

# ET-10 HANDHELD THERMAL EMISSOMETER

## Emittance at 3-5 and 8-12 microns

The ET10 answers the long-standing need for measuring emissivity as an entry parameter for calibrating infrared thermography devices. The ET10 measures total reflectance and directional emissivity at 20 degrees angle of incidence for 3-5 and 8-12 microns. View results immediately on the touch screen display.

### BENEFITS

- **MWIR/LWIR sensors**  
3-5 and 8-12  $\mu\text{m}$  bands.
- **Room temperature samples**  
Calculate emissivity without heating sample.
- **Fast warm up**  
90 sec warm up, no equilibration between measurements.
- **Portable**  
Battery powered cordless design.
- **Rapid measurements**  
Measure total solar reflectance in 7 seconds.
- **Immediate data**  
Touch screen display for data review and management.
- **Fast calibration**  
One minute calibration at start of measurement session.

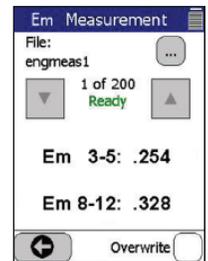
### APPLICATIONS

- **Defense | Aerospace**  
IR Signature | Low observable paint & coatings
- **Radiative Heat Transfer**  
Emissivity for thermal modeling | Thermal camera calibration
- **Semiconductors**  
Wafer fab hardware emissivity
- **Cool Building Materials**  
Energy performance | Thermal modeling



### EXAMPLE MENU SCREENS

Measurement screen. Results are displayed on the liquid crystal display touchscreen, and stored on a SecureDigital (SD) card.



### ORDERING

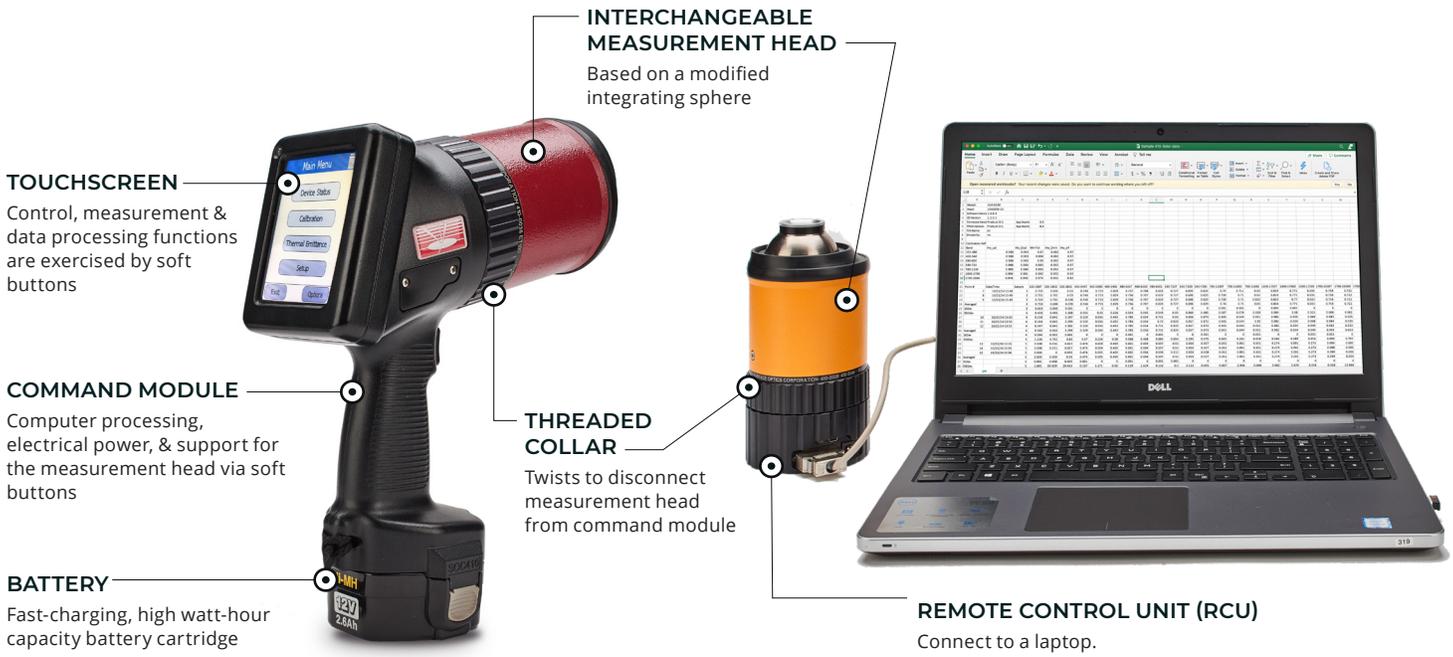
Standard components	0410-0008 0410-0001 0410-0100	ET10 Emissometer Measurement Head Handheld Command Module - 120VAC Specular Gold Calibration Coupon (Non-NIST Traceable)
Options	0410-0002 0410-0101 0410-1016 0410-1009 0410-1004 0410-0209 0410-0200 0410-0019	Benchtop Remote Control Unit - 120VAC Specular Gold Calibration Coupon (NIST Traceable) 410-Series Reflectometer Maintenance and Calibration Plan (Non-NIST) 410-Series Reflectometer Maintenance and Calibration Plan (NIST) ET10 Extended Warranty SD Card for Extra Data Storage Handheld Command Module - 220VAC Benchtop Remote Control Unit - 220VAC

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

# SPECIFICATIONS ET-10

ET-10	
<b>MEASURED DATA</b>	
<i>Measured Parameter</i>	Directional hemispherical reflectance (DHR)
<i>Method</i>	Integrated total reflectance in a band for a given angle of incidence
<i>Measured Value</i>	Absolute reflectance (0-1)
<i>Calculated Value</i>	Directional thermal emissivity at 20°
<i>Wavelength Bands (microns)</i>	3.0-5.0, 8.0-12.0
<i>Angle of Incidence</i>	20° from normal incidence
<i>Calibration Coupon</i>	Specular Gold
<b>PERFORMANCE</b>	
<i>Accuracy</i>	+/- .03
<i>Repeatability</i>	±.005 units
<i>Beam Spot Size</i>	0.50 inches
<i>Measurement Time</i>	7 sec
<i>Sample Size &amp; Geometry</i>	Flat: ≥ 0.5 in. diameter Curved: 6 in. convex; 12 in. concave
<i>Warm Up Time</i>	90 seconds
<i>Time Between Measurements</i>	2 seconds
<i>Sample Temperature</i>	Ambient or heated/cooled to 0 - 100° C
<i>Operating Temp</i>	0° to 40° C
<b>POWER</b>	
<i>Run Time</i>	2 hours on one battery. Battery easily replaced with continuous operation after battery replacement.
<i>Power Source</i>	Rechargeable battery (standard environmentally friendly NiMH)
<i>Battery Recharge Time</i>	1 hour
<i>IR Source</i>	Kanthal filament operated at about 1,000°C
<b>ENVIRONMENT</b>	
<i>Storage</i>	-25° to 70°C
<i>Operating</i>	0° to 40° C
<b>DIMENSIONS</b>	
<i>Weight</i>	4.7 lbs
<i>Form Factor/Size</i>	H 11.54", L 9.04", W 3.27" (29.31 cm x 22.96 cm x 9.44 cm)
<b>INTERFACE</b>	
<i>Operator Interface</i>	LCD graphics screen, 1/4 VGA, touch screen, software buttons; trigger switch in handle
<i>Inspection Applications</i>	Pass/fail can be incorporated, user set values
<i>Diagnostics</i>	On screen status and signals monitor. Signal values stored with data. Raw data collection and display.
<b>MISCELLANEOUS</b>	
<i>Date Format</i>	Data files can be opened and post processed with Excel or a text processor
<i>Data Storage</i>	Removable SanDisk (SD) card
<i>Export control</i>	ECCN #3A999.F

# 410 SERIES REFLECTOMETERS & EMISSOMETERS



## HANDHELD CONFIGURATION

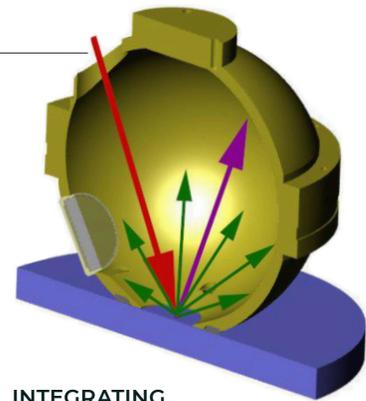
## BENCHTOP CONFIGURATION

### METHODOLOGY

The basic structure of 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 410 Series Reflectometers measures the integrated surface reflectance of a surface at a given angle of incidence ( $20^\circ$  or  $60^\circ$ ). 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 Series Reflectometer 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 on-board processor, stored in memory, and then used to determine the target sample reflectance at each incident angle and wavelength band. Those reflectances are used to calculate additional properties such as directional thermal emittance or total hemispherical emittance. Results are displayed on the liquid crystal display touchscreen, and stored on a SecureDigital (SD) card.



### INTEGRATING SPHERE SCHEMATIC

Schematic of the integrating sphere in contact with a sample.  
Red arrow - illuminating beam  
Purple arrow - reflected beam  
Green arrows - scattered light

### CALIBRATION COUPON



### CALIBRATION

An easy calibration process is required before each measurement session. The software GUI will walk the user through the process. Calibration is performed using calibration coupon(s) with known reflectance values.

# 410 REFLECTOMETERS MODEL COMPARISON GUIDE

The SOC410 Series Reflectometers are portable contact measurement devices designed to take precise, accurate reflectance and emittance measurements. Made with an ergonomic power-drill design, the SOC410 Series lets you easily take measurements in-the-field or around the lab—no cords or external batteries necessary. The world's largest defense, aerospace, and energy companies rely on SOC410 data.



Model	410-Solar	410-Solar-i	410-VIS-IR	ET-100	ET-10	410-DHR
<i>Spectral Bands</i>	335 - 380 nm 400 - 540 nm 480 - 600 nm 590 - 720 nm 700 - 1100 nm 1000 - 1700 nm 1700 - 2500 nm	335 - 380 nm 400 - 540 nm 480 - 600 nm 590 - 720 nm 700 - 1100 nm 1000 - 1700 nm 1700 - 2500 nm	Dual measurement head package consisting of a 410-Solar model and ET100 measurement heads with a single command module	1.5 - 2.0 $\mu\text{m}$ 2.0 - 3.5 $\mu\text{m}$ 3.0 - 4.0 $\mu\text{m}$ 4.0 - 5.0 $\mu\text{m}$ 5.0 - 10.5 $\mu\text{m}$ 10.5 - 21.0 $\mu\text{m}$	3.0-5.0 $\mu\text{m}$ 8.0-12.0 $\mu\text{m}$	0.9 - 1.1 $\mu\text{m}$ 1.9 - 2.4 $\mu\text{m}$ 3.0 - 4.0 $\mu\text{m}$ 3.0 - 5.0 $\mu\text{m}$ 4.0 - 5.0 $\mu\text{m}$ 8.0 - 12.0 $\mu\text{m}$
<i>Calculated Properties</i>	Total, diffuse & specular reflectance absorptance	Total reflectance/absorptance		In-band total reflectance Directional thermal emissivity at 20° Directional thermal emissivity at 60° Hemispherical thermal emissivity	Directional thermal emissivity at 20°	In-band total reflectance In-band emissivity
<i>Angle of Incidence</i>	20°	20°		20° and 60°	20°	20° and 60°
<i>Calibration Coupon(s)</i>	Solar Diffuse Solar Specular	Glazed Ceramic		Specular Gold	Specular Gold	Specular Gold
<i>ASTM Compliance</i>	C1549 E903 E1980	C1549 E903 E1980		E408 E1980		N/A



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