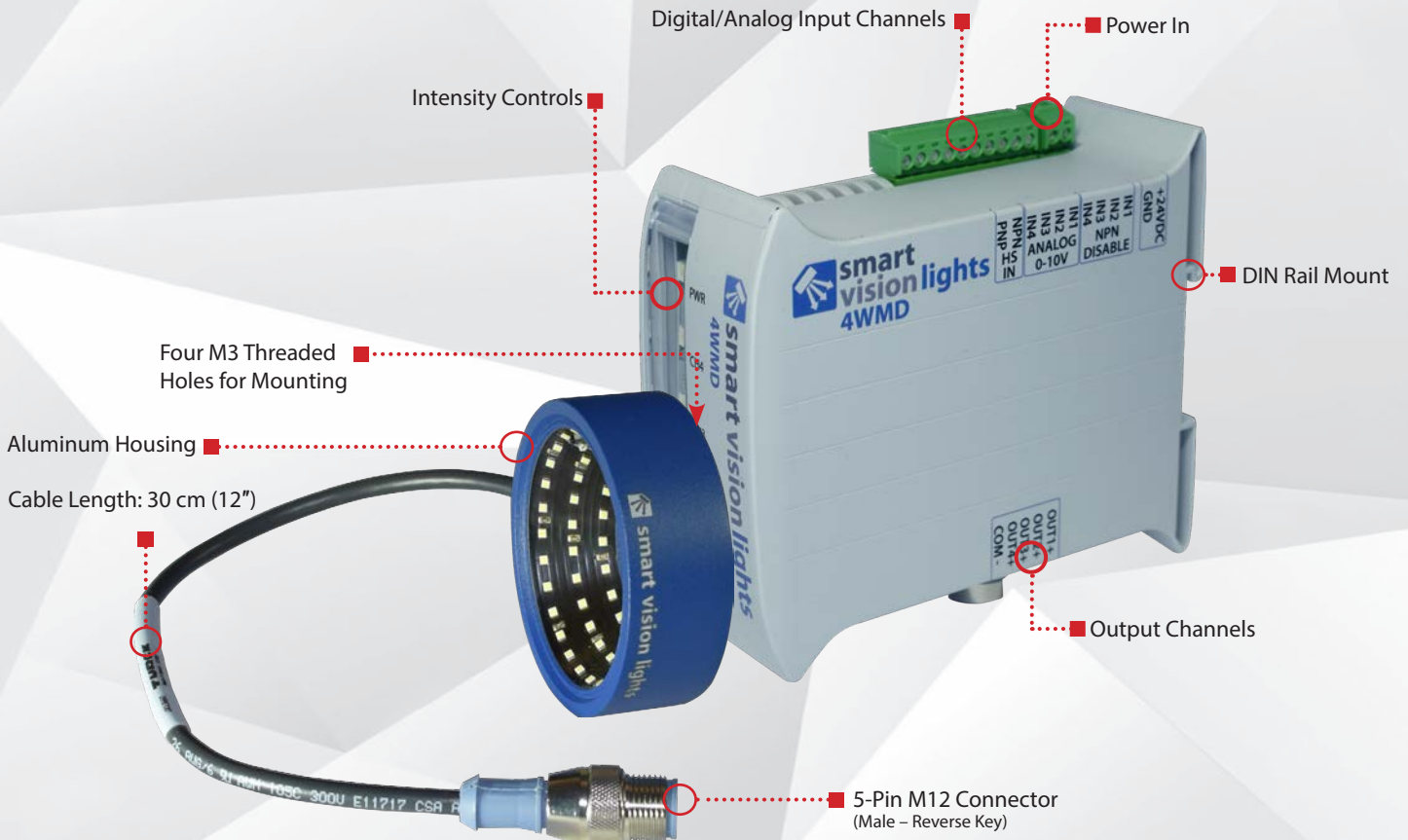


P R O D U C T D A T A S H E E T



Warranty <b>10</b> YEAR*	Compliant <b>IEC</b> 62471	Compliant <b>CE</b> RoHS	Zones <b>3</b>	Connector reverse-key <b>5-PIN</b> <b>M12</b>
--------------------------------	----------------------------------	--------------------------------	-------------------	--

\* see page 2 for details.

## PRODUCT HIGHLIGHTS

- ✓ Three individual LED zones with the ability to control each zone independently
- ✓ Kit available that includes the 4WMD-100 driver for adjusting individual zones intensity
- ✓ PNP and NPN high-speed trigger signal input
- ✓ Built-in over-current protection in 4WMD-100 driver
- ✓ 5-pin M12 quick connect (reverse key)





## PRODUCT DESCRIPTION

### RMF60

The RMF60 features three LED zones that can be controlled independently. The RMF60 is designed for dark field applications and produces a highly focused, homogeneous light pattern.

### 4WMD-100

The 4WMD-100 permits up to four individual channels (only 3 channels are needed for the RMF60) to be controlled independently. This external driver allows a single channel to drive LEDs in continuous operation or OverDrive™ strobe mode separate from the other channels. For quick and easy adjustments, each output channel has its own tuning control located on the front of the driver. When light is being used in continuous mode, the intensity can be controlled using the analog input signal.



## WHAT'S INCLUDED

When you order a RMF60 ring light, such as the RMF60-WHI, the following item is included:



RMF60  
RING LIGHT

RMF60 requires an external constant current driver with maximum 100 mA per channel.

When you order a RMF60 ring light kit, such as the RMF60-WHI-KIT, the following items are included:



RMF60  
RING LIGHT

+



4WMD-100  
DRIVER

## RESOURCE CORNER



Additional resources, including CAD files, videos, and application examples, are available on our website.

### Smart Vision Lights™

2359 Holton Road  
Muskegon, MI 49445  
P: +1 231.722.1199 | F: +1 231.722.9922  
[smartvisionlights.com](http://smartvisionlights.com)  
[techsupport@smartvisionlights.com](mailto:techsupport@smartvisionlights.com)  
Hours: Monday — Friday | 8 am–5 pm ET



## PRODUCT SPECIFICATIONS

### RMF60

PER CHANNEL	CONTINUOUS OPERATION	OVERDRIVE™ STROBE MODE
Maximum LED Input Current	100 mA	1.0 A
Input Connector	5-pin M12 connector (male — reverse-key)	
Strobe	<b>Not applicable</b>	Max. 50 ms
Duty Cycle	<b>Not applicable</b>	Max. 10%
Ambient Temperature	0°–45°C (32°–114°F)	
Weight	~100 g	
Warranty	10 year. For complete warranty information, visit <a href="http://smartvisionlights.com/warranty">smartvisionlights.com/warranty</a>	
Compliances	CE, RoHS, IEC 62471	

#### NOTE:

The RMF60 requires an external constant current driver, such as the recommended 4WMD-100.

### 4WMD-100

PER CHANNEL	Standard
Electrical Input	24 V DC +/- 5%
Electrical Input Connector	2-position screw terminal blocks – 14 AWG max wire size
Input Current	Max. 800 mA
Wattage	Max. 19.2 W
Operating Current (No Load)	70 mA
Number of Input Channels	4
Input Connector	10-position screw terminal block – 14 AWG max wire size (4 for channel control, 4 for analog, and 2 for PNP/NPN strobing/trigger)
On/Off Trigger Input	PNP trigger: +4 V DC or greater to activate (max 26 V DC) NPN trigger: GND (<1 V DC) to activate
Input Channel Current	PNP input: 4 mA @ 4 V DC   10 mA @ 12 V DC   20 mA @ 24 V DC NPN input: 15 mA @ Ground (0 V DC)
Analog Intensity	Continuous Operation: The output is adjustable from 10%–100% of intensity by applying 1–10 V DC signal OverDrive™ Strobe Mode: Apply 0 V DC
Output Channels	4 channels for LED tuning control
Output Connectors	One 5-pin M12 reverse-key connector 5-position screw terminal block – 14 AWG max wire size
Indicator Lights	Power on = Green light Individual channels = Yellow light Service = Red light
Mounting	DIN rail
Dimensions	H = 102 mm (4.0"), L = 119 mm (4.7"), W = 45 mm (1.8")
Ambient Temperature	-18°C–40°C (0°F–104°F)
Ambient Humidity	0%–95% noncondensing
Weight	~233 g
Compliances	CE, RoHS
Terminal Block Plugs (Included with 4WMD)	2-position terminal block plug 5-position terminal block plug 10-position terminal block plug
Warranty	3 year. For complete warranty information, visit <a href="http://smartvisionlights.com/warranty">smartvisionlights.com/warranty</a>

TOTAL INPUT PER UNIT (MAX)	CONTINUOUS OPERATION	OVERDRIVE™ STROBE MODE
Input Current	440 mA	3.4 A
Input Power	10.5 W	82 W



## LIGHT PATTERNS

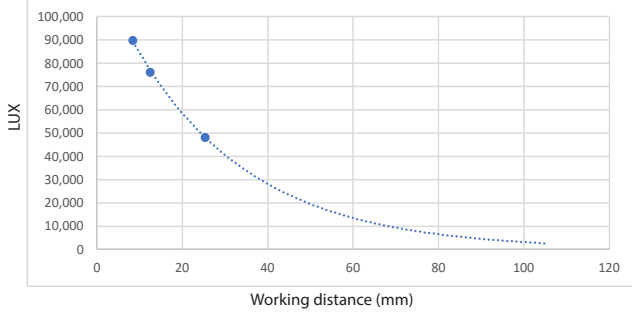
Smart Vision Lights™ recommends the RMF60 be used at a working distance between 5 mm and 20 mm.

### LIGHTING ILLUMINATION FOR THE RMF60

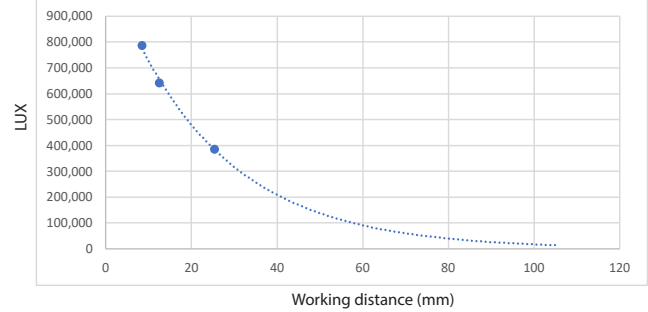
Continuous Operation Mode	
Typical Output Performance	Illuminance (Lux)
Distance = 10 mm	80,000
<i>Illuminance measurement taken on White Light, 4800K</i>	

OverDrive™ Strobe Mode	
Typical Output Performance	Illuminance (Lux)
Distance = 10 mm	700,000
<i>Illuminance measurement taken on White Light, 4800K</i>	

Illuminance calculated for Continuous Operation mode



Illuminance calculated for OverDrive™ strobe mode

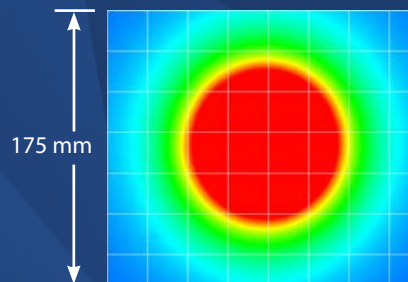


### HIGH OUTPUT

The RMF60 is capable of reaching 7 million lux in OverDrive™ strobe mode using a Smart Vision Lights™ custom driver. Contact Smart Vision Lights™ for more information.

The RMF60 Mini Ring Light produces a uniform light pattern.

Working Distance = 10 mm



(Grid set to 25 mm x 25 mm)

## MULTI-DRIVE™

Multi-Drive™ offers the best of both worlds. Continuous operation and OverDrive™ mode (HIGH output strobe/pulse) are available in a single light. Other advantages of Multi-Drive™ include faster imaging and capture/freeze motion on high-speed lines.



The Multi-Drive™ feature allows the user to run the light continuously or in OverDrive™ at the maximum allowed intensity by simply setting the product configuration. OverDrive™ strobe mode has **up to ten times** the power of continuous operation.

## SAFESTROBE™ TECHNOLOGY

SafeStrobe™ technology is a unique technology that applies safe working parameters to ensure high-current LEDs are not damaged by driving them beyond their limits, such as when using maximum strobe time or duty cycle. SafeStrobe™ is especially beneficial when overdriving our high-current LEDs.

## MOUNTING

The 4WMD-100 is designed to mount to DIN rail.

The RMF60 mounting options include four M3 threaded holes.

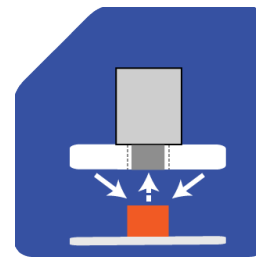
### Hardware included with light:

(2) M3 screws (hex)



## ILLUMINATION

RMF60 Series of Mini Ring Lights works best for:



Dark Field

## EYE SAFETY

According to IEC 62471:2006. Full documentation upon request.



### Notice

**Exempt Group:** No photobiological hazard to eyes or skin even for continuous, unrestricted use. Applicable for wavelength 625.

### Caution

**Risk Group 1:** Possibly hazardous optical radiation emitted from this product. Do not stare at operating lamp. May be harmful to eyes. Safe for most applications except prolonged exposure. Applicable for wavelengths 470, 530, and WHI.



## PART NUMBER

RMF60 – [ ] [ ] [ ] – [ ] [ ] [ ]



### Part Number Examples:

**RMF60-625** RMF60, 625 nm red wavelength (light only)  
**RMF60-470-KIT** RMF60, 470 nm blue wavelength and 4WMD-100 external driver

Additional wavelengths available upon request



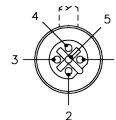
## OUTPUT CONFIGURATION

### Using the Reverse-Key 5-pin M12 Connector

When connecting a Smart Vision Lights™ three zone light to the 4WMD-100, a reverse-key 5-pin M12 cable is required. All Smart Vision Lights™ zone lights come equipped with a 5-pin reverse-key connector.

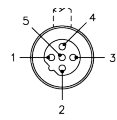
With very little wiring needed, the reverse-key 5-pin M12 connector simplifies connecting lights to the 4WMD-100

#### 4WMD



Reverse-Key 5-pin M12 Connector (female)

#### RMF60



Reverse-Key 5-pin M12 Connector (male)

5-pin M12 Connectors Pin Layout

Pin	Zone/Channel	Color
1	Common	Brown
2	1	White
3	2	Blue
4	3	Black
5	4	Gray

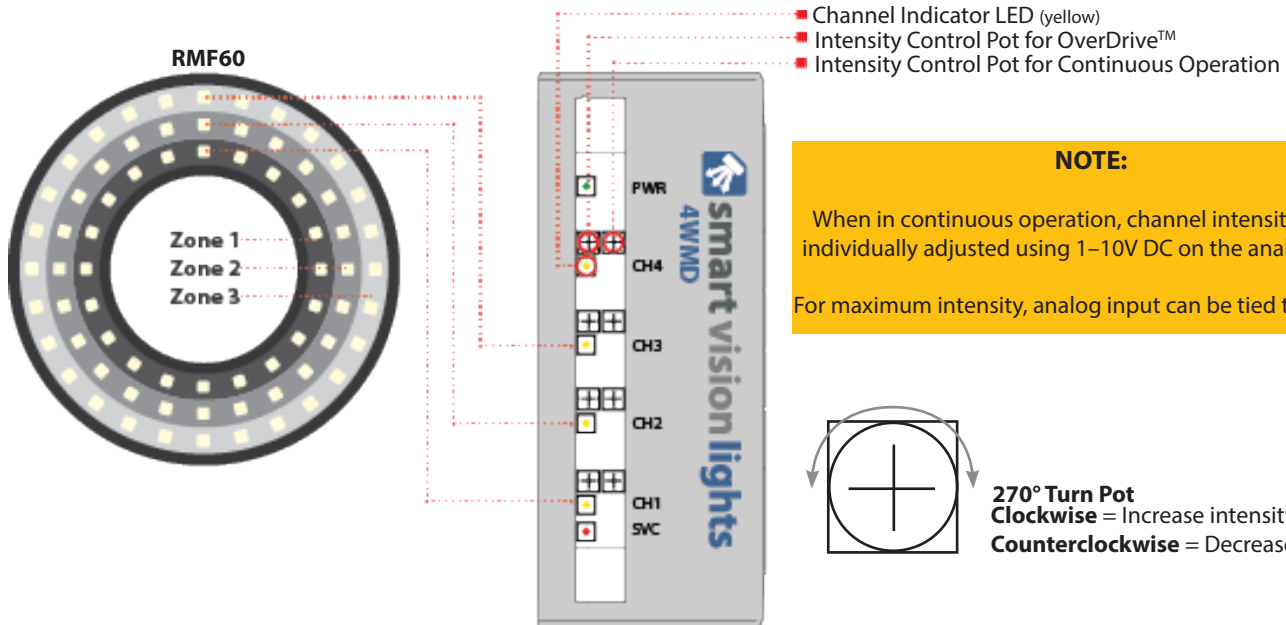
### NOTE:

Smart Vision Lights™ uses reverse-key cables that have a blue-grey tip on the connectors.



## ADJUSTING INTENSITY

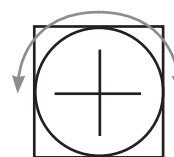
The 4WMD allows for the tuning of up to four individual wavelength intensities (only 3 channels are needed for the RMF60). Depending on its configuration, a channel can tune the output intensity of a given zone for either continuous operation or OverDrive™ strobe mode. Each channel can be tuned for continuous operation or OverDrive™ strobe mode. **Continuous operation and OverDrive™ cannot be used simultaneously on a single channel.** Each channel has a yellow indicator light that illuminates when the channel is active.



### NOTE:

When in continuous operation, channel intensity can be individually adjusted using 1–10V DC on the analog input.

For maximum intensity, analog input can be tied to 24V DC.



**270° Turn Pot**  
**Clockwise** = Increase intensity  
**Counterclockwise** = Decrease intensity



## DISABLE A CHANNEL

If one or more wavelengths are not needed, the channels associated with the wavelength can be disabled. Disabling a channel will turn off the wavelength. To disable a channel, connect that channel to ground (GND).

*Example:* To disable channel 4, connect NPN Disable IN 4 to GND.

**NOTE:**

All channels are enabled by default.

### Input Connectors (top of 4WMD)

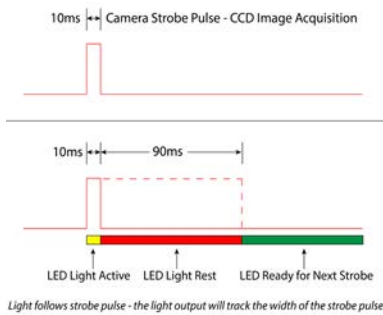
HS IN		Analog 0-10 V			NPN Disable				Power In		
PNP	NPN	IN 4	IN 3	IN 2	IN 1	IN 4	IN 3	IN 2	IN 1	GND	+24V DC
□	□	□	□	□	□	□	□	□	□	□	□



## DUTY CYCLE (OVERDRIVE™ MODE ONLY)

This section applies only if light is in OverDrive™ strobe mode.

The Duty Cycle (D) is related to the Strobe Time (ST) and Rest Time (RT).



### Calculating Rest Time

$$RT = \frac{ST}{D} - ST$$

RT = Rest Time  
ST = Strobe Time  
D = Duty Cycle

**Example**

$$90 \text{ ms} = \frac{10 \text{ ms}}{.1} - 10 \text{ ms}$$

Rest Time is 90 ms for 10 ms Strobe Time

### Calculating Strobe Rate

$$SR = \frac{D}{ST}$$

SR = Strobe Rate (strokes per second)  
ST = Strobe Time (seconds)  
D = Duty Cycle

**Example**

$$1000 = \frac{0.1}{0.0001}$$

Strobe Rate is 1000 strokes per second

### Calculating Duty Cycle

$$D = ST \times SR$$

SR = Strobe Rate (strokes per second)  
ST = Strobe Time (seconds)  
D = Duty Cycle

**Example**

$$0.1 = 0.0001 \times 1000$$

Duty Cycle is 10% (0.1)

**Maximum Duty Cycle for OverDrive™ light is 10% (0.1)**

*Note:* Strobe time is limited by the strobe rate.

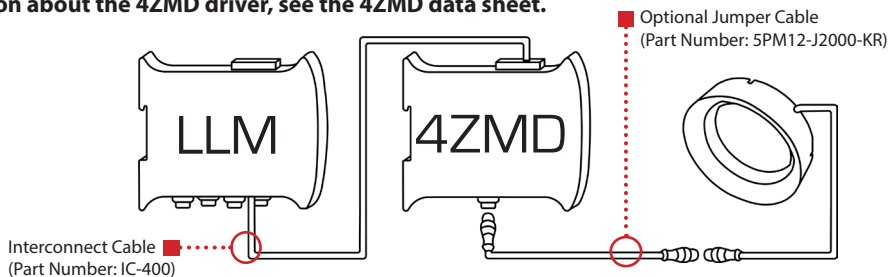


## ALTERNATIVE DRIVER

The 4ZMD is an alternative driver for the RMF60. The 4ZMD permits controlling the three separate light zones either independently or simultaneously, in any combination. Smart Vision Lights™ recommends managing the 4ZMD driver with the LED Light Manager (LLM). The LLM allows for easy control of each individual zone. The sequence event programmed within the LLM can contain multiple sequences, each with the ability to set each zones independently to continuous on, off, any intensity level in between, and even OverDrive™ strobe mode.

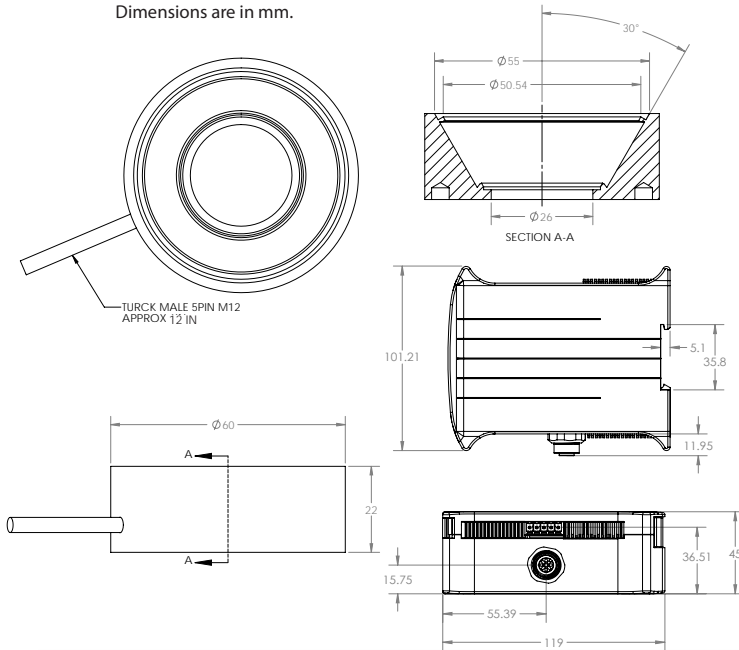
**For more information about how to use the LED Light Manager (LLM), see the LLM data sheet.**

**For more information about the 4ZMD driver, see the 4ZMD data sheet.**



## PRODUCT DRAWING

CAD files available on our website.  
Dimensions are in mm.



## ACCESSORIES

**Jumper/Extension Cable**

Length	Part Number
2000 mm	5PM12-J2000-KR

## GLOSSARY

This glossary covers all Smart Vision Lights™ product families; some content in this section may not apply to this specific light.

### TERMINOLOGY

**OverDrive™** Lights include an integrated high-pulse driver for complete LED light control.

**Continuous Operation** Lights stay on continuously.

**Multi-Drive™** Combines continuous operation and OverDrive™ strobe (high-pulse operation) mode into one easy-to-use light.

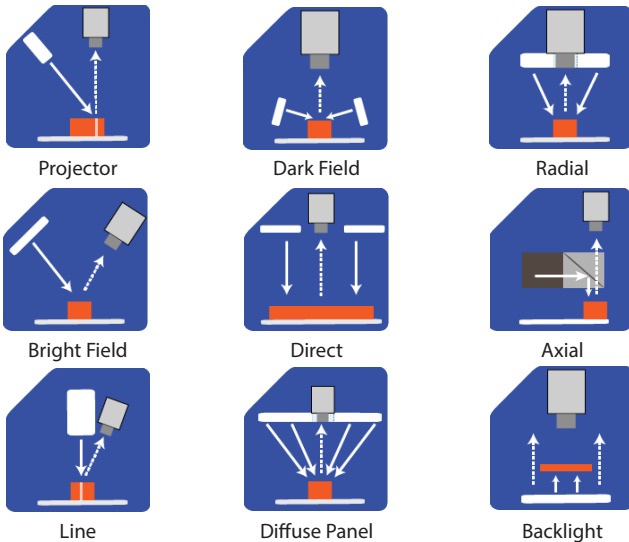
**Built-in Driver** The built-in driver allows full function without the need of an external controller.

**Camera to Light** Connecting the light directly to the camera, without the need for additional controllers or equipment.

**Polarizers** Filters that reduce reflections on specular surfaces.

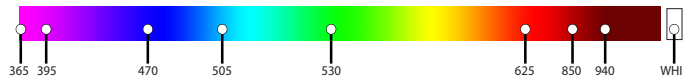
**Diffuser** Used to widen the angle of light emission, reduce reflections, and increase uniformity.

### TYPES OF ILLUMINATION



### COMMON COLOR/WAVELENGTHS LEGEND

Wavelengths options range from 365 nm to 1550 nm.\*  
Additional wavelengths available for many light families.



\*See Part Number section for **this light's** available standard wavelengths.



Shortwave Infrared LEDs are available in 1050 nm, 1200 nm, 1300 nm, 1450 nm, and 1550 nm.\*

\*Check Part Number section to see if **this light** is available in SWIR wavelengths.