

410-DHR

HANDHELD REFLECTOMETER

The SOC410 Series handheld reflectometers and emissometers are a product of collaboration between U.S. Naval Air Systems Command and Surface Optics Corporation, with vital input from the Naval Research Lab (NRL) and National Institute of Standards and Technology (NIST).



Quickly and accurately measure directional hemispherical reflectance in six bands from .9 to 12 μm

The 410-DHR's lightweight, counter-balanced, pistol-grip design allows single-handed carry and use. Simply hold the 410-DHR sampling port against the surface to be tested and press the trigger to take the measurement. The 410-DHR measures the integrated surface reflectance of the surface at two different angles of incidence (20° and 60°) and for six discrete wavelength bands in the $.9 \mu\text{m}$ to $12 \mu\text{m}$ spectral range. View results immediately on the touch screen display. Measurements can be taken on curved surfaces without special jigs or fixtures.

KEY BENEFITS

- Capture valuable reflectance characteristics with a portable, lab quality instrument you can take anywhere
- Access data measurement results in the field from the user friendly, color touchscreen interface .
- Easy calibration process ensures your measurement session produces good data.
- A 90 second warm-up time and 10 second measurement cycle for no wasted time.

APPLICATIONS

- Military
- Semiconductor manufacturing
- Aerospace

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FEATURES



- Measures reflectance in the infrared spectral range from .9 to 12 microns.
- Measures IR reflectance for 6 discrete bands within spectrum: .9-1.1, 1.9-2.4, 3.0-4.0, 3.0-5.0, 4.0-5.0, 8.0-12.0
- A total of twelve data points are produced during a single data acquisition cycle.
- Absolute reflectance can be measured for various materials; metals, dielectrics, or other.
- Calculated in-band emissivity
- Data reduction algorithm developed in collaboration with NIST

HOW IT WORKS

The basic structure in a measurement head is; an internal source, a modified integrating sphere, and detectors. The reflectance measurement is made by collimating the source beam onto the target, the energy is reflected back into the sphere, and eventually detected or dissipated.

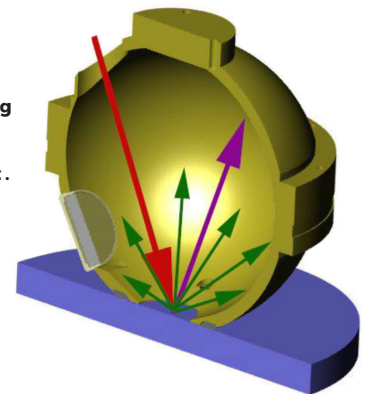
The integrating sphere captures the reflected light from the target material, integrating reflections in all directions. Wavelength-filtered detectors measure the total light reflected in each wavelength band and converts it to an analog electrical signal.

The 410-DHR electronics processes the detector signals for initial amplification (fixed), filtering, offset adjustment, secondary amplification (variable), and analog to digital conversion. The digitized signals are read by the onboard processor, stored in memory, and then used to determine the target sample reflectance at each incident angle and wavelength band. Results are displayed on the liquid crystal display touchscreen, and stored on a SecureDigital (SD) card.

An easy and quick calibration step is required before each measurement session. The software GUI walks the user through the process. Calibration of the 410-DHR is performed with a Specular Gold Calibration Coupon with known reflectance values.

Schematic of the integrating sphere in contact with a sample.

Red arrow - illuminating beam; purple arrow - reflected beam; green arrows - scattered light.



Specular Gold Calibration Coupon

COMPONENTS



SPECIFICATIONS

MEASURED DATA

Measured Parameter	Directional hemispherical reflectance (DHR)
Method	Integrated total reflectance in a band for a given angle of incidence
Measured Value	Absolute reflectance (0-1)
Calculated Value	In-band emissivity
Wavelength Bands (microns)	9-1.1, 1.9-2.4, 3.0-4.0, 3.0-5.0, 4.0-5.0, 8.0-12.0
Angle of Incidence	20° & 60° from normal incidence

PERFORMANCE

Accuracy	+/- .03
Measurement Time	10 sec (6 bands, 2 angles)
Surface Curvature	Any surface; convex 6" radius; concave 12" radius
Warm Up Time	90 seconds

POWER

Run Time	2 hours on one battery. Battery easily replaced with continuous operation after battery replacement
Power Source	Rechargeable battery (standard environmentally friendly NiMH)
Battery Recharge Time	1 hour
IR Source	Kanthal filament operated at about 1,000°C

ENVIRONMENT

Storage	-25 to 70°C
Operating	0 to 40°C

INTERFACE

Operator Interface	LCD graphics screen, 1/4 VGA, touch screen, software buttons; trigger switch in handle
Inspection Applications	Pass/fail can be incorporated, user set values
Diagnostics	On screen status and signals monitor. Signal values stored with data. Raw data collection and display.

DIMENSIONS

Weight	4.7 lbs
Form Factor/Size	H 11.54", L 9.04", W 3.27"

DATA

Format	Data files can be opened and post processed with Excel or a text processor
Storage	Removable SanDisk(SD) card

