

Advantage™ 100 Series **Integrator's Guide**

2020 May 14

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Symbols

The following symbols indicate safety precautions and supplemental information:

 **WARNING:** This symbol indicates a hazard that could cause death, serious personal injury or electrical shock.

 **CAUTION:** This symbol indicates a hazard that could result in property damage.

 **Note:** This symbol indicates additional information about a subject.

 **Tip:** This symbol indicates suggestions and shortcuts that might not otherwise be apparent.

About this Manual

The *Advantage™ 100 Series Integrator's Guide* provides detailed information on the configuration and operation of the Advantage 100 and 102 systems for Original Equipment Manufacturers (OEMs).

Product Overview

The Advantage™ 100 Series devices are enclosed, smart cameras with integrated lighting that provide the following communication and connections:

- standard Ethernet RJ-45 connector
- USB-C connector
- DB15 connector for power, RS-232, and IO

Both variants, Advantage 100 and Advantage 102, support simple mounting and integration.



Available Software Configurations

The Advantage™ 100 Series hardware comes with Cognex In-Sight software.

Communication Options

This section provides an overview of how you communicate with the Advantage™ 100 Series devices. The supported operating systems are the following:

- Microsoft® Windows® XP operating system, SP3, 32-bit edition
- Microsoft® Windows® XP operating system, 64-bit edition
- Microsoft Windows 7® 32-bit edition
- Microsoft Windows 7® 64-bit edition

Connections

The Advantage™ 100 Series devices use USB-C and Ethernet as means of communication along with RS-232 to provide serial output, as detailed below:

- Ethernet 10/100:
 - Standard RJ-45 Ethernet connection
 - Configure the device through Ethernet using Advantage In-Sight software installed on a PC running supported Windows OS



Note: Power over Ethernet (POE) is not supported. Connecting your device to a POE network may cause damage to the unit.

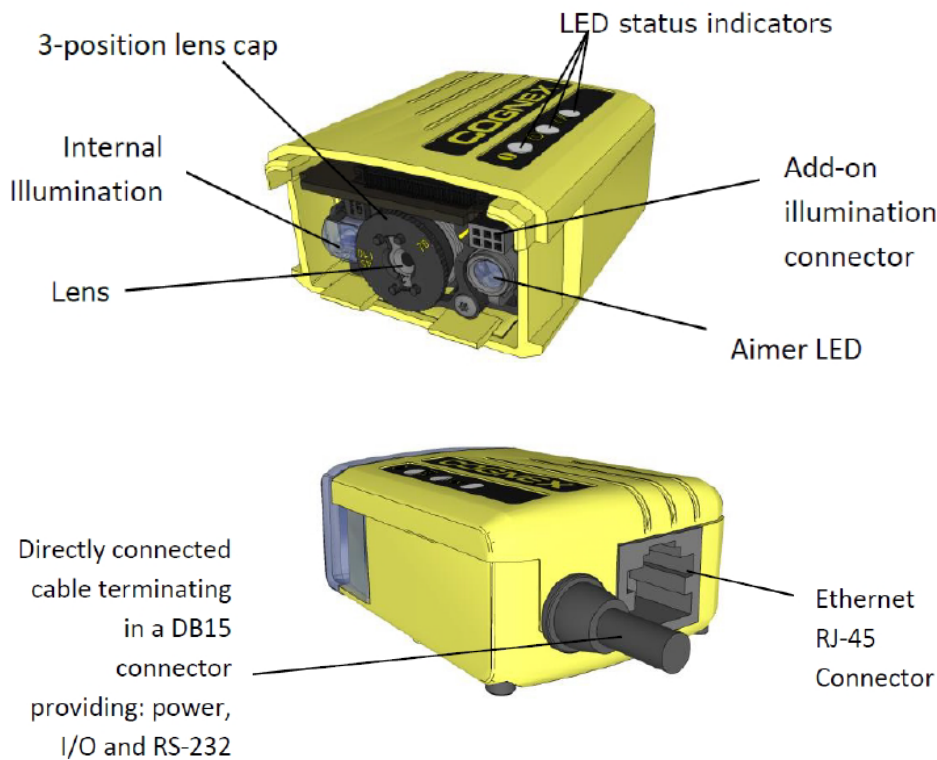
- RS-232:
 - You can operate RS-232 together with Ethernet
 - Send commands and receive responses over RS-232
 - Transmit results over RS-232
- I/O:
 - 2 current sink inputs
 - 3 outputs
 - 2 general purpose outputs: open collector, symmetric for source and sink
 - 1 TTL compatible external strobe output
- USB-C

Mechanical Information

This section provides information about the mechanical characteristics of the Advantage™ 100 Series devices.

Product Features

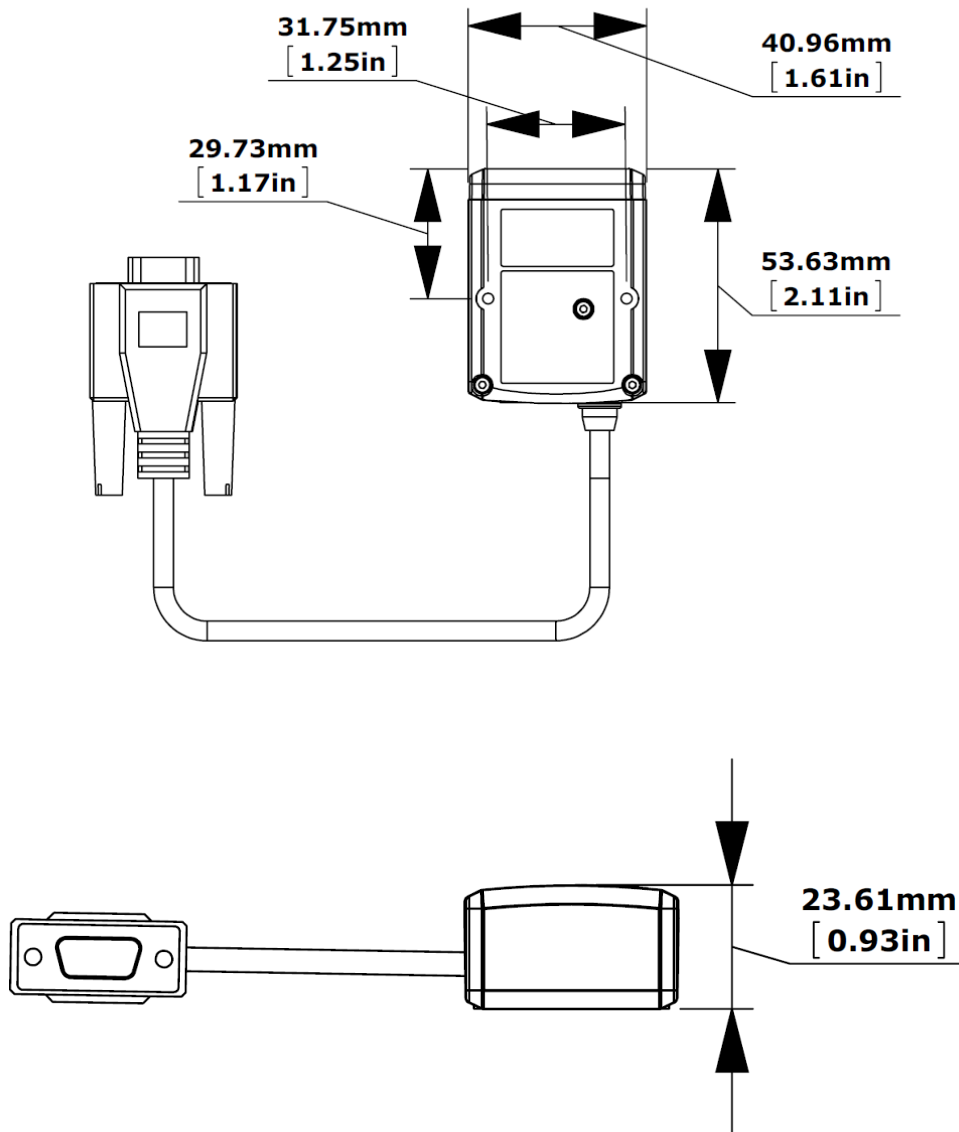
The Advantage™ 100 Series device features a metal housing for product protection and ease of integration. The following figures show the key features of the Advantage™ 100 Series device.



Mounting and Dimensional Information

This section describes the mounting options of the Advantage™ 100 Series device, along with the product dimensional information.

The Advantage™ 100 Series devices have two M3 screw mounting holes spaced 1.25" underneath.



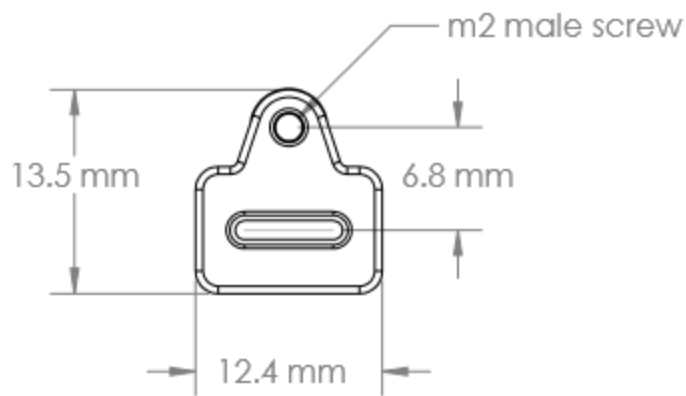
The attachment points have the following characteristics:

- M3 thread
- Maximum thread depth: 6 mm
- 1.3 N-m (11.5 in-lb) maximum torque

CAUTION: Use both attachment points when mounting your device.

Tip: Some applications can benefit from mounting the system at a slight angle (15 degrees) to reduce illumination reflection from the inspected surface back into the imager.

USB-C Connector Dimensions



Environmental Maximum Conditions

Operating temperature	0 – +40°C
Storage temperature	-10 – +60°C
Humidity	95% (non-condensing)
Intrusion Protection	IP40
Shock and Vibration	IEC 60068-2-27: 1 K shocks, semi-sinusoidal, 11 g, 10 ms IEC 60068-2-6: Vibration in each of 3 main axes for 2 hours at 10 gs (10 to 500 Hz at 100 m/s ² /15 mm)

Electrical Information

This section provides information on the electrical characteristics of the interconnect board of the Advantage™ 100 Series devices. The board is equipped to supply power and to provide interface connections of two different types:

- 10/100 BaseT Ethernet
- RS-232 with RxD, TxD, RTS and CTS according to TIA/EIA232-F

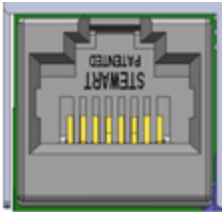
In addition, the board has the following features:

- 3 digital outputs
- 2 digital inputs

Connectors

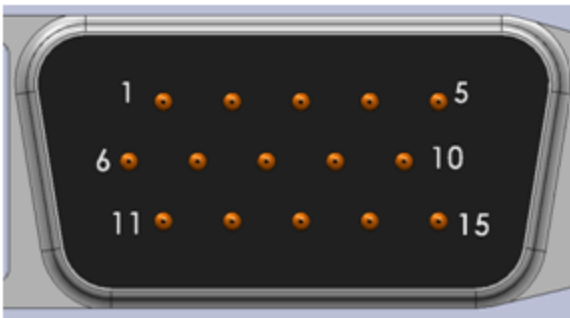
Ethernet

Standard RJ-45.



DB-15

Standard DB-15 male connector. Pin definitions:

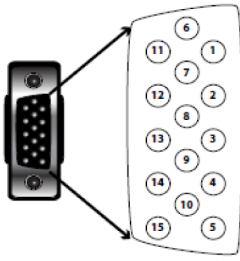


DB-15 HD Male	Signal Name	Range		Unit	Description
		Min	Max		
1	USB VBUS	4.5	5.5	VDC	USB power
2	RS-232-TXD				TIA/EIA232-F TxD (Output)
3	RS-232-RXD				TIA/EIA232-F RxD (Input)
4	GND				Reference ground (GND). All signals are referred to GND (except for Ethernet).

5	Power	4.9	24	VDC	External power supply pin (Input). Connect this pin to an external power supply pin to feed the device with proper power. Maximum 24 V + 10% is supported.
6	RS-232-RTS				TIA/EIA232-F RTS
7	OUT_0 Sink Mode: I(sink) = 25 mA (max) Out_1 = +24 V (max) Source Mode: I(source) = 25 mA (max) Out_1 = 1.5 V (max); -0.5 V (min)				Open collector output channel 0. Depending on the configuration, an external pull up resistor might be necessary. Current must not exceed 25 mA. This signal has a resettable fuse protection that releases the line in case of a short circuit.
8	IN_0 Threshold is +3.3 V @ 2.0 mA	0	24	VDC	Digital Input 0
9	IN_1 Threshold is +3.3 V @ 2.0 mA	0	24	VDC	Digital Input 1
10	RS-232-CTS				TIA/EIA232-F CTS
11	OUT_1 Sink Mode: I(sink) = 25 mA (max) Out_1 = +24 V (max) Source Mode: I(source) = 25 mA (max) Out_1 = 1.5 V (max); -0.5 V (min)	5	24	VDC	Open collector output channel 1. Depending on the configuration, an external pull up resistor might be necessary. Current must not exceed 25 mA. This signal has a resettable fuse protection that releases the line in case of a short circuit.
12	COM_OUT Sink Mode: COM_OUT = 1.5 V (max); - 0.5 V (min) Source Mode: COM_OUT = +24 V (max)				
13	LED_STROBE TTL Mode: Ioh = 25 mA (max) Voh = 4.4 V/5.0 V (min/max) Vol = 0.4 V (max) Open Collector Mode: Ioh = 25 mA (max) Voh = 24 V (max) Vol = 0.4 V (max)		25	mA	
14	Reserved				
15	Reserved				

Schematic of Individual Wires

Unused wires can be clipped short or tied back using a tie made of non-conductive material. For RS-232, use the Power Supply return path for ground.

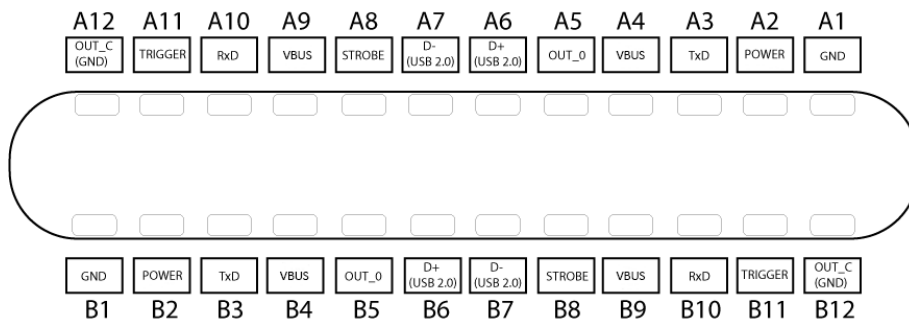


PIN	Color	Signal
1	Brown	USB VBUS
2	Green	TxD
3	Green/Black	RxD
4	Red and Brown/White	GND
5	Red/Black	DC+ (system power, 5-24 VDC)
6	Blue	RTS
7	Blue/White	Output-0
8	White	Input-0 (Trigger)
9	White/Black	Input-1
10	Light Blue	CTS
11	Light Blue/Black	Output-1
12	Light Blue/Yellow	Output-Common
13	Light Blue/Green	Output-Strobe
14	Yellow	Reserved
15	Yellow/Black	Reserved

Note: Pin 4 includes two ground wires: Red and Brown/White. There are 16 total wires connected to the DB15 connector as a result.

USB-C Connector

USB-C matches the pins in a paired configuration, enabling you to flip the plug and still operate. To support this feature, the Cognex connector will maintain the pairing of pins.



Pin Number Pair	Definition	DB15 Pin
A1 & B1	GND	4
A2 & B2	Power 4.9-24 V*	5
A3 & B3	TxD	2
A4 & B4	USB VBUS (4.5-5.5V)	1
A5 & B5	OUT_0	7
A6 & B6	D+ (USB 2.0)	14
A7 & B7	D- (USB 2.0)	15
A8 & B8	STROBE	13

A9 & B9	USB VBUS (4.5-5.5V)	1
A10 & B10	RxD	3
A11 & B11	TRIGGER	8
A12 & B12	OUT_COMMON (GND)	4
GND	OUT_COMMON	12
Drain Wire	GND	N/A
Not Connected	RTS/OUT_2	6
Not Connected	IN_1	9
Not Connected	CTS/IN_2	10
Not Connected	OUT_1	11

* Maximum 26.4 V is supported

Power Supply

The Advantage™ 100 Series device is powered through the DB15 connector. The power requirement is 5-24 V at 2.5 W.

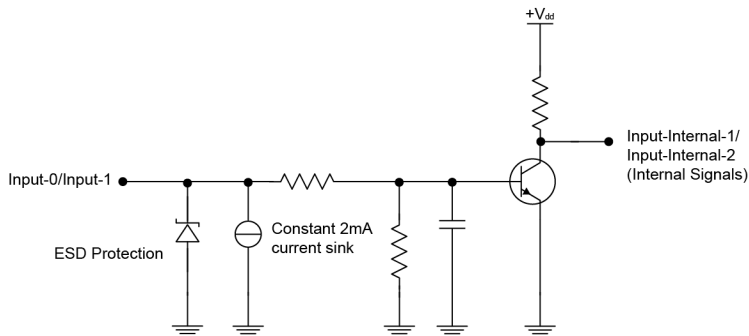
Apply external power to the device to pins #5 (Power 5-24 V) and #4 (GND) of the J2 connector (DB15-HD male). The required input voltage ranges from 4.9 VDC to 24.0 VDC.

When you dimension an external power supply, make sure that it supplies at least 1.0 A at 5V or 200 mA at 24V of continuous power to the device. The external power supply must be an NEC class 2 / LPS compliant power source.

Communication Interfaces

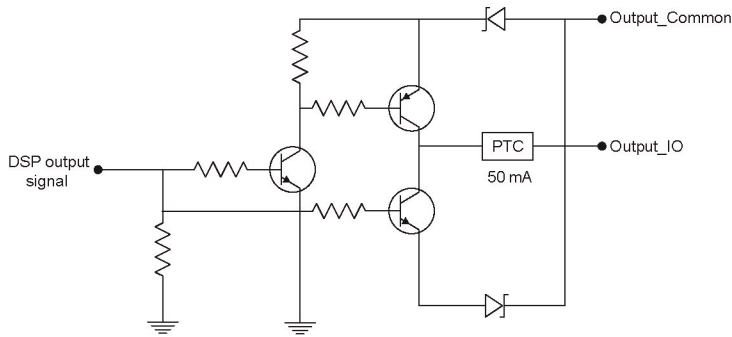
Digital Input Lines

The following figure shows a simplified block diagram of Input_0 and Input_1 of the Advantage™ 100 Series device. Inputs are not galvanic isolated, but need to be referenced to ground.



Digital Output Lines

The digital outputs can be used as either NPN (pull-down) or PNP (pull-up) lines. For NPN lines, connect the external load between the output and the positive supply voltage (<24 V). The outputs pull down to less than 3 V when ON, which causes current to flow through the load. When the outputs are OFF, no current flows through the load. Outputs are not galvanic isolated, but need to be referenced to ground. The following figure shows a simplified block diagram of the Advantage™ 100 Series device Sink/Source Output_0 and Output_1:



The NPN (pull down) output type characteristics are the following:

Applied voltage	24 VDC or less
Residual voltage	0.85 V or less
Maximum sink current	25 mA
Short-circuit current	100 mA or less
Short-circuit protection	multifuse - 50 mA

The PNP (pull up) output type characteristics are the following:

Output voltage range	24 V or less
Residual voltage	0.8 V or less
Maximum source current	25 mA
Short-circuit current	50 mA or less
Short-circuit protection	multifuse - 50 mA

Illumination Strobe Output

The strobe output is provided by a diode that is added to the push-pull circuit, with series to the pull-up transistor. This diode blocks the higher voltage when the output is pulled up in case of open-collector type driving, but enables the driving of high level in TTL mode.

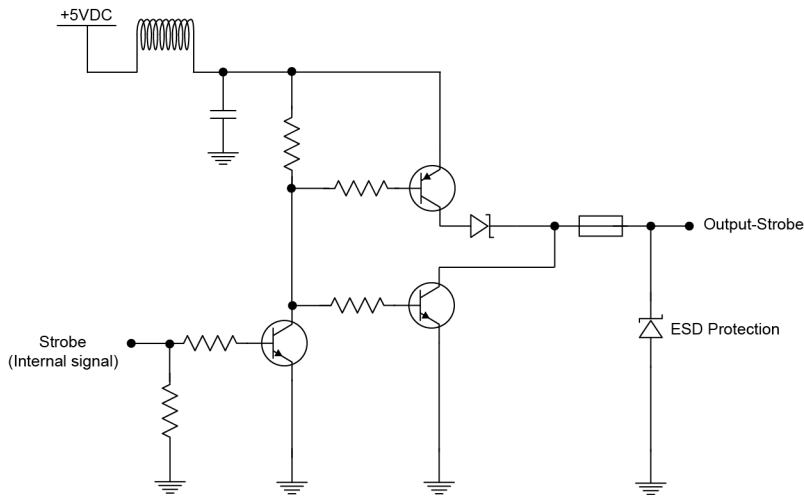
The TTL output type characteristics are the following:

High level	4.0-5.0 V
Low level	0-0.4 V
Output current	25 mA
Short-circuit current	125 mA
Short-circuit protection	multifuse - 50 mA

The Open-collector output type characteristics are the following:

Output voltage range	0-24 V
Low level	0-0.4 V
Output current	25 mA max
Short-circuit current	125 mA
Short-circuit protection	multifuse - 50 mA

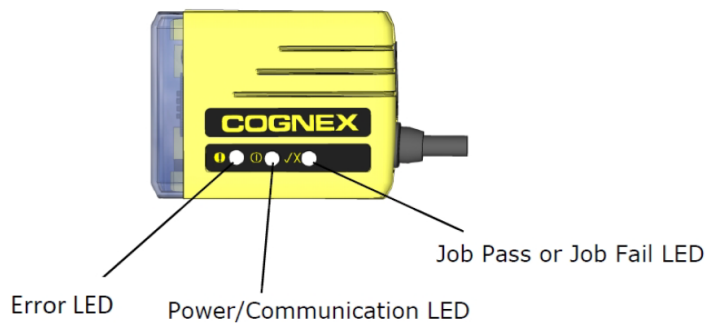
The following figure shows a simplified block diagram of the illumination strobe output of the Advantage™ 100 Series device:



Status LEDs

There are four status LEDs that occupy three positions. These LEDs can be used to provide status information about the operation of the Advantage™ 100 Series devices. The LEDs are defined for normal operation of the product as follows:

Event	Color
Error	Red LED
Power	Yellow LED
Communication (Ethernet and RS-232)	Flashing yellow LED
Job Pass/Job Fail	Green/Red LED



Note: The Error LED and the Job Pass/Fail LED will flash briefly when the unit is powered up as part of the initial boot.

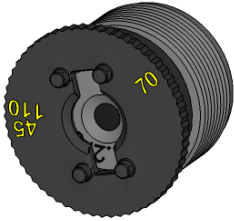
Optics and Lighting

Lens Configurations

This section gives a detailed description on the lenses you can use with the Advantage™ 100 Series device.

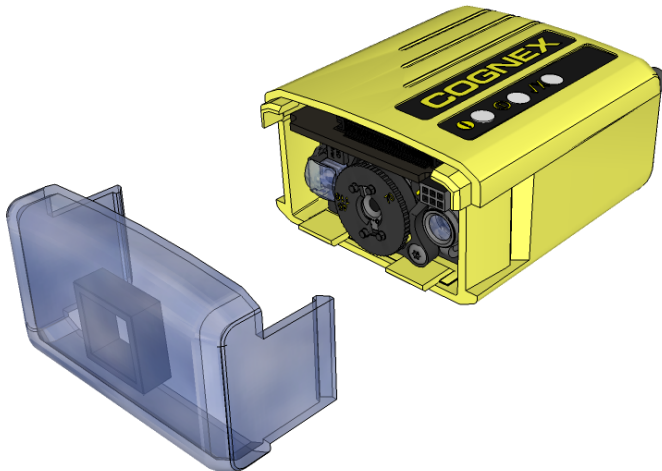
6.2 mm Lens (Standard)

This is a 3 focal position (45, 70, and 110 mm) lens.

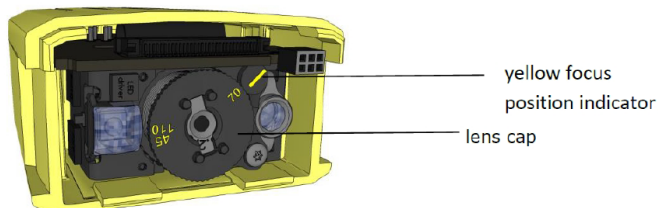


To set the right focal distance for your application with your standard Advantage™ 100 Series device, follow these steps:

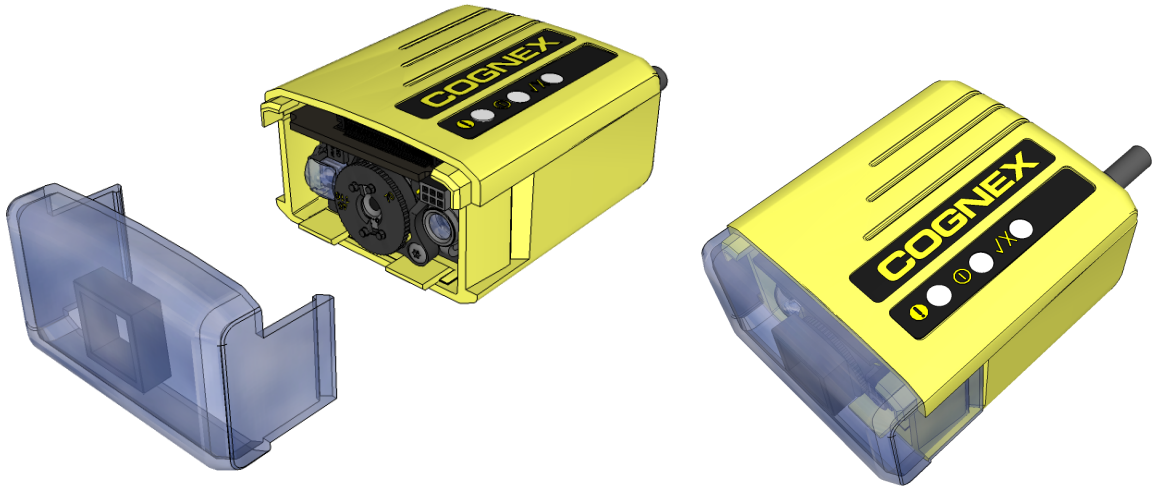
1. Remove the front cover of your Advantage™ 100 Series device.



2. Turn the lens cap clockwise (45→70→110) for larger focus settings; turn the lens cap counter-clockwise (110→70→45) for smaller settings. The yellow line indicates the selected focus position.



3. Reattach the front cover.

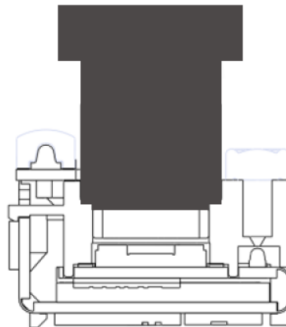


M12 Lenses

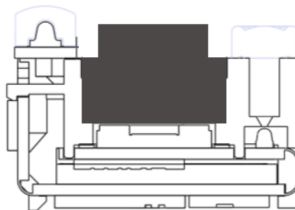
For larger volume OEM applications that require custom lenses, there is a range of M12 lenses available in the following configurations:

Note: The larger front cover (ADV-ADDILL-00) is required for some lens configurations. When using additional illumination, use ADV-ADDILL-00. When using external illumination, use ADV-EXTCVR-00 (10 pack of lens covers).

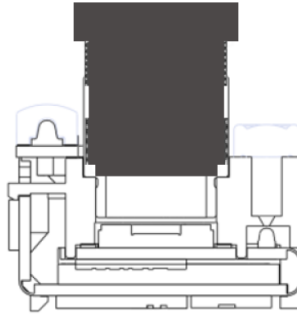
- 3.5 mm lens (f/6.0)



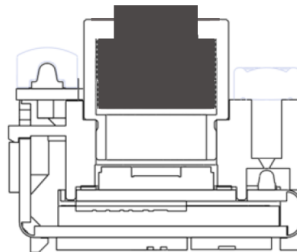
- 6.2 mm lens (f/5, f/10)



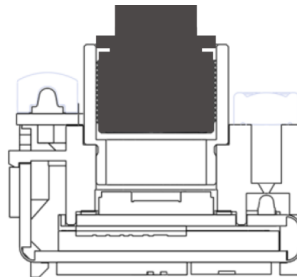
- 8 mm lens (f/2.0)



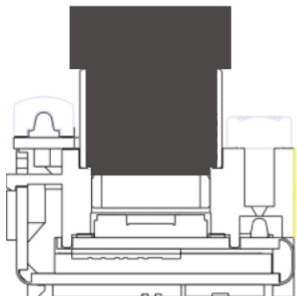
- 10.3 mm lens (f/5.0)



- 16 mm lens (f/7.0)

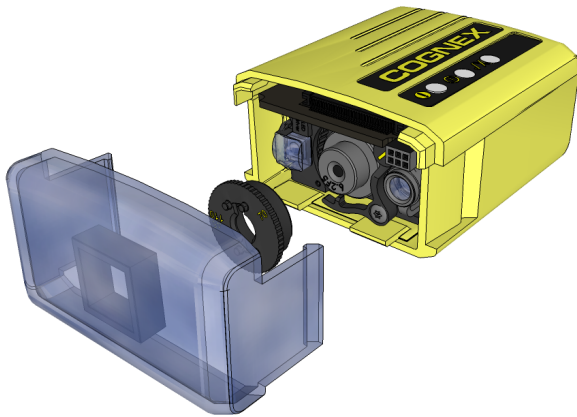


- 25 mm lens (f/2.0)

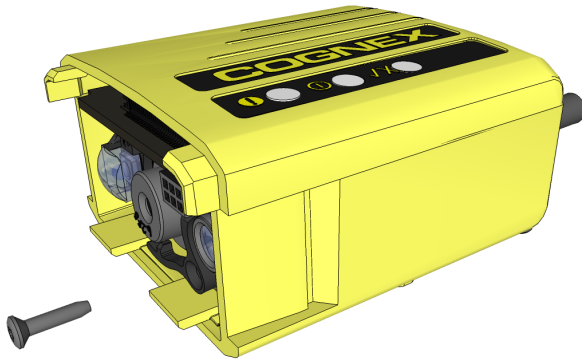


To install the M12 lens for different focal distance and aperture configurations, follow the steps below:

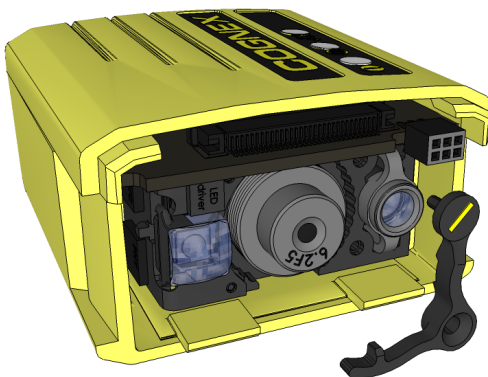
1. Remove the focus lens cap by using a flathead screwdriver.



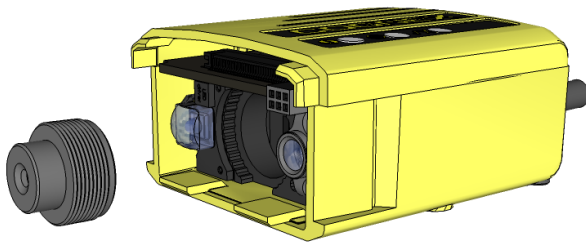
2. Unscrew focus locking lever screw (a T5 Torx screw).



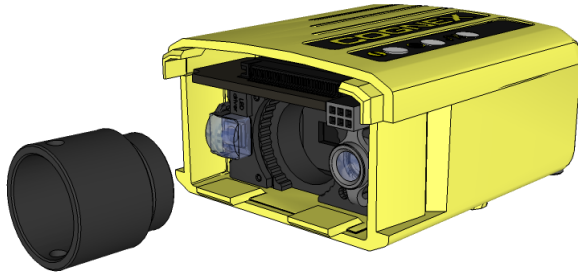
3. Remove locking lever.



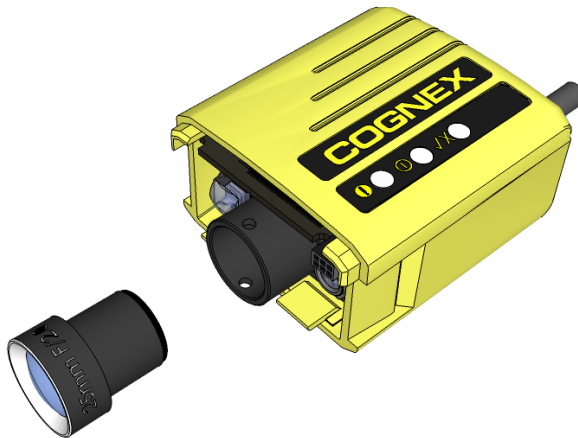
4. Remove the 6.2 mm lens by rotating it.



5. Insert the thread extender, if necessary.

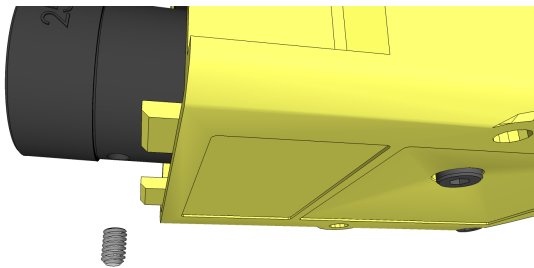


6. Insert your M12 lens.



7. After you have the focus you need, set the screw on the side of the lens and tighten it with a 0.9 mm hex driver or key. The screw is a M2X 2.4 set screw.

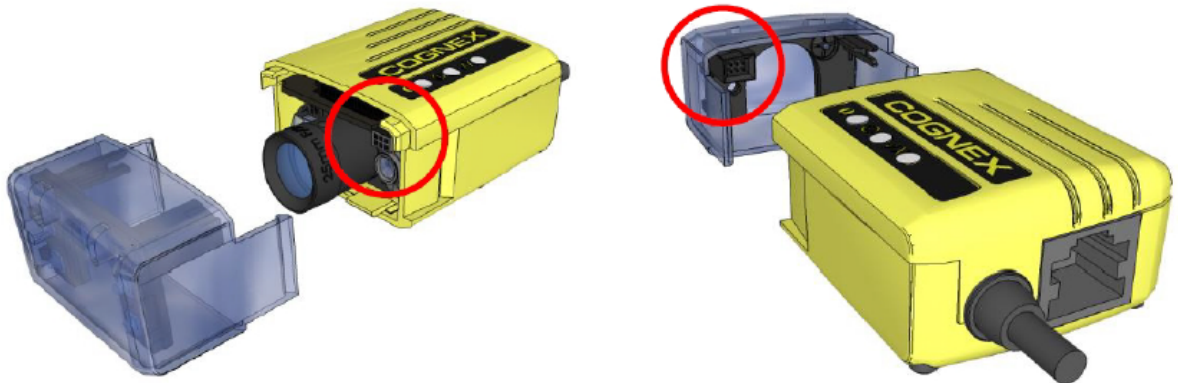
⚠ WARNING: The lens can be damaged if the screw is over-tightened.



Add-On Illumination Service Procedures

Installing Add-On Illumination

1. Disconnect the Advantage™ 100 Series device from power.
2. Connect the add-on illumination to the external illumination connector. Use the larger front cover (ADV-ADDILL-00).



3. Connect the Advantage™ 100 Series device to an external power supply (4.9 VDC – 24 VDC).

Uninstalling Add-On Illumination

1. Disconnect your Advantage™ 100 Series device from power.
2. Remove the cover with a flathead screwdriver starting from the left side of the device.



Field of View and Working Distances

The scan maps show the size of pixels and image width relative to the distance for the different lenses.

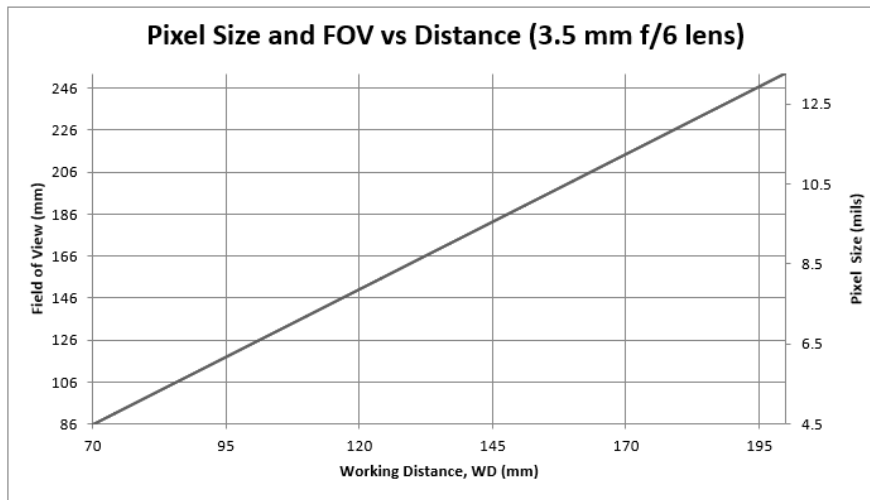
The field of view (FoV) determines the maximum length or width of a target that can be imaged by the Advantage™ 100 Series device. Using the 6.2 mm lens as an example, the maximum width of a centered target at 200 mm working distance is 150 mm. Anything larger than this will not be imaged.

The pixel size shown here is the width of a target that will be imaged onto one pixel of the Advantage™ 100 Series device. For the 6.2 mm lens a 7.9 mil wide target at 200 mm will be imaged onto 1 camera pixel, and thus the camera cannot distinguish features smaller than 7.9 mils at this distance.

Advantage 100 Scan Maps

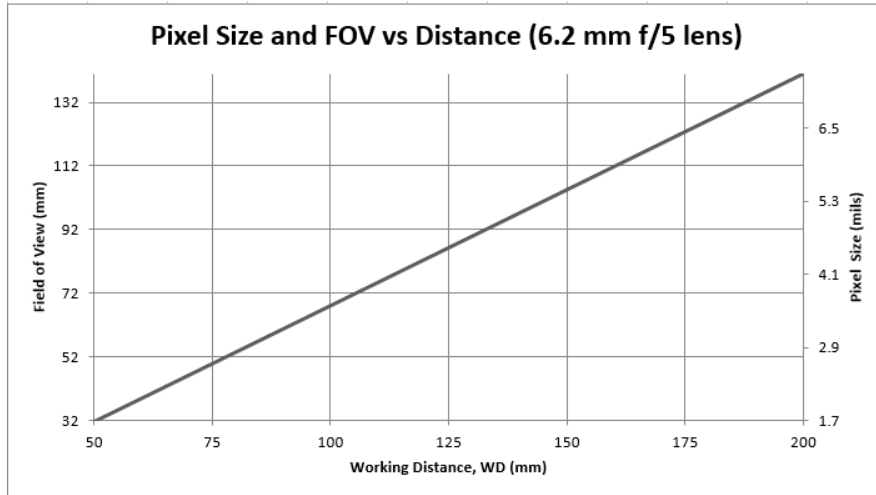
In all the cases below, working distances are measured from the front cover.

3.5 mm f/6 Lens



Working Distance	FoV	Pixel Size
70.000	86.000	4.50
95.000	118.000	6.20
120.000	150.000	7.90
145.000	182.000	9.60
170.000	215.000	11.20
195.000	247.000	12.90

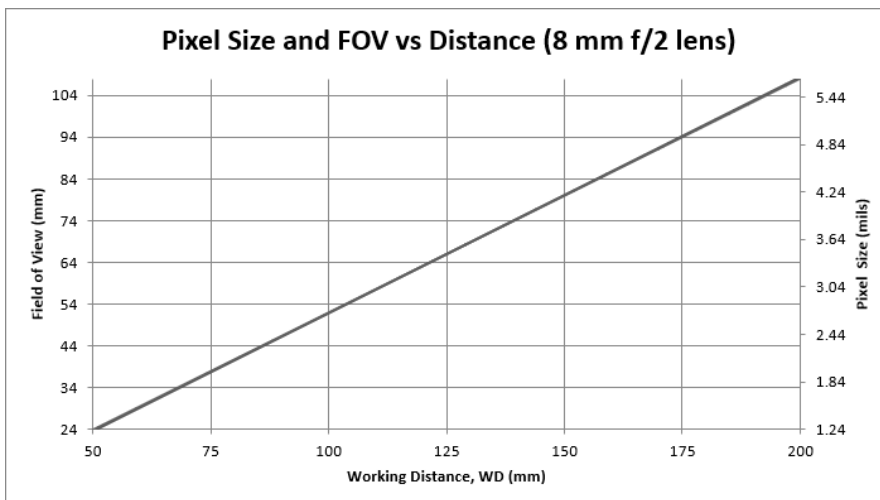
6.2 mm f/10 Lens



Working Distance	FoV	Pixel Size
50.000	32.000	1.70
75.000	50.000	2.60
100.000	68.000	3.60
125.000	86.000	4.50
150.000	105.000	5.50
175.000	123.000	6.40
200.000	141.000	7.40

8 mm f/2 Lens

Note: A lens extender is required.

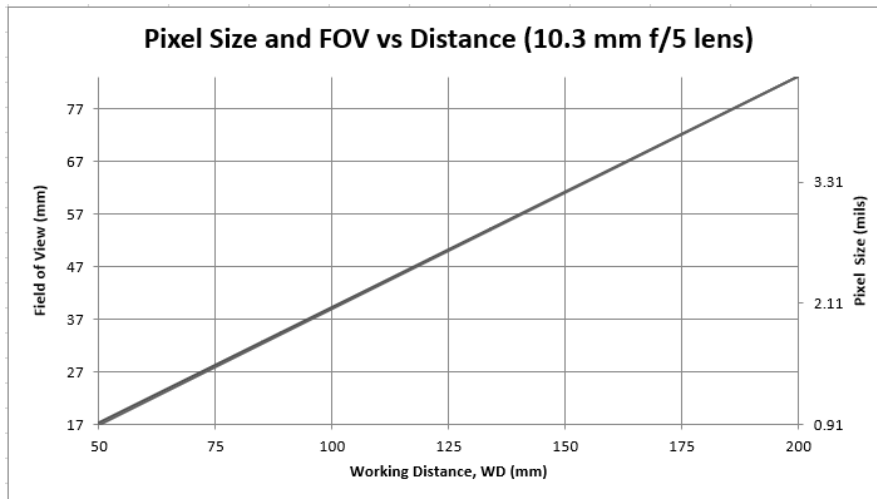


Working Distance	FoV	Pixel Size
50.000	24.000	1.24
75.000	38.000	2.00
100.000	52.000	2.70

Working Distance	FoV	Pixel Size
125.000	66.000	3.50
150.000	80.000	4.20
175.000	94.000	4.90
200.000	108.000	5.70

10.3 mm f/5 Lens

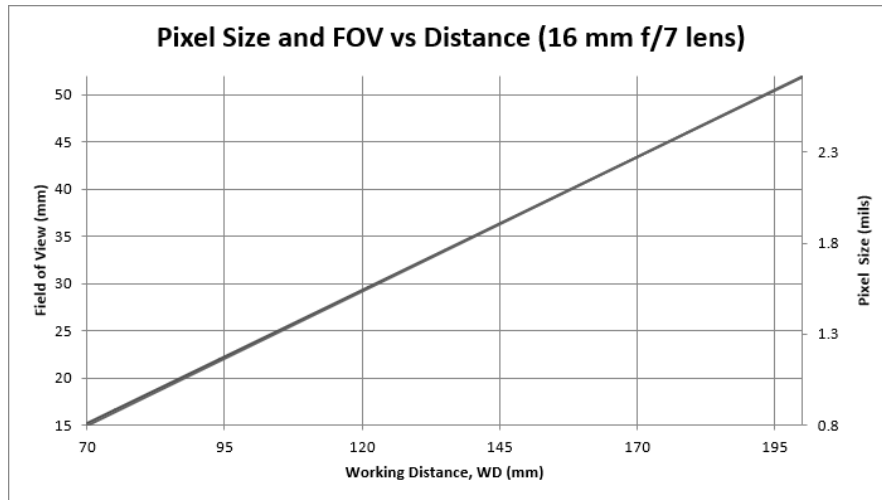
Note: A lens extender is required.



Working Distance	FoV	Pixel Size
50.000	17.000	0.91
75.000	28.000	1.50
100.000	39.000	2.10
125.000	50.000	2.60
150.000	61.000	3.20
175.000	72.000	3.80
200.000	83.000	4.40

16 mm f/7 Lens

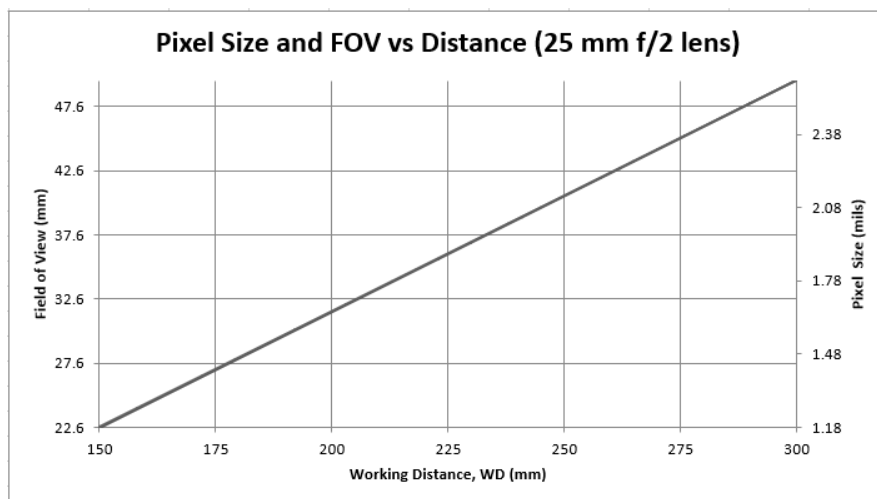
Note: A lens extender is required.



Working Distance	FoV	Pixel Size
70.000	15.000	0.80
95.000	22.000	1.20
120.000	29.000	1.50
145.000	36.000	1.90
170.000	43.000	2.30
195.000	50.000	2.60

25mm f/2 Lens

Note: A lens extender is required.



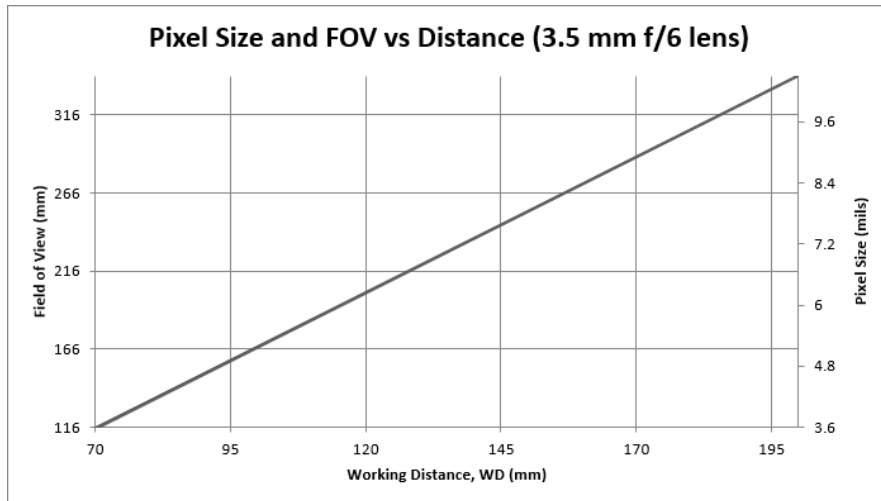
Working Distance	FoV	Pixel Size
150.000	22.600	1.18
175.000	27.000	1.40
200.000	32.000	1.70
225.000	36.000	1.90
250.000	41.000	2.10

Working Distance	FoV	Pixel Size
275.000	45.000	2.40
300.000	50.000	2.60

Advantage 102 Scan Maps

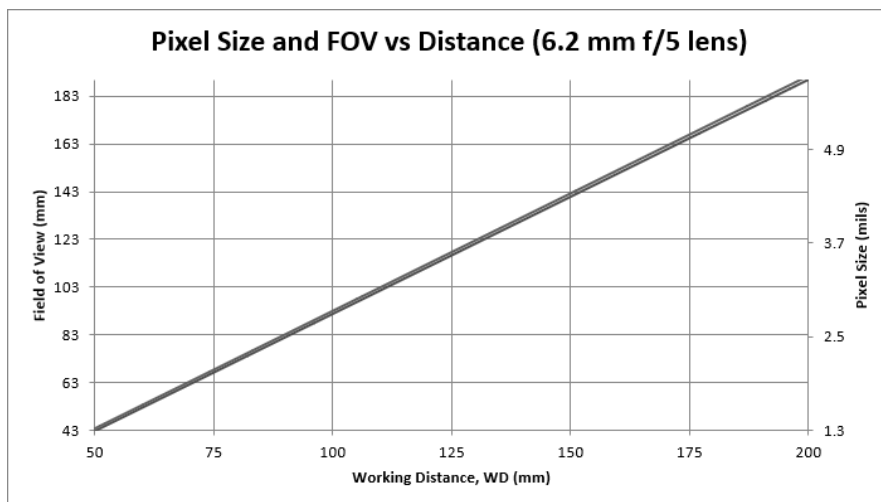
In all the cases below, working distances are measured from the front cover.

3.5 mm f/6 Lens



Working Distance	FoV	Pixel Size
70.000	116.000	3.60
95.000	159.000	4.90
120.000	202.000	6.20
145.000	246.000	7.60
170.000	289.000	8.80
195.000	333.000	10.20

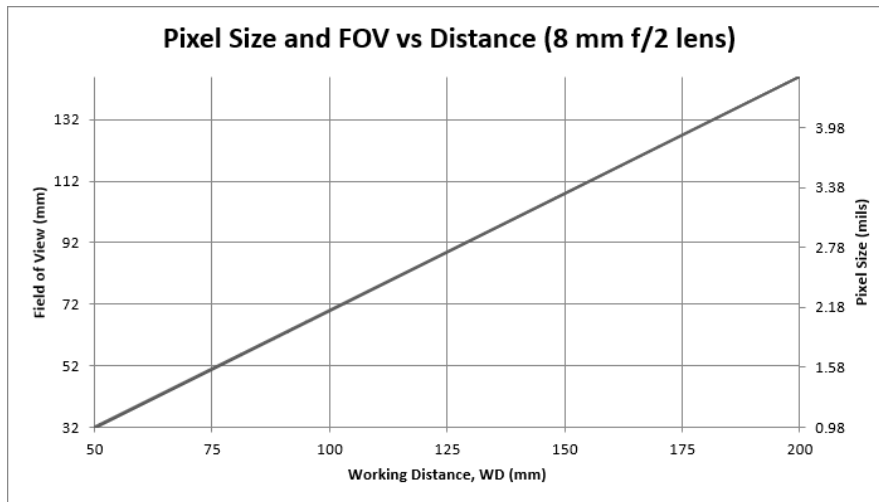
6.2 mm f/10 Lens



Working Distance	FoV	Pixel Size
50.000	43.000	1.30
75.000	67.000	2.10
100.000	92.000	2.80
125.000	117.000	3.70
150.000	141.000	4.30
175.000	166.000	5.10
200.000	190.000	5.80

8 mm f/2 Lens

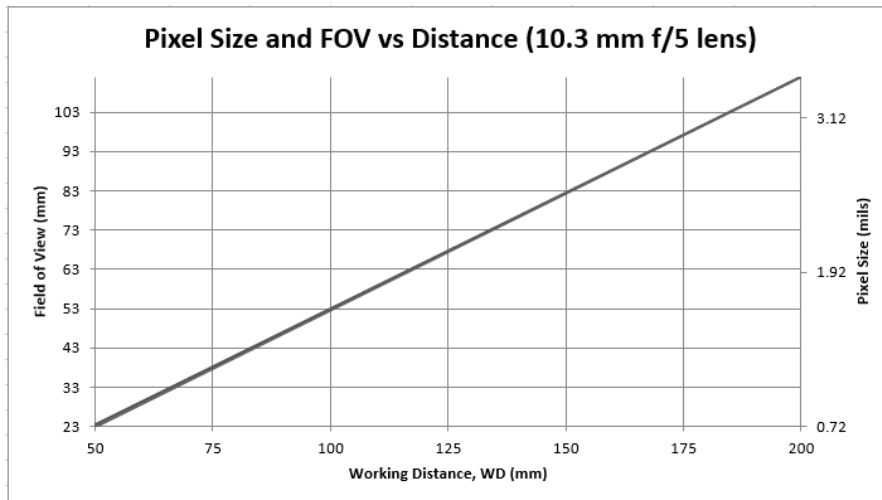
Note: A lens extender is required.



Working Distance	FoV	Pixel Size
50.000	32.000	0.98
75.000	51.000	1.60
100.000	70.000	2.20
125.000	89.000	2.70
150.000	108.000	3.30
175.000	127.000	3.90
200.000	146.000	4.50

10.3 mm f/5 Lens

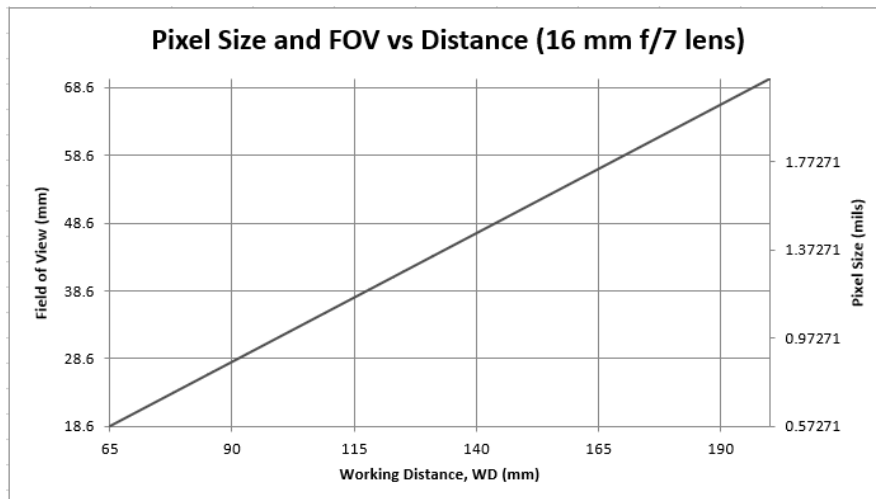
Note: A lens extender is required.



Working Distance	FoV	Pixel Size
50.000	23.000	0.72
75.000	38.000	1.20
100.000	53.000	1.60
125.000	68.000	2.10
150.000	82.000	2.50
175.000	97.000	3.00
200.000	112.000	3.40

16 mm f/7 Lens

Note: A lens extender is required.

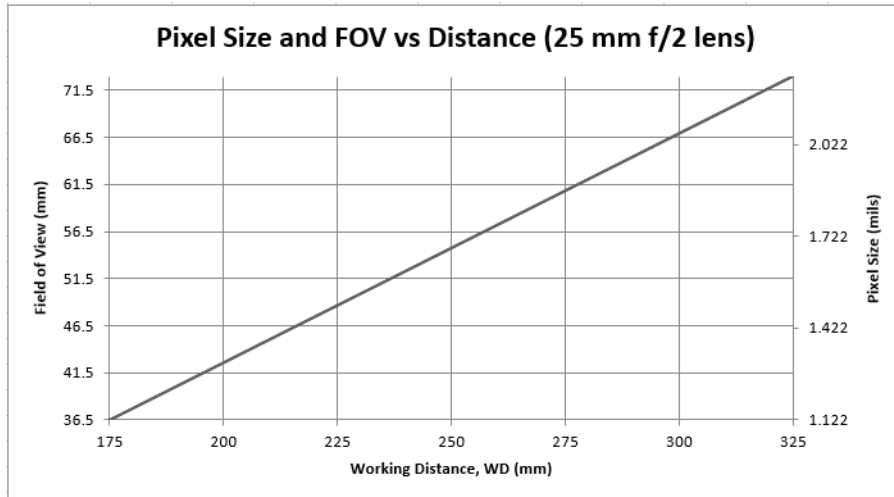


Working Distance	FoV	Pixel Size
65.000	19.000	0.57
90.000	28.000	0.90
115.000	38.000	1.20
140.000	47.000	1.40

Working Distance	FoV	Pixel Size
165.000	57.000	1.70
190.000	66.000	2.00

25 mm f/2 Lens

Note: A lens extender is required.



Working Distance	FoV	Pixel Size
175.000	36.500	1.12
200.000	43.000	1.30
225.000	49.000	1.50
250.000	55.000	1.70
275.000	61.000	1.90
300.000	67.000	2.10
325.000	73.000	2.24

Factory Focus Optimization

With custom factory focus, the lens used with the Advantage™ 100 Series device is adjusted to optimize focus for the center 25% of the image. Depending on the lens selection and object distance, this can lead to objects on the image periphery to have less than optimal focus.

Precautions

To reduce the risk of injury or equipment damage, observe the following precautions when you install the Cognex product:

- Route cables and wires away from high-current wiring or high-voltage power sources to reduce the risk of damage or malfunction from the following causes: over-voltage, line noise, electrostatic discharge (ESD), power surges, or other irregularities in the power supply.
- Changes or modifications not expressly approved by the party responsible for regulatory compliance could void the user's authority to operate the equipment.
- Ensure that the cable bend radius begins at least six inches from the connector. Cable shielding can be degraded or cables can be damaged or wear out faster if a service loop or bend radius is tighter than 10X the cable diameter.
- This device is certified for office use only and if used at home, there can be frequency interference problems.
- This device should be used in accordance with the instructions in this manual.
- All specifications are for reference purposes only and can change without notice.

Regulations/Conformity

The Advantage™ 100 Series device is compliant with the following industry standards:

- ROHS compliance
- China ROHS compliance

The Ethernet 10/100 Base-T and TIA/EIA232-F (56.7, 38.4, 19.2, 9.6 kbits/s) communication interfaces provided by the Advantage™ 100 Series device are protected per compliance with the following standard:

- EN55024: 1998 Immunity for information technology equipment
 - +/- 4KV Contact Discharge
 - +/- 8KV Air Discharge

When the Advantage™ 100 Series device is employed within a proper housing, the combined unit can be made compliant with the following standards:

- EN55022
- EN61326-1

Because the Advantage™ 100 Series device is a digital device, take into consideration electro-magnetic interference when designing your own system. Make sure that the following requirements are met:

- use a clean power supply
- ensure good signal ground integrity

In addition, carefully take into account the length and shape as well as the routing path of the flex strips and flex circuits that you use. They should be short, low resistance, and designed with no loops.

Safety and Regulatory	
Manufacturer	Cognex Corporation One Vision Drive Natick, MA 01760 USA
EU RoHS	Compliant to the most recent applicable directive.
Korea 	이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다. Regulatory Model R00055: MSIP-REM-CGX-R00055. Regulatory Model R00056: MSIP-REM-CGX-R00056. Regulatory Model 50204 R-R-CGX-50204 Regulatory Model 50206 R-R-CGX-50206 This device is certified for office use only and if used at home, there can be frequency interference problems.
International Product Safety	The following guidelines relate to shock and vibration: • I IEC 60068-2-27: 1K shocks, semi-sinusoidal, 11 g, 10 ms • I IEC 60068-2-6: vibration in each of 3 main axes for 2 hrs at 10 Gs (10 to 500 Hz at 100 m/s² / 15 mm) To ensure that your Advantage™ 100 Series device is not subject to ESD (electrostatic discharge) damage, keep the device away from highly charged materials. Before handling the device, make sure that you are grounded by using heel and wrist straps and that you work on a grounded surface. In addition, the Advantage™ 100 Series device must be kept in an environment controlled for low humidity.

For European Community Users

Cognex complies with Directive 2012/19/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 4 July 2012 on waste electrical and electronic equipment (WEEE).

This product has required the extraction and use of natural resources for its production. It may contain hazardous substances that could impact health and the environment, if not properly disposed.

In order to avoid the dissemination of those substances in our environment and to diminish the pressure on the natural resources, we encourage you to use the appropriate take-back systems for product disposal. Those systems will reuse or recycle most of the materials of the product you are disposing in a sound way.



The crossed out wheeled bin symbol informs you that the product should not be disposed of along with municipal waste and invites you to use the appropriate separate take-back systems for product disposal.

If you need more information on the collection, reuse, and recycling systems, please contact your local or regional waste administration.

You may also contact your supplier for more information on the environmental performance of this product.

Safety Warnings and Cautions

The following guidelines relate to shock and vibration:

- IEC 60068-2-27: 1 K shocks, semi-sinusoidal, 11 g, 10 ms
- IEC 60068-2-6: vibration in each of 3 main axes for 2 hrs at 10 Gs (10 to 500 Hz at 100 m/s² / 15 mm)

China RoHS



Part Name 部件名称	Hazardous Substances 有害物质					
	Lead (Pb) 铅	Mercury (Hg) 汞	Cadmium (Cd) 镉	Hexavalent Chromium (Cr (VI)) 六价铬	Polybrominated biphenyls (PBB) 多溴联苯	Polybrominated diphenyl ethers (PBDE) 多溴二苯醚
Regulatory Model R00055 Regulatory Model R00056	X	O	O	O	O	O

This table is prepared in accordance with the provisions of SJ/T 11364.
这个标签是根据SJ/T 11364 的规定准备的。

O: Indicates that said hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement of GB / T26572 - 2011.
表示本部件所有均质材料中含有的有害物质低于GB / T26572 - 2011 的限量要求。

X: Indicates that said hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement of GB / T26572 - 2011.
表示用于本部件的至少一种均质材料中所含的危害物质超过GB / T26572 - 2011 的限制要求。

