

410-Solar

Handheld Reflectometer

The 410-Solar is a battery-operated handheld reflectometer, the ideal tool for portable solar reflectance and absorptance measurements. It is designed for rapid characterization of materials, employing a touchscreen interface for guided calibration, sample identification, and immediate data display. The 410-Solar conforms to ASTM E903 and C1549.

410-SOLAR MODELS

	<i>410-Solar</i>	<i>410-Solar-i</i>
Data	Specular, Diffuse and Total Reflectance	Total Reflectance
Measurement time	10 seconds	7 seconds
Beam spot size	0.25 inches	0.50 inches
Calibration	Specular Coupon Diffuse Coupon	Glazed Ceramic Coupon

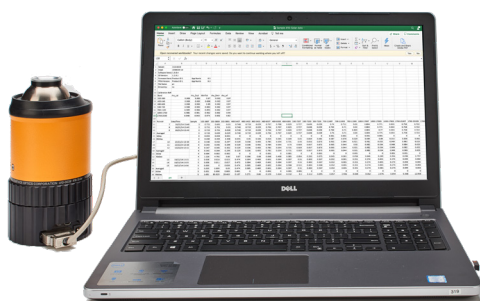
GENERAL SPECIFICATIONS

Measured parameter	Directional hemispherical reflectance (DHR)
Method	Integrated total reflectance in a band for a given angle of incidence
Wavelength bands	335 - 380 nm, 400-540 nm, 480-600 nm, 590-720 nm, 700-1100 nm, 1000-1700 nm, 1700-2500 nm
ASTM standards	C1549 E1980 E903
Accuracy	±.02
Angle of incidence	20° from normal incidence
Repeatability	±.001 units
Solar irradiance functions	Air Mass 0 (AM) Extraterrestrial irradiance (ASTM E490-00) Hazy sky AM1.5 beam-normal irradiance (ASTM E891-87) Clear sky AM1.5 global horizontal irradiance (SMARTS 2.9.5) Clear sky AM1.5 global irradiance surface tilted 37° (ASTM G173-03) Clear sky AM1.5 global irradiance surface tilted 20° (ASTM G197-14) Clear sky AM1.5 global irradiance surface tilted 90° (ASTM G197-14) Clear sky AM1.5 global horizontal irradiance (SMARTS 2.9.5) Clear sky AM2.0 global horizontal irradiance (SMARTS 2.9.5)
Sample size and geometry	Flat: ≥ 0.5 in. (1.27 cm) diameter Radius of curvature: 6 in. (15.2 cm) convex; 12 in. (30.5 cm) concave
Warm up time	90 seconds
Time between measurements	2 seconds
Sample temperature	Ambient or heated/cooled to 0 - 100 degrees Celsius (°C)
Readout / data output	3x2 inch LCD touch screen Data stored on SD card as .txt file for export to Excel
Dimensions	11.54 in. x 9.04 in. x 3.72 in (29.31 cm x 22.96 cm x 9.44 cm)
Weight	4.7 lbs (2.13 kg)
Source	Tungsten filament, temperature controlled by user
Export control	ECCN #3A999.F



APPLICATIONS

- Development of coatings and substrates for spacecraft
- Semiconductor manufacturing
- Surface evaluation of electroplated materials
- Qualification of building materials for LEED certification
- Cool roofing and Solar Reflectance Index of construction industry materials.
- Inspection of telescope mirrors
- Analysis of thermal properties of materials
- Development of solar selective coatings for use on solar towers
- Characterization of solar receivers in solar power generation
- Maintenance of solar fields / evaluation of soiling of mirrors
- Characterization of mirrors used in concentrated solar power
- To evaluate surfaces on LIDAR test targets



Using a modified integrating sphere, the 410-Solar measures reflectance at near-normal incidence for seven spectral bands: 335-380, 400-540, 480-600, 590-720, 700-1100, 1000-1700, and 1700-2500 nm.

Choose from eight solar irradiance functions, including air mass 0, 1, 1.5, and 2.0. Solar irradiance is the weighting function used to calculate total solar reflectance/absorptance from the measured spectral reflectance. Additional irradiance functions can be added to the default options.

There are two models of the 410-Solar: the original 410-Solar measures the specular and diffuse components of the provided total reflectance. The 410-Solar-*i* measures only the total reflectance but boasts a slightly faster measurement time and higher accuracy for rough or non-uniform materials. An additional benefit of the 410-Solar-*i* is a cleanable calibration standard.

Both models employ the same lightweight, power drill design with a touchscreen interface for guided calibration, sample identification, data display, and measurement settings. Simply hold the 410-Solar sampling port against the surface to be tested and press the handle's trigger to take a measurement. Results immediately on the touch screen display and averaging of multiple tests of the same sample.

The desktop configuration is interchangeable with the handheld module and operates by remote external control from a PC. Suited for quick analysis of samples in a lab or connected to a robotic arm for automated reflectance inspections.

ORDERING INFORMATION

410-Solar

Standard components	0410-0004	410-Solar Measurement Head
	0410-0001	Handheld Command Module - 120VAC
	0410-0102	Diffuse Calibration Coupon (Non-NIST Traceable)
	0410-0103	Specular Calibration Coupon (Non-NIST Traceable)
Optional	0410-0200	Handheld Command Module - 220VAC
	0410-0106	Diffuse Calibration Coupon (NIST Traceable)
	0410-0104	Specular Calibration Coupon (NIST Traceable)
	0410-1013	Calibration data for NIST coupons
	0410-1010	410-Solar Maintenance and Calibration Plan (Non-NIST)
	0410-1011	410-Solar Maintenance and Calibration Plan (NIST)
	0410-1002	410-Solar Extended Warranty
	0410-0205	SD Card for Extra Data Storage

410-Solar-i

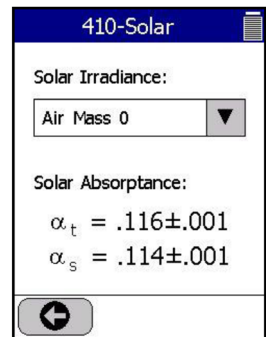
Standard components	0410-0015	410-Solar-i Measurement Head
	0410-0001	Handheld Command Module - 120VAC
	0410-0107	Glazed Ceramic Calibration Coupon (Non-NIST Traceable)
Options	0410-0200	Handheld Command Module - 220VAC
	0410-0123	Glazed Ceramic Calibration Coupon (NIST Traceable)
	0410-0002	Benchtop Remote Control Unit
	0410-1016	410-Solar-i Maintenance and Calibration Plan (Non-NIST)
	0410-1009	410-Solar-i Maintenance and Calibration Plan (NIST)
	0410-1019	410-Solar-i Extended Warranty
	0410-0207	SD Card for Extra Data Storage

SOFTWARE

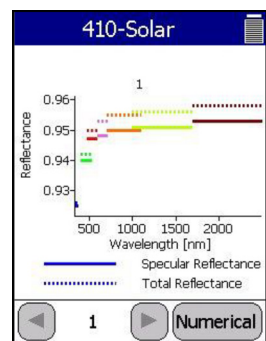
Measurement screen



Solar absorptance calculation for the selected solar irradiance function



Graphical representation of the measured reflectance values



Equipment described herein is subject to US export regulations and may require a license prior to export. Diversion contrary to US law is prohibited.

FOR MORE INFORMATION
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