again. A hold message will show across the top of the screen and the background of the readings will blink red.



This feature is very helpful when the window you are testing may be in a difficult-to-reach location. This could also be helpful for testing windows on upper floors of buildings where it would be unsafe to lean out the window to read the display.

To use the feature, simply position the meter around the window profile you want to measure. When you have the window sample perpendicular to the opening, press the HOLD button and then read the results on the display. This feature can also be helpful if you want to hold the values long enough to write them down or show them to your customer.

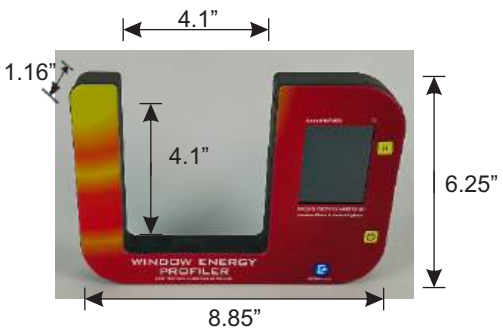
BATTERY REPLACEMENT

The WP4501 is powered by a 9 volt alkaline battery. When the battery voltage is getting too low to operate the meter, the low battery message will appear on the display. The instrument can still be used at this point, however it is recommended that the battery be replaced soon. When the battery voltage gets too low to safely power the instrument, the display will flash a message to replace the battery, and then power off automatically. When this happens, REPLACE THE BATTERY IMMEDIATELY. Failure to replace the battery at that point, may result in damage to the instrument. Alkaline batteries are required for this product.

POWERING OFF

To turn off the WP4501, push and hold the ON/OFF switch for a couple of seconds. The WP4501 instrument is also equipped with an automatic power-off feature to help extend the life of your battery. The instrument will automatically shut off after approximately five minutes of operation if it detects no new measurements being conducted.

DIMENSIONS



CENTER OF GLASS: MEASURED VERSUS WINDOW STICKER VALUES

All measured values of the WP4501 instrument are Center-of-Glass values. This means we are only measuring the performance of the glass in the window. We are not measuring the effects of the window frame itself. When you purchase a new window, there are often stickers attached to the window that show the same performance values we are measuring with the WP4501, namely Visible Transmittance (VLT) and Solar Heat Gain Coefficient (SHGC). The values on these stickers are for the entire window assembly, including the frame of the window. Obviously the frame of the window does not transmit light or solar gain, so when the frame of the window is added to the total performance of the entire window, it will reduce the Light Transmission and SHGC values. For this reason, the measurements of the WP4501 will always be higher than the performance numbers found on the sticker of a new window. Again, the WP4501 does not account for the performance of the frame, but rather only the performance of the glass itself.

SPECTRUM SPECIFICATIONS

The WP4501 displays energy transmission and rejection values in three spectrums. The energy sources used for each spectrum cover a range of wavelengths. The sources also have a peak response as noted in the chart below:

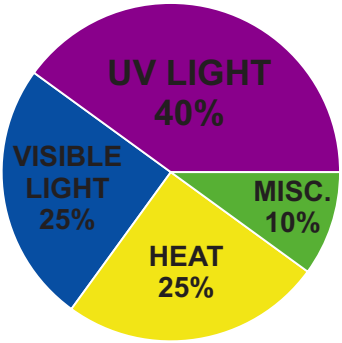
ENERGY	PEAK WAVELENGTH	WAVELENGTHS MEASURED
UV	365nm	345 - 380nm
VISIBLE	FULL SPECTRUM	380 - 780nm
INFRARED	950nm	900 - 1000nm

SHGC & TSER CALCULATIONS

The SHGC and TSER values estimated by the WP4501 instrument are only valid for glass and substrates that reflect the suns energy away (not aborb it). This wold be the case for any traditional low-e coatings in a window, and some window films that also reflect the energy. Also of note, the calculated value will always assume the Low-E coating is placed on surface #2 of the window. Surface #2 is the side of the exterior piece of glass that faces the air space of the window. Regardless of how you place the window into the meter opening, the estimated value will always give results as though the Low-E coating is on surface #2.

By definition, the SHGC and TSER values are comprised of energy that is transmitted through the glass via radiant energy from the sun, as well as a component of suns energy that warms up the glass or window film surface, and then re-radiates that heat into the interior of the building. The WP4501 instrument will NOT account for any energy that is re-radiated into the interior. For that reason, the SHGC value will be in error to a lower number than it actually is for those energy absorbing applications. The TSER will be in error to a higher number than it actually is for those applications.

FADING CHART



UV Light (40%):

- Ultraviolet radiation is the primary cause of fading, as it breaks down the chemical bonds in materials, leading to discoloration and degradation over time

Heat (25%):

- Radiant Heat is a result of the suns energy that converts to heat when it bounces off furnishsings (converting from short-wave radiation to long-wave radiation). This heat source contributes to the fading of materials. Radiant heat can penetrate materials and cause them to heat up, leading to the breakdown of chemical bonds and accelerated fading.
- Other Heat Sources: Heat from radiators, heaters, and other sources can cause materials to lose color and become brittle. Temperature fluctuations can further weaken the structure of materials, making them more susceptible to fading.

Visible Light (25%):

- Although not as potent as UV light, visible light still contributes significantly to fading, especially for materials that are sensitive to light exposure

Miscellaneous (10%):

- This category includes factors like humidity, air pollutants, and the quality of the materials used. These factors may not be as influential as the others, but still play a role in the fading process.

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WARRANTY

The manufacturer warrants all models of the WP4501 to be free from defects in material and workmanship under normal use and service as specified within the operator's manual. The manufacturer shall repair or replace the unit within twelve (12) months from the original date of shipment after the unit is returned to the manufacturer's factory, prepaid by the user, and the unit is disclosed to the manufacturer's satisfaction, to be thus defective. This warranty shall not apply to any unit that has been repaired or altered other than by the manufacturer. The aforementioned provisions do not extend the original warranty period of the unit which has been repaired or replaced by the manufacturer. Batteries are not covered by warranty.

The manufacturer assumes no liability for the consequential damages of any kind through the use or misuse of the WP4501 product by the purchaser or others. No other obligations or liabilities are expressed or implied. All damage or liability claims will be limited to an amount equal to the sale price of the WP4501, as established by the manufacturer.