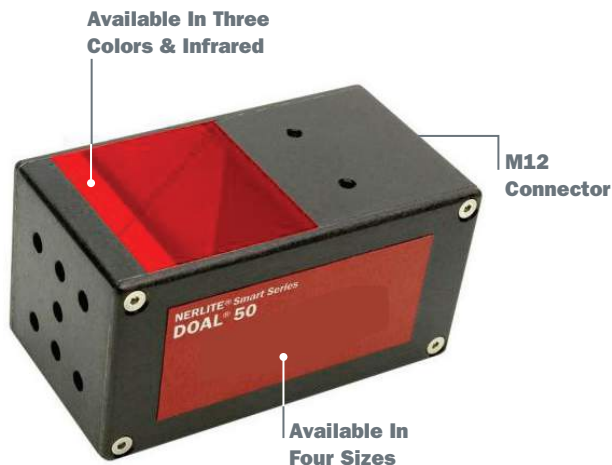


## NERLITE® DOAL®

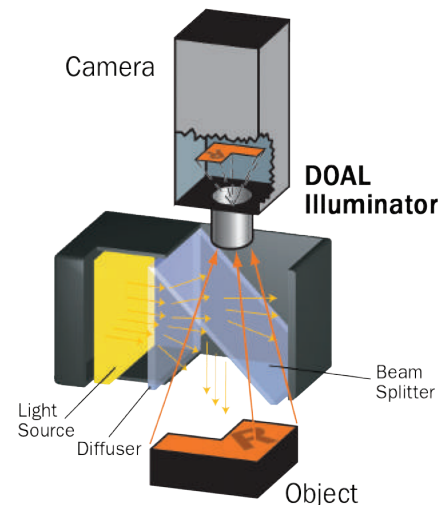


## Diffuse On-Axis Lighting (DOAL)

DOAL illuminators provide the best contrast for images of features marked or embossed on a flat specular surface with diffuse and uniform on-axis illumination. With the coaxial lighting approach, specular surfaces perpendicular to the camera appear bright, while surfaces which are marked or embossed absorb light and appear dark.

### DOAL: At a Glance

- Smart Series: Built-in controller with adjustable intensity continuous mode and high output strobe mode
- Integrated Pulse Width Modulation (PWM) feature for dimming and on-off control
- Provides high intensity diffuse illumination with superior uniformity throughout the envelope
- Compact, lightweight package can be used on moving camera modules
- Passively cooled design for efficient and reliable operation



### Illumination Example:

Object



Resulting Image



**Stamped characters on a metal plate:** High contrast image allows inspection or reading.

### Application Examples

- Evenly illuminate flat, shiny surfaces
- Enhance scribed, indented, or embossed features
- Create contrast between specular, diffuse, or absorptive surfaces
- Diminish visibility of clear overcoats or coverings
- Electronic component inspection
- Fiducial location

# NERLITE® DOAL® SPECIFICATIONS AND OPTIONS

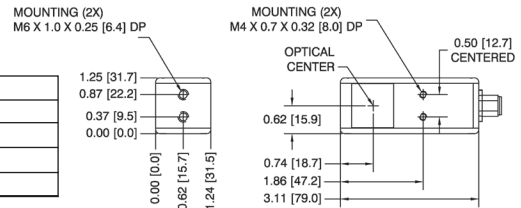
## DOAL 25

DESCRIPTION	nm/K	CONT. CURRENT	STROBE CURRENT	mcd	
				CONT.	STROBE
DOAL-25, Smart Series, Red	628 nm	110 mA	400 mA	4173	23369
DOAL-25, Smart Series, Blue	470 nm	83 mA	200 mA	2522	11096
DOAL-25, Smart Series, White	5500 K	83 mA	200 mA	5443	23406

**Light Aperture:** 1.00" x 0.95" (25.4 mm x 24.1 mm) **Field of View:** 0.50" (13 mm)

**Stand Off:** 0.50" (13 mm) **Weight:** 4 oz. (113 g)

**Dimensions:** H 1.24" (31.5 mm) x W 1.25" (31.8 mm) x D 3.11" (79 mm)



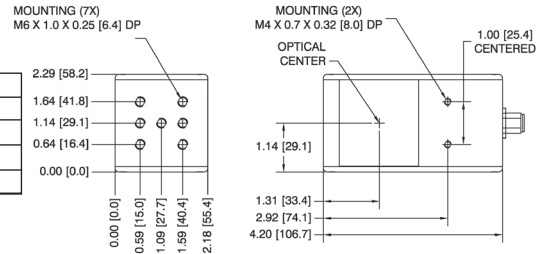
## DOAL 50

DESCRIPTION	nm/K	CONT. CURRENT	STROBE CURRENT	mcd	
				CONT.	STROBE
DOAL-50, Smart Series, Red	628 nm	345 mA	1.3 A	15967	76640
DOAL-50, Smart Series, Blue	470 nm	260 mA	1.0 A	9684	41156
DOAL-50, Smart Series, White	5500 K	260 mA	1.0 A	20902	89878

**Light Aperture:** 2.04" x 1.88" (51.8 mm x 47.8 mm) **Field of View:** 1.00" (25.4 mm)

**Stand Off:** 1.00" (25.4 mm) **Weight:** 11.2 oz. (318 g)

**Dimensions:** H 2.18" (55.4 mm) x W 2.29" (58.2 mm) x D 4.20" (106.7 mm)



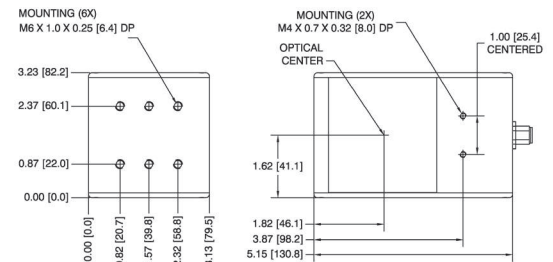
## DOAL 75

DESCRIPTION	nm/K	CONT. CURRENT	STROBE CURRENT	mcd	
				CONT.	STROBE
DOAL-75, Smart Series, Red	628 nm	650 mA	2.4 A	31026	148926
DOAL-75, Smart Series, Blue	470 nm	570 mA	1.5 A	22696	97594
DOAL-75, Smart Series, White	5500 K	570 mA	1.5 A	48989	210652

**Light Aperture:** 2.99" x 2.83" (75.8 mm x 71.9 mm) **Field of View:** 1.50" (38.1 mm)

**Stand Off:** 1.00" (25.4 mm) **Weight:** 22.4 oz. (635 g)

**Dimensions:** H 3.13" (79.5 mm) x W 3.23" (82.2 mm) x D 5.15" (130.8 mm)



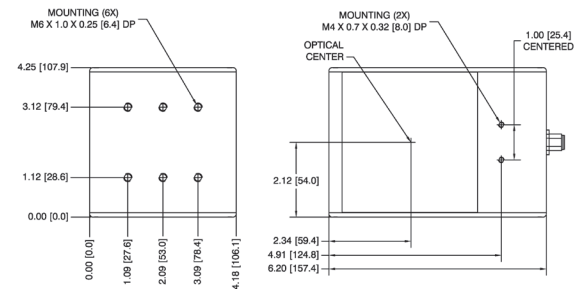
## DOAL 100

DESCRIPTION	nm/K	CONT. CURRENT	STROBE CURRENT	mcd	
				CONT.	STROBE
DOAL-100, Smart Series, Red	628 nm	1.05 A	3.6 A	50803	219470
DOAL-100, Smart Series, Blue	470 nm	740 mA	1.6 A	30665	113461
DOAL-100, Smart Series, White	5500 K	740 mA	1.6 A	66189	244900

**Light Aperture:** 4.00" x 3.88" (101.6 mm x 98.5 mm) **Field of View:** 2.00" (50.8 mm)

**Stand Off:** 1.00" (25.4 mm) **Weight:** 38.4 oz. (1089g)

**Dimensions:** H 4.18" (106.1 mm) x W 4.25" (107.9 mm) x D 6.20" (157.4 mm)



## ENVIRONMENTAL

**Enclosure:** Black anodized aluminum, IP40 rated; **Operating Temperature:** 0° to 50° C (32° to 122° F)

**Storage Temperature:** 0° to 50° C (32° to 122° F); **Humidity:** up to 95% (non-condensing)

## LIGHTING PARAMETERS

**Light Aperture Defined:** Area of light output from the coaxial illuminator.

**Field of View Defined:** Largest recommended evenly illuminated area as seen from the camera (also know as Area of Interest [AOI]).

**Stand Off Defined:** Recommended distance between the bottom of the light and the surface of the object being illuminated.

## LIGHT SOURCE

**Type:** High output LEDs

**Light Output:** Millicandelas

**Radiant Output:** Milliwatts

**Expected Life:** 50,000 hours (Red LEDs)

**Expected Life:** 10,000 hours (Blue, White LEDs)

**Eye Safety:** EN 60825-1: Class 1 (Red, White LEDs); Class 2 (Blue LEDs)

## CONNECTOR

**Type:** M12 5-pin plug, A-code

## ELECTRICAL

**Power:** 20.2–28.8 VDC

**Continuous Operation:** No additional signals required

**Continuous Operation with Dimming:** 0 VDC (LEDs off) to 3.1–3.5 VDC (LEDs on) PWM signal. < 1 mA, modulation frequency 2 KHz +/- 100 Hz. Note: LED duty cycle will equal duty cycle of dimming signal when using this mode.

**Continuous Operation with On/Off Control:** 0 VDC (LEDs off) to 3.1–3.5 VDC (LEDs on), < 1 mA

**High Output Strobe Operation:** Optoisolated. 0 VDC (LEDs off) to 3.1–28.8 VDC (LEDs on). 10 mA max, 5 µs min to 10 ms max pulse width. Note: High Output Strobe internally limits LED frequency and pulse width to maximum of 90 Hz and 1 ms respectively.

### M12 5-pin plug:



### Pin Assignment

- 1 +24 VDC
- 2 Trigger (-)
- 3 DC Ground
- 4 Trigger (+)
- 5 Dimmer

# NERLITE SMART SERIES DOAL ILLUMINATORS

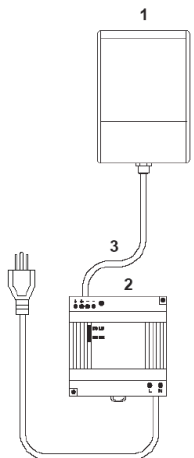
## CONFIGURATION GUIDE



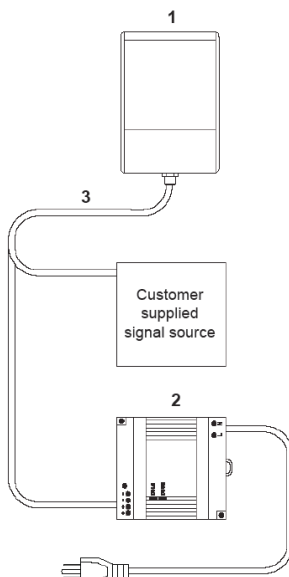
			Continuous Mode	Continuous Mode With Dimming Or On-Off Control	High Output Strobe Mode
PART NUMBER	DESCRIPTION	Current Draw @ 24VDC (typ.)	No Controller Required (Can Be Connected Directly To 24VDC)	No Controller Required (Can Be Connected Directly To 24VDC)	No Controller Required (Can Be Connected Directly To 24VDC)
NER-011660400G	SMART SERIES DOAL-25, RED	.40A	Figure A or D	Figure B	Figure C
NER-011660410G	SMART SERIES DOAL-25, WHITE	.20A	Figure A or D	Figure B	Figure C
NER-011660420G	SMART SERIES DOAL-25, BLUE	.20A	Figure A or D	Figure B	Figure C
NER-011660500G	SMART SERIES DOAL-50, RED	1.3A	Figure A or D	Figure B	Figure C
NER-011660510G	SMART SERIES DOAL-50, WHITE	1.0A	Figure A or D	Figure B	Figure C
NER-011660520G	SMART SERIES DOAL-50, BLUE	1.0A	Figure A or D	Figure B	Figure C
NER-011660600G	SMART SERIES DOAL-75, RED	2.4A	Figure A or D	Figure B	Figure C
NER-011660610G	SMART SERIES DOAL-75, WHITE	1.5A	Figure A or D	Figure B	Figure C
NER-011660620G	SMART SERIES DOAL-75, BLUE	1.5A	Figure A or D	Figure B	Figure C
NER-011660700G	SMART SERIES DOAL-100, RED	3.6A	Figure A	Figure B	Figure C
NER-011660710G	SMART SERIES DOAL-100, WHITE	1.6A	Figure A	Figure B	Figure C
NER-011660720G	SMART SERIES DOAL-100, BLUE	1.6A	Figure A	Figure B	Figure C

### Hardware Required

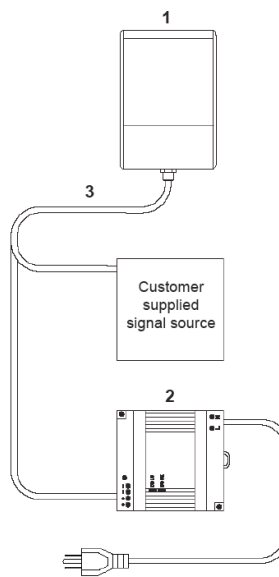
Item	Description	Part Number
1	Smart Series DOAL Lights	NER-011660XXXG
2	Power Supply DSP60 24VDC 2.5A DIN Mount	NER-011504100
2	Power Supply DSP100 24VDC 4.2A DIN Mount	97-000006-01
3	Cable 5 Pin M12 Female To Flying Leads, 3M	61-000186-01
3	Cable 5 Pin M12 Female To Flying Leads, 5M	61-000187-01
4	Cable, Power Smart Series to QX-1	61-000204-01



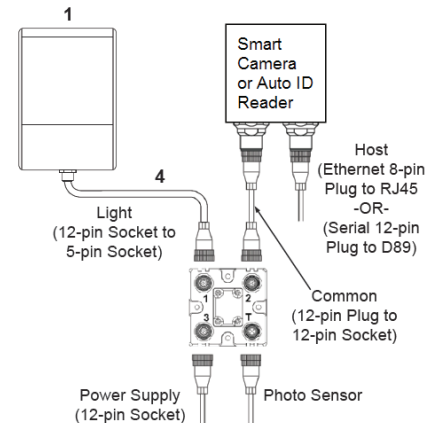
**Figure A**  
DOAL Series Illuminator  
with power supply



**Figure B**  
DOAL Series Illuminator  
with customer supplied  
dimming or on-off  
signal source



**Figure C**  
DOAL Series Illuminator  
with customer supplied  
strobe trigger signal source



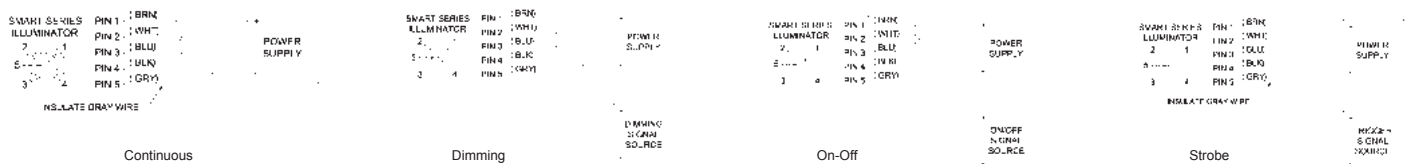
**Figure D**  
Doal Series Illuminator with  
QX-1 Interface Device  
(Not Compatible with DOAL 100 Series)

## Accessories

Description	Part Number	Application
AC Power Cord US	NER-030028300	Power Cord For Power Supply
AC Power Cord EU	NER-030028400	Power Cord For Power Supply
AC Power Cord UK	NER-030028500	Power Cord For Power Supply

## Connections

Input Connector (M12 Male, 5 Circuit, A-Code)	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Backshell
<b>Continuous Mode (Figures A &amp; D):</b>	+20.2-28.8VDC	DC GND	DC GND	+20.2-28.8VDC	No Connection	Shield
<b>Continuous Mode With Dimming (Figure B):</b>	+20.2-28.8VDC	DC GND	DC GND & DIM (-)	+20.2-28.8VDC	Dim (+)	Shield
<b>Continuous Mode With On-Off Control (Figure B):</b>	+20.2-28.8VDC	DC GND	DC GND & DIM (-)	+20.2-28.8VDC	Dim (+)	Shield
<b>High Output Strobe Mode (Figure C):</b>	+20.2-28.8VDC	TRIG (-)	DC GND	TRIG (+)	No Connection	Shield



## Control Signals

### DIM (Continuous Mode With PWM Dimming):

0VDC (LEDs off) to 3.1-3.5VDC (LEDs on) pulse width modulated (PWM) signal, <1mA, Modulation Frequency 2KHz +/- 100Hz

*Note: When using Continuous Mode With Dimming, the LED duty cycle will equal the duty cycle of the dimming signal.*

### DIM (Continuous Mode With On-Off Control):

0VDC (LEDs off), 3.1-3.5VDC (LEDs on), (<1mA)

### TRIG (High Output Strobe Mode):

optoisolated, 0VDC (LEDs off) to 3.1-28.8VDC (LEDs on), 10mA max, 20  $\mu$ s min Trigger pulse width. Note: High Output Strobe internally limits LED frequency and pulse width to a maximum of 90Hz and 1mS respectively. Light output pulse will follow Trigger pulse width from 20  $\mu$ s to 1ms.

*Note: When using Continuous Mode With Dimming, the LED duty cycle will equal the duty cycle of the dimming signal.*

## Cable Specifications

Wire colors for flying lead cables:

Pin 1 = Brown

Pin 2 = White

Pin 3 = Blue

Pin 4 = Black

Pin 5 = Gray

Connector Nut = Shield