

Gradient Lens Corporation®

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Agency Approvals



The V2-LED is in conformity with:

2011/65/EU – RoHS Directive

EN50581:2012

2006/95/EC (93/68 EEC) – Low Voltage Directive

IEC 62471:2006 LED Photobiological safety lamp standard, categorized as Risk Group 2 (Moderate risk).

Vendor Information

Manufactured for:

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REV. 0416



User Guide

HAWKEYE® V2-LED LIGHT SOURCE



Gradient Lens Corporation®

gradientlens.com










Hawkeye® V2-LED Light Source

The Hawkeye® V2-LED Light Source is the brightest, most efficient, handheld light source for use with the Hawkeye V2 Video Borescope, and for use with small diameter borescopes, such as Hawkeye MicroSlim and MicroFlex borescopes. When paired with the right borescope the V2-LED can be brighter than most benchtop light sources. The V2-LED features easy-to-use dimming capability, and has a long operating lifetime. Please read this operating manual in its entirety before using the product.

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System Symbol Descriptions

 CAUTION!	Caution	 WARNING!	Hazard Warning
 HOT SURFACE!	Caution: Hot Surface	 CAUTION!	Caution: Bright Light
	Manufacturer		Important Information
 <p>Do not dispose of this product as unsorted municipal waste. Prepare this product for reuse or separate collection as specified by Directive 2002/96/EC of the European Parliament and the Council of the European Union on Waste Electronic and Electrical Equipment (WEEE). If this product is contaminated, this directive does not apply.</p>			

Warnings & Precautions



Please be sure to handle the V2-LED with care at all times. The electrical and optical components may be damaged by physical trauma, extreme temperatures, or fluid invasion.



This manual describes the proper procedures for using the V2-LED. It also contains pertinent information on proper care and handling during use and storage.



Please read this entire manual carefully before using the V2-LED. If you have any questions concerning the material contained in this manual or the operation or safety of the equipment, please contact our Customer Service Department at service@gradientlens.com.



Check all items upon receipt to assure damage has not occurred during shipment. Verify compatibility of all components and accessories used with the V2-LED.



Since the V2-LED uses proprietary components, there are no user serviceable or replaceable parts inside the unit.



Avoid storing or using the V2-LED in areas of heavy traffic where it may sustain physical damage.

Warnings & Precautions (cont'd)



HOT SURFACE!

Unit MAY GET HOT. Provide adequate ventilation to prevent overheating.



CAUTION!

DO NOT IMMERSE or store liquids above or on the V2-LED.



WARNING!

Any changes or modifications made to this V2-LED that are not expressly approved by manufacturer will void the warranty.



CAUTION!

Possibly hazardous optical radiation emitted from this product. Do not stare at operating lamp. May be harmful to the eye.



WARNING!

This equipment is not suitable for use in the presence of flammable gasses or materials.

V2-LED Features

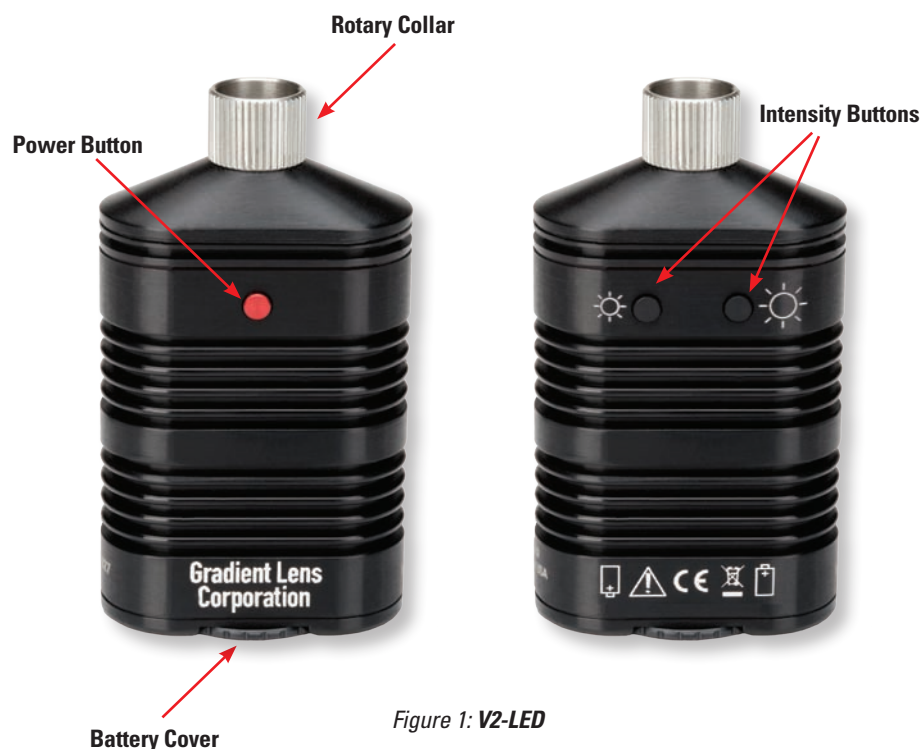


Figure 1: V2-LED

Mounting: The rotary collar allows the V2-LED to attach to the user's borescope. Rotate the collar clockwise to attach the V2-LED to a borescope and counterclockwise to remove. The rotary collar threads onto a standard universal light post's Storz adapter thread (M10 x 0.5).

Power Button: The **RED** power button controls the ON/OFF of the V2-LED.



CAUTION!

Possibly hazardous optical radiation emitted from this product. Do not stare at operating lamp. May be harmful to the eye.

Light Intensity Buttons:



Pressing button next to this symbol decreases the intensity of the light.



Pressing button next to this symbol increases the intensity of the light.

Battery Cover: The battery cover secures the batteries within the body of the V2-LED.

V2-LED Operation, Batteries and Charger

V2-LED Operation: The V2-LED operates on 2 rechargeable Lithium-Ion batteries and provides approximately 60 minutes of continuous operation when used with fully charged batteries.


LED Indicators



Charging the Batteries

- Plug the AC adapter into a wall outlet.
 - Connect the AC power adapter to the DC IN jack located at the end of the charger. Make sure no battery is installed. The LED indicator will glow green when the charger is ready.
 - Slide the batteries into the charger, making sure the negative ends of the batteries are inserted into the charger first, against the spring contact. The LED indicators will turn RED when the batteries are charging.
- LED indicator glowing red indicates batteries are charging and not ready for use.*
- LED indicator glowing green indicates batteries are fully charged and ready for use.*
- When fully charged, remove them from the charger and unplug the AC adapter from the wall outlet.
 - Install the batteries into the V2-LED.

Battery Installation/Removal: At the bottom of the V2-LED, rotate the locking knob of the battery cover counterclockwise until the index line on the knob is pointing 90° from the index mark on the cover. Remove the cover.

Insert the batteries into the unit using the battery symbol orientation  as a guide. The negative terminal of each battery should be in contact with the spring on each circuit board; refer to figure 3. Reinstall the cover, then rotate the locking knob clockwise until the index marks are aligned, as shown in figure 2.

Note: The battery cover may only be inserted into the V2-LED body in one direction. If the cover does not easily slide into the case, rotate the cover 180°.

To remove batteries, remove the battery cover, as noted above, and allow the batteries to slide out.



Figure 2: Index Marks Aligned



Figure 3: V2-LED Battery Orientation

Using the V2-LED

Installing V2-LED to User's Borescope: Slide the rotary collar onto the borescope's light post until the threads start to engage.

Tighten the rotary collar onto the borescope light post by turning rotary collar clockwise. Do not turn the V2-LED body once the collar is tight.

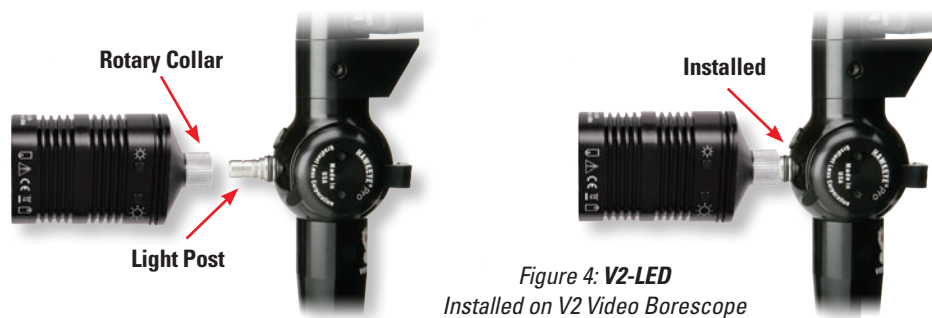


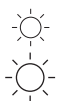
Figure 4: V2-LED
Installed on V2 Video Borescope

Turn the V2-LED ON by pressing and momentarily holding the **RED** Power ON/OFF button, refer to figure 5.



Possibly hazardous optical radiation emitted from this product. Do not stare at operating lamp. May be harmful to the eye.

Adjust light intensity as needed, refer to figure 6.



Pressing and holding the button next to this symbol decreases the intensity of the light.

Pressing and holding the button next to this symbol increases the intensity of the light.

After use, turn the V2-LED OFF by pressing the **RED** power button.

Remove the V2-LED from the borescope by turning the rotary collar counterclockwise.



Figure 5: **RED** Power Button



Figure 6: Intensity Control

Cleaning the V2-LED:

The V2-LED is rated for water resistance. The V2-LED is rated for slight water contact and mild detergent cleaning solutions only. However, it should NOT BE IMMERSSED in water or cleaning solutions for any prolonged period of time. After cleaning, dry and store the V2-LED in a clean and dry environment.



Failure to comply with the following may result in damage to the V2-LED and will void the product warranty.

In case of dirt or dust presence on the optical emitter itself (LED), the LED can be gently wiped with a cotton swab with a small amount of isopropyl alcohol. Avoid pressing too hard, and allow the alcohol to evaporate before using. A gentle burst of clean dry air may also help dislodge any foreign particles.

Use caution when cleaning the V2-LED; some methods may be harmful and could result in extensive damage. Manual cleaning is the recommended method. Certain cleaning agents may damage the device's materials. Only use water with a mild detergent such as a nonabrasive hand or dishwashing soap. Do not immerse the V2-LED in an ultrasonic cleaner.



Ensure that the battery cover is fully inserted and tightened, so the O-ring seal will prevent liquid intrusion into the battery compartment.

Never use any organic solvents to clean the V2-LED, other than isopropyl alcohol.

Drying the V2-LED:

If the V2-LED comes in contact with liquid, rinse with isopropyl alcohol and then dry with compressed air, commercial compressed gas canisters, or dry damp cloth.

Note: Dry air is highly recommended to reduce contamination of the optical components and reduce the possibility of oxidation of the materials used in the construction of the V2-LED.



Do not allow the V2-LED to remain in liquid cleaning solution for any prolonged period of time.

In addition, thoroughly dry the battery cover seal around the O-ring, with compressed air or by thoroughly wiping any excess liquid from this area, prior to removing the battery cover. This will prevent any trapped fluid from entering the battery compartment and exposing the electronics to fluids.



Ensure there is no trapped liquid between the battery cover and body prior to removing the battery cover.

Batteries and Charger (Included)



Figure 7: Batteries, Charger, Power Supply, and Plugs

PROBLEM	POSSIBLE CAUSE	ACTION
Loss of illumination	Battery charge is low.	Replace batteries with freshly charged batteries.
	Batteries cannot supply sufficient current at this power setting.	Replace batteries with freshly charged batteries.
		Verify batteries have been installed in the correct orientation.
		Reduce the light intensity and continue using the current battery. Recharge the batteries as soon as possible.
	Battery mismatch.	Make sure both batteries are the same type and freshly charged.
V2-LED light output flashing	Battery charge is low.	Reduce the light intensity and continue using the current battery.
	This is normal behavior indicator when the battery charge is low. Remaining run time is about 2 minutes.	Recharge the batteries as soon as possible.
Light guide does not attach properly to the borescope	The borescope has an adapter on its light post.	Remove the adapter and try attaching again.
	The borescope and V2-LED do not have a compatible coupling system.	Use an adapter sleeve or switch to V2-LED with a different type of rotary collar.
Light intensity is low	Foreign material or film on LED output taper.	VERY carefully clean the LED surface from visible contamination with a cotton swab and isopropyl alcohol. Do not use acetone or other solvents.
V2-LED becomes hot after prolonged use at full power	V2-LED has been left on for more than 30 minutes at full power.	Turn the V2-LED to a lower intensity setting if the examination must continue past 30 minutes.
		Turn the V2-LED OFF for a few minutes to permit adequate cool down of the body.

Specifications

Dimensions	
Length	24 mm (0.95")
Width	46 mm (1.8")
Height	81 mm (3.2")
Weight	126.8 g (4.5 oz.)
Illumination System	
Type	Light Emitting Diode (LED)
Color Temperature	5700 K Nom.
LED Power	3 Watts
Power System	
Power Source	Battery Powered (2 x RCR123A)
Battery Type	(2) Lithium Ion RCR123A 3.0V, 900mAh minimum
Battery Life at Full LED Power	60 minutes
Battery Charge Time	2.5-3 hours
Battery Recharge Cycles	500 charge cycles
Environment	
Operating Ambient Temperature Range	10° C to 40° C (50° F to 104° F)
Storage Temperature Range	-15° C to 55° C (-5° F to 131° F)
Humidity	0 – 95% RH
Mode of Operation	Continuous

Battery

Standard Part	RCR123A (Circuit Protected)
Type	Lithium-Ion (Li-Ion), rechargeable
Output Voltage	3.0V
Capacity	580mAh
Manufacturer/Part Number	Tenergy/30264
Battery Recharge Cycles	500 charge cycles
Battery Charge Time	3 hours



Figure 8: RCR123A Li-Ion Rechargeable Battery



WARNING!

- USE ONLY APPROVED BATTERIES.
- Use only pairs of fully charged batteries. Do not mix newly charged and depleted batteries.
- Never mix rechargeable battery with non-rechargeable batteries.
- Do not incinerate, disassemble, overcharge or short circuit the battery.



CAUTION!

- Do not expose the battery to high temperatures above 122°F/50°C.
- The batteries should be removed from the V2-LED if it will not be used for an extended time.

Charger Electrical Characteristics

Input/output Characteristics of External Adapter

Input voltage AC 100V 240V 50Hz/60Hz
 DC output no-loading voltage 12.0V ±5%
 Output current 0.5A

Input/output Characteristics of External Car Plug

Input voltage DC 12.0V

Input Voltage Range 2.50V-4.55V × 2CH

Output Characteristics of Charger

No-loading voltage 4.50V±0.05V × 2CH
 Rated input current (normal charging condition) 250±50mA × 2CH @CV = 3.7V
 Output Noise ≤150mV @CC = 200mA



Figure 9: Tenergy Li-Ion 2-bay Battery Smart Charger

Charger LED Indication

No battery Solid green
 Charging Solid red
 Fully charged Solid green
 Short circuit/Reverse polarity No LED indication

Manufacturer supplied charger is a 2-bay Li-Ion battery smart charger with MCU control which features:

- Independent charging channels.
- Constant current and constant voltage charging; Ensures the quality and safety of charging process.
- Worldwide AC input voltage 100-240V, 50Hz/60Hz. The kit includes AC adapter with interchangeable power plugs that may be used for US, EU, UK and AU.
- Two-color LEDs indicate charging status.
- Each LED indicates the corresponding channel.



CAUTION!

DO NOT use charger to charge other type of batteries.

DO NOT operate the charger when the temperature is higher than 40°C. We recommend operating when the temperature is lower than 35°C. Batteries may get warm during charging.



WARNING!

USE ONLY Tenergy Battery #30264.

DO NOT use charger and batteries in any acidic, alkaline or corrosive environment. DO NOT expose charger to rain, snow, water, gas, oil, etc.

DO NOT short circuit charging terminals.

Do not expose charger to fire, water or moisture.

To avoid electrical shock, do not disassemble the charger.

No user-serviceable parts inside the charger.

Limited Warranty

Gradient Lens Corporation warrants the V2-LED light source, when new, to be free of defects in material and workmanship and to perform in accordance with the manufacturer's specifications when subject to normal use and service for a period of 1 year from the date of purchase from Gradient Lens Corporation or an authorized agent. Gradient Lens Corporation will either repair or replace any components found to be defective or at variance from the manufacturer's specifications within this time at no cost to the customer. It shall be the purchaser's responsibility to return the instrument to the authorized distributor, agent, or service representative.

All non-warranty repairs will be warranted to be free from defects in materials and workmanship for a period of ninety (90) days from the date of the invoice.

This limited warranty does not cover the breakage or failure due to tampering, misuse, neglect, accidents, improper installation, modification, shipping, or to improper maintenance, service, fluid invasion and cleaning procedures. This limited warranty is also void if the instrument is not used in accordance with the manufacturer's recommendations or if required service is performed by anyone other than Gradient Lens Corporation or an authorized agent. The purchase date determines limited warranty requirements. No other express or implied limited warranty is given.

Suitability for use of the device for any procedure shall be determined by the user. Gradient Lens Corporation shall not be liable for incidental or consequential damages of any kind.