COGNEX

In-Sight® VC200 Vision System

Reference Guide

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Version: 7.1.0.26

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Table of Contents

Symbols

The following symbols indicate safety precautions and supplemental information.

WARNING: This symbol indicates the presence of a hazard that could result in death, serious personal injury or electrical shock.

CAUTION: This symbol indicates the presence of a hazard that could result in property damage.

Note: Notes provide supplemental information about a subject.

Tip: Tips provide helpful suggestions and shortcuts that may not otherwise be apparent.

Regulations/Conformity: Vision Controller

Note: For the most up-to-date regulations and conformity information, please refer to the Cognex online support site: http://www.cognex.com/Support.

Safety and Regulatory	
Manufacturer	Cognex Corporation One Vision Drive Natick, MA 01760 USA
CE	Regulatory Model 1AAL
FCC	FCC Part 15, Class A This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference; and (2) this device must accept any interference received, including interference that may cause undesired operation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.
KCC	Regulatory Model 1AAL: MSIP-REM-CGX-1AAL
NRTL	TÜV SÜD AM SCC/NRTL OSHA Scheme for UL/CAN 61010-1.
CB	TÜV SÜD AM, IEC/EN 61010-1. CB report available upon request.
RoHS	Compliant to the latest applicable Directive.

Regulations/Conformity: In-Sight Cameras

Note: For the most up-to-date regulations and conformity information, please refer to the Cognex online support site: http://www.cognex.com/Support.

Safety and Regulatory	
Manufacturer	Cognex Corporation One Vision Drive Natick, MA 01760 USA
CE	ISC-8402: Regulatory Model 1AAW ISC-8405: Regulatory Model 1AAU
FCC	FCC Part 15, Class A This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference; and (2) this device must accept any interference received, including interference that may cause undesired operation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.
KCC	ISC-8402: Regulatory Model 1AAW: MSIP-REM-CGX-1AAW ISC-8405: Regulatory Model 1AAU: MSIP-REM-CGX-1AAU
NRTL	TÜV SÜD AM SCC/NRTL OSHA Scheme for UL/CAN 61010-1.
CB	TÜV SÜD AM, IEC/EN 61010-1. CB report available upon request.
RoHS	Compliant to the latest applicable Directive.

Regulations/Conformity: DS900 Series

Note: For the most up-to-date regulations and conformity information, please refer to the Cognex online support site: http://www.cognex.com/Support.

DS900 series sensors meet or exceed the requirements of all applicable standards organizations for safe operation. As with any electrical equipment, however, the best way to ensure safe operation is to operate them according to the agency guidelines that follow. Please read these guidelines carefully before using your device.

Regulator	Specification
USA	CFR 47 FCC Part 15 (b) Class A FDA/CDRH Laser Notice No. 50
Canada	ICES-003 Issue 4 Class A
European Community	EN 55022:2006/A1:2007 Class A EN 61000-6-2:2005
Australia	C-TICK, AS/NZS CISPR 22 / EN 55022 for Class A Equipment
Japan	J55022, Class A

Safety and Regulatory

CE	The CE mark on the product indicates that the system has been tested to and conforms to the provisions noted within the 2004/108/EEC Electromagnetic Compatibility Directive and the 2006/95/EEC Low Voltage Directive. For further information please contact: Cognex Corporation One Vision Drive Natick, MA 01760 USA Cognex Corporation shall not be liable for use of our product with equipment (i.e., power supplies, personal computers, etc.) that is not CE marked and does not comply with the Low Voltage Directive.
FC	This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at personal expense.

Laser Safety Statement: DS900 Series

Compliance with FDA performance standards for laser products except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007.

This device has been tested in accordance with IEC60825-1 2nd ed., and has been certified to be under the limits of a Class 2M Laser device.

Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Regulations/Conformity: DS1000 Series Sensors

Note: For the most up-to-date regulations and conformity information, please refer to the Cognex online support site: http://www.cognex.com/Support.

DS1000 series sensors meet or exceed the requirements of all applicable standards organizations for safe operation. As with any electrical equipment, however, the best way to ensure safe operation is to operate them according to the agency guidelines that follow. Please read these guidelines carefully before using your device.

Regulator	Specification
USA	CFR 47 FCC Part 15 (b) Class A FDA/CDRH Laser Notice No. 50
Canada	ICES-003 Issue 4 Class A
European Community	EN 55022:2006/A1:2007 Class A EN 61000-6-2:2005
Australia	C-TICK, AS/NZS CISPR 22 / EN 55022 for Class A Equipment
Japan	J55022, Class A

Safety and Regulatory

CE	The CE mark on the product indicates that the system has been tested to and conforms to the provisions noted within the 2004/108/EEC Electromagnetic Compatibility Directive and the 2006/95/EEC Low Voltage Directive. For further information please contact: Cognex Corporation One Vision Drive Natick, MA 01760 USA Cognex Corporation shall not be liable for use of our product with equipment (i.e., power supplies, personal computers, etc.) that is not CE marked and does not comply with the Low Voltage Directive.
FC	This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at personal expense.

Laser Safety Statement: DS1050

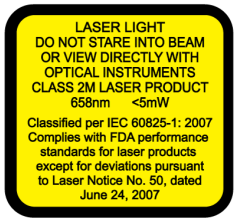
Compliance with FDA performance standards for laser products except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007.

This device has been tested in accordance with IEC60825-1 2nd ed., and has been certified to be under the limits of a Class 2M Laser device.

Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

C US

CAN/CSA-C22.2 No. 61010-1-04 Part 1, UL STD. No. 61010-1, 2nd Edition.



Laser Safety Statement: DS1101

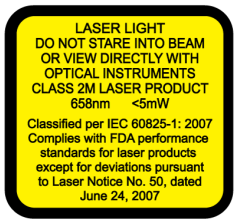
Compliance with FDA performance standards for laser products except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007.

This device has been tested in accordance with IEC60825-1 2nd ed., and has been certified to be under the limits of a Class 2M Laser device.

Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

C US

CAN/CSA-C22.2 No. 61010-1-04 Part 1, UL STD. No. 61010-1, 2nd Edition.



Laser Safety Statement: DS1300

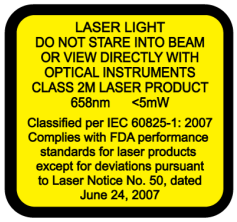
Compliance with FDA performance standards for laser products except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007.

This device has been tested in accordance with IEC60825-1 2nd ed., and has been certified to be under the limits of a Class 2M Laser device.

Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

C US

CAN/CSA-C22.2 No. 61010-1-04 Part 1, UL STD. No. 61010-1, 2nd Edition.



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.

Precautions

Observe these precautions when installing the vision controller to reduce the risk of injury or equipment damage:

- The vision controller is intended to be supplied by a NRTL listed power supply with a minimum output rated 24VDC, 3.5A and must be used with the Cognex-supplied 24VDC power connector. Any other voltage creates a risk of fire or shock and can damage the components. Applicable national and local wiring standards and rules must be followed. Wire and connections must be in accordance with these instructions, the National Electrical Code and applicable national and local wiring standards and rules.
- To reduce the risk of damage or malfunction due to over-voltage, line noise, electrostatic discharge (ESD), power surges, or other irregularities in the power supply, route all cables and wires away from high-voltage power sources.
- Do not install In-Sight vision systems where they are directly exposed to environmental hazards such as excessive heat, dust, moisture, humidity, impact, vibration, corrosive substances, flammable substances, or static electricity.
- Do not expose the In-Sight camera's image sensor to laser light; image sensors can be damaged by direct, or reflected, laser light. If your application requires the use of laser light that may strike the image sensor, a lens filter at the corresponding laser's wavelength is recommended. Contact your local integrator or application engineer for suggestions.
- The In-Sight vision system does not contain user-serviceable parts. Do not make electrical or mechanical modifications to In-Sight vision system components. Unauthorized modifications may void your warranty.
- Changes or modifications not expressly approved by the party responsible for regulatory compliance could void the user’s authority to operate the equipment.
- Service loops should be included with all cable connections.
- Cable shielding can be degraded or cables can be damaged or wear out more quickly if a service loop or bend radius is tighter than 10X the cable diameter. The bend radius must begin at least six inches from the connector.
- Remove power from the vision controller before connecting or disconnecting any cables or the I/O terminal blocks.
- The maximum torque that can be applied to the I/O terminal connectors is 0.25 Nm (2.2 in-lb). Applying torque above this limit can damage the connectors.
- Remove power from the vision controller before connecting or disconnecting the 24VDC power connector.
- The maximum torque that can be applied to the 24VDC power connector is 0.6 Nm (5.3 in-lb). Applying torque above this limit can damage the connector.
- Class A Equipment (broadcasting and communication equipment for office work): Seller and user shall be notified that this equipment is suitable for electromagnetic equipment for office work (Class A) and can be used outside the home.
- This device should be used in accordance with the instructions in this manual.
- All specifications are for reference purpose only and may be changed without notice.

Laser Models

The following sensors contain a class 2M laser:

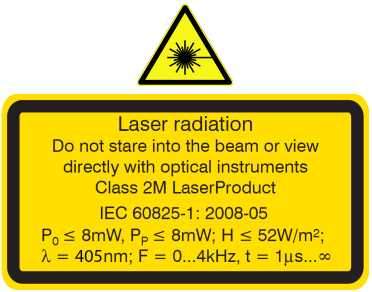
Model	Class 2M Laser
DS910B (820-9166-1R) DS925B (820-9164-1R)	√
DS1050 (821-0116-5R)	√
DS1101 (821-0116-3R)	√
DS1300 (821-0116-4R)	√

Laser Safety Warnings: DS900 Series

LASER LIGHT, DO NOT STARE INTO BEAM: CLASS 2M LASER PRODUCT
FAILURE TO FOLLOW THESE INSTRUCTIONS MAY CAUSE SERIOUS INJURY

Cognex places the following labels on every DS900 series displacement sensor:

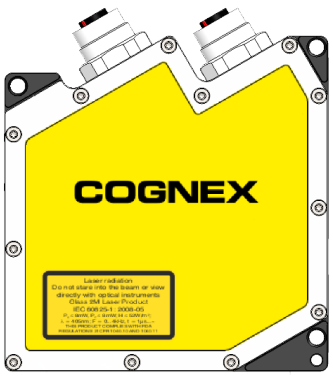
DS925B

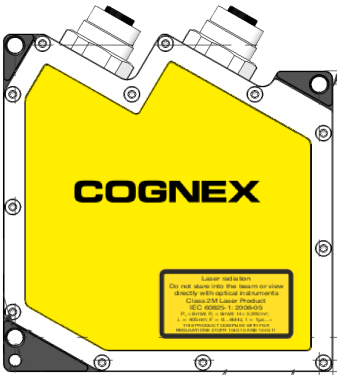


DS910B

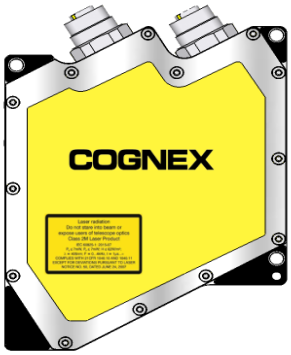
Label Locations

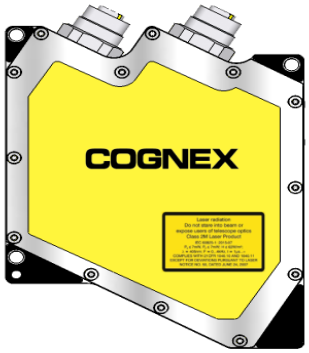
DS925B





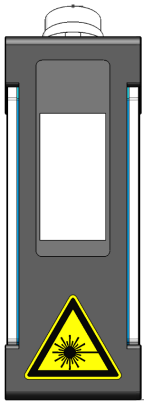
DS910B



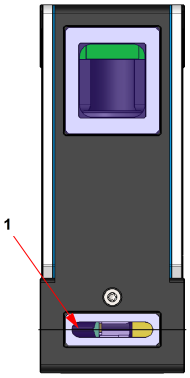


All DS900 Series Sensors

LASER LIGHT, DO NOT STARE INTO BEAM: CLASS 2M LASER PRODUCT



Label Location

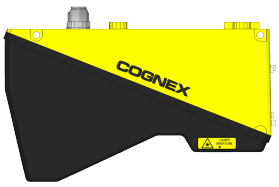


1 - Laser window

AVOID EXPOSURE - LASER RADIATION IS EMITTED FROM THIS APERTURE

Laser Safety Warnings: DS1000 Series

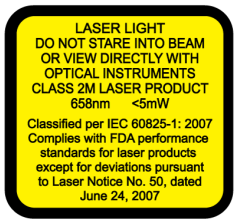
DS1050
DS1101
DS1300



LASER LIGHT, DO NOT STARE INTO BEAM: CLASS 2M LASER PRODUCT FAILURE TO FOLLOW THESE INSTRUCTIONS MAY CAUSE SERIOUS INJURY

Cognex places the following labels on every DS1000 series displacement sensor:

DS1000 Series



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.

Note: AVOID EXPOSURE - LASER RADIATION IS EMITTED FROM THIS APERTURE

Label Locations

Warnings and Notices: DS900 and DS1000 Series Sensors

Cognex provides the following warnings and notices:

- Do not stare into the beam.
- Do not view directly with optical instruments (magnifiers).
- Do not place optical components (mirrors) into the beam.
- Design test fixtures in such a way that unintentional viewing of the beam is prevented.
- Switch off the laser when not in use.
- Avoid the use of highly reflective materials. If you cannot, try to angle the part so unintentional viewing of the reflection is prevented.
- Terminate (block) unused beams.
- Keep the laser plane horizontal or pointing downwards.
- Report any issues that may have an impact on laser safety to your supervisor or Laser Safety Officer.
- There is no scheduled maintenance necessary to keep the product in compliance.
- Under no circumstances should you operate the sensor if it is defective or the seal damaged. Cognex Corporation cannot be held responsible for any harm caused by operating a faulty unit.
- Under no circumstance should you modify in any way the sensor or its housing.
- Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.
- When moving the unit from a very hot environment to a cold environment please allow the unit to equalize in a room temperature environment for 2 hours between temperature extremes.

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.

Product Service: DS900 and DS1000 Series Sensors

- Bring any performance issues to the attention of your Cognex sales representative.
- The sensor can only be serviced by a trained Cognex representative. Return the unit to Cognex for any service or repairs.
- Do not operate the sensor if the enclosure appears damaged.

Open Source Libraries

The In-Sight® VC200 vision controller uses third-party open source software, whose licenses are described in the click-accept agreement that is part of the In-Sight VC Explorer software installation.

Introduction

The In-Sight® VC200 vision controller is a compact, network-ready vision controller that can be directly connected to In-Sight cameras and Cognex 3D displacement sensors. In-Sight cameras are light-weight "smart" cameras used for automated inspection, measurement and identification applications on the factory floor. Cognex 3D displacement sensors combine GigE Vision and laser-stripe illumination to generate information about three-dimensional objects that cannot easily be generated by cameras that acquire two-dimensional images.

The vision controller extends the capabilities of the connected devices by providing:

- Direct connection to a Gigabit Ethernet network.
- 8 inputs, optically isolated.
- 16 outputs, optically isolated.
- Support for current sinking (NPN) and current sourcing (PNP) devices.
- DIN-rail mountable.

Support

Several resources are available to assist you in using the vision controller with the connected Cognex device:

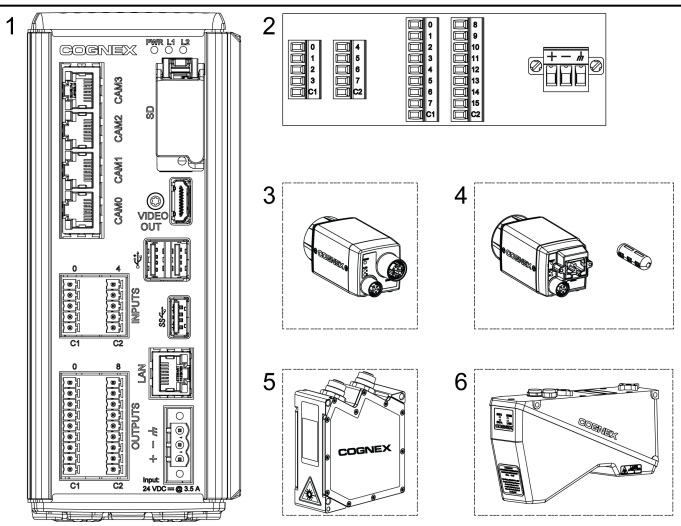
- The *In-Sight® VC Explorer User Guide*, included with In-Sight VC Explorer software.
- In-Sight online support: http://www.cognex.com/support/ISVC200.

Standard Components

The vision controller is shipped with the components listed below.

Note:

- If any of the standard components appear to be missing or damaged, immediately contact your Cognex Authorized Service Provider (ASP) or Cognex Technical Support.
- The number and type of cameras or sensors included with the vision controller will vary based on the product kit.
- Cables are sold separately.



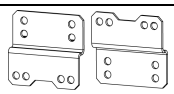
Component	
1	In-Sight VC200 Vision Controller
2	Terminal Block Kit: • INPUTS terminal blocks • OUTPUTS terminal blocks • 24VDC power connector
3	ISC-8402 Camera
4	ISC-8405 Camera and Ferrite
5	DS900 Series Sensor
6	DS1000 Series Sensor

Accessories

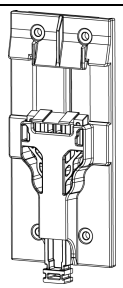
The following components can be purchased separately. For a complete list of options and accessories, contact your local Cognex sales representative.

Vision Controller Accessories

Mounting Hardware



Description	Part Number
Brackets for wall-mounting the vision controller.	BKT-WALL-VC200-01

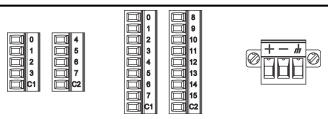


Description	Part Number
Bracket for mounting the vision controller to a 35 x 15mm DIN rail. **Note**: The DIN rail mounting bracket accessory is not suitable for a 7.5mm profile DIN rail.	BKT-DIN-VC200-01

Power Supply

	Part Number
DIN rail power supply that converts AC mains power to 24VDC.	ACC-Quint-PS

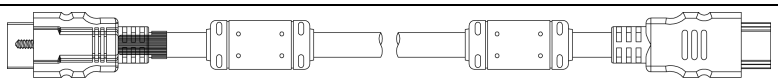
Terminal Block Kit



Description	Part Number
Terminal block kit includes replacement terminal blocks and connectors for the vision controller: • INPUTS terminal blocks • OUTPUTS terminal blocks • 24VDC power connector	820-10138-xR

HDMI Cable

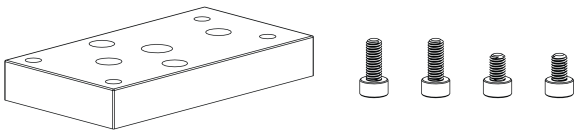
The shielded HDMI cable provides connection to a display device. The pin-outs for the cable are listed in the *HDMI Cable Specifications* on page 67.



Length	Part Number
5m	300-10006-xR

In-Sight Camera Accessories

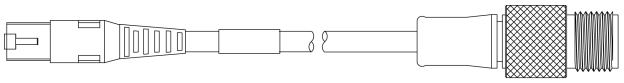
Mounting Hardware



Description	Part Number
Mounting kit and M3 screws	BKT-IS8K-01

Ethernet Cable (ISC-8402)

The Ethernet cable provides Ethernet connectivity and supplies power to the camera. The pin-outs for the cable are listed in the *Ethernet Cable Specifications (ISC-8402)* on page 73.

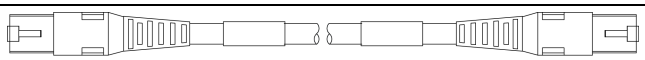


RJ-45 Connector M12 X-coded Connector

Length	Part Number
2m	CCB-84901-2001-02
5m	CCB-84901-2001-05
10m	CCB-84901-2001-10
15m	CCB-84901-2001-15

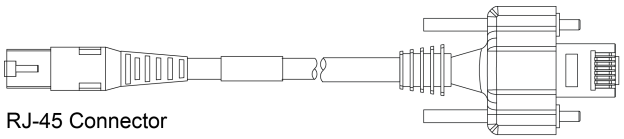
Ethernet Cable (ISC-8405)

The Ethernet cable provides Ethernet connectivity and supplies power to the camera. The pin-outs for the cable are listed in the *Ethernet Cable Specifications (ISC-8405)* on page 74. This cable is available in the lengths and styles listed below.



RJ-45 Connector RJ-45 Connector

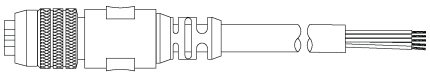
Length	Part Number
5m	CGE-CBL-SHLD-5M
10m	CGE-CBL-SHLD-10M
20m	CGE-CBL-SHLD-20M



Length	Part Number
5m	CGE-CBL-FLEX-H-5M
10m	CGE-CBL-FLEX-H-10M
20m	CGE-CBL-FLEX-H-20M

Breakout Cable

The Breakout cable provides access to the camera's strobe output. The pin-outs for the cable are listed in the *Breakout Cable Specifications* on page 72.

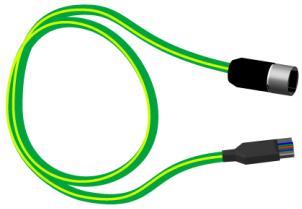


Length	Part Number
0.6m	CCB-M8IO-00
2m	CCB-M8IO-02
5m	CCB-M8IO-05
10m	CCB-M8IO-10
15m	CCB-M8IO-15

DS900 Series Sensor Accessories

Ethernet Cable

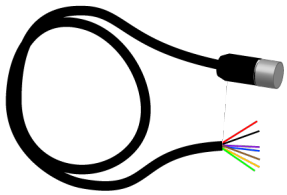
Note: This cable is not compatible with the DS1000 series.



Length	Description	Part Number
5m	M12 to RJ-45, straight	CCB-2901858-05

Multifunction Cable

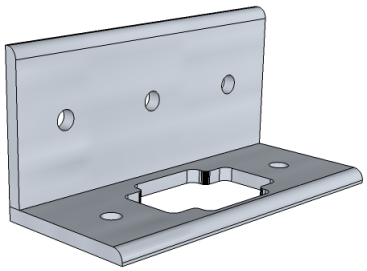
For more information, refer to *Multifunction Port* on page 83 for the pin-out of the unterminated flying leads.



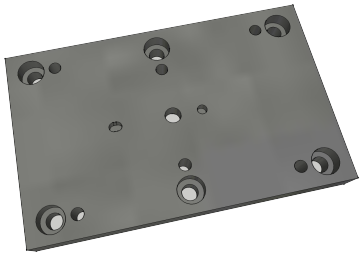
Length	Description	Part Number
5m	I/O, and Encoder, M12 to flying lead, straight	CCB-2901868-05

DS1000 Series Sensor Accessories

Mounting Hardware



Description	Part Number
Mounting bracket and M6 screws.	DS-BKT-000

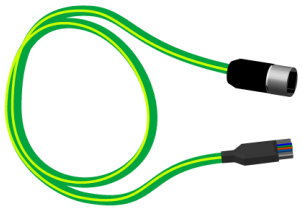


Description	Part Number
High-accuracy mounting plate and M6 screws.	DS-MPHA-00

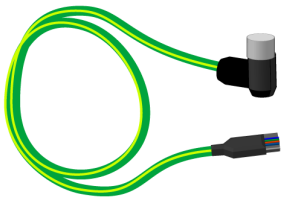
Steel Enclosure

Description	Part Number
IP69K stainless steel enclosure	DS-ENC-SS-00

Ethernet Cable



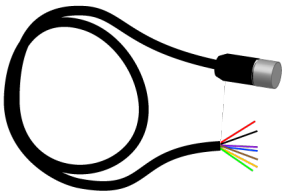
Length	Description	Part Number
0.6m	M12 to RJ-45, straight	CCB-84901-1001-00
2m		CCB-84901-1002-02
5m		CCB-84901-1003-05
10m		CCB-84901-1004-10
15m		CCB-84901-1005-15
30m		CCB-84901-1006-30



Length	Description	Part Number
2m	M12 to RJ-45, right-angle	CCB-84901-6005-02
5m		CCB-84901-6001-05
10m		CCB-84901-6002-10
15m		CCB-84901-6003-15
30m		CCB-84901-6004-30

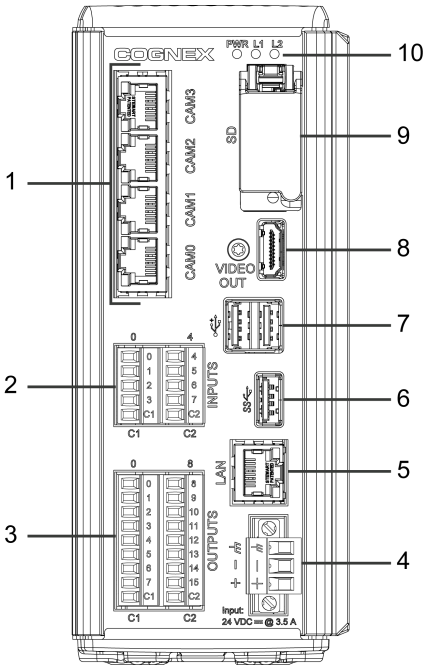
Power and I/O

For more information, refer to *Power and I/O Cable Specifications* on page 94 for the pin-out of the unterminated flying leads.

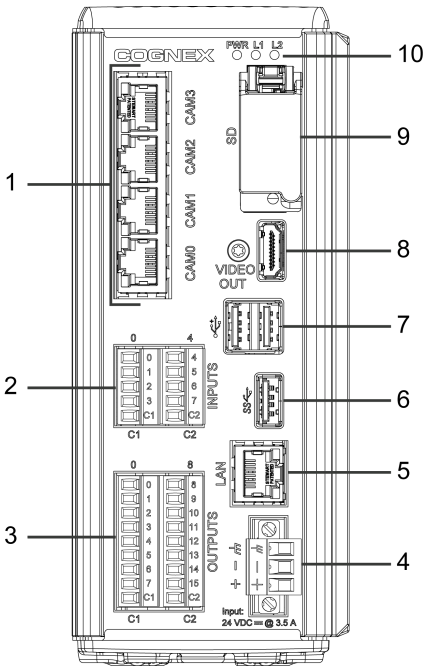


Length	Description	Part Number
5m	Cable Power and I/O, M12 to flying lead, straight	CBL-05P2-S1
20m		CBL-20P2-S1

Vision Controller Connectors and Indicators



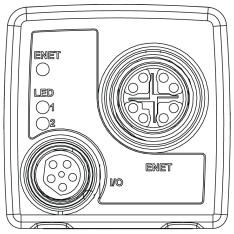
Connector/Indicator		Function
1	CAM Ports and LEDs	The four CAM ports (CAM 0 - CAM 3) are RJ-45 ports that provide Ethernet connectivity to In-Sight cameras, DS900 sensors and DS1000 sensors. These ports also provide power to the Cognex industrial devices that support Power over Ethernet (PoE). The green LED is solid when the connected device is running at 1000 Mbps; the green LED is off when the connected device is running at 10/100 Mbps. The yellow LED blinks when network activity is detected. For more information, refer to *CAM Ports* on page 61. **CAUTION**: The vision controller's CAM ports provide Power over Ethernet (PoE) to supported Cognex devices; connecting other PoE devices to these ports could damage the vision controller or the PoE device.
2	INPUTS Terminal Block	The INPUTS terminal blocks provide access to a total of 8 inputs and 2 common connections. For more information, refer to *INPUTS Terminal Block Assignments* on page 64.
3	OUTPUTS Terminal Block	The OUTPUTS terminal blocks provide access to a total of 16 outputs and 2 common connections. For more information, refer to *OUTPUTS Terminal Block Assignments* on page 65.
4	24VDC Power Connector	The 24VDC power connector is used to connect an external power supply to the vision controller. For more information, refer to *24VDC Power Connector Terminal Assignments* on page 66.
5	LAN Port and LEDs	The LAN port is a 10/100/1000 RJ-45 Ethernet port that is used to connect the vision controller to an Ethernet network. The green LED is solid when connected to a 1000 Mbps network; the green LED is off when connected to a 10/100 Mbps network. The yellow LED blinks when network activity is detected. For more information, refer to *LAN Port* on page 61.
6	USB 3.0 Port	The USB 3.0 port can be used to connect mouse, keyboard or mass storage device. For more information, refer to *USB 3.0 Port* on page 63.
7	USB 2.0 Port	The two USB 2.0 ports can be used to connect mouse, keyboard or mass storage device. For more information, refer to *USB 2.0 Ports* on page 63.



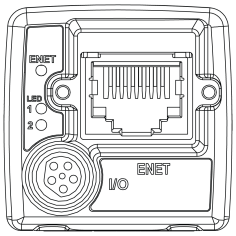
Connector/Indicator		Function
8	VIDEO OUT Port	The VIDEO OUT port is a locking HDMI port that provides connection to a display device. For more information, refer to *VIDEO OUT Port* on page 62.
9	SD Card Slot	The SD card slot is used to save images, run time files and results.
10	LEDs	• PWR LED: The green PWR LED illuminates to indicate that the vision controller is powered on. • LED1: Green when active. User configurable. • LED2: Red when active. User configurable.

In-Sight Camera Connectors and Indicators

ISC-8402



ISC-8405

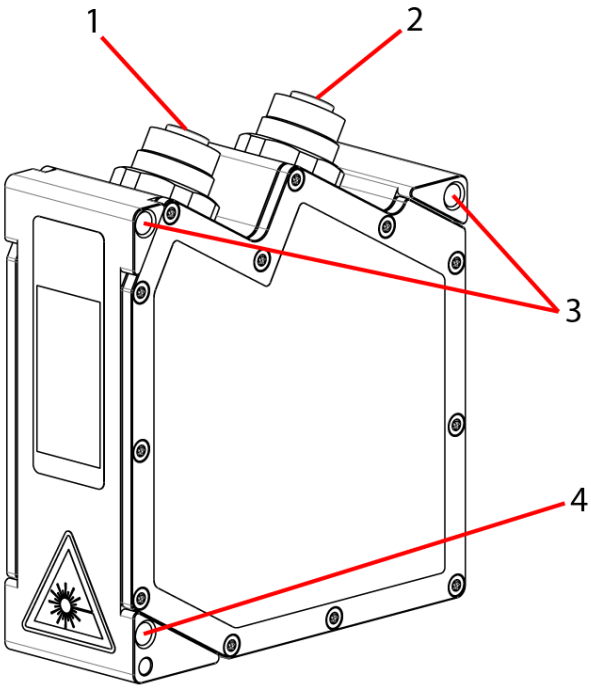


Connector/Indicator	Description
ENET LED	• 1000-BaseT: LED turns on when the camera is receiving power during startup, and blinks green once network traffic is detected. • 100-BaseT: LED turns on when the camera is receiving power during startup, and blinks green and red (appears orange) once network traffic is detected. • 10-BaseT: LED turns on when the camera is receiving power during startup, and blinks red once network traffic is detected.
LED 1	Green when active.
LED 2	Red when active.
I/O Port	The I/O port is an M8 port that provides connection to the strobe output via the Breakout cable. For more information, refer to *Breakout Cable Specifications* on page 72.
ENET Port	The ENET port is a 10/100/1000 port that provides Gigabit Ethernet connectivity and supplies Power over Ethernet (PoE) via the Ethernet cable. For more information, refer to *Ethernet Cable Specifications (ISC-8402)* on page 73 and *Ethernet Cable Specifications (ISC-8405)* on page 74.

Note:

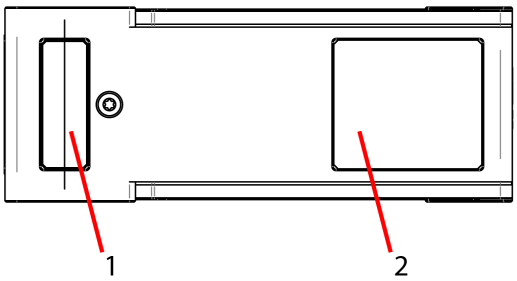
- When initially powered up, the ENET LED turns on and is orange and LED 1 turn on and is steady green for approximately 10 seconds. Next, LED 2 flashes green and then red, and then both LED 1 and LED 2 turn off. Next, the ENET LED turns off and then momentarily flashes when a network connection is established, and then begins blinking once network traffic is detected.
- If both LED 1 and LED 2 are solid red, the camera's firmware update was interrupted.

DS900 Series Connectors and Indicators



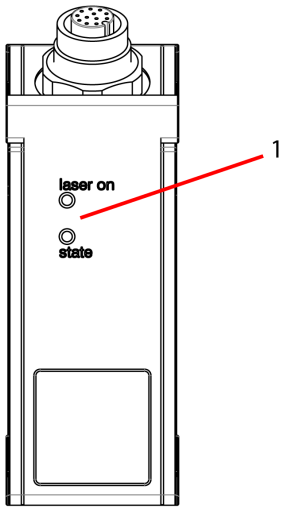
Component	Description
1	Ethernet socket
2	Multifunction socket (24V DC power + I/O connector)
3	M5 threaded mounting holes
4	This pin hole is provided for a position locking pin. The sensor can be mounted reproducible and replaceable together with an attachment point.

Bottom View



Component	Description
1	Laser window ⚠ **CAUTION**: AVOID EXPOSURE - LASER RADIATION IS EMITTED FROM THIS APERTURE
2	Camera window

System LEDs



Component	Description	
Laser On	Indicates the laser is on.	
State	Solid green	Measuring
	Green flashing	Data transmission: • Long flashes for data transmission. • Short for access to vision controller.
	Red flashing	Error code.

DS900 Series Error Codes

- indicates that the “state” LED lights for a longer time.

. indicates that the “state” LED lights briefly.

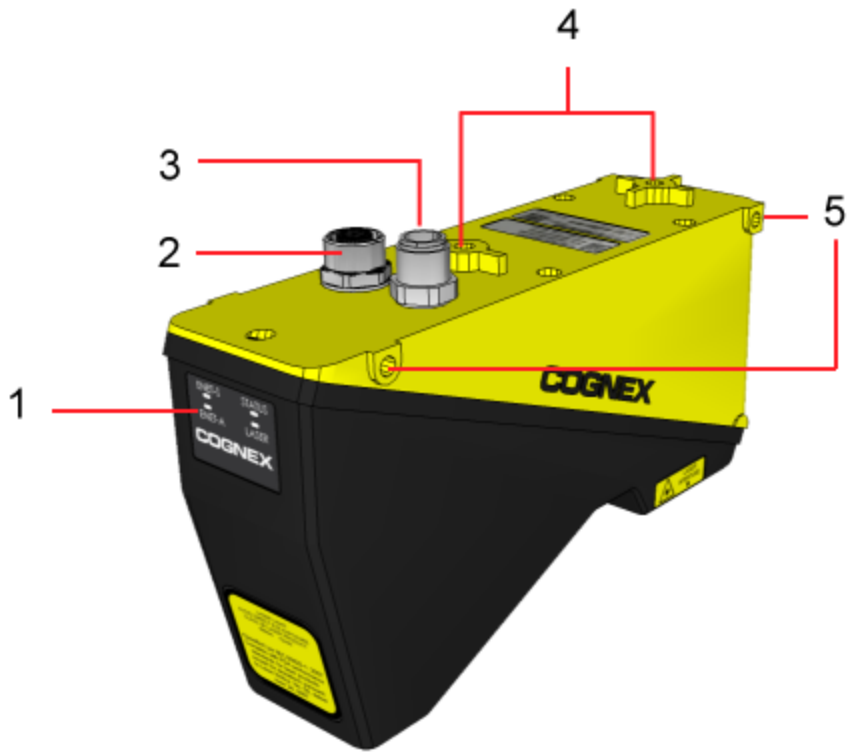
Flashing sequence	Cause	Remedy	Notes
Group: Loading / saving configuration			
.. 2x short	Mode not found.	Select different one.	Only previously stored modes can be called up.
..- 2x short, 1x long	White error flash.	Contact manufacturer, return sensor.	Should not occur in normal operation.
... 3x short	Flash full.	None, contact manufacturer.	Should not occur in normal operation.
.... 4x short	Loading suppressed due to active data transmission.	Stop active data transmission.	Prevents PC software crashes.
--... 2x long, 3x short	Data overflow during transmission of the data via Ethernet.	Reduce profile frequency, increase packet size.	Data can be impaired.
--..... 2x long, 5x short	Error during calculation.	Reduce profile frequency, select faster calculation mode.	Data can be impaired.
--..... 2x long, 6x short	Error during Ethernet transmission.	Reduce profile frequency.	Data can be impaired.
Group: Data processing and transmission			
-- 2x long	Data overflow in the sensor.	Select smaller measuring field, reduce profile frequency, select less complex measuring program.	Data can be impaired; exposure time can be longer than expected.
--. 2x long, 1x short	Data overflow during receipt of the data from the sensor.	Select smaller measuring field, reduce profile frequency, select less complex measuring program.	Data can be impaired.
--.. 2x long, 2x short	Data overflow for serial port RS422.	Reduce profile frequency, select less complex measuring program.	Data can be impaired.
Group: Ethernet Interface			
---- 4x long	IP Address conflict.	Check the Ethernet configuration of device and the host PC. Choose another IP address for the device.	If the problem persists, please contact the manufacturer.

- The "state" LED flashes green and **long** during active data transmission.
- The "state" LED flashes green and **short** for controller accesses. A controller access can cause various data overflows particularly if the measuring frequency is near its maximum.

DS900 Series Sensor Accuracy

- Measurement accuracy varies depending on how accurately the unit is mounted and on the surface characteristics of the object being measured; it is not possible to specify a guaranteed accuracy value.
- In general, sensor accuracy is improved when:
    - Relative measurements are made within a single scene (what is the difference between surface A and surface B) are more accurate than absolute measurements (how far is surface B from the sensor).
    - The sensor is rigidly mounted using the high-accuracy mounting hole.
    - The sensor is precisely perpendicular to the surface being measured.
- In general, sensor accuracy is the best at the optical axis.
- In general, sensor range measurements are extremely repeatable, however the accuracy is dependent on how well the exposure is set.

DS1000 Series Connectors and Indicators

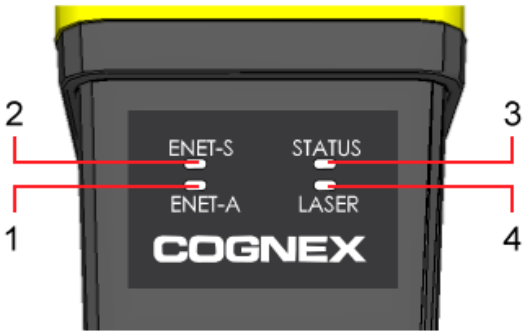


Component	Description
1	Status LEDs
2	Ethernet connector
3	24V DC power + I/O + Encoder connector
4	M6 mounting boss
5	M4 through-body mounting holes

Bottom View

Component	Description
1	High-accuracy planar mounting pins
2	Laser window ⚠ **CAUTION**: Avoid Exposure - Emits Laser Radiation
3	Camera window

System LEDs



Connector	Indicator	Description
1	Ethernet Link	Blinks when there is Ethernet activity on the link, or is off to indicate there is no link with the host.
2	Ethernet Link Status	Blinks in groups of three when a 1000 Mbps connection is established with the host.
3	Sensor Status	Blinks approximately every 5 seconds when the sensor is running normally.
4	Laser Enabled	Lights while the laser is triggered.

Installation

This section describes the connection of the vision controller to its standard and optional components. For a complete list of options and accessories, contact your Cognex sales representative.

Note: Cables are sold separately.

CAUTION: All cable connectors are “keyed” to fit the connectors on the vision controller; do not force the connections or damage may occur.

Mount the Vision Controller

The vision controller provides mounting holes for attachment to either a bottom or backside mounting surface.

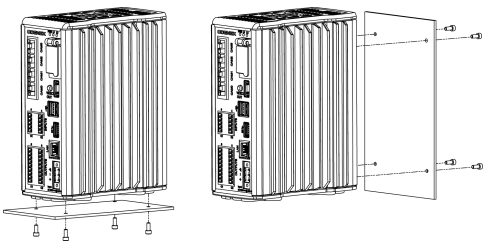
Note: The vision controller may be optionally mounted using the accessory wall mounting bracket (BKT-WALL-VC200-01) or to a 15mm DIN rail, using the accessory DIN rail mounting bracket (BKT-DIN-VC200-01).The DIN rail mounting bracket accessory is not suitable for a 7.5mm profile DIN rail. Please contact your Cognex sales representative for more information.

CAUTION:

- The vision controller must be mounted in a vertical orientation with the top of the controller up, and cannot be mounted in a horizontal orientation.
- To ensure sufficient ventilation, the vision controller must be mounted with sufficient clearance. If mounting to the bottom surface, 50mm of clearance is required above and on both sides of the vision controller. If mounting to the back surface or using the accessory wall mounting bracket or DIN rail mounting bracket, 24.5mm of clearance is required above, below and on both sides of the vision controller. If an adjacent device also produces heat, additional space or cooling is required if air space around the vision controller exceeds 45°C (113°F).
- Allow sufficient clearance and strain relief for wires and cables connected to the vision controller.

1. Drill the clearance holes for the mounting fasteners per the defined bolt pattern. The vision controller mounting hole screw thread is M4 x 0.7.
2. Align the holes on the mounting surface with the mounting holes on the vision controller.
3. Insert and tighten the mounting screws; the maximum torque is 2 Nm (18 in-lb).

   CAUTION: The length of the screws used depends on the depth of the mounting surface; thread engagement of the screws must be 8mm - 10mm.



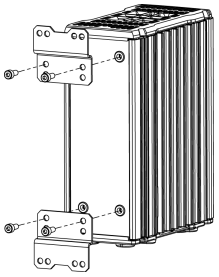
Use the Accessory Wall Mounting Brackets

The accessory wall mounting bracket kit (BKT-WALL-VC200-01) includes two wall mounting brackets and M4 screws (quantity 4) to secure the controller to a mounting surface.

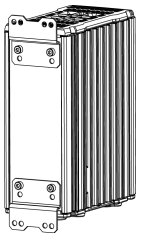
CAUTION:

- The vision controller must be mounted in a vertical orientation with the top of the controller up, and cannot be mounted in a horizontal orientation.
- To ensure sufficient ventilation, the vision controller must be mounted with sufficient clearance. If mounting to the bottom surface, 50mm of clearance is required above and on both sides of the vision controller. If mounting to the back surface or using the accessory wall mounting bracket or DIN rail mounting bracket, 24.5mm of clearance is required above, below and on both sides of the vision controller. If an adjacent device also produces heat, additional space or cooling is required if air space around the vision controller exceeds 45°C (113°F).
- Allow sufficient clearance and strain relief for wires and cables connected to the vision controller.

1. Align the holes on the wall mounting brackets with the mounting holes on the vision controller. The vision controller mounting hole screw thread is M4 x 0.7.



2. Insert the M4 screws into the mounting holes and tighten the screws using a 3mm hex wrench; the maximum torque is 2 Nm (18 in-lb).



Use the Accessory DIN Rail Mounting Bracket

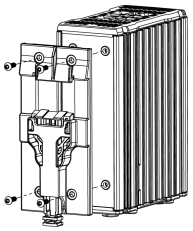
The accessory DIN rail mounting bracket kit (BKT-DIN-VC200-01) includes the DIN rail bracket and M4 screws (quantity 4) to secure the controller to a 35 x 15mm DIN rail.

Note: The DIN rail mounting bracket accessory is not suitable for a 7.5mm profile DIN rail.

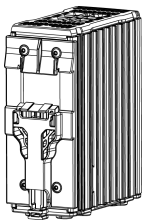
CAUTION:

- The vision controller must be mounted in a vertical orientation with the top of the controller up, and cannot be mounted in a horizontal orientation.
- To ensure sufficient ventilation, the vision controller must be mounted with sufficient clearance. If mounting to the bottom surface, 50mm of clearance is required above and on both sides of the vision controller. If mounting to the back surface or using the accessory wall mounting bracket or DIN rail mounting bracket, 24.5mm of clearance is required above, below and on both sides of the vision controller. If an adjacent device also produces heat, additional space or cooling is required if air space around the vision controller exceeds 45°C (113°F).
- Allow sufficient clearance and strain relief for wires and cables connected to the vision controller.

1. Align the holes on the DIN rail mounting bracket with the mounting holes on the vision controller. The vision controller mounting hole screw thread is M4 x 0.7.



2. Insert the M4 screws into the mounting holes and tighten the screws using a 2.5mm hex wrench; the maximum torque is 2 Nm (18 in-lb).



Install the Camera

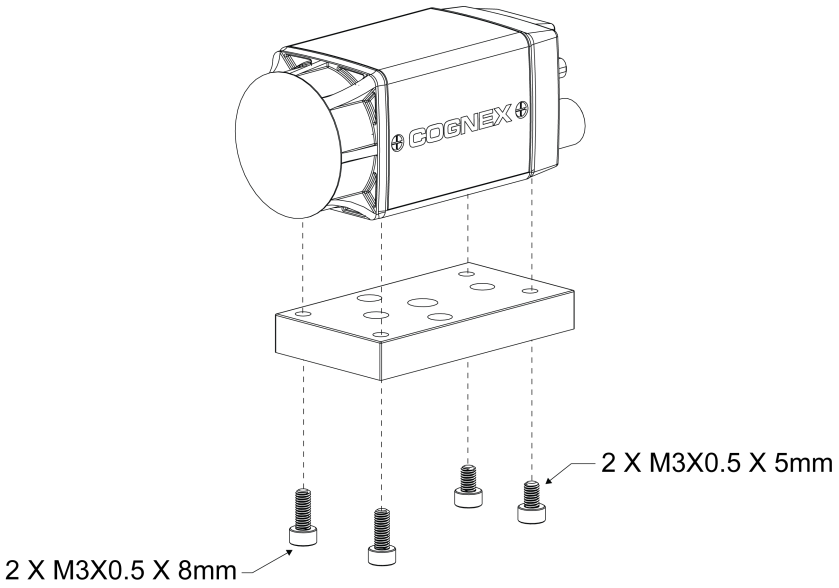
The following sections provide steps for installing the camera and connecting it to the vision controller.

Mount the Camera

Note:

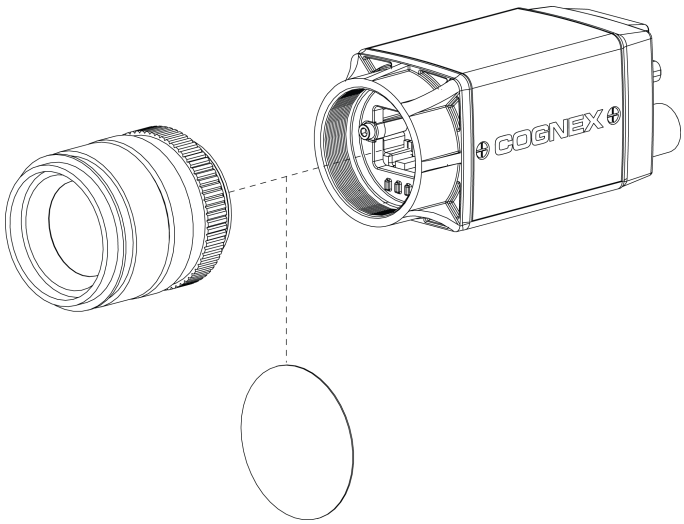
- For the mounting holes closest to the lens opening, the thread length of the M3 screw should not exceed 4.5mm. For the mounting holes closest to the connectors, the thread length of the M3 screw should not exceed 1.6mm. This does not include the thickness of the mounting material used. For more information, refer to *ISC-8402 Dimensions* on page 75 and *ISC-8405 Dimensions* on page 77.
- The accessory mounting kit includes a mounting block and M3 screws (quantity 4) for mounting the camera and securing it to a mounting surface. The mounting block also provides 1/4-20 and M6 mounting holes for attaching the camera to a mounting surface. For more information, refer to *ISC-8402 Dimensions (with Accessory Mounting Block)* on page 76 and *ISC-8405 Dimensions (with Accessory Mounting Block)* on page 78.
- It is recommended that the camera be grounded, either by mounting the camera to a fixture that is electrically grounded or by attaching a wire from the camera's mounting fixture to frame ground or Earth ground.

1. Align the holes on the mounting surface with the mounting holes on the camera.
2. Insert the M3 screws into the mounting holes and tighten using a 2.5mm hex wrench; the maximum torque is 0.3 Nm (2.5 in-lb).



Install the Lens

1. Remove the protective film covering the threaded lens opening, if present.
2. Attach a C-Mount lens to the camera. The exact lens focal length needed depends on the working distance and the field of view required for your machine vision application.



Connect the Breakout Cable (Optional)

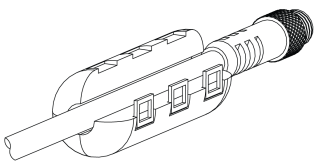
The camera's I/O connector provides access to the STROBE and COMMON lines on the camera.

Note:

- I/O wiring or adjustments to I/O devices should be performed when the camera is not receiving power.
- The Ethernet cable should be unplugged or the PoE source powered down before making adjustments to the connections at the far end of the Breakout cable.
- Unused bare wires can be clipped short or tied back using a tie made of non-conductive material.

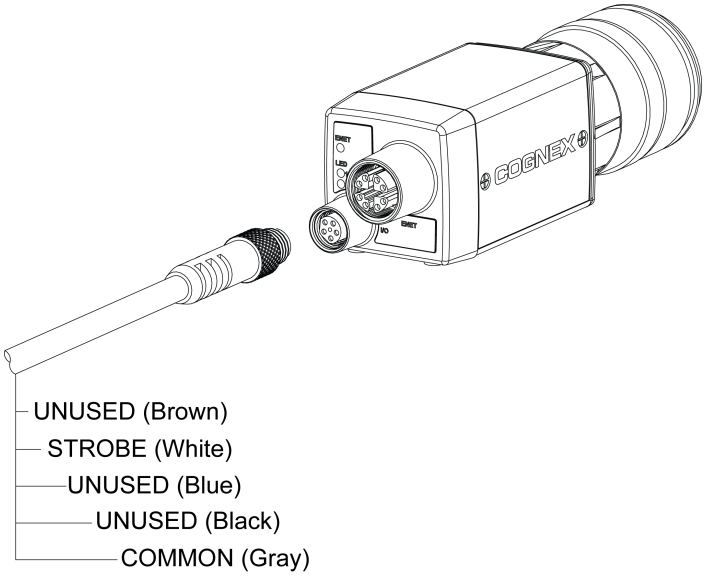
1. If installing the ISC-8405 camera, attach the ferrite around the Breakout cable, adjacent to the strain relief on the cable.

CAUTION: A ferrite is included with the ISC-8405 camera standard components. To reduce emissions, the ferrite must be attached to the Breakout cable.



2. Connect the Breakout cable's M8 connector to the camera's I/O connector.

3. Connect the STROBE (White) and COMMON (Gray) wires to a strobe device. For more information, refer to *Breakout Cable Specifications* on page 72.

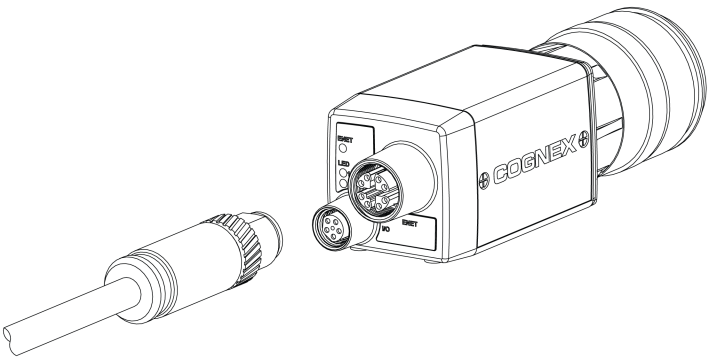


Connect the Ethernet Cable

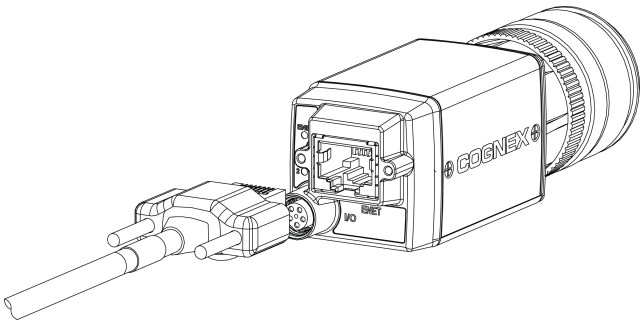
CAUTION:

- Cognex recommends only cold-plugging the camera; turn the vision controller power off when connecting or disconnecting the camera.
- The Ethernet cable must be shielded. For the ISC-8405 camera, Cognex strongly recommends Cat 6 or Cat 7 Ethernet cables with S/STP shielding.
- The Ethernet cable shield must be grounded at the far end.
- The vision controller's CAM ports provide Power over Ethernet (PoE) to supported Cognex devices; connecting other PoE devices to these ports could damage the vision controller or the PoE device.

1. Connect one end of the Ethernet cable to the camera's ENET connector.

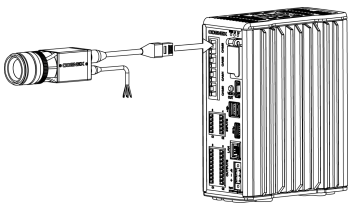


If installing the ISC-8405 camera and using a compatible horizontal screw-locking Ethernet cable, use a screw driver to tighten the connector screws until snug, to secure it to the camera. The screws must be tight to ensure a reliable connection.



2. Connect the other end of the cable to one of the vision controller's CAM ports.

Note: If using a vision controller that supports a two camera configuration, connect the camera Ethernet cables to the vision controller's CAM 0 and CAM 1 ports.



Install the DS900 Series Sensor

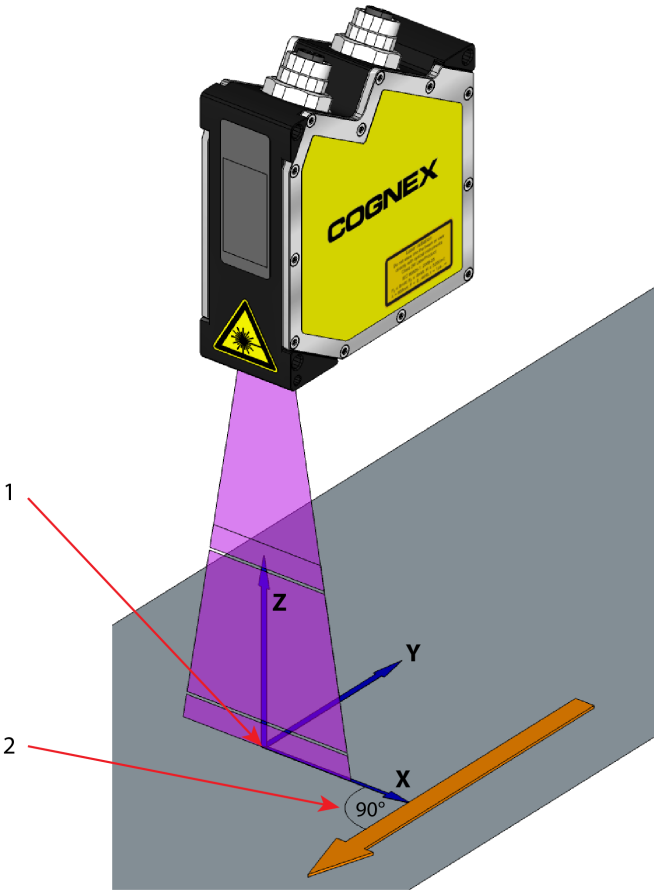
The following sections provide steps for installing the DS900 series sensor and connecting it to the vision controller.

Mount the DS900 Series Sensor

Firmly mount the sensor so that the laser is perpendicular to the motion of travel. The accuracy and reliability of your 3D images relies on the three-dimensional coordinate system defined by the position of the sensor and the movement of objects that pass within its view.

The device has three (3) threaded M5 holes and can be mounted using 2 or 3 of these holes, either as direct attachment points using M5 screws, or as through-holes accommodating M4 screws. One of the mounting holes is a 3mm diameter reference pin hole, provided to ensure accurate location of the unit during initial mounting or replacement. Refer to *DS910B Dimensions* on page 86 and *DS925B Dimensions* on page 87 for mounting dimensions and hole locations.

Note: The unit should be mounted such that the laser beam strikes the target surface at right angles. Misalignment of the unit can result in inaccurate measurements.



	Description
1	The origin of the X axis is the optical centerline of the sensor projected onto the Working Section.
2	For best results, movement should be perpendicular to the laser plane.

Connect the DS900 Series Sensor

The DS900 series sensor's Ethernet connector provides an Ethernet connection and Power over Ethernet (PoE) to the sensor. The sensor's multifunction port provides access to I/O connections.

CAUTION:

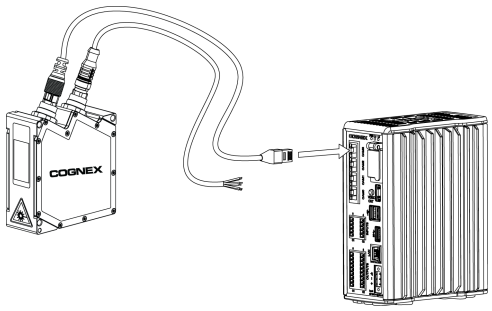
- Cognex recommends only cold-plugging the DS900 series sensor; turn the vision controller power off when connecting or disconnecting the DS900 series sensor.
- The vision controller's CAM ports provide Power over Ethernet (PoE) to supported Cognex devices; connecting other PoE devices to these ports could damage the vision controller or the PoE device.

1. Connect the Ethernet cable's M12 connector to the DS900 series sensor. Connect the cable's RJ-45 connector to one of the vision controller's CAM ports.

   Note: Your specific configuration and firmware version may support between 1 and 4 sensors. Regardless of how many sensors your device supports or how many sensors you connect, you should always connect the first sensor to port 0, the second sensor to port 1, and so on.

2. Optionally, connect the terminated end of the Multifunction cable to the DS900 series sensor's Multifunction port. Connect the I/O wires to the applicable I/O device. Refer to *Multifunction Port* on page 83 for wiring details.

   CAUTION: The Multifunction cable's PWR (Red) and GND (Blue) flying lead wires must not be connected to any external point or to each other.

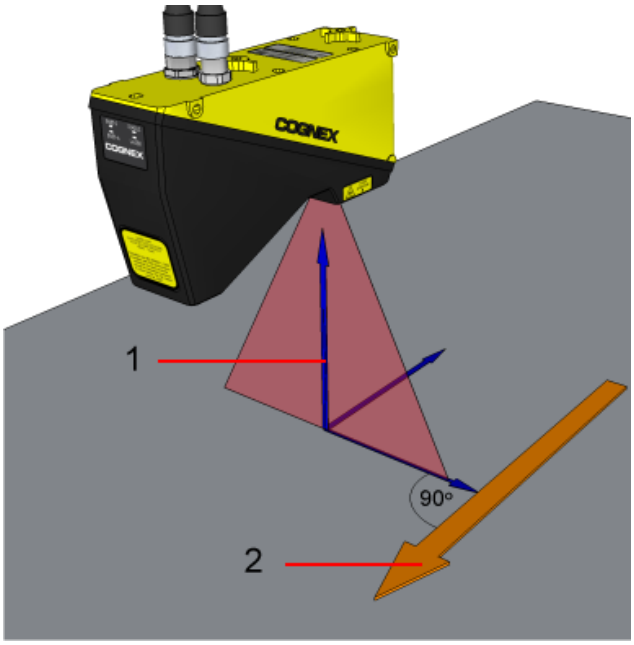


Install the DS1000 Series Sensor

The following sections provide steps for installing the DS1000 series sensor and connecting it to the vision controller.

Mount the DS1000 Series Sensor

Firmly mount the sensor so that the laser is perpendicular to the motion of travel. The accuracy and reliability of your 3D images relies on the three-dimensional coordinate system defined by the position of the sensor and the movement of objects that pass within its view.



Feature	Description
1	A three-dimensional coordinate system where the origin is at the center of the laser plane on the surface of movement.
2	For best results, movement should be perpendicular to the laser plane.

The sensor offers three mounting options:

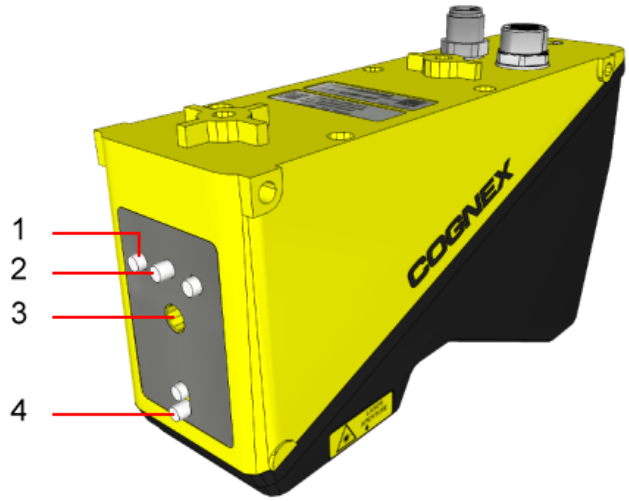
- Recommended: Attach the sensor to the DS1000 series high-accuracy mounting plate. Refer to *High-Accuracy Mounting* on page 48 for more information.
- Use the mounting bosses on the top of the device. Refer to *Top Mounting* on page 51 for more information.
- Use the mounting through-body holes on the side of the device. Refer to *Through-Body Mounting* on page 51 for more information.

High-Accuracy Mounting

The mounting plate (part number DS-MPHA-00) accessory offers the following advantages when anchoring your sensor to your production environment:

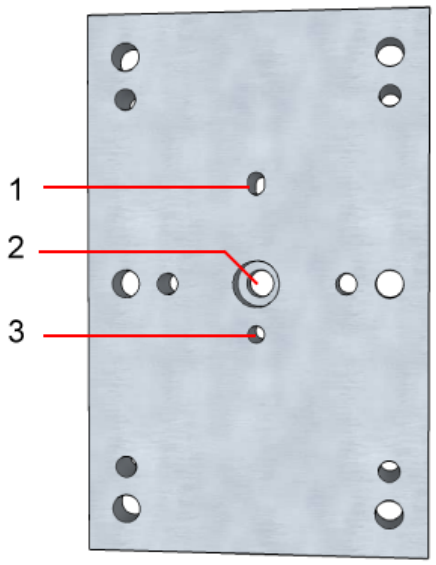
- The laser plane will always be parallel to the mounting plate.
- Removing and replacing a sensor requires fewer steps and allows you to mount a new sensor in exactly the same position as the previous unit.

Be aware of the following mounting features for use with the mounting plate:



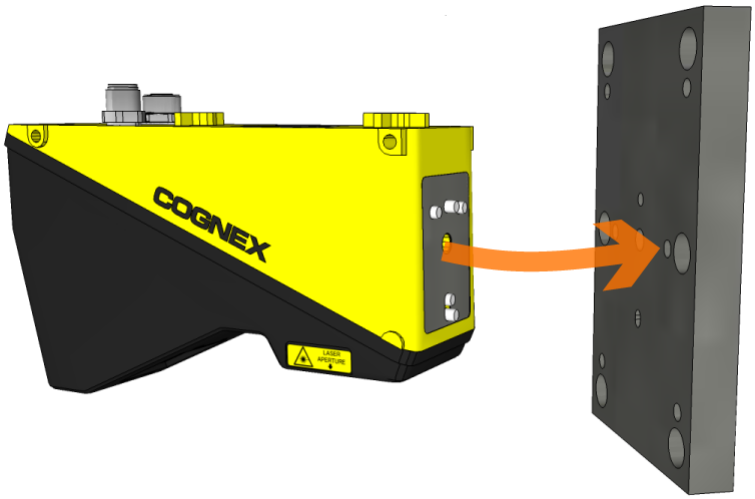
Feature	Description	Usage
1	Plane Pins (3 total)	Ensures that the laser plane is parallel to the mounting plate.
2	Location Pin	Constrains the rotation of the sensor around the Master Pin.
3	M6 screw thread	
4	Master Pin	

The mounting plate supports the corresponding holes:

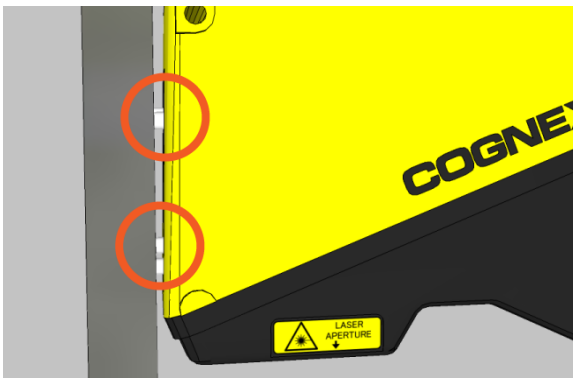


Feature	Description
1	Hole for Location Pin
2	Through-hole for M6 screw
3	Hole for Master Pin

1. Align the Master Pin, the Location Pin and the through-hole for the M6 screw with the holes in the mounting plate.

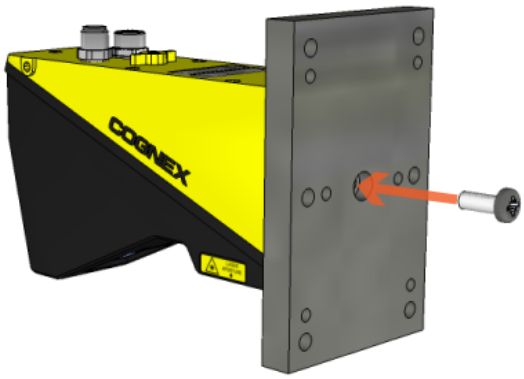


2. Confirm the three plane pins make contact with the mounting plate.

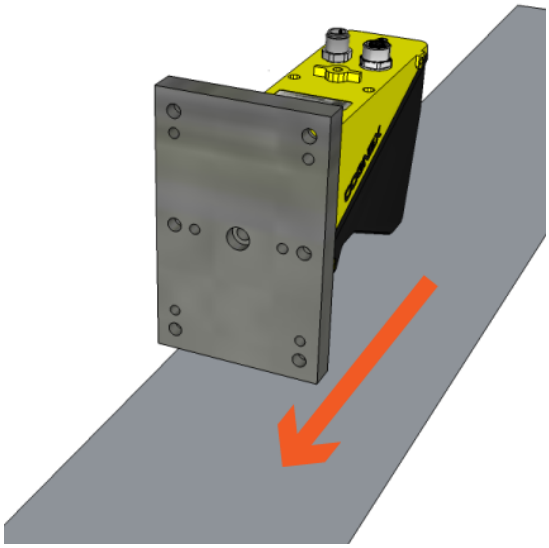


3. Insert and tighten the M6 screw.

CAUTION: Observe torque limit: 2.2 Nm (19 Lb-In).



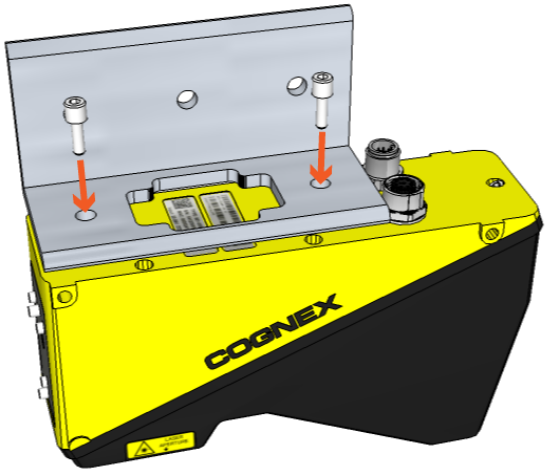
4. Mount the plate perpendicular to the direction of moment of the objects to be inspected.



Top Mounting

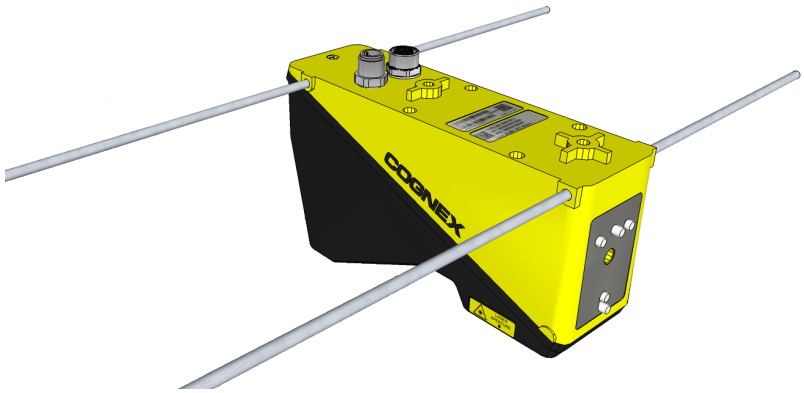
Align the top-mounting bracket (DS-BKT-000) with the mounting bosses on top of the device, and attach the bracket with the M6 screws.

CAUTION: Observe torque limit: 2.2 Nm (19 Lb-In).



Through-Body Mounting

To mount your sensor using the through-body mounting option, insert rods or appropriate hardware through the sensor unit and use a clamping mechanism to prevent the sensor from shifting during operation.



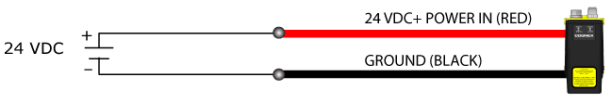
Connect the DS1000 Series Sensor

The sensor's 24VDC Power + I/O + Encoder connector provides access to power and I/O connections. The DS1000 series sensor's Ethernet connector provides an Ethernet connection to the DS1000 sensor.

CAUTION:

- Cognex recommends only cold-plugging the DS1000 series sensor; turn the DS1000 sensor and vision controller power off when connecting or disconnecting the DS1000 series sensor.
- The vision controller's CAM ports provide Power over Ethernet (PoE) to supported Cognex devices; connecting other PoE devices to these ports could damage the vision controller or the PoE device.

1. Verify that the DS1000 power supply is unplugged and not receiving power. Attach the Power and I/O Breakout cable's +24VDC (Red wire) and GND (Black wire) to the corresponding terminals on the power supply. Refer to *Power and I/O Cable Specifications* on page 94 for wiring details.



CAUTION:

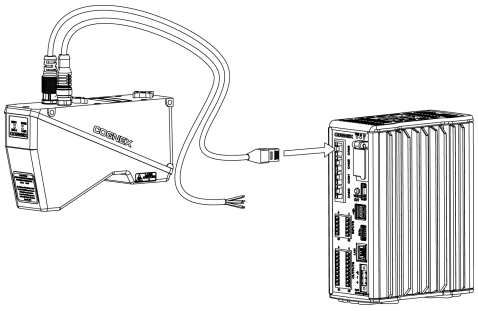
- Use a listed power supply with an output rated 24VDC, at least 500 mA, and marked Class 2, Limited Power Source (LPS). Any other voltage creates a risk of fire or shock and can damage the sensor.
- Connect the cable or connector shield to earth ground.

Note:

- Pins 1, 2, 3, and 4 may be used for an encoder connection. The configuration that you set for your sensor using the Cognex software determines how those lines are used.
- Cognex recommends unused encoder connections be tied to ground. If encoder signal inputs are left unconnected and your Cognex software is configured to use an encoder, the behavior of the encoder counter is undetermined.

2. Connect the Power and I/O cable's M12 connector to the DS1000 series sensor.
3. Connect the Ethernet cable's M12 connector to the DS1000 series sensor. Connect the cable's RJ-45 connector to one of the vision controller's CAM ports.

Note: Your specific configuration and firmware version may support between 1 and 4 sensors. Regardless of how many sensors your device supports or how many sensors you connect, you should always connect the first sensor to port 0, the second sensor to port 1, and so on.



5.

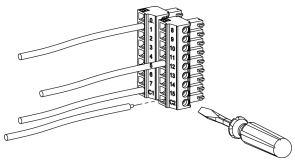
Connect the INPUTS and OUTPUTS Terminal Blocks

The vision controller is shipped with four terminal blocks for connecting inputs and outputs.

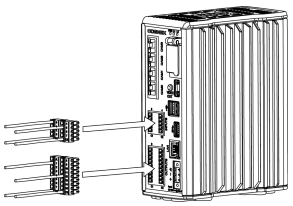
Note:

- It is recommended that all terminal blocks be installed to the vision controller, even if no devices are wired to the terminal block connectors. For ease of installation, the terminal block connectors on the vision controller are labeled to match the labels on the corresponding terminal blocks.
- I/O wiring or adjustments to I/O devices should be performed when the vision controller is not receiving power.
- If an input or output terminal row is not used, the COMMON connection for the terminal row should be connected to frame ground.

1. Determine how I/O devices will be connected to the vision controller's INPUTS and OUTPUTS terminals. Refer to *Wire Inputs and Outputs* on page 96 for common wiring configurations.
2. Use a screwdriver to loosen the wire retention screws on the terminal blocks.
3. Insert the input and output wires (16 - 26 AWG, solid or stranded wire) into the terminals. Refer to *INPUTS Terminal Block Assignments* on page 64 and *OUTPUTS Terminal Block Assignments* on page 65 for terminal block pin assignments.



4. Tighten the wire retention screws to secure the wire leads in the terminal block; the maximum torque is 0.25 Nm (2.2 in-lb).
5. Insert the terminal blocks into the corresponding INPUTS and OUTPUTS terminal block connectors on the vision controller, and push in until firmly seated.

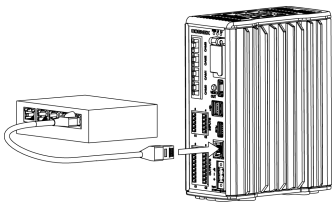


6. Connect the other end of the input and output wires to the applicable I/O device.

Connect to an Ethernet Network

Connect one end of the 10/100/1000 RJ-45 Ethernet cable into the vision controller's LAN port. Connect the other end of the cable to an Ethernet network adapter or switch, as applicable.

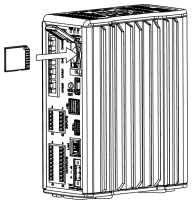
Note: To avoid electromagnetic interference, the Ethernet cable must be shielded. Cognex strongly recommends CAT5E Ethernet cables with S/STP shielding.



Insert the SD Card (Optional)

Note: SD cards should be USH-I or USH-II and formatted with a FAT32 file system.

1. Lift the hinged door covering the SD card slot.
2. Insert the SD card into the SD card slot, ensuring the card is properly oriented.

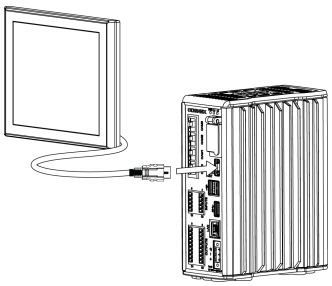


Connect to a Display (Optional)

CAUTION: Cognex recommends only cold-plugging the HDMI cable and display; turn the vision controller power off when connecting or disconnecting the HDMI cable.

Note: To avoid electromagnetic interference, the HDMI cable must be shielded. A shielded Cognex accessory HDMI cable (P/N 300-10006-xR) is available for purchase separately.

1. Connect a locking HDMI cable to the vision controller's VIDEO OUT port and tighten the thumb screw to secure it to the vision controller.
2. Connect the other end of the cable to the display.



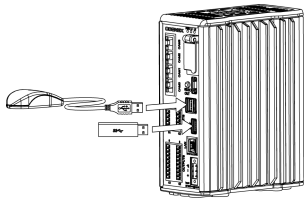
Connect USB Devices (Optional)

If connecting a USB mouse, keyboard or storage device to the vision controller, connect the USB device to one of the vision controller's USB ports.

CAUTION: Cognex recommends only cold-plugging USB devices; turn the vision controller power off when connecting or disconnecting USB devices.

Note:

- When using the vision controller in an electrically noisy environment, it is important to use USB devices that are rated for industrial use in the same environment. Most commercially available USB devices are rated for home use but are not designed for, or rated for, use in industrial environments. The use of peripherals not fully rated for the environment of use can result in impaired system immunity to nearby electrical noise.
- USB drives should be formatted with a FAT32 file system.



Connect the 24VDC Power Supply

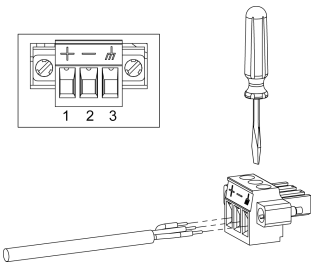
The vision controller is shipped with a 24VDC power connector.

Note:

- A DIN rail-mountable power supply accessory is available. Please contact your Cognex sales representative for more information.
- If using a power supply with a ground terminal, the terminal must be connected to earth ground. If using a DIN rail-mounted power supply, the power supply must be mounted to an earth-grounded DIN rail. Wire and connections must be in accordance with these instructions, the National Electrical Code and applicable national and local wiring standards and rules.

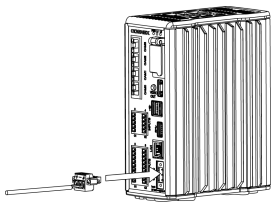
1. Verify that the 24VDC power supply being used is unplugged and not receiving power.
2. Use a screwdriver to loosen the wire retention screws on the 24VDC power connector.

3. Insert the power supply's +24VDC (Power) wire to Pin 1 and the -24VDC (Return) wire to Pin 2 on the power connector. Connect a frame ground wire from Pin 3 to frame ground. Recommended wiring is 14 - 18 AWG, solid or stranded wire. Refer to *24VDC Power Connector Terminal Assignments* on page 66 for terminal pin assignments.



CAUTION: Do not connect AC power directly to the vision controller's power connector. Connecting AC power will damage the vision controller.

4. Tighten the wire retention screws to secure the wire leads in the terminals; the maximum torque is 0.6 Nm (5.3 in-lb).
5. Insert the power connector into the vision controller's 24VDC power port. Tighten the connector screws to secure it to the vision controller.



6. Restore power to the 24VDC power supply and turn it on if necessary.

Vision Controller Specifications

Specifications	Vision Controller
Supported Cognex Devices	ISC-8402 and ISC-8405 cameras.
Program Memory	8GB non-volatile flash memory. Unlimited storage via remote network device.
Image Processing Memory	2GB SDRAM.
Cooling System	Fanless Design.
Inputs	8 optically isolated discrete inputs.
Outputs	16 optically isolated discrete outputs.
CAM Ports[1]	4 RJ-45 dedicated Ethernet ports for connecting directly to supported Cognex devices, additionally supplying power to Cognex industrial cameras and sensors that support Power over Ethernet (PoE).
LAN Port[2]	1 RJ-45 Ethernet port, 10/100/1000 BaseT with auto MDIX. IEEE 802.3 TCP/IP Protocol. Dedicated port for connecting to wide area network.
USB Ports[3]	1 host USB 3.0 port (5 Gb/sec.) and 2 host USB 2.0 ports (480 Mb/sec.) ports for connecting mouse, keyboard or storage device. USB drives should be formatted with a FAT32 file system.
SD Card Slot	1 SD card slot for saving images, run time files and results. SD cards should be USH-I or USH-II and formatted with a FAT32 file system.
VIDEO OUT Port	1 locking HDMI port that provides connection to a display device.
I/O Terminal Connectors	16 - 26 AWG, solid or stranded wire. Torque 0.25 Nm (2.2 in-lb).
24VDC Power Connector	14 - 18 AWG, solid or stranded wire. Torque 0.6 Nm (5.3 in-lb).
Status LEDs	PWR LED, LED 1, LED 2
Housing	Aluminum, steel sheet metal, injection-molded housing.
Mounting	Four bottom and four backside M4 x 0.7 threaded mounting holes. The vision controller may be optionally mounted using the accessory wall mounting bracket (BKT-WALL-VC200-01) or to a 35 x 15mm DIN rail, using the accessory DIN rail mounting bracket (BKT-DIN-VC200-01).
Dimensions	178.8mm (7.04in) x 142.1mm (5.59in) x 75.1mm (2.96in)
Weight	1.45 kg (3.2 lb)
Current	3.5A (maximum)
Voltage	24VDC ±10%
Power Consumption	84W (maximum)
Operating Temperature[4]	0°C to 45°C (32°F to 113°F)

[1] To ensure reliable communication using 1000 BaseT operation, the Ethernet cable must not exceed 100 meters.

[2] To ensure reliable communication using 1000 BaseT operation, the Ethernet cable must not exceed 100 meters.

[3] Maximum USB port speeds are listed. Actual speeds are dependent on the USB device, which are typically lower.

[4] To ensure sufficient ventilation, the vision controller must be mounted with sufficient clearance. If mounting to the bottom surface, 50mm of clearance is required above and on both sides of the vision controller. If mounting to the back surface or using the accessory wall mounting bracket or DIN rail mounting bracket, 24.5mm of clearance is required above, below and on both sides of the vision controller. If an adjacent device also produces heat, additional space or cooling is required if air space around the vision controller exceeds 45°C (113°F).

Specifications	Vision Controller
Storage Temperature	-30°C to 80°C (-22°F to 176°F)
Humidity	10% - 85%, non-condensing (Operating and Storage)
Altitude	2,000m (6565ft)
Protection	IP30
Shock (Storage and Shipment)	30 G, per IEC 60068-2-7EA.
Vibration (Storage and Shipment)	2 G, 2 hrs/axis (10-500 Hz) per IEC 60068-2-6, FC.
Regulatory Compliance	CE, FCC, KCC, TÜV SÜD NRTL, RoHS

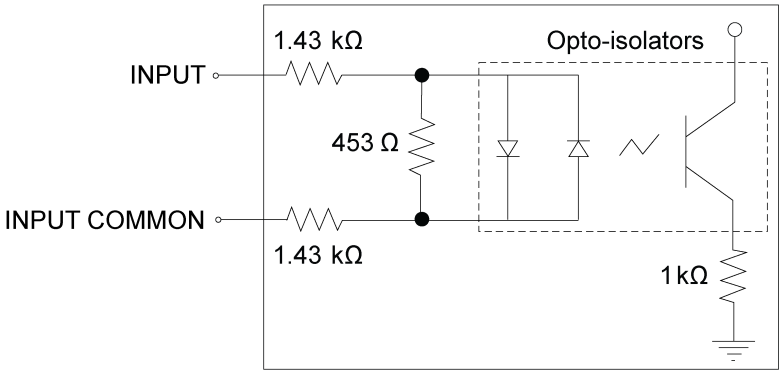
Inputs

The vision controller features eight independent inputs (INPUTS 0 - 7), which can be used to trigger vision controller events. The inputs are optically isolated and typically connected (directly or indirectly) to a PLC or photoelectric sensor. The vision controller will respond to an event when the voltage difference between the INPUT and INPUT COMMON exceeds 10VDC. Refer to *Wire Inputs and Outputs* on page 96 for common wiring configurations.

Note:

- There are two input terminal rows. INPUTS 0 - 3 share the COMMON 1 connection and INPUTS 4 - 7 share the COMMON 2 connection. Therefore the input devices for each terminal row must be the same; either current sinking or current sourcing.
- To maintain optical isolation of the I/O lines, the devices connected to these lines must not be connected to the same power supply as the vision controller. If they are connected to, or share a ground with, the same power supply, they may still function but will no longer be optically isolated.

Specification	Description
Input Voltage Limit	24VDC
Voltage	Input ON: >10VDC Input OFF: < 2VDC
Current	Input ON: > 6mA Input OFF: < 1.5mA Each line is optically isolated and polarity-independent.



24VDC Max. across input pins - transition approx. 10VDC (Nom.)

Outputs

The vision controller features sixteen independent outputs (OUTPUTS 0 -15), which are optically isolated.

- OUTPUTS 0 - 7 provide up to 50mA current (maximum). These outputs are typically connected (directly or indirectly) to an input, such as a trigger input or PLC input.
- OUTPUTS 8 - 15 provide up to 100mA of current (maximum). These outputs are typically connected (directly or indirectly) to a load, such as a relay, indicator light or reject mechanism.

Refer to *Wire Inputs and Outputs* on page 96 for common wiring configurations.

Note:

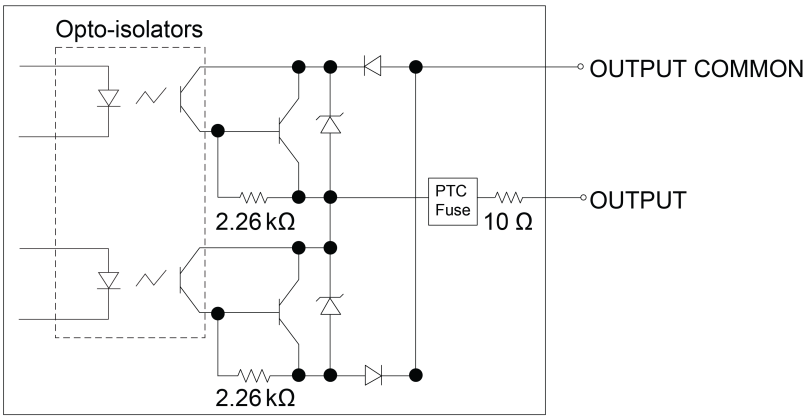
- There are two output terminal rows. OUTPUTS 0 - 7 share the COMMON 1 connection and OUTPUTS 8 - 15 share the COMMON 2 connection. Therefore the output devices for each terminal row must be the same; either current sinking or current sourcing.
- To maintain optical isolation of the I/O lines, the devices connected to these lines must not be connected to the same power supply as the vision controller. If they are connected to, or share a ground with, the same power supply, they may still function but will no longer be optically isolated.

OUTPUTS 0 - 7 Specifications:

Specification	Description
Voltage	24VDC maximum between an output and output common.
Current	50mA maximum. Each line protected against over-current, short circuit and reverse polarity.
Maximum Voltage Drop	3VDC @ 50mA
Delay[1]	25µs (maximum due to opto-isolators turning ON)

OUTPUTS 8 - 15 Specifications:

Specification	Description
Voltage	24VDC maximum between an output and output common.
Current	100mA maximum. Each line protected against over-current, short circuit and reverse polarity.
Maximum Voltage Drop	3.5VDC @ 100mA
Delay[2]	25µs (maximum due to opto-isolators turning ON)



[1] Delay when opto-isolators turn OFF depends on the load to which the output is connected. With a 1K load, the maximum delay will be 500 µs.

[2] Delay when opto-isolators turn OFF depends on the load to which the output is connected. With a 1K load, the maximum delay will be 500 µs.

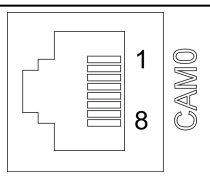
Port and Terminal Block Specifications

The following sections provide specifications for the vision controller's ports and terminal blocks.

CAM Ports

The four CAM ports (CAM 0 - CAM 3) are RJ-45 ports that provide Ethernet connectivity to In-Sight cameras, DS900 sensors and DS1000 sensors. These ports also provide power to the Cognex industrial devices that support Power over Ethernet (PoE).

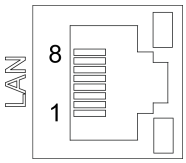
CAUTION: The vision controller's CAM ports provide Power over Ethernet (PoE) to supported Cognex devices; connecting other PoE devices to these ports could damage the vision controller or the PoE device.



Pin Number	Signal Name
1	TxRx A +
2	TxRx A -
3	TxRx B +
4	TxRx C +
5	TxRx C -
6	TxRx B -
7	TxRx D +
8	TxRx D -

LAN Port

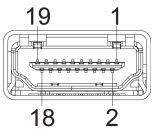
The LAN port is a 10/100/1000 RJ-45 Ethernet port that is used to connect the vision controller to an Ethernet network.



Pin Number	Signal Name
1	TxRx A +
2	TxRx A -
3	TxRx B +
4	TxRx C +
5	TxRx C -
6	TxRx B -
7	TxRx D +
8	TxRx D -

VIDEO OUT Port

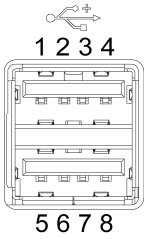
The VIDEO OUT port is a locking HDMI port that provides connection to a display device.



Pin Number	Signal Name
1	D2 +
2	D2 - Shield
3	D2 -
4	D1 +
5	D1 - Shield
6	D1 -
7	D0 +
8	D0 - Shield
9	D0 -
10	CLK +
11	CLK Shield
12	CLK -
13	CEC
14	RSVD
15	I2C_SCL
16	I2C_SDA
17	DDC_CEC GND
18	+5VDC
19	HOT_PLUG

USB 2.0 Ports

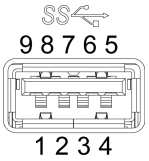
The two USB 2.0 ports can be used to connect mouse, keyboard or mass storage device.



Pin Number	Signal Name
1	VCC
2	D -
3	D +
4	GND
5	VCC
6	D -
7	D +
8	GND

USB 3.0 Port

The USB 3.0 port can be used to connect mouse, keyboard or mass storage device.

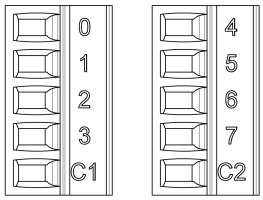


Pin Number	Signal Name
1	VBUS
2	D -
3	D +
4	GND
5	SSRx -
6	SSRx +
7	GND
8	SSTx -
9	SSTx +

INPUTS Terminal Block Assignments

The INPUTS terminal blocks provide access to a total of 8 inputs and 2 common connections. Recommended wiring is 16 - 26 AWG, solid or stranded wire.

CAUTION: The maximum torque that can be applied to the I/O terminal connectors is 0.25 Nm (2.2 in-lb). Applying torque above this limit can damage the connectors.

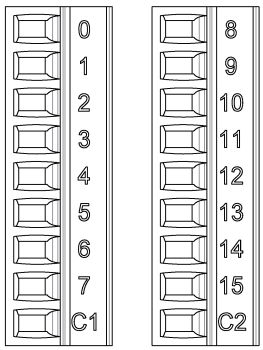


Pin Label	Signal Name
0	INPUT 0
1	INPUT 1
2	INPUT 2
3	INPUT 3
C1	INPUT COMMON 1
4	INPUT 4
5	INPUT 5
6	INPUT 6
7	INPUT 7
C2	INPUT COMMON 2

OUTPUTS Terminal Block Assignments

The OUTPUTS terminal blocks provide access to a total of 16 outputs and 2 common connections. Recommended wiring is 16 - 26 AWG, solid or stranded wire.

CAUTION: The maximum torque that can be applied to the I/O terminal connectors is 0.25 Nm (2.2 in-lb). Applying torque above this limit can damage the connectors.

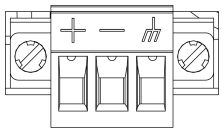


Pin Label	Signal Name
0	OUTPUT 0
1	OUTPUT 1
2	OUTPUT 2
3	OUTPUT 3
4	OUTPUT 4
5	OUTPUT 5
6	OUTPUT 6
7	OUTPUT 7
C1	OUTPUT COMMON 1
8	OUTPUT 8
9	OUTPUT 9
10	OUTPUT 10
11	OUTPUT 11
12	OUTPUT 12
13	OUTPUT 13
14	OUTPUT 14
15	OUTPUT 15
C2	OUTPUT COMMON 2

24VDC Power Connector Terminal Assignments

The 24VDC power connector is used to connect an external power supply to the vision controller. Recommended wiring is 14 - 18 AWG, solid or stranded wire.

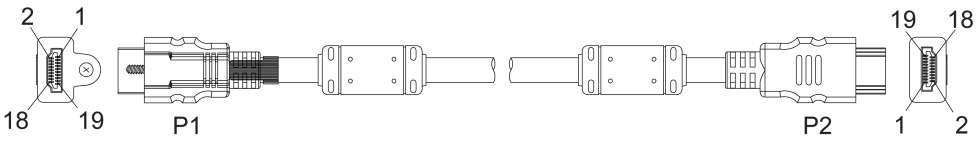
CAUTION: The maximum torque that can be applied to the 24VDC power connector is 0.6 Nm (5.3 in-lb). Applying torque above this limit can damage the connector.



Pin Number	Signal Name
1	+24VDC (POWER)
2	-24VDC (RETURN)
3	FRAME GROUND

HDMI Cable Specifications

The shielded HDMI cable provides connection to a display device.



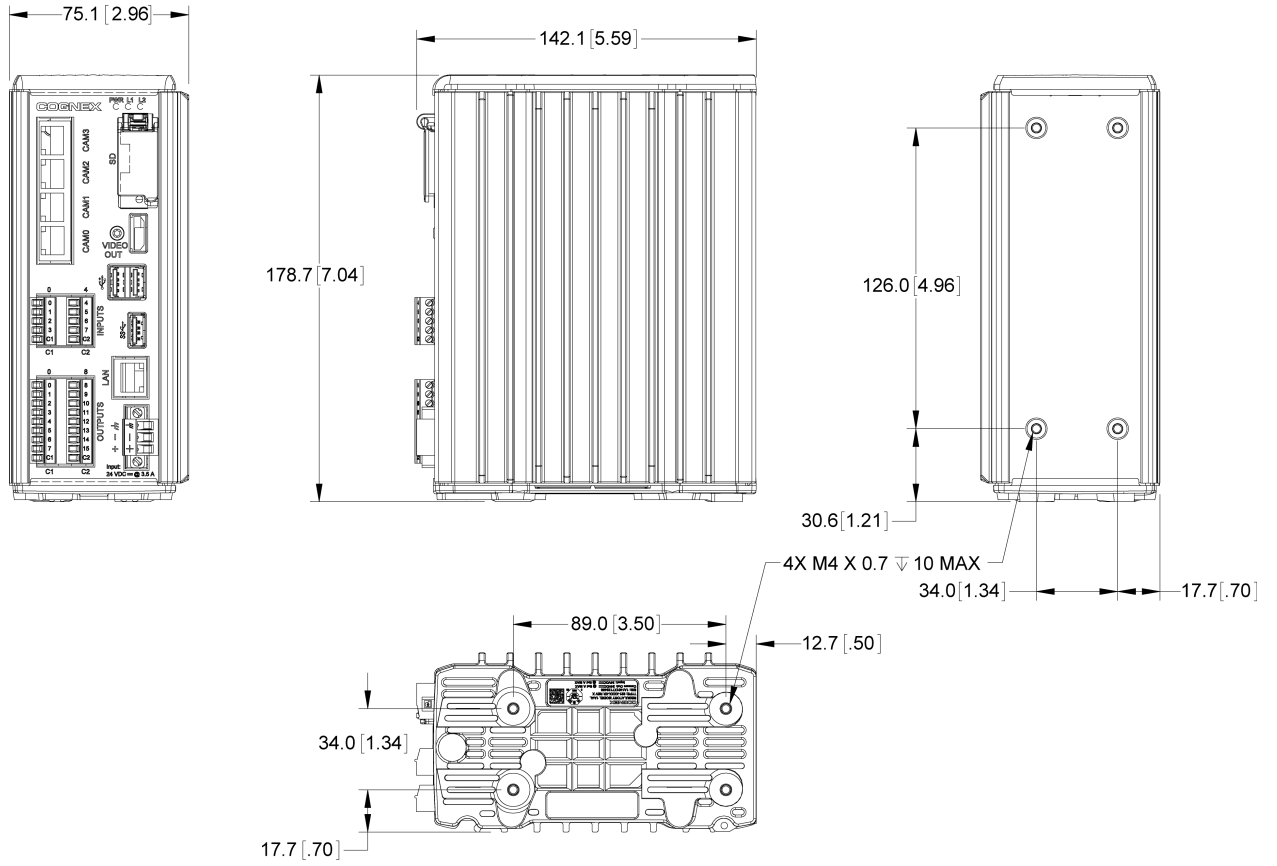
P1 Pin Number	Signal	Wire Color	P2 Pin Number
1	D2 +	White	1
3	D2 -	Brown	3
2	D2 - Shield	Drain	2
4	D1 +	White	4
6	D1 -	Red	6
5	D1 - Shield	Drain	5
7	D0 +	White	7
9	D0 -	Green	9
8	D0 - Shield	Drain	8
10	CLK +	White	10
12	CLK -	Blue	12
11	CLK Shield	Drain	11
13	CEC	Red	13
15	I2C_SCL	White	15
16	I2C_SDA	Black	16
18	+5VDC	Violet	18
14	RSVD	White	14
19	HOT_PLUG	Orange	19
17	DDC_CEC GND	Drain	17
Shell	N/A	Drain	Shell

Note: Cables are sold separately.

Vision Controller Dimensions

Note:

- All dimensions are in millimeters [inches] and are for reference purposes only.
- All specifications are for reference purpose only and may be changed without notice.



In-Sight Camera Specifications

Specifications	ISC-8402	ISC-8405
Image Processing Memory	512MB SDRAM	
Sensor Type	1/1.8 inch CMOS, global shutter	1/2.5 inch CMOS, rolling shutter
Sensor Properties	9mm diagonal, 4.5 x 4.5µm sq. pixels	7.13mm diagonal, 2.2 x 2.2µm sq. pixels
Maximum Resolution (pixels)[1]	1600 x 1200	2592 x 1944
Electronic Shutter Speed	20µs to 940ms	32µs to 1000ms
Acquisition	Rapid reset, progressive scan, full-frame integration.	
Bit Depth	256 grey levels (8 bits/pixel).	
Lens Type	C-Mount	
Discrete Inputs	None.	
Discrete Outputs	1 strobe output line.	
Status LEDs	Network, 2 user-configurable.	
Network Communication	1 Ethernet port, 10/100/1000 BaseT with auto MDIX. IEEE 802.3af TCP/IP Protocol.	
Serial Communication	None.	
Power	Class 2 Power over Ethernet (PoE) device.	
Power Type	PoE Type A and Type B.	
Power Consumption	6.49 W maximum per Class 2 PoE.	
Current	Per Class 2 PoE requirements.	
Voltage	48VDC nominal, applied from a Class 2 PoE device, which is typically powered from some other voltage.	
Material	Die-cast zinc housing.	
Finish	Painted.	
Mounting	Four M3 threaded mounting holes (1/4-20 and M6 mounting holes also available on accessory mounting block).	
Dimensions	31.0mm (1.22in) x 31.2mm (1.23in) x 75.1mm (2.96in) without accessory mounting block. 39.0mm (1.54in) 31.2mm (1.23in) x 75.1mm (2.96in) with accessory mounting block.	31.0mm (1.22in) x 31.2mm (1.23in) x 71.6mm (2.82in) without accessory mounting block. 39.0mm (1.54in) x 31.2mm (1.23in) x 71.6mm (2.82in) with accessory mounting block.
Weight	132.2 g (4.66 oz.) without accessory mounting block. 163.2 g (5.76 oz.) with accessory mounting block.	78 g (2.75 oz.) without accessory mounting block. 109 g (3.84 oz.) with accessory mounting block.
Case Temperature[2]	0°C to 50°C (32°F to 122°F)	
Storage Temperature	-20°C to 80°C (-4°F to 176°F)	
Humidity	< 80% non-condensing	

[1] The number of image sensor rows are configurable and can be set within the In-Sight VC Explorer. Decreasing the number of rows will increase the number of frames per second acquired by the camera. Refer to the *In-Sight® VC Explorer User Guide* for more information.

[2] Case temperature can be verified using the camera's Temperature property within In-Sight VC Explorer, which displays the camera's internal temperature in degrees Celsius. The internal temperature will be ±5 degrees above the camera case temperature. Refer to the *In-Sight® VC Explorer User Guide* for more information. Additional cooling measures are required if the case temperature cannot be kept below 50°C. Examples of such measures include: mounting the camera to a heat sink using the M3 mounting screws, reducing the ambient temperature and ensuring there is air flow over the camera.

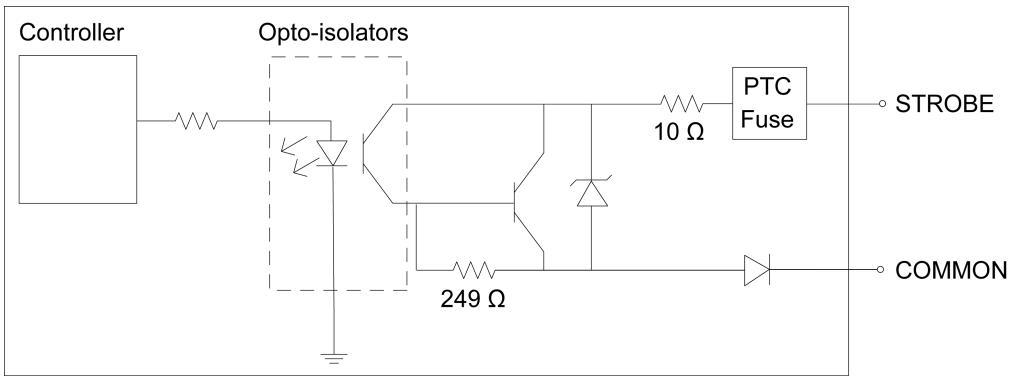
Specifications	ISC-8402	ISC-8405
Protection	IP40 with cables and lens attached.	IP30 with cables and lens attached.
Shock (Shipping and Storage)	IEC 60068-2-27: 18 shocks (3 shocks in each polarity in each (X, Y, Z) axis) 80 Gs (800m/s^2 at 11ms, half-sinusoidal)	
Vibration (Shipping and Storage)	IEC 60068-2-6: vibration test in each of the three main axis for 2 hours @ 10 Gs (10 to 500 Hz at 100m/s^2 / 15mm)	
Regulations/Conformity	CE, FCC, KCC, TÜV SÜD NRTL, RoHS	

Strobe Output

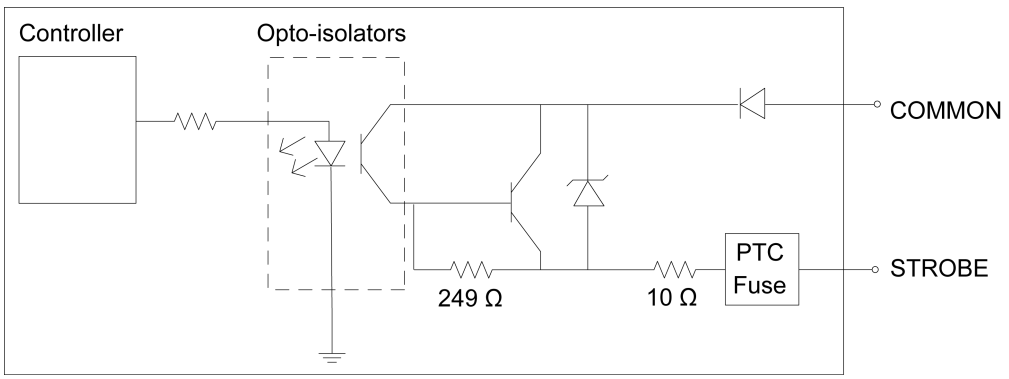
The camera features one built-in strobe output, which is optically isolated. The strobe output can be used as either an NPN (current sinking) or PNP (current sourcing) line.

Specification	Description
Voltage	28VDC maximum through external load.
Current	100mA maximum sink current.
	OFF state leakage current 100µA maximum.
	External load resistance 240 Ohms to 10 kOhms.
	Maximum 100mA, protected against over-current, short circuit and transients from switching inductive loads. High current inductive loads require an external protection diode.
Delay[1]	30µs (maximum due to opto-isolators turning ON).

For NPN lines, the external load should be connected between the STROBE output and the positive supply voltage (+24VDC nominal). COMMON should be connected to the negative supply voltage (0VDC). The STROBE output pulls down to less than 3VDC when ON, which causes current to flow through the load. When the STROBE output is OFF, no current flows through the load.



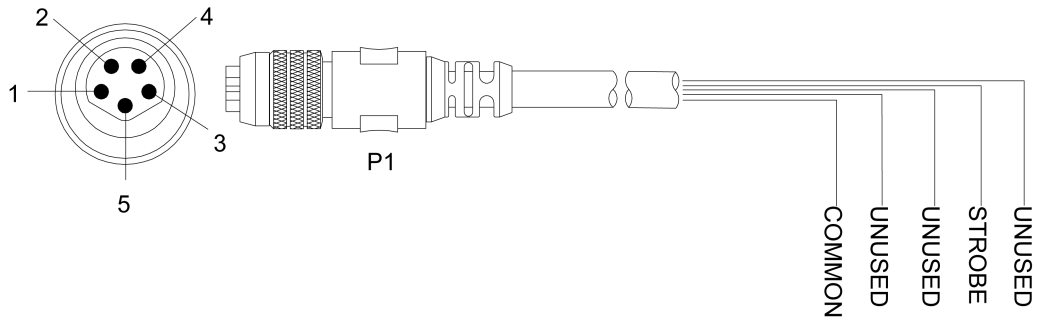
For PNP lines, the external load should be connected between the STROBE output and the negative supply voltage (0VDC). When COMMON is connected to the positive supply voltage (+24VDC nominal), the STROBE output pulls up to greater than 21VDC when ON, and current flows through the load. When the STROBE output is OFF, no current flows through the load.



[1] Delay when opto-isolators turn OFF depends on the load to which the output is connected. With a 240 Ohm load, the maximum delay will be 35µs.

Breakout Cable Specifications

The camera's Breakout cable can be connected to a strobe light. The Breakout cable is not terminated.



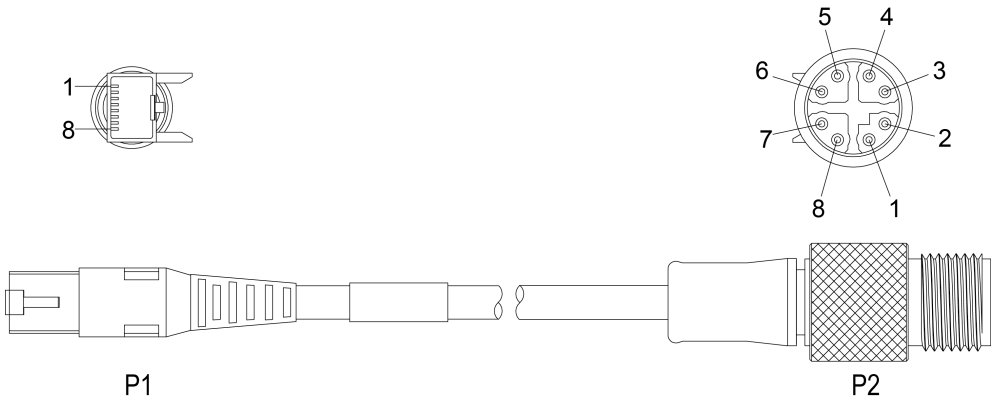
P1 Pin Number	Signal	Wire Color
1	UNUSED	Brown
2	STROBE	White
3	UNUSED	Blue
4	UNUSED	Black
5	COMMON	Gray

Note:

- Cables are sold separately.
- Unused bare wires can be clipped short or tied back using a tie made of non-conductive material.

Ethernet Cable Specifications (ISC-8402)

The Ethernet cable provides Ethernet connectivity and supplies power to the camera.



P1 Pin Number	Wire Color	Signal Name	P2 Pin Number
1	White/Orange	TxRx A +	1
2	Orange	TxRx A -	2
3	White/Green	TxRx B +	3
4	Blue	TxRx C +	8
5	White/Blue	TxRx C -	7
6	Green	TxRx B -	4
7	White/Brown	TxRx D +	5
8	Brown	TxRx D -	6

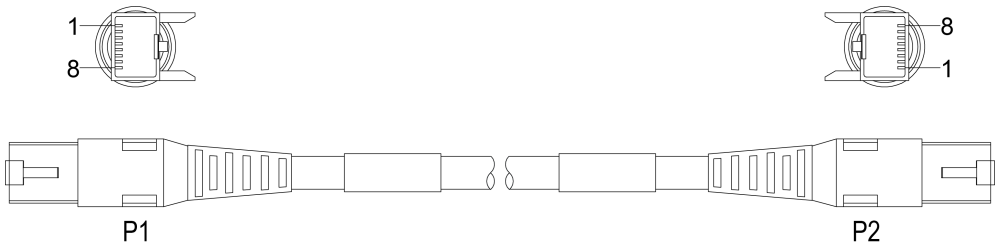
Note:

- Cables are sold separately.
- The wiring for this cable follows standard industrial Ethernet M12 specifications. This differs from the 568B standard.

CAUTION: The Ethernet cable shield must be grounded at the far end.

Ethernet Cable Specifications (ISC-8405)

The Ethernet cable provides Ethernet connectivity and supplies power to the camera.



P1 Pin Number	Wire Color	Signal Name	P2 Pin Number
1	White/Orange	TxRx A +	1
2	Orange	TxRx A -	2
3	White/Green	TxRx B +	3
4	Blue	TxRx C +	4
5	White/Blue	TxRx C -	5
6	Green	TxRx B -	6
7	White/Brown	TxRx D +	7
8	Brown	TxRx D -	8

Note: Cables are sold separately.

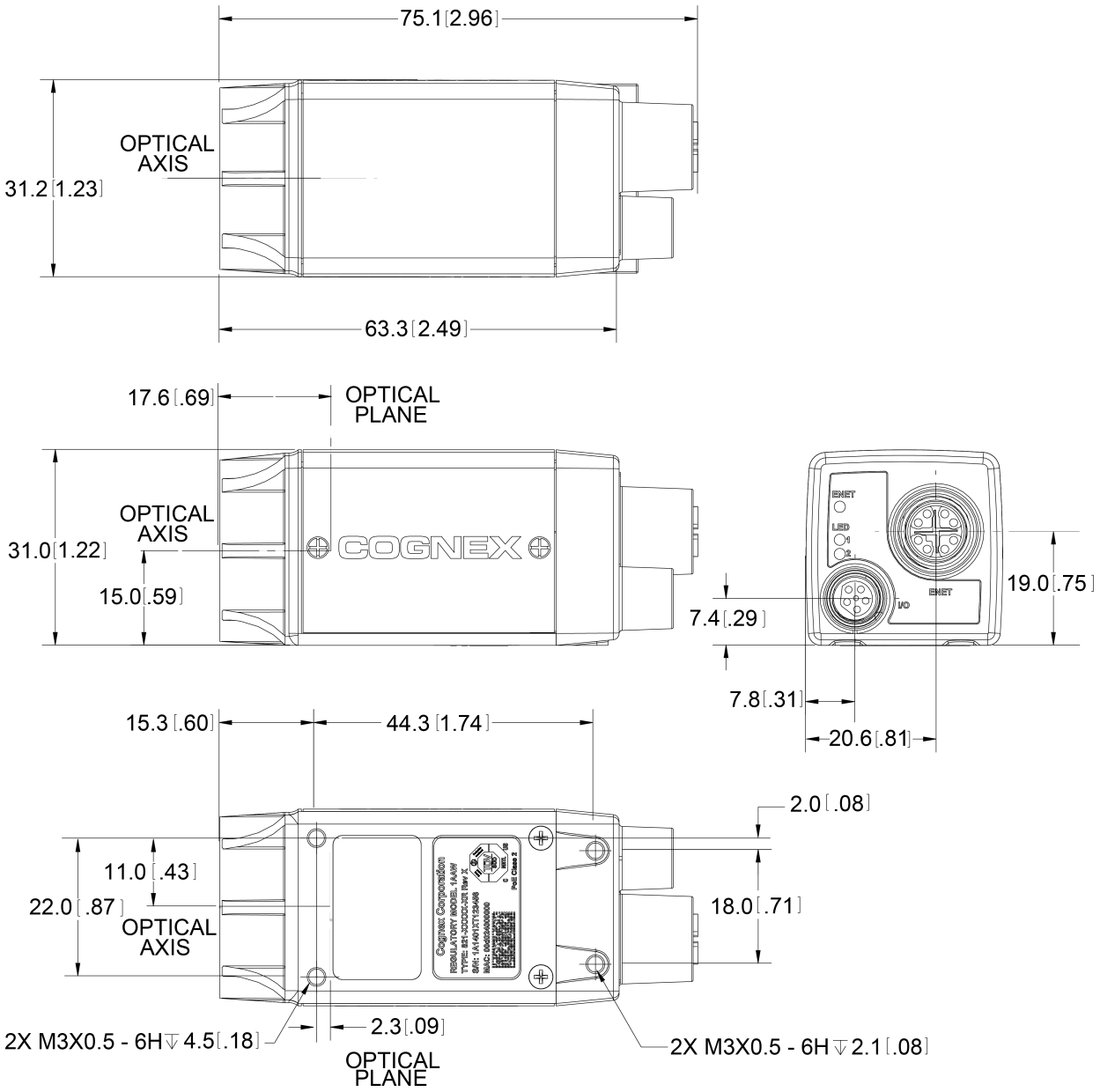
CAUTION:

- The Ethernet cable must be shielded. For the ISC-8405 camera, Cognex strongly recommends Cat 6 or Cat 7 Ethernet cables with S/STP shielding.
- The Ethernet cable shield must be grounded at the far end.

ISC-8402 Dimensions

Note:

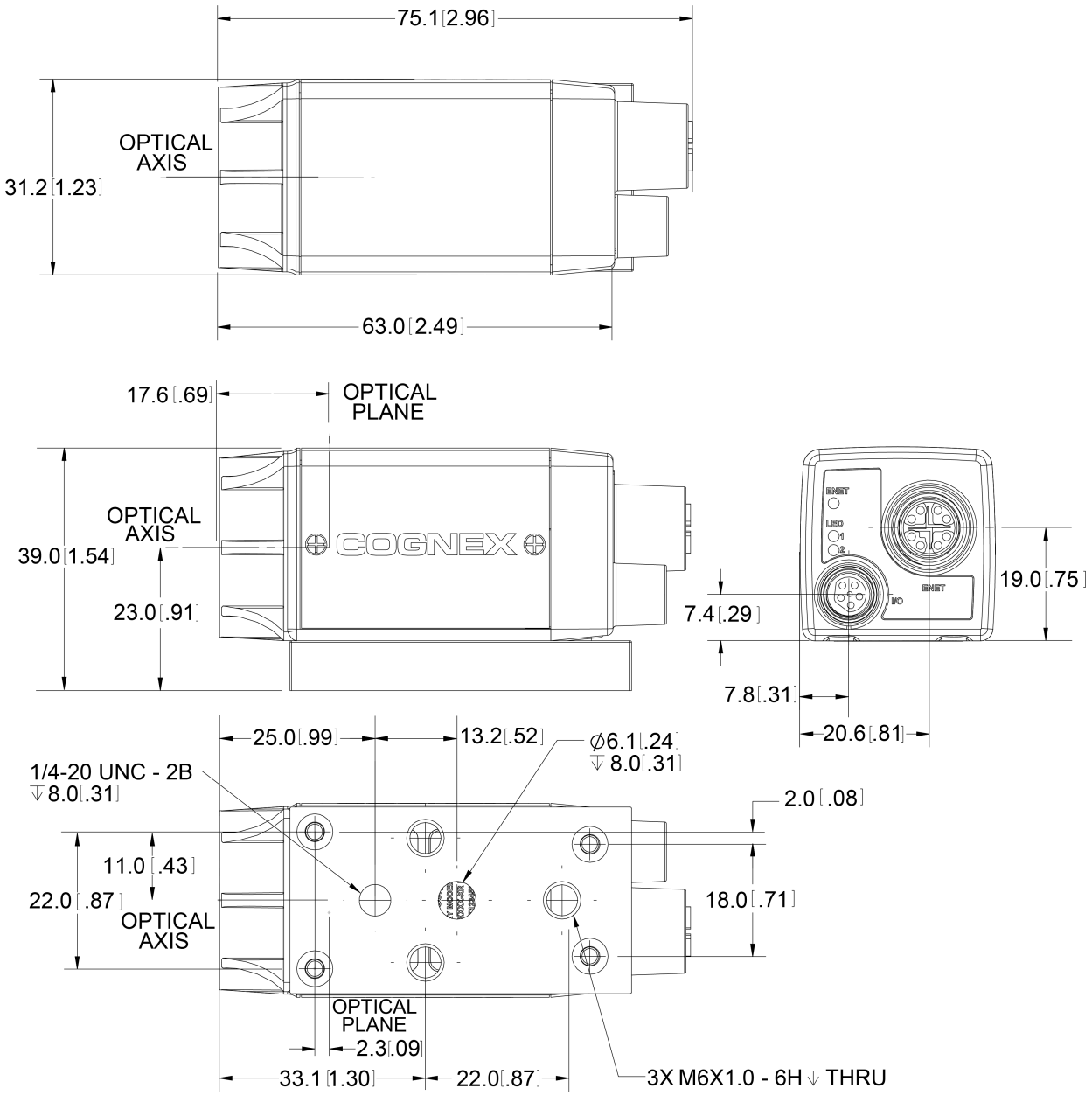
- All dimensions are in millimeters [inches] and are for reference purposes only.
- All specifications are for reference purpose only and may be changed without notice.



ISC-8402 Dimensions (with Accessory Mounting Block)

Note:

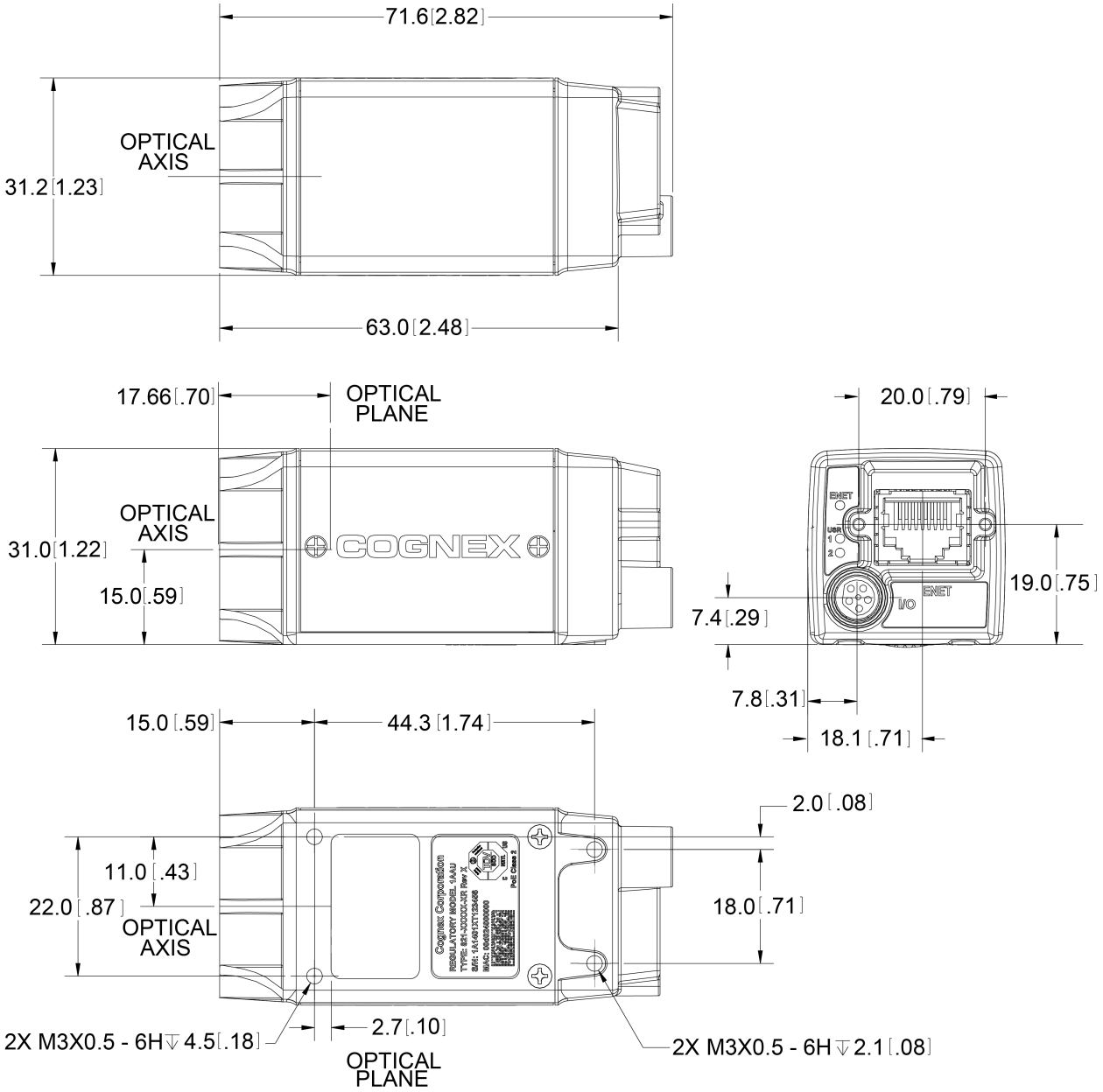
- All dimensions are in millimeters [inches] and are for reference purposes only.
- All specifications are for reference purpose only and may be changed without notice.



ISC-8405 Dimensions

Note:

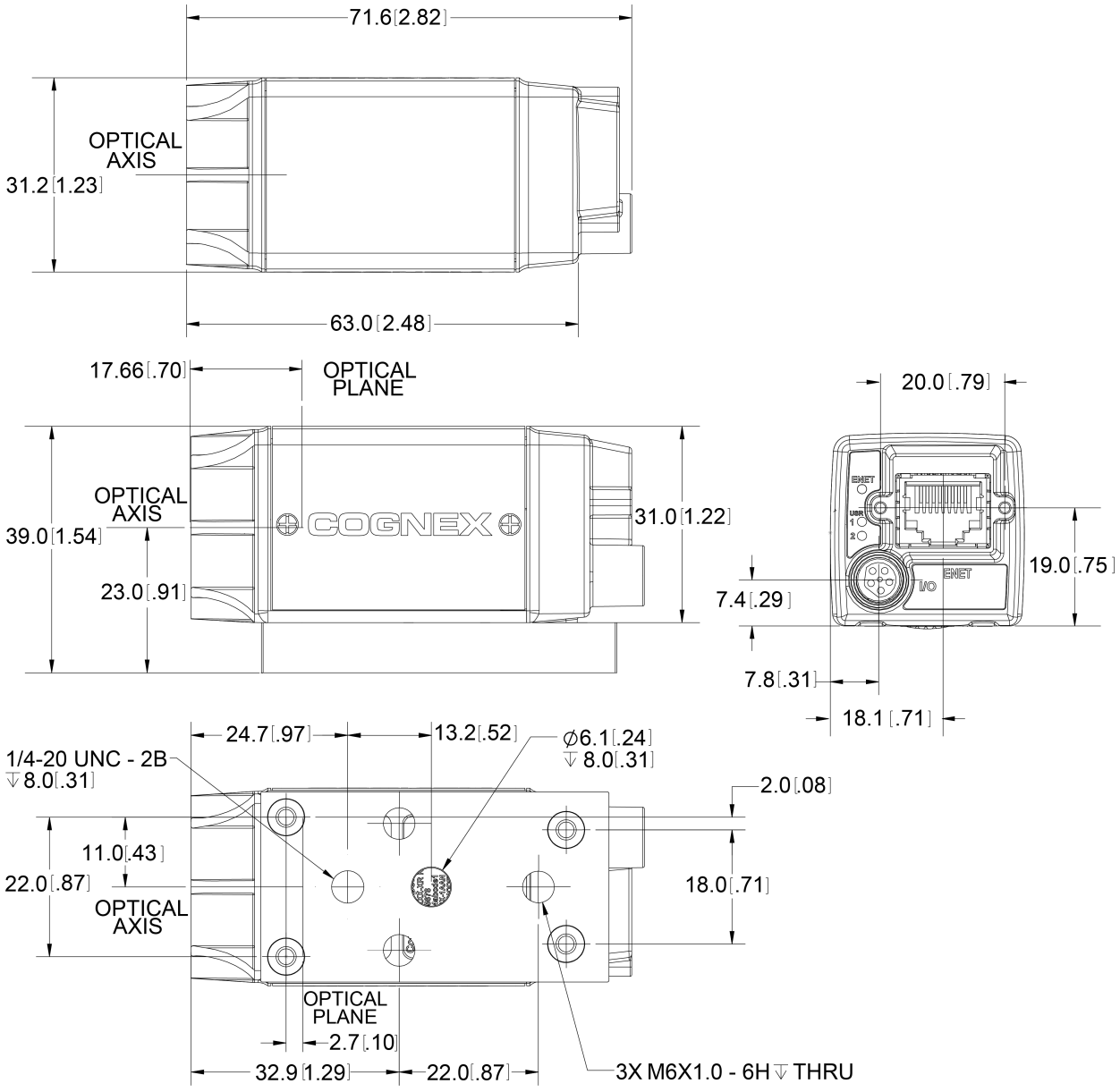
- All dimensions are in millimeters [inches] and are for reference purposes only.
- All specifications are for reference purpose only and may be changed without notice.



ISC-8405 Dimensions (with Accessory Mounting Block)

Note:

- All dimensions are in millimeters [inches] and are for reference purposes only.
- All specifications are for reference purpose only and may be changed without notice.



DS900 Series Sensor Specifications

Specification	DS910B	DS925B
Weight	440 g	380 g
Dimensions	118.5 mm (H) x 33 mm (W) x 85 mm (L)	96 mm (H) x 33 mm (W) x 85 mm (L)
Operating Temperature	0ºC to 45ºC (32ºF to 113ºF)	
Storage Temperature	-20ºC to 70ºC (-4ºF to 158ºF)	
Maximum Humidity	5% - 95% (non-condensing)	
Environmental	IP65 (with Cognex recommended IP65 Ethernet and Power I/O cables)	
Laser Power	7mW (class 2M) at 405nm wavelength	8mW (class 2M) at 405nm wavelength
Power	Voltage: +24 VDC (11-30 VDC) Current: 500 mA max IEEE 802.3af Power over Ethernet	
Discrete I/O Operating Limits: Trigger	Input voltage limits: 0 VDC to +30 VDC Input ON: > 2.4 VDC (TTL); > 11 VDC (HTL) Input OFF: < 0.8 VDC (TTL); < 3 VDC (HTL)	
Encoder Input Specification	Single -ended: A+/B+: 5-24V; A-/B-: +0VDC	
Scan Rate	Up to 2 kHz	
Ethernet	• Gigabit Ethernet interface • Standard M12-8 female connector	
Certifications	CE	

DS900 Series Technical Data

Data	DS910B	DS925B
Measuring Range Z-axis	8 mm	25 mm
Start of Measuring Range	52.5 mm	53.5 mm
End of Measuring Range	60.5 mm	78.5 mm
Start of Measuring Range, Extended, Approx.	-	53 mm
End of Measuring Range, Extended, Approx.	-	79 mm
Line Length Midrange (X-axis)	10 mm	25 mm
Linearity[1]	± 0.17 % FSO (3 σ)	± 0.16 % FSO (3 σ)
Resolution X-axis	1280 points/profile	
Profile Frequency (dependent on selected measuring field) - up to 2000 Hz	200 - 2000 Hz	
Light Source Laser	Semiconductor laser, approx. 405 nm, 10° aperture angle, Laser class 2M: laser power 7 mW, reduced 2 mW	Semiconductor laser, approx. 405 nm, 20°... 25° aperture angle, Laser class 2M: laser power 8 mW, reduced 2 mW
Displays	1x state / 1x laser on	

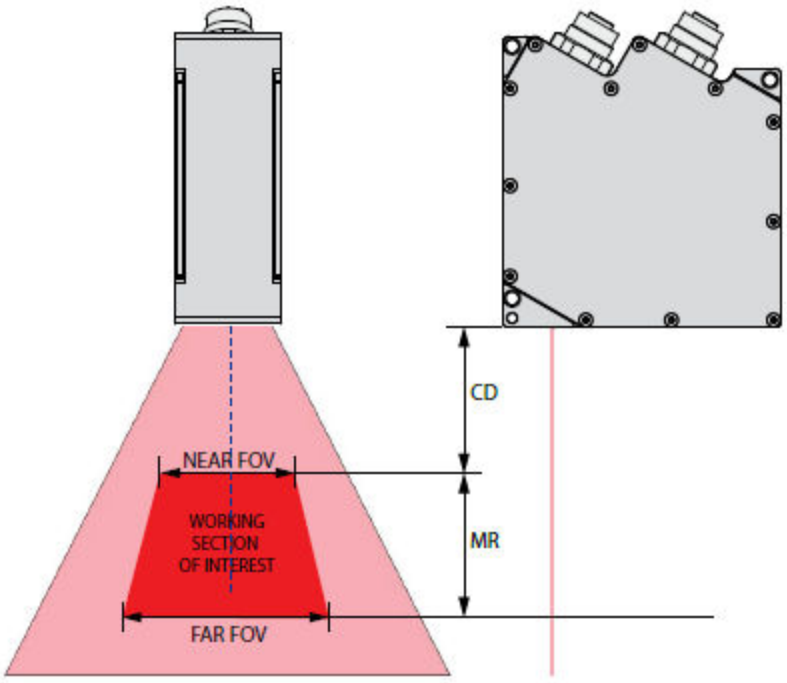
[1] Based on a Cognex Optronic standard target with metallic finished surfaces.

Data	DS910B	DS925B
Electromagnetic Compatibility (EMC)	According to: EN 61326-1: 2006-10 DIN EN 55011: 2007-11 (Group 1, Class B) EN 61000-6-2: 2006-03	

FSO = Full Scale Output | MMR = Midrange

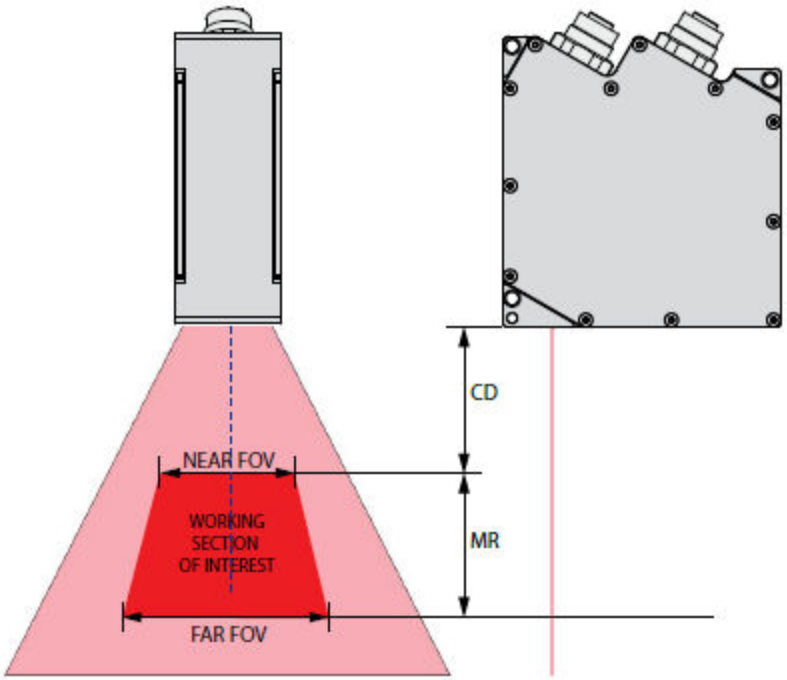
DS910B Measurement Specifications

Specification	DS910B
Near Field of View	9.4 mm
Far Field of View	10.7 mm
Clearance Distance (CD)	53 mm
Measurement Range (MR)	8 mm
Resolution X	0.0073 mm- 0.0084 mm
Resolution Z	0.001 mm



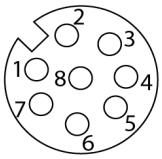
DS925B Measurement Specifications

Specification	DS925B
Near Field of View	23.4 mm
Far Field of View	29.1 mm
Clearance Distance (CD)	53.5 mm
Measurement Range (MR)	25 mm
Resolution X	0.0183 mm – 0.0227 mm
Resolution Z	0.002 mm

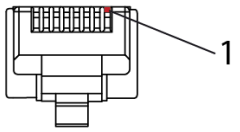
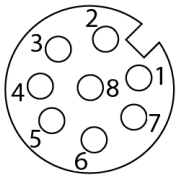


Ethernet Connection

For Ethernet connections, the 3D sensor supports an M12-8 connector with female pins:



The Ethernet cable uses an RJ-45 connector and an M12-8 connector with male pins:

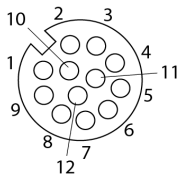
RJ-45 Connector		8-pin screw connector (sensor side)		
				
Pin No.	**Color Stranded Hook-up Wire**	**Pin No.**	**10BaseT, 100BaseTX**	**1000BaseT**
1	white / orange	5	Tx+	D1+
2	orange	6	Tx-	D1-
3	white / green	8	Rx+	D2+
6	blue	1		D3+
4	white / blue	2		D3-
5	green	7	Rx-	D2-
7	white / brown	3		D4+
8	brown	4		D4-

Cognex recommends the Gigabit-Ethernet connection cable CCB-2901858-05 for the Ethernet connection (5m). Characteristics: 4 x 2 x 0.4 mm²; shielded.

Note: Not compatible with the Ethernet cable used by the DS1000 series sensors.

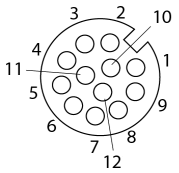
Multifunction Port

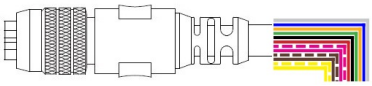
The following information pertains to the multifunction port, an M12-12 port with female pins.

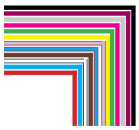


The shielded Multifunction cable (CCB-2901868-05) is recommended. It uses an M12-12 connector with male pins, providing access to trigger and inputs.

CAUTION: The Multifunction cable's PWR (Red) and GND (Blue) flying lead wires must not be connected to any external point or to each other. Unused bare wires can be clipped short or tied back using a tie made of non-conductive material.







Pin #	Signal Name	Notes	Wire Color
9	PWR	Unused	Red
2	GND	Unused	Blue
3	+Laser on/off	Optional	White
1	-Laser on/off		Brown
6	In1	Digital Input 1	Yellow
4	GND-In1	Ground In1	Green
5	In2	Digital Input 2	Pink
8	GND-In2	Ground In2	Gray
10	In3	Digital Input 3	Purple
7	GND-In3	Ground In3	Black

- **PWR, GND**: galvanically isolated from In1, In2, In3, and Laser on/off
- **Laser on/off**: Input galvanically isolated from GND, In1, In2, In3
- **In1, In2, In3**: Inputs galvanically isolated from GND and Laser on/off
- GND-In1, GND-In2, GND-In3 - IO ground references for In1, In2, In3. Galvanically isolated from GND.

RS422 Connections

The RS422 connection (Pin 11 and 12 of the multifunction port) can be used in either of the following configurations:

- Load user modes and sensor control (half-duplex RS422).
- Supplying line trigger signals.
- Synchronization of line trigger signals.

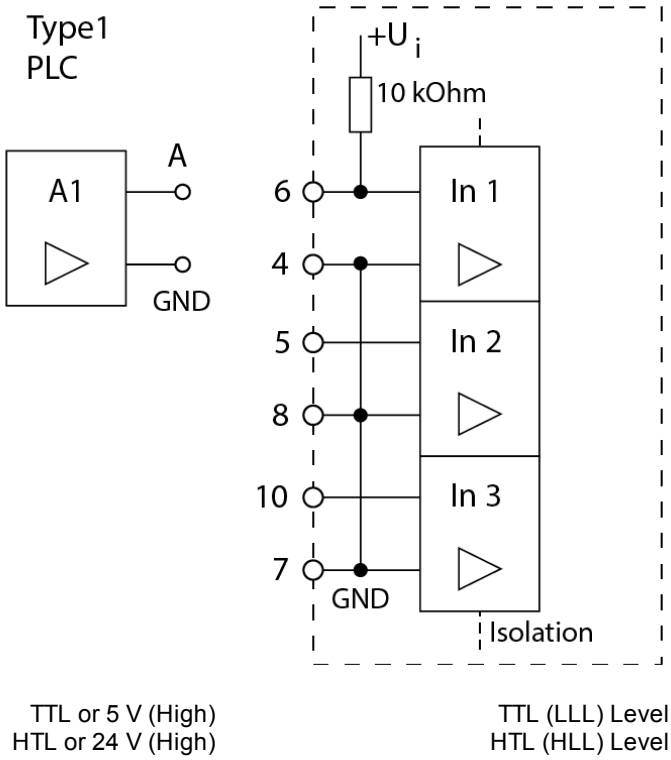
Signal Levels

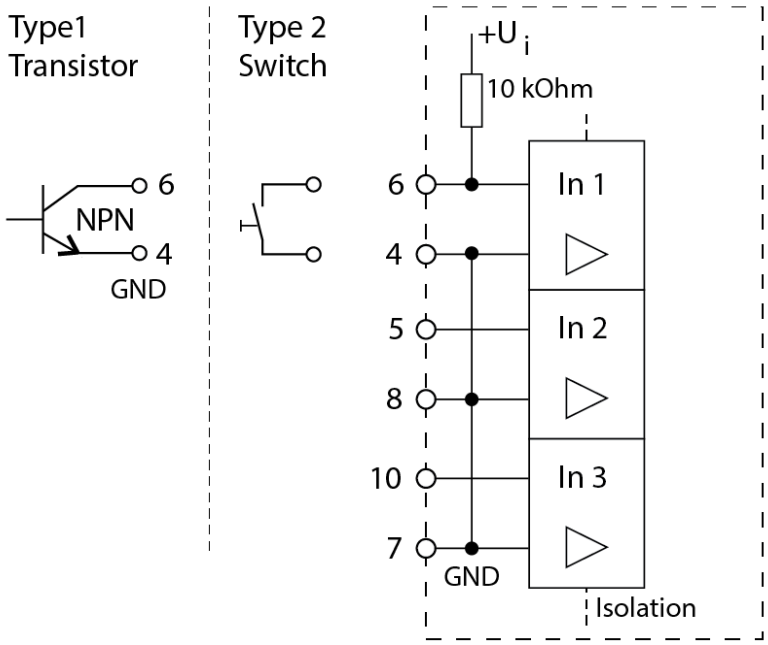
The switching inputs of the multifunction port can either be used for encoder or trigger input or for loading previously stored user modes. The signal levels are switchable for all switching inputs together via software between LLL (low-voltage-, TTL logic) and HLL (high-voltage-, HTL logic).

- LLL level: Low 0 V… 0.8 V, High 2.4 V… 5 V, internal pull-up 10 kOhm to 5 V
- HLL level: Low 0 V… 3 V, High 11 V… 24 V (permitted up to 30 V), internal pull-up 10 kOhm to 24
- Pulse duration: ≥ 5 µs

Switching Inputs

The switching inputs **In1** up to **In3** can be used for triggering or for connecting an encoder. All switching inputs are identical. The circuits have internal electrical isolation. The inputs are galvanically isolated from the GND and Laser on/off. Each switching input has its own ground connection (GND-In1 to 3), which has to be connected with the external ground (synchronization/trigger source or another device).





TTL (LLL) Level

The multifunction port can be used with any of the following configurations:

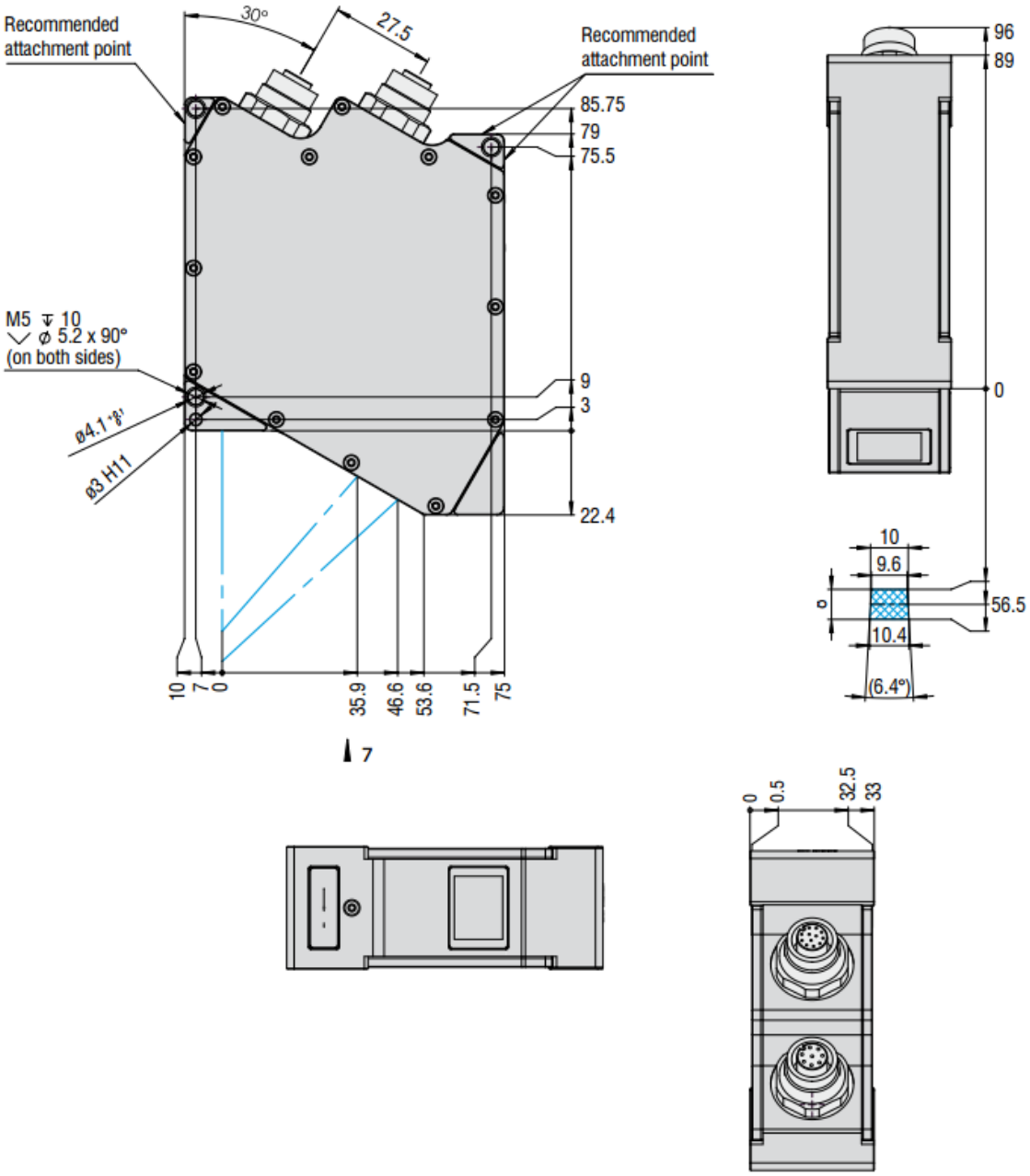
	Configuration	In1	In2	In3
0	Encoder with index, positive edge works with the index[1]	N	A	B
1	Encoder without index, additionally line trigger possible[2]	Trigger	A	B
2	Line trigger	Trigger		
3	Line trigger, load up to 4 user modes	Trigger	Mode Bit 0	Mode Bit 1
4	Load up to 8 user modes	Mode Bit 0	Mode Bit 1	Mode Bit 2
5	Transmit in time stamp	Bit 0	Bit 1	Bit 2

Note: Use a shielded cable with twisted wires. The shielded Multifunction cable (CCB-2901868-05) is recommended. It uses an M12-12 connector with male pins, providing access to trigger and inputs.

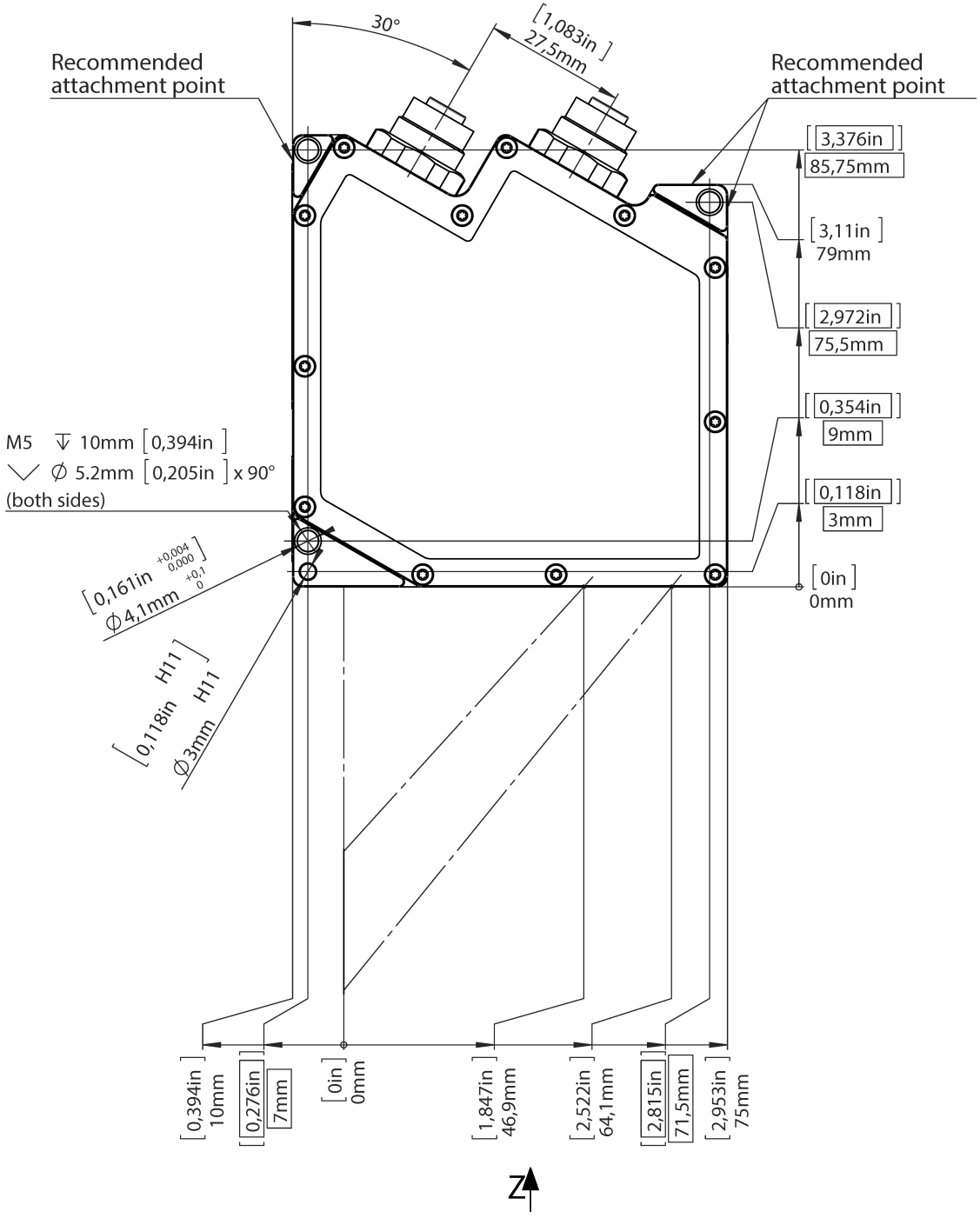
[1] The encoder input counts each edge. Quadrature encoders typically output 4 edges per encoder step.

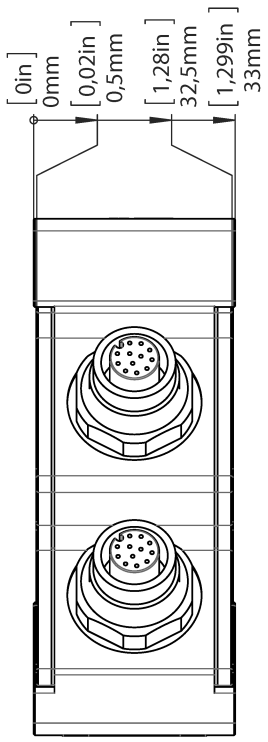
[2] The encoder input counts each edge. Quadrature encoders typically output 4 edges per encoder step.

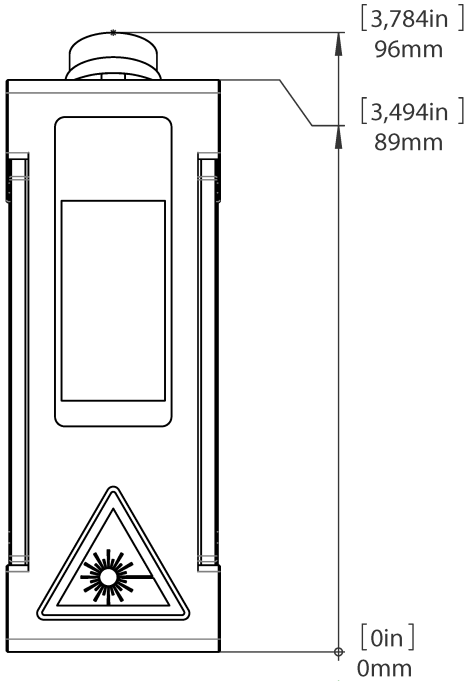
DS910B Dimensions



DS925B Dimensions




[0in]
0mm
[0,02in]
0,5mm
[1,28in]
32,5mm
[1,299in]
33mm


[3,784in]
96mm
[3,494in]
89mm
[0in]
0mm

DS1000 Series Sensor Specifications

Specifications	DS1050	DS1101	DS1300
Weight	700 g		
Operating Temperature	0 ºC to 50 ºC (32 ºF to 122 ºF)		
Storage Temperature	-10 ºC to 80 ºC (14 ºF to 176 ºF)		
Maximum Humidity	10% to 85%, non-condensing (Operating and Storage)		
Environmental	IP65 (with Cognex recommended IP65 Ethernet and Power I/O cables)		
Power Supply Requirements	Voltage: +24 VDC +/- 10% Current: 500 mA max		
Trigger	Input voltage limits: Trig+ - Trig - = - 24VDC to +24VDC Input ON: > 10 VDC (> 6 mA) Input OFF: < 2 VDC (< 1.5 mA)		
Encoder Input Specification	Differential: A+/B+: 5-24V (50 kHz max) A-/B-: Inverted (A+/B+) Single Ended: A+/B+: 5-24V (50 kHz max) A-/B-: VDC = ½ (A+/B+)		
Working Distance	87 to 163 mm	135 mm to 355 mm	180 mm to 905 mm
Ethernet	• Gigabit Ethernet interface • Integrated link and traffic LEDs • Standard M12-8 female connector		
Shock	50 G's Half-Sine with a pulse of 11 milliseconds duration. Test conducted while instrumented in a shipping package dropped from a maximum of 36 inches		
Vibration	8 G's RMS Random Between 10-500 Hz for a duration of 30 minutes.		
Certification			
Altitude rating	2 km / 6561 ft		

DS1000 Series Laser Specifications

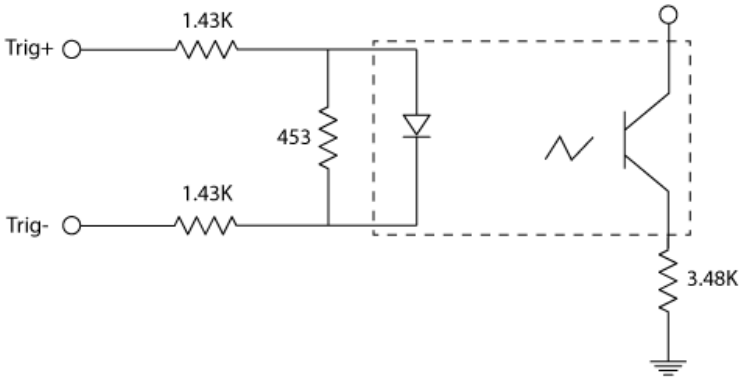
This laser product is designated as Class 2M.

Specification		DS1050	DS1101	DS1300
Wavelength		658 nm		
Laser Power for Classification		< 5 mW		
Laser Maximum Total Power		< 40 mW		
Minimum Divergence		vertical: < 1.5 mrad horizontal: 32 degrees		
Laser Line Thickness (FWHM)		< 0.4 mm	< 0.5 mm	< 0.8 mm
Sensor Size		1024x768 pixels		
X Resolution	Top	0.059 mm	0.079 mm	0.101 mm
	Bottom	0.090 mm	0.181 mm	0.457 mm
Y Resolution	This value depends on Encoder Resolution, the Distance per Cycle and the Steps per Line settings.			
Z Resolution	Top	0.005 mm	0.010 mm	0.016 mm
	Bottom	0.014 mm	0.052 mm	0.265 mm

Acquisition Trigger

The acquisition trigger input to the sensor is opto-isolated, and the sensor will respond to a trigger event when the voltage difference between the Trig+ and Trig- inputs exceeds 10V.

Trigger Circuit



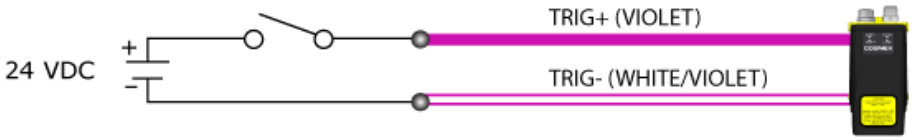
24V max across the input pins - Transition approx. 10V (Min.)

To configure the acquisition trigger as a sourcing input, connect the Trig+ terminal to the high-voltage reference (24 VDC) and the Trig- terminal to the output of the photo-electric sensor.

Trigger (source)

To configure the acquisition trigger as a sinking input, connect the Trig- terminal to the low voltage reference (ground) and the Trig+ terminal to the output of the photo-detector or PLC.

Trigger (sink)



Encoders

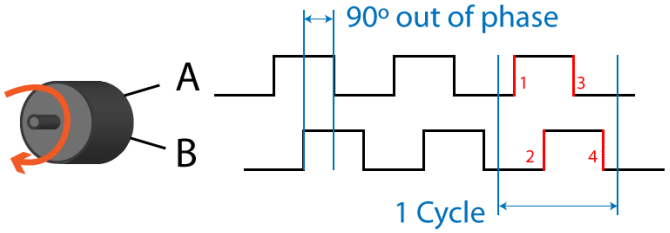
The DS1000 series sensor typically relies on electrical signals from an encoder to generate images, allowing the sensor to capture image information based on the speed of the moving object rather than predetermined exposure settings. Many vision applications use a rotary encoder attached to the conveyor system.

Note:

- The frequency of encoder pulses must not exceed 50 kHz.
- Using an encoder allows you to specify input and output delay values in pulse counts instead of real time units.
- The sensor supports a test encoder that generates encoder pulses internally. The test encoder can be used to acquire images without connecting a physical encoder, which can be useful as you develop your application or if you need to verify the operation of the sensor while debugging encoder connection issues.

A rotary encoder typically uses two output channels (A and B) to provide cyclical outputs as the encoder rotates. The signals are *quadrature* outputs - 90 degrees out of phase with each other. Each complete quadrature cycle consists of four rising or falling *pulse* edges. The number of cycles per encoder rotation depends on the specific encoder you use.

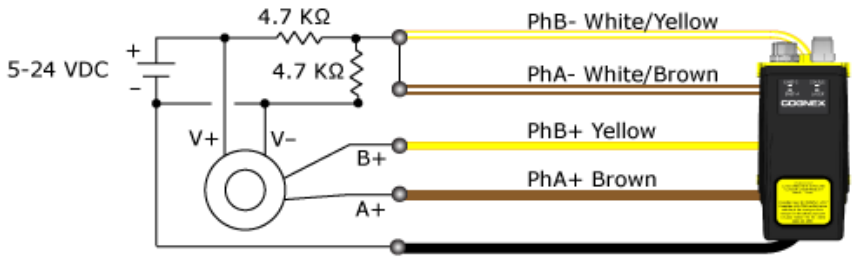
Signal A and B in Quadrature

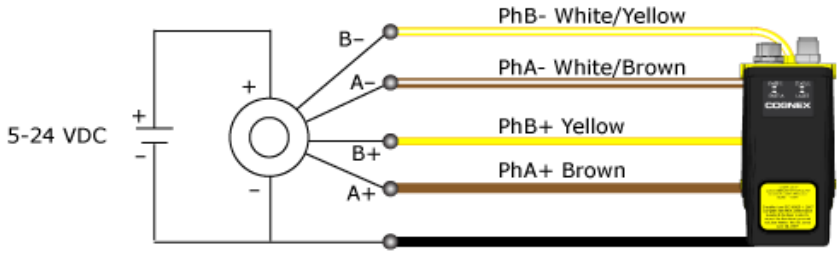


The *distance per cycle* is the physical distance that the conveyor system must travel to cause the encoder to output one full cycle. This distance can be calculated based on the dimensions of your encoder and the length of the image you want to acquire.

The DS1000 series sensors support single-channel and dual-channel encoders.

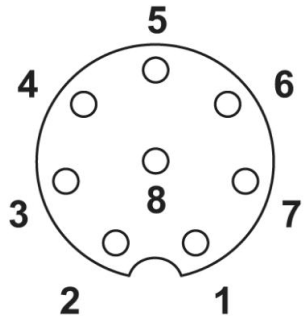
- Single-channel encoders generate only one signal (A). Cognex recommends you use only the PhA+ input of the I/O cable with a single-channel encoder. Be aware that single-channel encoders cannot determine which direction the conveyer system is moving, and they are more susceptible to electrical noise than other types of encoders. See the topic *Power and I/O Cable Specifications* on page 94 for details on the I/O cable.
- *Single-ended* dual-channel encoders use one wire each for signals A and B. Be aware single-ended encoders are still susceptible to electrical noise.
- *Differential* dual-channel encoders use two lines each for signals A and B. Differential encoders greatly reduce susceptibility to electrical noise.

Single-ended Encoder

Connect PhA+ and PhB+ to the encoder outputs. Derive PhA- and PhB- from the encoder voltage source and make them equal to 50% of the encoder reference voltage. For example, if the encoder is connected to 24V, set PhA- and PhB- to 12V.

Differential Encoder


Ethernet Connector

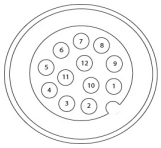
The Ethernet connection uses an M12-8 female connector.

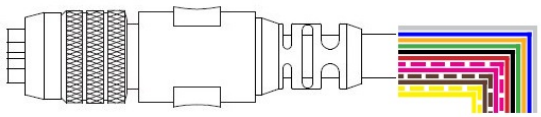


Ethernet Signal	RJ-45 Pin Number	M12-8 Pin Number
DA+	1	6
DA-	2	4
DB+	3	5
DB-	6	8
DC+	4	7
DC-	5	1
DD+	7	2
DD-	8	3

Power and I/O Cable Specifications

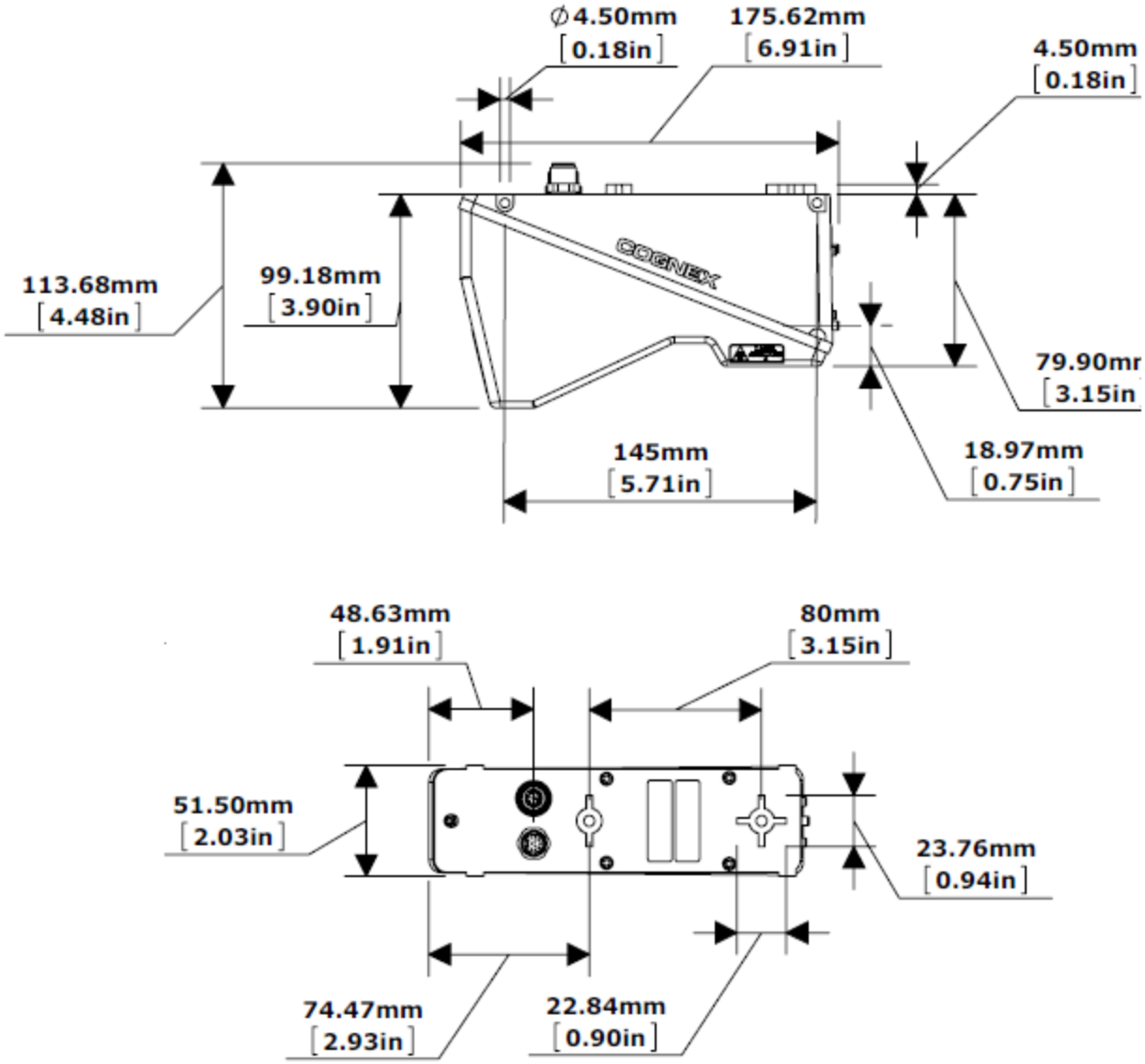
The I/O cable provides access to trigger and inputs. Unused bare wires can be clipped short or tied back using a tie made of non-conductive material.





Pin #	Signals Name	Notes	Color
1	PhB+	Encoder "B" input (twisted pair)	Yellow
2	PhB-		White/Yellow
3	PhA+	Encoder "A" input (twisted pair)	Brown
4	PhA-		White/Brown
5	Trig+	Trigger	Violet
6	Trig-		White/Violet
7	+24VDC	Power	Red
8	GND	Ground	Black
9	Laser+	Not Used	Green
10	Laser-	Not Used	Orange
11	Ctrl+	Not Used	Blue
12	Ctrl-	Not Used	Grey

DS1000 Series Dimensions



Wire Inputs and Outputs

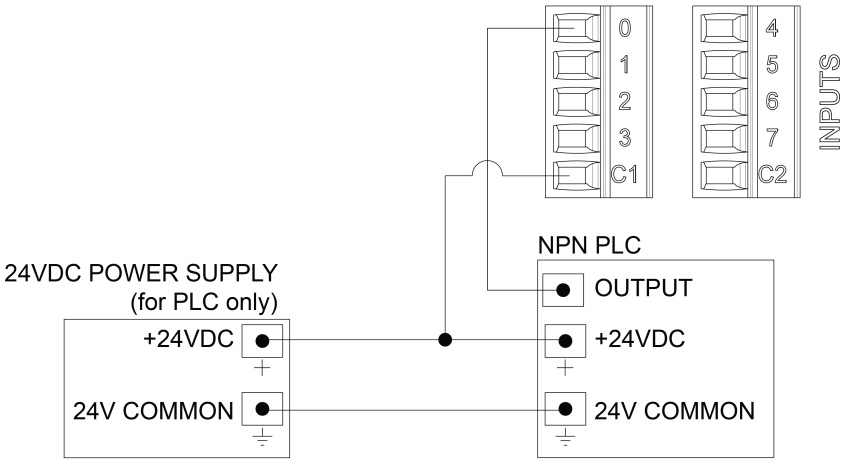
The following figures show basic wiring for some of the more common I/O configurations.

Input from PLC - Current Sinking

To configure the input as a sinking input, connect INPUT COMMON (for example, C1) to the high voltage reference (+24VDC) and connect one of the INPUTS on the same terminal row (for example, INPUT 0) to the OUTPUT of the photoelectric sensor or PLC. When the PLC output turns ON, the INPUT is pulled down to a low voltage level.

Note:

- There are two input terminal rows. INPUTS 0 - 3 share the COMMON 1 connection and INPUTS 4 - 7 share the COMMON 2 connection. Therefore the input devices for each terminal row must be the same; either current sinking or current sourcing.
- To maintain optical isolation of the I/O lines, the devices connected to these lines must not be connected to the same power supply as the vision controller. If they are connected to, or share a ground with, the same power supply, they may still function but will no longer be optically isolated.

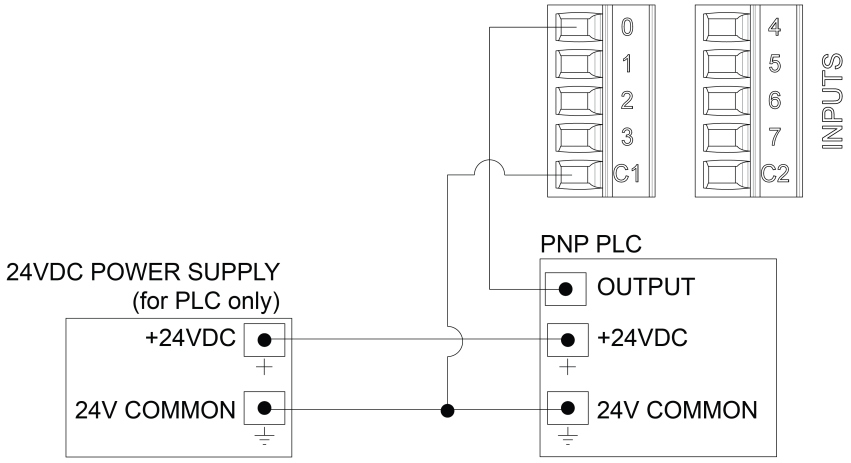


Input from PLC - Current Sourcing

To configure the input as sourcing input, connect INPUT COMMON (for example, C1) to the low voltage reference (24V COMMON) and one of the INPUTS on the same terminal row (for example, INPUT 0) to the OUTPUT of the photoelectric sensor or PLC. When the PLC output turns ON, the INPUT is pulled up to a positive voltage level.

Note:

- There are two input terminal rows. INPUTS 0 - 3 share the COMMON 1 connection and INPUTS 4 - 7 share the COMMON 2 connection. Therefore the input devices for each terminal row must be the same; either current sinking or current sourcing.
- To maintain optical isolation of the I/O lines, the devices connected to these lines must not be connected to the same power supply as the vision controller. If they are connected to, or share a ground with, the same power supply, they may still function but will no longer be optically isolated.

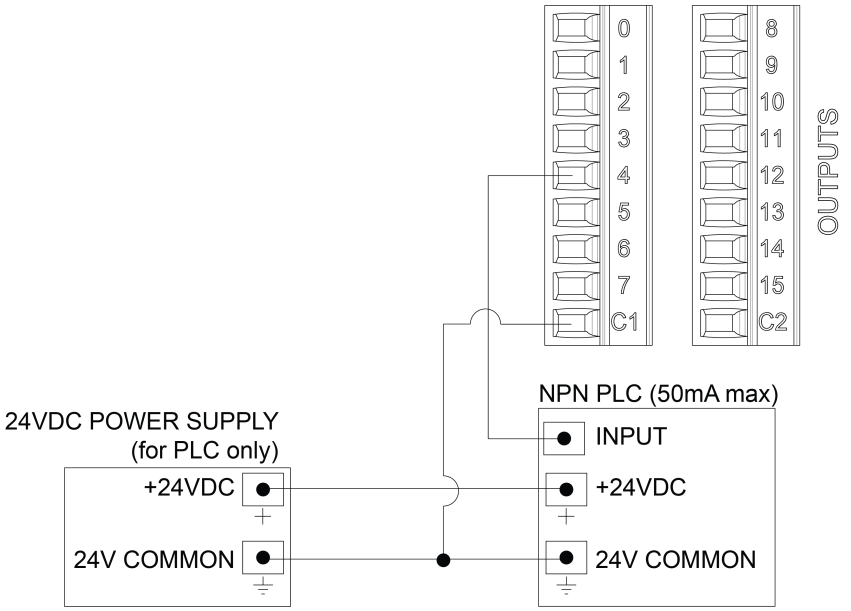


Output to PLC - Current Sinking

To configure the output as a sinking output, connect OUTPUT COMMON (for example, C1) to the low voltage reference (24V COMMON) and connect one of the OUTPUTS on the same terminal row (for example, OUTPUT 4) to the INPUT of the PLC. When the vision controller output turns ON, the PLC input is pulled down to a low voltage level.

Note:

- OUTPUTS 0 - 7 provide up to 50mA current (maximum).
- There are two output terminal rows. OUTPUTS 0 - 7 share the COMMON 1 connection and OUTPUTS 8 - 15 share the COMMON 2 connection. Therefore the output devices for each terminal row must be the same; either current sinking or current sourcing.
- To maintain optical isolation of the I/O lines, the devices connected to these lines must not be connected to the same power supply as the vision controller. If they are connected to, or share a ground with, the same power supply, they may still function but will no longer be optically isolated.

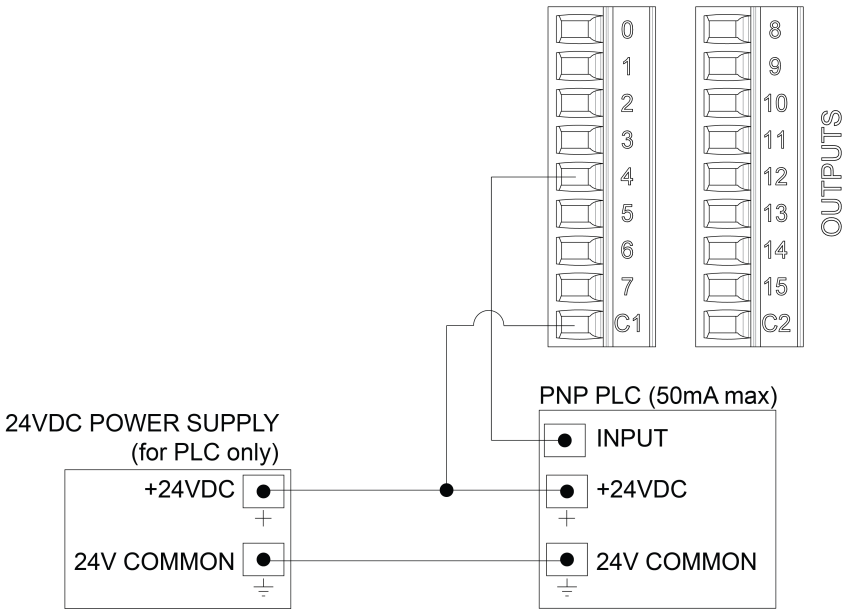


Output to PLC - Current Sourcing

To configure the output as a sourcing output, connect OUTPUT COMMON (for example, C1) to the high voltage reference (+24VDC) and connect one of the OUTPUTS on the same terminal row (for example, OUTPUT 4) to the INPUT of the PLC. When the vision controller output turns ON, the PLC input is pulled up to a high voltage level.

Note:

- OUTPUTS 0 - 7 provide up to 50mA current (maximum).
- There are two output terminal rows. OUTPUTS 0 - 7 share the COMMON 1 connection and OUTPUTS 8 - 15 share the COMMON 2 connection. Therefore the output devices for each terminal row must be the same; either current sinking or current sourcing.
- To maintain optical isolation of the I/O lines, the devices connected to these lines must not be connected to the same power supply as the vision controller. If they are connected to, or share a ground with, the same power supply, they may still function but will no longer be optically isolated.

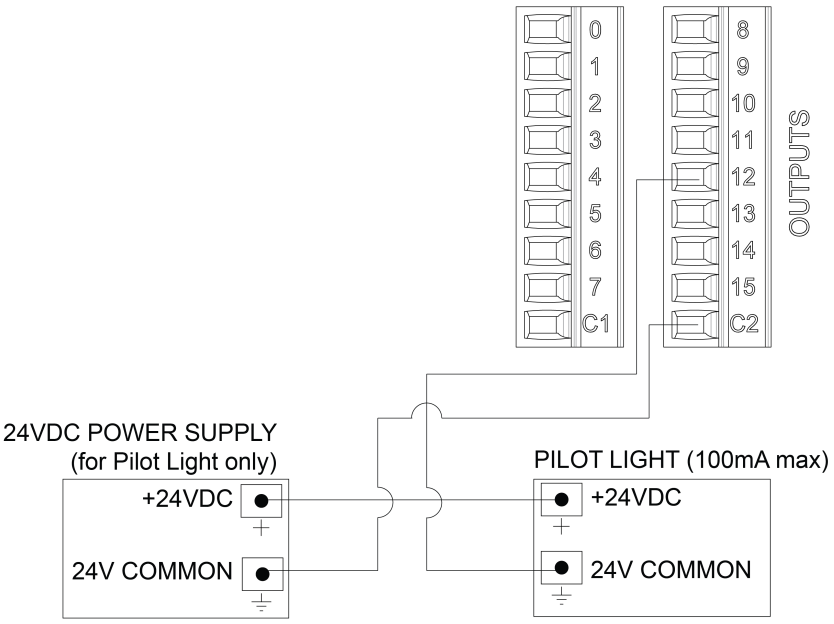


Output to Pilot Light - Current Sinking

To configure the output as a sinking output, connect OUTPUT COMMON (for example, C2) to the power supply's low voltage reference (24V COMMON) and connect one of the OUTPUTS on the same terminal row (for example, OUTPUT 12) to the pilot light's low voltage reference (24V COMMON).

Note:

- OUTPUTS 8 - 15 provide up to 100mA of current (maximum).
- There are two output terminal rows. OUTPUTS 0 - 7 share the COMMON 1 connection and OUTPUTS 8 - 15 share the COMMON 2 connection. Therefore the output devices for each terminal row must be the same; either current sinking or current sourcing.
- To maintain optical isolation of the I/O lines, the devices connected to these lines must not be connected to the same power supply as the vision controller. If they are connected to, or share a ground with, the same power supply, they may still function but will no longer be optically isolated.

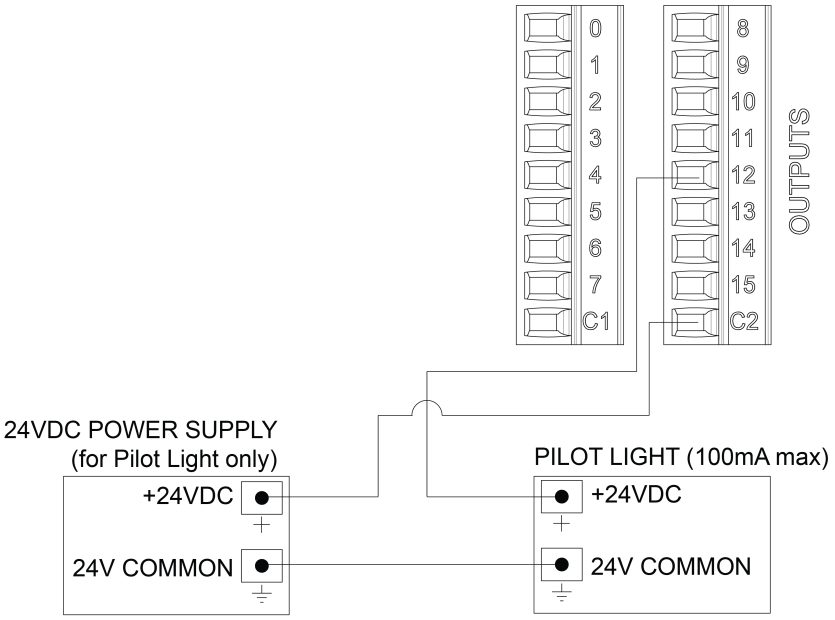


Output to Pilot Light - Current Sourcing

To configure the output as a sourcing output, connect OUTPUT COMMON (for example, C2) to the power supply's high voltage reference (+24VDC) and connect one of the OUTPUTS on the same terminal row (for example, OUTPUT 12) to the pilot light's high voltage reference (+24VDC).

Note:

- OUTPUTS 8 - 15 provide up to 100mA of current (maximum).
- There are two output terminal rows. OUTPUTS 0 - 7 share the COMMON 1 connection and OUTPUTS 8 - 15 share the COMMON 2 connection. Therefore the output devices for each terminal row must be the same; either current sinking or current sourcing.
- To maintain optical isolation of the I/O lines, the devices connected to these lines must not be connected to the same power supply as the vision controller. If they are connected to, or share a ground with, the same power supply, they may still function but will no longer be optically isolated.



Cleaning/Maintenance

Cleaning the Vision Controller

Use a cleaning cloth or brush to remove dirt, dust and smudges from the vision controller. Keep all liquids away from the vision controller connectors and openings.

CAUTION: Cleaning chemicals should not be used on the vision controller.

Clean the In-Sight Camera Housing

To clean the outside of the camera housing, use a small amount of mild detergent cleaner or isopropyl alcohol on a cleaning cloth. Do not pour the cleaner directly onto the camera housing.

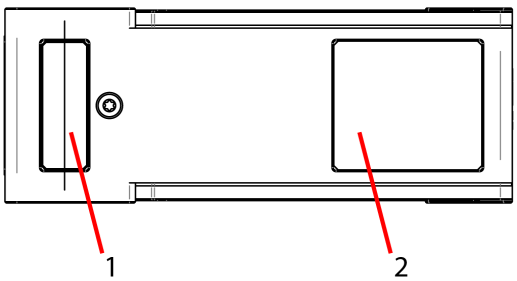
CAUTION: Do not attempt to clean any In-Sight product with harsh or corrosive solvents, including lye, methyl ethyl ketone (MEK) or gasoline.

Clean the In-Sight Camera Image Sensor Window

To remove dust from the outside of the image sensor window, use a pressurized air duster. The air must be free of oil, moisture or other contaminants that could remain on the glass and possibly degrade the image. Do not touch the glass window. If oil/smudges still remain, clean the window with a cotton bud using alcohol (ethyl, methyl or isopropyl). Do not pour the alcohol directly on the window.

Sensor Maintenance: DS900 Series Sensors

LASER LIGHT, DO NOT STARE INTO BEAM OR VIEW DIRECTLY WITH OPTICAL INSTRUMENTS: CLASS 2M LASER PRODUCT



Component	Description
1	Laser window **CAUTION**: AVOID EXPOSURE - LASER RADIATION IS EMITTED FROM THIS APERTURE
2	Camera window

The windows to the camera and laser must be kept clean and free of defects to ensure proper operation. Any scratches, dust or dirt will impact the accuracy of acquired images.

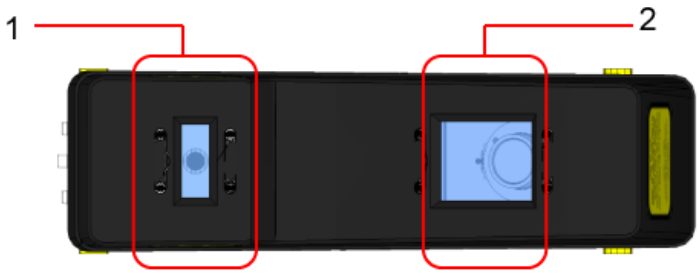
CAUTION: Use care not to damage the anti-reflective coating on the windows.

Cognex makes the following recommendations for cleaning the laser and camera windows:

- Unplug the unit so the laser cannot be enabled.
- Use lint-free tissue or an optical grade cotton swab ("Q-tip").
- Use reagent-grade isopropyl alcohol.
- Use minimal pressure.
- Use several tissues or swabs.
- Start at the center of each window and spiral out to the edges.
- Rotate the tissue or swab during cleaning so dirt is not dragged across the surface.

Sensor Maintenance: DS1000 Series Sensors

LASER LIGHT, DO NOT STARE INTO BEAM OR VIEW DIRECTLY WITH OPTICAL INSTRUMENTS: CLASS 2M LASER PRODUCT



Component	Description
1	Laser Window ⚠ **CAUTION**: AVOID EXPOSURE - LASER RADIATION IS EMITTED FROM THIS APERTURE
2	Camera Window

The windows to the camera and laser must be kept clean and free of defects to ensure proper operation. Any scratches, dust or dirt will impact the accuracy of acquired images.

⚠ **CAUTION**: Use care not to damage the anti-reflective coating on the windows.

Cognex makes the following recommendations for cleaning the laser and camera windows:

- Unplug the unit so the laser cannot be enabled.
- Use lint-free tissue or an optical grade cotton swab ("Q-tip").
- Use reagent-grade isopropyl alcohol.
- Use minimal pressure.
- Use several tissues or swabs.
- Start at the center of each window and spiral out to the edges.
- Rotate the tissue or swab during cleaning so dirt is not dragged across the surface.