VE Series Smart Camera

BANNER®
more sensors, more solutions

Datasheet

Self-contained Smart Camera with User-Friendly Vision Manager Software

⚠️ **WARNING: Not To Be Used for Personnel Protection**

Never use this device as a sensing device for personnel protection. Doing so could lead to serious injury or death. This device does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized sensor output condition.

⚠️ **CAUTION: Electrostatic Discharge**

Avoid the damage that electrostatic discharge (ESD) can cause to the Sensor.

Always use a proven method for preventing electrostatic discharge when installing a lens or attaching a cable.

⚠️ **CAUTION: Hot Surface**

Use caution when handling the camera. The surface of the camera may be hot during operation and immediately after use.

Models

Model[1]	Resolution
VE200G1A	WVGA, 752 × 480 pixels grayscale
VE201G1A	1.3 MP, 1280 × 1024 pixels grayscale
VE202G1A	2 MP, 1600 × 1200 pixels grayscale
VE205G1A	5 MP, 2592 × 2048 pixels grayscale

Specifications

Power
12 V dc to 30 V dc (24 V dc ± 10% if a Banner light source is powered by the sensor)
Current: 400 mA maximum (exclusive of load and lights)
Use only with a suitable Class 2 power supply, or current limiting power supply rated 12 V dc to 30 V dc, 1 A

Supply Protection Circuitry
Protected against reverse polarity and transient overvoltages

Discrete I/O
1 Trigger IN
5 Programmable I/O

Output Configuration
Optically isolated

Output Rating
Output Resistance: < 2 Ω
Strobe Output Resistance: < 13 Ω
Programmable Output: 100 mA
External Strobe Output: 100 mA
Off-State Leakage Current: < 100 µA

External Light Maximum Current Draw
350 mA

Exposure Time
0.01 ms to 500 ms

Memory
Device Settings and Inspection Storage Memory: 500 MB
Number of inspection files: 999

Acquisition
256 grayscale levels

Model	Frames Per Second[2]	Image Size
VE200G1A	60 fps, maximum	752 × 480 px
VE201G1A	60 fps, maximum	1280 × 1024 px
VE202G*A	50 fps, maximum	1600 × 1200 px
VE205G1A	22 fps, maximum	2592 × 2048 px

Torque—Tapped Holes for Mounting Screws
8 lbf·in (0.9 N·m) maximum torque

Construction
Housing: Aluminum
Display Label: Polyester

Connections
Ethernet: M12, 8-pin or 4-pin D-code Euro-style female
Light Connector: M8, 3-pin Pico-style female
Power, Discrete I/O: M12, 12-pin Euro-style male

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1 Model VE202G2A, 2 MP, 1600 × 1200 grayscale with 4-pin D-code M12 Ethernet connection is also available.
2 This value can vary based on inspection settings.

Imager
VE200G1A: 6.9 mm × 5.5 mm, 8.7 mm diagonal (1/1.8-inch CMOS)
VE201G1A: 6.9 mm × 5.5 mm, 8.7 mm diagonal (1/1.8-inch CMOS)
VE202G*A: 7.2 mm × 5.4 mm, 9.0 mm diagonal (1/1.8-inch CMOS)
VE205G1A: 12.4 mm × 9.8 mm, 15.9 mm diagonal (1-inch CMOS)

Lens
C-mount

Pixel Size
VE200G1A: 5.3 µm
VE201G1A: 5.3 µm
VE202G*A: 4.5 µm
VE205G1A: 4.8 µm

Communication
10/100/1000[3] Mbps Ethernet

Communication Protocols
Ethernet/IP™, Modbus/TCP, PCCC, PROFINET®, TCP/IP, FTP, and RS-232

Environmental Rating
IEC IP67 with an optional sealed lens cover properly installed

Operating Conditions
Operating Temperature: 0 °C to +50 °C (+32 °F to +122 °F)
95% maximum relative humidity (non-condensing)
Stable Ambient Lighting: No large, quick changes in light level; no direct or reflected sunlight
Storage Temperature: –30 °C to +70 °C (–22 °F to +158 °F)

Vibration and Mechanical Shock
Meets EN 60947-5-2: 30 G Shock per IEC 60068-2-27; 1 mm amplitude from 10 - 60 Hz per IEC 60068-2-6

Certifications

CE   c(UL)us   Information Technology Equipment E365235   PI CERTIFIED PROFIBUS · PROFINET

PC Requirements

Operating System
Microsoft® Windows® operating system version 7, 8, or 10[4]

System Type
32-bit, 64-bit

Hard Drive Space
80 MB (plus up to 280 MB for Microsoft .NET 4.5, if not already installed)

Memory (RAM)
512 MB minimum, 1 GB+ recommended

Processor
1 GHz minimum, 2 GHz+ recommended

Screen Resolution
1024 × 768 full color minimum, 1650 × 1050 full color recommended

Third-Party Software
Microsoft .NET 4.5, PDF Viewer (such as Adobe Acrobat)

USB Port
USB 3.0, recommended if a USB to Ethernet adapter used to communicate with the sensor

👉 **Important:** Administrative rights are required to install the Vision Manager software.

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[3] 1000 Mbps communication speed not available on 4-pin Ethernet models
[4] Microsoft and Windows are registered trademarks of Microsoft Corporation in the United States and/or other countries.

Dimensions

All measurements are listed in millimeters [inches], unless noted otherwise.

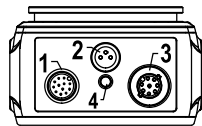* 41,6 [1.64] for 5 MP (VE205G1A) models
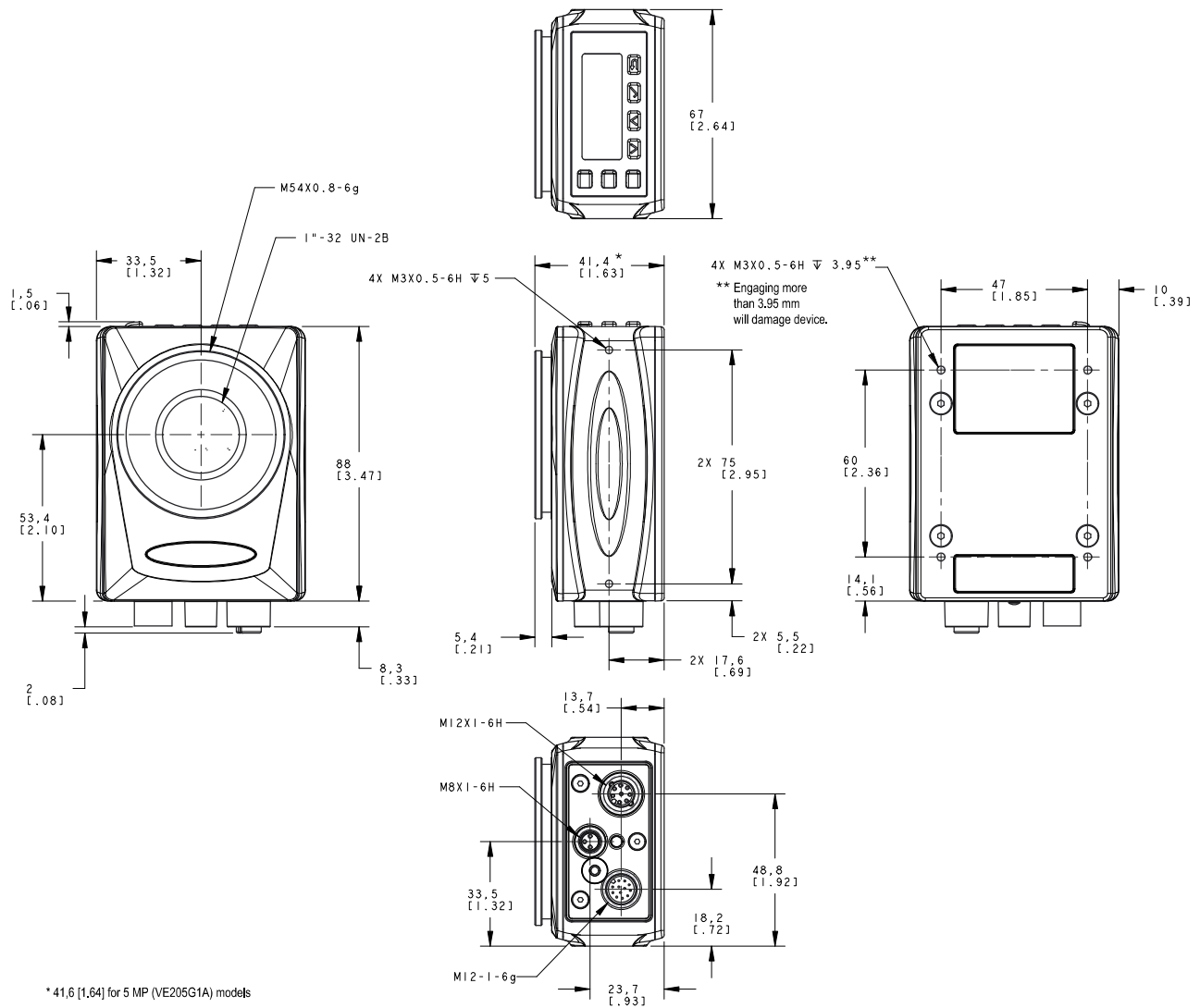
Cable Connections

Figure 1. Cable Connections

1. Power, Discrete I/O connection
2. Light connection
3. Ethernet connection
4. Ethernet indicator

Table 1: Power and I/O Pinouts

Pin	Wire Color	Description	Direction
1	White	Discrete I/O #3	Input/Output
2	Brown	12 V dc to 30 V dc	Input
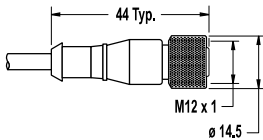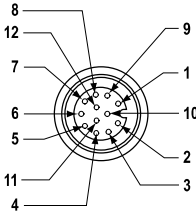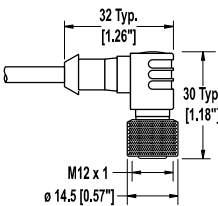
Pin	Wire Color	Description	Direction
3	Green	I/O output common **Important:** For PNP (sourcing) outputs connect pin 3 to +V dc, for NPN (sinking) outputs connect pin 3 to 0 V dc. The discrete I/O pins are 1, 5, 8, 10, and 11.	-
4	Yellow	RS-232 TX (transmit)	Output
5	Gray	Discrete I/O #5	Input/Output
6	Pink	Trigger input	Input
7	Blue	Common	Input
8	Red	Discrete I/O #2	Input/Output
9	Orange	I/O input common **Important:** For PNP (sourcing) inputs connect pin 9 to 0 V dc, for NPN (sinking) inputs connect pin 9 to +V dc. The discrete I/O pins are 1, 5, 6, 8, 10, and 11.	-
10	Light Blue	Discrete I/O #4	Input/Output
11	Black	Discrete I/O #1	Input/Output
12	Violet	RS-232 RX (receive)	Input
Shield	Bare metal	Chassis ground	-

Accessories

Cordsets

All measurements are listed in millimeters [inches], unless noted otherwise.

Power, Discrete I/O Cordsets
I/O sealed high-flex cordsets, 12 flying leads

12-Pin M12/Euro-Style Cordsets with Open Shield				
Model	Length	Style	Dimensions	Pinout (Female)
MQDC2S-1206	1.83 m (6 ft)	Straight	44 Typ. M12 x 1 ø 14.5	1 = White 2 = Brown 3 = Green 4 = Yellow 5 = Gray 6 = Pink 7 = Blue 8 = Red 9 = Orange 10 = Light Blue 11 = Black 12 = Violet
MQDC2S-1215	4.57 m (15 ft)			
MQDC2S-1230	9.14 m (30 ft)			
MQDC2S-1250	15.2 m (50 ft)			
MQDC2S-1275	22.9 m (75 ft)			
MQDC2S-1206RA	1.83 m (6 ft)	Right Angle	32 Typ. [1.26"] 30 Typ. [1.18"] M12 x 1 ø 14.5 [0.57"]	
MQDC2S-1215RA	4.57 m (15 ft)			
MQDC2S-1230RA	9.14 m (30 ft)			
MQDC2S-1250RA	15.2 m (50 ft)			

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Ethernet Cordsets

RJ45 Ethernet to 8-Pin Threaded M12/Euro-Style Cordsets				
Model	**Length**	**Style**	**Dimensions**	**Pinout**
STP-M12-806	1.83 m (6 ft)	Straight, Cat5e Shielded		 1 = White/Black 2 = White/Brown 3 = Brown 4 = Orange 5 = White/Green 6 = White/Orange 7 = Blue 8 = Green
STP-M12-815	4.57 m (15 ft)			
STP-M12-830	9.14 m (30 ft)			

The following Ethernet cables are used with 4-pin D-code Ethernet models only.

Model	Description
BWA-E2M	Ethernet cable, RSCD RJ45 440, 2 m (6.6 ft)
BWA-E8M	Ethernet cable, RSCD RJ45 440, 8 m (26.2 ft)

Brackets

All measurements are listed in millimeters [inches], unless noted otherwise.

SMBVERA
- Right-angle mounting bracket with curved slots
- 12-gauge stainless steel
- M3 × 0.5 mounting hardware included
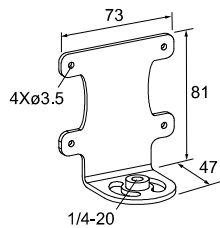
SMBVEMP
- Painted black aluminum
- Adapter holes for mounting hardware
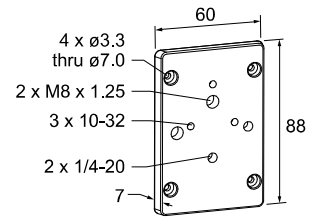
Lenses

Additional models are available. See www.bannerengineering.com.

Table 2: C-Mount Standard Lens Focal Length—For use with WVGA models only

4 mm	8 mm	12 mm	16 mm
LCF04	LCF08	LCF12	LCF16

Table 3: C-Mount Megapixel Lens Focal Length—For use with WVGA, 1.3MP, or 2MP models

Manufacturer	5 mm	6 mm	8 mm	12 mm	16 mm	25 mm	35 mm	50 mm	75 mm
Computar	LCF05LCMP[5]	-	LCF08LMP	LCF12LMP	LCF16LCMP	LCF25LCMP	LCF35LCMP	LCF50LCMP	LCF75LCMP
Evetar	-	LCF06LEVMP [5]	LCF08LEVMP	LCF12LEVMP [5]	LCF16LEVMP	LCF25LEVMP	LCF35LEVMP	LCF50LEVMP [5]	LCF75LEVMP[5]
Edmund Optics	-	-	LCF08LEMP	LCF12LEMP	LCF16LEMP [5]	LCF25LEMP[5]	LCF35LEMP[5]	-	-
Tamron	-	-	LCF08LTMP[5]	-	LCF16LTMP	LCF25LTMP	-	LCF50LTMP	-

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[5] For 2 MP lenses only: Denotes specific lens used for WD and FOV example.

Table 4: C-Mount 1-Inch Format Lens—For use with 5MP models only

Manufacturer	6 mm	8 mm	12 mm	16 mm	25 mm	35 mm	50 mm	75 mm
Kowa	LCF06LK1F[6]	LCF08LK1F[6]	LCF12LK1F	LCF16LK1F	LCF25LK1F	LCF35LK1F	LCF50LK1F[7]	LCF75LK1F[7]

WVGA Lens Working Distance and Field of View

For use with VE200G1A models.

Table 5: C-Mount Standard Lens Focal Length—Working Distance and Field of View

	4 mm[8]	8 mm	12 mm	16 mm
WD (mm)	Approximate Horizontal × Vertical Field of View (FOV) in mm			
150	162 × 103	71 × 45	46 × 29	32 × 20
600	656 × 419	303 × 193	198 × 126	141 × 90
1500	1646 × 1050	767 × 489	500 × 319	360 × 230
FOV (mm)	Approximate Working Distance (WD) in mm			
100 × 64	94	206	310	430
300 × 192	276	594	905	1253
600 × 384	549	1177	1798	2488
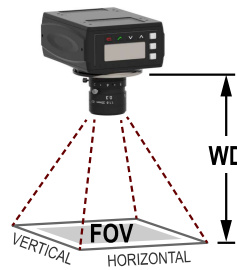
Figure 2. Working Distance and Field of View

1.3 MP Lens Working Distance and Field of View

For use with VE201G1A models.

Table 6: C-Mount Megapixel Lens Focal Length—Working Distance and Field of View

	6 mm	8 mm	12 mm	16 mm	25 mm	35 mm	50 mm	75 mm
WD (mm)	Approximate Horizontal × Vertical Field of View (FOV) in mm							
150	130 × 104	100 × 80	66 × 53	-	-	-	-	-
600	629 × 503	469 × 375	318 × 254	229 × 183	147 × 118	111 × 89	71 × 57	-
1500	1628 × 1302	1207 × 966	822 × 658	598 × 478	381 × 305	289 × 231	191 × 153	124 × 99
FOV (mm)	Approximate Working Distance (WD) in mm							
100 × 80	123	151	211	286	420	547	820	1227
300 × 240	303	395	569	774	1189	1557	2312	3474
600 × 480	574	760	1104	1505	2343	3072	4551	6845

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[6] Not compatible with the sealed lens cover.
[7] Not compatible with 60 mm sealed lens cover. Use with 85 mm sealed lens cover. Requires LHWK-1 setscrew accessory packet.
[8] Using a 0.25 mm spacer (LEKS).
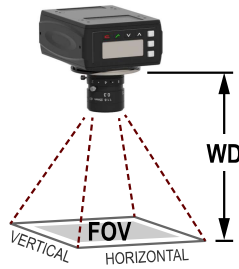
Figure 3. Working Distance and Field of View

2 MP Lens Working Distance and Field of View

For use with VE202G1A and VE202G2A models.

Table 7: C-Mount Megapixel Lens Focal Length—Working Distance and Field of View

	5 mm	6 mm	8 mm	12 mm	16 mm	25 mm	35 mm	50 mm	75 mm
WD (mm)	Approximate Horizontal × Vertical Field of View (FOV) in mm								
150	188 × 141	140 × 105	126 × 95	72 × 54	55 × 41	36 × 27	-	-	-
600	822 × 617	663 × 498	549 × 411	340 × 255	259 × 194	164 × 123	114 × 86	75 × 56	47 × 35
1500	2091 × 1568	1710 × 1283	1393 × 1045	874 × 656	667 × 500	422 × 317	300 × 225	205 × 154	132 × 99
FOV (mm)	Approximate Working Distance (WD) in mm								
100 × 75	88	-	122	196	248	376	531	774	1160
300 × 225	229	288	335	533	690	1074	1500	2161	3263
600 × 450	442	545	655	1038	1353	2120	2950	4241	6417
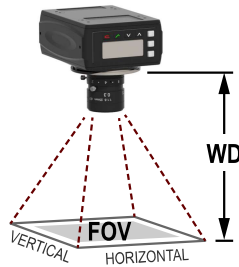
Figure 4. Working Distance and Field of View

5 MP Lens Working Distance and Field of View

For use with VE205G1A models.

Table 8: C-Mount Megapixel Lens Focal Length—Working Distance and Field of View

	6 mm	8 mm	12.5 mm	16 mm	25 mm	35 mm	50 mm	75 mm
WD (mm)	Approximate Horizontal × Vertical Field of View (FOV) in mm							
300	565 × 446	415 × 328	265 × 209	211 × 167	138 × 109	93 × 73	-	-
600	1212 × 957	887 × 701	566 × 447	445 × 352	289 × 228	200 × 158	130 × 103	-
1500	3154 × 2492	2305 × 1821	1469 × 1161	1147 × 906	742 × 586	521 × 412	352 × 278	233 × 184
FOV (mm)	Approximate Working Distance (WD) in mm							
200 × 158	-	164	235	286	424	600	884	1299
400 × 316	224	291	434	543	821	1160	1697	2511
800 × 632	409	545	833	1056	1614	2282	3322	4935
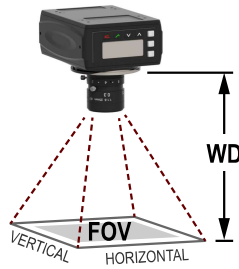
Figure 5. Working Distance and Field of View

C-Mount Lens Filter Models

Use filters to improve the image contrast and system reliability in vision applications.

For additional filter information, see p/n 173239.

Family	Color	-	Size
FLT	B470 (Blue) G525 (Green) I850 (Infrared) R635 (Red) R660 (Dark Red) PR032 (Linear Polarizer)	- (dash)	25.5 (25.5 mm) 27 (27 mm) 30.5 (30.5 mm) 34 (34 mm) 35.5 (35.5 mm) 43 (43 mm) 46 (46 mm) 55 (55 mm)

Filters are available in six sizes, specific to the inside thread diameter of the lens. Use the table below to select the corresponding filter for each C-mount lens available through Banner Engineering.

Size	Lens Option
25.5 mm	Edmund Optics, Tamron
27 mm	Ricoh, Evetar (8 mm, 12 mm, 16 mm, 25 mm, 35 mm)
30.5 mm	Computar (8 mm, 12 mm, 16 mm, 25 mm, 35 mm, 50 mm, 75 mm[9]), Evetar (50 mm)
34 mm	Evetar (6 mm, 75 mm[9])
35.5 mm	Kowa (12 mm, 16 mm, 25 mm, 35 mm)[10]
43 mm	Computar (5 mm)
46 mm	Kowa (5 mm)
55 mm	Kowa (8 mm)

👉 **Important:** These filters are for the C-mount lens only. Depending on the lighting technique used, a polarizing filter may be needed for both the lens and the light source. See *www.bannerengineering.com* for Banner's selection of light filters.

Sealed Lens Cover

When used, the optional sealed lens covers offer an IP67 rating for the sensor for wet or dirty environments. The cover is painted black aluminum.

The following sealed lens covers are compatible with all WVGA, 1.3 MP, and 2 MP models with lenses installed. The sealed lens covers are compatible with some 5 MP models with lenses installed.

Model	Length	Material	Window Material
VELC60-PC[11]	60 mm	Painted aluminum	Polycarbonate
VELC60-BG[11]			Borosilicate glass

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9   The filter is not compatible with the sealed lens cover when installed on this lens.
10   The filter is not compatible with the lens and 60 mm sealed lens cover installed.
11   For 5 MP camera and lens, only compatible with 25 mm and 35 mm focal lengths without a filter installed.

Model	Length	Material	Window Material
VELC85-PC[12]	85 mm		Polycarbonate
VELC85-BG[12]			Borosilicate glass

Display Cover

Use the Display Cover to protect the display and buttons from the elements.

VEDC-BG
- Painted anodized aluminum with borosilicate glass window
- Mounting hardware included
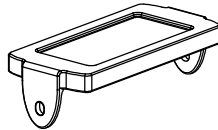
Ring Lights

For additional ring light information, see p/n 192656 for standard lights and p/n 192657 for high intensity lights. Additional (standalone) lights are available. See *www.bannerengineering.com*.

Due to the size of the 5 MP lenses, a ring light cannot be mounted to the 5 MP camera and lens. However, they can be mounted nearby, connected to and controlled by the camera.

Standard Ring Lights

62 × 62 mm Models	80 × 80 mm Models	Color	Connection
LEDIRV62X62M	LEDIRV80X80M	Infrared, 940 nm	
LEDRRV62X62M	LEDRRV80X80M	Visible red, 630 nm	
LEDWRV62X62M	LEDWRV80X80M	White, all visible	300 mm (12 in) cable with a threaded 3-pin Pico-style connector
LEDBRV62X62M	LEDBRV80X80M	Visible blue, 464 nm to 475 nm	
LEDGRV62X62M	LEDGRV80X80M	Visible green, 520 nm to 540 nm	

High Intensity Ring Lights

Model	LED Color	Intensity Adjustment	Connection
LEDRRV70XD5-XM	Visible red, 620 nm to 630 nm		
LEDWRV70XD5-XM	White, 5000 K to 8300 K		
LEDBRV70XD5-XM	Visible blue, 465 nm to 485 nm	Fixed	
LEDGRV70XD5-XM	Visible green, 520 nm to 535 nm		
LEDIRV70XD5-XM	Infrared, 850 nm		
LEDUV395RV70XD5-XM	Ultraviolet, 395 nm		300 mm (12 in) cable with a threaded 3-pin Pico-style connector[13]
LEDRRV70XD5-PM	Visible red, 620 nm to 630 nm		
LEDWRV70XD5-PM	White, 5000 K to 8300 K		
LEDBRV70XD5-PM	Visible blue, 465 nm to 485 nm	Potentiometer	
LEDGRV70XD5-PM	Visible green, 520 nm to 535 nm		
LEDIRV70XD5-PM	Infrared, 850 nm		
LEDUV395RV70XD5-PM	Ultraviolet, 395 nm		

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[12] For 5 MP camera and lens, compatible with 12 mm to 75 mm focal lengths without filter installed. With filter installed the sealed lens cover is only compatible with 25 mm to 35 mm focal lengths.
[13] Connects directly to the VE Series smart cameras

Interface Module

For additional interface module information, see p/n 193821.

Models	Trigger	Connections
VESIM-PT	Current Sourcing (PNP)	Two 13-pin Terminals

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