



Tech Insights

Ultraviolet light (UV) is the part of the electromagnetic spectrum that is adjacent to and greater in energy than visible light. The ultraviolet spectrum extends from 180 to 400 nm and is divided into three general categories: shortwave, midrange, and longwave. Always remember to use the correct protective gear and make special precautions when using UV equipment.

Shortwave UV light extends from 180 to 280 nm with a peak in energy at about 254 nm.

Midrange UV light extends from 280 to 320 nm with a peak in energy at about 302 nm.

Longwave UV light, also called "black light" or "wood light," extends from 320 to 380 nm with a peak in energy at about 365 nm.

Common UV Terms:

Fluorescence: emission of light produced by certain substances when excited by ultraviolet energy. The emission ends when UV source is removed.

Germicidal: sterilization action of short wave ultraviolet light. UV light, in the range of 254 nm, penetrates the cell membrane of living cells and disrupts the DNA molecules, preventing cell replication.

Luminescence: emission of light produced by the absorption of short wave radiation (such as ultraviolet).

Phosphorescence: emission of light which continues after the excitation source is removed.

KEY INFORMATION

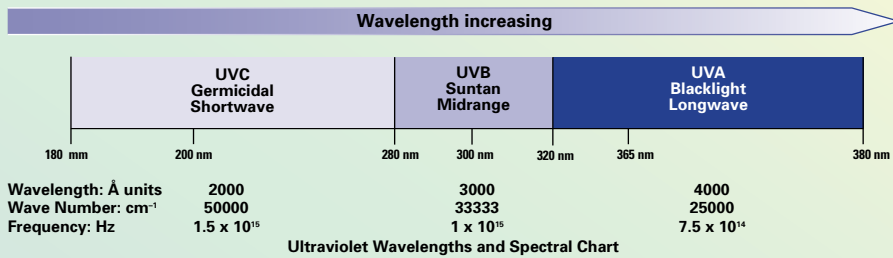
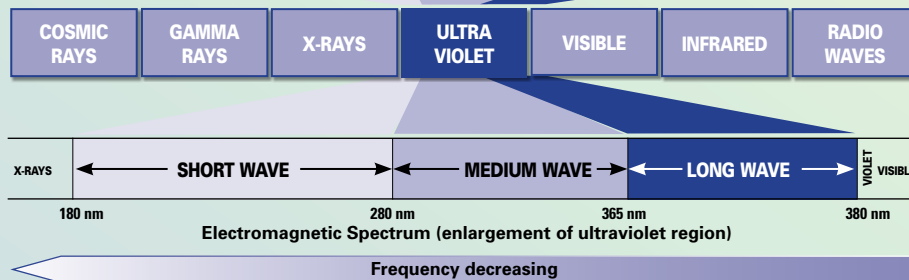


Photo above shows a scorpion fluorescing under longwave (365 nm) UV light. The fluorescence is due to a substance in the cuticle of the scorpion.



Application/Selection Guide

Industry	Application	UVA longwave UV (365 nm)	UVB midrange UV (302 nm)	UVC shortwave (254 nm)
Laboratory	Bacterial identification	•		
	Specimen staining	•		
	Electrophoresis	•	•	•
	Chlorination	•		
	Fluorochemistry	•		•
	Fluorescence photography	•		•
	Titration processes	•		
	Thin Layer Chromatography (TLC)	•		•
	Nucleic acid visualization	•		•
	Genetic experiments	•		
	Virology sanitation: aflatoxin detection	•		
	Rodent contamination and lice detection	•		
	Food contamination detection	•		
	Milkstone inspection	•		
	E. coli water testing	•		
	Mercury detectors			•
	Optical alignment		•	
	Pesticide analysis	•		•
	Polymer curing			•
	Sterilization			•
	DNA analysis			•
	Biochemical testing			•
	Mutation			•
	Mycology			•
	Photochemistry			•
Photo dissociation			•	
Electronics	Cleanroom inspection	•		
	Epoxy coating	•		
	Quality control	•		
	Inspection	•		

Industry	Application	UVA longwave UV (365 nm)	UVB midrange UV (302 nm)	UVC shortwave (254 nm)
Industrial	Non-destructive testing	•		
	UV curing	•	•	
	Magnetic particle inspection	•		
	Inspection of conformal coatings	•		
	Gradient sampling		•	
	Alumina testing			•
Forensics	Solar experimentation		•	
	Detection of altered documents and counterfeit currency	•		•
	Signature verification	•		
	Coding and marking	•		
	Arson investigation	•		•
	Lab testing	•		
Medical†	Field clues			•
	Toxicology			•
	Cosmetology	•		
	Culture fluorescence: medical diagnostics	•		
Automotive	Phototherapy		•	
	Dermatology		•	
Misc.	Leak detection	•		
	Windshield repair	•		
Misc.	Fine art examination/museum inspection	•	•	
	Archaeology	•		•
	Entomology	•		
	Photoresist exposure	•		
	Philately (stamp collecting)	•		•
	Re-admission control	•		

†Cole-Parmer products are not approved for medical or personal use.



Ultraviolet Equipment

Introduction / Lamps

KEY INFORMATION

Find MORE!

Related Products

Cole-Parmer offers a broad spectrum of ultraviolet equipment found throughout this catalog. For complete product offerings, refer to the pages below or visit our web site at ColeParmer.com/ultravioletequipment for all of our most up-to-date products.

Crosslinkers	1885	Transilluminators	1886-1887
Electrophoresis imaging	433-434, 1888	Viewing cabinets	1883
Lamps	1880-1882	Water sterilizers	1964-1982
Radiometers (ultraviolet intensity meters)	1889-1890		

Ultraviolet Lamps

Ideal for UV testing through small apertures

- Economically calibrate your photometric and fluorometric instruments
- Use as primary references or spectral sources

These long-lasting lamps are rated for 5000 hours of use. Lamps feature a double bore quartz tube, an excellent transmitter of UV radiation. Choose from standard, deluxe, or extra-long models.

What's included: a 16" (40.6 cm) cable to plug into a power supply. Order power supplies separately in the table below. Order optional lamp shield for deluxe model below.

Lamp Shields are available for deluxe model 97606-00. Use to direct UV light through a point-like aperture or small window opening. Shields also protect tube from breakage.



Deluxe lamp 97606-00 shown with power supply 97606-80 and optional lamp shield 97606-52



Catalog number	Description	Wavelength (nm)	Intensity (μW/cm²) [†]	Dimensions (L x W x D)	Price	Power supplies					
						Cat. no.	VAC, Hz	Price	Cat. no.	VAC, Hz	Price
TW-97606-02	Standard	365	145	4¾" x ¾" x ¾" (12.1 x 1.0 x 1.0 cm)		TW-97606-80[‡]	115, 60		TW-97606-85^{††}	230, 50	
TW-97606-00	Deluxe	254	4400	4¾" x ¼" x ¾" (11.7 x 0.6 x 1.0 cm)		TW-97606-80[‡]			TW-97606-85^{††}		
TW-97606-08	Extra-long	254	5400	11¾" x ¾" x ½" (29.5 x 1.0 x 1.3 cm)		TW-97606-90			TW-97606-95^{††}		

[†]Measured at 0.75" [‡]ETL/ETLc certified ^{††}CE certified ^{**}Avg lamp current is 26 mA

[TW-97606-50](#) Lamp shield, 0.04" (0.1 cm) ID opening

[TW-97606-52](#) Lamp shield, 5/16" x 5/8" (0.8 x 1.6 cm) opening

Handheld Mini Ultraviolet Lamps

Compact—fit in your pocket

- Average bulb life is 3000 hours

Small, lightweight lamps are ideal for use anywhere. Choose from single- or dual-wavelength models. The dual-wavelength model 97602-22 has a wavelength selector for choosing 254 or 365 nm light.

What's included: one 4-watt tube and a nylon strap. Order batteries separately below.

Catalog number	Description	Wattage	Wavelength (nm)	Intensity (μW/cm²)	Dimensions (W x H x D)	Power	Price	Replacement tubes	
								Cat. no.	Price
TW-97602-02	No flashlight	4 watts	254	170 at 3"	6½" x 1¾" x 1¼" (16.5 x 4.4 x 3.2 cm)	4 AA batteries (not included)		TW-09815-12	
TW-97602-12			365	230 at 3"				TW-97602-52	
TW-97602-22			254/365	113/68 at 3"				TW-97602-54	
TW-97602-30	Flashlight included	4 watts	365	230 at 3"	6½" x 1¾" x 1¼" (16.5 x 4.4 x 3.2 cm)			TW-97602-52	

[TW-09376-01](#) Batteries, AA. Pack of 4



UV lamp 97602-30 features a flashlight.

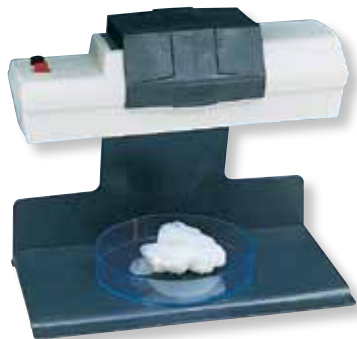


Handheld and Portable Ultraviolet Lamps

A Shortwave Ultraviolet Lamp

Compact 254 nm, 4-watt lamp.

What's included: tube, 2" x 3" (5.1 x 7.6 cm) filter and an 8-ft (2.4 m), two-wire cord (115 VAC model has a plug). Order optional lamp stand 09817-00 below right to free your hands.



A

Lamp 09815-10 shown with optional stand 09817-00

B 4-Watt Short/Longwave Ultraviolet Lamp

Compact, short/longwave lamp comes with two 4-watt tubes (254 and 365 nm). Each tube produces a distinct wavelength; no mixing of primary UV ranges occurs.

What's included: 2" x 3" (5.1 x 7.6 cm) filter and a 7-ft (2.1 m), two-wire cord with on/off switch (115 VAC model has a plug). Order optional lamp stand 09817-00 at right.



B
09817-20

C 6-Watt, Short/Longwave Ultraviolet Lamp

Get short or longwave ultraviolet light at the touch of a button. Two separate tubes (254 and 365 nm) operate independently—no wavelength mixing occurs.

Snap-on filter frame simplifies filter replacement. Filter measures 6" x 1 3/4" (15.2 x 4.4 cm). Wavelength rocker switch is conveniently located for index-finger operation. Housing is constructed of lightweight Cyclocac® plastic.

What's included: 7-ft (2.1 m), two-wire cord (115 VAC model has a plug.) Order optional lamp stand 09818-50 at right.



C

Lamp 09818-00 shown with optional stand 09818-50

D Longwave Ultraviolet Wand

Long, narrow design is ideal for quick reliable leak detection in tight spots or hard to reach areas.

What's included: 365 nm, 15-watt tube, and a 27 1/2-ft (8.4 m), two-wire cord with plug.



D

Lamp 97601-00 is ideal for tight or hard to reach spots.

E High-Intensity, Shortwave Ultraviolet Lamp

This high-intensity, ultraviolet lamp has a 2" x 6" (5.1 x 15.2 cm) filter area and a high-intensity grid.

What's included: 115 VAC model comes with a plug; the 230 VAC model has stripped ends. A 3-ft (0.9 m) cord connects lamp to base; an 8-ft (2.4 m), three-wire cord connects base to outlet.



E

09813-00

Lamp Stands for A-C

TW-09817-00 Lamp stand for UV lamps 09815-02, -10 and 09817-20, -22. Holds UV light at an angle for maximum light spread. Measures 4 7/8"H (12.4 cm)

TW-09818-50 Lamp stand for UV lamps 09818-00 and -02. Cast-aluminum base. Measures 6 1/8"H (15.5 cm)

Genesis® Safety Glasses

■ Absorb 99.9% of harmful UVA and UVB radiation
 Wraparound lens design provides uncompromised peripheral vision. Coating helps to keep your lenses scratch free.

Compliance: ANSI Z87.1, CSA Z94.3, and MIL-STD 662



Catalog number	Frame color	Lens color	Price per pair
LZ-86325-70	Black	Clear	
LZ-86325-82	Translucent blue	Indoor/outdoor	

Key	Description	Wattage	Wavelength (nm)	Intensity (µW/cm ²)	Dimensions (L x W x H)	Lamps; 115 VAC, 60 Hz		Lamps; 230 VAC, 50 Hz		Replacement tubes ^{††}		Replacement filters	
						Cat. no.	Price	Cat. no.	Price	Cat. no.	Price	Cat. no.	Price
A	Shortwave	4 watts	254	1120 at 3"	7 7/8" x 2 1/8" x 2" (19.8 x 7.1 x 5.1 cm)	TW-09815-10 [†]		TW-09815-02 [±]		TW-09815-12		TW-09815-11	
B	Short/longwave	4 watts	254/365	760/720 at 3"	7 7/8" x 2 1/8" x 2" (19.8 x 7.1 x 5.1 cm)	TW-09817-20 [†]		TW-09817-22 [±]		TW-09815-12 TW-09816-12		TW-09815-11	
C	Short/longwave	6 watts	254/365	1350/1200 at 3"	15" x 3 1/8" x 2 1/2" (38.1 x 8.1 x 6.4 cm)	TW-09818-00 [†]		TW-09818-02 [±]		TW-09814-27 TW-09814-26		TW-09818-10	
D	Longwave wand	15 watts	365	350 at 6"	20" L x 1 1/2" D (50.8 x 3.8 cm)	TW-97601-00		—		TW-09819-10		—	
E	High-intensity shortwave, grid	20 watts	254	2400 at 5"	15" x 3 1/8" x 2 1/2" (38.1 x 8.1 x 6.4 cm)	TW-09813-00		TW-09813-02		TW-09813-12		—	

[†]ETL and ETLc certified ^{††}For short/longwave lamps, order one replacement tube for each wavelength.



09815-10, 09815-02, 09817-20, 09817-22, 09818-00, 09818-02 09815-02, 09817-22, 09818-02



Ultraviolet Equipment Lamps

Distributed by:
Fiedler Scientific Instruments, s.r.o.
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Cole-Parmer Ultraviolet Lamps

Change light sources with the flick of a switch

- Durable, extruded metal housing with a scratch-resistant powder-coat finish

Lamps provide longwave, midrange, shortwave, or white light in a compact, economical design. Models available in 4-, 6-, and 8-watt configuration and come with two tubes, except 97620-42 and -43 which include three tubes. Basic configuration features one UV tube and one white light tube—for added illumination in dimly lit areas. A selector switch on the lamp back makes it easy to switch light sources. Twin-tube models use two tubes of the same wavelength for added UV intensity. Double-UV models use two tubes of different wavelengths, and triple-UV models use three tubes of different wavelengths for added flexibility.

Use the 4-watt lamps with optional viewing cabinet 97620-70 for a darkroom environment. The 8-watt lamps can be used with the Cole-Parmer viewing cabinets sold on page 1883. Optional lamp stand accommodates all models to provide hands-free operation.

What's included: power cord and plug.



97620-00



97620-42

97620-32

97620-26



Lamp 97620-10
shown with
lamp stand 97620-65



Lamp 97620-00
shown on
viewing cabinet 97620-70

Specifications

Dimensions

4-watt lamps: 9¾"L x 3¾"W x 2½"H (24.8 x 9.5 x 6.4 cm)

6-watt lamps: 12"L x 3¾"W x 2½"H (30.5 x 9.5 x 6.4 cm)

8-watt lamps: 14¾"L x 3¾"W x 2½"H (37.5 x 9.5 x 6.4 cm)

Wavelength (nm)	Intensity [†] (µW/cm ²)	Lamps; 115 VAC, 60 Hz		Lamps; 230 VAC, 50 Hz		Replacement tubes							
		Catalog number	Price	Catalog number	Price	365 nm		302 nm		254 nm		White light	
						Cat. no.	Price	Cat. no.	Price	Cat. no.	Price	Cat. no.	Price
4-watt ultraviolet lamps													
365/white	590	TW-97620-00		TW-97620-01		TW-09816-12	—	—	—	—	—	—	TW-97620-58
254/white		TW-97620-02		TW-97620-03		—	—	TW-09815-12	—	—	TW-97620-58		
365/365	1400	TW-97620-04		TW-97620-05		TW-09816-12	—	—	—	—	—	—	—
254/254		TW-97620-06		TW-97620-07		—	—	TW-09815-12	—	—	—		
365/254	590/900	TW-97620-08		TW-97620-09		TW-09816-12	—	—	TW-09815-12	—	—	—	—
6-watt ultraviolet lamps													
365/white	830	TW-97620-10		TW-97620-11		TW-09814-26	—	—	—	—	—	—	TW-97620-59
302/white	880	TW-97620-12		TW-97620-13		—	—	TW-97620-53	—	—	TW-97620-59		
254/white	940	TW-97620-14		TW-97620-15		TW-09814-26	—	—	TW-09814-27	—	—	TW-97620-59	
365/365	2200	TW-97620-16		TW-97620-17		TW-09814-26	—	—	—	—	—	—	—
302/302	2200	TW-97620-18		TW-97620-19		—	—	TW-97620-53	—	—	—	—	—
254/254	2300	TW-97620-20		TW-97620-21		—	—	—	—	—	—	—	—
365/302	940/880	TW-97620-22		TW-97620-23		TW-09814-26	—	—	TW-97620-53	—	—	—	—
365/254	940/830	TW-97620-24		TW-97620-25		TW-09814-26	—	—	—	—	—	—	—
8-watt ultraviolet lamps													
365/white	950	TW-97620-26		TW-97620-27		TW-97607-52	—	—	—	—	—	—	TW-97607-54
302/white	900	TW-97620-28		TW-97620-29		—	—	TW-97607-51	—	—	—	—	—
254/white	1200	TW-97620-30		TW-97620-31		—	—	—	TW-97607-50	—	—	TW-97607-54	
365/365	2000	TW-97620-32		TW-97620-33		TW-97607-52	—	—	—	—	—	—	—
302/302	2000	TW-97620-34		TW-97620-35		—	—	TW-97607-51	—	—	—	—	—
254/254	2300	TW-97620-36		TW-97620-37		—	—	—	TW-97607-50	—	—	—	—
365/302	950/900	TW-97620-38		TW-97620-39		TW-97607-52	—	—	TW-97607-51	—	—	—	—
365/254	950/1200	TW-97620-40		TW-97620-41		TW-97607-52	—	—	—	—	—	—	—
365/302/254	950/900/1200	TW-97620-42		TW-97620-43		TW-97607-52	—	—	TW-97607-51	—	—	—	—

[†]Intensity measured at 3"

[TW-97620-65](#) Lamp stand; 13"L x 3"W x 10¾"H (33.0 x 7.6 x 27.3 cm)

[TW-97620-70](#) Mini viewing cabinet for 4-watt lamps; 9"L x 10½"W x 12"H (22.9 x 26.7 x 30.5 cm)



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Economical Ultraviolet Viewing Cabinets

Special contrast control filter eliminates "blue haze" and protects your eyes

- Models available for use in the lab or field

Use these economical viewing cabinets for chromatography examination (paper or TLC), fluorescent analysis, and industrial inspection. Special contrast filter absorbs UV energy to protect your eyes and eliminates blue haze associated with UV viewing.

Removable bottom panel allows you to position cabinet over large and bulky samples or over a transilluminator. Cabinets include a lightweight curtain to block ambient light. Soft rubber viewing port makes viewing comfortable. **Note:** Lamps are not included with viewing cabinets, order separately on page 1882.

97604-00
(lamp sold separately)



Catalog number	Description	Wattage	Wavelength (nm)	Dimensions (W x H x D)	Price
TW-97604-00	Lab cabinet	4 watts	Depends on tube	10½" x 12" x 9" (26.7 x 30.5 x 22.9 cm)	
TW-97604-02	Field cabinet	6 watts			

MORE info!

Order UV lamps separately on page 1882.

Cole-Parmer Ultraviolet Viewing Cabinets

Uniform UV illumination for optimal sample viewing

- Soft rubber viewport provides a comfortable viewing area with adequate space for eyeglasses
- Removable bottom panel allows cabinet to be placed over large samples or a transilluminator
- Lightweight access curtain blocks out ambient light
- Contrast control filter absorbs UV energy to protect users' eyes

A Customizable Viewing Cabinet is designed to accommodate one or two 8-watt lamps from page 1882. Lamps plug directly into the cabinet housing as needed and can be removed for handheld use. Using two lamps provides uniform illumination from two sides of the cabinet. Cabinet features interior overhead white light, included with unit, for basic sample illumination.

B High-Performance Viewing Cabinets feature high-intensity 15-watt UV tubes. Control switches, for selecting UV or white light, are conveniently located on the top of the cabinet. Models 97621-10 and -15 feature two each of shortwave and longwave UV tubes mounted on one side of the cabinet. Models 97621-20 and -25 feature four longwave UV tubes mounted on one side of the cabinet. Models 97621-30 and -35 feature two shortwave and two longwave tubes mounted on two sides of the cabinet.

A
97621-00



B
97621-10



Wattage	Wavelength (nm)	Intensity (µW/cm²)	Dimensions (W x H x D)	Cabinets; 115 VAC, 60 Hz		Cabinets; 230 VAC, 50 Hz	
				Catalog number	Price	Catalog number	Price
A Customizable viewing cabinet							
2 x 8 watts	Depends on lamps		19¾" x 15¾" x 16½" (50.2 x 40 x 41.9 cm)	TW-97621-00		TW-97621-05	
B High-performance viewing cabinets							
4 x 15 watts	254/365	1200/950	23¾" x 13" x 15¾" (59.4 x 33 x 40 cm)	TW-97621-10		TW-97621-15	
	365	2000	23¾" x 13" x 15¾" (59.4 x 33 x 40 cm)	TW-97621-20		TW-97621-25	
	254/365	1200/950	19½" x 15¾" x 16½" (49.5 x 40 x 41.9 cm)	TW-97621-30		TW-97621-35	

- [TW-97605-50](#) Replacement tube; 15 watts, 254 nm
- [TW-97621-45](#) Replacement tube; 15 watts, 365 nm
- [TW-97621-50](#) Replacement tube; 25 watts, white light

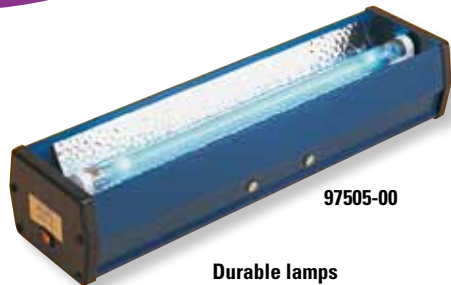
B
97621-30





Ultraviolet Equipment Lamps

Distributed by:
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97505-00

Durable lamps have a shock-resistant anodized aluminum housing.

Ultraviolet Germicidal Lamps

A low-cost choice for destroying bacteria, molds, yeasts, and viruses

Help prevent contamination in your research laboratories, food factories, and white rooms with these germicidal lamps. They emit 254 nm shortwave UV light for efficient destruction of bacteria, molds, yeast, and viruses. Replace starter and tubes at the same time.

What's included: a 6-ft (1.8 m) cord and a plug; the 220 VAC models have a European plug.

Specifications

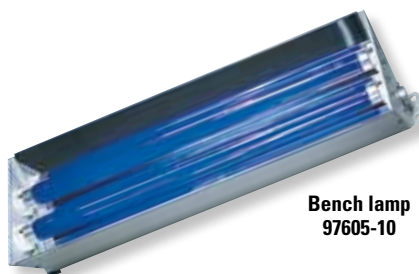
Tube life: 2000 hours

Intensity [†] (μW/cm ²)	Dimensions (L x W x H)	Lamps; 115 VAC, 60 Hz		Lamps; 230 VAC, 50 Hz		Replacement tubes		Replacement filters	
		Cat. no.	Price	Cat. no.	Price	Cat. no.	Price	Cat. no.	Price
31	20" x 5½" x 4.6"	TW-97505-00 [‡]		TW-97505-05 [‡]		TW-09815-59		TW-09815-99	
76	(50.8 x 14.0 x 11.6 cm)	TW-97505-10 [‡]		TW-97505-15 [‡]		TW-09815-59 ^{††}			
60	38" x 5½" x 4¼"	TW-97505-20		TW-97505-25		TW-97505-80			
152	(96.5 x 14.0 x 10.8 cm)	TW-97505-30		TW-97505-35		TW-97505-80 ^{††}		TW-97505-90	

[†]Intensity is measured at 6½ feet.

[‡]Lamps include fixation bracket.

^{††}Order two replacement tubes.



Bench lamp
97605-10

Ultraviolet Bench Lamps

Reliable sterilization and inspection for applications in hospitals, laboratories, and pharmaceutical companies

- 365-nm models are ideal for fluorescence and inspection applications
- 254-nm models provide an effective tool for sterilization and sanitation control

The 365-nm models have self-filtering, low pressure "black light" tubes that stay cool for a longer period of time than conventional UV tubes, making them ideal for nondestructive testing. Highly polished inner aluminum deflector provides maximum UV reflectance.

The 15-watt models are designed for flooding an area of 15 ft² (1.4 m²) at 20" (50.8 cm); the 40-watt models flood an area of 300 ft² (27.8 m²) at 12 ft (3.6 m).

What's included: two tubes; brackets for wall or ceiling mounting; and a 7-ft (2.1 m), three-wire cord (115 VAC model comes with three-prong plug).



Model 97605-00 shown with optional exposure stand 97605-80. Shelf is adjustable to vary distance from the UV source.

Wattage	Wavelength (nm)	Dimensions (W x H x D)	Lamps; 115 VAC, 60 Hz		Lamps; 230 VAC, 50 Hz		Replacement tubes	
			Cat. no.	Price	Cat. no.	Price	Cat. no.	Price
15 watts	254	19¾" x 4½" x 6" (50.2 x 10.8 x 15.2 cm)	TW-97605-00		TW-97605-05		TW-97605-50	
	365		TW-97605-10		TW-97605-15		TW-09819-10	
20 watts	254	24" x 4¼" x 6" (61.0 x 10.8 x 15.2 cm)	TW-97615-00		TW-97615-05		TW-97615-50	
	365		TW-97615-10		TW-97615-15		TW-97615-51	
40 watts	254	51¾" x 6½" x 5" (131.4 x 16.5 x 12.7 cm)	TW-97605-30		TW-97605-35		TW-97605-54	
	365		TW-97605-40		TW-97605-45		TW-97605-52	

TW-97605-80 Exposure stand for 15-watt bench lamps. One adjustable shelf. Measures 20"W x 13"H x 6"D (50.8 x 33.0 x 15.2 cm)

Portable High-Intensity Ultraviolet Lamps

Portable lightweight design is ideal for use in the field

Choose from single- or dual-wavelength lamps; all include 6-watt tube(s). Single-wavelength lamps let you use both tubes simultaneously to achieve intensities twice as high as similar units. Dual-wavelength lamps let you choose from either 254 or 365 nm light.

These battery-operated lamps are made of lightweight Cicolac® for easy fatigue-free use. All models have a built-in flashlight. Powered by two 6-volt lantern batteries (included); average battery life is 20 hours.



Battery-operated ultraviolet lamp
09817-80

Catalog number	Wavelength (nm)	Intensity (μW/cm ²)	Dimensions (W x H x D)	Price	Replacement tubes		Replacement filters	
					Cat. no.	Price	Cat. no.	Price
TW-09817-60	254	1350	2⅞" x 9½" x 9⅞" (7.3 x 24.1 x 23.9 cm)		TW-09814-27		TW-09817-97	
TW-09817-70	254/365	930/710			TW-09817-93		TW-09817-99	
TW-09817-80	365	1650			TW-09817-91		—	—

TW-09376-05 Replacement battery, 6 V. Two required /ea

TW-09817-95 Replacement white bulb for flashlight



High-Intensity Longwave Ultraviolet Lamps

Detach lamp head from transformer base for portability

These high-intensity lamps produce 365 nm UV light. Lamp head rotates 360° in its transformer base. A filter minimizes white light interference allowing you to easily detect weak fluorescence.

What's included: a 100-watt spot bulb that provides a 7° beam width. Models 97600-00 and -05 are ETL/ETLc approved and have an 8-ft (2.4 m) cord from the lamp to the transformer and an 8-ft (2.4 m) power-line cord. Models 97600-10 and -15 have a 20-ft (6-m) cord from the lamp to the transformer and a 20-ft (6-m) power-line cord. The 115 VAC models have a three-prong plug; the 230 VAC models have stripped ends.



Lamp
97600-00



Specifications

Filter life: 5000 hours **Flood bulb life:** 2000 hours
Spot bulb life: 5000 hours

Wattage	Wavelength (nm)	Intensity (µW/cm ²)	Dimensions (W x H x D) (13.5 x 39.4 x 35.1 cm)	Cord ft (m)	115 VAC, 60 Hz		230 VAC, 50 Hz	
					Cat. no.	Price	Cat. no.	Price
100 watts	365	21,000 at 2", 8,900 at 10"	5 5/8" x 15 1/2" x 13 1/8"	8 (2.4) 20 (6)	TW-97600-00 TW-97600-10		TW-97600-05 TW-97600-15	



Exposure box
09819-29

- [TW-09819-27](#) Lamp funnel directs light
- [TW-09819-28](#) Lamp visor shields your eyes
- [TW-09819-29](#) Exposure box exposes samples to direct UV source
- [TW-09819-23](#) Replacement filter
- [TW-09819-24](#) Replacement bulb, 7° beam width



Lamp visor
09819-28

Lamp funnel
09819-27

Ultraviolet Crosslinkers

Microprocessor-controlled UV sensor feedback system ensures maximum energy efficiency

- Available with interchangeable shortwave, midrange, and longwave tubes
- Preset and manual controls for UV or time exposure settings
- Small footprint saves valuable benchtop space

UV crosslinking procedure optimizes the use of the UV energy while ensuring that crosslinking is consistent. Internal UV sensor is calibrated with traceability to NIST (or NPL in UK and Europe) standards. Change the wavelength for different applications by changing the UV tube (order separately) and corresponding UV wavelength calibration sensor. Other features include preset or user-selected UV exposure and time, internal safety system with automatic shutoff, large LED that displays remaining time or energy, and a UV-blocking clear viewing window. The 115 VAC models are ETL/ETLc certified, and the 230 VAC models are CE certified.

Use shortwave (254 nm) for sterilization, uniform radiation for crosslinking DNA or RNA to membranes after Northern or Southern blots, dot blotting, and colony or plaque lifts. Other applications include nicking ethidium bromide stained DNA in agarose gels and gene mapping for creating cleavage-inhibiting thymine dimers. Use midrange (302 nm) for phototherapy, UV crosslinking and curing, and gradient sampling. Use longwave (365 nm) for UV curing, photochemistry, and immunology research.

What's included: 8-ft (2.4 m) power cord with plug (three-prong plug on 115 VAC models; standard European plug on 230 VAC models).



39462-00

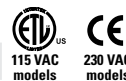
Specifications

Dimensions
Chamber: 10"W x 5"H x 12"D (25.4 x 12.7 x 30.5 cm) Overall: 15 3/8"W x 8 3/4"H x 13 3/4"D (39.7 x 22.2 x 34.9 cm)

Catalog number	Wavelength (nm)	Power (VAC, Hz)	Price	Replacement tubes	
				Catalog number	Price
TW-39462-00[†] TW-39462-05[†]	254	115, 60 230, 50		TW-97607-50	
TW-39462-10[‡] TW-39462-12[‡]	254	115, 60 230, 50		TW-97607-50	
TW-39462-18 TW-39462-20	302	115, 60 230, 50		TW-97607-51	
TW-39462-14 TW-39462-16	365	115, 60 230, 50		TW-97607-52	

[†]With swing-out door

[‡]With pull-down drawer



39462-10



Ultraviolet Equipment

Transilluminators



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97623-24

Cole-Parmer Benchtop Ultraviolet Transilluminators

Compact size saves space over larger high-performance models

- UV-blocking cover is hinged and height adjustable to suit the user and provide easy access to the surface, blocking 99% of the UV rays
- UVG long-life filters are rated for 5000 hours of use

Midrange (302 nm) models are available in single- or dual-intensity configuration. Dual intensity high setting is ideal for analytical documentation. Low setting reduces photoniccking or photobleaching of gel samples while doing preparative work. Dual- and triple-wavelength models cover a wide range of applications reducing the need for multiple units. Use the longwave setting for viewing stained gels, the midrange setting for sensitive nucleic acid visualization, and the shortwave setting to irradiate samples. Safety cover blocks 99% of harmful UV radiation.

What's included: power cord with plug.



Specifications

Filter area	Wattage	Wavelength (nm)	Dual intensity (high or low)	Dimensions (W x H x D)	Transilluminators; 115 VAC, 60 Hz		Transilluminators; 230 VAC, 50 Hz	
					Catalog number	Price	Catalog number	Price
Single-wavelength models								
15 x 15 cm	8 watts	302	Yes	14" x 5" x 11¼" (35.6 x 12.7 x 28.6 cm)	TW-97623-00		TW-97623-02	
			No		TW-97623-04		TW-97623-06	
20 x 20 cm	8 watts		Yes		TW-97623-08		TW-97623-10	
			No		TW-97623-12		TW-97623-14	
21 x 26 cm	8 watts		Yes		TW-97623-16		TW-97623-18	
			No		TW-97623-20		TW-97623-22	
Dual-wavelength models								
20 x 20 cm	8 watts	302/365	—	14" x 5" x 11¼" (35.6 x 12.7 x 28.6 cm)	TW-97623-24		TW-97623-26	
21 x 26 cm	8 watts		—		TW-97623-28		TW-97623-30	
Triple-wavelength models								
20 x 20 cm	8 watts	254/302/365	—	14" x 6" x 11¼" (35.6 x 15.2 x 28.6 cm)	TW-97623-32		TW-97623-34	
21 x 26 cm	8 watts		—		TW-97623-36		TW-97623-38	



97622-00

Cole-Parmer High-Performance Ultraviolet Transilluminators

High-intensity tubes provide uniform illumination across entire filter surface for optimal viewing

- UV blocking cover tilts to provide access to the filter surface
- Dual-intensity models are ideal for fluorescence viewing and photography applications

Our transilluminators produce the highest intensity and brilliant UV fluorescence with backlit midrange UV illumination. Higher watt tubes provide increased light diffusion while maintaining high intensity output. Midrange and longwave models feature a background uniformity screen, further enhancing the UV illumination.

Dual-intensity models enable you to switch settings between low and high intensity for added flexibility. The low setting reduces photoniccking or photobleaching of gel samples during prep work, allowing for extended gel preparation time. The high setting is ideal for analytical documentation work.

Stainless steel frame reduces contamination and prevents corrosion. A powerful cooling fan maintains low filter surface temperatures to minimize sample damage.

What's included: adjustable protective cover and power cord with plug.



Specifications

Filter area	Wattage	Wavelength (nm)	Dimensions (W x H x D)	Transilluminators; 115 VAC, 60 Hz		Transilluminators; 230 VAC, 50 Hz	
				Catalog number	Price	Catalog number	Price
20 x 20 cm	25 watts	254	19½" x 5½" x 13¼" (48.6 x 14.3 x 33.7 cm)	TW-97622-00		TW-97622-02	
		302		TW-97622-04		TW-97622-06	
21 x 26 cm	25 watts	254		TW-97622-08		TW-97622-10	
		302		TW-97622-12		TW-97622-14	
25 x 30 cm	25 watts	254		TW-97622-16		TW-97622-18	
		302		TW-97622-20		TW-97622-22	
20 x 40 cm	25 watts	254		TW-97622-24		TW-97622-26	
		302		TW-97622-28		TW-97622-30	
		365		TW-97622-32		TW-97622-34	



Cole-Parmer

Ultraviolet/White Light Transilluminators

Side-by-side white light and UV sources save space and money

- Hinged UV-blocking cover adjusts to suit the user's viewing angle and to provide easy access to the surface
- UV side utilizes a long-life filter

The transilluminators provide both a white light area and UV area, each measuring 20 x 20 cm. Easily switch between light sources with rocker switch. View Coomassie Blue stained gels, silver-stained protein gels, autoradiographs, and microtiter plates on the white light side. View ethidium bromide gels on the UV side. Transilluminators feature 5000 hour long-life UV filters. Durable, scratch-resistant epoxy-powder paint finish is easy to clean and maintain. Cover blocks 99% of harmful UV radiation.

What's included: UV or white light tubes, UV blocking cover, long-life filter, and power cord with plug.



97623-76

Wavelength (nm)	Dimensions (W x H x D)	Transilluminators; 115 VAC, 60 Hz		Transilluminators; 230 VAC, 50 Hz	
		Catalog number	Price	Catalog number	Price
302	19" x 5 5/8" x 13 1/4" (48.3 x 14.3 x 33.7 cm)	TW-97623-70		TW-97623-72	
365		TW-97623-74		TW-97623-76	
302/365		TW-97623-78		TW-97623-80	

TW-97607-54 Replacement tube; 8 watts, white light

TW-97607-51 Replacement tube; 8 watts, 302 nm

TW-97607-52 Replacement tube; 8 watts, 365 nm

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Cole-Parmer White Light Transilluminators

Uniform white light diffusion for viewing negative and film positives

- Cool white light is emitted through an evenly diffused glass surface which is permanently sealed into the unit for durability
- Scratch- and chemical-resistant Plexiglas® surface can be cleaned easily
- Excellent for viewing Coomassie Blue stained gels as well as autoradiographs, X-rays, and microtiter plates

Two sizes available—21 x 26 cm filter size contains two 8-watt tubes, or 36 x 43 cm filter size contains four 14-watt tubes.



09814-00

09814-10



Filter area	Wattage	Dimensions (W x H x D)	Lamps; 115 VAC, 60 Hz		Lamps; 230 VAC, 50 Hz		Replacement tubes	
			Catalog number	Price	Catalog number	Price	Catalog number	Price
21 x 26 cm	2 x 8 watts	13 1/4" x 4 1/4" x 9 1/2" (33.7 x 10.8 x 24.1 cm)	TW-09814-00 [†]		TW-09814-05 [‡]		TW-97607-54	
36 x 43 cm	4 x 14 watts	16" x 4 1/4" x 19 1/8" (40.6 x 10.8 x 48.6 cm)	TW-09814-10 [‡]		TW-09814-15 [‡]		TW-97607-53	

[†]These transilluminators require two identical tubes.

[‡]These transilluminators require four identical tubes.

Economical Mini Light Box

Compact, lightweight mini light box is ideal for viewing slides, mini-gels, and petri dishes. Operates on four C batteries (sold separately) or optional 110 VAC adapter. Includes a removable counting grid.



14211-04

Catalog number	Dimensions (W x H x D)	Price
LZ-14211-04	6 1/2" x 1 1/4" x 5 3/8" (16.5 x 4.4 x 13.7 cm)	

LZ-09376-02 Batteries, C. Pack of 4

LZ-14211-60 Replacement grids. Pack of 5

Revelation™ Safety Glasses

Customize fit to suit your comfort level with five-position ratchet and four-position telescoping temples. Feature a soft rubber, self-adjusting nosepiece, scratch-resistant hard-coated lens, and 99.9% UV protection. Vented channel between lens and frame reduces fogging.

Compliance: ANSI Z87.1-2003



Adjustable temple

86497-10

Catalog number	Frame color	Lens color	Price per pair
LZ-86497-10	Black	Clear	



Ultraviolet Equipment Imaging Systems

DigiDoc-It™ Imaging System

15.1 megapixel high-resolution CCD digital color camera for clear, high-quality images

- Lightweight, compact hood with viewport and easy-access door
- High-quality images with low-light capability
- Auto and manual focus, and exposure control

The DigiDoc-It imaging system offers an economical imaging solution for gel imaging by combining an easy-to-use software interface with a high-resolution megapixel digital color camera—all housed in a lightweight hood. Handles on the hood let you easily move the unit.



97702-40

The camera is controlled by exclusive capture software which loads onto your computer. View live preview of gels, plates, and colonies on the monitor and save images in multiple file formats. The easy-to-use software offers multiple image capture, image enhancement, and reporting tools and supports compliance with 21 CFR Part 11. The camera is housed under the protective cap.

The hood enclosure fits on top of a high-performance 25-watt UV transilluminator (302 nm UV; high-, medium-, and low-variable intensity settings). Access to the transilluminator surface is via the flip-open door. The viewport allows UV-safe visibility of fluorescent-stained gels.

Specifications

- CCD camera:** color digital, 15.1 megapixels[†]
- Image resolution:** up to 4416 x 3312
- Lens:** 5x optical zoom, 4x digital zoom
- Focus:** automatic
- Filters:** 55 mm ethidium bromide
- Interface:** USB
- Hood dimensions (W x H x D):** 17¾" x 16½" x 12" (45.1 x 42.2 x 30.5 cm)
- Transilluminator dimensions (W x H x D):** 19½" x 6½" x 13¼" (48.6 x 16.5 x 33.7 cm)
- Transilluminator power:** 115 VAC

Catalog number	Transilluminator	Price
TW-97701-40	None	
TW-97702-40	20 x 20 cm filter	
TW-97702-42	21 x 26 cm filter	
TW-97702-44	25 x 30 cm filter	

[†]Contact Cole-Parmer for current camera specifications.

- [TW-97701-42](#) Drawer for DigiDoc-It
- [TW-97701-62](#) Doc-It analysis software
- [TW-97601-54](#) Thermal printer, 110 VAC
- [TW-97601-56](#) Thermal printer, 230 VAC
- [TW-97701-52](#) Thermal paper. Pack of 4 rolls

Find MORE!

Order additional electrophoresis equipment on pages 427-434.

MultiDoc-It™ Multi-User Imaging System

Designed for multiple user laboratories for capturing gels, plates, and membrane images

- 15.1 megapixel digital color camera with 3x optical zoom lens
- Darkroom has built-in overhead white light
- Transilluminator included

The MultiDoc-It system is a sturdy metal system for multiple user laboratories. The enclosure provides a darkroom environment and protects the digital color camera (see ad at left for camera details). The camera produces high quality images with low light capability and can be used in other laboratory applications. Use your existing computer with the Doc-It software (order separately at left) for camera control, image capture and enhancement or other laboratory applications.



97701-20 with M-20V transilluminator

The darkroom features a built-in overhead white light. When overhead UV illumination is required, install the optional UV lamps. Two lamps are recommended for uniform illumination. A safety switch turns UV off when the door is open.

Specifications

- Camera:** 15.1 megapixel digital color camera, see details on model 97701-40 at left
- Software:** large selection of image capture and effects settings, compatible with Windows® 98, ME, XP, 7, Vista, and 2000 with a USB interface
- Transilluminator:** models with 20 x 20 or 21 x 26 cm filters, 302 nm or 2 UV

Catalog number	Filter wavelength	Intensity style	Filter size	Power	Price
TW-97701-20	302 nm	Hi/lo/med	20 cm x 20 cm	115 VAC 230 VAC	
TW-97701-22					
TW-97701-24	302 nm/365 nm	Single	20 cm x 20 cm	115 VAC 230 VAC	
TW-97701-26					
TW-97701-28	302 nm	Hi/lo/med	21 cm x 26 cm	115 VAC 230 VAC	
TW-97701-31					
TW-97701-32	302 nm/365 nm	Single	21 cm x 26cm	115 VAC 230 VAC	
TW-97701-34					

- [TW-97701-62](#) Doc-It analysis software
- [TW-09815-10](#) Optional UV lamp, 254 nm; 115 VAC
- [TW-09815-02](#) Optional UV lamp, 254 nm; 230 VAC
- [TW-09817-01](#) Optional UV lamp, 365 nm; 115 VAC
- [TW-09817-02](#) Optional UV lamp, 365 nm; 230 VAC
- [TW-09817-20](#) Optional UV lamp, 365/254 nm; 115 VAC
- [TW-09817-22](#) Optional UV lamp, 365/254 nm; 230 VAC
- [TW-97601-54](#) Thermal printer, 115 VAC
- [TW-97601-56](#) Thermal printer, 230 VAC
- [TW-97701-52](#) Thermal paper. Pack of 4 rolls

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TECHNICAL info!

Ultraviolet Intensity Meters (Radiometers)

Ultraviolet (UV) intensity meters measure shortwave, medium-wave, and longwave UV light intensities. Use an intensity meter (radiometer) to monitor the efficiency of your UV light source and ensure that you are providing optimal UV light for your application. UV intensity meters are perfect for industrial safety, laboratory, UV curing, and air/water purification industries.

Common Applications

- Protection against potential UV hazards such as fluorescent lighting, monitor glare, or welding
- Maintaining biologically effective UV radiation from the sun and artificial sources



Ultraviolet Intensity Meters

Choose a longwave or shortwave model—each model has two switch-selectable ranges. Do not use these meters where visible-light intensity exceeds 40 footcandles.

What's included: a 4-ft (1.2-m) cord connects the sensor to the meter for remote readings, a snap-on contrast filter, document of calibration, and a carrying case.

Specifications

Short-term repeatability: ±1% under isothermal conditions
Linearity tolerance: ±10%
Dimensions: 3"W x 3¼"H x 3"D (7.6 x 8.3 x 7.6 cm)
Power: solar cell

Catalog number	Sensor type	Wavelength (nm)	Intensity $\mu\text{W}/\text{cm}^2$	Price
TW-09819-71	Longwave	365	20 to 6000	
TW-09819-72	Shortwave	254	20 to 12,000	



09819-71

Cole-Parmer® Digital Ultraviolet Intensity Meter

With interchangeable sensors

This radiometer is used to monitor the useful life of any UV light source by measuring lamp irradiance. It operates with a 9 V battery for up to 120 hours. Select three intensity ranges: 0 to 20 mW/cm², 0 to 2000 $\mu\text{W}/\text{cm}^2$, and 0 to 200 $\mu\text{W}/\text{cm}^2$. Optional 10:1 attenuator extends the reading range up to 200 mW/cm².

Choose one of the three interchangeable sensors for measuring 254 nm, 302 nm, or 365 nm ultraviolet wavelengths. All sensors come calibrated, and are ±5% accurate. The 3-ft (0.9-m) cable length is ideal for measuring UV in remote locations. Sensors are not included; order separately below. We recommend that the sensors are recalibrated every six months; call for detailed information.



97651-10

Specifications

Accuracy: ±2% **Sensor accuracy:** ±5%
Display: 3½-digit LCD **Dimensions:** 6½"L x 3¾"W x 2"H (16.5 x 8.1 x 5.1 cm)

Catalog number	Description	Power	Price
TW-97651-10	Digital UV intensity meter	9 V battery (not included)	

- [TW-97651-26](#) Attenuator, 10:1
- [LZ-09376-04](#) Batteries, 9 V. Pack of 4

Sensors

Catalog number	Wavelength	Price
TW-97561-20	254 nm	
TW-97651-22	365 nm	
TW-97651-24	302 nm	

UV-A/B and UV-C Light Meters

Measure damaging UV light

Conduct UV degradation studies for pharmaceutical, cosmetic, semiconductor, printing, forensic applications and more. The UV light intensity appears on the large backlit display in either W or mW/cm² while the small lower display simultaneously shows minimum, maximum, average, and recorded data. Up to 20 data points can be recorded automatically at a variety of intervals.

The UV-A/B model measures long and medium wave UV-A/B for forensics, chromatography, electrophoresis, and dermatology applications. Use the UV-C model for UV light fume hoods, UV sterilization, industrial glass, and nondestructive testing.

What's included: UV probe, tripod screw, magnetic mount, hard foam-lined carrying case, and one 9 V battery.



50513-00

Specifications

Range: 1 $\mu\text{W}/\text{cm}^2$ to 40.00 mW/cm²
Resolution: 1 μW and 0.01 mW/cm²
Accuracy: ±4% ±1 digit (at 23 ±5°C)
Functions: min/max/avg, zero point reset, hold, low battery, data storage/recall
Output: none
Display: dual-line backlit LCD
Dimensions (W x H x D): 2" x 6" x 1½" (5 x 15.2 x 3.8 cm)

Catalog number	Description	Price
LZ-50513-00	Light meter, UV-A/B	
LZ-50513-02	Light meter, UV-C	

[LZ-09376-04](#) Replacement batteries, 9 V. Pack of 4



Find MORE!

Find additional light measurement equipment on **pages 849–852.**

Ultraviolet Equipment Radiometers

Radiometers and Sensors

User-friendly instrument simplifies data collection and fits in the palm of your hand

- Automatic unit conversion with a push of a button
- Save time with the quick integration of various sensors
- Radiometers even allow you to measure humidity and temperature

Log specifications easily—radiometers display minimum, average, and maximum values at the push of a single button. Easily download into computer and graph results with the included software. Radiometer does not include sensors; order separately at below.

1 Radiometers

Single-Input Radiometer can be used with any one of the sensors below. Displays minimum, maximum, and mean readings. Features built-in radiometric capability and dose integration.

Dual-Input Data logging Radiometer accepts two inputs to measure two samples simultaneously. Stores up to 1024 readings. Each reading includes date, time, sensor type, and serial number for data tracking. Set independent alarms for the instantaneous value or integrated dose for each detector. The alarm settings are stored in the detector and automatically recalled when the detector is in use.

What's included: Model 97650-02 includes four AA batteries. Model 97650-00 includes a UL-listed 6-ft (1.8-m), two-wire AC adapter/charger (90 to 265 VAC), RS-232 cable, batteries, and a carrying case. Sensors are not included; order sensors separately. NIST-traceable calibration report supplied by the manufacturer.

Catalog number	Inputs	Data logging	Power	Price
TW-97650-02	1	No	4 AA batteries	
TW-97650-00	2	1 minute to 2 hours [†]	4 AA batteries, AC/DC charger [‡]	

[†]User-set intervals between the range of 1 minute to 2 hours. [‡]9 to 12 V AC/DC charger

2 Interchangeable Sensors

- All sensors are submersible to three feet

UV Sensors give accurate measurement of either UVA or UVB radiation from sunlight or artificial sources. The UVC germicidal sensor provides an accurate reading of the ultraviolet radiation from a UVC germicidal lamp to ensure that the lamp is killing all the bacteria. The UV radiation safety sensor measures the amount of UV radiation that it is being exposed to and indicates the level at which it is unsafe by the standards of the American Conference of Governmental Industrial Hygienists (ACGIH).

Visible Light Sensors measure light intensity below 0.01 lux and can also be used as a safety detector for hazardous intensities of light. The PAR sensor measures photosynthetic active radiation. The blue light hazard sensor measures the blue light (near UV) radiation hazard to eyes. It can be used by employers and safety officers to protect against the effects of excessive daily blue light exposure.

Humidity/Temperature/Dew Point Sensor measures relative humidity, ambient temperature, and dew point.

What's included: NIST-traceable calibration report supplied by the manufacturer.

REQUIRED SYSTEM Components

- Radiometer
- Sensor



Single-input radiometer 97650-02 shown with sensor 97650-54

Dual-input radiometer 97650-00 shown with sensor 97650-50

Catalog number	Description	Spectral response	Range	Resolution	Price
UV sensors					
TW-97650-52	UVA	320 to 400 nm	200 mW/cm ² 2000 W/m ²	0.001 mW/cm ² 0.01 W/m ²	
TW-97650-50	UVB	280 to 340 nm	200 MED ^{††} /hr 1160 μW/cm ²	0.001 MED/hr 0.01 μW/cm ²	
TW-97650-61	UVC/ germicidal	249 to 261 nm	2000 μW/cm ² 20,000 mW/m ²	0.01 μW/cm ² 0.1 mW/cm ²	
TW-97650-59	UV radiation ^{††}	200 to 400 nm	1000 μW/cm ² 10,000 mW/m ²	0.01 μW/cm ² 0.1 mW/m ²	
Visible sensors					
TW-97650-54	Visible photopic	380 to 780 nm	150,000 lux 220 W/m ²	1 lux 0.001 W/m ²	
TW-97650-56	PAR	400 to 700 nm	20,000 μE/s/m ²	0.1 μE/s/m ²	
TW-97650-60	Blue light safety	400 to 520 nm	2000 μW/cm ² 20,000 mW/m ²	0.01 μW/cm ² 0.1 mW/cm ²	
Humidity / temperature / dew point sensor					
TW-97650-58	Humidity/ temp/dew point ^{†††}	—	0 to 100% RH	0.1% RH	

^{††}These are minimal erythemal doses.

^{†††}Measures duration of exposure prior to TLV proposed by the ACGIH.

^{†††}Not applicable to NIST traceability. Converts values to dew point.