How To Select A Radiometer

Choose the Right UV Measurement Device for Your Specific Needs

UVPS®
UV PROCESS SUPPLY, INC.

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How To Select A Radiometer Manual

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What Kind of UV User Are you?

Find your UV Curing Application/Method from the choices below.

WEB PRESS SYSTEM:

(or any system with vertical motion and/or pinch rollers)

A **Good** Radiometer for you is:
PALM Probe™ (page 25)
A **Better** Radiometer for you is:
Micro Puck™ (page 17)
The **Best** Radiometer for you is:
LM-9000™ (page 23)

FLEXO/NARROW WEB SYSTEM:

A **Good** Radiometer for you is:
PALM Probe™ (page 25)
A **Better** Radiometer for you is:
Micro Puck™ (page 17)
The **Best** Radiometer for you is:
LM-9000™ (page 23)

SHEETFED/OFFSET SYSTEM:

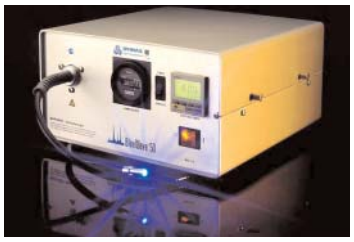
A **Good** Radiometer for you is:
PALM Probe™ (page 25)
A **Better** Radiometer for you is:
Micro Puck™ (page 17)
The **Best** Radiometer for you is:
LM-9000™ (page 23)

WIDE WEB/COATING SYSTEM:

A **Good** Radiometer for you is:
PALM Probe™ (page 25)
A **Better** Radiometer for you is:
Micro Puck™ (page 17)
The **Best** Radiometer for you is:
LM-9000™ (page 23)

CONTAINER CURING:

Good Radiometers for you are:
Diskure 365™/Micro Puck™ (page 16/17)
A **Better** Radiometer for you is:
OmniScan™ (page 18)
The **Best** Radiometer for you is:
Diskure™ 4Scan (page 16)



SPOT CURING:

The **Best** Radiometer for you is:
Spot Cure Meter™ (page 27)

What Kind of UV User Are you?

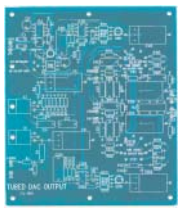
Find your UV Curing Application/Method from the choices below.

ADHESIVES/PRODUCT ASSEMBLY:

A **Good** Radiometer for you is:
Spot Cure Meter™ (page 27)
A **Better** Radiometer for you is:
VersaProbe Pro™ (page 28)
The **Best** Radiometer for you is:
Diskure™ 4Scan (page 16)

SCREEN PRINTING:

A **Good** Radiometer for you is:
Diskure 365™ (page 16)
A **Better** Radiometer for you is:
Diskure™ 4Scan (page 16)
The **Best** Radiometer for you is:
UV Profiler-3000™ (page 21)



PHOTORESIST/PRINTED CIRCUIT BOARDS:

A **Good** Radiometer for you is:
UV FastCheck™ Strips (page 17)
A **Better** Radiometer for you is:
IL-1400 (page 22)
The **Best** Radiometer for you is:
IL-1700 (page 22)

FLOORING:

A **Good** Radiometer for you is:
Diskure 365™ (page 16)
A **Better** Radiometer for you is:
OmniScan™ (page 18)
The **Best** Radiometer for you is:
LM-9000™ (page 23)

SIGN PRINTERS:

A **Good** Radiometer for you is:
PALM Probe™ (page 25)
A **Better** Radiometer for you is:
Micro Puck™ (page 17)
The **Best** Radiometer for you is:
LM-9000™ (page 23)

METAL DECORATION:

A **Good** Radiometer for you is:
Micro Puck™ (page 17)
A **Better** Radiometer for you is:
VersaProbe Pro™ (page 28)
The **Best** Radiometer for you is:
LM-9000™ (page 23)

What Kind of UV User Are you?

Find your UV Curing Application/Method from the choices below.

ELECTRONICS/PC (Encapsulation):

A **Good** Radiometer for you is:
Micro Puck™ (page 17)
A **Better** Radiometer for you is:
Spot Cure Meter™ (page 27)
The **Best** Radiometer for you is:
LM-9000™ (page 23)

LAB (Testing):

A **Good** Radiometer for you is:
VersaProbe Pro™ (page 28)
A **Better** Radiometer for you is:
Micro Puck™ (page 17)
The **Best** Radiometer for you is:
LM-9000™ (page 23)

MEDICAL GERMICIDAL:

A **Good** Radiometer for you is:
Silver Line™ UV-C (page 26)
A **Better** Radiometer for you is:
VersaProbe Pro™ UV-C (page 28)
The **Best** Radiometer for you is:
LM-9000™ (page 23)

3-D CURING:

A **Good** Radiometer for you is:
Micro Puck™ (page 17)
A **Better** Radiometer for you is:
PALM Probe™ (page 25)
The **Best** Radiometer for you is:
LM-9000™ (page 23)

DIGITAL INKJET:

A **Good** Radiometer for you is:
PALM Probe™ (page 25)
A **Better** Radiometer for you is:
Micro Puck™ (page 17)
The **Best** Radiometer for you is:
LM-9000™ (page 23)

GRAVURE INTAGLIO:

A **Good** Radiometer for you is:
PALM Probe™ (page 25)
A **Better** Radiometer for you is:
Micro Puck™ (page 17)
The **Best** Radiometer for you is:
LM-9000™ (page 23)

What Kind of UV User Are you?

Find your UV Curing Application/Method from the choices below.

POWDER COATING:

A **Good** Radiometer for you is:
Micro Puck™ (page 17)
A **Better** Radiometer for you is:
OmniScan™ (page 18)
The **Best** Radiometer for you is:
LM-9000™ (page 23)

CD/DVD MANUFACTURING:

A **Good** Radiometer for you is:
Diskure 365™ (page 16)
A **Better** Radiometer for you is:
Micro Puck™ (page 17)
The **Best** Radiometer for you is:
Diskure™ 4Scan (page 16)

WIRE/CABLE:

A **Good** Radiometer for you is:
Micro Puck™ (page 17)
A **Better** Radiometer for you is:
PALM Probe™ (page 25)
The **Best** Radiometer for you is:
LM-9000™ (page 23)

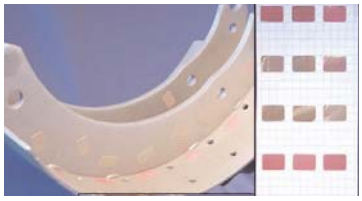
QUALITY CONTROL - ISO 9000:

A **Good** Radiometer for you is:
PALM Probe™ (page 25)
A **Better** Radiometer for you is:
Diskure™ 4Scan (page 16)
The **Best** Radiometer for you is:
LM-9000™ (page 23)

SAFETY MANAGEMENT:

A **Good** Radiometer for you is:
Handheld UV Hazard Meter (page 28)

The **Best** Radiometer for you is:
Sunburning & UV-A Intensity Meter (page 27)



ALTERNATIVE UV MEASUREMENT:

A **Good** Radiometer for you is:
UV FastCheck™ Strips (page 17)

The **Best** Radiometer for you is:
RadCheck™ (page 19)

		Style	Spectral Range						Features							
Part Number	Description	Pass-Through	UV-A 320-400	UV-B 280-320	UV-C 200-280	UV-V 400+	OTHER UV	Individual UV Range Measurements	DOSE mJ/cm^2	INTENSITY mW/cm^2	Temperature	Graphing	PC Interface	Probe	Battery Operated	AC Adapter
M007-091	DISKURE 365 Radiometer	X	X	X	X				X						X	
M007-111	DISKURE 4SCAN Radiometer	X	X	X	X			X	X	X					X	
M007-112	DISKURE 4SCAN-C Radiometer	X	X	X	X			X	X	X		X	X		X	
M007-113	DISKURE 4SCAN-T Radiometer	X	X	X	X			X	X	X	X				X	
M007-114	DISKURE 4SCAN-TC Radiometer	X	X	X	X			X	X	X	X	X	X		X	
N010-002	FASTCHECK Strips	X	X	X	X	X			X							
M007-074A	MICROCURE w/Data Reader 10W/cm^2	X	X						X	X					X	
M007-074	MICROCURE w/Data Reader 2W/cm^2	X	X						X	X					X	
M007-130	MICRO PUCK Full UV Radiometer	X	X	X	X				X						X	
M007-131	MICRO PUCK UV-A Radiometer	X	X						X						X	
M007-132	MICRO PUCK UV-B Radiometer	X		X					X						X	
M007-133	MICRO PUCK UV-C Radiometer	X			X				X						X	
M007-135	MICRO PUCK MULTI Full UV Radiometer	X	X	X	X				X						X	
M007-136	MICRO PUCK MULTI UV-A Radiometer	X	X						X						X	
M007-137	MICRO PUCK MULTI UV-B Radiometer	X		X					X						X	
M007-138	MICRO PUCK MULTI UV-C Radiometer	X			X				X						X	
M007-098AH	OMNISCAN Radiometer UV-A HIGH	X	X						X	X		X			X	
M007-098AL	OMNISCAN Radiometer UV-A LOW	X	X						X	X		X			X	
M007-098ABH	OMNISCAN Radiometer UV-AB HIGH	X	X	X					X	X		X			X	
M007-098ABL	OMNISCAN Radiometer UV-AB LOW	X	X	X					X	X		X			X	
M007-098BH	OMNISCAN Radiometer UV-B HIGH	X		X					X	X		X			X	
M007-098BL	OMNISCAN Radiometer UV-B LOW	X		X					X	X		X			X	
M007-098CH	OMNISCAN Radiometer UV-C HIGH	X			X				X	X		X			X	
M007-098CL	OMNISCAN Radiometer UV-C LOW	X			X				X	X		X			X	
M007-098VH	OMNISCAN Radiometer UV-V HIGH	X				X			X	X		X			X	
M007-098VL	OMNISCAN Radiometer UV-V LOW	X				X			X	X		X			X	
M007-040	POWER PUCK Radiometer	X	X	X	X	X		X	X	X					X	
M007-078	RADCHECK 300 DOSIMETER	X	X						X							X
M007-081	RADCHECK 800 DOSIMETER	X	X						X							X
M007-088A	UV MAP+ UV-A Radiometer	X	X						X	X	X	X	X		X	X
M007-088B	UV MAP+ UV-B Radiometer	X		X					X	X	X	X	X		X	X
M007-088C	UV MAP+ UV-C Radiometer	X			X				X	X	X	X	X		X	X
M007-088V	UV MAP+ UV-V Radiometer	X				X			X	X	X	X	X		X	X
M007-087	UV POWER MAP Radiometer	X	X	X	X	X		X	X	X	X	X	X		X	X
M007-040A	UVICURE PLUS UV-A Radiometer	X	X						X	X					X	
M007-040B	UVICURE PLUS UV-B Radiometer	X		X					X	X					X	
M007-040C	UVICURE PLUS UV-C Radiometer	X			X				X	X					X	
M007-040V	UVICURE PLUS UV-V Radiometer	X				X			X	X					X	
M007-106	UV MICROLOG Radiometer D	X	X	X	X				X	X	X	X	X		X	
M007-107	UV MICROLOG Radiometer 6	X	X	X	X				X	X	X	X	X		X	
M007-120	UV PROFILER-3000 Radiometer	X	X	X	X				X	X	X	X	X		X	
M007-121	UV-T PROFILER Full UV Radiometer	X	X	X	X				X	X	X	X	X		X	
M007-122	UV-T PROFILER UV-A Radiometer	X	X						X	X	X	X	X		X	
M007-123	UV-T PROFILER UV-B Radiometer	X		X					X	X	X	X	X		X	
M007-124	UV-T PROFILER UV-C Radiometer	X			X				X	X	X	X	X		X	
M007-125	UV-3C PROFILER Radiometer	X	X	X	X			X	X	X		X	X		X	
M007-126	UV-3C-T PROFILER Radiometer	X	X	X	X			X	X	X	X	X	X		X	

		Style			Spectral Range						Features							
		Online (Fixed Mount)	Probe Style		UV-A 320-400	UV-B 280-320	UV-C 200-280	UV-V 400+	OTHER UV	Individual UV Range Measurements	DOSE mJ/cm^2	INTENSITY mW/cm^2	Temperature	Graphing	PC Interface	Probe	Battery Operated	AC Adapter
Part Number	Description		Benchtop	Hand Held														
M007-017F	IL-1400 Radiometer:Custom			X	X	X	X	X	X	X	X	X	X			X	X	
M007-017C	IL-1440A Radiometer:Photoresist A			X	X			X			X	X	X			X	X	
M007-017D	IL-1440B Radiometer:Photoresist B			X	X						X	X	X			X	X	
M007-017A	IL-1445 Radiometer:Curing			X	X	X	X	X			X	X	X			X	X	
M007-017B	IL-1447 Radiometer:Curing/RAMP			X	X	X	X	X			X	X	X			X	X	
M007-017E	IL-1471 Radiometer:Germicidal			X		X	X		X		X	X	X			X	X	
M007-001F	IL-1700 Radiometer:Custom		X		X	X	X	X	X	X	X	X	X	X	X	X		X
M007-001C	IL-1740A Radiometer:Photoresist A		X		X			X			X	X	X	X	X	X		X
M007-001D	IL-1740B Radiometer:Photoresist B		X		X						X	X	X	X	X	X		X
M007-001A	IL-1745 Radiometer:Curing		X		X	X	X	X			X	X	X	X	X	X		X
M007-001B	IL-1747 Radiometer:Curing/RAMP		X		X	X	X	X			X	X	X	X	X	X		X
M007-001E	IL-1771 Radiometer:Germicidal		X			X	X		X		X	X	X	X	X	X		X
M007-068A	LAMPLINE DIN Module	X			X	X	X	X				X				X		X
M007-067A	LAMPLINE Multi-Channel Monitor	X			X	X	X	X				X				X		X
M007-066A	LAMPLINE Panel Mount	X			X	X	X	X				X				X		X
LM9000	LM9000	X			X	X	X	X	X	X	X	X	X	X	X	X		X
M007-096A	PALM PROBE UV-A Radiometer			X	X						X	X				X	X	
M007-096B	PALM PROBE UV-B Radiometer			X		X					X	X				X	X	
M007-096V	PALM PROBE UV-V Radiometer			X				X			X	X				X	X	
M007-108	R3 Probe UV-A Radiometer			X	X							X				X	X	
M007-109	R3 Probe Full UV Radiometer			X	X	X	X					X				X	X	
M007-150	Silver Line UV-A Radiometer			X	X							X				X	X	
M007-151	Silver Line UV-B Radiometer			X		X						X				X	X	
M007-152	Silver Line UV-C Radiometer			X			X					X				X	X	
M007-153	Silver Line Full UV Radiometer			X	X	X	X					X				X	X	
M007-054	SOLAR 5.0 Radiometer			X	X	X						X					X	
M007-073	SOLAR 6.0 Radiometer			X		X						X					X	
M007-072	SOLAR 6.5 Radiometer			X	X	X						X					X	
M007-041A	SPOT CURE UV-A Meter			X	X							X					X	
M007-041B	SPOT CURE UV-B Meter			X		X						X					X	
M007-041C	SPOT CURE UV-C Meter			X			X					X					X	
M007-041V	SPOT CURE UV-V Meter			X				X				X					X	
M007-110	SUNBURNING UV Meter			X	X	X						X				X	X	
M007-051	UV HAZARD Radiometer			X	X	X			X		X						X	
M007-043	UVX Radiometer			X	X	X	X					X				X	X	
M007-155	VersaProbe Pro Full UV Radiometer			X	X	X	X				X	X				X	X	
M007-156	VersaProbe Pro UV-A Radiometer			X	X						X	X				X	X	
M007-157	VersaProbe Pro UV-B Radiometer			X		X					X	X				X	X	
M007-158	VersaProbe Pro UV-C Radiometer			X			X				X	X				X	X	

WHY DO YOU NEED A RADIOMETER?

Intense ultraviolet light is used in many industrial applications. While UV offers many advantages over conventional drying methods, it has its own requirements for maintaining process control. In particular, the UV lamps and irradiators deteriorate over time, causing less UV energy to reach the cure surface. As the UV energy decreases, adjustments in the process must be made to maintain product quality. The difficulty is in determining when the UV energy is decreasing. Ultraviolet light is generally considered to be wavelengths in the 200nm to 400nm region. These wavelengths of light are too short to been seen by the human eye. Just looking into a curing system to see if it is still working will not tell you if the system is actually producing any UV. In fact, as some UV lamps age and the UV is dropping off, they actually produce more visible and infrared light causing them to look brighter. The only way to monitor the condition of these UV reactors is by using instrumentation with UV specific filters.

Why would you want to measure UV used in industrial processing? There are several answers. During setup, "sacrifice" workpieces are run through the process to determine if the curing conditions produce the desired results. This may require several runs and the loss of several pieces until the process has been adjusted properly. By measuring the UV energy when properly cured product is being made, all that has to be done the next time is to adjust the curing system until the same UV levels are achieved. It is not necessary to go through the same time consuming, wasteful setup routine.

As well, UV lamps are expensive and should be replaced only after they no longer produce a usable level of UV energy. Depending on the lamp, the curing system, and how well the system is maintained, UV lamps may last less than 250 hours or well over 3000 hours. UV output should therefore be measured in order to replace lamps only when necessary. The same goes for the reflector assemblies inside the UV irradiator. They, too, are costly and should only be replaced when required.

The cost of downtime when a curing problem has been detected often far outweighs the cost of replacement components and the cost of a radiometer. By using a radiometer to monitor UV output levels, preventive maintenance can be scheduled at a convenient, less costly time rather than right in the middle of a production run.

Using a UV radiometer can save time and money in the following areas:

- Set-up time reduced
- Reduce cost of "sacrifice" workpieces
- Replace lamps only when necessary
- Replace reflectors only when necessary
- Avoid costly, inopportune downtime
- Avoid production of unsatisfactory product

To be able to produce quality product consistently is really the end goal in any process. By monitoring UV levels in a curing system, it is possible to produce quality product time after time and avoid the production of bad product due to improper curing. It is very difficult to measure the cost of producing bad product. Of course, the cost of the materials and labor is lost. In addition, the cost of bad product increases exponentially the closer it gets to the customer before it is discovered. Just think of the loss of goodwill if bad product gets into the customer's hands, not to mention transportation costs, replacement costs, and administrative costs. In some very critical applications, such as medical devices, there are liability costs, as well.

Some companies may be required to have a means of quantifying their UV curing processes because they must meet a MIL or ISO-9000 specification. If these or other statistical process control requirements are to be met, numbers must be attached to elements of the process. Once this data is accumulated, the process can be fully analyzed for variability, trends, preventive maintenance programs, etc.

HOW A RADIOMETER IS USED

Many processes are developed in a laboratory and operating parameters are established for each application before carrying the process out to the production floor. Quite a number of variables must be studied, one of which is the UV level necessary to effect a proper cure. A radiometer is used to quantify the dosage and intensity required and numerous tests are run to assure that the product being cured has all the right properties. After laboratory studies have been performed, the real test is to try it in a production environment. Sometimes a direct transfer can be made, but more often there are conditions in the production setting that are different from the lab setting which have an affect on curing. The operating temperature may be higher in production than in the lab; the production UV curing system may have multiple lamps while the lab studies were conducted using just one; it may not be possible to duplicate the high production line speeds in the lab; and a host of other variables may exist that must be measured to fully quantify and transfer the process from the laboratory to the production floor.

In use, a radiometer measurement is taken after product has been produced which is determined to be at optimal cure. This becomes the benchmark value for "good" product. Once a process has been established and control parameters are measured, it is necessary to routinely measure the operating parameters to assure that they fall within the satisfactory range. Now the operator has established parameters within which to operate. A UV radiometer is used to stringently monitor the UV component. Some applications simply require that an equivalent UV dosage be repeated from one work order to the next to achieve a good cure.

As a production tool, the UV radiometer is typically used to take a reading or a series of readings at the beginning of each day, each shift, each work order, or even each hour to assure that the UV curing system is operating within established guidelines. The production radiometer may or may not be the exact same model that was used to establish the process in the lab.

Often the lab will use a more sophisticated instrument, such as a **UV-Profiler-3000™** (M007-120) or the **UV PowerMAP™** (M007-087), and the production crew will use a simple, easy to use dosage radiometer such as a **Diskure 365™** (M007-091). The operator is given a strict window to operate within. If he gets a reading that falls outside the window, either the lab radiometer is brought in for verification and to troubleshoot the curing system or adjustments are made to the curing system to bring the operating parameters back into line; e.g. change the UV lamp, clean the reflectors, adjust the lamp focus.

Any variance outside the cure window is reported to the QA manager for resolution. Quite often the QA manager will have a UV radiometer of his own which he uses periodically to monitor production conditions and to verify that the production radiometer is still operating within the calibration specifications. The QA unit is often used in production while the production unit is being returned for service and calibration re-certification.

WHAT YOUR UV RADIOMETER MEASURES

A radiometer should be chosen to fit the application and the information required. Functions range from simple intensity and simple dosage to sophisticated mapping and graphing devices. Which wavelength to measure is also a matter of choice. Most UV radiometers on the market measure in the UVA spectrum (320nm-390nm). This is because the majority of the chemistry responds to this band of energy. If it is desirable to measure other parts of the UV spectrum, many radiometers are available to do so. Certain chemistry is formulated to respond to different wavelengths of light and for different applications. Radiometers are also configured for use in different applications.

For instance, in UV spot curing, a high intensity UV source is channeled through a liquid light guide in order to control a very high intensity light and focus it onto a relatively small area. UV spot curing is used for many adhesive applications. An example would be attaching hypodermic needles to a plastic injector. It is important to monitor the output from these UV systems as the lamp, reflector and light guide deteriorate with use. A radiometer, configured like the **SpotCure Meter™** (M007-041A), measures the UV intensity from the liquid light guide and can be used to determine when the output has dropped below a usable level. The radiometer can also be used to optimize the positioning of the light guide. Each time the light guide is bent or twisted, some UV output is lost. By measuring the UV output with a radiometer, light guide position can be adjusted until the maximum intensity is realized from the system.

Most radiometry typically involves measuring UV Dosage in Millijoules/cm^2. More sophisticated measurements involve measuring peak UV Intensity in addition to UV Dosage. UV Dosage is only a measurement of total energy, while the UV Intensity (most often measured in MilliWatts) at which the energy was delivered, has profound effects on the cure characteristics of the finished product.

A good analogy to explain the difference between mW/cm^2 and mJ/cm^2 is: imagine a leaky faucet is dripping into a coffee cup at the bottom of a sink. The rate at which the drips fall from the faucet, or how ***intensely*** it is dripping, is analogous to MilliWatts. The total amount of water that has accumulated in the coffee cup is similar to MilliJoules. Milliwatts are Intensity; MilliJoules are Dosage.

The formula for calculating Joules/cm^2 is: 1 W/cm^2 x 1 s = 1 J/cm^2. The calculation for MilliJoules is the same, only the UV level is 1,000 times less: 1 mW/cm^2 x 1 s = 1 mJ/cm^2.

To offer a real world example, one would get very different cure characteristics by exposing a workpiece to 500mJ/cm^2 of UVA light under a 300W/in. mercury vapor lamp versus laying the workpiece outside in the sun for a period of time which would produce 500mJ/cm^2 (about 3 min.). UVA in this example is primarily 365nm wavelength light. In the curing system, the energy equation would be:

UV Intensity x Time = Dosage Energy
250 mW/cm^2 x 2 s = 500 mJ/cm^2

By contrast, the daylight exposure equation might look something like the following:

UV Intensity x Time = Dosage Energy
2.5 mW/cm^2 x 200 s = 500 mJ/cm^2

In each case the workpiece was exposed to 500 mJ/cm^2 of UVA energy, but the cure properties of each workpiece will be substantially different.

A radiometer like the **Diskure™ 4SCAN** (M007-111) and the **UV Power Puck™** (M007-040) can measure both intensity and dosage of multiple, individual wavelength ranges (UVA, UVB, UVC, and/or UVV.) This information reveals how the UV was delivered and at what wavelength range.

Often the user is interested in the spectral content of the UV source being used. Since different chemistry is affected by different UV wavelengths, it is desirable to optimize the curing process by matching UV lamps to the chemistry of the application. Also, the spectral content of the UV source may shift as it ages with the shorter wavelengths moving toward the longer end of the spectrum. The spectral reflectivity of the irradiator often changes over time as well. UV lamp manufacturers and end users alike are interested in this phenomenon.

It is possible to fully analyze the entire curing system using a mapping device such as the **UV-3C-T Profiler™** (M007-126) or the **UV PowerMAP™** (M007-087). By mapping the curing system, you can determine the irradiance of each lamp in the curing system, peak intensity, dosage, focus, and reflector efficiency. Very simple to use, these type of radiometers provide all the vital information necessary to completely characterize a UV curing system for a given spectral bandpass. The unit is passed through the curing system. It measures and stores the UV intensity and temperature data it encounters inside the curing system. The unit is then attached to a computer. The data captured and displayed is: total dosage, peak intensity, peak temperature, sample rate, number of samples, and internal temperatures. In addition, the included software graphs the UV and temperature conditions inside the curing system. By analyzing the graph, the condition of each UV lamp can be determined and compared to other lamps in the system. The shape of the curve is quite revealing.

Typically, a fresh lamp that is properly focused has a very sharp peak with uniform slope on either side. As the lamp ages and the reflector degrades, the shape of the curve changes. The peak is not as sharp and takes on a rounded appearance. The slope of the sides may no longer be symmetrical as the reflector does not always degrade uniformly.

If the curve exhibits a double peak, then most likely the lamp is not in focus. The lamp could be either too high or too low as the trace looks the same. If one side of the double peak is higher than the other, the reflector may be less efficient on one side than the other or the reflector may be tilted off center.

With a standard radiometer that measures only dosage, the detailed condition of the UV source cannot be determined. The dosage may have dropped off but it is not easy to ascertain why it happened. Particularly in a system with multiple lamps, measuring the dosage does not tell you if all lamps degraded equally or if there is a problem with just one lamp. Even a radiometer that gives you peak intensity does not tell you which lamp had the highest output. The only way to get such information is to "map" the curing system or use a radiometer that can specify which data belongs to which lamp (such as the **OmniScan™** (M007-098)).

Environmental Conditions

The environment in which the radiometer is used also plays an important role in the selection of a radiometer. If the instrument is used in the field, portability may be a concern. Power requirements may also be a concern in a given environment. If utility power is not conveniently available, the instrument must be battery operated. The battery capacity may be an issue if the instrument is used for extended periods of time under battery operation. Instruments used in a laboratory or permanent monitoring situation should be powered by utility power.

TYPES OF RADIOMETERS

Pass-Through Radiometers

These type of units are a good choice when a radiometer will fit into the curing station. The key measurables of dosage, peak UV intensity, and temperature can simply be obtained by sending a pass-through radiometer on the conveyor through your UV curing system. Available in the full spectrum of UV and individual UV ranges, these units run from the basic (**Diskure 365™** (M007-091)) to the full featured (**Diskure 4Scan-TC™** (M007-114)). They measure the amount of UV reaching the surface where the curing is to take place. So they accurately reflect how much UV energy your material to be cured is actually receiving.

Specialty Pass-Through Radiometers
In certain UV curing units, it can be difficult for a pass-through radiometer to physically fit into and travel through the machine. For these type of circumstances, specially designed radiometers apply.

Miniature
There are miniature sensors that can travel through nearly any type of of unit. These sensors are retrieved after passing through the UV curing portion of the machine and then are connected to a base unit that downloads the captured readings for the user to observe. Examples of this type of radiometer are the **Micro Puck™** (M007-130) and the **MicroCure™** (M007-074).

Ultra-Thin
A new style of pass-through radiometer is the ultra-thin unit. The **UV Microlog D™** (M007-106) is a full featured radiometer that measures UV intensity, UV Dose, and temperature. With an ultra-thin profile of only 1/4", this unit can pass through the narrowest of curing environments. Unlike the miniature sensors referenced above, the UV Microlog D's resulting measurements can be viewed 2 ways: either numerical results via the on-board display or downloaded through a USB computer link.

Flexible
For curing environments through which even smallest sensors can't travel, there are 2 flexible, pass-through options that can safely travel through rollers. **UV FastCheck™ Strips** (N010-002) are simple, reliable, and easy to use indicators of accumulated UV light dosage. They let a user know when a certain UV dose has or has not been achieved via 5 separate color changing zones. Due to their paper-thin profile and thermal stability, they can be used in all narrow web environments -- going places no radiometer can go.

Another option for UV curing stations that can't accept a radiometer is the **RadCheck™ UV Measurement System** (M007-078). Incorporating a UV/EB-detection dosimeter and disposable UV and EB sensitive flexible test strips, the Rad Check system delivers numerical results indicating UV dose exposure. Each test strip contains a UV/EB sensitive compound which is destroyed upon exposure to a UV light. After exposing the test strip, the density of the remaining compound can be measured by the Rad Check Dosimeter, which produces a numerical value reflecting energy received.

Other radiometers that are useful in these environments are probe-style radiometers that are inserted into the UV curing portion at specific and repeatable locations. These are discussed in more detail in the Probe-Style Radiometer section.

Online (Fixed Mount) Monitoring

Online monitoring is used when continuous monitoring is desired (not just spot-checking) and in places where a radiometer will not fit in the spatial requirement. The overall cost to monitor a multi-lamp system with individual online monitors is generally more than using one portable radiometer. But if using a radiometer is NOT an option, online monitoring is desirable, effective, and reliable.

Online monitors such as the **LM-9000™** read relative intensity only (percentage of original output when the bulb is new). The measurements are relative to that particular machine because the sensor records output in a particular location at a certain distance from and at a certain angle to the reflector and UV bulb -- measurements between different machines or different factories is not the aim of online monitoring. It is used to determine the ongoing efficiency of any given machine over a lengthy period of time.

Multiple Curing Stations

When you need to monitor multiple UV curing machines, a portable radiometer is less expensive than online monitoring. One radiometer can be shared between multiple machines. As well, UV readings taken from one radiometer can be shared with lamp manufacturers, lamp suppliers, adhesive and ink manufacturers, etc. Radiometers allow machine-to-machine comparison. Readings can also be compared between R&D and production or to other plants.

Probe-Style Radiometers

A probe-style radiometer is best suited for certain UV environments. These include:

- UV environments that can only be accessed through a small opening
- UV curing chambers
- UV stations that cure without utilizing conveyors

Rigid Probes

For UV curing equipment that cannot be accessed by a pass-through radiometer, but must have it's rollers spinning in order for the UV lamps to be on, a rigid probe radiometer is often the best choice. A unit such as the **R3 Probe™** (M007-109) or the **PALM Probe™** (M007-096A) are handheld devices featuring a long, thin, tube-like sensor that can extend into UV curing areas while they are operating. Only a small access point is required to measure UV intensity.

Flexible Probes

When a moving conveyor belt is a factor in the UV curing environment, or when you need to measure a UV curing chamber, a flexible probe radiometer suits the application. There is quite a variety of this sort of unit, ranging from a basic handheld radiometer that only measures intensity (**Silver Line™** (M007-153)), to a full featured lab measurement tool like the **IL 1700** (M007-001A). Others radiometers include models that are available in multiple UV ranges and measure both peak intensity and total dose (**VersaProbe Pro™** (M007-155)), and handheld models with a large array of swappable probes and filters (**IL 1400** (M007-017A)). A major benefit of some flexible probe radiometers is the ability to match removable probes to the specific UV wavelengths you need to measure.

Wavelengths

The wavelengths being measured are a key determiner of which radiometry system to select. Two types of radiometers exist today in regards to which wavelengths are measured. The first is a single purpose meter with dedicated wavelengths, and the second is a radiometer with detachable detectors and various wavelength availability. The dedicated meter tends to be less expensive for an application

which requires only one type of measurement. However, if more than one measurement is made, the removable detector is more economical and less time consuming. If multiple measurements are required, simply pick the number of detectors needed and use the same meter. This saves time in obtaining the additional meters and also in learning how to use them.

SO YOU GET THE RADIOMETER, NOW WHAT?

We get calls all the time from people who are already in trouble with their UV curing systems. Their product isn't curing and they figure that a UV radiometer will tell them what's wrong. It's not that simple. A UV radiometer will measure the conditions in your curing system today. It can't tell you what the conditions were when your product was curing properly.

A radiometer is a very effective tool at measuring the parameters of UV irradiance and UV dosage. You must make the judgment as to what those readings mean to you and your process. To be able to make that judgment, you should do some homework up front. You need to measure the various parameters that affect your curing process-as many as you possibly can. Just because the curing system worked fine on that recent job you finished doesn't mean that the system is set up to run the job you want to do today. You don't know what will happen if you haven't done your homework.

If you want control of your process, you must measure and document every variable that can be measured. You should establish baseline parameters, document them, then constantly monitor the process and record the results. Compare your measurements to your baseline data. As your database grows, you will be able to predict your curing results and set your parameters accordingly. You will also be able to predict when maintenance should be performed and schedule it during planned downtime.

Since there are so many things you can't control, doesn't it make sense to take control of every aspect that you can? It can be very costly for your company and for you professionally if you do not measure your process parameters and you produce uncured product. You know the downside of producing poor product. The upside of measurement and the reason you measure your process parameters is repeatability. Measuring allows you to establish control limits and helps you determine what went wrong when something goes awry.

Decide what parameters you are going to use before you commit to a job and then take responsibility for it. Do not leave the outcome to guesswork. If possible, get information from your ink, coating or adhesive supplier regarding what wavelengths of UV are important for the formulation you are curing. What intensity levels are required to activate the photoinitiator? Your formulator knows exactly what was put into the formulation when it was developed. Most of the chemistry suppliers have UV measurement devices, so they can tell you what they expect to happen under certain curing conditions.

Your UV equipment supplier has information on the spectral output, intensity level and temperatures involved in using the system you purchased. Get this information. It may be possible to purchase lamps that spectrally match the response profile of your formulation. For example, if your product requires UV that is very rich in the 365-nm region, you can get lamps that have been doped to enhance the output in this part of the spectrum. Work closely with your equipment and chemistry suppliers to optimize your curing system.

Set up your curing system using your best guess, perhaps using the settings from a similar job you've run previously. Continually monitor the curing characteristics as you increase line speed. Pass a

radiometer through with the product each time. When the cure properties are just beginning to become adversely affected and you are undercuring, note the line speed, the number of lamps you are running, the lamp settings, and the UV dosage and peak intensity values. Once you've identified the threshold of failure, multiply the UV dosage reading by 1.2 to give yourself a 20 percent cushion. The measurement taken becomes the minimum "cure window" value.

Conversely, slow the line speed down while monitoring the cure properties. The exposure time is therefore gradually increased until undesirable results from overcuring are obtained. Once the cure properties become adversely affected, once again note the line speed, the number of lamps you are running, the lamp settings, and the UV dosage and peak intensity values. Multiply UV dosage by 0.8 to give yourself a 20 percent cushion on the down side. The measurement taken becomes the maximum "cure window" value. Typically, overcure is really overheat. You may want to monitor substrate temperature as well.

You'll need to run these tests for each combination of ink and substrate that you use. Over time, you will develop a history that will allow you to cure this combination of chemistry and substrate properly time after time. As your database grows, the need to run sacrifice work pieces through the process will diminish. You can run quality control on your new lamps when they come in by comparing them to your established baseline data. You can track and then predict when the lamp needs replacement before it fails.

Measure and Document on a Routine Basis

If you continue to log your measurements on a regular schedule, you will minimize the number of problems you have with your UV curing system. You will have data readily at hand to answer your supplier's questions when a problem arises. As you gain experience, the number of times you have to call out for assistance will decrease.

One of the chief benefits you will derive from measuring and documenting your curing system is the improvement in the quality of the product reaching your customer. You will be able to avoid producing inferior product.

Data Handling

The radiometer should have a means of accurately and efficiently allowing the user to utilize the data. This data can be manually recorded or can be digitally stored in the unit. A PC connection such as RS232 is extremely useful for transferring data from the instrument to a PC for analysis. This connection eliminates the possibility of error due to manually recording the data on paper and typing it into a PC. If the radiometer will not have continuous access to a PC, datalogging may be preferable.

Calibration

Any absolute measurement is only as good as the instruments calibration. Radiometers should be calibrated to a NIST (National Institute of Standards and Technology) traceable standard to provide accurate readings and ongoing NIST traceability. Typical recalibration is performed every 12 months.

DISKURE 365 RADIOMETER

The CON-TROL-CURE® Diskure 365™ radiometer is our most economical pass-through radiometer for measuring UV radiation levels in high intensity, high energy curing environments. It is a UV dose measuring instrument small enough (5.5" / 140 mm diameter x .5" / 13mm height) for use in most UV curing ovens. A sensor on one side is exposed to the UV source and the other side contains a digital LCD which displays direct energy readings in mJ/ cm².

The aluminum housing can withstand exposure to oven temperature as well as intense vibration and shock. This durability makes the Diskure 365 ideal for measuring UV light energy in harsher environments such as photosensitive resist exposure systems, web processing equipment, print plate exposure systems and most UV curing ovens. Special filters and photodiodes absorb the visible as well as the IR portion of the light, so that measurements are made only on the required spectral region. After exposure, the radiometer's LCD shows the total UV measured in mJ/cm2 to which the unit was exposed.

SPECIFICATIONS:

• Weight:	17.6 lbs (500 g)
• Spectral Range:	250-410nm
• Accuracy:	+/-10%
• Measuring Range:	0-5,000mW/cm²
• Heat Resistance:	158°F / 70°C (long exposure duration)
• Calibration Requirements:	Every 12 months depending on use (average use: once a day; heavy: 3-5 times/day)

PART NUMBER	DESCRIPTION
M007-091	**DISKURE 365 RADIOMETER**

DISKURE 4SCAN RADIOMETER

The CON-TROL-CURE® Diskure™ 4Scan Radiometers are equipped with three UV sensors for individual measuring of UV-A, UV-B, UV-C, and Total UV. They are designed to measure and display UV Intensity (mW/cm²) and UV Dose (mJ/cm²) for each of the 3 UV ranges individually in the UV curing process. This allows you to determine not only total energy, but also how that energy is delivered (which intensity/dose at each UV range).

There are 4 models available. Each measures as stated above. The differences are:

Diskure™ 4Scan (M007-111): Base model

Diskure™ 4Scan-C (M007-112): Adds a USB comport. When connected to a computer via USB, the Diskure 4Scan-C is able to show, profile, and store a history of the measured results of the entire UV curing process as graphic charts in mW/cm² and mJ/cm².

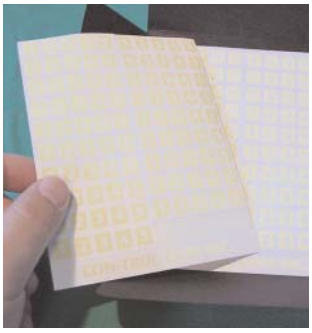
Diskure™ 4Scan-T (M007-113): Adds a temperature sensor

Diskure™ 4Scan-TC (M007-114): Adds a USB comport and temperature sensor. When connected to a computer via USB, the Diskure 4Scan-TC is also able to show, profile, and store a history of the measured results of the entire UV curing process as graphic charts in mW/cm², mJ/cm², and °C/°F.

SPECIFICATIONS:

Spectral Range:	UV-A, UV-B, UV-C, Full UV
Max. Power Input:	0 to 5,000 mW/cm²
Display Range:	0 to 36,000 mJ/cm² 0 to 2,000 mW/cm²
Power source:	2 x long life 3.6 V Lithium Battery
Battery Service Life:	2,000 hrs
Max Temperature:	110°C (up to 10 seconds), housing shouldn't exceed 45°C
Dimensions:	Diameter 5.5" (140mm)
Height:	½" (13mm)
Weight:	9 ounces (500g)

PART NUMBER	DESCRIPTION
M007-111	**DISKURE 4SCAN RADIOMETER**
M007-112	**DISKURE 4SCAN-C RADIOMETER**
M007-113	**DISKURE 4SCAN-T RADIOMETER**
M007-114	**DISKURE 4SCAN-TC RADIOMETER**



UV FASTCHECK STRIPS

CON-TROL-CURE®'s UV FastCheck™ Strips are simple, reliable, and easy to use indicators of accumulated UV light dosage. They let a user know when a certain UV dose has or has not been achieved. FastCheck Strips are a quick way to determine the power of your UV light source at any specific location. The versatility of this unique UV measurement tool allows users to measure a significant range of UV doses. FastCheck Strips measure UV doses from 0mJ/cm² to 1500mJ/cm². As well, due to their paper-thin profile and thermal stability, they can be used in all narrow web environments -- going places no radiometer can go. Included with the UV FastCheck Strips is a chart which enables the user to compare the tested strip against the chart to establish the dose range. UV FastCheck Strips can be further coupled with a handheld colorimeter to measure the dose even more precisely.

FEATURES:

- Accurate visual determination of UV dose made possible
- Monitor UV dose in difficult-to-access curing environments
- Detect UV lamp degradation and equipment failures
- Provide the user with periodic assurance that their UV source is performing to expectations
- Greater rate of color change provides clearer, more precise UV dose determination
- Determine the dose profile in the 3D curing chambers or across wide webs to ensure even cure
- Measure the dose of sunlight in outdoor curing applications
- Evaluate and compare multiple UV light sources

SPECIFICATIONS:

- 20 adhesive backed UV FastCheck Strips per sheet, 10 sheets per package
- UV FastCheck Strips Dimensions: 1/2”H x 2-1/8”W (13mm x 54mm)

PART NUMBER	DESCRIPTION
N010-002	**UV FASTCHECK STRIPS**

MICROCURE RADIOMETER

Directly affix this ultra-compact electro-optic device to almost any workpiece to accurately measure UV dosage under normal operating conditions. With a UV data collection instrument measuring only 1.30" (33 mm) by 1.0" (25 mm), the MicroCure™ is ideal for inaccessible curing environments such as web presses, bottle printers, container decorators, and compact disc coaters.

In web press applications, MicroCure passes through a UV curing station and is removed prior to reaching the print station location. Equipped with an adhesive-backed transport pad and pocket, the MicroCure adheres directly to any item including a web traveling vertically and/or while traveling at high speeds. In fact, MicroCure's high sampling rate of 2000 samples/second ensures that measurements taken at rapid web speeds will be accurate. Due to the instrument's extremely small surface area and very low profile (only 0.25" / 6.35 mm high), MicroCure can actually travel around idler rollers. For applications not requiring adhesion, the unit can be inserted directly into a can, cup or tube. Compact disc manufacturers who screen and/or coat CDs can put MicroCure into one of the CD "nests" when checking UV dosage against production parameters.

MicroCure is easy to use. There are no wires or connectors. Since it's always "on", there are no switches or buttons to push. Insert the unit into the DataReader and simply push the "Select" button to check the UV dosage. Available in 2 models: Standard 2W/cm² (90% intensity) or 10W/cm² (for heavy-duty microwave lamps).

PART NUMBER	DESCRIPTION
M007-074	**MICROCURE RADIOMETER w/DATA READER 2W/cm²**
M007-074A	**MICROCURE RADIOMETER w/DATA READER 10W/cm²**

MICRO PUCK RADIOMETER

The CON-TROL-CURE® Micro Puck™ is a unique instrument that enables UV measurement in extremely difficult to access environments. Compact UV sensors make it possible to measure UV Dose even in most confined UV curing units. The Micro Puck system consists of two parts: a hand-held base unit with a display and a UV sensor. Simply plug the sensor into the base unit to view the measured results. The Micro Puck is available in four different measuring ranges: UV-A, UV-B, UV-C, or Full UV.

While the Micro Puck reads from only one sensor, a multi sensor compatible base unit is also available. The Micro Puck Multi, can accommodate up to 8 sensors that read from the same base unit. This system can combine sensors from different UV spectral ranges, allowing for full spectrum, 3-D UV evaluation.

MICRO PUCK RADIOMETER (cont.)

The sensors are available as either a rectangular or a round model. Both sensors work with both base units and are available in each of the 4 different UV measuring ranges.

SPECIFICATIONS:

Spectral Range:	UV-A, UV-B, UV-C, or Full UV
Max. Power Input:	0 to 5,000 mW/cm²
Display Range:	0 to 1,999 mJ/cm² (standard) or 0 to 19,990 mJ/cm² (x10 type)
Power Source:	2 x 2,000 hrs 3.6 V Lithium Battery
Sensor Max. Temp.:	110°C (230°F) for up to 10 seconds
Dimensions of Reader:	5.5" x 3" x 0.4" (140 x 75 x 10mm)
Dimensions of Sensor:	Rectangular: 1.5" x 0.6" x 0.5" (40 x 15 x 12mm)
	Round: Diameter 1.5" x 0.35" (40 x 9mm)
	Round: (only Full UV sensor) Diameter 1.5" x 0.25" (40 x 6mm)

PART NUMBER	DESCRIPTION
M007-130	**MICRO PUCK FULL UV RADIOMETER**
M007-131	**MICRO PUCK UV-A RADIOMETER**
M007-132	**MICRO PUCK UV-B RADIOMETER**
M007-133	**MICRO PUCK UV-C RADIOMETER**
M007-135	**MICRO PUCK MULTI FULL UV RADIOMETER**
M007-136	**MICRO PUCK MULTI UV-A RADIOMETER**
M007-137	**MICRO PUCK MULTI UV-B RADIOMETER**
M007-138	**MICRO PUCK MULTI UV-C RADIOMETER**

OMNISCAN RADIOMETER

The revolutionary CON-TROL-CURE® OmniScan™ is the first UV analyzer to combine dosage measurements for ensuring product quality, with system diagnostics in one simple, automated package. The exclusive Irradiance Profiler graphically shows the absolute performance of each lamp subassembly in your system. A stored reference plot allows you to compare, on-the-spot, the current performance of the system with standard operating parameters. There is no need to go to a computer station or to run complicated software.

As the OmniScan passes through the oven, it acquires the maximum irradiance at every point along the curing path. It then shows this information as a graph of irradiance versus position allowing the operator to instantly see the uniformity of the product illumination. By recalling a stored baseline run, the OmniScan provides both quantitative and qualitative analysis of the current run. This information is provided automatically and immediately to the operator.

Low unit profiling starts at 1mW/cm² threshold: ***Irradiance Range:*** 1mW/cm² to 2.5W/cm²
Dose Range: 1mJ/cm² to 20J/cm²

Hi unit profiling starts at 20mW/cm² threshold: ***Irradiance Range:*** 20mW/cm² to 20W/cm²
Dose Range: 1mJ/cm² to 20J/cm²

SPECIFICATIONS:

• Dose Range:	1mJ/cm² to 20J/cm²
• Intensity Range:	1mW/cm² to 20W/cm²
• Temperature Range:	10°C to 60°C
• Accuracy:	Typically better than 6%
• Information Displayed:	Dose, Maximum irradiance, Irradiance uniformity profile, Reference profile, Difference profile
• Spectral Ranges:	205nm-345nm or 250nm-400nm
• Dimensions:	0.5"D x 4.4"W x 6.3"L (12.7 mm x 111 mm x 161 mm)
• Weight:	0.75 lbs/0.34 kg

PART NUMBER	DESCRIPTION
M007-098AH	**OMNISCAN RADIOMETER UV-A HIGH**
M007-098AL	**OMNISCAN RADIOMETER UV-A LOW**
M007-098ABH	**OMNISCAN RADIOMETER UV-AB HIGH**
M007-098ABL	**OMNISCAN RADIOMETER UV-AB LOW**
M007-098BH	**OMNISCAN RADIOMETER UV-B HIGH**
M007-098BL	**OMNISCAN RADIOMETER UV-B LOW**
M007-098CH	**OMNISCAN RADIOMETER UV-C HIGH**
M007-098CL	**OMNISCAN RADIOMETER UV-C LOW**
M007-098VH	**OMNISCAN RADIOMETER UV-V HIGH**
M007-098VL	**OMNISCAN RADIOMETER UV-V LOW**

UV POWER PUCK AND UVICURE PLUS RADIOMETERS

The UV Power Puck™ and UVICURE™ Plus are self-contained, electro-optic instruments designed to measure and display peak UV intensity and total UV energy used in the UV curing process. These units' unique compact design, (4.60"D x 0.5"H), allows them to be placed directly in most curing environments.

The UV Power Puck's carefully designed optical sensing system measures total UV dosage on 4 different channels simultaneously. These four different channels represent four different UV bandwidths of interest for most curing applications: UV-A (320 to 390nm), UV-B (280 to 320nm), UV-C (250 to 260nm) and UV-V (395 to 445nm). The output of the sensing system is converted to digital form and displayed on the LCD by scrolling through a user-friendly menu. Total UV dosage, measured in Joules/cm², is how much actual UV energy was impinged on the unit from the time it encountered UV until the time the UV source was removed. The UV Power Puck also has the distinct advantage of being able to monitor the peak intensity in Watts/cm² in each bandwidth. This allows the operator to determine not only the total energy, but also how that energy is delivered, i.e., what intensity at what wavelength. The UV Power Puck can accommodate energy intensities up to 10W/cm². Total energy range is 0 to 250 J/cm² for each UV range.

The UVICURE Plus offers all of the standard features of the UV PowerPuck but in a lower cost, single spectral range version. Available in UV-A (320 to 390nm), UV-B (280 to 320nm), UV-C (250 to 260nm) or UV-V (395 to -445nm); the UVICURE Plus can accommodate energy intensities up to 5W/cm². Total energy range is also 0 to 250 Joules/cm².

Part Number	Description
M007-040	**POWER PUCK RADIOMETER**
M007-040A	**UVICURE PLUS UV-A RADIOMETER**
M007-040B	**UVICURE PLUS UV-B RADIOMETER**
M007-040C	**UVICURE PLUS UV-C RADIOMETER**
M007-040V	**UVICURE PLUS UV-V RADIOMETER**

RAD CHECK UV MEASUREMENT SYSTEM

By producing a linear, numerical benchmark of UV and EB system performance, the CON-TROL-CURE® Rad Check™ UV Measurement System provides repeatable evaluation results over extended periods of use. Incorporating a UV/EB-detection dosimeter and disposable UV and EB sensitive flexible test strips, the Rad Check system does not require outside calibration to ensure consistency.

Designed for web offset, flexo, 3-D screen and other systems incorporating inaccessible UV and high energy EB curing systems, the Rad Check test strip is the only UV dosage measurement device which can be passed completely through rollers, wrapped around cylindrical objects, or measure high EB dosages. Each test strip contains a UV/EB sensitive compound which is destroyed upon exposure to a UV light or EB energy source. After exposing the test strip, the density of the remaining compound can be measured by the Rad Check Dosimeter, which produces a numerical value reflecting energy received. This numerical value can be used to compare against jobs of similar characteristics for evaluating lamp degradation and system performance. 2 models available: the 800 for high intensity systems and the 300 for low intensity systems.

TEST STRIP SPECIFICATIONS:

- Dose Levels: Test Strip 300: UV: 0-300 mJ/cm²; EB: 0-35 Mrad
  Test Strip 800: UV: 0-1400 mJ/cm²; EB: TBD
- Range: 320-380nm
- Durability: Approximately 6 months
- Packaging: 100 strips/pack

Part Number	Description
M007-078	**RADCHECK 300 DOSIMETER**
M007-081	**RADCHECK 800 DOSIMETER**

UV POWERMAP AND THE UV MAP PLUS

The UV PowerMAP™ and the UV MAP Plus™ are both advanced measurement systems that measure and store UV energy, UV irradiance, and temperature information derived from their optics and thermocouple probes in UV curing processes. The UV PowerMAP simultaneously measures all 4 UV spectral regions (UV-A, UV-B, UV-C, and UV-V) while the UV MAP Plus only measures 1.

The information is transferred to a PC where it is presented in graph and data format for viewing and analysis. The information is characteristic of the same energy and irradiance that would be impinged on an actual work piece passing through the curing process. Variables such as reflector materials, reflector shapes, wavelength-specific reflector degradation and uniformity, and lamp focus can be documented.

UV POWERMAP AND THE UV MAP PLUS (cont.)

FEATURES:

- **UV PowerMAP** measures peak power density and total energy density in 4 spectral regions:
  - UV-A
  - UV-B
  - UV-C
  - UV-V
- **UV MAP Plus** measures the peak power density and total energy density for any 1 spectral region
- Collection and storage of up to 1 million data points
- Collected data displayed in graphical and tabular forms in the PowerView™ software package
- PowerView enables an ultra-fast, user-adjustable sampling rate - up to 2048 samples/second – that ensures high resolution even at high speeds
- Detachable Optics Head - allows the use of different optics heads with the Data Collection Unit to minimize downtime during recalibration
- Type J thermocouple records temperatures from 0-500°C
- Low, narrow profile to allow access to most curing applications
- Rugged aluminum chassis and stainless steel case

The UV PowerMAP and UV MAP Plus systems are composed of a data collection unit, detachable optic measurement head, and PowerView software package. The units measure UV energy in J/cm² and UV irradiance in W/cm².

PART NUMBER	DESCRIPTION
M007-087	**UV POWERMAP RADIOMETER**
M007-088A	**UV MAP PLUS UV-A RADIOMETER**
M007-088B	**UV MAP PLUS UV-B RADIOMETER**
M007-088C	**UV MAP PLUS UV-C RADIOMETER**
M007-088V	**UV MAP PLUS UV-V RADIOMETER**

UV-MICROLOG D AND UV-MICROLOG 6 RADIOMETER

The CON-TROL-CURE® UV-MICROLOG D™ is an extra thin (only 1/4" flat) self-contained UV data logging radiometer. This revolutionary unit is perfect for fitting into UV curing systems that bulkier models cannot. Contained in its sleek case is a sophisticated microprocessor that measures UV Intensity (mW/cm²), UV Dose (mJ/cm²), and Temperature.

The resulting measurements can be viewed 2 ways: either numerical results via the on-board display or downloaded through a USB computer link. Once the measured data is downloaded to a computer, you are then able to show a graphical representation of the UV Intensity Profile, the Peak Intensity, the Total Dose, and Temperature.

An Auto Off function shuts down the unit after one minute of inactivity to save battery energy. Special data acquisition software is included with each unit.

This unit is available with the LCD as shown to the left (M007-106), or without. **The UV-Microlog 6™** (M007-107), the unit that is without an LCD, connects to a computer to display its readings.

SPECIFICATIONS:

Spectral Range:	UV 230 - 400 nm
Max. Power Input:	0 to 5,000 mW/cm²
Measuring Period:	30 sec.
Sampling Rate:	0.005 sec (200/sec)
Display:	LCD, 2 lines x 16 digits
Power Source:	2 x long life 3.0 V Lithium Battery
Power Consumption:	20 µA
Battery Service Life:	2,000 hrs
Dimensions:	4.5" x 2.5" x 0.25" (117 x 64 x 6mm)
Weight:	3 ounces (85 g)

While on the conveyer belt, the UV-Microlog radiometers can withstand 110°C (230°F) for up to 10 seconds. The housing temperature should not exceed 45°C (113°F).

PART NUMBER	DESCRIPTION
M007-106	**UV-MICROLOG RADIOMETER D**
M007-107	**UV-MICROLOG RADIOMETER 6**

UV-PROFILER RADIOMETERS

The CON-TROL-CURE® UV-Profiler™ Radiometers are a breakthrough in pass-through UV radiometers. These instruments measure UV Intensity (mW/cm²) and UV Dose (mJ/cm²). The measurement, integrating, and recording of data from all sensor channels takes place at user-defined intervals (eg. 20 second measuring time with a sample rate of 20 milliseconds).

Powerful Windows CE software is included and enables the user to synchronize the UV-Profiler with a PC via RS232 by Microsoft ActiveSync. Once downloaded to a computer, the measured data can be displayed via charts or in graphs showing mW/cm² and mJ/cm². These graphs offer zooming, auto-scale, and free-selectable peaks and integrals.

The UV-Profiler Radiometers are available in 4 distinct models:

The UV-Profiler-3000™ handheld system combines the power and convenience of a PDA with the analysis of a full featured radiometer. The UV-Profiler-3000 delivers a rapid profile of your UV curing system and displays the results via its onboard color viewing screen or it can be connected to a PC.

The UV-Profiler-3000 measures UV from 250nm to 410nm. Results are presented as UV Intensity (mW/cm²), UV Dose (mJ/cm²), and Temperature. The UV-Profiler-3000 is equipped with one UV sensor and one temperature sensor.

The TFT touch screen display shows the complete UV energy profile and offers zooming and auto scale functions. Peaks and Integrals are selectable on the screen and will be displayed in numerical format. The sampling rate is 50 milliseconds (20/second).

The UV-T Profiler™ series of radiometers is similar to the UV-Profiler-3000 in that it measures UV Intensity, UV Dose, and Temperature. But it differs in 2 main aspects. There is no onboard viewing screen. Results are accessed by connecting the unit to a computer. The other main difference is that the UV-T Profilers are available in 4 different UV ranges:

- Full UV: 230nm-410nm (M007-121)
- UV-A: 315nm-410nm (M007-122)
- UV-B: 280nm-315nm (M007-123)
- UV-C: 230nm-280nm (M007-124)

The UV-3C Profiler™ radiometer measures UV Intensity and UV Dose (not Temperature). The main difference between this unit and the UV-T models is that the UV-3C has 3 UV sensors. So it is able to simultaneously measure UV-A, UV-B, UV-C, and Full UV. As with the UV-T, the data is displayed only via a computer link.

The UV-3C-T Profiler™ radiometer is identical to the UV-3C but adds the capacity to measure Temperature. As with the UV-3C, the data is displayed via a computer link.

FEATURES:

- UV Energy Measurement
- 64 MB Memory
- UV Dose Measurement
- Auto-scale Function
- ComPort for Computer Downloads
- Microsoft ActiveSync Software

SPECIFICATIONS:

Spectral Range:	Total UV (250nm to 410nm)
Max. Power Input:	0 to 5,000 mW/cm²
Display Range:	0 to 100,000 mJ/cm²
	0 to 2,000 mW/cm²

PART NUMBER	DESCRIPTION
M007-120	**UV PROFILER 3000 RADIOMETER**
M007-121	**UV-T PROFILER FULL UV RADIOMETER**
M007-122	**UV-T PROFILER UV-A RADIOMETER**
M007-123	**UV-T PROFILER UV-B RADIOMETER**
M007-124	**UV-T PROFILER UV-C RADIOMETER**
M007-125	**UV-3C PROFILER RADIOMETER**
M007-126	**UV-3C-T PROFILER RADIOMETER**

IL-1700 AND IL-1400 RADIOMETERS

The **IL-1700 Research Radiometer** is the most versatile current measurement instrument in the world. Designed specifically to measure photo detector current, the IL-1700 maintains unmatched linearity over a 10 billion to 1 dynamic range. This benchtop device is a powerful analytical tool.

The portable **IL-1400 Radiometer** combines the latest technical innovations in low level current amplification technology with microprocessor controlled simplicity. The onboard computer interrogates each "smart" detector for units, calibration and range information, automatically displaying a calibrated reading in the correct optical units. In addition to being user-friendly, the IL-1400 provides performance specifications unmatched by any other handheld radiometer on the market.

For general applications we have made ordering easy. Pre-packaged systems are now available including: Radiometer, probe, and applicable filters. No more guessing what system is right for you, we have done the work for you.

UV CURING

We offer the full line of IL UV curing radiometers designed specifically for this application. All radiometers are calibrated to NIST standards in W/cm² and J/cm². For general purpose measurement requirements, the ***IL-1745*** and ***IL-1445*** are a perfect pre-packaged solution. However, in many graphic applications it is not possible to pass a monitor through the curing system. The RAMP probe has been designed to take spot irradiance measurements in confined environments. The ***IL-1747*** and ***IL-1447*** curing radiometers include the RAMP probe and appropriate detectors.

PHOTORESIST

Photoresist is an organic polymer which becomes soluble when exposed to ultraviolet light. It contains a light-sensitive substance whose properties allow image transfer onto a PCB board. Unique to these radiometer systems is the ability to autorange during exposure integrations. Proprietary floating current-to-current amplification technology permits autoranging without any gain changes, for real-time integration without data loss. Consult your photoresist manufacturer to determine whether the ***IL-1740*** and ***IL-1440*** in "A" (wide) response or "B" (narrow) response is appropriate for your application.

GERMICIDAL

UV irradiation is an effective method of killing a broad range of microbes. In essence, the UV radiation breaks the molecular bonds in the organism's DNA. These Germicidal Radiometers use solar blind vacuum photodiodes and filters with band passes in accordance with the IES Luckiesh and DIN standards. For general Germicidal applications we recommend the ***IL-1771*** or ***IL-1441***.

CUSTOM

Both the ***IL-1400*** and the ***IL-1700*** systems can be further customized for the above applications and additionally configured for use in: Photometry, Radiometry, Phototherapy, Photobiology, Photostability, UV Hazard, Solar, Laser, and LED. Individual sensors, probes, and filters are available for adding to or upgrading your existing device.

PART NUMBER	DESCRIPTION
M007-017F	**IL-1400 RADIOMETER: CUSTOM**
M007-017C	**IL-1440A RADIOMETER: PHOTORESIST A**
M007-017D	**IL-1440B RADIOMETER: PHOTORESIST B**
M007-017A	**IL-1445 RADIOMETER: CURING**
M007-017B	**IL-1447 RADIOMETER: CURING/RAMP**
M007-017E	**IL-1471 RADIOMETER: GERMICIDAL**
M007-001F	**IL-1700 RADIOMETER: CUSTOM**
M007-001C	**IL-1740A RADIOMETER: PHOTORESIST A**
M007-001D	**IL-1740B RADIOMETER: PHOTORESIST B**
M007-001A	**IL-1745 RADIOMETER: CURING**
M007-001B	**IL-1747 RADIOMETER: CURING/RAMP**
M007-001E	**IL-1771 RADIOMETER: GERMICIDAL**

LampLine Multi-Channel Monitor

LAMPLINE UV INTENSITY MONITOR

The state-of-the-art LampLine UV Intensity Monitors are electro-optic instruments designed for continuous on-line UV lamp monitoring. With continuous monitoring, a UV lamp's relative UV output is used to verify ongoing lamp performance. In each system, the LampLine UV Sensors (sold separately) are mounted permanently looking at the UV source.

With any LampLine monitoring system, the principle is the same. After installation, the user calibrates their system(s). When the lamp(s) are new and the irradiator(s) are clean, each monitor is set to 100%. The user then determines a Lower Limit percentage for the alarms and sets those. As a lamp degrades over

LampLine Panel Mount

LAMPLINE UV INTENSITY MONITOR (cont.)

time, the signal from the sensor is translated into a percentage of your original intensity setting as calibrated.

LAMPLINE MULTI-CHANNEL MONITOR:

This top of the line UV lamp monitoring system can monitor up to 4 lamps at a time on-line. However, it is cascadable, meaning more than 4 lamps may be monitored by adding additional Monitors, each interconnected so that any lamp dropping below threshold will set off an alarm. The front display shows the percentage of original output for any lamp being monitored.

LampLine DIN Module

LAMPLINE PANEL MOUNT:

This online monitoring system can be retrofitted to existing machinery or incorporated directly into equipment design. Each small monitor can be front-panel mounted so that the percentage of original output displayed on its LED can be constantly viewed and assessed by the user.

LAMPLINE DIN MODULE:

The intent of this on-line system is to be able to monitor a multitude of lamps by snapping individual modules onto a rail which is normally mounted in the rear or side of the equipment. This system is available for use in integrated monitoring and control systems containing analog signal processing and shared display capability. DIN Modules do NOT have a display. Each rail mounted module allows for monitoring of a single UV lamp.

LampLine Sensors

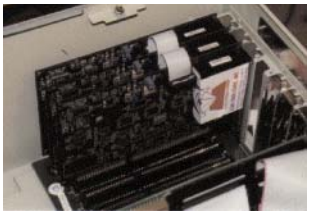
LAMPLINE SENSORS:

The sensors work with mercury vapor, electrodeless, deuterium, or any lamps which produce UV light. Sensors are ordered individually and are available in 250-260nm, 280-320nm, 320-390nm, or 395-445nm spectral responses. “Lamp On” detector indicates UV system is powered and lamp is running. Each sensor comes with a 10' cable (custom lengths are available).

Part Number	Description
M007-067A	**LAMPLINE MULTI-CHANNEL MONITOR**
M007-066A	**LAMPLINE PANEL MOUNT**
M007-068A	**LAMPLINE DIN MODULE**

LM-9000 UV LAMP MONITOR

CON-TROL-CURE provides an entire line of solutions to determine critical information on UV Lamp conditions while the lamp is operating within the curing application. The CON-TROL-CURE® LM-9000™, the flagship of this technology, is a highly modular, computer-based, full spectrum UV data acquisition and management system providing both real-time display and data storage of UV Lamp output characteristics. Our exclusive Optical Probe and Fiber Optic sub-systems will allow permanent sensor placement inside the curing zone, reflector housing, or even directly on the lamp.



1) The LM-9000 Instrument is available in 2 forms:
- The Internal LM-9000 Instrument is a PC card (ISA or PCI Bus), mounted directly inside the PC.
- The External LM-9000 Instrument is housed in an impact resistant case connected to the PC’s USB port.
Both units allow direct connection of the UV enhanced Fiber Optic Cable to the PC, bringing the full spectrum of UV light (200nm to 450nm, other ranges available on special order) into the system. The incoming "Light Sample" is broken up into individual wavelengths and reflected onto a CCD array containing 2000 individual sensors. Data from each sensor (and wavelength) is then displayed by the computer and maintained in an MS-SQL DataBase. Multiple lamp configurations can be created by incorporating the additional card units and adding additional instrument units to the system.

2) The LM-9000 Lamp Monitor Software is Windows compatible featuring real-time display of the wavelength intensity distribution between 200 and 450 nanometers sampled every 5 seconds, selective wavelength monitoring, and a saved baseline display. The LM-9000 captures all the performance characteristics of your UV Lamp output throughout the course of each job, not just when the operator pushes a button. The LM-9000 even saves information for later, so you can keep process and machine settings, job characteristics and system state information to help duplicate the exact conditions that job required. "Events" for selected wavelengths can be defined to alert operators of changes in lamp intensity.

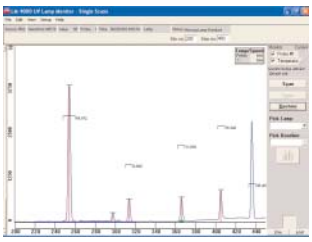
3) The Basic Optical Probes are available as small as 1/4" diameter by 3/4" long, intrude only 3/8" into the curing system, and are easily installed inside the curing zone, anywhere around the lamp. Using a proprietary lens system that interface with the connecting Fiber Optic cabling, Basic Probes will withstand up to 400°C, and come in 4 levels of Optical Attenuation, designed to address very high UV light levels when used in High Energy (300+ watt) lamp systems.

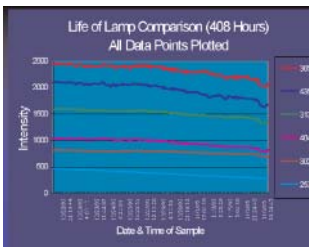
4) The connecting Fiber Optic Cabling is designed for industrial applications and is specially UV enhanced

LM-9000 UV LAMP MONITOR (cont.)

to transmit all the UV energy in the 200nm - 450nm range without loss of signal. Jacketed and encased within a flexible stainless steel covering, the Fiber is designed to function at up to 300°C continuous operation and will not solarize over long term UV exposure. Cables feature easy installation on industrial processing equipment without fear of damage to the fiber. Cables are available in 2 meter, 10 meter, and in Custom lengths.

Do you need multiple lamp and multiple system monitoring capabilities? What about process control interfacing with the LM-9000 to make production line control a reality? Visible light and UV monitoring capacity is available, making control of other aspects of product creation possible.





LM-9000 SYSTEM FEATURES:

- Continuous Monitoring of Lamp Energy
- Full Spectral Range Sensitivity From 200-450nm Range
- Selective Wavelength Monitoring
- Full Capabilities At Any Intensity with No Wattage Limitations
- Automatic Calibration At Startup
- Completely Modular Component Designs
- Single or Multiple Lamp Configurations Are Available
- Simultaneous Multi-Lamp Monitoring And Event Storage Capabilities
- Choice of View Angle To the Lamp
- No Environmental Barriers To Probe Installation: Temp 400ºC Max.
- Probes May Be Installed Anywhere Around The Lamp, or Anywhere Along It
- Small Probe Profile: 1/4" (6 mm) Diameter, 3/8" intrusion into curing area
- Focal Plane Positioning using the Optional Right Angle Probe
- Long Range Positioning of Central Station to Monitored Lamps
  - Up To 20 meters from Central Station (Longer Ranges Are Available)
- Selective Sampling By Hour, Minute, Day, Week or Month
- History of Lamp Performance With:
  - Full Range Data Storage
  - Maintains All Lamp Operation Information
  - Records All Lamp Operating Parameters
  - Event Data Storage By Job, Skid, Hour, Day, Operation, Operator, Machine
  - Event Recording By Critical Wavelength / Critical Energy Level
- Completely Software Controlled by Windows

LM-9000 DATA COLLECTION FEATURES:

- Lamp Data:
  - Date & Time of Lamp Installation
  - Lamp Serial Number (for tracking)
  - Number of Hours On (in use) and Number of Lamp Starts
  - Peak Irradiance at Each Wavelength
  - Baseline Performance of New Lamp
- Process Data:
  - Operating Temperature, Power and Speed Settings
  - Output Energy Events
  - User Defined Data Collection
- Data Storage:
  - Lamp & Job Baselines
  - Lamp & Job Description Information
- Data Reporting Capabilities:
  - ISO-9000 Level Reporting
  - Lamp Performance Over Time
  - Process Data Reports On Demand
  - Ink/Coating, Job, Lot & Skid
  - I/O Interfacing Options for Extended Process Controls and Data Logging
- Optional Accessories
  - Computer
  - Light, Medium & Heavy - Duty Probes,
  - Probe & Fiber Optic Lengths
  - Temperature Monitoring Sensors
  - Visible Spectrum Optical Bench 200-1000nm
  - Modular System Expansion for Additional Lamps or Probes

Part Number	Description
LM-9000	**LM-9000 SYSTEM**

PALM PROBE RADIOMETER

The PALM (P)roduction (A)mbient (L)ight (M)easurement Probe™ UV Radiometer is a process control instrument designed for measuring UV energy within inaccessible environments. It provides a safe, reliable measurement solution for UV-web and other applications.

The PALM Probe has an extremely wide dynamic range allowing it to measure very low (i.e. fluorescent bulbs) and very high (i.e. powerful UV curing systems) levels of UV. As the harsh physical conditions inside a UV curing chamber include extreme temperature variations, the PALM Probe is designed to withstand these conditions as well as protect the operator and instrument from damage or electrical shock. The light guide is constructed of steel alloy and coated with a non-conductive ceramic coating to insulate and protect the user from accidental shock. It is further isolated from the instrument body by a non-conductive Delrin block.

An input aperture at the tip of the PALM Probe light guide detects all wavelengths of ultraviolet, visible and infrared radiation. The light is directed down the light guide to the base of the instrument where a UV filter passes the UV light of interest to the photodetector. The LCD display toggles between watts, joules, and seconds during data collection and at the end of data collection.

ELECTRICAL SPECIFICATIONS:

• UV Range:	100µW/cm²-10W/cm²
• Spectral Response:	UV-A 320-390nm, UV-B 280 to 320nm, UV-V 395 to 445nm
• Instrument Body Operating Temperature:	0°C to 70°C
• Light Guide Temperature Resistance:	750°F on a continuous basis; much higher for measurement length exposures
• Batteries:	2 “AA” alkaline batteries

MECHANICAL SPECIFICATIONS:

• Overall Length:	25.75” (65.4 cm)
• Probe Body Length:	7.5” (19.0 cm)
• Light Guide Length:	18.25” (46.4 cm)
• Weight:	21 oz (596 g)

PART NUMBER	DESCRIPTION
M007-096A	**PALM PROBE UV-A RADIOMETER**
M007-096B	**PALM PROBE UV-B RADIOMETER**
M007-096V	**PALM PROBE UV-V RADIOMETER**

R3 PROBE RADIOMETER

The CON-TROL-CURE® R3 Probe™ UV Radiometer is an affordable electro-optic UV measuring instrument. It is battery-operated, portable, extremely light-weight, and easy to use. It is designed to measure and display peak UV intensity in hard-to-reach curing chambers (such as narrow web presses) in order to evaluate system performance.

With the increasing use of narrow web presses and flexo printing technology, it has become necessary to create a method for measuring system performance. Degradation of UV lamps and parts can cause decreases in lamp output and create curing problems.

R3 stands for “Rapid Reach Radiometer”. The R3 Probe features an 18” extended probe allowing the operator to reach areas that might otherwise be inaccessible or dangerous to access. The probe is simple to use; just hold the unit’s base and position the sensor under the curing source. Quick readings allow the operator to measure performance of the system long before curing problems occur, without holding up the curing process.

The inside of a UV curing system can include extreme temperature variations and other harsh physical conditions. The R3 Probe is designed to withstand these conditions while protecting the operator and instruments from electrical shock or damage. The 18” rigid light guide is completely made of non-conductive ceramic material to insulate and protect the equipment and the operator from damage or accidental shock.

The tip of the R3 Probe can detect all ultraviolet, visible and infrared radiation wavelengths with its specially designed input aperture. It even detects into the UV-C spectrum down to 230nm. The sensor at the end of the arm directs the light down the arm to the base of the unit, there a UV filter passes the light of interest to the unit.

The R3 Probe is an effective method of quantifying UV output. It provides the operator with instant feedback as to the performance of his UV curing system.

R3 PROBE RADIOMETER (cont.)

FEATURES:

- A 9V battery block ensures extremely long life in excess of 100,000 readings.
- It can monitor UV intensities up to 9,990 mW/cm²
- Compact, Portable size
- Light-weight - Approx. 5 ounces
- 18” non-conductive ceramic probe
- The measurements taken can be viewed directly on the LCD display.

TECHNICAL DATA:

• Spectral range:	UV 230 – 400 nm (Standard)
• Max. Power Input:	0 to 9,990 mW/cm²
• Display:	LCD, 3 digits X 10
• Display range:	0 to 9,990
• Measuring range:	0 to 9,990 mW/cm²
• Power source:	9 V Block Battery
• Power consumption:	20 µA
• Battery service life:	2,000 hrs (100.000 Measurings)
• Handle dimensions:	6.25” (158 mm) x 1.6” (40 mm) x 1.3” (34 mm)
• Length of light guide:	Approx. 18” (45 cm)
• Overall length:	Approx. 24.25”
• Weight:	Approx. 5 ounce (125 g)
• Operating temperature:	0 to 122° F / 0 to 50° Centigrade
• Base Accuracy:	± 5 %

The maximum permissible temperature for the light guide is 400° Centigrade/ 750° Fahrenheit. The temperature of the housing should not exceed 122° F / 50° Centigrade.

PART NUMBER	DESCRIPTION
M007-108	**R3 PROBE UV-A RADIOMETER**
M007-109	**R3 PROBE FULL UV RADIOMETER**

SILVER LINE RADIOMETER

The CON-TROL-CURE® Silver Line™ Radiometers are rugged, probe-style UV measurement devices. These simple-to-operate radiometers measure UV Intensity (mW/cm²).

The Silver Line radiometers have 2 resolution settings. The “x1” setting displays UV intensities from 0 to 19.99 mW/cm², while the “x10” setting displays from 0 to 199.90 mW/cm². The rugged metal-housed sensor is capable of withstanding high temperatures and moderate shock. While exposed to the heat of UV curing lamps, the Silver Line radiometer probe can withstand 110°C (230°F) for up to 10 seconds. The temperature of the housing should not exceed 45°C (113°F).

An Auto Off function shuts down the unit after one minute of inactivity to save battery energy.

The Silver Line series offers 4 models, each measuring a different UV wavelength:
UV-A (315 - 400nm)
UV-B (280 - 315nm)
UV-C (230 - 280nm)
Full UV (230 - 410nm)

SPECIFICATIONS:

Max. Power Input:	Sensor input to 1,000 W/cm²
Display:	LCD, 4 digits
Range x1:	0 - 19.99 mW/cm²
Range x10:	0 - 199.90 mW/cm²
Power Source:	9V Battery
Dimensions (housing):	5.5"H x 2.75"W x 0.5"D (140 x 70 x 13mm)
Dimensions (sensor):	1.6"Diameter x 0.4"D (40 x 10mm) - 1m length
Weight:	200 g

PART NUMBER	DESCRIPTION
M007-150	**SILVER LINE UV-A RADIOMETER**
M007-151	**SILVER LINE UV-B RADIOMETER**
M007-152	**SILVER LINE UV-C RADIOMETER**
M007-153	**SILVER LINE FULL UV RADIOMETER**

SOLAR SERIES RADIOMETERS

These 3 palm-sized precision instruments measure UV light for a variety of applications. Each unit incorporates a semiconductor UV sensor consisting of a GaAsP photodiode chip and UV filter. The sensor is completely insensitive to visible light longer than 400nm and IR radiation.

Solar 5.0 measures total UV-A and UV-B (280-400nm) and is ideal for evaluating UV lamp intensity during its life span.

Solar 6.0 measures UV-B (280-320nm) and is ideal for determining lamp UV-B intensity and acrylic transmission.

Solar 6.5 measures environmental (outdoor) solar intensity (290-400nm, peaking between 297-310nm) and provides LCD readout in mW/m² SUV/25 (the WMO international standard for displaying erythemally weighted irradiance on a 1-15 scale).

Point the meter at the UV light source (leakage), record reading, and compare to chart to determine the number of hours of permissible UV exposure. Calibrated to accuracy standards referenced to NIST.

SPECIFICATIONS:

- Irradiance Range: 0-199.9mW/cm² Total UV
- Resolution: 0.1mW/cm²
- Conv. Rate: 3.0 Readings/Second
- Operating Temperature: 32°F to 120°F
- Accuracy: ± 5%
- Dimensions: 4.2"L x 2.4"W x .9"D
- Weight: 4.5 oz
- Power Source: 9V DC Battery

PART NUMBER	DESCRIPTION
M007-054	**SOLAR 5.0 RADIOMETER**
M007-073	**SOLAR 6.0 RADIOMETER**
M007-072	**SOLAR 6.5 RADIOMETER**

SPOT CURE METER

The Spot Cure™ Meter is an easy, portable, and effective means of quantifying UV output. This self contained, electro-optic instrument is designed to measure and display the intensity emitted by a UV spot curing system.

It uses a special lithium battery stick for extremely long life-in excess of 100,000 readings. It measures UV intensity from 0 to 19.99W/cm². A measurement head which contains the optics is attached to one end of the cylindrical instrument. Light guide adaptors which fit into the measurement head are available to fit all size light guides. It can be configured to read one of the following UV transmission bandwidths: 250 to 260nm (UV-C), 280 to 320nm (UV-B), 320 to 390nm (UV-A), or 395 to 445nm (UV-V). Meets ISO-9000 requirements.

PART NUMBER	DESCRIPTION
M007-041A	**SPOT CURE UV-A METER**
M007-041B	**SPOT CURE UV-B METER**
M007-041C	**SPOT CURE UV-C METER**
M007-041V	**SPOT CURE UV-V METER**

SUNBURNING & UV-A INTENSITY METER

The Sunburning & UV-A Intensity Meter is capable of measuring the UV-A and UV-B spectrum. The meter shows the intensity of UV-B (also called SUV - Sunburning UV) in Minimal Erythemal Doses per Hour (MED/Hr), the accepted clinical measure for sunburn potential. The UV-A detector measures the range between 320-400 nm, displaying irradiance in mW/cm². This unit features a hold toggle that freezes the present reading, an auto shut off meter that turns the unit off after 8 minutes with near zero reading, and 3 ft extension cables for each detector.

METER SPECIFICATIONS:

- UV-B (SUV) Readout range: 0 -19.99 MED/HR
- UV-A Readout range: 0-19.99mW/cm²
- Resolution: 0.01 MED/HR or mW/cm²
- Operating temperature: 0 to +50°C
- Power source: 9V alkaline battery

SUNBURNING & UV-A INTENSITY METER (cont.)

UV-B (SUV) Detector

Spectral Response: 280-320nm
Operating Temperature: -10°C to +60°C

UV-A Detector

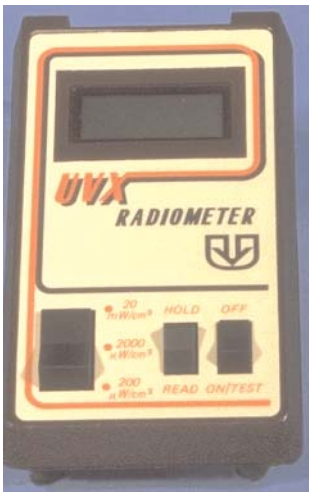
Spectral Response: 320-400nm
Operating Temperature: -10°C to +60°C

PART NUMBER	DESCRIPTION
M007-110	**SUNBURNING & UV-A INTENSITY METER**

HANDHELD UV HAZARD METER

The maximum exposure time for which one can be safely subjected to UV radiation is the threshold limit value (TLV). The Handheld UV Hazard Meter's digital display indicates the number of exposure hours to reach the TLV for the UV source being measured. A reading above 8 hours indicates that there is no hazard in a working day.

PART NUMBER	DESCRIPTION
M007-051	**HANDHELD UV HAZARD METER**



UVX RADIOMETER

The CON-TROL-CURE® UVX™ Radiometer's unique simplicity makes its operation as easy and fool-proof as possible. Simply plug in 1 of the 3 remote interchangeable probes (254nm, 300nm, or 365nm), set the EXTERNAL ZERO ADJUST to read 00.0 on the LCD, and you're ready to measure. The probe is then placed in the UV environment and the intensity reading will be shown on the display. It continuously monitors its own power supply and informs when its voltage is too low for accurate readings.

A 3-foot shielded cable allows the placement of the probe in hard-to-reach locations. Full exposure is not necessary as accurate readings are still possible because each probe's cosine sensitivity is nearly perfect. Each sensor has a tripod mount which is built into the bottom of the probe. All 3 probes are calibrated for measurement in their own UV band. Calibrations are accurate to +/-2% and traceable to the National Bureau of Standards.

NOTE: BECAUSE OF ITS HEAT SENSITIVITY, THE UVX RADIOMETER IS NOT RECOMMENDED FOR USE WITH HIGH INTENSITY UV CURING SYSTEMS.

PART NUMBER	DESCRIPTION
M007-043	**UVX RADIOMETER**

VERSAPROBE PRO RADIOMETER

The CON-TROL-CURE® VersaProbe Pro™ Radiometers are compact, high-tech, probe-style UV measurement devices. They measure UV Dose (mJ/cm²) and UV Intensity (mW/cm²).

The VersaProbe Pro can measure UV intensity and dose with the push of a button. Pressing the “Scan” button begins a 30 second cycle during which peak UV intensity and total dose are measured and recorded.

While exposed to the heat of UV curing lamps, the VersaProbe Pro’s metal-housed probe can withstand 110°C (230°F) for up to 10 seconds. The temperature of the housing should not exceed 45°C (113°F). An Auto Off function shuts down the unit after one minute of inactivity to save battery energy.

The VersaProbe Pro offers 4 models, each measuring a different UV wavelength:
- Full UV 250 - 410nm
- UV-A 315 - 400nm
- UV-B 280 - 315nm
- UV-C 230 - 280nm

SPECIFICATIONS:

Spectral Range: UV-A, UV-B, UV-C, Full UV
Max. Power Input: Sensor input to 5,000 mW/cm²
Display: LCD, 2 x 16 digits
Display Range: 0 to 36,000 mJ/cm²
Measuring Range: 0 to 2,000 mW/cm²

VERSAPROBE PRO RADIOMETER (cont.)

SPECIFICATIONS (cont.):

Sampling Rate:	0.005 sec (200/sec)
Recording Cycle:	30 seconds
Base Accuracy:	±5%
Power source:	2 x 3.6V Long Life Lithium Batteries
Battery Service Life:	2,000 hours
Dimensions (housing):	5.5"H x 3"W x 0.4"D (120 x 75 x 10mm)
Dimensions (sensor):	1.6"Diameter x 0.4"D (40 x 10mm)
Length of Sensor Cable:	40” (1m)
Weight:	6 oz (150 g)

PART NUMBER	DESCRIPTION
M007-155	**VERSAPROBE PRO FULL UV RADIOMETER**
M007-156	**VERSAPROBE PRO UV-A RADIOMETER**
M007-157	**VERSAPROBE PRO UV-B RADIOMETER**
M007-158	**VERSAPROBE PRO UV-C RADIOMETER**

