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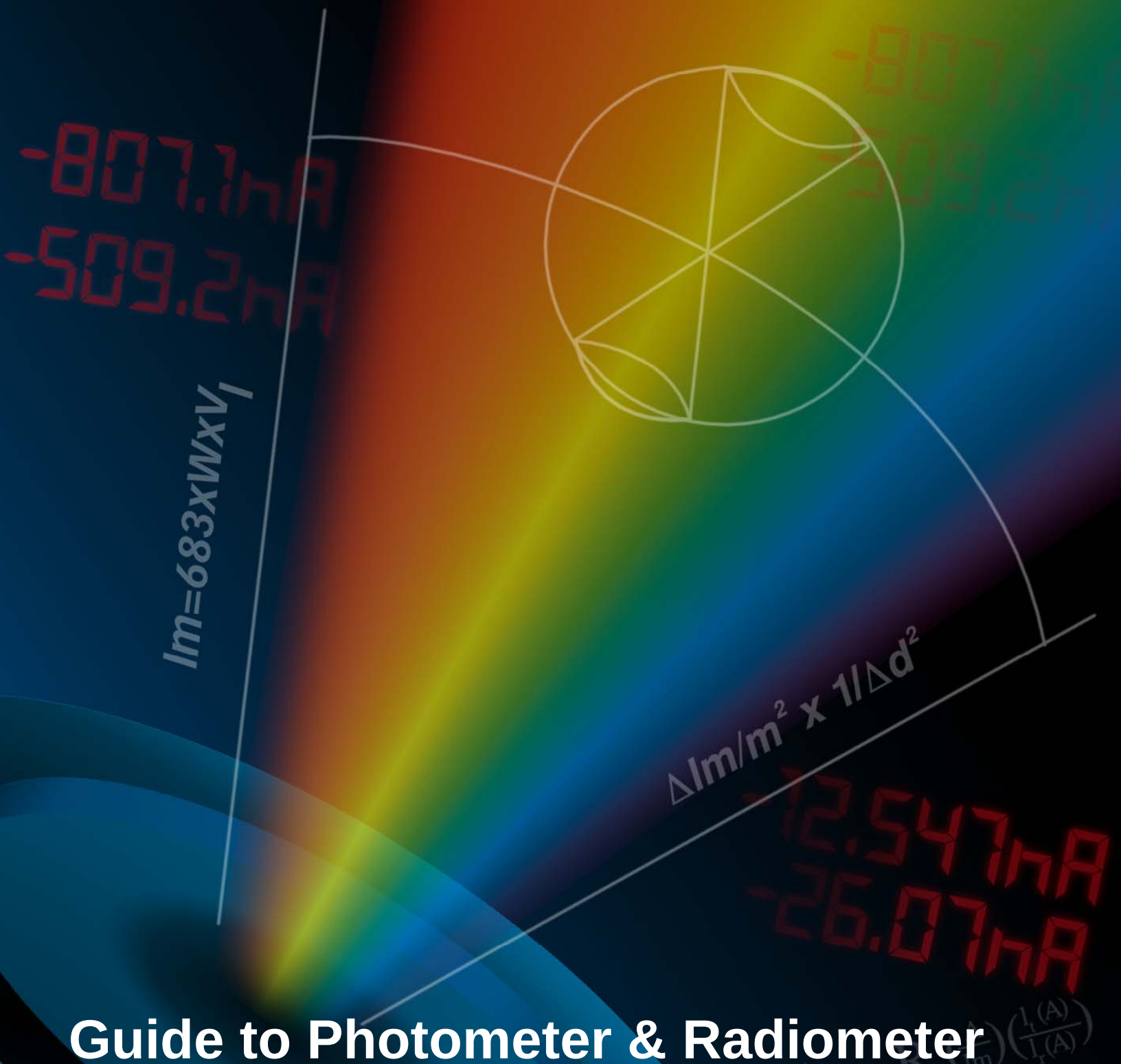
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UDT INSTRUMENTS

MAKING LIGHT WORK OF LIGHT MEASUREMENT



Guide to Photometer & Radiometer

System Configuration

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System Configuration Guide

for PHOTOMETRY & RADIOMETRY

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Introduction

OVERVIEW

GUIDE to SYSTEM CONFIGURATION



UDT Instruments offers a wide range of solutions to meet your light-measurement needs. Our extensive selection of photosensors, optometers, and accessories, supported by state-of-the-art calibration facilities, allows our applications engineers to assemble and configure a tremendous variety of photometric and radiometric systems.

To simplify the selection of options available, we have defined a set of standard bundles, which represent a sample of the photometric solutions available from UDTi. Our **most popular bundled solutions** are listed by application on our website:

Applications

- Display Measurement
- LED Test & Measurement
- Laser Power Measurement
- Fiber-Optic Testing
- General Photometry
- General Radiometry

A still wider variety of systems may be configured by combining system components from the UDTi catalog, according to specific application requirements. Our technical sales team is always available to help you to specify an appropriate solution. For those who prefer to define their own solution, the following guide is intended to help identify the optimum system configuration to meet your needs.

Beyond the range of options achievable using standard components, our engineering staff stands ready, if needed, to design and build a custom system to meet your exact needs.

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CONFIGURING YOUR PHOTOMETER or RADIOMETER SYSTEM

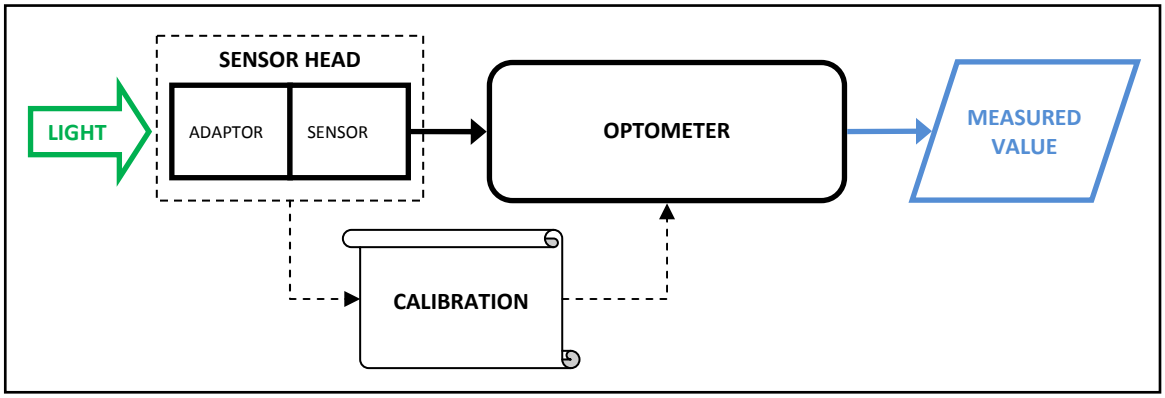


Figure 1 - Block Diagram, Optometer System: *A Photometer or Radiometer system consists of a calibrated **sensor head** combined with an **optometer**. The sensor head in turn consists of a **basic sensor** combined with an **optical adaptor**. The optometer is programmed with the sensor head **calibration** data, so that the system can display light measurement results in the appropriate units*

BACKGROUND: RADIOMETRY & PHOTOMETRY

Radiometry is a broad discipline, involving the measurement of electromagnetic radiation in terms of its *physical power*. Radiometric quantities include *radiant flux*, *radiant intensity*, *irradiance*, and *radiance*. Further information about radiometric concepts, and their practical application, can be found in our **Radiometry Tutorial**.

Photometry involves the measurement of electromagnetic radiation in terms of its *luminous power* - that is, its capacity to stimulate the human visual system, and to be perceived as light. Photometric quantities include: *luminous flux*, *luminous intensity*, *illuminance*, and *luminance*. Further information can be found in our **Photometry Tutorial**.

CONFIGURING AN OPTOMETER SYSTEM:

1) Choose a **SENSOR HEAD** Configuration
   a. Select a complete, preconfigured **SENSOR HEAD**, or…
   b. Assemble a sensor head from components:
      i. Choose a **BASIC SENSOR** – *based on spectral requirements*
      ii. Choose an **OPTICAL ADAPTOR** – *based on geometric requirements*

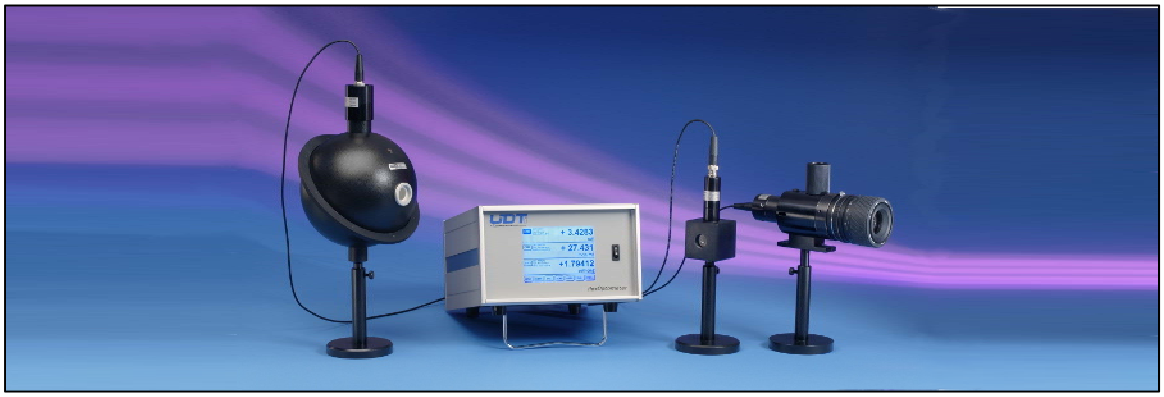
2) Choose an **OPTOMETER** – *taking into account the following factors:*
   a. Total number of sensors to be monitored
   b. Pulse Integration requirements
   c. Portability requirements/Available bench space

3) Specify a **CALIBRATION** – *usually indicated by choice of sensor head*

4) Add **MECHANICAL FIXTURES** *(if needed)*

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OPTOMETERS for PHOTOMETRY & RADIOMETRY



An *optometer* measures the photocurrent produced by a photometric or radiometric sensor, applies a predefined electro-optical calibration factor, and displays the result in optical units. A *photometer* system is built by coupling an optometer to a photometric sensor; a *radiometer* system is built by coupling an optometer to a radiometric sensor.

OPTOMETER SELECTION TABLE

Optometer Model #:	S470	S480	S490	S450	S471
Benchtop	✓	✓	✓		
Handheld				✓	✓
Number of Sensors	1	2	4	1	1
Flux Mode	✓	✓	✓	✓	✓
Energy Mode (Pulse Integration)	✓	✓	✓	✓	
PC Interface: USB	✓	✓	✓	✷	✷
PC Interface: RS-232	✓	✓	✓	✓	✓
PC Interface: RS-485	✓	✓	✓		

✷ *The S450 and S471 can be operated via an optional USB/RS-232 converter*

Photometric Sensors:

Models s470, s480, s490: flexOptometers
Model s471: Portable Optometer
Model s450: Portable Power/Energy Optometer

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flexOptometer

PRODUCT SUMMARY

The UDT Instruments flexOptometer is a high-performance radiometer/photometer designed to operate as either a stand-alone instrument or a computer-controlled, full-function photometric, radiometric or fiber optic measurement tool. Gamma's new model is available with a single head or with up to four interchangeable sensor heads for optimal flexibility. The 4-channel, flexOptometer includes a new touch-screen backlit LCD interface that offers the end user immediate readout results. Highly configurable via the USB, RS-232, RS-485, and IEEE-488.2 computer interfaces, it is easy to integrate into existing lab instrument architectures. The new light-measuring instrument offers faster, more accurate measurements than any previously available optometric system.

The electronic design is based on Gamma Scientific's advanced performance, highly reliable, TIA-3000 measurement systems, which have become the primary working standards of several National Standards Labs. The transimpedance amplifier design gives very stable DC measurements down to the femptowatt (10^{-15} Watt) level. It also includes a pulse-integrator for pulsed energy measurements . The instrument is designed as a laboratory grade optometer, with the robustness to operate flawlessly on even the most rigorous production lines. The optometer can be configured with UDTi's extensive collection of optical sensors making it suitable for a wide variety of light measurement applications. Simply put, the flexOptometer is the ideal instrument for measurement applications such as display, LED, laser power, fiber optics, strobe or signal measurements and more.



FEATURES

- ***Available in single and multi-channel models:***

  Model S470 *Single-channel*
  Model S480 *Dual-channel*
  Model S490 *Four-channel*

- *Touch screen back-lit LCD display*
- *Configurable from 1 up to 4 measurement Sensor heads*
- *USB, RS-232-, RS-485, and IEEE-488.2 PC interfaces*
- *Low-light level measurements down to 10^{-15} Watts or 10^{-8} Lux*
- *Silicon, photomultiplier, germanium and indium-gallium-arsenide (InGaAs) detectors available*
- *Configurable with World-class photopic detectors (f1' < 1%)*

APPLICATIONS

- *Display Measurements*
- *LED Measurements*
- *Fiber-optic Measurements*
- *Laser Power Measurements*
- *Strobe & Signal Measurements*
- *Lamp Measurements*
- *Night-Vision Testing*
- *Customized optics for any application*

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flexOptometer

SPECIFICATIONS

Electronic	Integrator
Eight Photometric/Radiometric Ranges	Four Integrate Ranges
Range-to-Range Linearity <0.1% for most ranges (<0.25% for most sensitive range)	Range-to-Range Linearity <0.1% for most ranges (<0.25% for most sensitive range)
Sensitivity: 10^{-15} to 10^{-3} Amps	Sensitivity: 10^{-14} to 10^{-3} coulomb
Resolution: $1x10^{-15}$ Amps	Decay Error: analog-approx. 0.01% / sec
Dark Current Suppression: 50 nA Max	Digital-holds reading indefinitely
Noise: $<5x10^{-15}$ Amps	
Frequency Roll-off: <10 Hz on most sensitive range	
A-to-D converter: 24-bit for each decade	

Radiometric/Photometric Ranges		
Radiometric Units*	**Range**	**Sensor Configuration**
Irradiance	< 0.020 nanoWatts/cm² to 3000 microWatts/cm²	Model 221
	< 0.055 nanoWatts/cm² to 8000 microWatts/cm²	Model 247
Irradiant Energy	<0.04 nanoJoules/cm² to 1.0 microJoules/cm² **	Model 221
	<0.075 nanoJoules/cm² to 1.0 microJoules/cm² **	Model 247
Radiant Flux	< 0.020 nanoWatts to 3000 microWatts	Model 221
	< 0.055 nanoWatts to 8000 microWatts	Model 247
Photometric Units*		
Luminous Intensity	< 0.0001 candelas to 10,000 candelas	Model 424 CIE 127 Condition B Configuration
Illuminance	< 0.005 lux to 500,000 lux	Model 211
Luminance	< 0.007 candela/m² to 1,200,000 candela/m²	Model 2153
Illuminant Energy	<0.005 lux*seconds to 10 lux*seconds ***	Model 211

General	
Automatic/Manual ranging	
Microprocessor Controlled Functions	
High Voltage circuit for photomultipliers (300-1500 Volts)	
Thermo-electric coolers for Sensor and filter stabilization	
USB, RS-232, RS-485 and IEEE-488.2 Communications	
Analog Output	
Power Input: 12.0 volts DC	
Operating Temperature Range: 0 to 50° C	
Humidity: 0% to 95% RH non-condensing	
Length (flexOptometer)	13.00 inches (33.02 cm)
Width (flexOptometer)	8.55 inches (21.72 cm)
Height (flexOptometer)	5.22 inches (13.26 cm)

*Ranges based on system configured with a 1 square centimeter silicon sensor and corresponding accessories
**Model 221 Maximum integrated energy 4.0 microJoules/cm² . Lower energy pulses will allow the average energy measurement to very accurate **Model 247 Maximum integrated energy 10.5 microJoules/cm² . Lower energy pulses will allow the average energy measurement to very accurate ***Model 211 Maximum integrated energy 450 lux*seconds . Lower energy pulses will allow the average energy measurement to very accurate

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flexOptometer

SPECIFICATIONS

Sensors & Accessories (see Photosensors & Sensor Heads datasheet for more information)			
UV/Visible		**Photometric**	
221	Silicon Sensor (350-1100nm) 1cm^2 active area	211	Photometric Sensor with Cosine Receptor (Illuminance)
222	Silicon Sensor (200-400nm) 1 cm^2 active area	265	Photometric Display Brightness Sensor (Luminance)
268UVA	Low Profile UVA Optimized Sensor Head (365 nm)	268P	Low-Profile Photometric Sensor with Cosine Receptor
268UVC	Low Profile UVC Optimized Sensor Head (254 nm)	2153	Photometric Sensor with 13 degree FOV Lens (Luminance)
268BLUE	Low Profile Blue Optimized 450 nm Sensor	424	LED Photometric Sensor (CIE 127 Luminous Intensity)
Radiometric		**Laser Power**	
247	Flat Response Sensor	264	Miniature Attenuated Laser Sensor Head
268R	Low Profile Flat Response Sensor	268LP	Low Profile Laser Sensor Head
424R	LED Radiometric Sensor (CIE 127 Radiant Intensity)	**Infrared**	
		261	Miniature Infrared Germanium Sensor (800-1750nm)
		280	Miniature Infrared InGaAs Sensor (800-1750nm)

*Standard Operating Range for Gamma Scientific Instruments- Temperature: Minimum: 0°C (32°F) - Maxi-mum: 35°C (95°F); Relative Humidity (Non-Condensing): Minimum: 20% -Maximum 70%
**The information contained in this data sheet is based on Gamma Scientific's internal evaluation and is sub-ject to change at any time without notice
***Revised on JOctober 13, 2015

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Model S471 Portable Optometer

PRODUCT SUMMARY

The UDT Instruments Model S471 is a high-performance handheld optometer, designed for use in both laboratory and field environments. Compatible with the full range of UDTi sensor heads, the Model S471 is easily configured as a high-performance radiometer or photometer with a dynamic range of over nine decades. The Model S471 features high sensitivity, sophisticated microprocessor control and three data-presentation options: Direct display with analog bar, RS-232 computer interface, and programmable analog voltage output.

The Model S471's sensitivity enables electrical measurements in the 10-pA range with less than 5% uncertainty. This makes the instrument ideally suited for challenging low-light measurement applications. The Model S471 also provides wide dynamic range and high sampling rates. The S471 can store nine spectral calibrations or fifty single-point calibrations. All calibrations are traceable to the National Institute of Standards and Technology (NIST).

Operating conveniences include a large, backlit LCD for easy readout; intuitive operation via a simple touch keypad; a "calibration information center" that stores a wealth of calibration information for instant recall; long battery life (or direct external power); and an optional USB-to-serial bridge converter. The unit is enclosed in a ruggedized housing built to withstand the rigors of day-to-day field use.

CONFIGURATION OPTIONS

The S471 can be configured with a wide range of different sensors and calibrations in order to perform measurements of quantities including:

- *Luminous Flux (lumen) or Radiant Flux (Watt)*
- *Illuminance (lux, foot-candle) or Irradiance (W/m^2)*
- *Luminous Intensity (candela) or Radiant Intensity (W/sr)*
- *Luminance (cd/m^2, footLambert) or Radiance (W/m^{2}sr)*



The UDT Model S471 is compatible with the full range of UDTi sensor heads. The unit is shown here configured as a simple spot luminance meter.

FEATURES

- *High-accuracy*
- *Wide dynamic range*
- *High sampling rates*
- *Programmable low-pass or boxcar averaging*
- *Electronic Temperature-drift compensation*
- *Large calibration capacity*
- *Calibration data/accessories information center*

- *Simple touch keypad controls*
- *Icon driven menus*
- *Large backlit LCD graphical display*
- *Portable and durable*
- *Compact and Light-weight*
- *Rechargeable NiMH battery or AC powered*
- *RS-232 or optional USB computer interface*

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Model S471 Portable Optometer

PRODUCT SUMMARY

Analog to Digital Accuracy

	Full Scale	A to D Converter Resolution	% of Full Scale
A	4.12 mA	8 nA	±.02%
B	412 µA	800 pA	±.02%
C	41.2 µA	80 pA	±.02%
D	4.13 µA	8 pA	±.02%
E	416 nA	800 fA	±.04%
F	45.4 nA	87 fA	±.04%
G	4.12 nA	8 fA	±.04%

Electrical Accuracy
± 1.2 % ± 2 counts

Dynamic Range
$9^{1/2}$ Decades Linear (Power)
$9^{1/2}$ Decades (Log)
$9^{1/2}$ Decades (Energy)

Data Presentation
Handheld Display
RS-232 Computer Interface
Analog Output

Analog Output
± 4.0 Volts, selectable slope

Computer Interface
RS-232 or USB via optional serial to USB converter

Bandwidth
7.5 Hz

Sampling Rate
18.9 msec

Averaging Modes
Low pass or Boxcar average, programmable

Update Rates
RS-232 (Display enabled): 2 times / second
RS-232 (Display disabled): Up to 53 times / second

Communication Rate
9600 Baud

Calibration Capacity
9 spectral calibrations or 50 single point calibrations

Calibration Traceability
All calibrations traceable to the National Institute of Standards and Technology (NIST)

Sensor Configuration
Compatible with all UDT Instruments Sensors

Display
Monochrome Graphic 128x64 dot chip-on-glass LCD

Display Modes
Linear
Log
Analog (Bar graph)

Displayed Precision
Up to 4.5 Digits

Display Update Rate
2 Times / sec

Power Source (DC)
Rechargeable Integral Battery Pack
Five NiMH AA, 1800 mA hr batteries

Recharge Time
< 4 Hours

Operational Battery Life

Backlight Off:	32 Hours
Backlight On:	24 Hours

Power Source (AC)
100-240V 0.7A 50-60 Hz
Output: 12V DC, 2.5 A (Center Conductor Positive)
TUV, CSA, UL, CE Approved

Operating Temperature Range
10 deg C to 60 deg C

Storage Temperature Range
-20 deg C to 35 deg C for <1 year

Display Unit Dimensions

Height	36 mm (1.4")
Width	114 mm (4.5")
Length	234 mm (9.25")
Weight	590 g (1.3 lb)

Power Supply Dimensions

Height	41 mm (1.63")
Width	59 mm (2.3")
Length	112 mm (4.4")
Weight	267 g (0.59 lb)
Cable length	1.04 m (41.0")

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Model S450 Power / Energy Optometer

PRODUCT SUMMARY

The UDT Instruments Model S450 is a high-performance handheld Power / Energy Optometer designed for both laboratory and field environments. The Model S450 features ultra-high sensitivity, sophisticated microprocessor control and three data-presentation options: Direct display with analog bar, RS-232 computer interface, and programmable analog voltage output. Compatible with the full range of UDT Instruments sensor heads, the Model S450 is easily configured as a high-performance radiometer, photometer or energy meter with a dynamic range of over nine decades.

The Model S450's sensitivity enables electrical measurements in the 10-pA range with less than 5% uncertainty. This makes the instrument ideally suited for challenging low-light measurement applications. The Model S450 also provides wide dynamic range, high sampling rates, and programmable averaging in low-pass or boxcar modes. The S450 can store nine spectral calibrations or fifty single-point calibrations. All calibrations are traceable to the National Institute of Standards and Technology (NIST).

Operating conveniences include a large, backlit LCD for easy readout; intuitive operation via a simple touch keypad; a "calibration information center" that stores a wealth of calibration information for instant recall; long battery life (or direct external power); and an optional USB-to-serial bridge converter. The unit is enclosed in a ruggedized housing built to withstand the rigors of day-to-day field use.

CONFIGURATION OPTIONS

The S450 can be configured with a wide range of different sensors and calibrations in order to perform measurements of quantities including:

- *Luminous Flux (lumen) or Radiant Flux (Watt)*
- *Illuminance (lux, foot-candle) or Irradiance (W/m^2)*
- *Luminous Intensity (candela) or Radiant Intensity (W/sr)*
- *Luminance (cd/m^2, footLambert) or Radiance (W/m^2sr)*
- *Pulse Energy (Joule)*



The UDT Model S450 is compatible with the full range of UDT Instruments sensor heads. The unit is shown here configured as a spot luminance meter, equipped with an optional variable field-of-view luminance optic (1120V).

FEATURES

- *Measures in Power or Energy mode*
- *High-accuracy*
- *Wide dynamic range*
- *Electronic Temperature-drift compensation*
- *High sampling rates*
- *Programmable low pass or boxcar averaging*
- *Large calibration capacity*
- *Calibration data/accessories information center*
- *RS-232 or optional USB computer interface*
- *Simple touch keypad controls*
- *Icon driven menus*
- *Large backlit LCD graphical display*
- *Rechargeable NiMH battery or AC powered*
- *Portable and durable*
- *Compact and Light-weight*

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Model S450 Power / Energy Optometer

SPECIFICATIONS

Analog to Digital Accuracy

	Full Scale	A to D Converter Resolution	% of Full Scale
A	4.12 mA	8 nA	±.02%
B	412 µA	800 pA	±.02%
C	41.2 µA	80 pA	±.02%
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E	416 nA	800 fA	±.04%
F	45.4 nA	87 fA	±.04%
G	4.12 nA	8 fA	±.04%

Electrical Accuracy
± 1.2 % ± 2 counts

Dynamic Range
$9^{1/2}$ Decades Linear (Power)
$9^{1/2}$ Decades (Log)
$9^{1/2}$ Decades (Energy)

Data Presentation
Handheld Display
RS-232 Computer Interface
Analog Output

Analog Output
± 4.0 Volts, selectable slope

Computer Interface
RS-232 or USB via optional serial to USB converter

Bandwidth
7.5 Hz

Sampling Rate
18.9 msec

Averaging Modes
Low pass or Boxcar average, programmable

Update Rates
RS-232 (Display enabled): 2 times / second
RS-232 (Display disabled): Up to 53 times per second

Communication Rate
9600 Baud

Calibration Capacity
9 spectral calibrations or 50 single point calibrations

Calibration Traceability
All calibrations traceable to the National Institute of Standards and Technology (NIST)

Sensor Configuration
Compatible with all UDT Instruments Sensors

Display
Monochrome Graphic 128x64 dot chip-on-glass LCD

Display Modes
Linear
Log
Energy
Analog (Bar graph)

Displayed Precision
Up to 4.5 Digits

Display Update Rate
2 Times / sec

Power Source (DC)
Rechargeable Integral Battery Pack
Five NiMH AA, 1800 mA hr batteries

Recharge Time
< 4 Hours

Operational Battery Life

Backlight Off:	32 Hours
Backlight On:	24 Hours

Power Source (AC)
100-240V 0.7A 50-60 Hz
Output: 12V DC, 2.5 A (Center Conductor Positive)
TUV, CSA, UL, CE Approved

Operating Temperature Range
10 deg C to 60 deg C

Storage Temperature Range
-20 deg C to 35 deg C for <1 year

Display Unit Dimensions

Height	36 mm (1.4")
Width	114 mm (4.5")
Length	234 mm (9.25")
Weight	590 g (1.3 lb)

Power Supply Dimensions

Height	41 mm (1.63")
Width	59 mm (2.3")
Length	112 mm (4.4")
Weight	267 g (0.59 lb)
Cable length	1.04 m (41.0")

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SENSORS for PHOTOMETRY & RADIOMETRY

UDT Instruments offers a wide range of photosensors for both photometric and radiometric applications. **Basic sensors**, used alone, are suitable for illuminance or irradiance measurements. Each type of sensor can be combined with various types of optical adaptors to form **sensor head assemblies** suitable for measurements of flux, intensity, luminance, or radiance.

UDTi photosensors and sensor heads are offered in three different mechanical configurations: Sensors from the *Standard Series* adapt for use with most accessories. The *Miniature Series* includes a similar range of sensors with a smaller-diameter package, compatible with UDTi's line of integrating sphere accessories. The *Low-Profile Series* is designed for applications with limited mechanical clearance.

BASIC SENSORS

Model#	Photometric (Illuminance)	Simple Radiometric (Irradiance)	Radiometric, Modified (Irradiance)
Standard Series	**#211**	**#221** - Si **#222** - Si (UV)	**#247** - Flat **#228** – 633nm
Miniature Series	**#263**	**#260** - Si **#261** – Ge **#280** – InGaAs	**#262** – Flat **#264** – Attenuated
Low-Profile Series	**#268P**	**#268S** - Si	**#268R** – Flat **#268LP** - Laser **#268C** - 254 nm **#268A** - 365 nm **#268BLUE** - 450 nm

Photometric Sensors:

Model 211: Illuminance Sensor Head
Model 263: Illuminance Sensor Head - Miniature
Model 268P: Illuminance Sensor Head - Low-profile

Radiometric Sensors:

Model 221: Silicon Sensor Head
Model 222: UV Sensor Head
Model 247: Flat Response Sensor Head
Model 260: Silicon Sensor Head - Miniature
Model 261: Germanium Sensor Head
Model 262: Flat Response Sensor Head - Miniature
Model 264: Laser Sensor Head
Model 280: InGaAs Sensor Head
Model 268LP: Laser Sensor Head - Low Profile
Model 268R: Flat Response Sensor Head - Low-Profile
Model 268UVA: UVA Optimized Sensor Head
Model 268UVC: UVC Optimized Sensor Head
Model 268BLUE: UV/Blue Optimized Sensor Head

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SENSORS for PHOTOMETRY & RADIOMETRY (continued)

SENSOR HEAD ASSEMBLIES			
Model#	Flux (Power)	LED Intensity	Luminance
Standard Series		#224 #424 #424R	#2153
Miniature Series	#s2575 #s2575GE #s2575R		#265 #265M

Photometric Sensor Heads:

Model 424: LED Measurement Head
Model 224: LED Measurement Head

Model 2153: Brightness Sensor
Model 265: Display Brightness Sensor
Model 265M: Display Brightness Sensor - Mini

Radiometric Sensor Heads:

Model 424R: LED Measurement Head - Radiometric

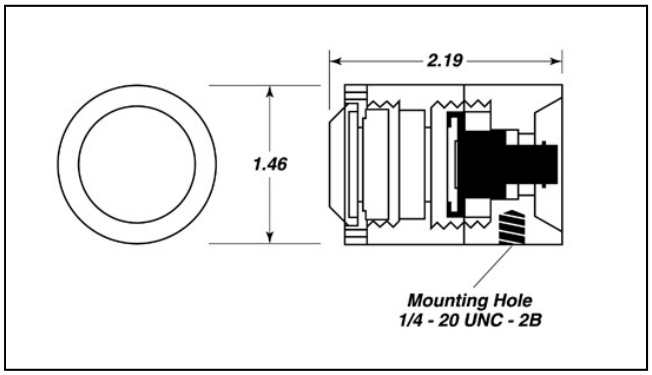
Model S2575: Silicon Sensor/Minisphere
Model S2575GE: Germanium Sensor/Minisphere
Model S2575R: Flat Response Sensor/Minisphere



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Illuminance Sensor Heads

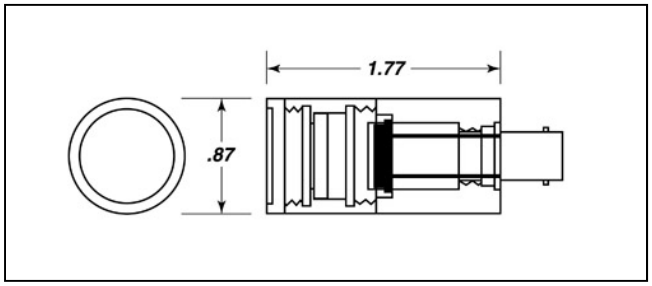
Model 211: Illuminance Sensor Head



The model 211 is UDTi's universal photometric head as it can be adapted for use with most accessories. It consists of a Standard Series silicon sensor a spectrally-matched photometric filter and a cosine diffuser to reduce directional sensitivity.

Standard Calibration(s)	lux; fc
Photometric Filter Accuracy	< 1.0%
CIE V(λ) function	< f_1' ≤ 3%
Sensor Active area (cm^2)	1
Dynamic Range	1.0E-02 - 5.0E+05 lux
Typical response	3.2E-09 A/lux @555 nm
Features	High accuracy photometric filter (f'1 < 3%)
Compatible Components	2525; 2500; 1153; 1120; 116; 124; 114; 105; 106; 107

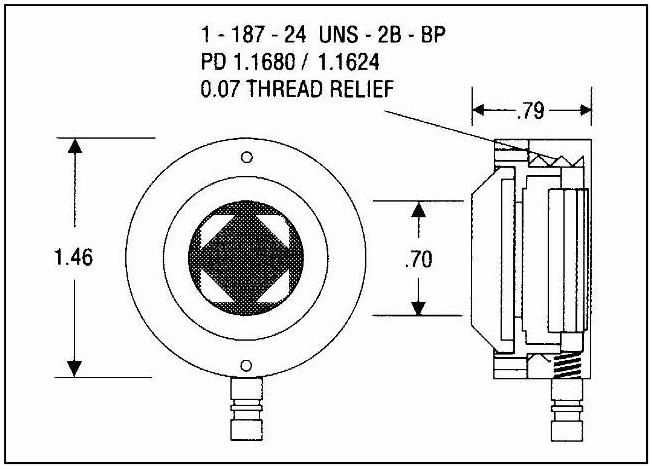
Model 263: Illuminance Sensor Head - Miniature



The Model 263 is a scaled-down version of the Model 211 designed for use in confined spaces. It consists of a silicon sensor with a spectrally-matched photometric filter and a cosine diffuser to reduce directional sensitivity.

Standard Calibration(s)	lux; fc
Photometric Filter Accuracy	< 1.0%
CIE V(λ) function	< f_1' ≤ 3%
Sensor Active area (cm^2)	0.34
Dynamic Range	5.0E-01 - 5.0E+05 lux
Typical response	7.3E-10 A/lux @555 nm
Features	High accuracy photometric filter (f'1 < 3%)
Compatible Components	2575; With adaptor #1718: 2525; 2500

Model 268P: Illuminance Sensor Head - Low-profile



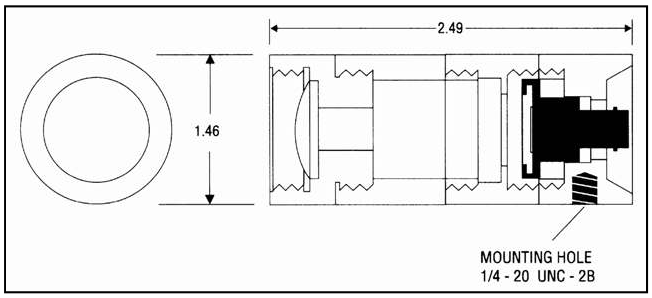
The Model 268P is a low-profile illuminance sensor designed for applications with limited mechanical clearance. Like the Model 211 It consists of a silicon sensor with a spectrally-matched photometric filter and a cosine diffuser to reduce directional sensitivity.

Standard Calibration(s)	lux; fc
Photometric Filter Accuracy	< 1.0%
CIE V(λ) function	< f_1' ≤ 3%
Sensor Active area (cm^2)	1
Dynamic Range	1.0E-03 - 2.0E+04 lux
Features	High accuracy photometric filter (f'1 < 3%)

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Luminance Sensor Heads

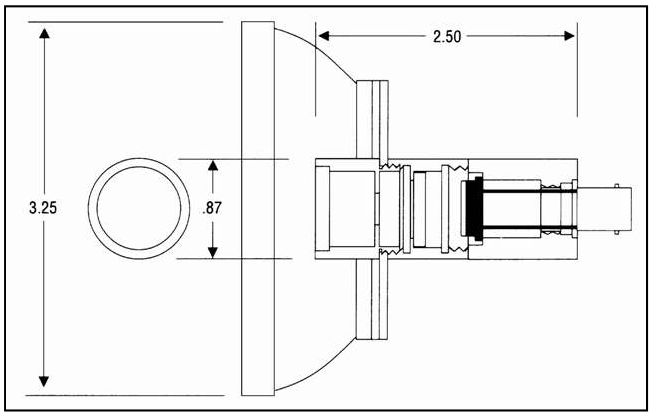
Model 2153: Brightness Sensor



The model 2153 is the UDTi standard luminance head with an integral lens that provides a fixed field-of-view of 13 degrees. It is suitable for measurement of the brightness (luminance) of diffuse surfaces or uniform light sources.

Standard Calibration(s)	nit (cd/m²); footlamberts
Photometric Filter Accuracy	< 1.0%
CIE V(λ) function	< f_1' ≤ 3%
Sensor Active area (cm²)	1
Dynamic Range	1.2E-02 - 1.0E+06 nit
Features	High accuracy photometric filter (f'1 < 3%)

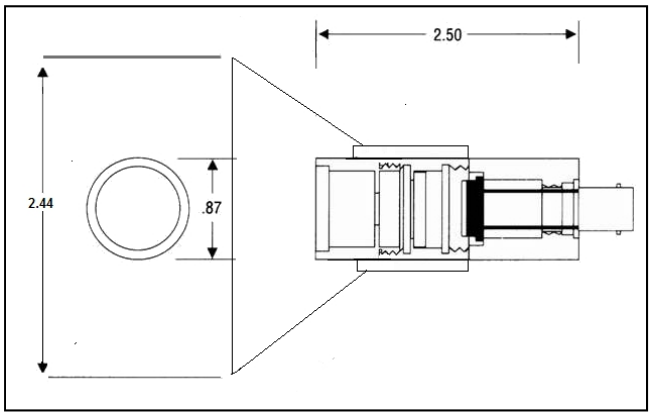
Model 265: Display Brightness Sensor



This luminance head was specifically designed for measuring display brightness. Its integral lens provides a fixed field-of-view of 13 degrees and a soft rubber light shade eliminates errors due to ambient light and keeps the display from being scratched during measurement.

Standard Calibration(s)	nit (cd/m²); footlamberts
Photometric Filter Accuracy	< 1.0%
CIE V(λ) function	< f_1' ≤ 3%
Sensor Active area (cm²)	0.34
Dynamic Range	1.0E-03 - 1.0E+05 cd/m²
Typical response	1.1E-09 A/cd/m² @0 nm
Features	High accuracy photometric filter (f'1 < 3%)

Model 265M: Display Brightness Sensor - Miniature



This luminance head was specifically designed for measuring display brightness. Its integral lens provides a fixed field-of-view of 13 degrees and a miniature fixed rubber light shade eliminates errors due to ambient light and keeps the display from being scratched during measurement.

Standard Calibration(s)	nit (cd/m²); footlamberts
Sensor Active area (cm²)	0.34
Typical response	1.1E-09 A/cd/m² @0 nm
Features	High accuracy photometric filter (f'1 < 3%)

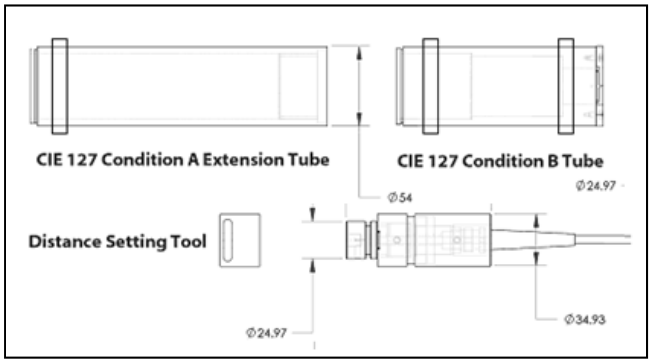
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LED Intensity Heads- Photometric

LUMINOUS INTENSITY (cd)

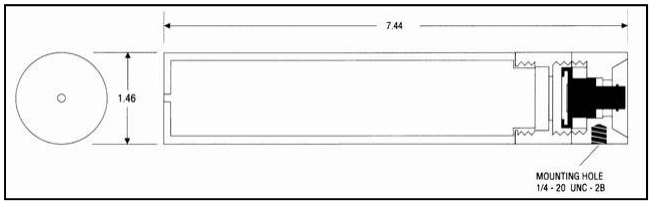
MODEL 424: LED MEASUREMENT HEAD



This sensor head couples a high-performance photopic sensor (based on the Model 211) with a special fixture to measure the averaged luminous intensity of LEDs according to the recommendations of CIE Publication 127 (illustrated above; LED Sockets sold separately). The intensity fixture precisely sets the distance and alignment between the LED and the sensor, so that measurement accuracy and repeatability are ensured. The system can easily be configured for either of the CIE-prescribed geometries: Condition A or Condition B. Measurement results are expressed in units of candela (cd). The sensor is calibrated over the visible spectral range, so that the nominal peak wavelength of the device under test can be selected during measurement, ensuring maximum possible measurement accuracy.

Standard Calibration(s)	Luminous Intensity (cd) for both CIE127 Conditions: A and B
Dynamic Range	1.0E-04 - 5.0E+04 cd

MODEL 224: LED MEASUREMENT HEAD



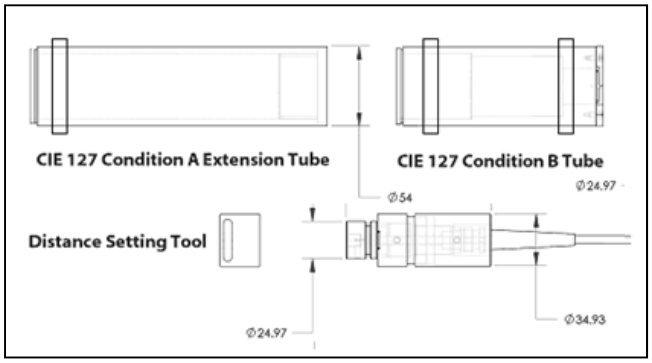
This sensor head makes use of a special fixture to measure lensed LEDs. This attachment fixes the distance and angle between the LED and the detector so that measurement accuracy and repeatability are ensured. *NOTE: For most applications, this sensor head has been replaced by the Model 424 CIE 127 Intensity head. The Model 224 is presently offered to support legacy applications.*

Standard Calibration(s)	candela (cd) @ specified wavelength
Photometric Filter Accuracy	< 1.0%
CIE V(λ) function	< f_1' ≤ 3%
Dynamic Range	1.0E-05 - 1.0E+03 cd

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MODEL 424R: LED MEASUREMENT HEAD - RADIOMETRIC



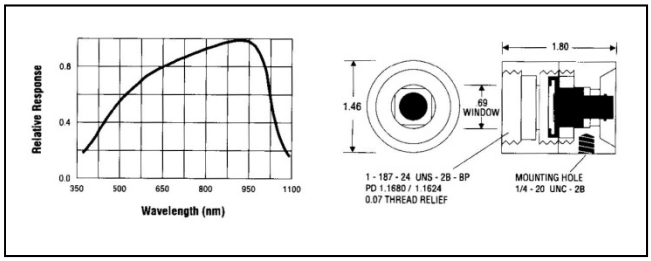
This sensor head couples a filtered silicon sensor with a flat spectral response (based on the **Model 247**) with a special fixture to measure the averaged radiant intensity of LEDs according to the recommendations of CIE Publication 127 (illustrated above; LED Sockets sold separately). The intensity fixture precisely sets the distance and alignment between the LED and the sensor, so that measurement accuracy and repeatability are ensured. The system can easily be configured for either of the CIE-prescribed geometries: Condition A or Condition B. Measurement results are expressed in units of watts per steradian (W/sr). The sensor's response is approximately constant (within ±5%) from 450 nm to 950 nm, to allow quick measurements of devices with unknown peak waelengths, etc. The sensor is calibrated over the a wider spectral range (350 - 1100 nm), so that the peak wavelength of the device under test (where known) can be selected during measurement, ensuring maximum possible measurement accuracy.

Standard Calibration(s)	Radiant Intensity (W/sr) for both CIE127 Conditions: A and B
Calibration range	350 - 1100 nm in 10 nm steps
Spectral Flatness	5%-7% over the 450 - 950 nm range

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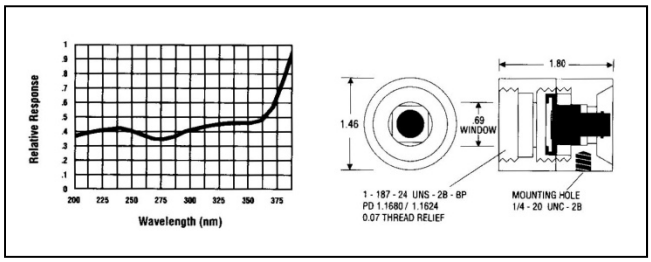
MODEL 221: SILICON SENSOR HEAD



The Model 221 is UDTi's basic silicon sensor. It can be adapted for use with Standard Series accessories.

Standard Calibration(s)	Watt
Sensor Active area (cm^2)	1
Dynamic Range	5.0E-11 - 2.4E-03 W
Calibration range	350 - 1100 nm in 10 nm steps
Typical response	5.1E-01 A/W @980 nm
Features	High linearity; low noise
Peak Wavelength (nm)	*
Compatible Components	All Standard Series accessories. (Filters; diffusers; integrating spheres; spacers; etc.)

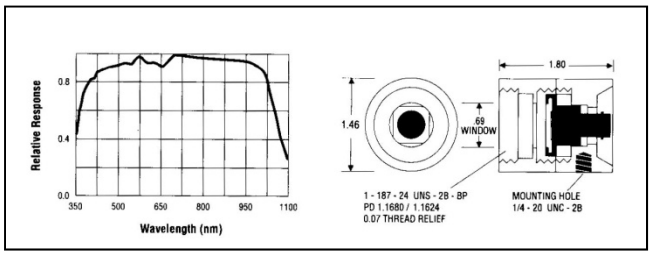
MODEL 222: UV SENSOR HEAD



The Model 222 is a Standard Series silicon sensor calibrated in the UV region (200 - 400 nm)

Standard Calibration(s)	Watt
Sensor Active area (cm^2)	1
Calibration range	200 - 400 nm in 10 nm steps
Typical response	1.5E-01 A/W @400 nm
Features	High linearity; low noise
Peak Wavelength (nm)	*

MODEL 247: FLAT RESPONSE SENSOR HEAD



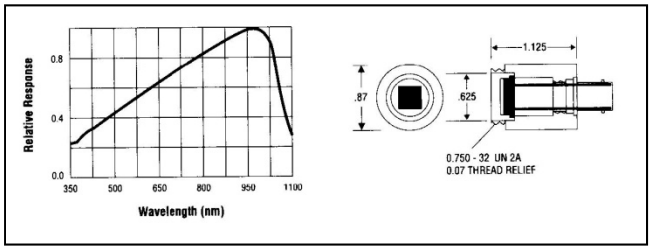
The Model 247 is UDTi's Standard Series flat response radiometric sensor. It can be adapted for use with Standard Series accessories.

Standard Calibration(s)	Watt
Sensor Active area (cm^2)	1
Dynamic Range	1.3E-10 - 6.4E-03 W
Calibration range	350 - 1100 nm in 10 nm steps
Typical response	1.9E-01 A/W @630 nm
Features	Precision Radiometric Filter
Spectral Flatness	5%-7% over the spectral range: 450 - 950 nm
Compatible Components	Standard Series accessories. (Diffusers; integrating spheres; spacers; etc.)

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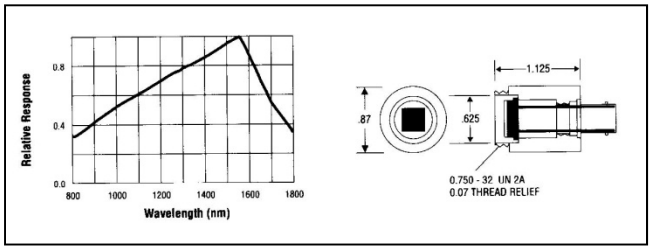
MODEL 260: SILICON SENSOR HEAD - MINIATURE



The Model 260 is UDTi's Miniature Series silicon sensor. It can be adapted for use with Miniature Series integrating spheres and other accessories.

Standard Calibration(s)	Watt
Sensor Active area (cm^2)	0.34
Dynamic Range	5.0E-11 - 1.5E-03 W
Calibration range	350 - 1100 nm in 10 nm steps
Typical response	5.1E-01 A/W @980 nm
Features	High linearity; low noise. Small package design.
Peak Wavelength (nm)	*
Compatible Components	All Miniature Series accessories. (Filters; diffusers; integrating spheres; spacers; etc.)

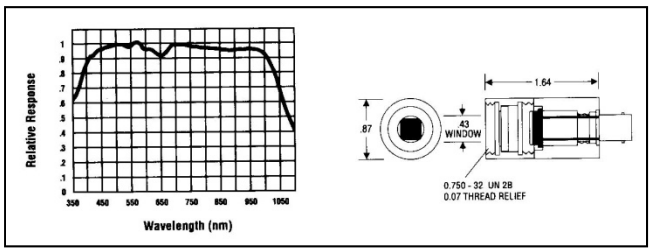
MODEL 261: GERMANIUM SENSOR HEAD



The Model 260 is UDTi's Germanium (Ge) sensor. It can be adapted for use with Miniature Series integrating spheres and other accessories.

Standard Calibration(s)	Watt
Sensor Active area (cm^2)	0.5
Dynamic Range	5.0E-10 - 6.0E-03 W
Calibration range	800 - 1750 nm in 10 nm steps
Typical response	7.6E-01 A/W @1300 nm
Features	Responsive over a range of telecommunication wavelengths.
Peak Wavelength (nm)	*
Compatible Components	Miniature Series integrating spheres; and Standard series integrating spheres (with Model 1718 step-up adaptor)

MODEL 262: FLAT RESPONSE SENSOR HEAD - MINIATURE

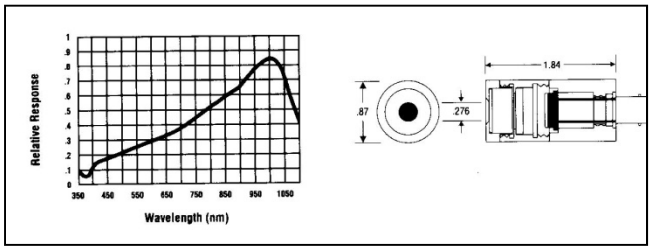


The Model 247 is UDTi's Miniature Series flat response radiometric sensor. It can be adapted for use with Miniature Series accessories.

Standard Calibration(s)	Watt
Sensor Active area (cm^2)	0.34
Dynamic Range	1.3E-10 - 4.0E-03 W
Calibration range	350 - 1100 nm in 10 nm steps
Typical response	1.9E-01 A/W @630 nm
Features	Precision Radiometric Filter
Spectral Flatness	5%-7% over the spectral range: 450 - 950 nm
Compatible Components	Miniature Series accessories. (Diffusers; integrating spheres; spacers; etc.)

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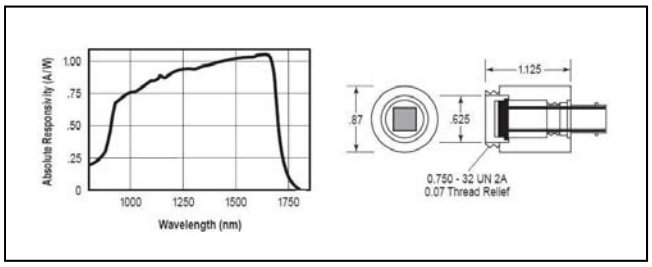
MODEL 264: LASER SENSOR HEAD



The Model 264 is a Miniature Series sensor specifically designed for laser power measurement. It consists of a Model 260 type sensor with a built-in diffuser and reduced aperture for attenuation of optical power.

Standard Calibration(s)	Watt - at single user-specified wavelength (350 - 1100 nm)
Aperture diameter (mm)	7
Dynamic Range	3.5E-08 - 4.0E-02 W
Typical response	2.4E-03 A/W @630 nm
Features	Laser Attenuator (diffuser)

MODEL 280: INGAAS SENSOR HEAD



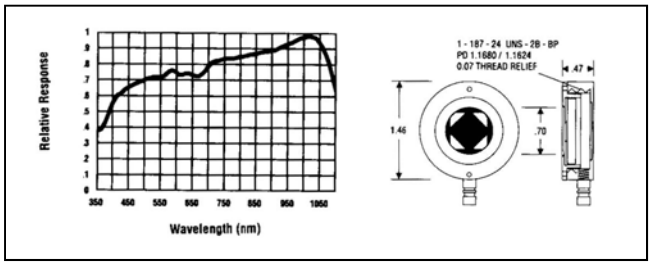
The Model 280 is UDTi's Indium-Gallium-Arsenide (InGaAs) sensor. It can be adapted for use with Miniature Series integrating spheres and other accessories.

Standard Calibration(s)	Watt
Aperture diameter (mm)	3
Dynamic Range	1.4E-04 - 2.2E-03 W
Calibration range	800 - 1750 nm in 10 nm steps
Typical response	9.5E-01 A/W @1550 nm
Features	Dynamic range: -8.5 to +3.5 dBm. Very low noise. Optimal sensor for measurement at 1550 nm.
Compatible Components	Miniature Series integrating spheres; and Standard series integrating spheres (with Model 1718 step-up adaptor)

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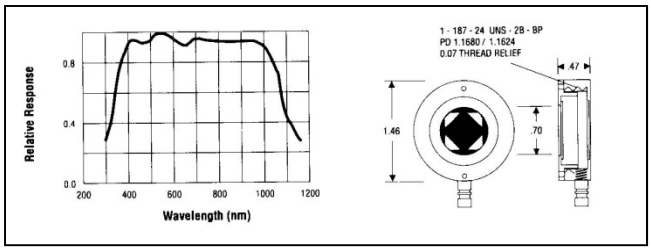
MODEL 268LP: LASER SENSOR HEAD - LOW PROFILE



The Model 268LP is a Low-Profile Series flat response radiometric sensor designed for Laser power measurement.

Standard Calibration(s)	Power (W) at user-specified wavelength
Aperture diameter (mm)	18
Dynamic Range	7.0E-10 - 6.0E-02 W
Calibration range	350 - 1100 nm in * nm steps
Typical response	3.0E-02 A/W @633 nm
Features	Radiometric Filter; Diffuser; 4.5 inch "lollipop"-style handle.

MODEL 268R: FLAT RESPONSE SENSOR HEAD - LOW-PROFILE



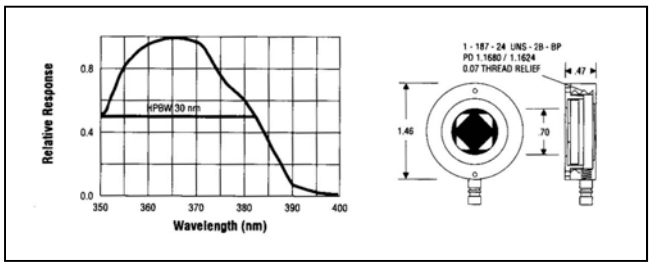
The Model 268R is a Low-Profile Series flat response radiometric sensor.

Standard Calibration(s)	Power (W) at user-specified wavelength
Sensor Active area (cm^2)	1
Dynamic Range	1.3E-10 - 6.0E-03 W
Calibration range	350 - 1100 nm in * nm steps
Typical response	2.0E-01 A/W @633 nm
Features	Radiometric Filter; 4.5 inch "lollipop"-style handle.
Spectral Flatness	5%-7% over the 450 - 950 nm range

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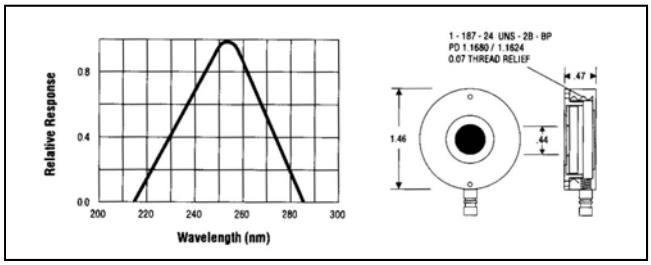
MODEL 268UVA: UVA OPTIMIZED SENSOR HEAD



The Model 268UVA is a Low-Profile Series radiometric sensor optimized for measurements in the UVA region (320 - 400 nm).

Standard Calibration(s)	Irradiance (W/cm²) at 365 nm
Sensor Active area (cm²)	1
Aperture diameter (mm)	18
Dynamic Range	5.0E-10 - 1.0E-01 W/cm²
Typical response	2.0E-02 A/W/cm² @365 nm
Features	365 nm Bandpass Filter; internal opal glass diffuser

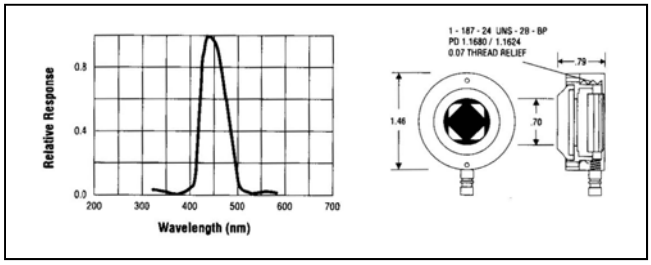
MODEL 268UVC: UVC OPTIMIZED SENSOR HEAD



The Model 268UVC is a Low-Profile Series radiometric sensor optimized for measurements in the UVC region (200 - 280 nm).

Standard Calibration(s)	Irradiance (W/cm²) at 254 nm
Sensor Active area (cm²)	1
Aperture diameter (mm)	11
Dynamic Range	5.0E-08 - 5.0E-01 W/cm²
Typical response	2.4E-03 A/W/cm² @254 nm
Features	254 nm Bandpass Filter; internal Teflon diffuser

MODEL 268BLUE: UV/BLUE OPTIMIZED SENSOR HEAD



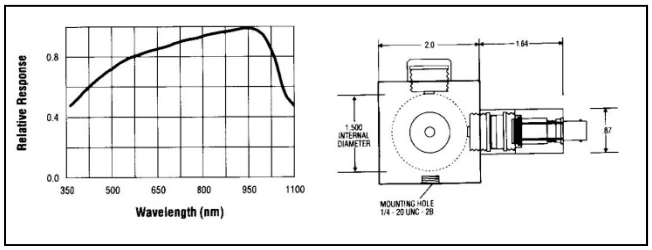
The Model 268BLUE is a Low-Profile Series radiometric sensor optimized for measurements in the blue region centered at 450nm.

Standard Calibration(s)	Irradiance (W/cm²) at 450 nm
Sensor Active area (cm²)	1
Dynamic Range	5.0E-10 - 5.0E-02 W/cm²
Typical response	3.1E-02 A/W/cm² @450 nm
Features	450 nm Bandpass Filter; Cosine Diffuser

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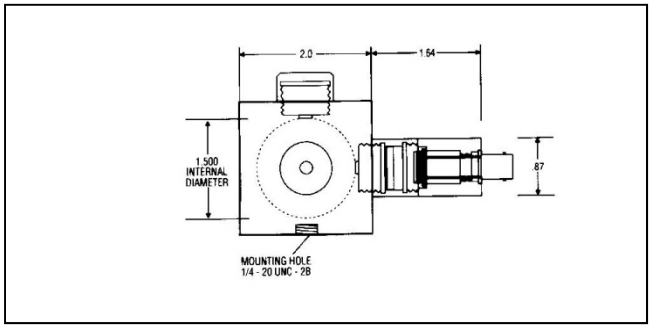
MODEL S2575: SILICON SENSOR/MINISPHERE



The Model S2575 consists of a Model 260 Silicon sensor coupled to a Model 2575 Integrating sphere.

Standard Calibration(s)	Power (W) at user-specified wavelength
Dynamic Range	3.0E-08 - 9.5E-01 W
Calibration range	450 - 1100 nm in * nm steps
Typical response	1.7E-03 A/W @940 nm
Features	Mini Integrating Sphere
Sphere diameter (mm)	50
Entrance Aperture diameter (mm)	5

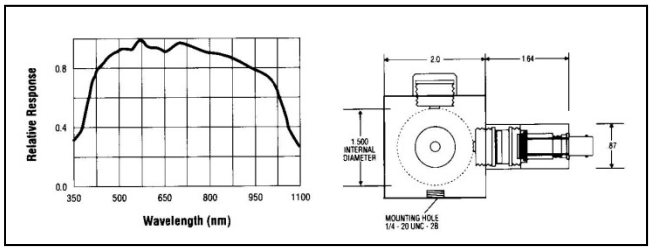
MODEL S2575GE: GERMANIUM SENSOR/MINISPHERE



The Model S2575GE consists of a Model 261 Germanium sensor coupled to a Model 2575 Integrating sphere.

Standard Calibration(s)	Power (W) at 1300 nm and 1550 nm
Dynamic Range	3.0E-09 - 1.6E+00 W
Calibration range	800 - 1750 nm in * nm steps
Typical response	1.9E-03 A/W @1300 nm
Features	Mini Integrating Sphere
Sphere diameter (mm)	50
Entrance Aperture diameter (mm)	5

MODEL S2575R: FLAT RESPONSE SENSOR/MINISPHERE



The Model S2575R consists of a Model 262 Flat-reponse sensor coupled to a Model 2575 Integrating sphere.

Standard Calibration(s)	Power (W) at user-specified wavelength
Dynamic Range	6.0E-08 - 1.8E+00 W
Calibration range	350 - 1100 nm in * nm steps
Typical response	9.0E-04 A/W @740 nm
Features	Radiometric Filter; Mini Integrating Sphere
Sphere diameter (mm)	50
Entrance Aperture diameter (mm)	5

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OPTICAL ACCESSORIES for PHOTOSENSOR SYSTEMS



Photosensors can be equipped with various types of optical adaptors to form *sensor head assemblies* suitable for diverse types of measurements. In addition to a range of preconfigured sensor heads, UDTi offers the following optical components to enable configuration of custom sensor heads for the measurement of flux, illuminance, irradiance, intensity, luminance, or radiance.

OPTICAL ADAPTORS

Model#	Flux (Power)	Illuminance /Irradiance	Intensity	Luminance /Radiance
Standard Series	2500 2525	2550		114 116 124 1120 1153
Miniature Series	2575 2575-10			

Flux Adaptors (Integrating Spheres):

Model 2500: Integrating Sphere - Standard Series
Model 2525: Integrating Sphere
Model 2575: Miniature Integrating Sphere
Model 2575-10: Mini Sphere-10mm Port

Luminance/Radiance Adaptors:

Model 114: Steradian Shade
Model 116: Luminance Probe
Model 124: Luminance Probe
Model 1120: Reflex Viewing Module
Model 1153: Lumilens

Irradiance Adaptor (Diffuser):

MODEL 2550: ATTENUATOR - STANDARD SERIES

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OPTICAL ACCESSORIES for PHOTOSENSOR SYSTEMS (continued)

OPTICAL FILTERS & FILTER HOLDERS				
Model#	ND Filters	Bandpass Filters	Aperture Set	Filter Holders
Standard Series	105 106 107	1112 1113 1114 1115	110	102 104
Miniature Series				104-Mini

Optical Filters:

Model 105: ND Filter - ND1
Model 106: ND Filter -ND2
Model 107: ND Filter -ND3
Model 1112: Bandpass Filter - 632.8 nm
Model 1113: Bandpass Filter - 905 nm
Model 1114: Bandpass Filter - 1064 nm
Model 1115: Bandpass Filter - 514.8 nm

Filter Holders:

Model 102: Filter Holder
Model 104: Filter Holder/Coupler
Model 104-MINI: Filter Holder/Coupler - Miniature

Aperture Assembly:

Model 110: Sensor Holder and Aperture Set

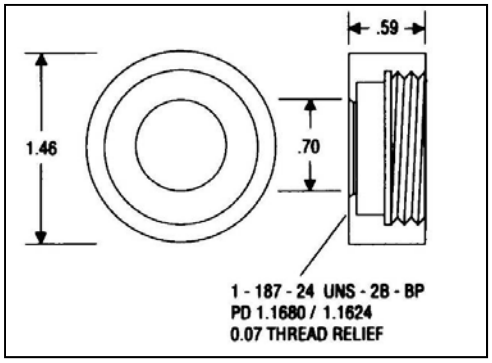




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Optical Filter Assemblies

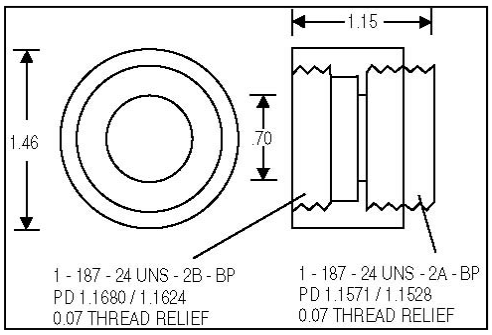
Models 105, 106, 107: ND Filters – ND1, ND2, ND3



These metallic neutral density filters are used for attenuating incident radiation. The degree of attenuation is approximately constant over a wide range of wavelengths (spectrally neutral). Assembly includes a Model 102 Filter Holder.

Attenuation	10:1 (ND1); 100:1 (ND2); 1000:1 (ND3)
Features	Metallic-type ND filter (Absorption-type filters are available by special order.)
Spectral Flatness	±1% over the spectral range: 350 - 800 nm
Compatible Components	211; 221; 222; 247

Models 1112, 1113, 1114, 1115: Narrow Bandpass Filters



UDT Instruments' bandpass filters provide a 10 nm half-power bandpass (FWHM) at peak wavelengths corresponding to common laser lines. Assembly includes a Model 104 Filter Holder. Other types of bandpass filters are available as special order items.

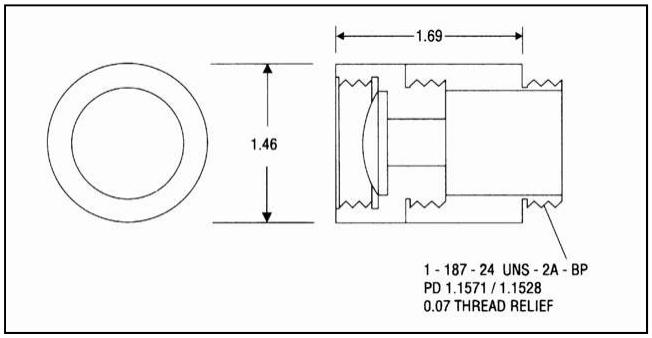
Features	Alternative peak and bandpass (FWHM) available upon request
Peak Wavelengths (nm)	
Model 1112:	632.8
Model 1113:	905
Model 1114:	1064
Model 1115:	514.8
Compatible Components	221; 222; 247

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Optical Adaptors – Luminance/Radiance

Model 1153: Lumilens

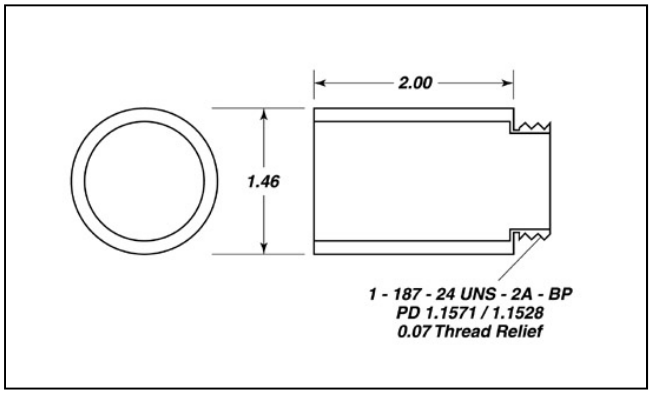


The Model 1153 converts a Model 211 illuminance sensor to a Model 2153 Brightness Sensor. It is intended for users who wish to make both illuminance and luminance measurements with a single sensor.

Standard Calibration(s) nit (cd/m²); footlamberts

Compatible Components 211; 221; 247

Model 114: Steradian Shade

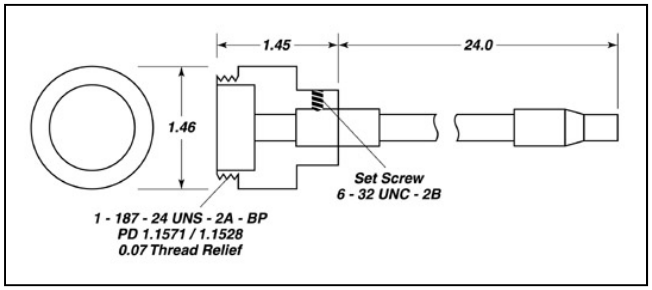


When used with a compatible sensor the Model 114 forms a 0.155 steradian field-of-view.

Standard Calibration(s) cd/m² (nit); footlamberts; W/cm²sr

Compatible Components 211; 221; 247

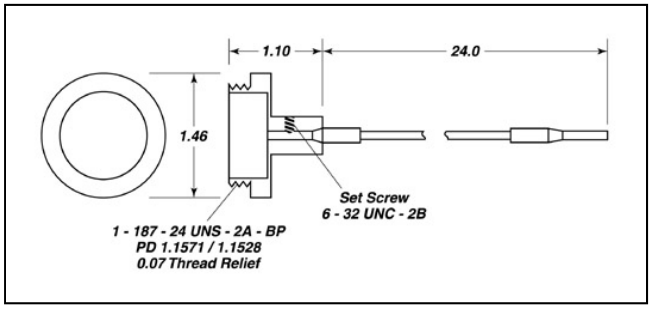
Model 116: Luminance Probe



For luminance measurements in difficult to reach places such as in photocopiers or photolithography systems UDT Instruments offers two luminance probes. Both are fiberoptic bundles. The model 116 is two feet long 0.25" fiber core which couple to the Model 211 sensor head.

Standard Calibration(s) nit (cd/m²); footlamberts
Aperture diameter (mm) 6.35
Dynamic Range 1.0E-02 - 1.0E+05 cd/m²
Compatible Components 211

Model 124: Luminance Probe

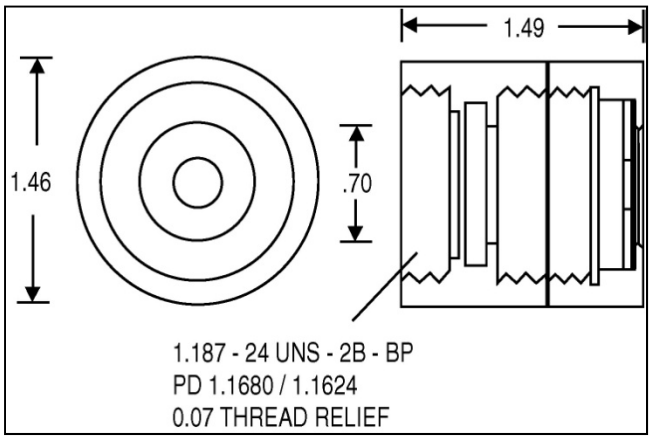


For luminance measurements in difficult to reach places such as in photocopiers or photolithography systems UDT Instruments offers two luminance probes. Both are fiberoptic bundles. The model 124 is two feet long 0.0625" fiber core which couple to the Model 211 sensor head.

Standard Calibration(s) nit (cd/m²); footlamberts
Aperture diameter (mm) 1.5
Dynamic Range 1.0E-01 - 1.0E+06 cd/m²
Compatible Components 211

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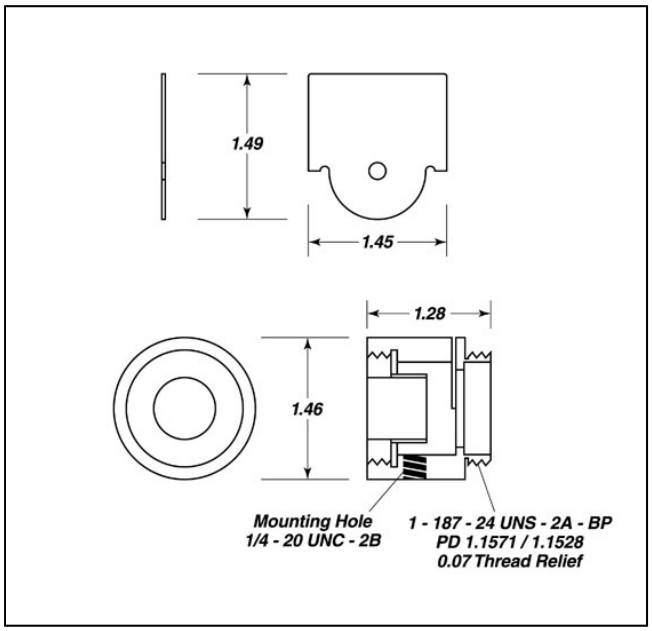
Model 2550: Attenuator - Standard Series



The Model 2550 uses separate layers of diffuse material to attenuate radiation reaching a sensor thereby increasing input power capacity. It is compatible with Standard Series sensors.

Standard Calibration(s)	Power (W) at user-specified wavelength
Attenuation	100:1 (nominal)
Calibration range	350 - 1100 nm in * nm steps
Features	Low attenuation
Entrance Aperture diameter (mm)	7
Compatible Components	221; 247

Model 110: Sensor Holder and Aperture Set



This accessory holds our standard 1cm^2 silicon photosensors. It is provided with five interchangeable apertures.

Features	Five Interchangeable apertures - 5mm; 6mm; 7mm; 8mm; 9mm.
Compatible Components	211; 224; 221; 222; 247

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Model 1120 Reflex Viewing Module

PRODUCT SUMMARY

Since the Model 1120 provides a direct view of the measurement field, it is ideal for CRT measurements of a single pixel, small pixel cluster, or narrow scan line. But it also enables users to measure distant objects, small light sources, or to survey the distribution of light across luminous surfaces.

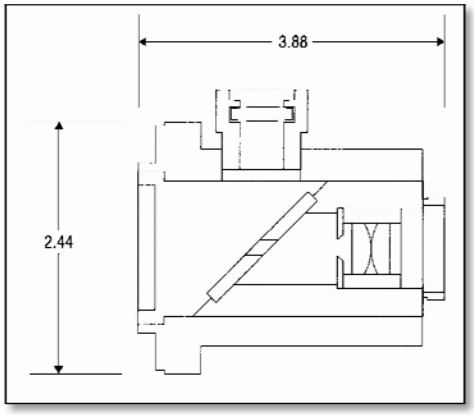
This accessory operates like a camera viewing system, since it splits the measurement and viewing fields. When attached to the front of the 1120, a camera lens or microscope objective focuses an object at the center of the internal 45° mirror. The user sees the object as an upright image in the eyepiece. A small hole in the center of the mirror allows a portion of the image to pass through. Then it is imaged by a relay lens onto the 211 sensor. To the user, the hole appears as a black spot on the object, corresponding to the actual area measured.

The Model 1120's field-of-view is established by the focal length of the lens affixed to it. Adapters are available to accept camera lenses or microscope objectives, converting the 1120 into a microphotometer or a telephotometer. Since UDT offers a variety of lens accessories, a system can be constructed to fit most any working-distance versus measurement-field-size requirement.

To ensure accuracy, the Model 1120 must be calibrated with each lens/aperture with which it is used. These calibrations are expressed in footlamberts or cd/m2.



Model 1120 – with optional lenses



Model 1120 – Section View

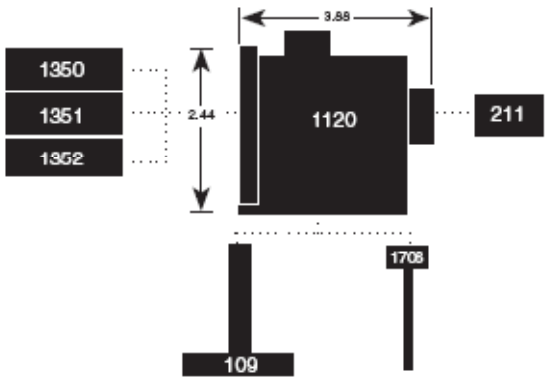
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Model 1120 Reflex Viewing Module

SPECIFICATIONS

MODEL 1120 REFLEX VIEWING MODULE IN TELEPHOTOMETER CONFIGURATION



Model 1120 Reflex Viewing Module in Telephotometer Configuration

Telephotometer Configuration List

1120	Reflex viewing module
211	Photometric sensor head
1350	Lens, 50 mm
1351	Lens, 55 mm Macro
1352	Lens, 135 mm
1706	Tabletop Tripod
109	Heavy-duty lab stand

Telephotometer Lens Performance Specifications

Lens Model #	Focal Length	f/#	Minimum Focal Distance(m)	Internal Limiting Measurement Field-of-View	Aperture size (mm)	Typical sensitivity (A/fl)
1350	50 mm	f/1.8	0.4	3.3 º	4.0	1.0×10^{-10}
1351	55 mm Macro	f/2.8+	0.2 for 1:1 conjugates	3.3 º	1.6	1.8×10^{-10}
1352	135 mm	f/2.8	2.1	1.3 º	4.0	1.2×10^{-10}

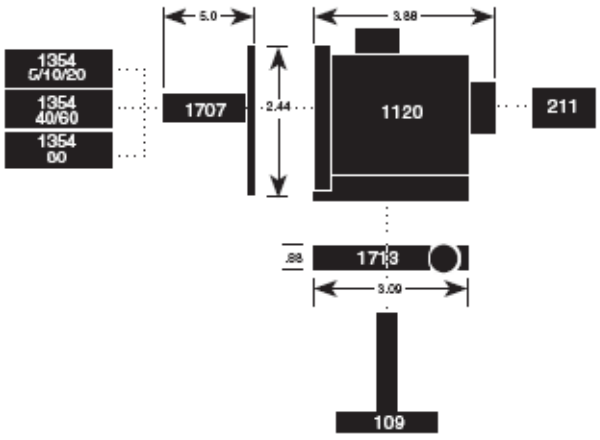
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Model 1120 Reflex Viewing Module

SPECIFICATIONS

MODEL 1120 REFLEX VIEWING MODULE IN MICROPHOTOMETER CONFIGURATION



Model 1120 Reflex Viewing Module in Microphotometer Configuration

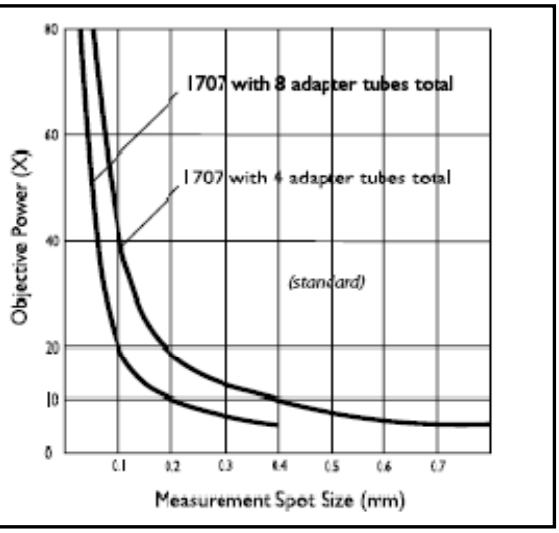
Microphotometer Configuration List

1120	Reflex viewing module
211	Photometric sensor head
1713	Rack and pinion focus mount
1707	Micro-adapter tube (includes 4 1" adapter tubes)
1354-5/10/20	5x, 10x, or 20x microscope objectives
1354-40/60	40x or 60x microscope objectives
109	Heavy-duty lab stand

Microphotometer Lens Performance Specifications

Microscope Objective Lens Measurement Spot Size

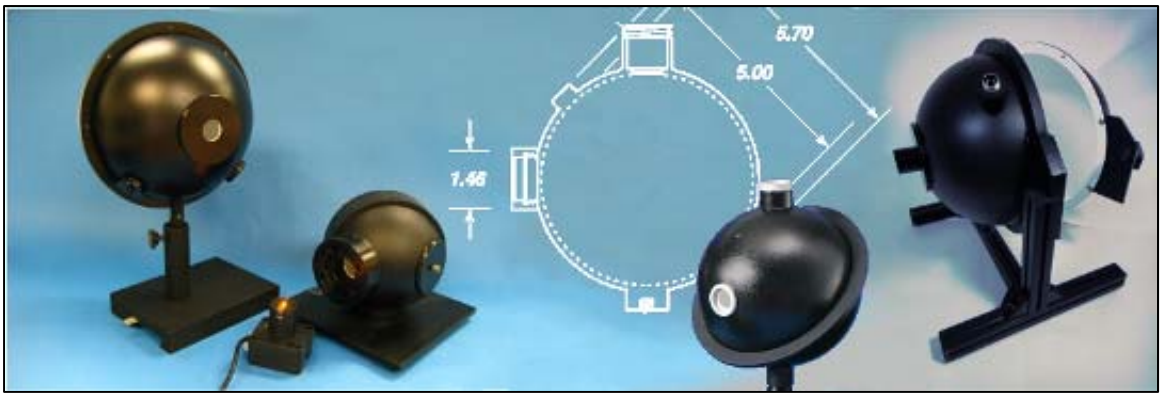
Model #	Power	Focal Length	NA	Working Distance	1707 with 4 Adapter Tubes	Typical Sensitivity (A/fl)	1707 with 8 Adapter Tubes	Typical Sensitivity (A/fl)
1354-1	1x	1.36mm			2.60mm		1.30mm	
1354-5	5x	30mm	10	20mm	0.8mm	9.8 x 10-12	0.4mm	3.7 x 10-12
1354-10	10x	16mm	3	6mm	0.4mm	8.7 x 10-12	0.2mm	3.4 x 10-12
1354-20	20x	9mm	2	3.2mm	0.25mm	6.0 x 10-12	0.1mm	2.5×10^{-12}
1354-40	40x	5mm	1.5	0.3mm	0.1mm	3.7 x 10-12	0.06mm	1.6 x 10-12
1354-60	60x	3mm	1.2	< 0.3mm	0.07mm	2.3 x 10-12	0.04mm	9.8 x 10-12



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INTEGRATING SPHERES & SPHERE SYSTEMS



UDT Instruments offers a variety of integrating spheres, as well as complete, **preconfigured sphere systems**, to meet diverse test and measurement requirements. UDTi integrating spheres are available in sizes from **50 mm to 2 m** diameter, with designs optimized for applications including:

Applications:

- **LED Test & Measurement**
- **Laser Power Measurement**
- **Fiber-Optic Testing**
- **General Photometry & Radiometry**
- *Plus:* **Custom Designs**

The UDTi Advantage: *Our line of integrating spheres and systems are distinguished by:*

- **Expert Design**
- **Quality Manufacturing** - Mechanical and Optical
- **Technical Support** - for configuration, calibration, & use
- **Value** - top performance at reasonable prices

Choosing a UDTi Sphere Solution: Some of our most popular spheres are described in the following pages. A complete and up-to-date list of UDTi standard spheres is presented on our website in the form of a **sphere selection chart**; the attached **system selection chart** presents a list of preconfigured sphere-based system solutions. Specialized configurations and custom designs are also available.

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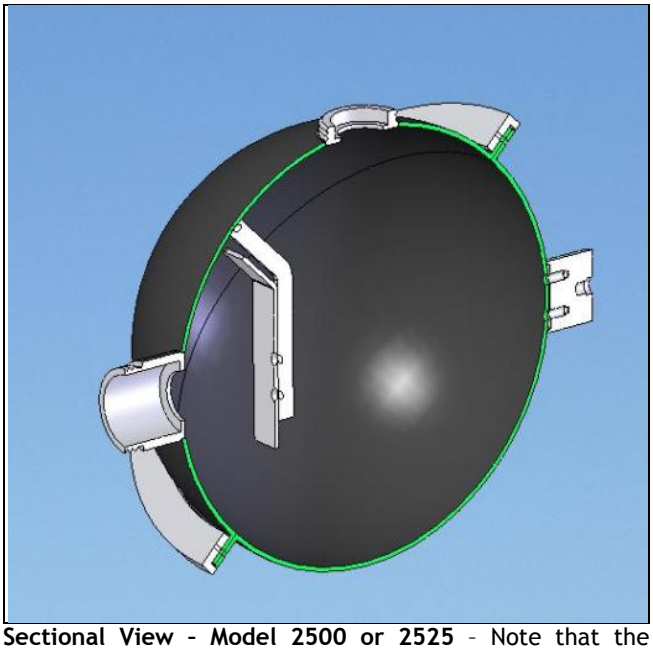
MODEL 2500: INTEGRATING SPHERE - STANDARD SERIES



The model 2500 is a six-inch diameter integrating sphere with a 3/4 inch entrance port. It is suitable for both laser power measurement and LED photometry. It is compatible with Standard Series sensors.

Standard Calibration(s)	Power (W) or Luminous Flux (lumen)
Attenuation	6000:1 (nominal)
Features	High attenuation
Sphere diameter (mm)	150
Entrance Aperture diameter (mm)	19
Mounting Interface	1/4-20 - Female
Compatible Components	211; 221; 247

MODEL 2525: INTEGRATING SPHERE



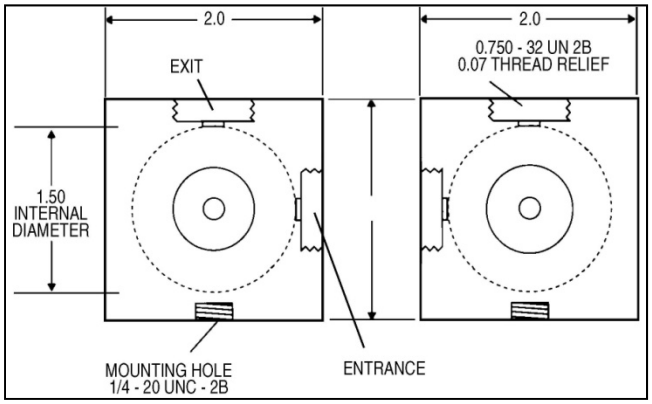
Sectional View - Model 2500 or 2525 – Note that the design of the two models differs only in the size of the aperture mounted at the sphere's sensor port.

This integrating sphere can be used with Standard Series sensors to determine the luminous or radiant flux of LEDs. The sphere has an internal baffle which makes it ideal for diverging light sources. It includes an input aperture disk with a standard 5mm port and a blank adaptor which can be drilled for other aperture sizes.

Standard Calibration(s)	Luminous Flux (lumen) or Power (W)
Attenuation	600:1 (nominal)
Features	Medium attenuation; aperture disks for LED measurement
Sphere diameter (mm)	150
Entrance Aperture diameter (mm)	19
Mounting Interface	1/4-20 - Female
Compatible Components	211; 221; 247

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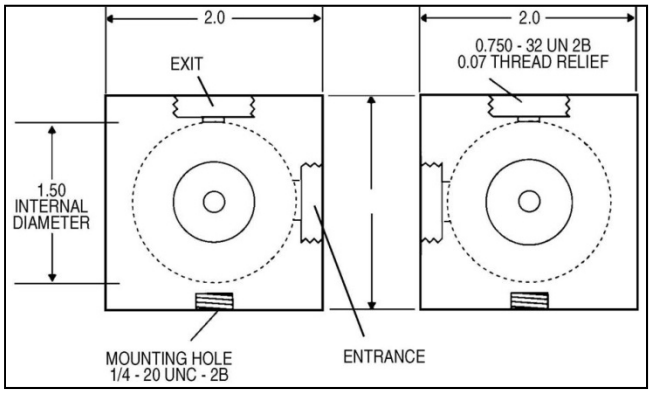
MODEL 2575: MINIATURE INTEGRATING SPHERE



This 50 mm diameter integrating sphere features a 5 mm entrance aperture. This sphere is a favorite for test and measurement of lasers LEDs and fiber-optic illuminators. It is compatible with Miniature Series sensors.

Standard Calibration(s)	Power (W) at user-specified wavelength
Attenuation	300:1 (nominal)
Calibration range	350 - 1750 nm in * nm steps
Features	Low attenuation
Sphere diameter (mm)	50
Entrance Aperture diameter (mm)	5
Compatible Components	260; 261; 262; 280

MODEL 2575-10: MINIATURE INTEGRATING SPHERE



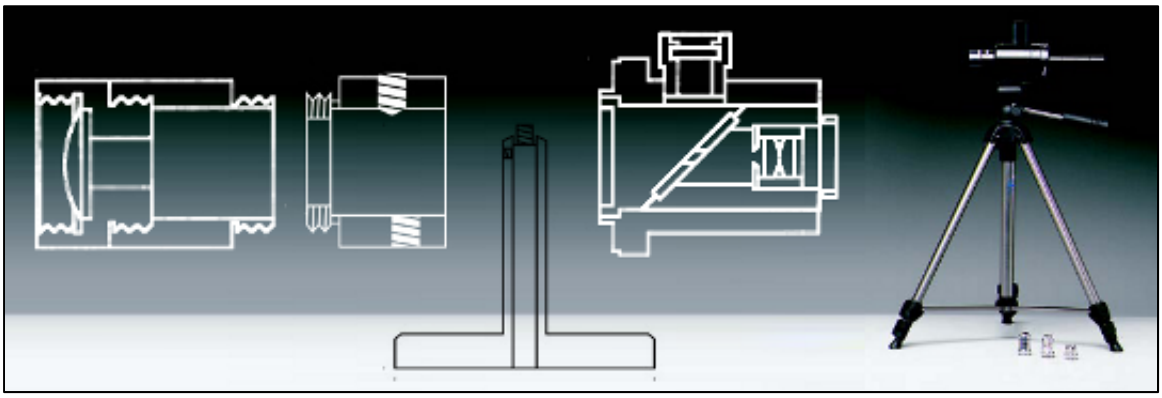
This 50 mm diameter integrating sphere features a 10 mm entrance aperture. This sphere is suitable for testing of larger fiber/beam diameters. Compatible with Miniature Series sensors.

Standard Calibration(s)	Power (W) at user-specified wavelength
Attenuation	250:1 (nominal)
Calibration range	350 - 1750 nm in * nm steps
Features	Low attenuation
Sphere diameter (mm)	50
Entrance Aperture diameter (mm)	10
Compatible Components	260; 261; 262; 280

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MECHANICAL ACCESSORIES for PHOTOSENSOR SYSTEMS



HOLDERS, STANDS, & ADAPTORS				
Model#	Couplers	Filter Holders	Stands	Other
Standard Series	108 1718	102 104 110	103 109 1706	101-1
Miniature Series	108-Mini 1718	104-Mini		*1700 Series F-O Adaptors*

Couplers:

Model 108: Male Coupler
Model 108-MINI: Male Coupler - Miniature
Model 1718: Step-Up Adapter

Stands for Sensor Heads:

Model 103: Standard Lab Stand
Model 109: Heavy-Duty Lab Stand
Model 1706: Tabletop Tripod

Filter Holders:

Model 102: Filter Holder
Model 104: Filter Holder/Coupler
Model 104-MINI: Filter Holder/Coupler - Mini

Aperture Assembly:

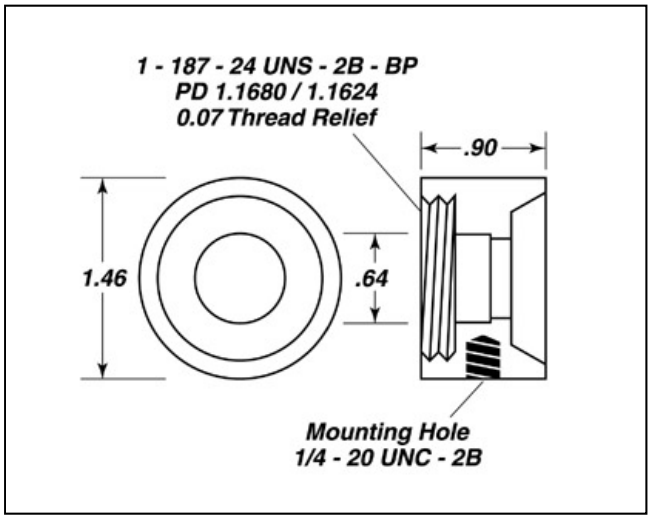
Model 110: Sensor Holder and Aperture Set

Other Fixtures:

Model 101-1: Universal Sensor Housing
Model 1700 Series Fiber-Optic Adaptors

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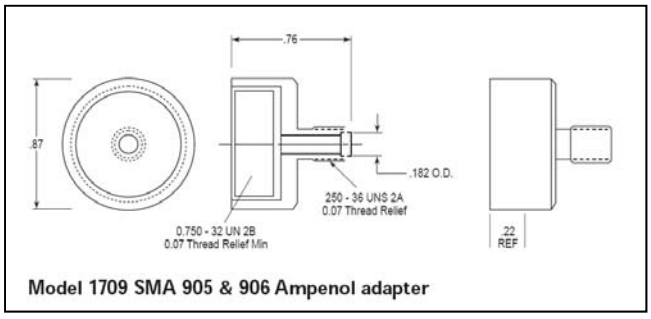
Model 101-1: Universal Sensor Housing



This Universal Sensor Housing holds a standard 1 cm^2 BNC detector package and is a component of UDTi Standard Series sensors. Includes a male-threaded adaptor (Model 108) which connects directly to Standard Series filter holder (Model 104) attenuators and integrating spheres.

Mounting Interface	1/4-20 - Female
Compatible Components	Model 1223 and 1223-A series sensors

Model 1700 Series Fiber-Optic Adaptors



Model 1709 SMA 905 & 906 Ampenol adapter

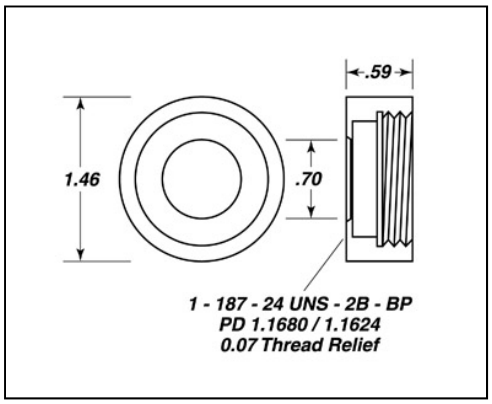
1700-Series Fiber-Optic Adaptors are compatible with UDT Instruments Miniature Series Sensors (Model 260, 261 and 280). Details are provided in the following brochure:

PDF Brochure: UDTi Fiberoptic Connector Adapters

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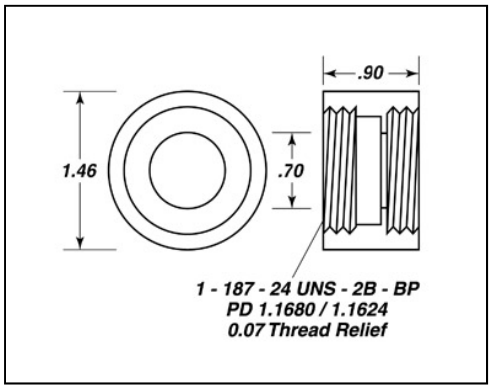
MODEL 102: FILTER HOLDER



The model 102 Filter Holder holds any 25 mm diameter filter. It is female-threaded on one side for connection to Standard Series sensors.

Compatible Components 211; 221; 222; Standard 25 mm diameter filters.

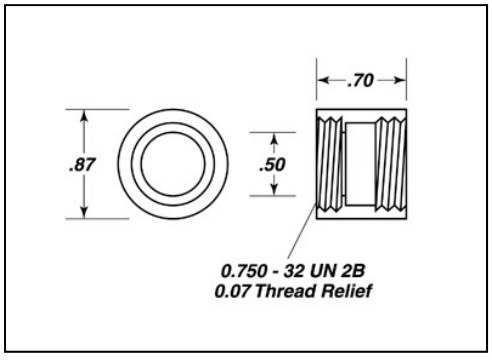
MODEL 104: FILTER HOLDER/COUPLER



Designed to hold standard 25 mm diameter filters the Model 104 connects male-threaded Standard Series sensors and accessories. While the Model 102 Filter Holder is threaded on one side only both sides of the Model 104 are threaded to permit stacking of accessories.

Compatible Components 211; 221; 222; Standard 25 mm diameter filters.

MODEL 104-MINI: FILTER HOLDER/COUPLER - MINIATURE



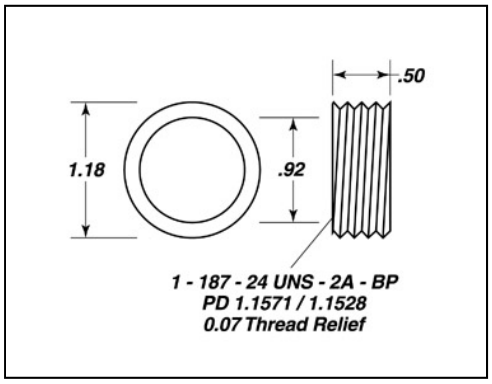
Designed to hold 12.5 mm diameter filters the Model 104-MINI connects male-threaded Miniature Series sensors and accessories.

Compatible Components 260; 261; 280; 2575 series mini-spheres; Custom 12.5 mm diameter filters

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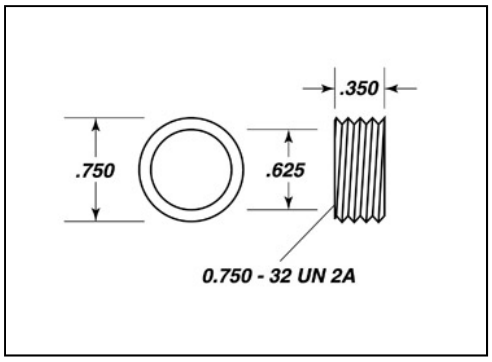
MODEL 108: MALE COUPLER



The Model 108 coupler is designed to connect two female-threaded Standard Series accessories.

Compatible Components 211; 221; 222; 247; 104 and other female-threaded Standard Series accessories

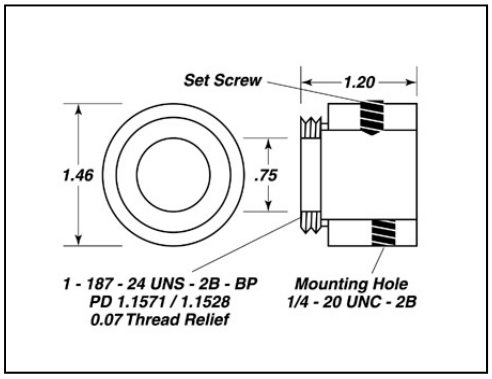
MODEL 108-MINI: MALE COUPLER - MINIATURE



The Model 108-MINI coupler is designed to connect two female-threaded Miniature Series accessories

Compatible Components 260; 261; 280; 104-MINI and other female-threaded Miniature Series accessories

MODEL 1718: STEP-UP ADAPTER



The Model 1718 is designed to couple female-threaded Miniature Series sensors and accessories to male-threaded Standard Series accessories.

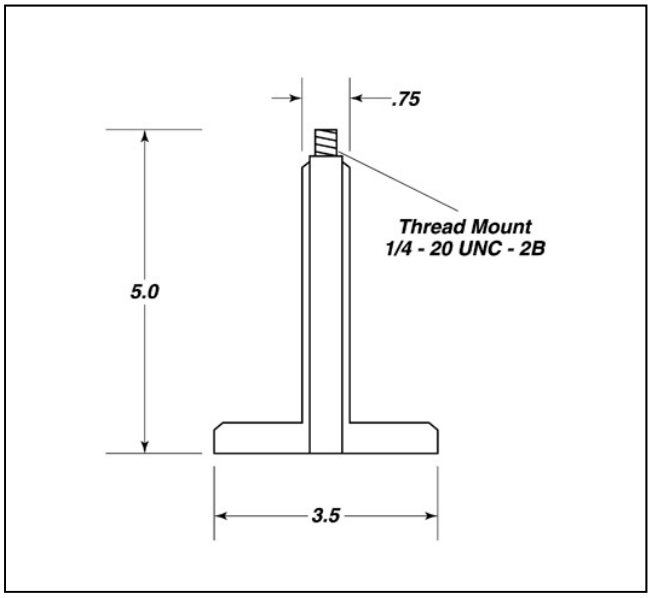
Mounting Interface 1/4-20 - Female

Compatible Components 260; 261; 280; 2550; Standard Series integrating spheres

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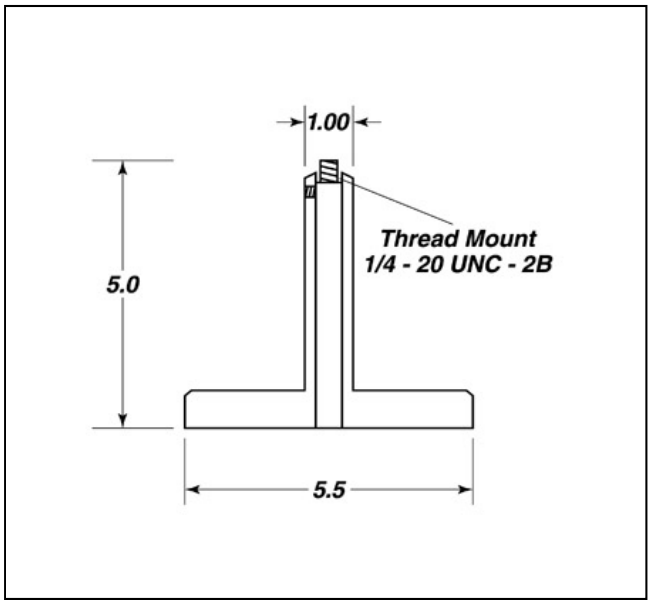
Model 103: Standard Lab Stand



This lab stand has a 1/4-20 threaded post for holding Standard Series sensors.

Compatible Components 211; 221; 247; 2153; 101-1; 1153; 1718; 2500; 2525; 2575

Model 109: Heavy-Duty Lab Stand



This lab stand has a 1/4-20 threaded post for holding UDTi sensors and accessories. Its extra-heavy base makes it suitable for use with large optical assemblies.

Mounting Interface 1/4-20 - Male

Compatible Components 211; 224; 2153; 221; 222; 247; 101-1; 1718; 2500; 2525; 1120; SLS-9400FC-Plus

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MODEL 1706: TABLETOP TRIPOD



Designed for use in display-measurement microphotometry and telephotometry applications the Model 1706 provides tip tilt and pan capabilities for accurate pointing and alignment. It attaches to any sensor head with a 1/4-20 thread mount and is especially suitable for use with the Model 1120.

Compatible Components Model 1120; All UDTi Standard Series Sensors; Models 101-1; 1718; 2153

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