BlueWave® QX4 LED Spot-Curing System

Control up to Four LED Heads Independently for Greater Curing Flexibility

- One controller controls up to four LED heads
- Available in three wavelengths - 365, 385, & 405 nm
- Variable mode allows each LED head to be programmed independently
- Interchangeable/replaceable focusing lenses in 3-, 5-, and 8-mm diameters
- Efficient LED-head temperature management for better energy efficiency
- PLC interface with 4-channel mode

The BlueWave® QX4 is the next step in high-performance LED spot curing units. This small, versatile unit offers higher intensity, longer die life, and better PLC functionality than the previous version with all the same great benefits of LED technology. The system is comprised of a controller with an easy-to-use control interface and up to four LED heads. Curing cycles can be activated by foot pedal or PLC interface, allowing the unit to be easily incorporated into automated systems. LED heads are available in 365, 385, and 405 nm and can be outfitted with 3-, 5-, or 8-mm diameter focusing lenses. LED heads and focusing lenses can be used in any combination and can be controlled through the system's constant or variable mode.

In variable mode or through the 4-channel PLC interface, each LED head (up to four) can operate independently of the others. Each can be programmed in 1% increments for specific duty cycles, creating curing profiles with many advantages in a manufacturing or R&D setting. Variable mode gives users maximum curing flexibility and control over their process.

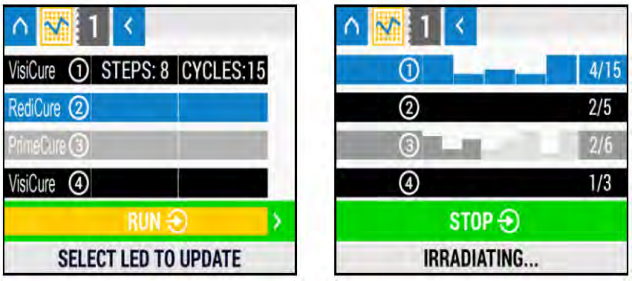
CE

System Features & Benefits

Features	Benefits
One controller controls up to four LED heads	• Provides maximum application flexibility
LED heads available in 365, 385, or 405 nm wavelengths	• Compatible with a variety of UV and visible light-curable materials • Wavelength flexibility allows co-optimization of adhesive and curing system for optimal cure • Units can be custom configured to your curing requirements
Variable mode allows each LED head to be programmed independently	• Individual exposure times and intensity settings available in 1% increments for each LED head allows for maximum curing flexibility
Interchangeable/Replaceable focusing lenses in 3-, 5-, and 8-mm diameters	• Allows tailoring of the unit to your curing requirements
Instant on-off	• No warm-up period • More energy efficient
Efficient LED-head temperature management	• Maximized continuous operation without overheating • Comfortable hand-held operating temperature • Temperature monitoring assures maximum LED life
PLC interface with 4-channel mode	• Easily incorporated into automated systems • Allows the four LED heads to be operated and activated independently • in PLC mode
Cross Platform Compatibility	• LED heads are compatible with the BlueWave® MX-series multi-channel controllers when used with the MX-4E expansion module

Heat Control

For applications with heat-sensitive components, or exo-thermal chemistry properties, interruptions in the exposure duration can reduce the materials' and substrates thermal rise during the cure process. This isn't a concern with the BlueWave QX4 because each LED head can be programmed to a precise curing energy exposure profile to reduce the risk of substrate damage.



Depth of Cure vs. Surface Cure

Utilizing the multiple narrow bands available for the BlueWave QX4 the perfect combination of outputs can orchestrate the perfect cure. The approach of alternating between depth of cure and surface cure LED heads can aid in the reduction of surface tack otherwise found on single wavelength LED products.

Fluorescing for Inspection

If all four LED heads are not used during parts production, a RediCure® LED head could be set to operate as a low-intensity lamp to fluoresce many Dymax products. This aids in QC inspections, resulting in higher quality finished products.

LED Light-Curing Technology

Dymax LED spot-curing systems generate curing energy using high-intensity LEDs instead of conventional metal-halide or mercury-arc lamps. The relatively narrow frequency band of energy emitted by LEDs results in cooler substrate temperatures compared to traditional conventional arc lamp systems, making them ideal for curing thermally sensitive materials. Dymax LED-curing systems offer many energy and cost-saving benefits, such as no warm-up period, lower energy consumption, no bulbs to change, and more consistent frequency and intensity output for better process control.

Key Advantages of LED Light-Curing Technology

- High electrical efficiency and instant on/off capability for lower operational costs
- Long service life that eliminates bulb replacement and reduces maintenance costs
- Narrow wavelength spectral emissions that minimize substrate thermal rise
- Compact unit footprint that reduces workspace requirements and cost of the system
- Consistent frequency and intensity output for better process control
- "Green" attributes that eliminate mercury and ozone safety risks and disposal handling costs

Compatible Materials & Applications

The BlueWave QX4 is ideally suited for a number of applications in the medical, consumer electronics, automotive, aerospace and defense, optical, and appliance industries. The chart below displays some of the materials commonly used in those industries and where the BlueWave QX4 can be considered as a curing system.

Materials			
Adhesives		✓	Medical device (catheter, needles, tube set, facemask) assembly; glass bonding (stemware, furniture, etc.); automotive headlamp assemblies; camera module assemblies; appliance assembly; speaker assembly; optical display bonding
Conformal Coatings		✓	Printed circuit board protection in aerospace avionics, automobiles, appliances, and consumer electronics; camera module assembly; electric vehicle battery management systems
Potting Compounds		✓	Tamper proofing; potting electrical connectors, switches, and sensors; cable potting; medical potting*
Maskants		✓	Surface protection for turbine blades and rotorcraft components during processing; protection for surfaces during metal finishing processes; protection of orthopaedic parts during processing; protection of PCB components for consumer electronics, automotive electronics, avionics, and medical electronics; protection for surfaces during metal finishing processes*
Encapsulants		✓	Chip encapsulation on PCBs used in automobiles, plane and helicopter control panels, consumer electronics, appliance, and medical diagnostic equipment*
Ruggedization Materials			Flex circuit reinforcement; wire tacking; ball grid array (BGA) ruggedization; Videos graphics arrays (VGA) ruggedization; shock absorption; underfill alternative

✓ BlueWave QX4 compatible with this material

* Materials cured with BlueWave QX4 to be evaluated in customer application to their performance requirements.

System Specifications

Property	Specification
Output Frequency	RediCure® - 365 nm PrimeCure® - 385 nm VisiCure® - 405 nm
Intensity Output*	RediCure® - 13.9 W/cm^2 PrimeCure® - 18.8 W/cm^2 VisiCure® - 14.9 W/cm^2
Power Supply Input	100-240 V ~2 A, 50/60 Hz
LED Timer	0.1 to 999 seconds
LED Activation	Footswitch, front panel, or PLC
Cooling	Natural convection
Dimensions (W x D X H)	3.5" x 5.5" x 5.6" [9.0 cm x 14.1 cm x 13.7 cm]
Weight	Controller: 2.3 lbs. [1.03 kg] / Head: 0.2 lbs. [0.08 kg]
Unit Warranty	1 year from purchase date
Operating Environment	5-40°C [41-104°F], 0-80% relative humidity, non-condensing

* Measured with 3-mm lens using a Dymax ACCU-CAL™ 50-LED Radiometer, in spot mode using the BlueWave QX4 Integrated Optic Adapter

Figure 1. BlueWave QX4 Dimensions

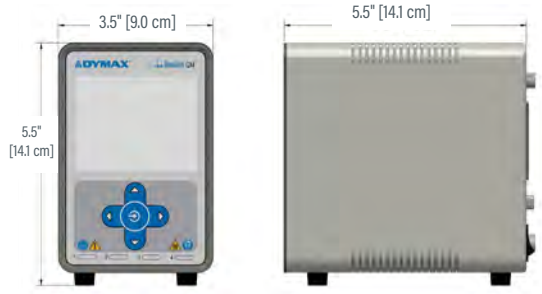
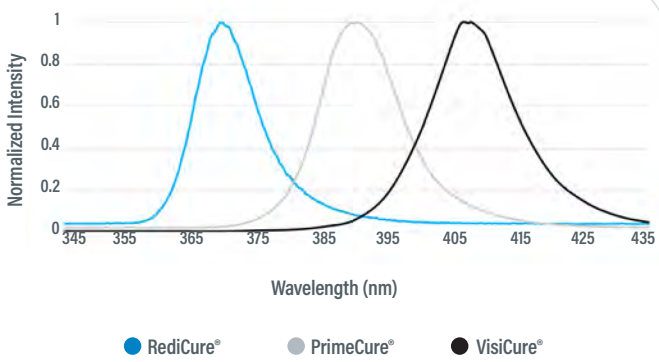
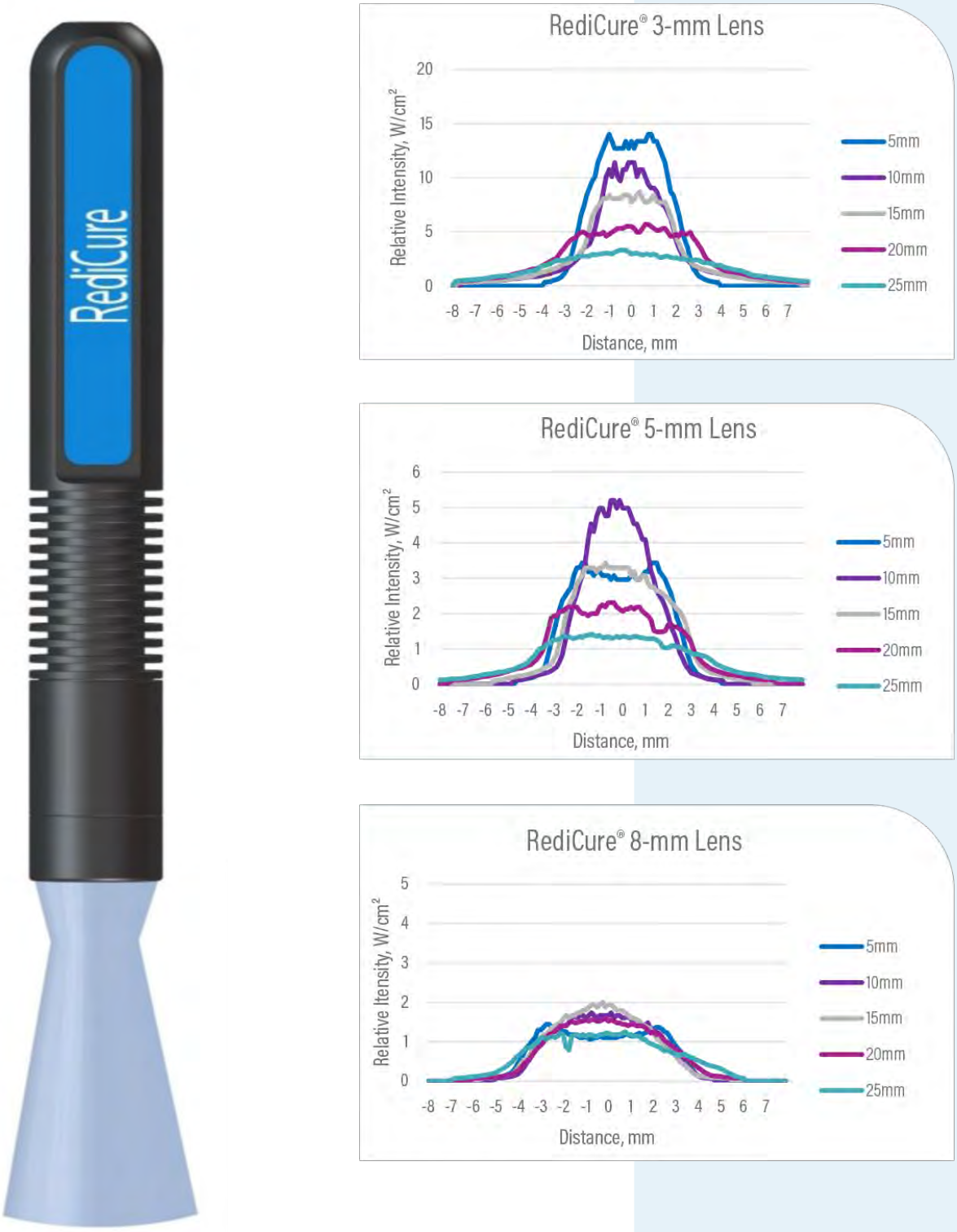


Figure 2. BlueWave QX4 Spectral Output Chart



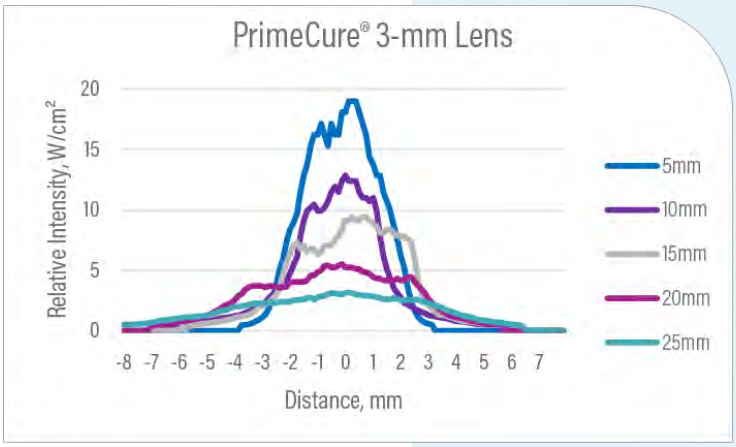
System Intensity

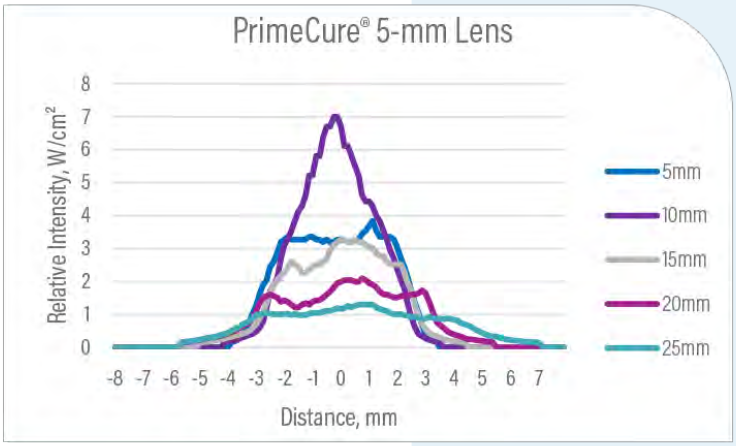
Figure 3. RediCure® LED Head, 365 nm - Intensity* at Various Working Distances

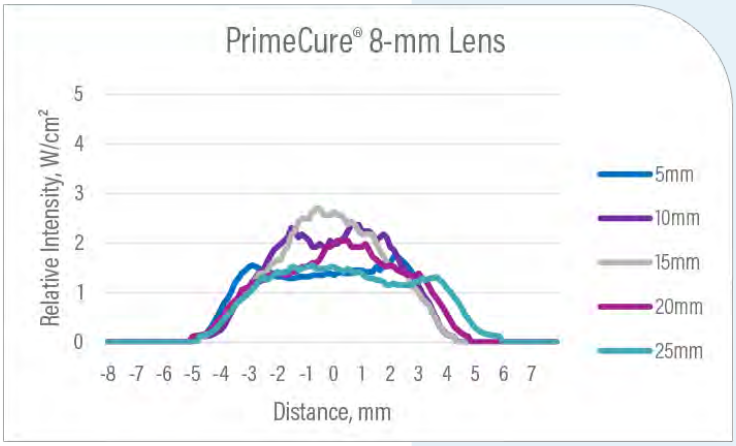


Note: Curing area data taken using Fuji UV Light Distribution Mapping System and normalized to ACCU-CAL™ 50 LED Radiometer.

Figure 4. PrimeCure® LED Head, 385 nm - Intensity* at Various Working Distances

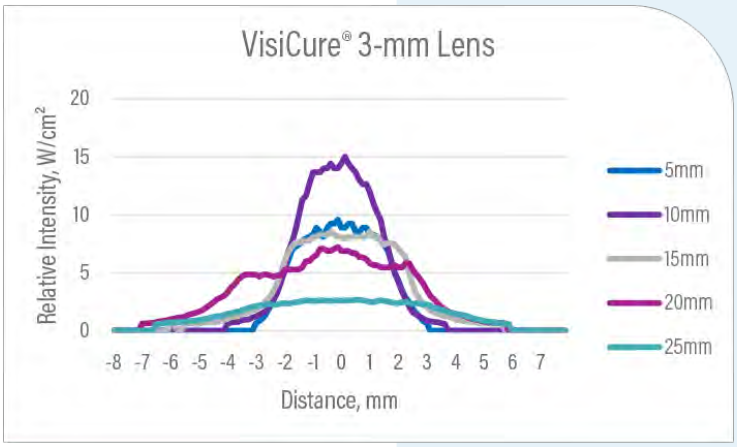


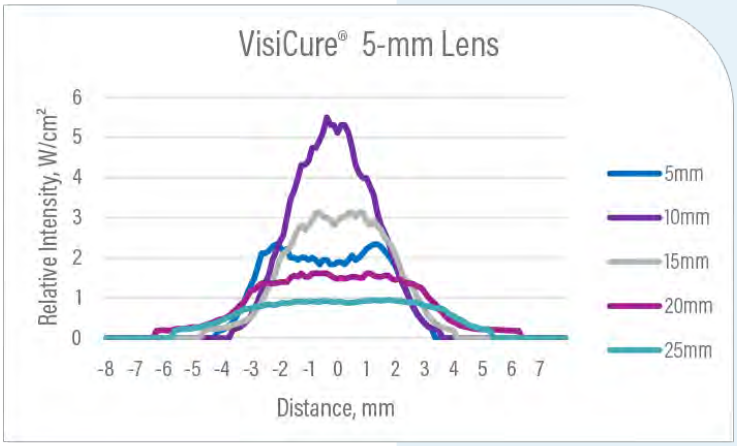


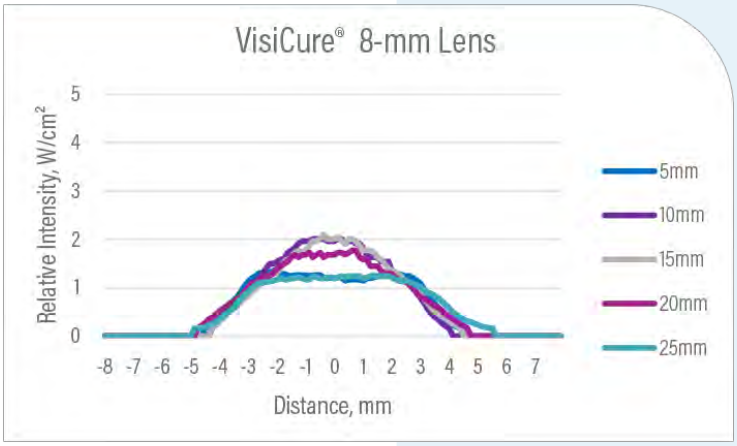


Note: Curing area data taken using Fuji UV Light Distribution Mapping System and normalized to ACCU-CAL™ 50 LED Radiometer.

Figure 5. VisiCure® LED Head, 405 nm - Intensity* at Various Working Distances







Note: Curing area data taken using Fuji UV Light Distribution Mapping System and normalized to ACCU-CAL™ 50 LED Radiometer.

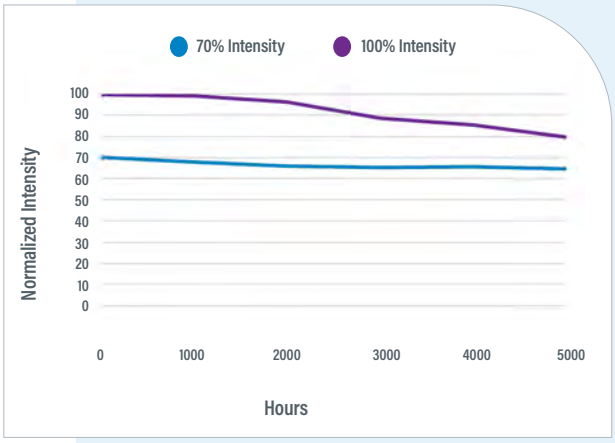
Degradation/Life Testing

Unlike broad-spectrum lamps, LED curing systems do not have bulbs that require regular replacement. Instead, LED curing systems operate with high-intensity LEDs. The instant on/off functioning of LEDs greatly increases the life of these LED systems. Long-term life testing of BlueWave QX4 systems was conducted for 5,000 continuous hours at 100% and 70% intensity. As noted in the graphs below, LED degradation was found to be very low for all wavelengths and intensities. Contact Dymax Application Engineering for additional details on setting up an LED curing process for maximum throughput and LED die life.

RediCure® (365 nm) Emitters

- 100% Intensity resulted in a 2.8% degradation per 1,000 hours
- 70% Intensity resulted in a 1.5% degradation per 1,000 hours

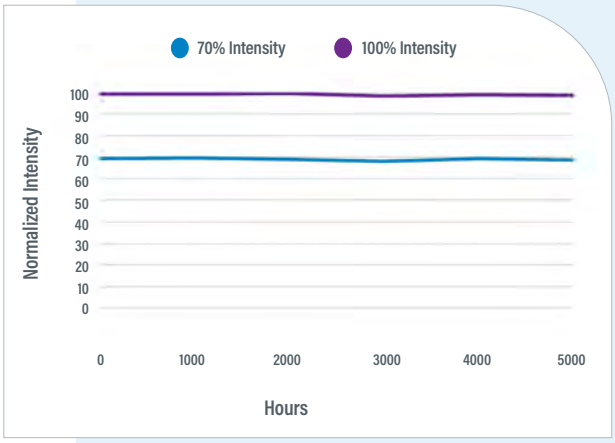
Figure 6. LED Degradion Testing - RediCure®



PrimeCure® (385 nm) Emitters

- 100% Intensity resulted in a 0.2% degradation per 1,000 hours
- 70% Intensity resulted in a 0.0% degradation per 1,000 hours

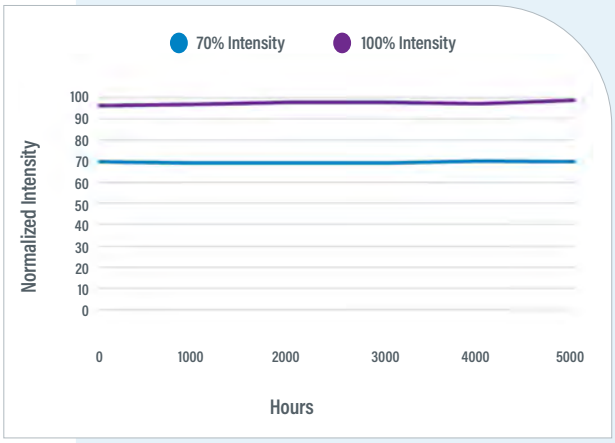
Figure 7. LED Degradion Testing - PrimeCure®



VisiCure® (405 nm) Emitters

- 100% Intensity resulted in a 0.0% degradation per 1,000 hours
- 70% Intensity resulted in a 0.0% degradation per 1,000 hours

Figure 8. LED Degration Testing - VisiCure®



Note: Testing conducted at 70ºF +/-3°F and 30% +/-10% Relative Humidity

Ordering Information

A complete BlueWave QX4 system features a controller and up to our LED heads/lenses. Each LED head must have a lens in order to operate properly. Components are sold separately.

Units are warrantied against defects in material and workmanship for one year from date of purchase.

Part Numbers - Main System Components	
Controller Only	41572 BlueWave QX4 Controller with No Power Cord*
LED Head (1 M)	43161 RediCure® 365 nm 43162 PrimeCure® 385 nm 43163 VisiCure® 405 nm
Lens Only	43164 3-mm Lens 43165 5-mm Lens 43166 8-mm Lens
LED Head Upgrade Kit Upgrades existing LED heads to the latest design	43197 Upgrade Kit for 3-mm 43198 Upgrade Kit for 5-mm 43199 Upgrade Kit for 8-mm

* The appropriate power cord will be added for European customers.

Controller

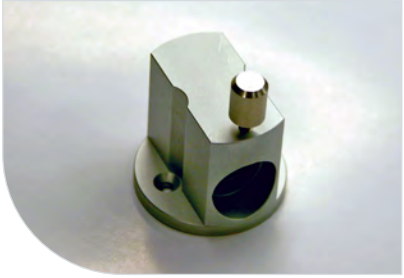
LED Heads (1 M Long)

Focusing Lenses
Available in 3, 5, and 8 mm

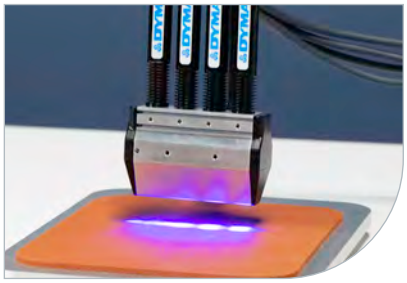
Spare Parts & Accessories

Spare Parts & Accessories	
AC Power Adapter	41547 AC Power Adapter
Connection Cable Extensions	41563 0.5 M Extension 41564 1.0 M Extension 41565 1.5 M Extension 41566 2.0 M Extension
Line Array Optic	43177 Line Optic that Accepts up to 4 LED Heads
Stands	41325 2-Pole Lightguide Stand 41595 4-Pole Expansion Kit for Lightguide Stand 41395 3-Sided Acrylic Shield - Works with Stand 41268
Radiometers	40505 ACCU-CAL™ 50-LED Radiometer Kit for LED Spots, Floods, and BlueWave QX4 42218 BlueWave QX4 Adapter Upgrade Kit (For customers who already own an ACCU-CAL 50-LED radiometer) Includes the integrated optic adapter, upgraded internal software, & calibration. Note: Your ACCU-CAL 50-LED must be returned to Dymax for programming.

2-Pole Lightguide Stand with 4-Pole Expansion Kit



Integrated Optic Adapter
Specially designed for use with ACCU-CAL 50-LED Radiometer to test the BlueWave QX4



Line Optic - Accepts Up to 4 LED Heads

Line Optic

Figure 9. BlueWave QX4 with Stand and Line Optic Accessory

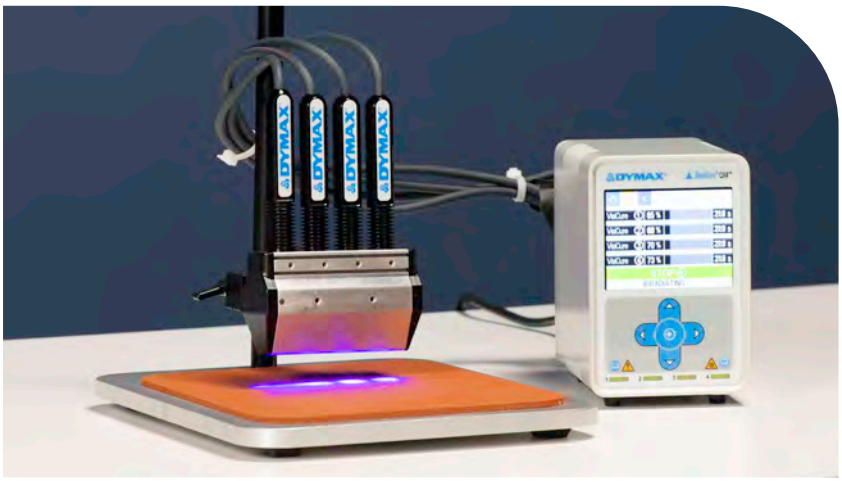
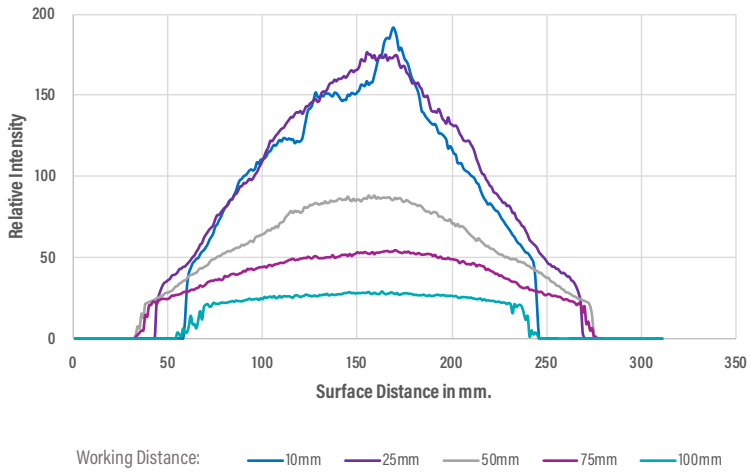


Figure 10. Line Optic Uniformity



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