FS/VS 40/70 Smart Camera

Product Reference Guide

ZEBRA

MN-003810-03EN Rev A

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Contents

About this Guide

This guide provides information on using the FS/VS 40-70 Smart Camera.

Service Information

If you have a problem with your equipment, contact Zebra Global Customer Support for your region. Contact information is available at: zebra.com/support.

When contacting support, please have the following information available:

- Serial number of the unit
- Model number or product name
- Software/firmware type and version number

Zebra responds to calls by email, telephone, or fax within the time limits set forth in support agreements.

If your problem cannot be solved by Zebra Customer Support, you may need to return your equipment for servicing and will be given specific directions. Zebra is not responsible for any damages incurred during shipment if the approved shipping container is not used. Shipping the units improperly can possibly void the warranty.

If you purchased your Zebra business product from a Zebra business partner, contact that business partner for support.

Notational Conventions

The following notational conventions make the content of this document easy to navigate.

- **Bold** text is used to highlight the following:
  - Dialog box, window, and screen names
  - Dropdown list and list box names
  - Checkbox and radio button names
  - Icons on a screen
  - Key names on a keypad
  - Button names on a screen

- Bullets (•) indicate:
  - Action items
  - List of alternatives
  - Lists of required steps that are not necessarily sequential.
- Sequential lists (for example, those that describe step-by-step procedures) appear as numbered lists.

Icon Conventions

The documentation set is designed to give the reader more visual clues. The following visual indicators are used throughout the documentation set.

NOTE: The text here indicates information that is supplemental for the user to know and that is not required to complete a task.

IMPORTANT: The text here indicates information that is important for the user to know.

CAUTION: If the precaution is not heeded, the user could receive a minor or moderate injury.

WARNING: If danger is not avoided, the user CAN be seriously injured or killed.

DANGER: If danger is not avoided, the user WILL be seriously injured or killed.

Getting Started

The xS40 and xS70 Smart Cameras are available in various configurations with different focus ranges, resolutions, and illumination options. Connectivity includes USB-C with DisplayPort, power serial and GPIO, x-coded Ethernet, and external lighting, with power options via M12 connector, PoE, or USB-C. Visual and auditory feedback is provided through LEDs and beepers for statuses such as power and decode success.

xS40 Configurations

The guide covers the following xS40 configurations.

Table 1 xS40 Configurations

SKU	Toolset	Focus	Range	Resolution	Illumination
FS40 Standard Range					
FS40-SR20D4-2C00W	DPM with Fast 2D Decoder Ethernet with PoE, Serial, USB and Industrial Protocols	Auto	Standard Range	2.3 MP	Red Illumination No Filter
FS40-SR20D4-3X00W	DPM with Fast 2D Decoder Ethernet with PoE, Serial, USB and Industrial Protocols	Auto	Standard Range	2.3 MP	White Illumination RGB Filter
FS40-SR20D4-6C00W	DPM with Fast 2D Decoder Ethernet with PoE, Serial, USB and Industrial Protocols	Auto	Standard Range	2.3 MP	Red, White and Infrared Illumination No Filter
FS40-SR20F4-2C00W	Fast 2D Decoder Ethernet with PoE, Serial, USB and Industrial Protocols	Auto	Standard Range	2.3 MP	Red Illumination No Filter
FS40-SR20F4-5C00W	Fast 2D Decoder Ethernet with PoE, Serial, USB and Industrial Protocols	Auto	Standard Range	2.3 MP	Infrared Illumination No Filter

Table 1 xS40 Configurations (Continued)

SKU	Toolset	Focus	Range	Resolution	Illumination
FS40-SR20F4-6C00W	Fast 2D Barcode Decoder Ethernet with PoE, Serial, USB and Industrial Protocols	Auto	Standard Range	2.3 MP	Red, White and Infrared Illumination No Filter
FS40-SR20Z4-2C00W	Standard 2D Barcode Decoder Ethernet with PoE, Serial, USB and Industrial Protocols	Auto	Standard Range	2.3 MP	Red Illumination No Filter
FS40 Wide Angle					
FS40-WA20D4-2C00W	DPM with Fast 2D Decoder Ethernet with PoE, Serial, USB and Industrial Protocols	Auto	Wide Angle	2.3 MP	Red Illumination No Filter
FS40-WA20D4-3X00W	DPM with Fast 2D Decoder Ethernet with PoE, Serial, USB and Industrial Protocols	Auto	Wide Angle	2.3 MP	White Illumination RGB Filter
FS40-WA20D4-6C00W	DPM with Fast 2D Decoder Ethernet with PoE, Serial, USB and Industrial Protocols	Auto	Wide Angle	2.3 MP	Red, White, and Infrared Illumination No Filter
FS40-WA20F4-2C00W	Fast 2D Barcode Decoder Ethernet with PoE, Serial, USB and Industrial Protocols	Auto	Wide Angle	2.3 MP	Red Illumination No Filter
FS40-WA20F4-5C00W	Fast 2D Barcode Decoder Ethernet with PoE, Serial, USB and Industrial Protocols	Auto	Wide Angle	2.3 MP	Infrared Illumination No Filter
FS40-WA20F4-6C00W	Fast 2D Barcode Decoder Ethernet with PoE, Serial, USB and Industrial Protocols	Auto	Wide Angle	2.3 MP	Red, White, and Infrared Illumination No Filter
FS40-WA20Z4-2C00W	Standard 2D Barcode Decoder Ethernet with PoE, Serial, USB and Industrial Protocols	Auto	Wide Angle	2.3 MP	Red Illumination No Filter
VS40 Standard Range					

Table 1 xS40 Configurations (Continued)

SKU	Toolset	Focus	Range	Resolution	Illumination
VS40-SR20S4-2C00W	Sensor Toolset Ethernet with PoE, Serial, USB and Industrial Protocols	Auto	Standard Range	2.3 MP	Red Illumination No Filter
VS40-SR20S4-2R00W	Sensor Toolset Ethernet with PoE, Serial, USB and Industrial Protocols	Auto	Standard Range	2.3 MP	Red Illumination Red Bandpass Filter
VS40 Wide Angle					
VS40-WA20S4-2C00W	Sensor Toolset Ethernet with PoE, Serial, USB and Industrial Protocols	Auto	Wide Angle	2.3 MP	Red Illumination No Filter
VS40-WA20S4-2R00W	Sensor Toolset Ethernet with PoE Serial, USB and Industrial Protocols	Auto	Wide Angle	2.3 MP	Red Illumination Red Bandpass Filter

xS70 Configurations

The guide covers the following xS70 configurations.

Table 2 xS70 Configurations

SKU	Toolset	Resolution
FS70		
FS70-CM20D5-0C00W	DPM with Fast 2D Barcode Decoder Dual Ethernet (1 PoE), Serial, USB and Industrial Protocols	2.3 MP
FS70-CM20F5-0C00W	Fast 2D Barcode Decoder Dual Ethernet (1 PoE), Serial, USB and Industrial Protocols	2.3 MP
VS70		
FS40-WA20D4-2C00W	Sensor Toolset Dual Ethernet (1 PoE), Serial, USB and Industrial Protocols	2.3 MP
FS40-WA20D4-3X00W	DPM with Fast 2D Barcode Decoder Dual Ethernet (1 PoE), Serial, USB and Industrial Protocols	2.3 MP

License Types

The Zebra Web HMI refers to the License Name when describing license types that apply to FS/VS devices.

The following table outlines the available licenses and the corresponding License Name referenced in the Zebra Web HMI.

Table 3 License Types

License Type	Part Number	License Name
VS Sensor Package	LIC-SEN001-0100	xs-feature-vspkg:1.0
VS Standard Package	LIC-SEST01-0100	xs-feature-vspkg:2.0
FS DPM Full Package	LIC-DPM001-0200	xs-feature-fspkg:3.0
FS Fast 1D/2D	LIC-2DF001-0200	xs-feature-fast1D2D:1.0
VS OCR	LIC-OCR002-0100	xs-feature-OCR02
FS OCR	LIC-OCR003-0100	xs-feature-OCR03
NS Anomaly Detection	LIC-AD002-0100	NSx2-feature-AD02
FS Anomaly Detection	LIC-AD003-0100	FSx2-feature-AD03
Gateway Connectivity License for FS10 devices	LIC-10LF-0000	xs-feature-deviceWISE03
Gateway Connectivity License for FS20 and VS20 devices	LIC-20LF-0000	xs-feature-deviceWISE04
Gateway Connectivity License for FS40, FS42, FS70, VS40, and VS70 devices	LIC-47LF-0000	xs-feature-deviceWISE05
Gateway Connectivity Full License for all devices in the FS and VS family	LIC-EXLF-0000	xs-feature-deviceWISE06

NOTE: Upgrades are available from a Sensor Toolset to a Standard Toolset and from an Fixed Scanning License to a Machine Vision License.

Installation

The following illustrations display the dimensions and mounting orientation for the xS40 and x70 devices. Use the guidance provided to mount the device to an L-bracket, as shown in the mounting instructions

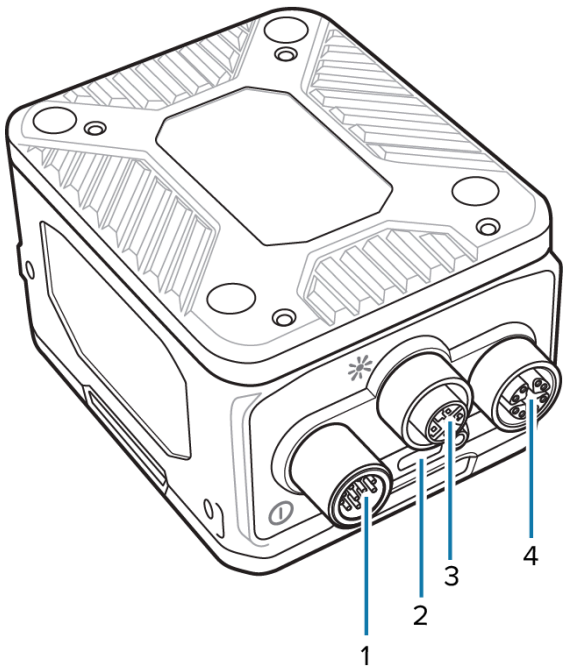
Connection Interfaces

Both devices support connections for USB-C with DisplayPort, power serial and GPIO, x-coded Ethernet, and external lighting.

xS40 Connections

The xS40 supports connections for USB-C with DisplayPort, power serial and GPIO, x-coded Ethernet, and external lighting.

Figure 1 xS40 Connections



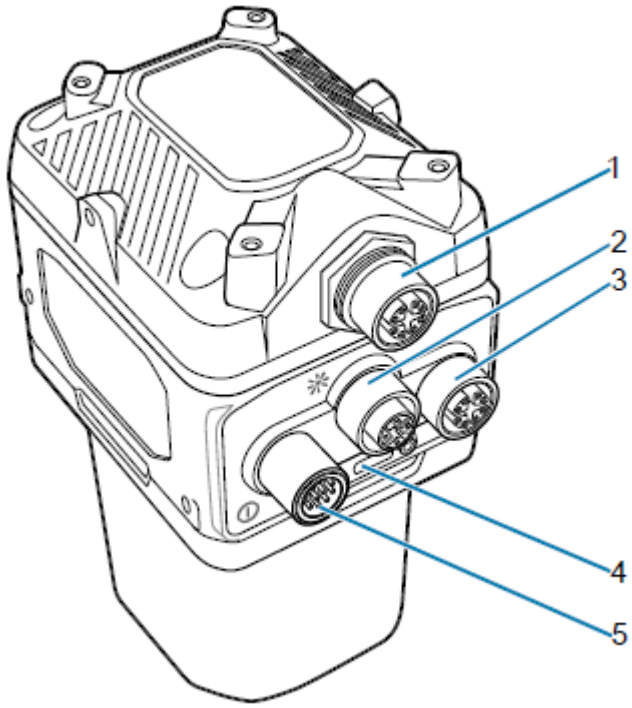
1	Power Serial and GPIO

2	USB-C (with DisplayPort)
3	External Lighting
4	X-Coded Ethernet Port

xS70 Connections

The xS70 supports connections for USB C with DisplayPort, power serial and GPIO, X-coded Ethernet, and external lighting.

Figure 2 xS70 Connections



1	X-Coded Ethernet Port (Secondary)
2	External Lighting
3	X-Coded Ethernet Port
4	USB C (with DisplayPort)
5	Power Serial and GPIO

Power Sources

Power the device through a 12-pin M12 connector, Power over Ethernet (PoE), or USB Type C to satisfy various use cases.

A power priority scheme selects power from the M12 connector over PoE and PoE over USB-C to ensure the device consumes the least restrictive power source. Changes to the power source trigger a reboot. This acts as a power budget for the device, dynamically allocating power to prevent an overload

condition. Allocation is based on sensor type and enabled features such as Ethernet PHYs, digital outputs, and advertised USB Type C port current. Models with internal illumination reduce illumination intensity or duration to operate within budget and may disable internal illumination entirely if necessary.

NOTE: Develop jobs with power sources and auxiliary equipment that are representative of the final intended configuration to prevent a mismatch during deployment.

12 Pin M12 Power Input

If the input voltage exceeds 21.5 V, the vision system enables up to 1.5 A output to the USB Type C connector. If the external light connector is placed in external light mode, power is shunted from the power supply directly to the light through a bypass circuit that supports the high peak currents of strobe lights. A self-resettable fuse prevents physical overload of the 12-pin M12 connector.

If less than 21.5 V is provided to the device, the advertised USB Type C current is lowered to 500 mA, and the overall power budget is reduced. This may impact allowable internal illumination configurations. As a result, a 24 V industrial power supply capable of high pulse currents of long duration is recommended for optimal performance.

Power Over Ethernet

The devices support operation from power sourcing equipment meeting the 802.3at class 4 (30 W) or 802.3af class 3 (15.4 W) IEEE Power Over Ethernet (PoE) standards. These are commonly referred to as PoE + and PoE, respectively by equipment providers.

Peak power draw must be strictly maintained within the power envelope of the power-sourcing equipment. If the external light connector is enabled in external light mode, the vision system generates 24 V to power the external light with the following limitations in place:

- Simultaneous activation of the internal and external illumination is not permitted.
- Auto-strobe lights with high pulse current are not supported and trip over current protection in the vision system, disabling the external light connector.
- External lights with adjustable intensity may be used, provided the peak current draw is below the over-current protection limit. It is recommended to start with the lowest intensity setting and work upwards or to use the auto-tune feature.

Power over Ethernet requires an extra regulation step which incurs additional thermal buildup within the device. As a result, the specified operating temperature range is reduced when powered by PoE.

USB Type C

USB Type C allows for novel and cost-effective installations provided the following constraints are acceptable:

- Digital GPIO are unavailable.
- Optocoupled GPIO is still functional, provided the COMMON_IN and COMMON_OUT are properly terminated.
- The External Light Connector is disabled and cannot be used in GPIO or External Light modes.
- 0 V to 10 V analog output is disabled.

- Illumination is limited or requires a USB power source with further capabilities to be enabled at any capacity.

NOTE: The device boots from legacy USB host ports. However, the current draw is not guaranteed to be under 500 mA, and device functionality may be restricted to the extent that performance can be impaired. An override mode can be enabled for legacy host ports that are known by the operator to be capable of supplying up to 1.5 A. Ports of this type are often described as having USB BC1.2 or USB charging support.

Grounding for Electro-Magnetic Compliance and ESD Safe

The vision system is designed with a rugged metal chassis connected internally to ground for robust Electro-Magnetic Compliance (EMC) and ESD Safe operation. Do not mount to any conductive object, body, structure, or mechanism that may become connected to line voltage or a voltage potential other than Protected Earth Ground. Chassis grounding via cable shield, mounting screws, or low inductance ground strap to a local Protected Earth Ground is acceptable.

NOTE: There is no galvanic connection to Earth Ground when the device is powered over an unshielded Ethernet cable. In this scenario, grounding to local Earth Ground through another cable shield, mounting screw, or ground strap is required for ESD Safe compliance and best practice for EMC.

Mounting Instructions

The following sections describe the steps to mount the device to the L-bracket accessory.

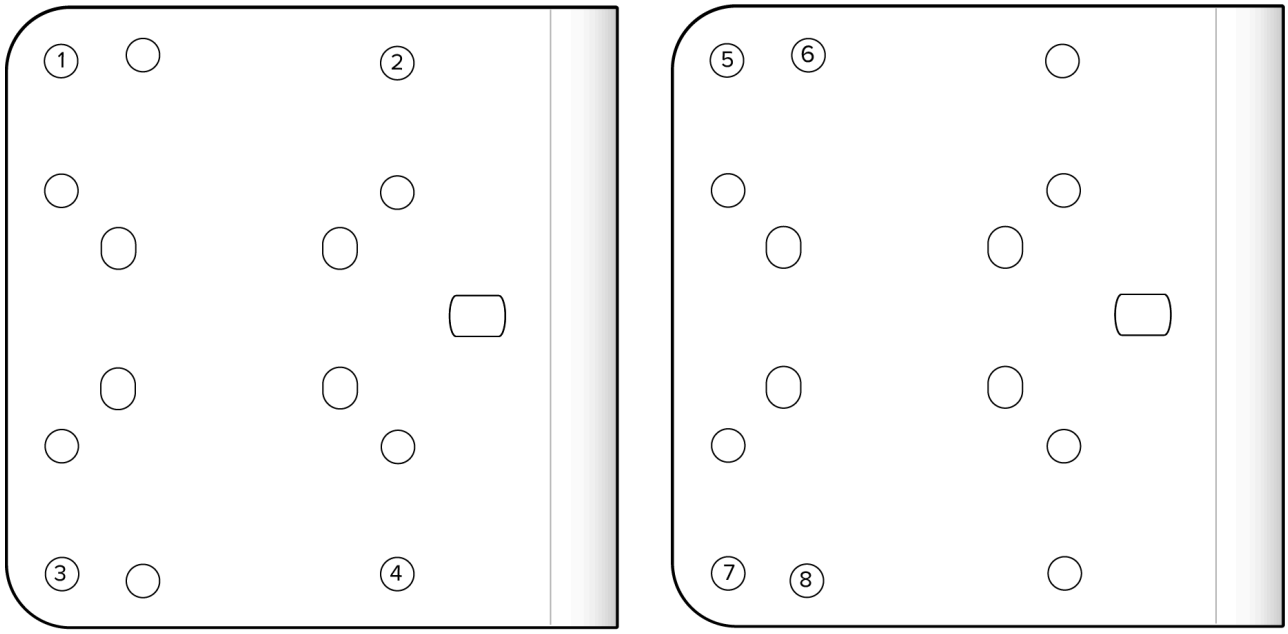
1. Align the holes on the mounting surface with the mounting holes on the device.
2. Insert screws into the mounting holes and tighten. It is recommended to use four M3 screws to attach the camera on the bottom surface. Torque screws to 6.9 kgf-cm (6.0 lbf-in).

Review the dimensional drawings for mounting hole placements on the devices to determine the proper screw lengths needed based on the provided tapping depths into the camera.

Mounting the Device Using the L-Bracket

1. Use the mounting screws provided with the kit to attach the camera to the bracket. Torque screws to 6.9 kgf-cm (6.0 lbf-in).
2. Refer to the L-bracket mounting options outlined below.

Figure 3 Bottom and Side Mounting Options

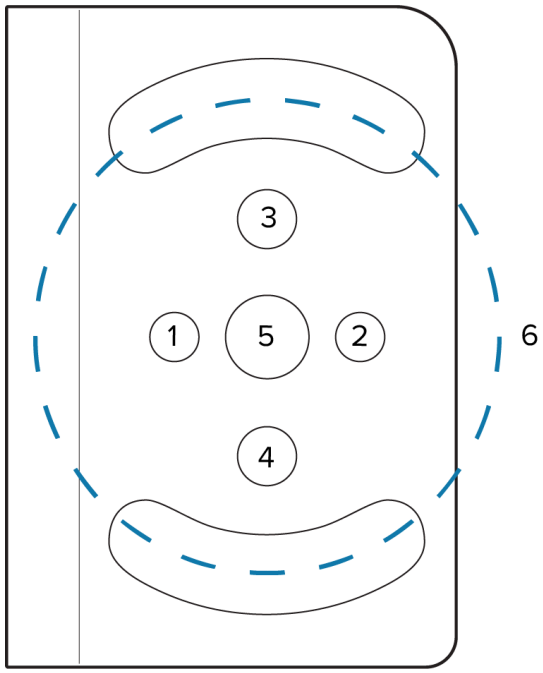


Bottom Mounting Holes

Side Mounting Holes

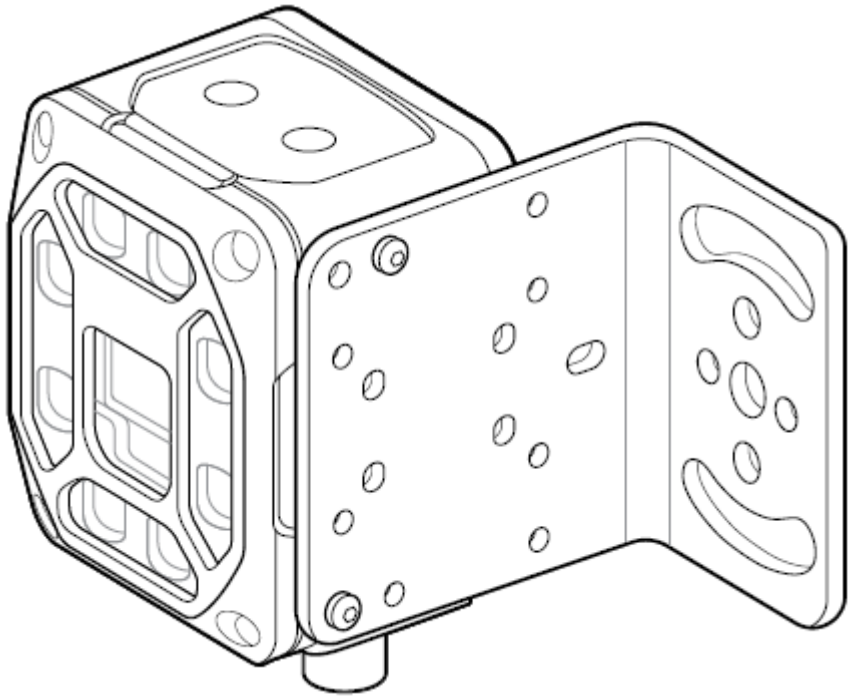
1-4	Bottom Surface Mounting Holes for both devices
5-8	Side Mounting Holes for the xS40

Figure 4 Side Mounting Orientation



1-2	M5 Clearance
3-4	1/4-20 Clearance
5	M8 Clearance
6	M8 Clearance Slots

Figure 5 Side Mounting Orientation



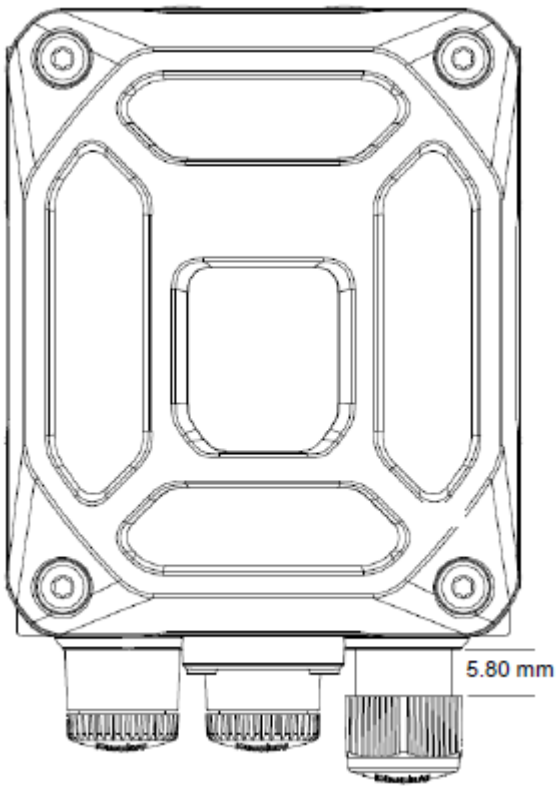
Torque Specification

To ensure an IP65 and IP67 product specification, Zebra cables and/or connector covers must be torqued to the following specification:

- Torque for M12 Zebra cables: 24.0 in-lbs
- Torque for connector covers: 10.0 in-lbs

NOTE: Connector covers are hand tightened from the factory to allow for easy hand removal. The covers must be torqued at installation to guarantee an IP65 and IP67 specification if cables are not used.

Refer to the following diagram for the reference dimension (in mm) of the 12-pin M12 cable:



Installing an Illumination System

Proper illumination improves detection capabilities in challenging lighting conditions.

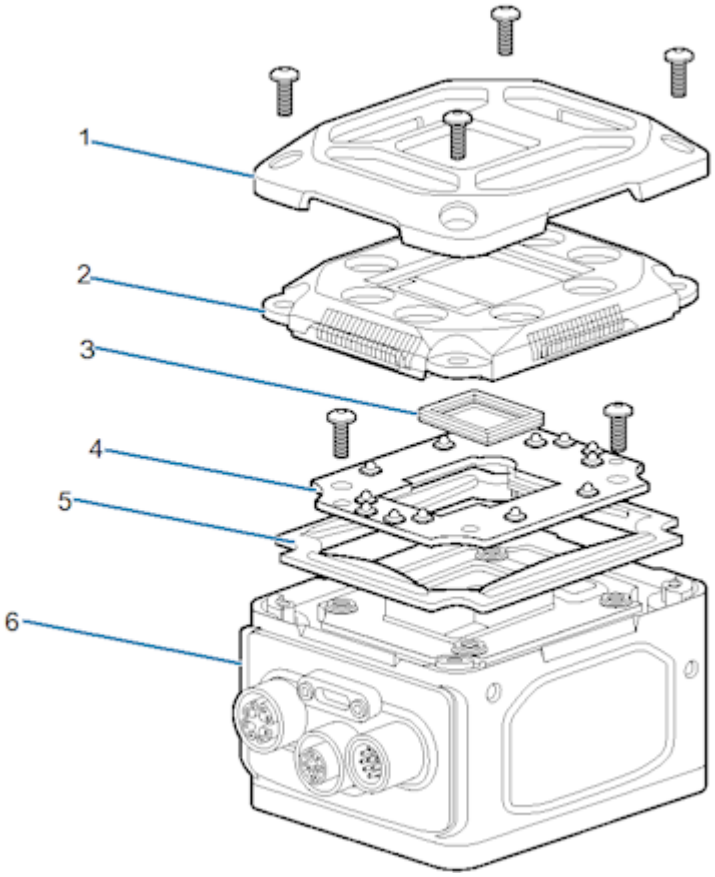
1. Place the gasket onto the camera.
2. Attach the Illumination PCB to the camera via the board-to-board connector and secure it with two screws. The recommended Torque is 6.9 kgf-cm (6.0 lbf-in) using the Torx T8 fasteners.
3. Place the filter onto the camera exit window, lining up the corner chamfer of the filter to the corner chamfer of the camera housing (if required).
4. Place the illumination plate assembly onto the camera.
5. Attach the top cover and secure it with four screws. The recommended Torque is 6.0 in-lbs using the Torx T8 fasteners.

Disassembling the Illumination System

1. Remove the four screws and remove the top cover.
2. Remove the illumination plate assembly.
3. Remove the filter (if applicable).
4. Remove the two screws and gently lift the PCB to disconnect it from the device.

The gasket can be left in place unless damaged. Replace the gasket if it is damaged to maintain its IP67 specification.

Figure 6 Lens Disassembly



1	ESD Safe Cover (Four Screws)
2	Illumination Plate Sub-Assembly
3	Filter Assembly
4	Illumination PCB (Two Screws)
5	Illumination Plate Gasket
6	Main Assembly

Threaded Lens Cover Assembly Installation

If a threaded lens cover assembly is preferable over the IP67 cover provided with the xS70, follow the instructions below for installation.

NOTE: The threaded lens cover assembly can only be used with C-Mount lenses.

1. Remove the lens cover.
2. Place the threaded lens adapter accessory onto the camera (HN-001466-01).
3. Insert and tighten the screws. The recommended torque is 6.0 in-lbs using the Torx T8 fasteners.

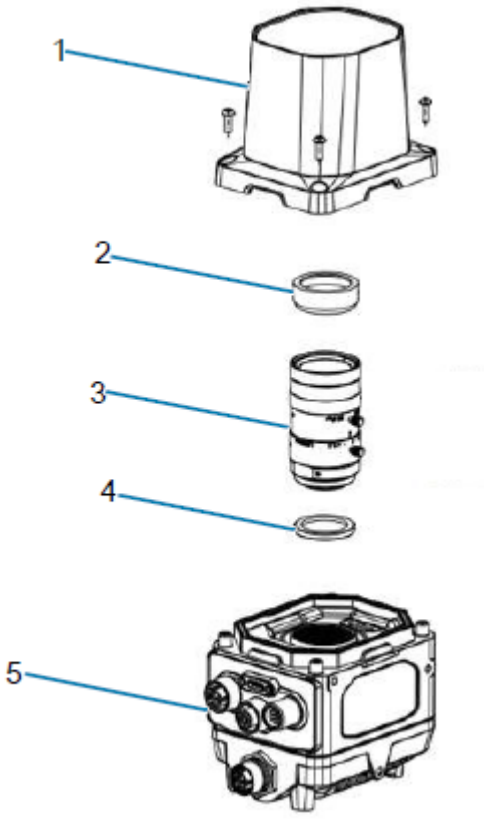
4. Install filter into the camera (if required).
5. Thread the lens into the camera.
6. Place the reader at the desired working distance from the focal point.
7. Adjust the lens (if necessary).
8. Thread on appropriate length cover to accommodate chosen lens.

C-Mount Lens Installation

C-Mount lenses are compatible for use with xS70 devices only.

1. Remove the lens cover.
2. Install the filter into the camera (if required).
3. Thread the lens into the camera.
4. Place the camera at the desired working distance from the focal point.
5. Adjust the lens (if necessary).
6. Attach the front cover.
7. Insert and tighten the screws. The recommended Torque is 6.0 in-lbs using the Torx T8 fasteners.

Figure 7 C-Mount Lens Installation



1	Lens Cover

2	Polarizer
3	C-Mount Lens
4	Filter
5	Main Assembly

Setting Focus

Calibrate the gain and exposure settings by utilizing the Live View feature in the Web HMI of the Zebra Aurora Focus application

The focus and aperture of the C-mount lens can also be adjusted manually.

NOTE: The set screws must be loosened before adjusting the lens. The screws are fixed after the optimum focus and aperture are set.

Using the Device

This section explains the proper use of USB Type C, compatible display resolutions, UI indicators, and LED and beeper feedback that indicate device state.

USB Type C

USB Type C allows for novel and cost-effective installations provided the following constraints are acceptable:

- Digital GPIO are unavailable.
- Optocoupled GPIO is still functional, provided the COMMON_IN and COMMON_OUT are properly terminated.
- The External Light Connector is disabled and cannot be used in GPIO or External Light modes.
- 0 V to 10 V analog output is disabled.
- Illumination is limited or requires a USB power source with further capabilities to be enabled at any capacity.

NOTE: The device boots from legacy USB host ports. However, the current draw is not guaranteed to be under 500 mA, and device functionality may be restricted to the extent that performance can be impaired. An override mode can be enabled for legacy host ports that are known by the operator to be capable of supplying up to 1.5 A. Ports of this type are often described as having USB BC1.2 or USB charging support.

USB Type C Operation

The devices implement a full capability 5 Gbps USB 3.0 USB Type C port with support for DisplayPort Alt Mode. The sealed port implements a standard USB Type C dual screw lock mechanism for secure connections. When paired with the IP67 series of Zebra screw locking cables, the interface maintains a full IP67 seal.

NOTE: The sealing gasket on IP67 series Zebra USB Type C cables requires adequate pressure for proper seal and connector engagement. Always tighten the locking screws when using these cables, even if IP67 sealing is not required.

When connected as a peripheral to a USB host, the devices can be configured to support the following functionality:

- RNDIS Ethernet over USB

- USB-CDC or HID keyboard (configurable using Windows device settings)

When operating as a host, the USB Type C port supports many types of accessories and functionality, including:

- Native USB-C displays
- USB-C to Display Port and USB-C to HDMI adaptors
- HID-compliant keyboards and trackpads
- USB mass storage devices for firmware updates
- USB docks and hubs

NOTE: DisplayPort output is only supported over USB Type C to Type C cables capable of SuperSpeed data rates. High-speed charging cables typically do not have the necessary data wires for DisplayPort functionality.

Supported Display Resolutions

Display resolution is automatically negotiated upon connection. Displays with at least 1920 x 1080 resolution provide the preferred user experience.

The FS/VS Smart Camera series supports the following resolutions:

- 1024 x 768
- 1280 x 800
- 1280 x 1024
- 1366 x 768
- 1600 x 900
- 1600 x 1050
- 1920 x 1080
- 1920 x 1200

NOTE: Monitors with USB-C input offer an efficient method for quick and easy configuration over a single USB Type C to Type C cable. An attached device powers directly from the monitor's USB Power Delivery and outputs the Human Machine Interface (HMI) directly to the display. A USB mouse and keyboard attached to the monitor hub ports provide the user with interface control. Battery-powered portable USB Type C monitors are also compatible for easy status or manipulation in the field.

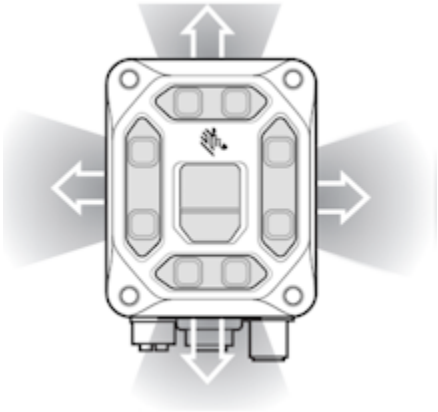
User Interface

The device is compatible with 24VDC power supplies and PoE injectors.

Decode LEDs

The device has a 360° LED decode indicator that flashes green upon successful decode and red upon job failure.

Figure 8 360° LEDs



User Interface Label

The User Interface (UI) label uses LEDs to provide information on device state and feedback. Two sensor PCB switches control the device's trigger and tune buttons. The TRIG switch acts as a trigger, and the TUNE switch adjusts and optimizes focus.

LED and Beeper Indicators

The following table describes the LED and beeper indications of the FS/VS Smart Camera upon device events such as power-up, running a job, maintenance operations, and parameter programming.

Table 4 LED and Beeper Indications

Event	Beeper	360° LED	Power LED	Device Status LED	Focus Status LED	Warning LED
Power Up						
Power up with Low Power	Low, Medium, High Tone	Single Green Blink	Solid Red	-	-	-

Table 4 LED and Beeper Indications (Continued)

Event	Beeper	360° LED	Power LED	Device Status LED	Focus Status LED	Warning LED
Power up with Limited Power (USB or 15W PoE)	Low, Medium, High Tone	Single Green Blink	Solid Amber	-	-	-
Power up with Full Power (24V or 30W PoE)	Low, Medium, High Tone	Single Green Blink	Solid Green	-	-	-
Job Error	Low, Low Tone	-	Solid Green	Solid Red	-	Solid Red
Device Maintenance						
Factory Reset	Medium, Medium Tone	Continuous Red Flash (5hz)	Solid Green	-	-	-
Firmware Operations						
Firmware Update Start	-	Continuous Red Flash (2hz)	Solid Green	Continuous Red Flash (2hz)	-	-

Table 4 LED and Beeper Indications (Continued)

Event	Beeper	360° LED	Power LED	Device Status LED	Focus Status LED	Warning LED
Firmware Update Success	-	-	Solid Green	-	-	-
Firmware Update Fail	Low Tone	Continuous Red Flash (5hz)	Solid Green	Continuous Red Flash (5hz)	-	-
Autotune Operations						
AutoTune Start	Medium Tone	-	Solid Green	-	Continuous Green (2Hz)	-
AutoTune Success	High Tone	-	Solid Green	-	Solid Green	-
AutoTune Fail	Low Tone	-	Solid Green	-	Solid Red	-
Decode						
Barcode Decode Start[1]	-	-	Solid Green	Solid Amber	-	-

Table 4 LED and Beeper Indications (Continued)

Event	Beeper	360° LED	Power LED	Device Status LED	Focus Status LED	Warning LED
Barcode Decode Success[1]	Medium Tone	Single Green Flash	Solid Green	-	-	-
Barcode Decode Failure	-	Single Red Flash	Solid Green	-	-	-
Parameter Programming						
Parameter Entry Accepted	High, Low, High, Low Tone	Single Green Blink	-	Solid Green	-	-
Parameter Number Entry Expecting Barcodes	High, Low Tone	Single Green Blink	-	Solid Green	-	-
Parameter Entry Error	Low, High Tone	Single Red Blink	-	Solid Green	-	-

NOTE: [1] This is the default, Barcode Decode Success and Barcode Decode Failure beeper UI feedback is configurable in Aurora Focus.

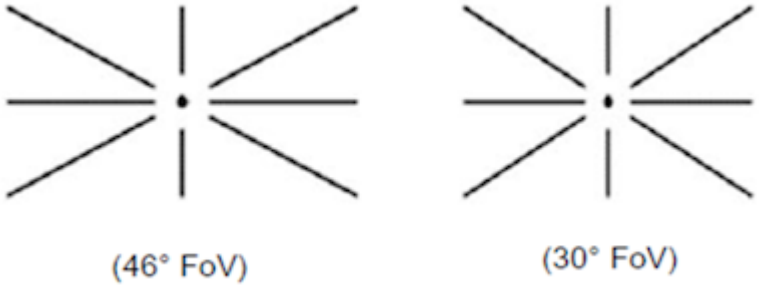
Data Capture

This section describes aiming patterns and decode ranges for the xS40 as well as minimum focus distances for the xS70 while using a C-mount lens.

Aiming Patterns

The aimer indicates the center and size of the field of view including diagonal corners 24 in. away from the subject.

Figure 9 Aiming Patterns



Minimum Focus Distances

The following table outlines the minimum focus distances for C-mount lenses provided by Zebra for use with the xS70 device. Decode ranges are dependent upon the lens's effective focal length, focusing distance setting, and aperture setting.

C-Mount Lens	8 MM	12 MM	16 MM	25 MM	35 MM
Minimum Focus Distance from the Lens	6.35 cm (2.5 in.)	11.43 cm (4.5 in.)	10.16 cm (4 in.)	11.43 cm (4.5 in.)	19.05 cm (7.5 in.)

General Purpose Input and Outputs

The device has two types of general-purpose inputs and outputs (GPIO).

GPIO0 through GPIO3 are optically coupled to provide electrical isolation and wiring flexibility. GPIO4 through GPIO8 are 24 V Digital GPIO, which are not isolated and source power from the external power supply or Power over Ethernet (PoE). Digital GPIO is unavailable when the system is powered by USB. However, optocoupled GPIOs remain functional when COMMON_IN and COMMON_OUT are terminated appropriately.

Figure 10 Opto-Isolated Inputs

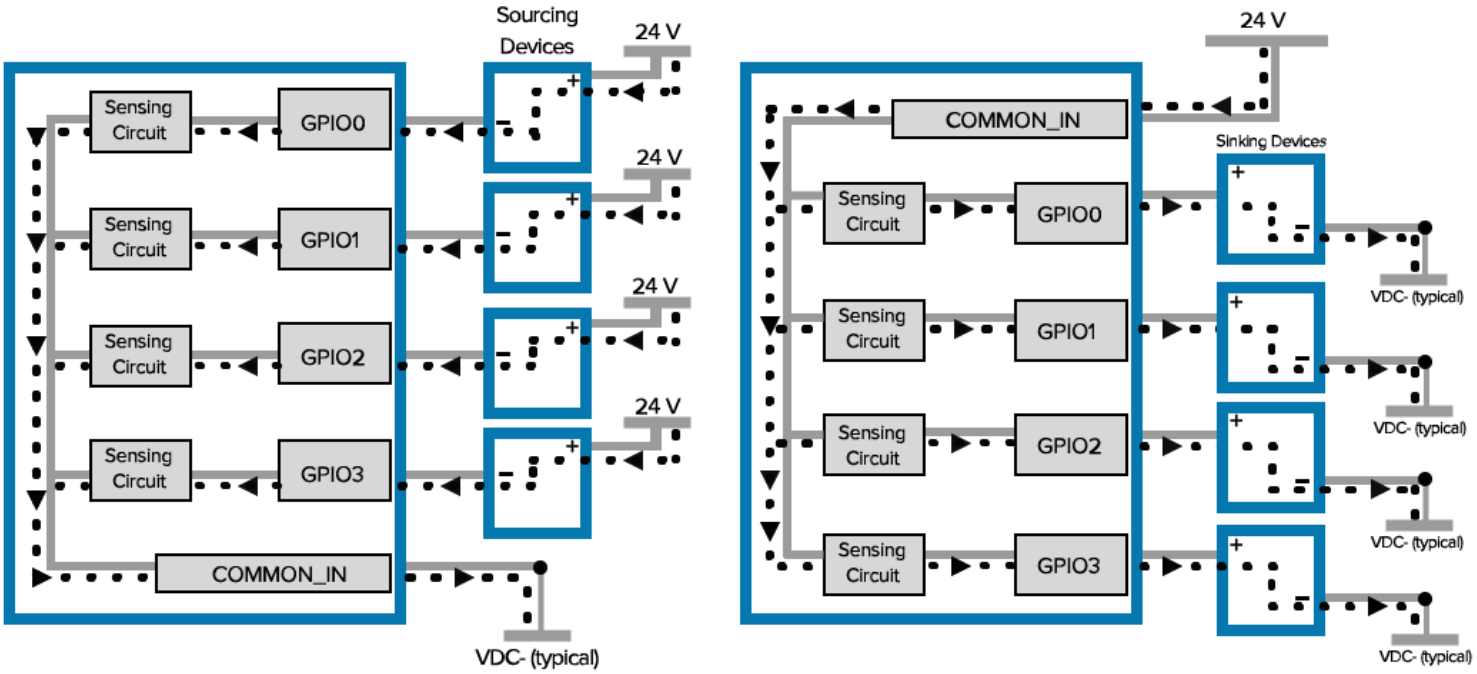
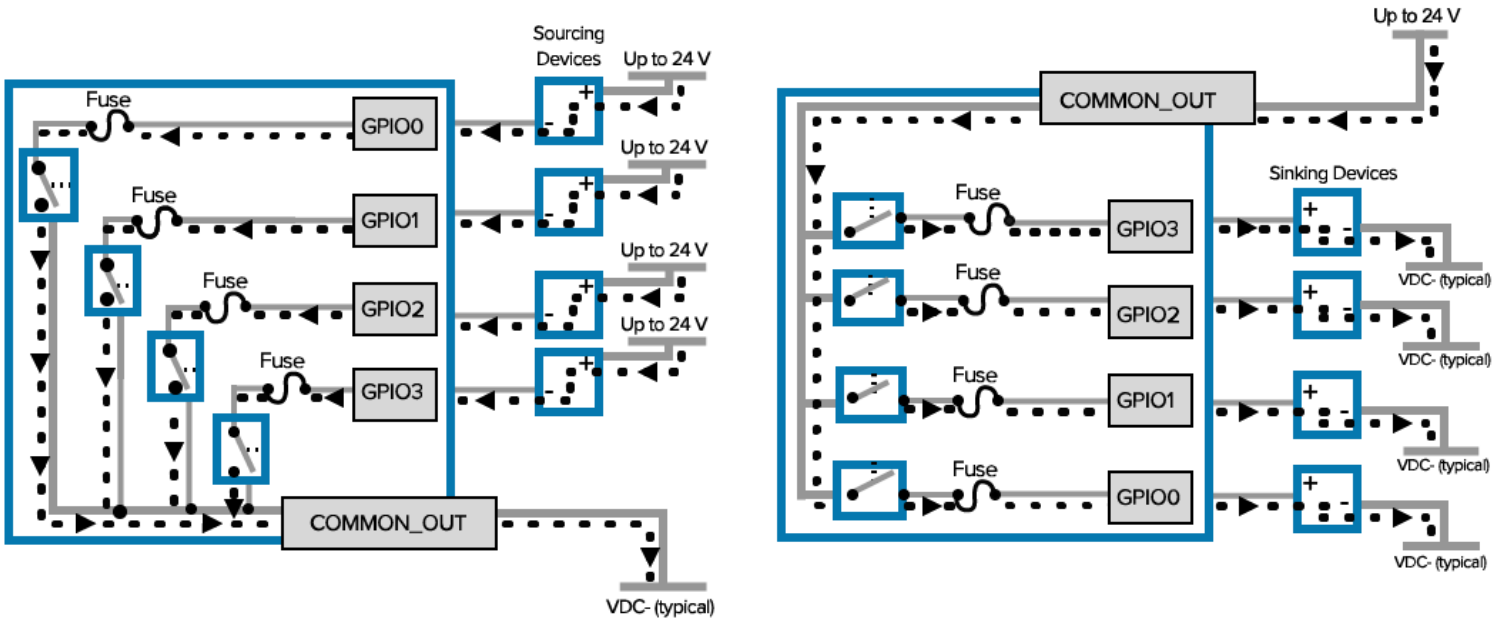


Figure 11 Opto-Isolated Outputs



GPIO Summary

The following table provides GPIO details such as connector, input, and output modes.

Table 5 GPIO Summary

Hardware	PIN	Conn.	Iso	Input Mode		Output Mode				
				Sink PNP	Source NPN	Sink NPN	Source PNP	Push-Pull	Max Current	USB Power
Opto	GPIO0	12 Pin	Yes	Yes	Yes	Yes	Yes	No	50mA	Yes
Opto	GPIO1	12 Pin	Yes	Yes	Yes	Yes	Yes	No	50mA	Yes
Opto	GPIO2	12 Pin	Yes	Yes	Yes	Yes	Yes	No	50mA	Yes
Opto	GPIO3	12 Pin	Yes	Yes	Yes	Yes	Yes	No	50mA	Yes
Digital	GPIO4	12 Pin	No	Yes	No	Yes[2]	Yes[2]	Yes	100mA[1]	No
Digital	GPIO5	12 Pin	No	Yes	No	Yes[2]	Yes[2]	Yes	100mA[1]	No
Digital	GPIO6	5 Pin	No	Yes	No	Yes[2]	Yes[2]	Yes	100mA[1]	No
Digital	GPIO7	5 Pin	No	Yes	No	Yes[2]	Yes[2]	Yes	100mA[1]	No
Digital	GPIO8	5 Pin	No	Yes	No	Yes[2]	Yes[2]	Yes	100mA[1]	No

NOTE: [1]Digital outputs consume power and reduce the power budget available for illumination. Disabling unused output when using PoE is recommended.

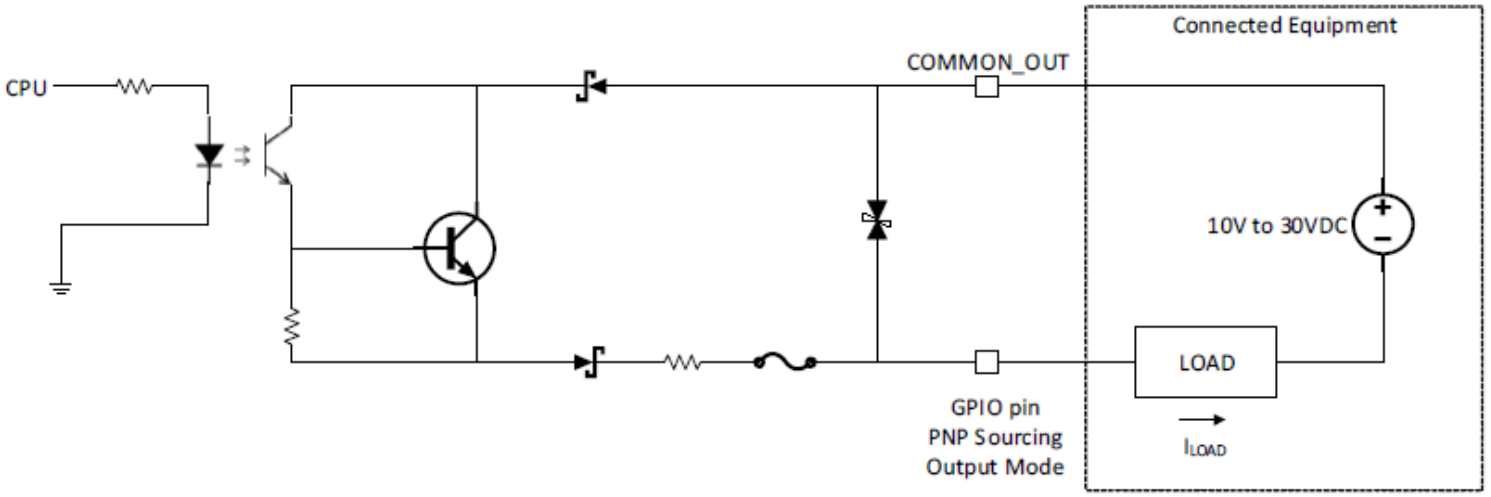
NOTE: [2]Push-pull output is compatible with auxiliary equipment having NPN inputs referenced to GND or PNP inputs referenced to DC IN.

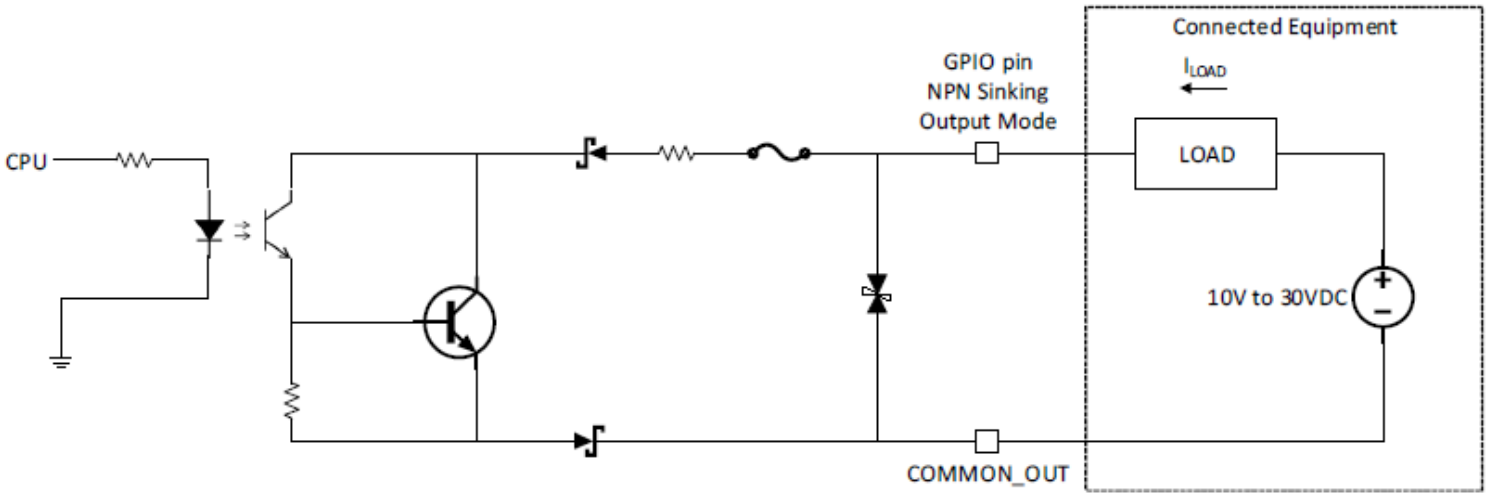
Optically Coupled GPIO

Optocoupled GPIO are electrically isolated from the rest of the system and require external reference through the COMMON_IN and COMMON_OUT wires.

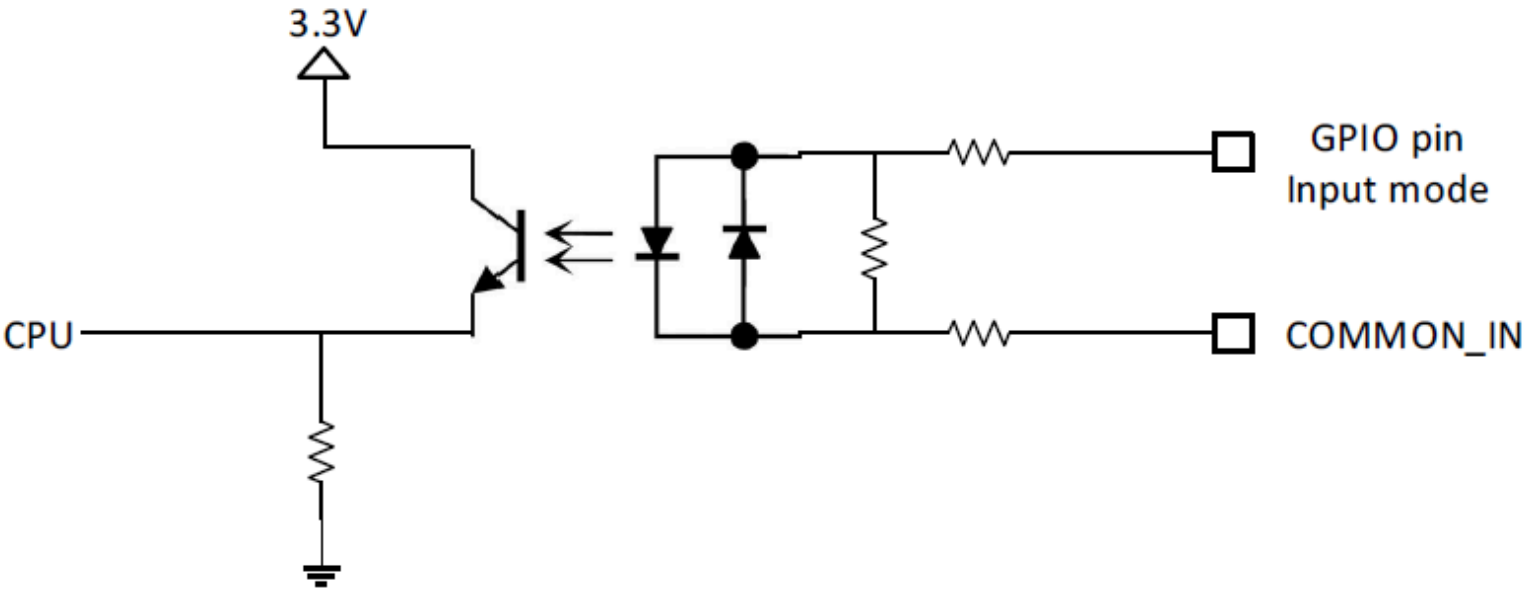
The termination of COMMON_IN and COMMON_OUT to an external voltage or ground determines if the input or output is Sinking type or Sourcing type.

In output mode, the GPIO performs similarly to switches connecting the GPIO pin to COMMON_OUT. When disabled, the GPIO pin is disconnected from COMMON_OUT and allowed to float. As a result, optocoupled outputs turn on quickly, while the turn-off time depends on how quickly the connected load dissipates the charge





Optocoupled inputs are enabled when voltage is applied across the GPIO pin and COMMON_IN.



Optocoupled GPIO can operate non-isolated by terminating COMMON_IN and COMMON_OUT to the DC_IN or GND wires that power the device.

Table 6 Connection References

Wire	Termination	Configuration
COMMON_IN	GND	Sinking Input (PNP)
COMMON_IN	DC_IN	Sourcing Input (NPN)
COMMON_OUT	GND	Sinking Output (NPN)
COMMON_OUT	DC_IN	Sourcing Output (PNP)

While it is possible to configure inputs and outputs of the same type, this is not recommended as inputs and outputs must be of opposite type to be compatible. All optocoupled GPIO share the COMMON_IN for input mode and COMMON_OUT for output mode. Therefore, all inputs must be of the same type and all outputs must be of the same type. For example, it is not possible to simultaneously configure sinking output on GPIO0 and sourcing output on GPIO1.

In practice, sinking inputs paired with sourcing outputs is common. This combination is compatible with widely available digital industrial GPIO, which typically only support sinking-type inputs.

NOTE: Refer to the documentation of the connected auxiliary equipment to ensure a compatible configuration, and remember to leave unused GPIO in a disabled state.

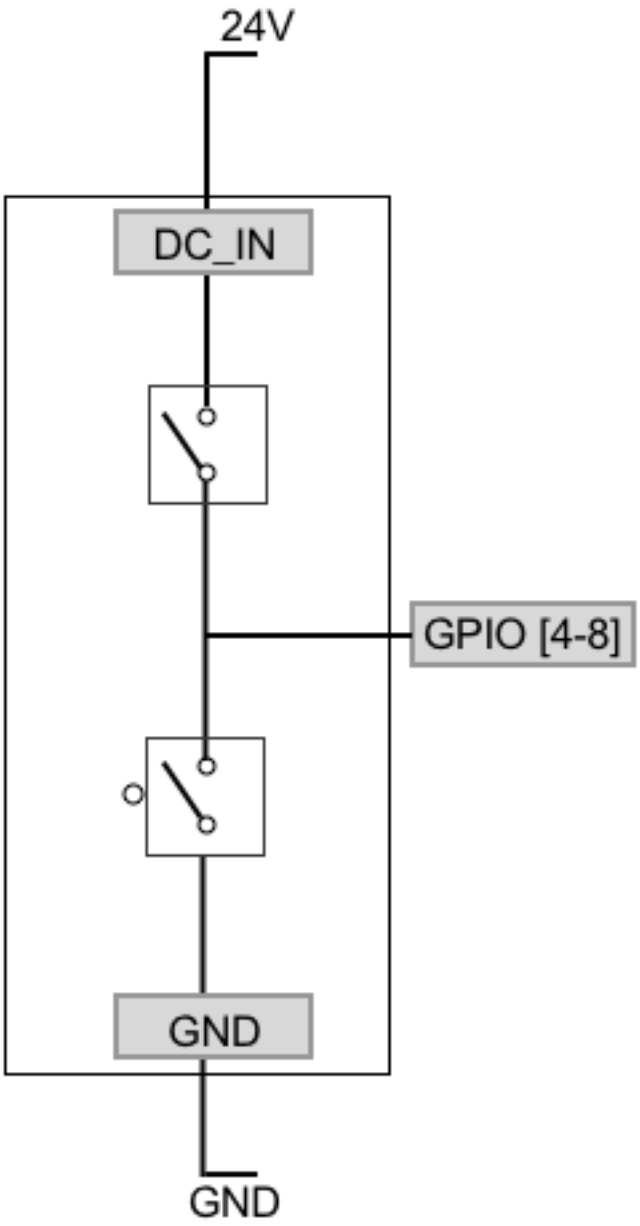
Optocoupled outputs are individually fused to protect against damage from short circuits or overload events. Since no power is consumed from the vision system, optocoupled GPIO have no impact on power budgeting.

Digital Industrial GPIO

Unlike optocoupled GPIO, digital GPIO actively drive the output signal high and low for significantly faster turn-on and turn-off time. Digital GPIO is not isolated and references the power supply and ground of the system. COMMON_IN and COMMON_OUT do not need to be terminated to use digital GPIO.

NOTE: Refer to the documentation of the connected auxiliary equipment to ensure a compatible configuration, and remember to leave unused GPIOs disabled.

Figure 12 Digital Outputs (Non-Isolated)



NOTE: A digital GPIO can be configured as a 24 V output and wired back into COMMON_IN or COMMON_OUT to create the necessary bias voltage to operate an optocoupled GPIO when PoE

powers the system. Knowing the 100 mA total current budget per digital GPIO is essential when attaching loads to any optocoupled outputs powered this way.

Digital inputs on the devices are of the sinking (PNP) input type and do not support the less common sourcing (NPN) input configuration. Voltage above the specified threshold relative to the vision system ground must be applied for a logic high to register. Drive these inputs with a sourcing (PNP) or push-pull output.

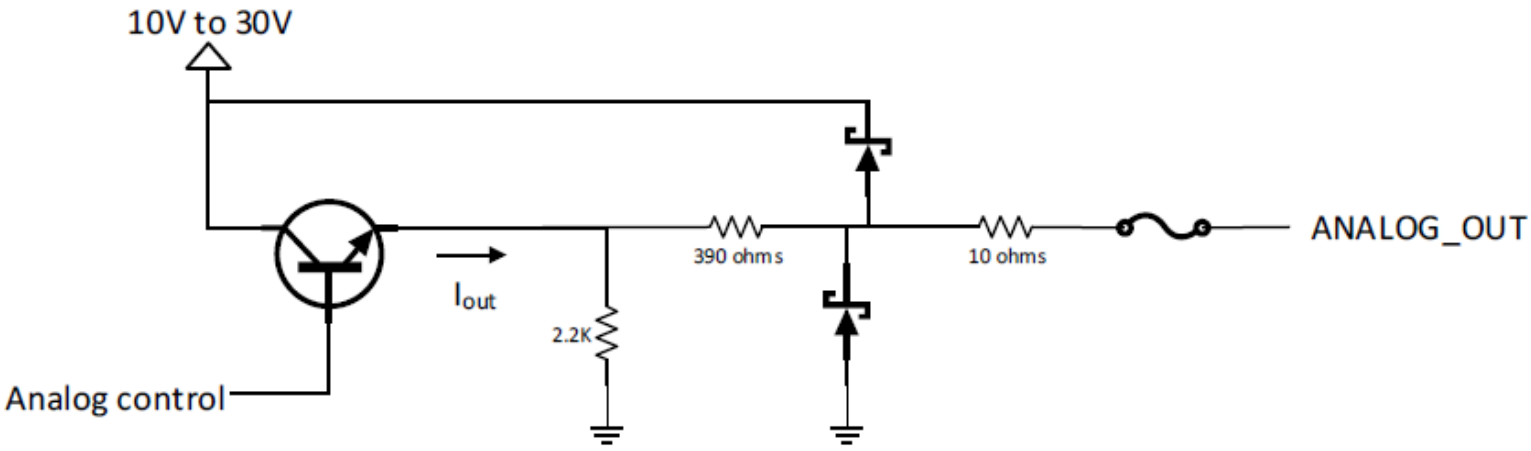
Configuring the 5-pin M12 External Light connector to GPIO Mode makes GPIO6 through GPIO8 available for general use. Configuring the External Light connector to External Light Mode switches GPIO8 into a high current output to provide power and sets up GPIO6 and GPIO7 to control the connected light.

NOTE: When a 24VDC external power supply powers the vision system, and the External Light connector is configured for External Light mode, GPIO8 operates in a bypass mode capable of shunting input power directly to high-power strobe lights. High peak currents are possible with adequate power supply capability, minimized cable losses, and observing the duty cycle limits that keep the average current in the system below 1500 mA.

Analog Output

The system has an analog output on the External Light connector capable of generating between 0 V and 10 V.

An output impedance of approximately 400 ohms protects the analog output driver against overload conditions. However, this introduces an output voltage offset directly proportional to the output current. For optimal accuracy, connect devices with low input bias current.



GPIO Wire Diagrams

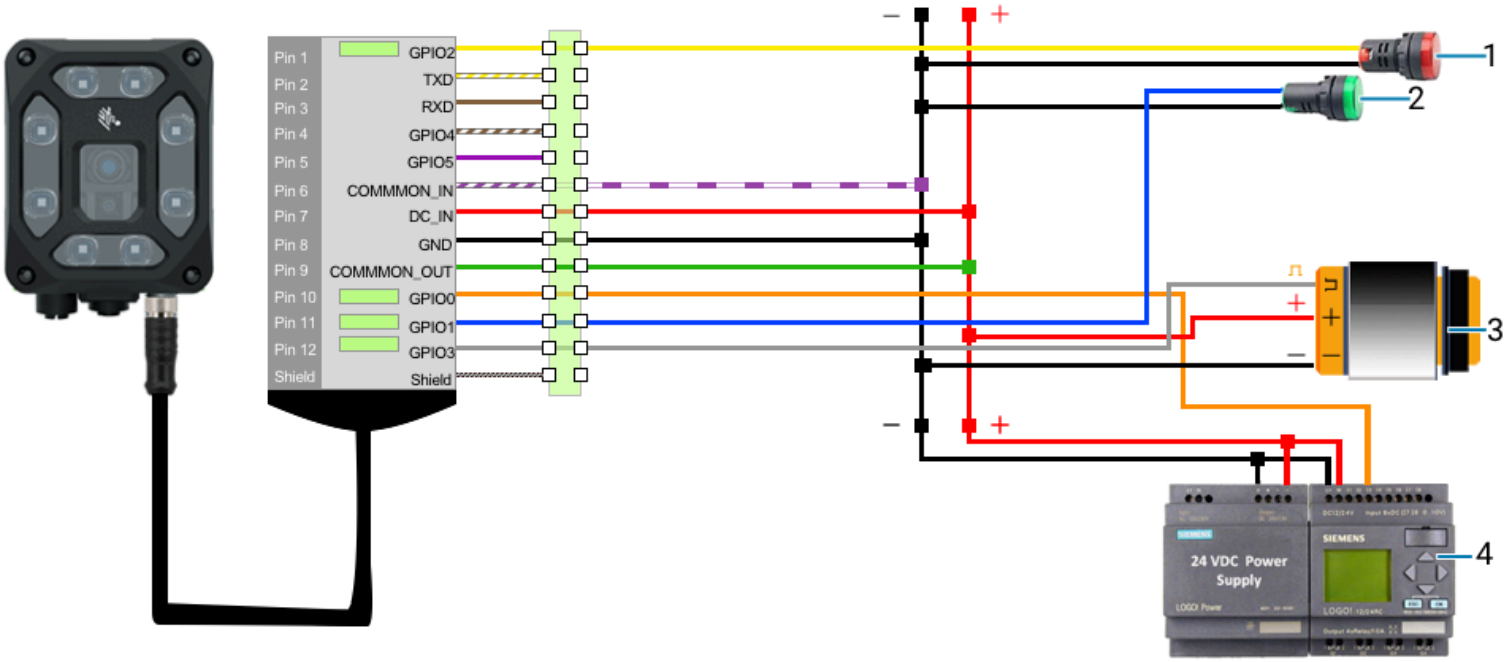
The diagrams in this section describe GPIO wiring with the Output as Current Source and as Current Sink.

Output as Current Source

The following diagram displays a configuration with GPIO 3 set to Input and GPIO0, GPIO1, and GPIO2 set to Output.

The GPIO Outputs are the Current Source (PNP), and the GPIO Input is the Current Sink (PNP). Input is received from a PNP proximity sensor. The power source is a PLC 24VDC PSU, and the GPIO functions are not opto-isolated.

Figure 13 Output as Current Source / Input as Current Sink



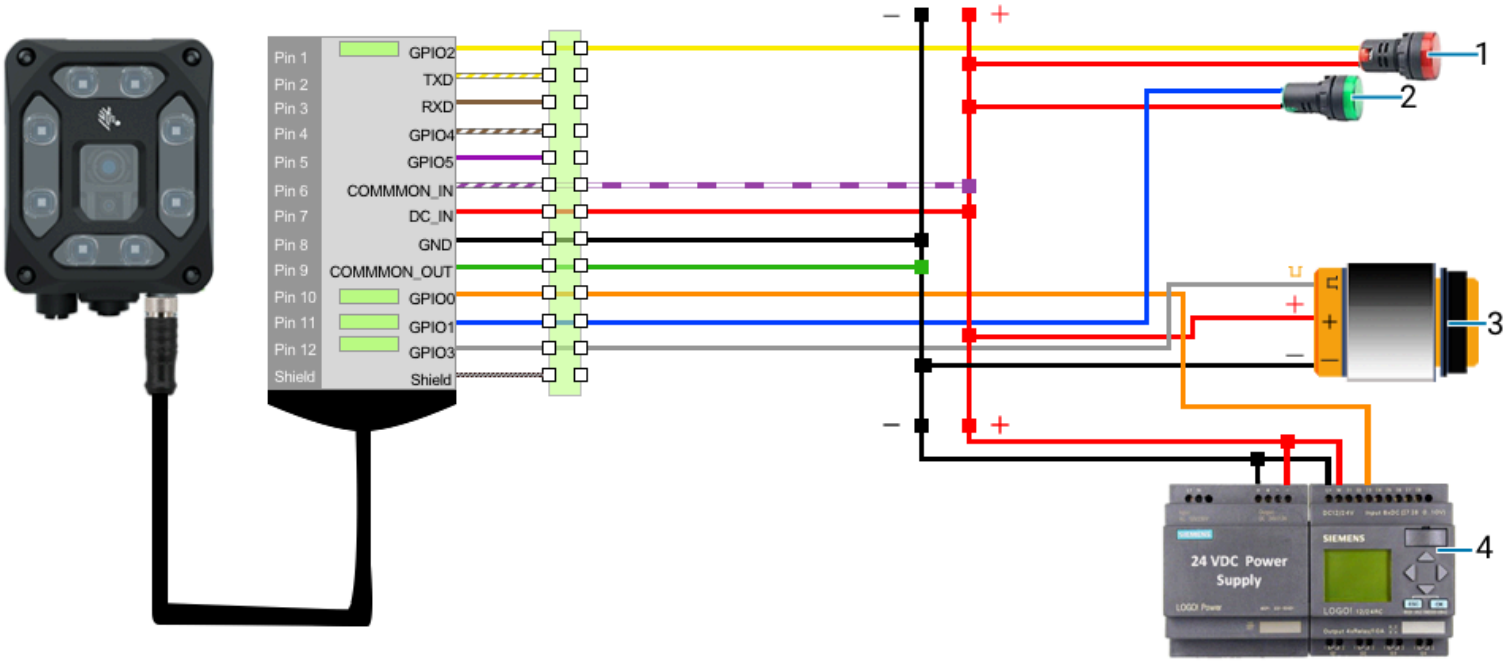
1	Job Fail
2	Job Pass
3	PNP Proximity Sensor
4	Power Supply

Output as Current Sink

The following diagram displays a configuration with GPIO 3 set to Input and GPIO1, GPIO2, and GPIO3 set to Output.

The GPIO Outputs are the Current Sink (NPN), and the GPIO Input is the Current Source (NPN). Input is received from an NPN proximity sensor. The power source is a PLC 24VDC PSU, and the GPIO functions are not opto-isolated.

Figure 14 Output as Current Sink / Input as Current Source



1	Job Fail
2	Job Pass
3	NPN Proximity Sensor
4	Power Supply

Power and Thermal Management

Algorithms keep the system within acceptable power and thermal parameters to ensure reliable operation over the device's lifetime.

CAUTION: A warning indicates if the available power budget is inadequate for the configured settings. In some cases, the user can choose to ignore or override the warning. In this case, the integrator should evaluate the operational stability of the system.

If the device temperature exceeds a safe limit, the system response may include disabling certain features, reducing processor performance, or stopping active jobs.

If overheating is a problem, effective mitigation strategies include:

- Reducing the average system power consumption
- Using external illumination
- Avoiding operating from PoE
- Operating in a cooler environment
- Actively cooling with a fan

- Heatsinking the chassis to a large thermally conductive mounting surface through a thermally conductive mounting system

For optimal performance, ensure that the device does not exceed the recommended operating ranges stated below.

Table 7 Operating Temperature

Temperature	Operating Range
Ambient Temperature	0°C to 40°C (POE, duty cycle-dependent) 0°C to 45°C (non-POE, duty cycle-dependent)

NOTE: If temperatures exceed the operating range, additional heatsinking strategies may be necessary, for example, mounting to a metal infrastructure or forced convection via an external fan. The Zebra Universal Mounting Bracket (BRKT-LMNT-U000) provides multiple mounting options for a metal infrastructure.

Power Cycling the Device

Power cycling the device can help in troubleshooting potential network discoverability issues.

1. Remove all cables to ensure no power is being directed to the device.
2. Reinsert a power source and allow the device approximately one minute to boot up.
3. Re-attempt to:
   - Discover a device in Zebra Aurora Focus by restarting the application and clicking **View Devices**.
   - View a device in the Windows Network.
   - Access a device using the Zebra Web HMI.

If failure persists, repeat the steps above for all of the connection types being used with the device, including:

- Ethernet directly to the PC.
- Ethernet connection to a network via switch or hub.

Symbologies

The following table lists supported symbologies for the devices.

Table 8 Supported Symbologies

Type	Symbologies
1D	Codabar, Code 39, Code 93, Code 128, Interleaved 2 of 5, MSI, UPC/EAN, Discrete 2 of 5, GS1 Databar
2D	Aztec, Data Matrix, DotCode, MaxiCode, PDF417, QR Code
OCR	Deep Learning-based OCR

NOTE: Deep Learning OCR supports Latin characters and is available through an add-on license.

Fixed Industrial Scanning Toolset

The following tools are available with a specific license type.

Table 9 Fixed Industrial Scanning Tools

Tool	Standard 2D	Fast 2D	DPM with Fast 2D	OCR
Barcode Reading	X	X	X	
Fast 2D (60 fps)		X	X	
DPM			X	
Locate Object				X
Deep Learning OCR				X

Machine Vision Toolsets

The following tools are available with a specific license type.

Table 10 Machine Vision Tools

Type	Tool	Sensor	Essential (NS42 Only)	Standard
Locate Tools	Locate Object	X	X	X
	Locate Object Plus		X	X
	Locate Edge	X	X	X
	Locate Blob		X	X
	Locate Circle	X	X	X
Filter Tools	Binarize		X	X
	Dilate		X	X
	Erode		X	X
	Open		X	X
	Close		X	X
	Gradient Full		X	X
	Gradient Horizontal		X	X
	Gradient Vertical		X	X
Identification Tools	Read Barcode		X	X
	Read DPM			X
	Read DPM and Barcode			X
	Datacode			X

Table 10 Machine Vision Tools (Continued)

Type	Tool	Sensor	Essential (NS42 Only)	Standard
Presence/ Absence Tools	Object P/A	X	X	X
	Object Plus P/A		X	X
	Brightness	X	X	X
	Contrast	X	X	X
	Edge Detect	X	X	X
	Blob P/A		X	X
Measurement Tools	Distance	X	X	X
	Circle Diameter	X	X	X
	Measure Object Width		X	X
Counting Tools	Pixel Count	X	X	X
	Blob Count		X	X
	Edge Count	X	X	X
	Locate Object Count	X	X	X
Flaw Detection	Edges		X	X
	Intensity		X	X

Reading Diagrams

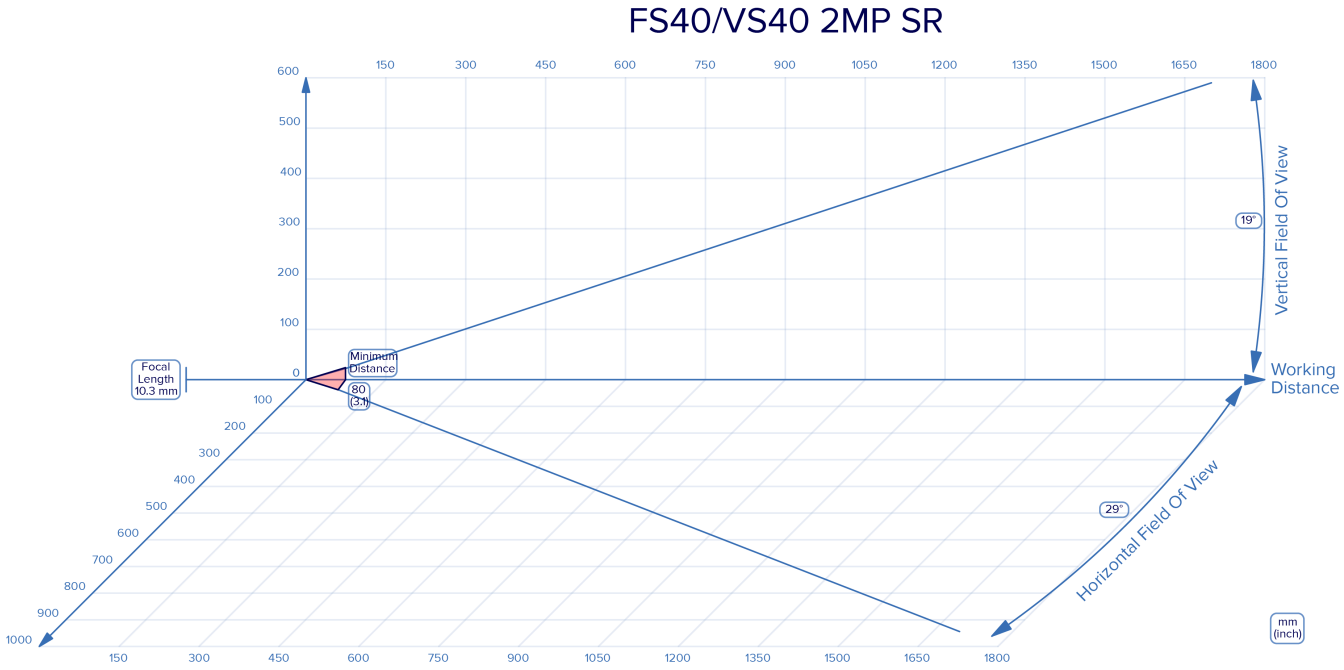
The following diagrams provide reading distances for xS40 and xS70 devices.

xS40 2MP Reading Diagrams

This section provides reading distances for xS40 devices while reading barcodes at various distances.

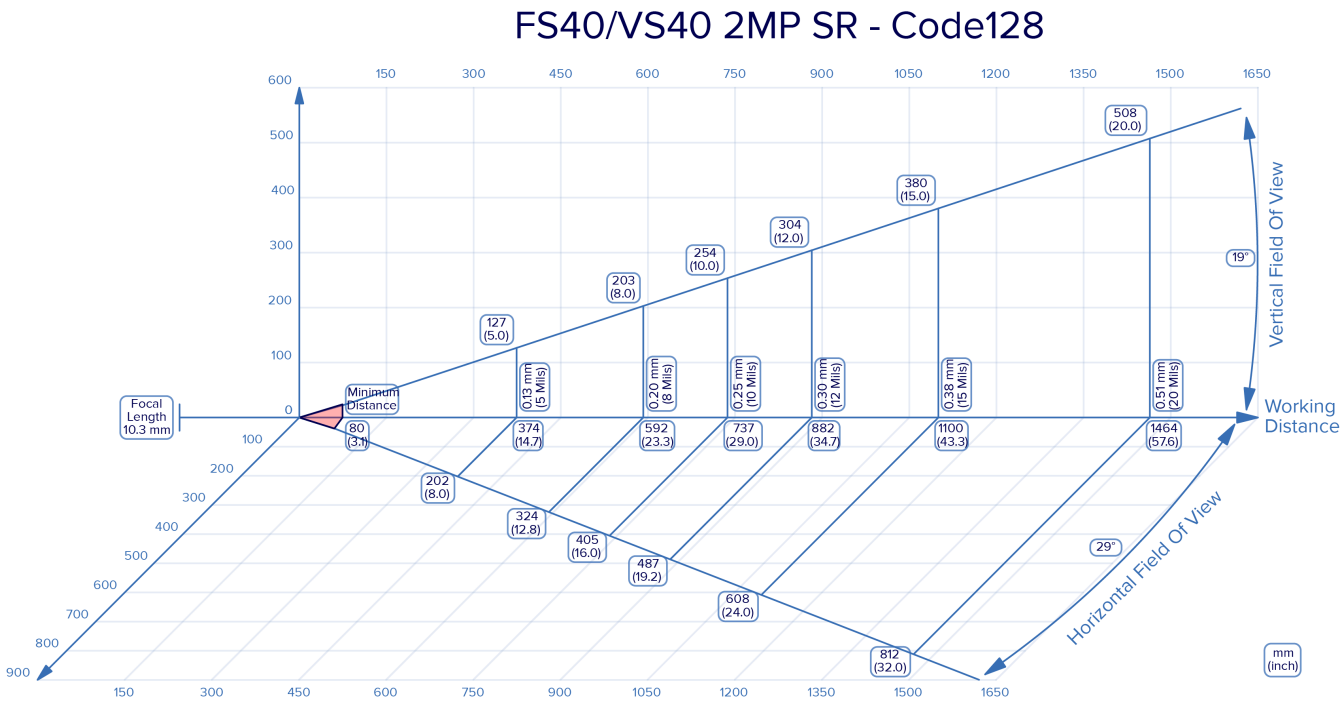
Standard Range

Figure 15 xS40 2MP Standard Range



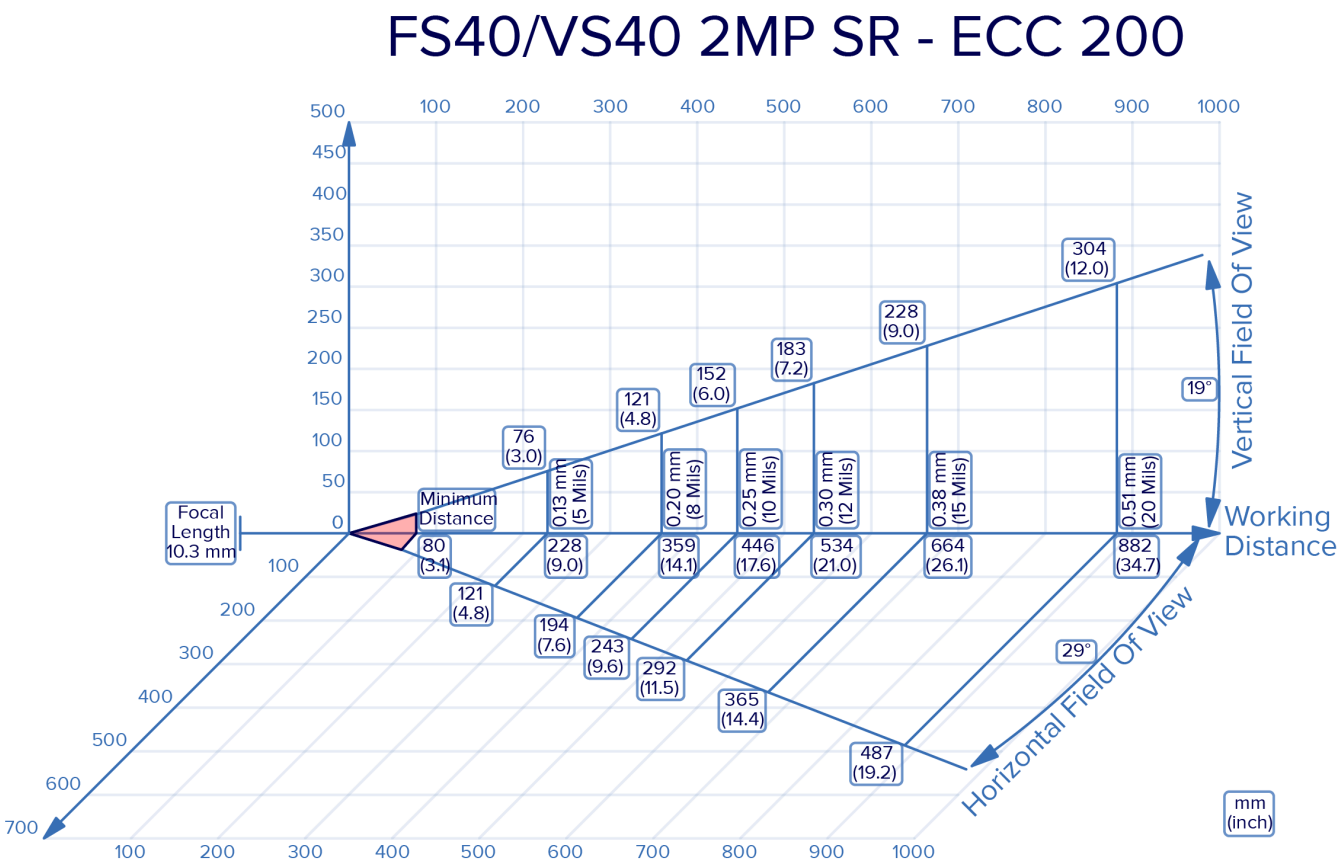
Standard Range - Code128

Figure 16 xS40 2MP Standard Range Code128



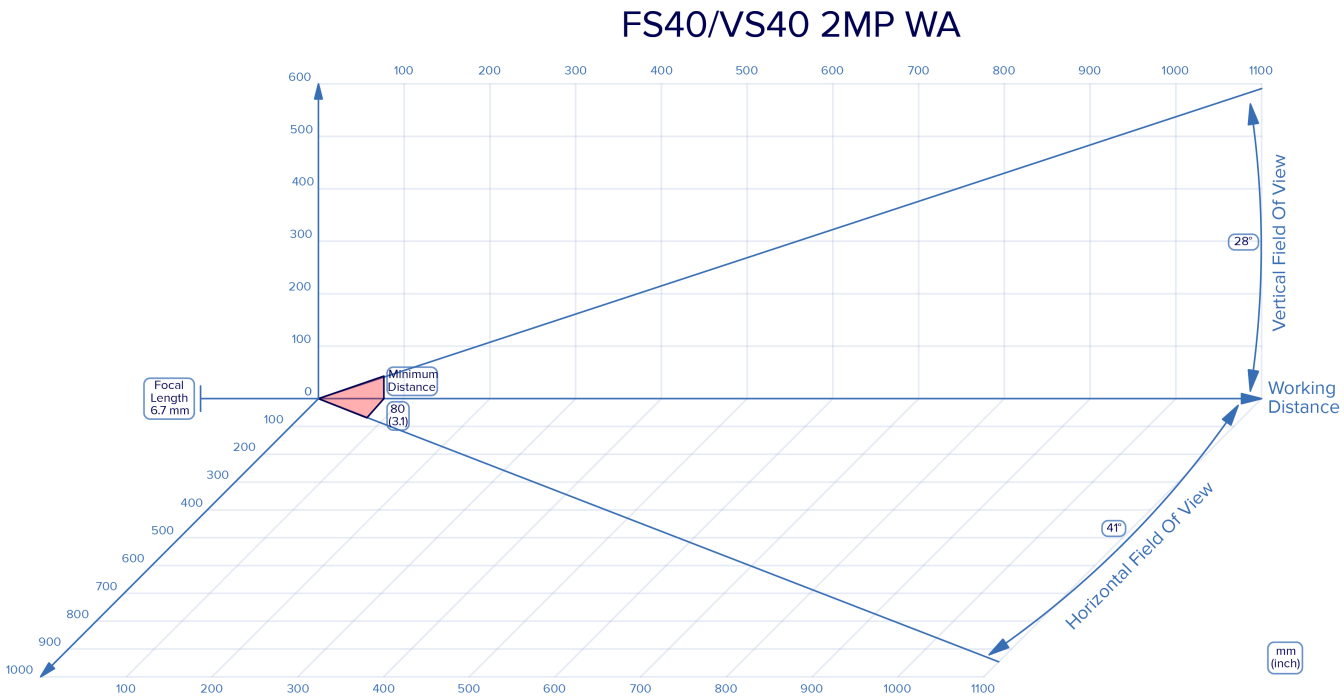
Standard Range - ECC 200

Figure 17 xS40 2MP Standard Range ECC 200



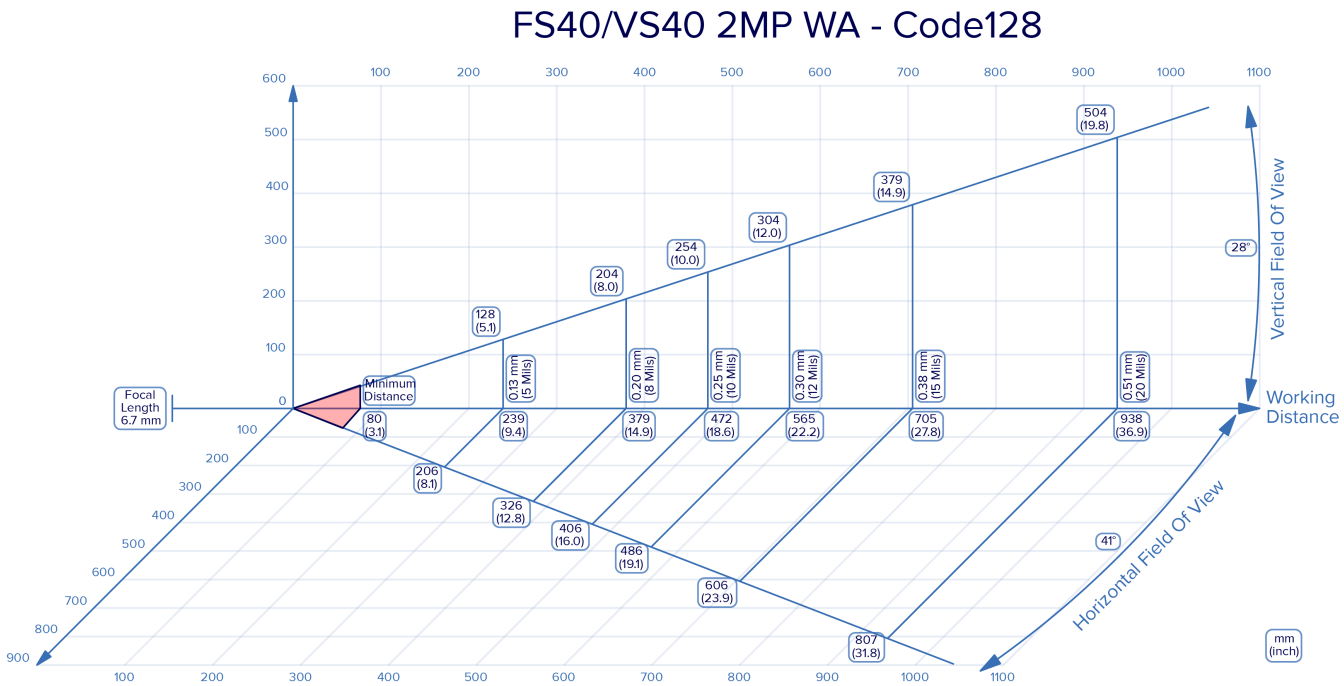
Wide Angle

Figure 18 xS40 2MP Wide Angle



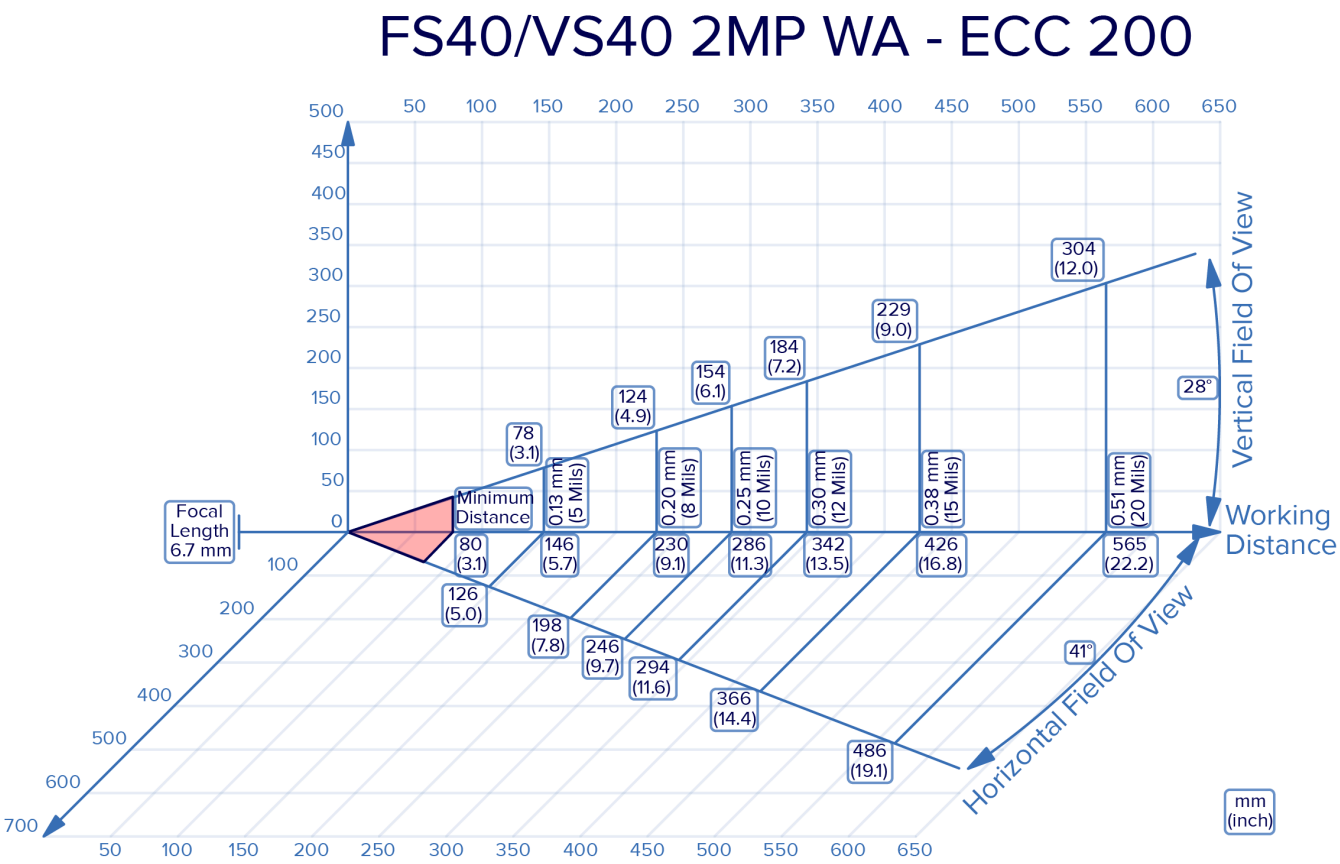
Wide Angle - Code128

Figure 19 xS40 2MP Wide Angle - Code128



Wide Angle - ECC 200

Figure 20 xS40 2MP Wide Angle - ECC 200



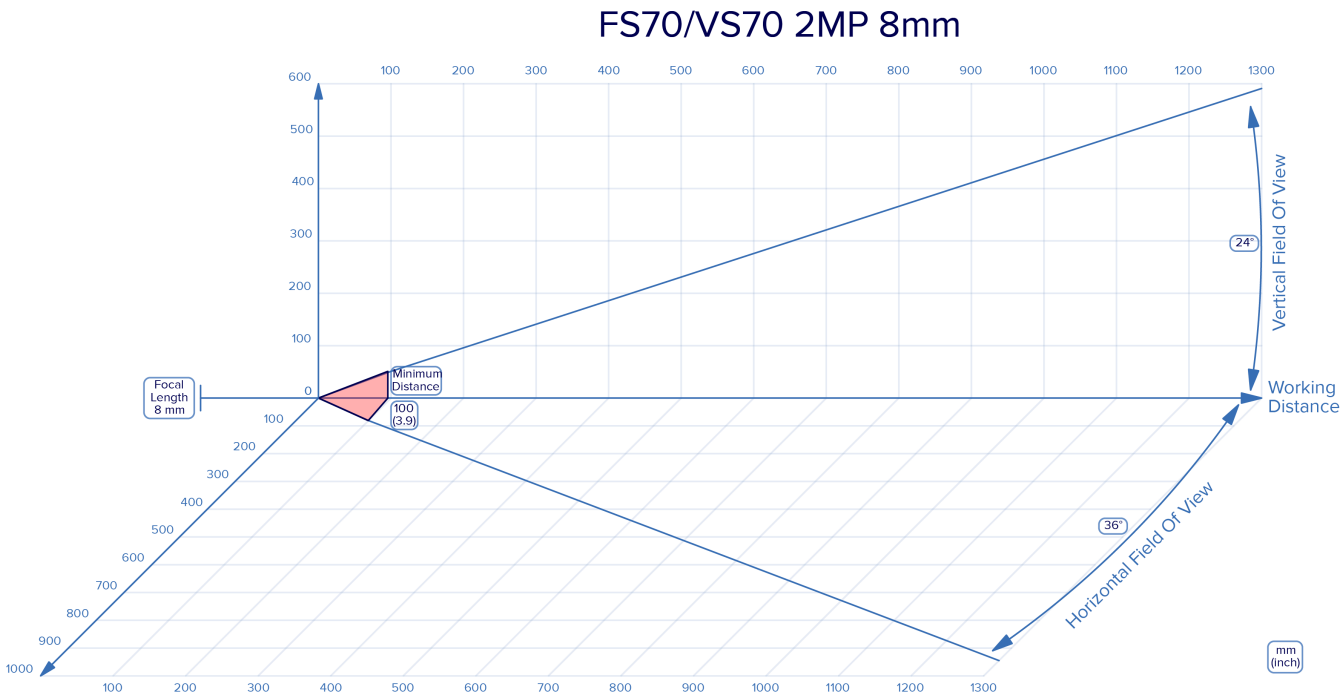
xS70 2MP Reading Diagrams

This section provides reading distances for 2MP xS70 devices while reading barcodes at various distances.

xS70 2MP 8mm

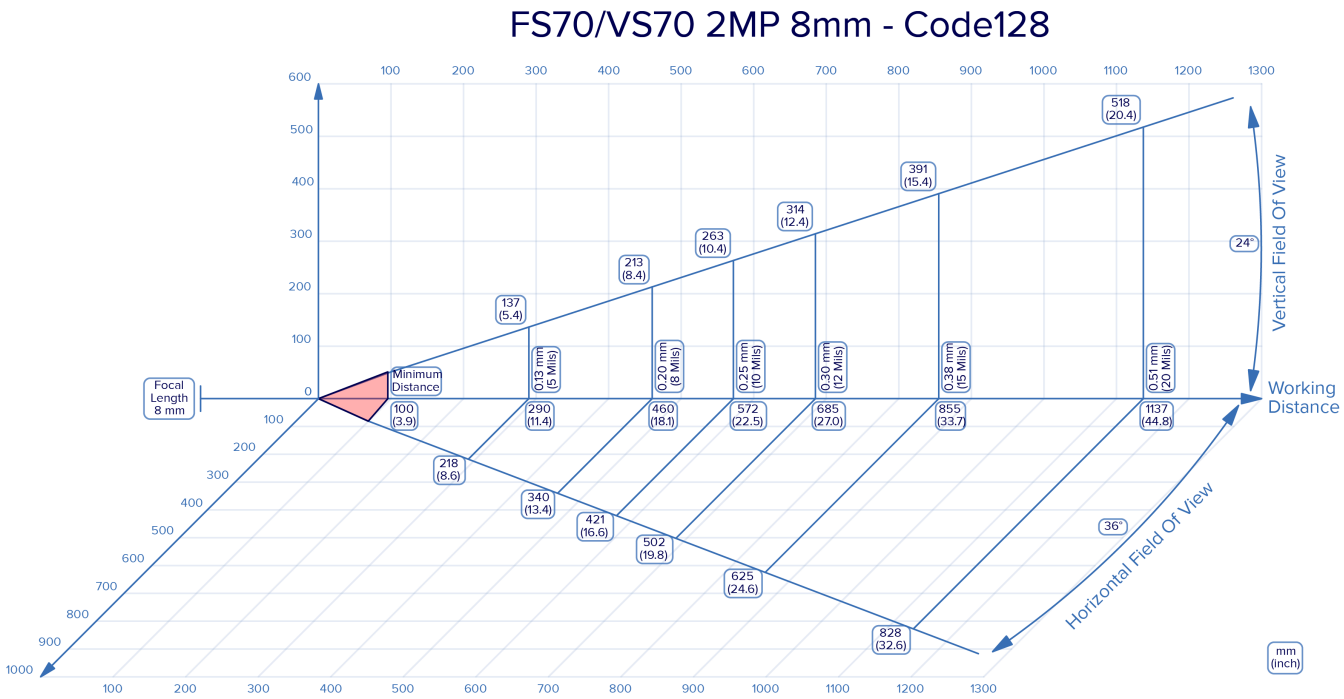
8mm

Figure 21 xS70 2MP 8mm Reading Diagram



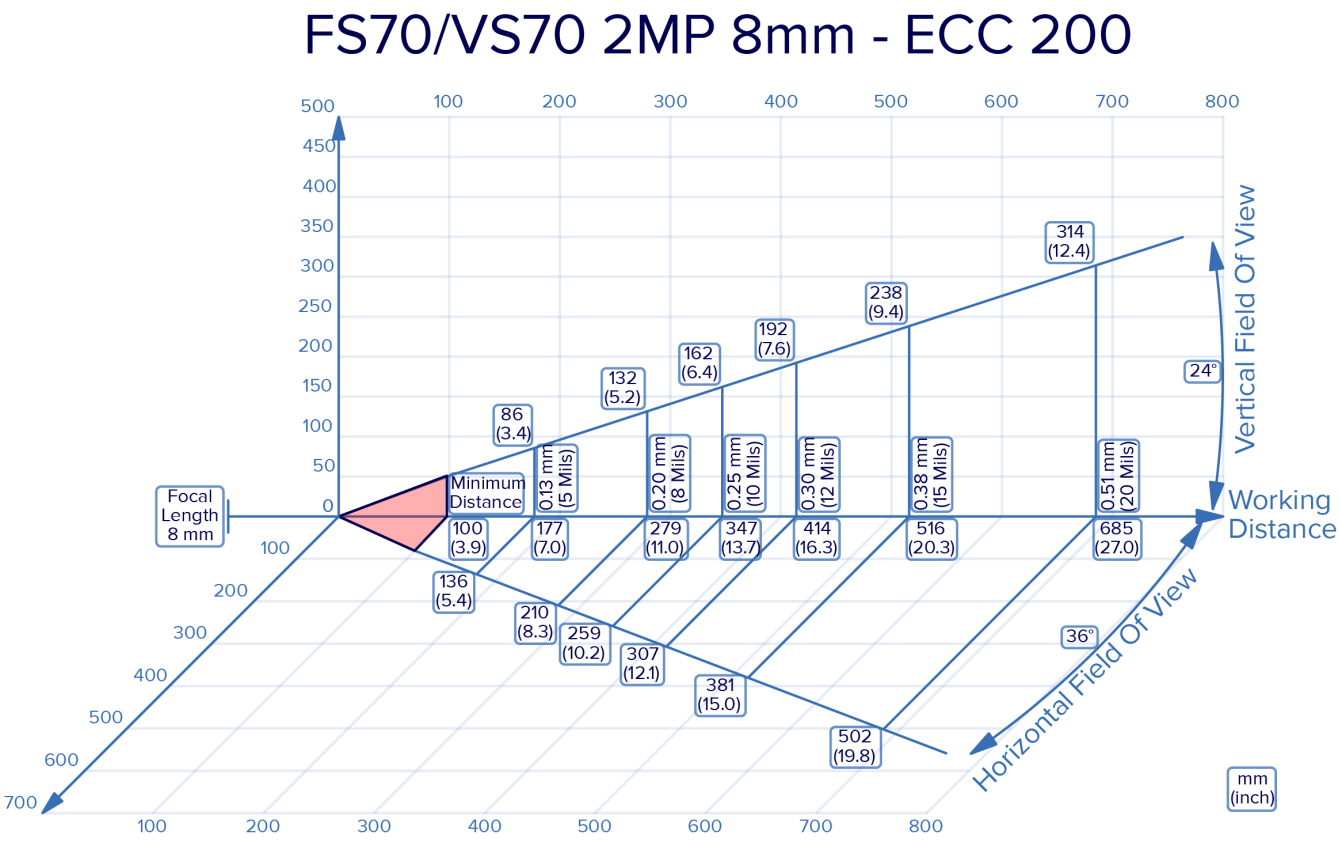
8mm - Code128

Figure 22 xS70 2MP 8mm Reading Diagram - Code128



8mm - ECC 200

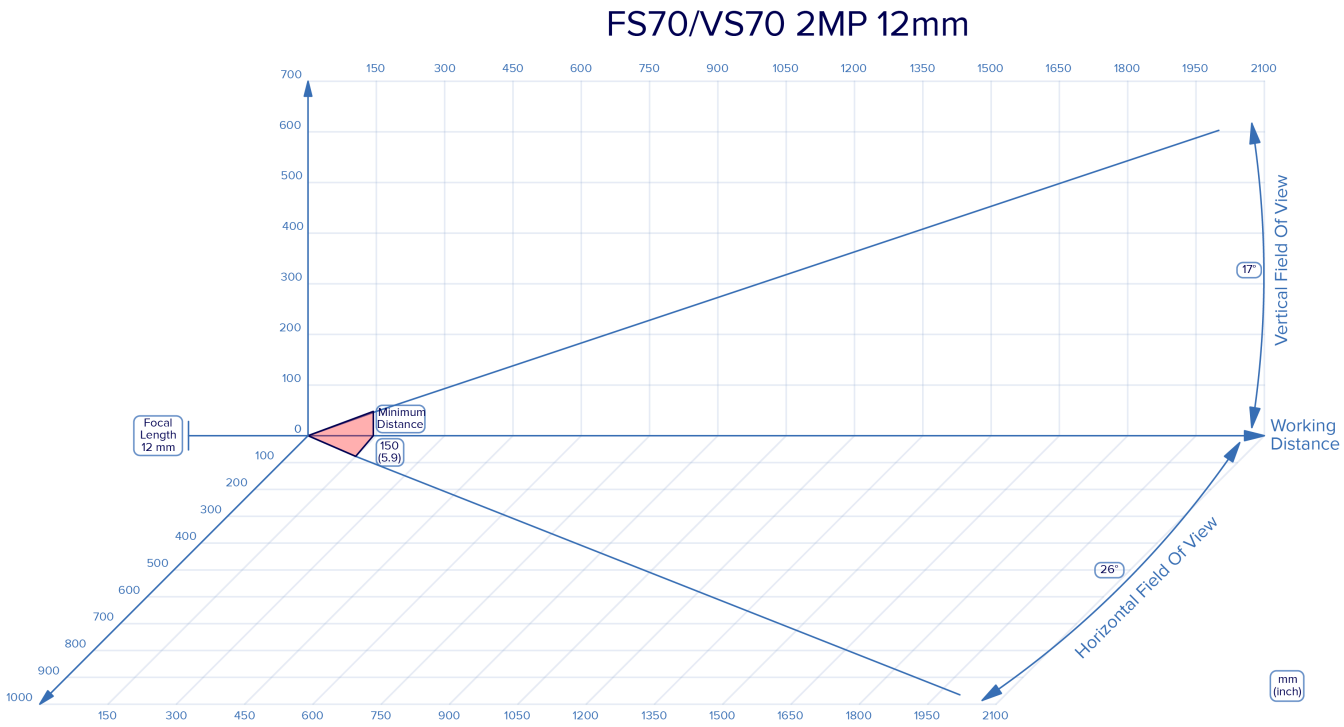
Figure 23 xS70 2MP 8mm Reading Diagram - ECC 200



xS70 2MP 12mm

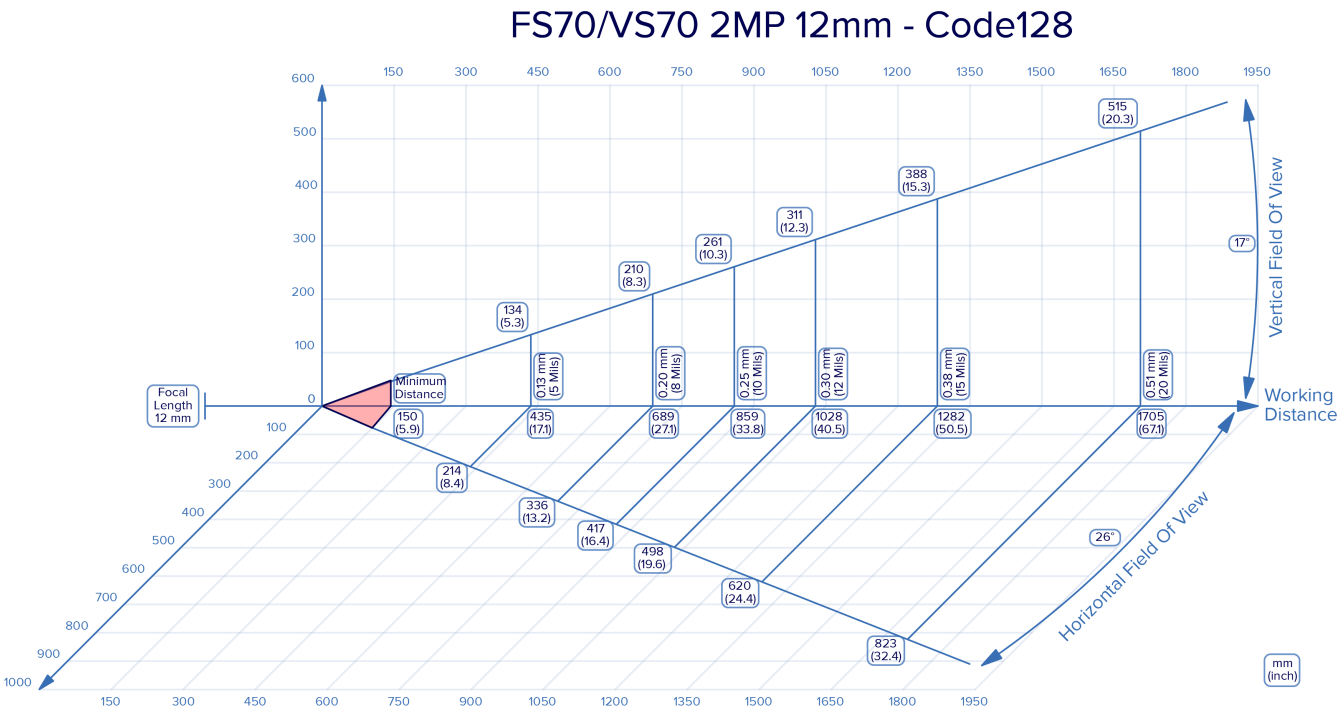
12mm

Figure 24 xS70 2MP 12mm



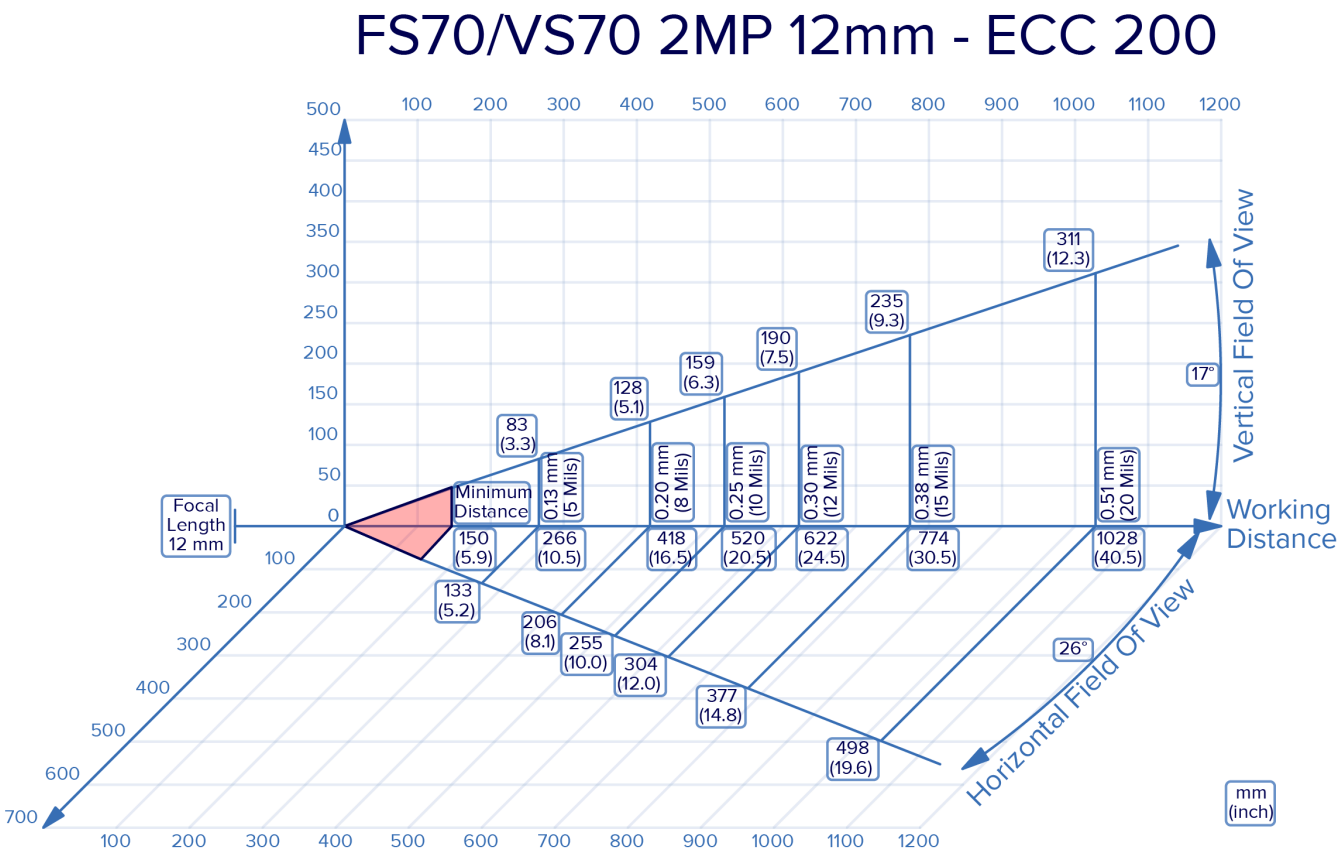
12mm - Code128

Figure 25 xS70 2MP 12mm - Code128



12mm - ECC 200

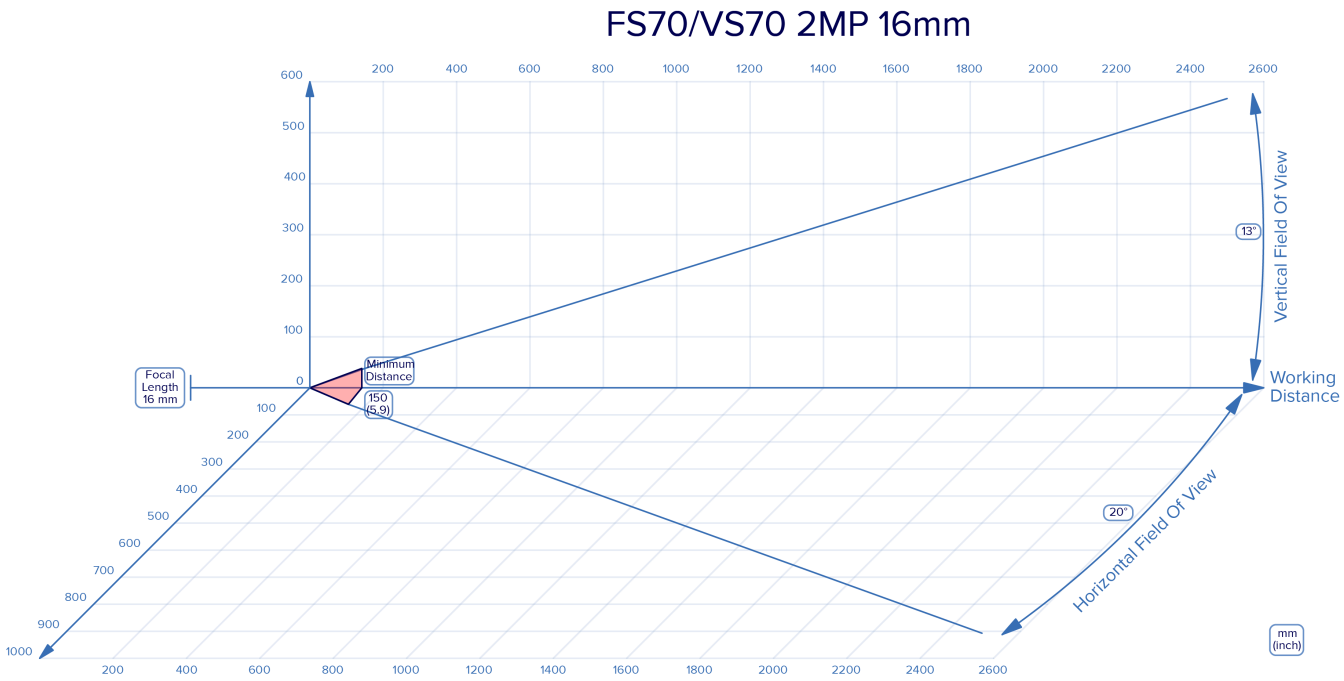
Figure 26 xS70 2MP 12mm - ECC 200



xS70 2MP 16mm

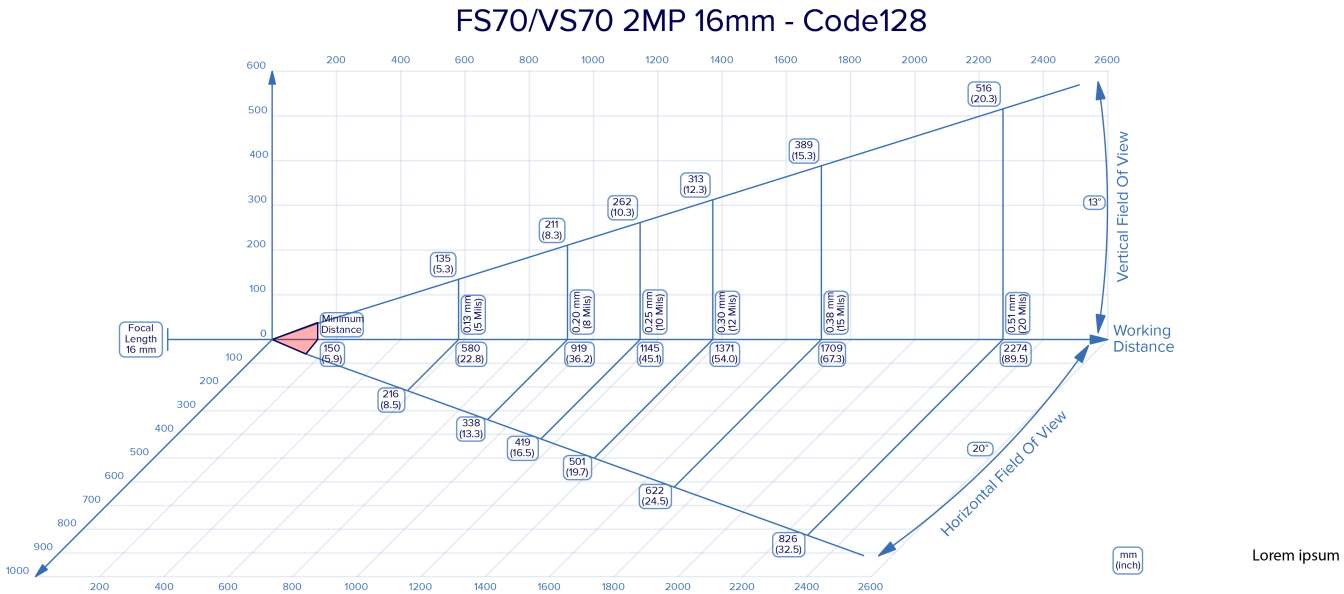
16mm

Figure 27 xS70 2MP 16mm



16mm - Code128

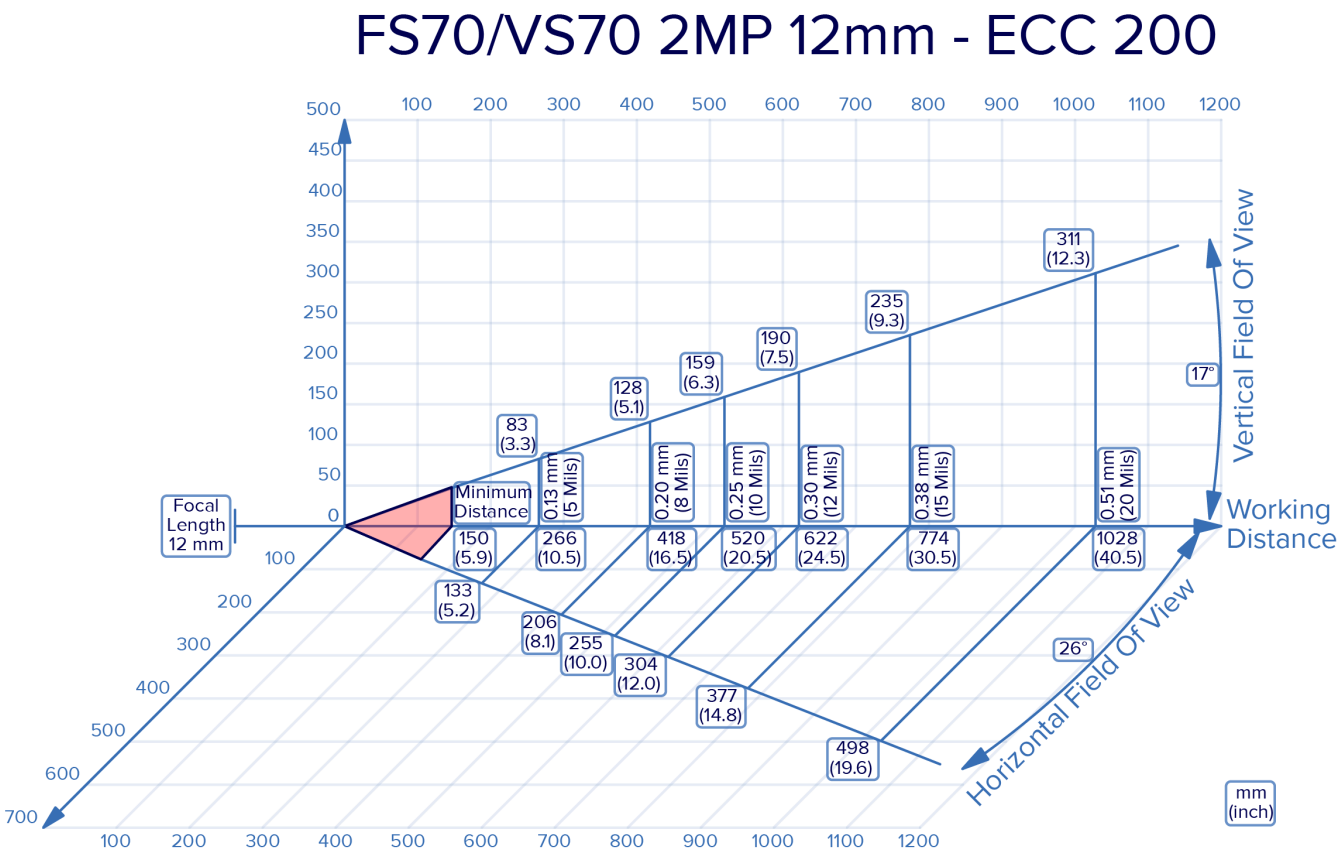
Figure 28 xS70 2MP 16mm - Code128



Lorem ipsum

16mm - ECC 200

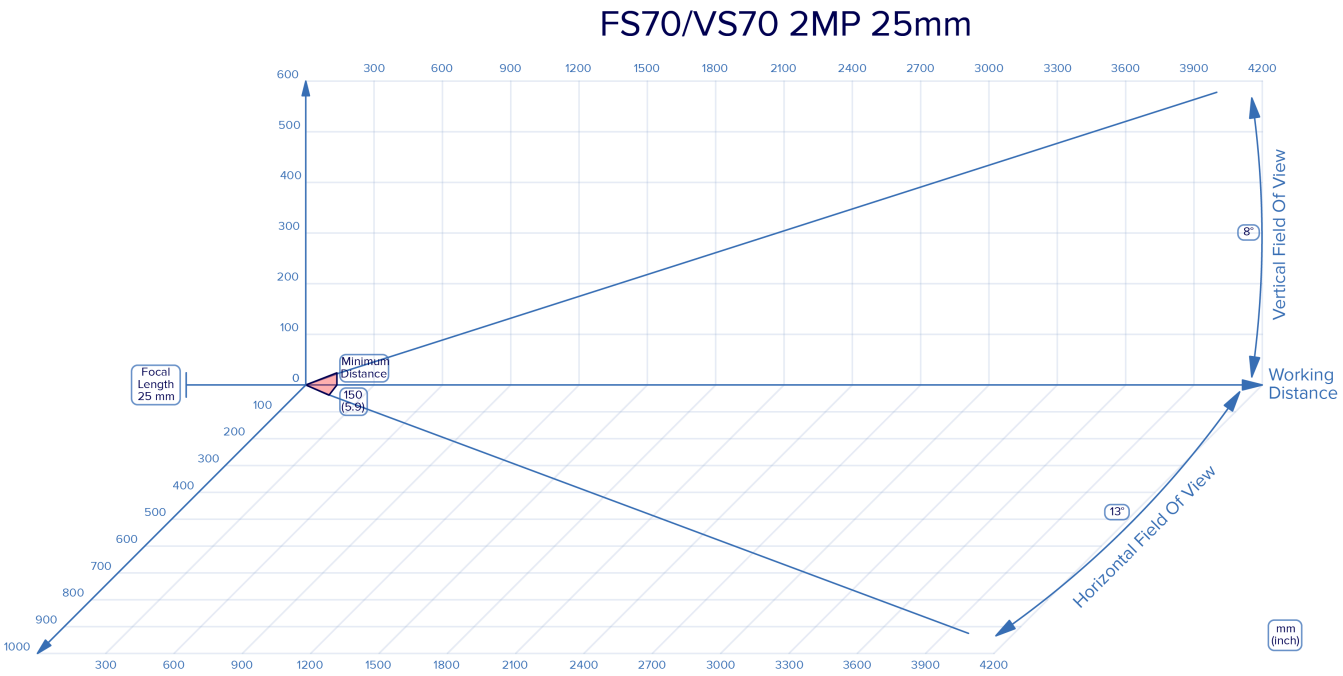
Figure 29 xS70 2MP 16mm - ECC 200



xS70 2MP 25mm

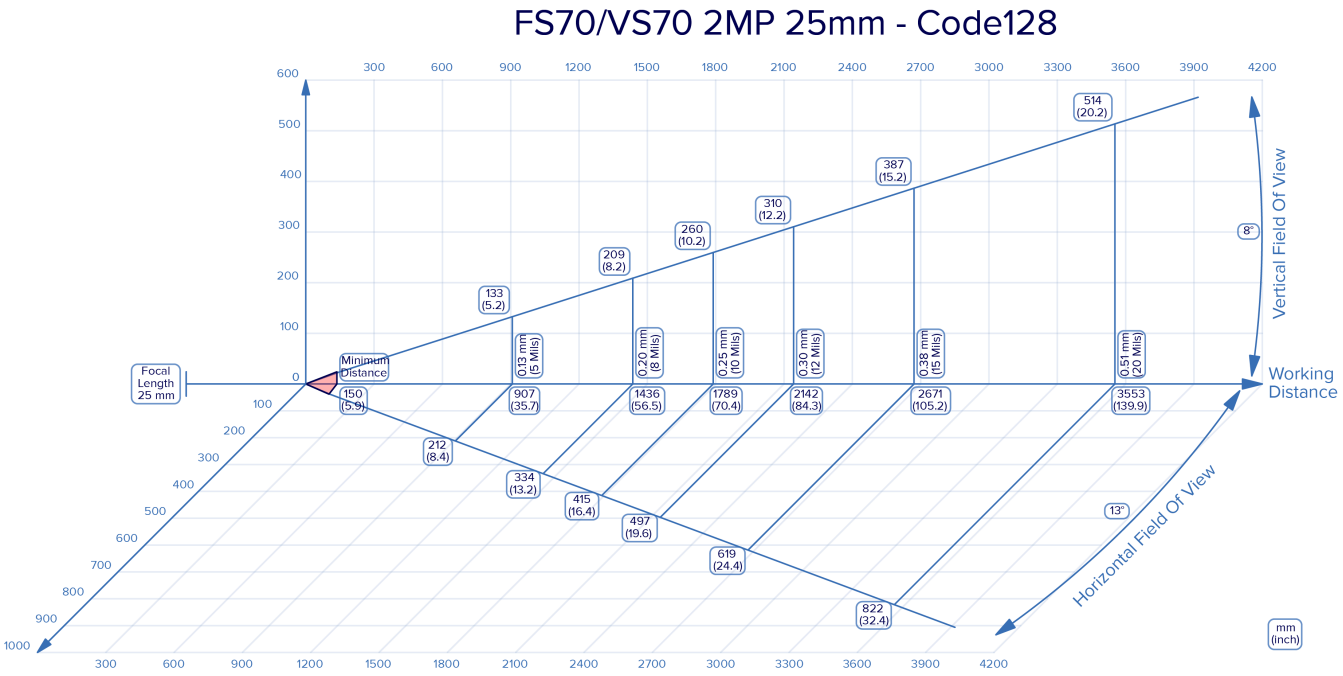
25mm

Figure 30 xS70 2MP 25mm



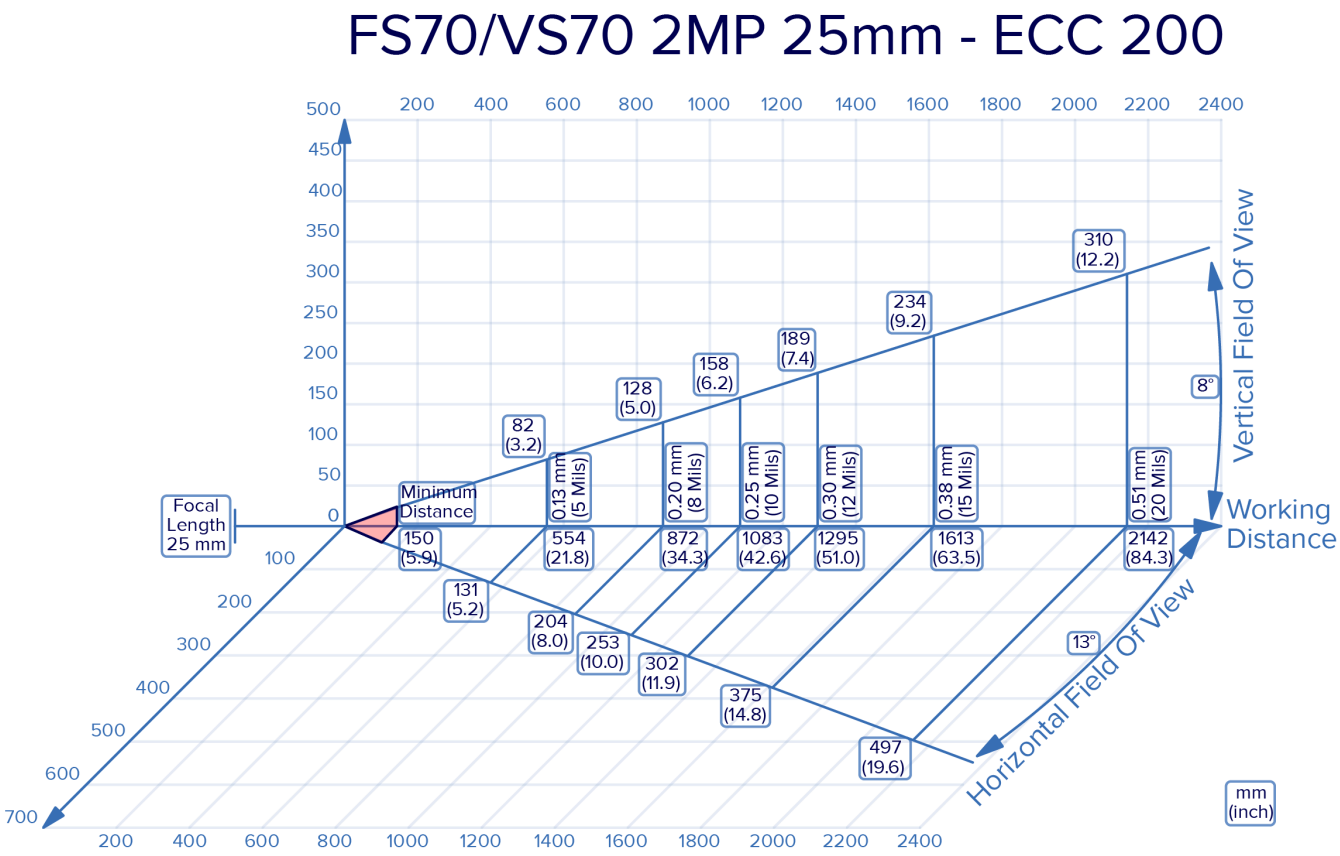
25mm - Code128

Figure 31 xS70 2MP 25mm - Code128



25mm - ECC 200

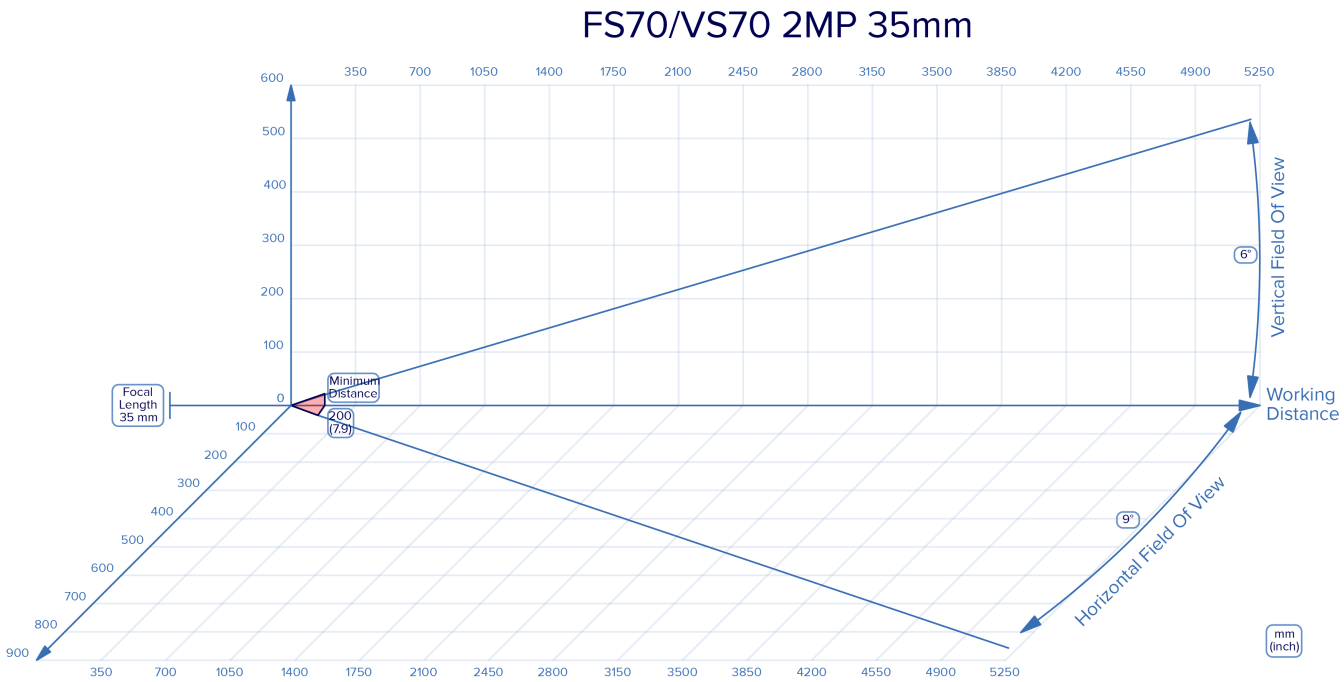
Figure 32 xS70 2MP 25mm - ECC 200



xS70 2MP 35mm

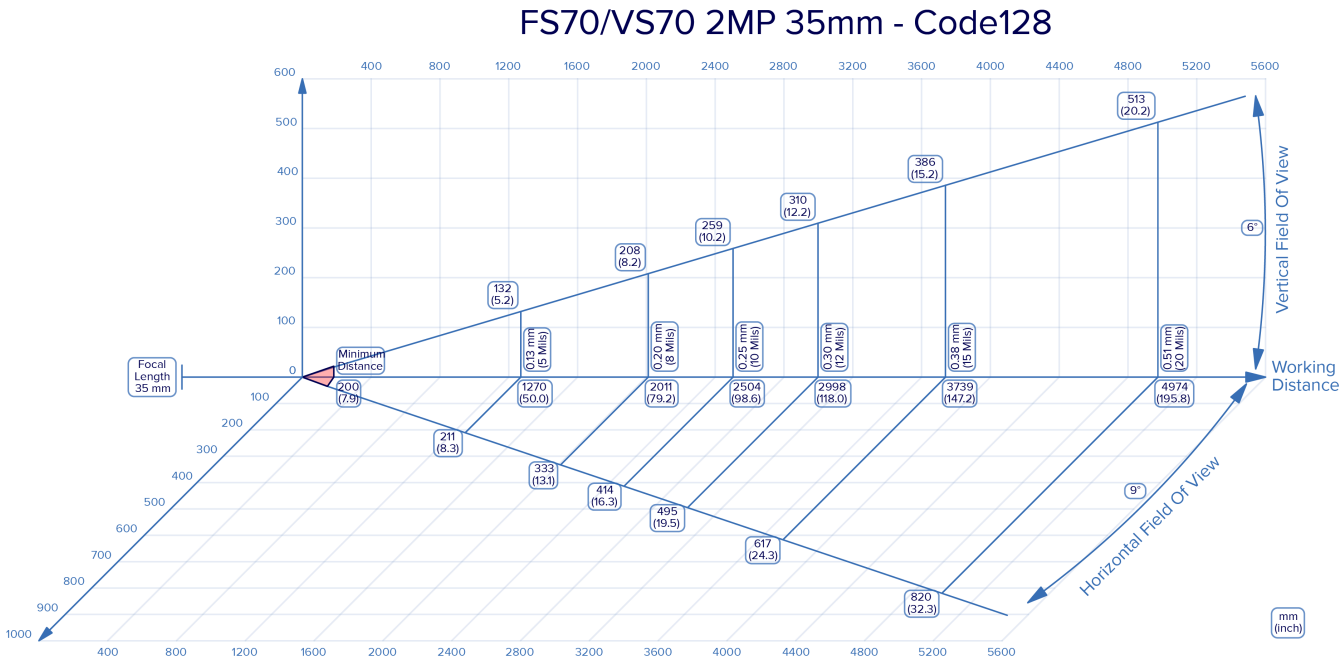
35mm

Figure 33 xS70 2MP 35mm



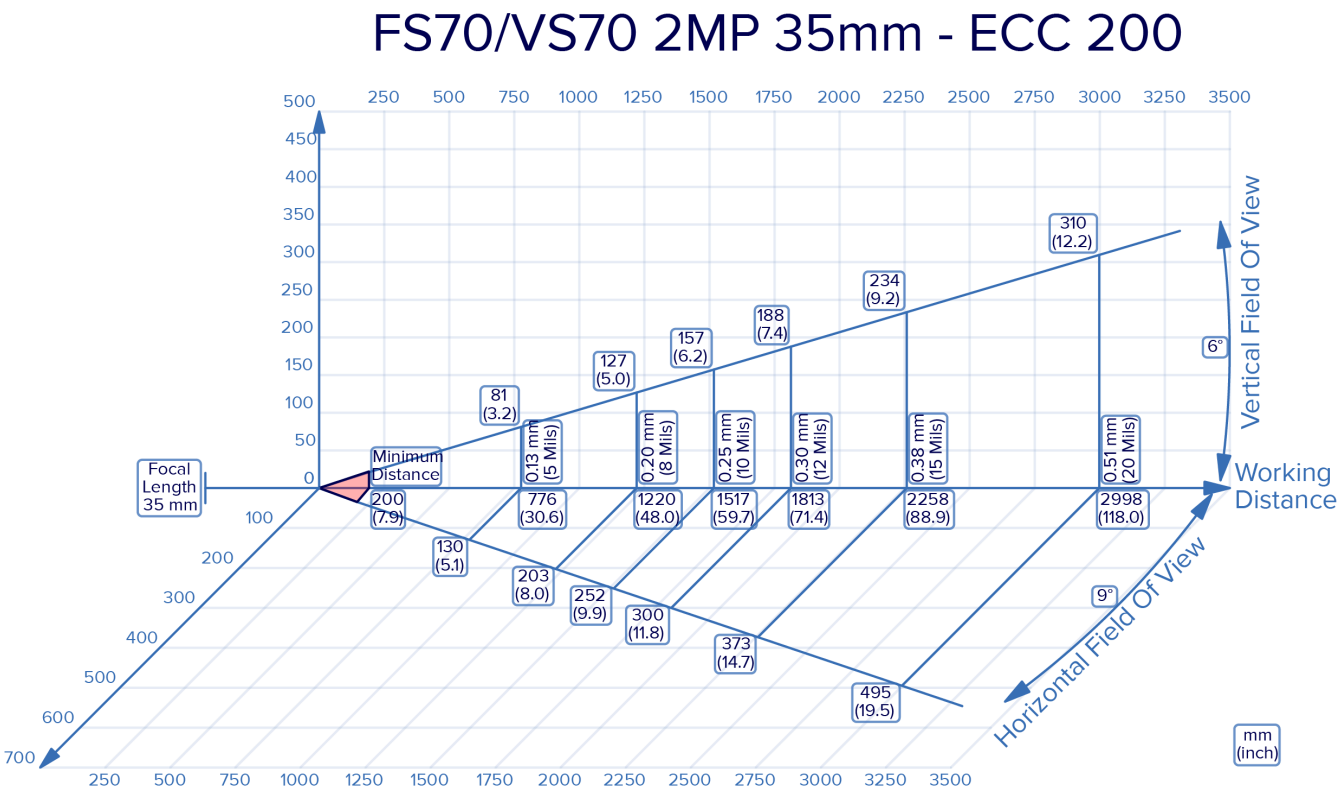
35mm - Code128

Figure 34 xS70 2MP 35mm - Code128



35mm - ECC 200

Figure 35 xS70 2MP 35mm - ECC 200



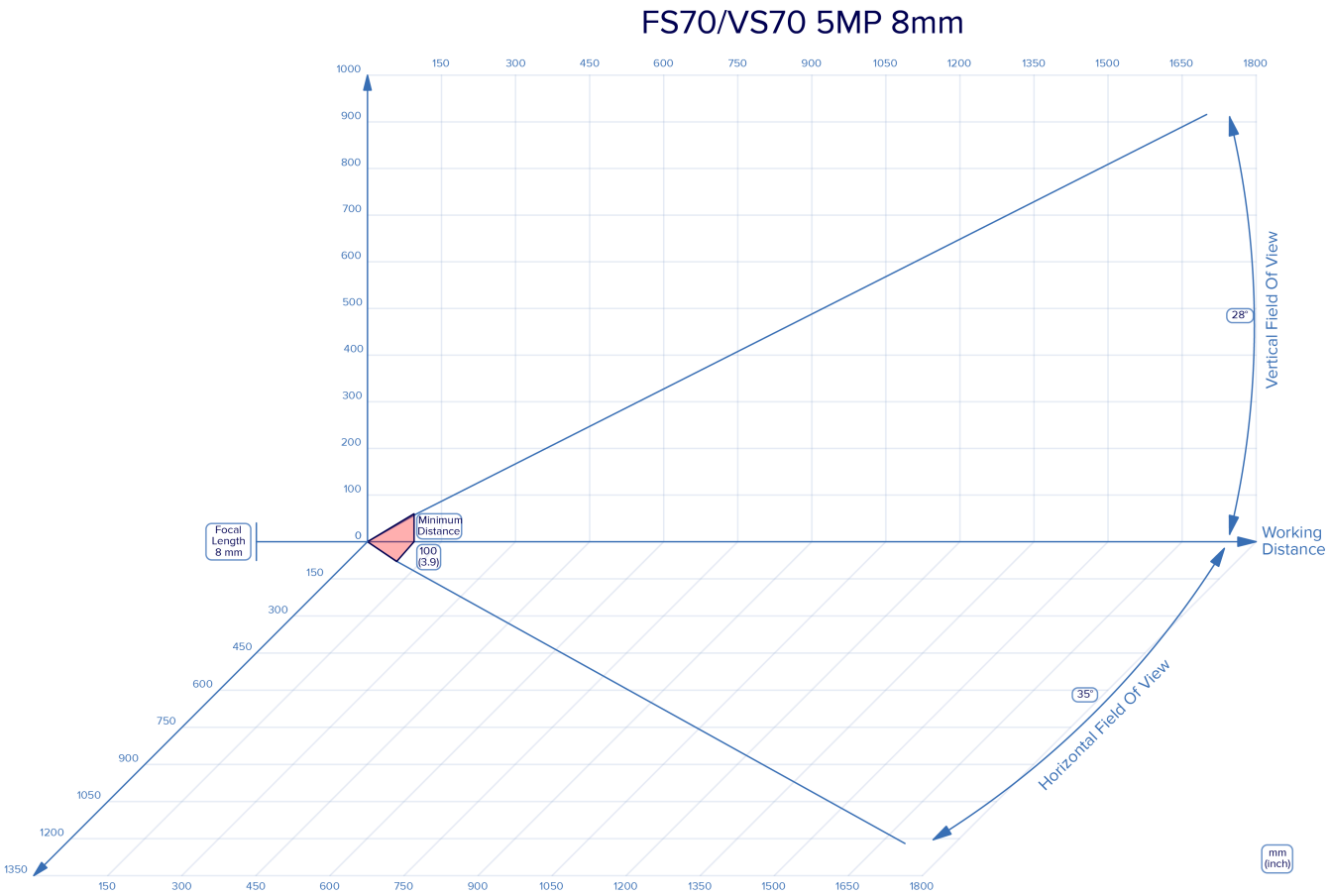
xS70 5MP Reading Diagrams

This section provides reading distances for 5MP xS70 devices while reading barcodes at various distances.

xS70 5MP 8mm

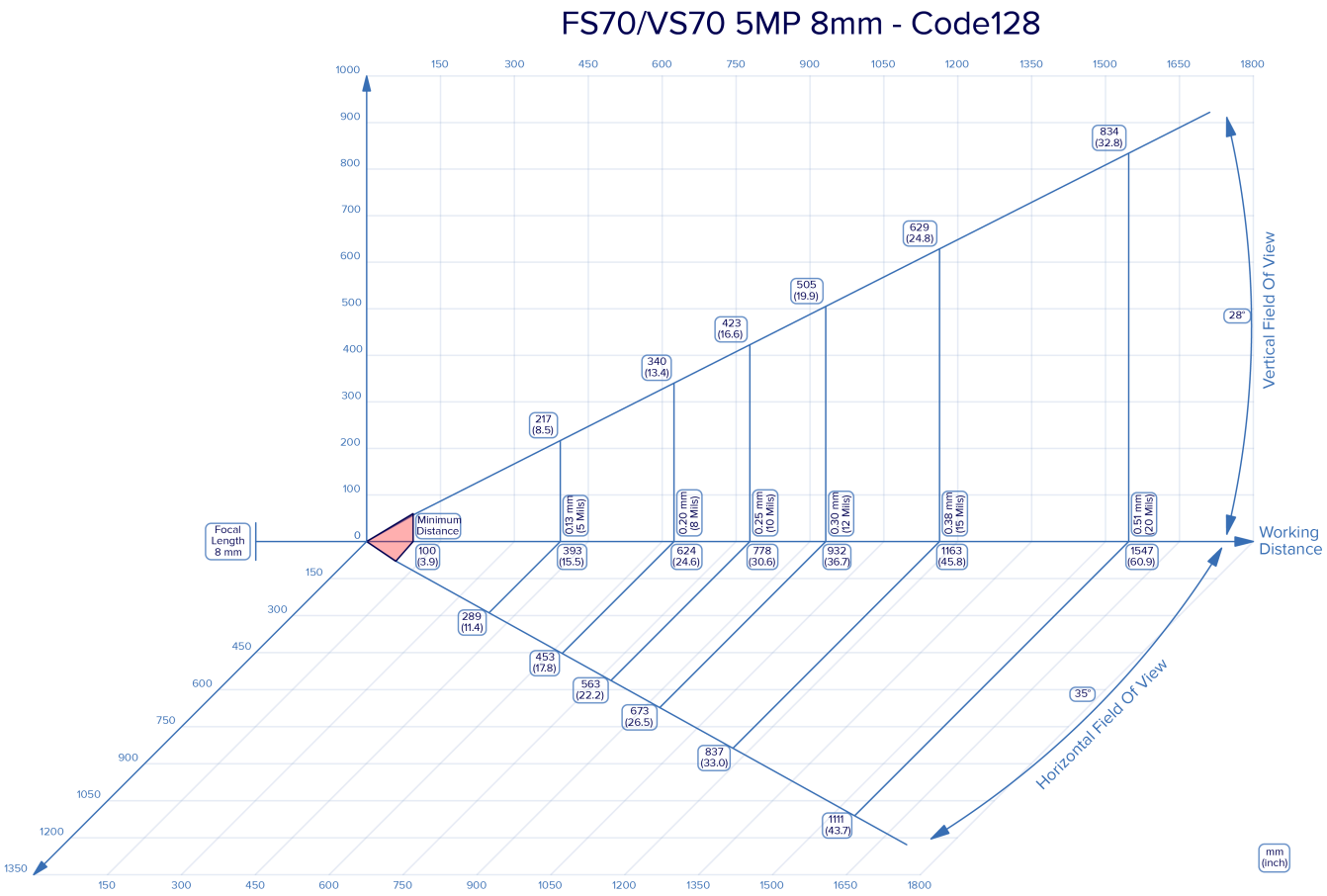
8mm Reading Distance

Figure 36 xS70 5MP 8mm



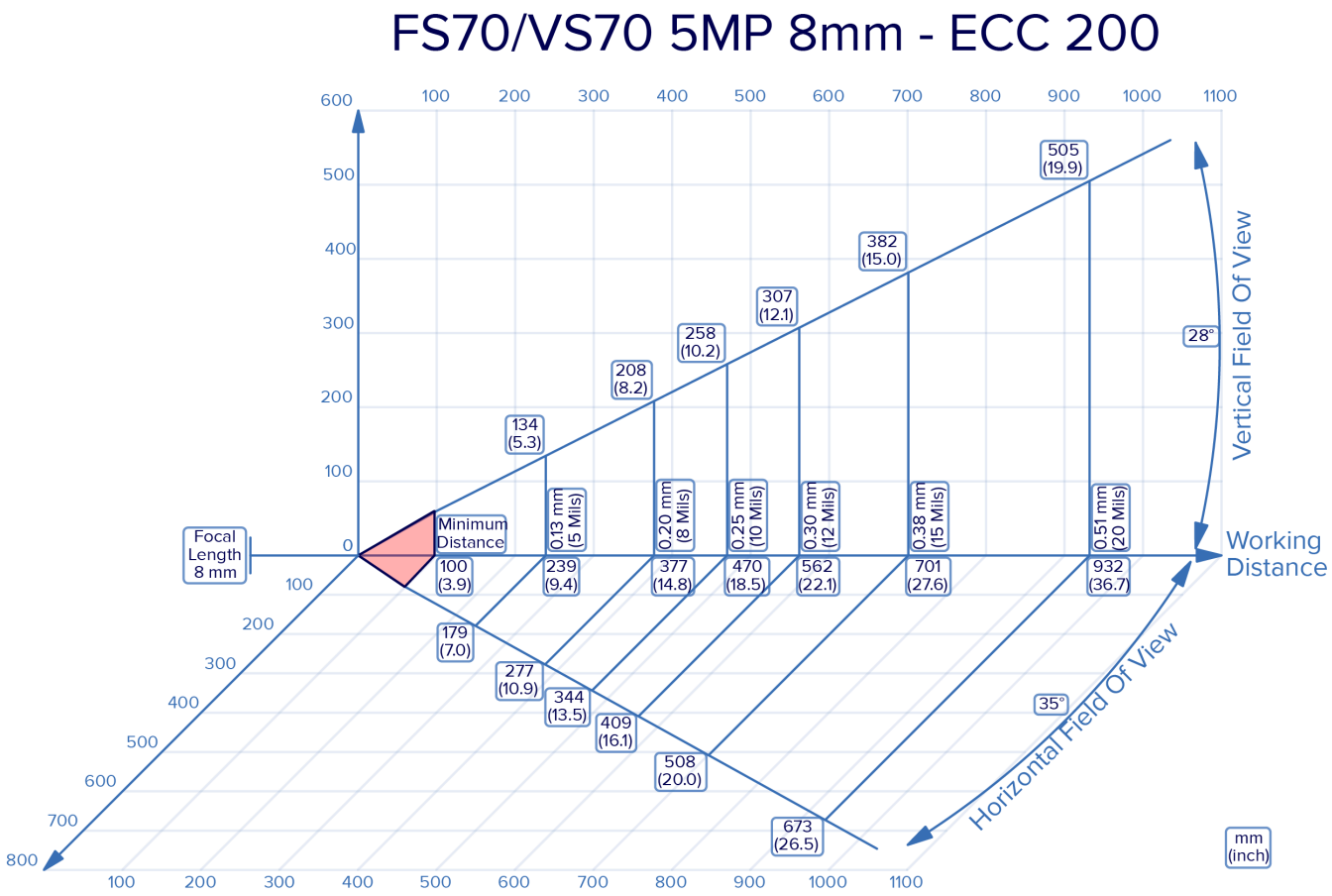
8mm - Code128

Figure 37 xS70 5MP 8mm - Code128



8mm - ECC 200

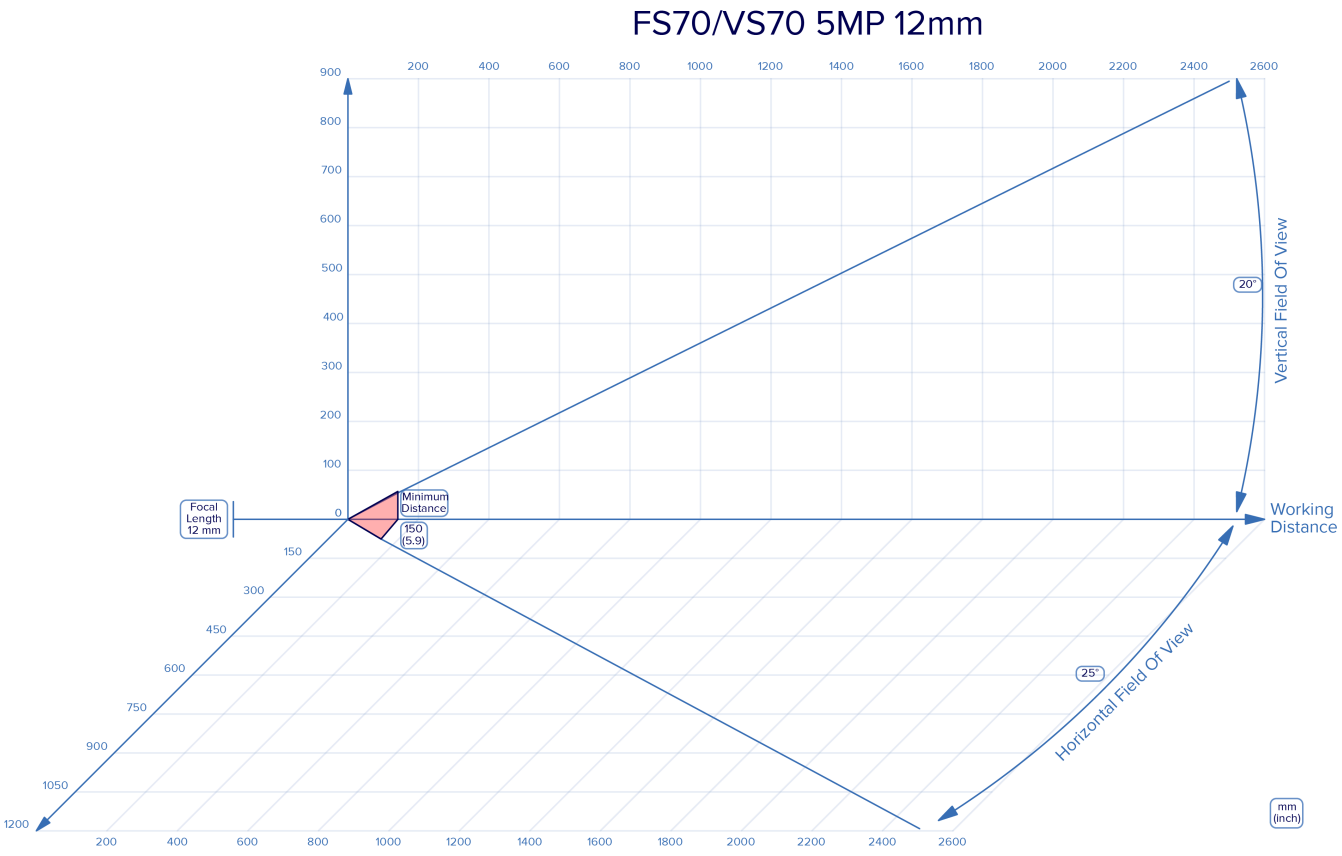
Figure 38 xS70 5MP 8mm - ECC 200



xS70 5MP 12mm

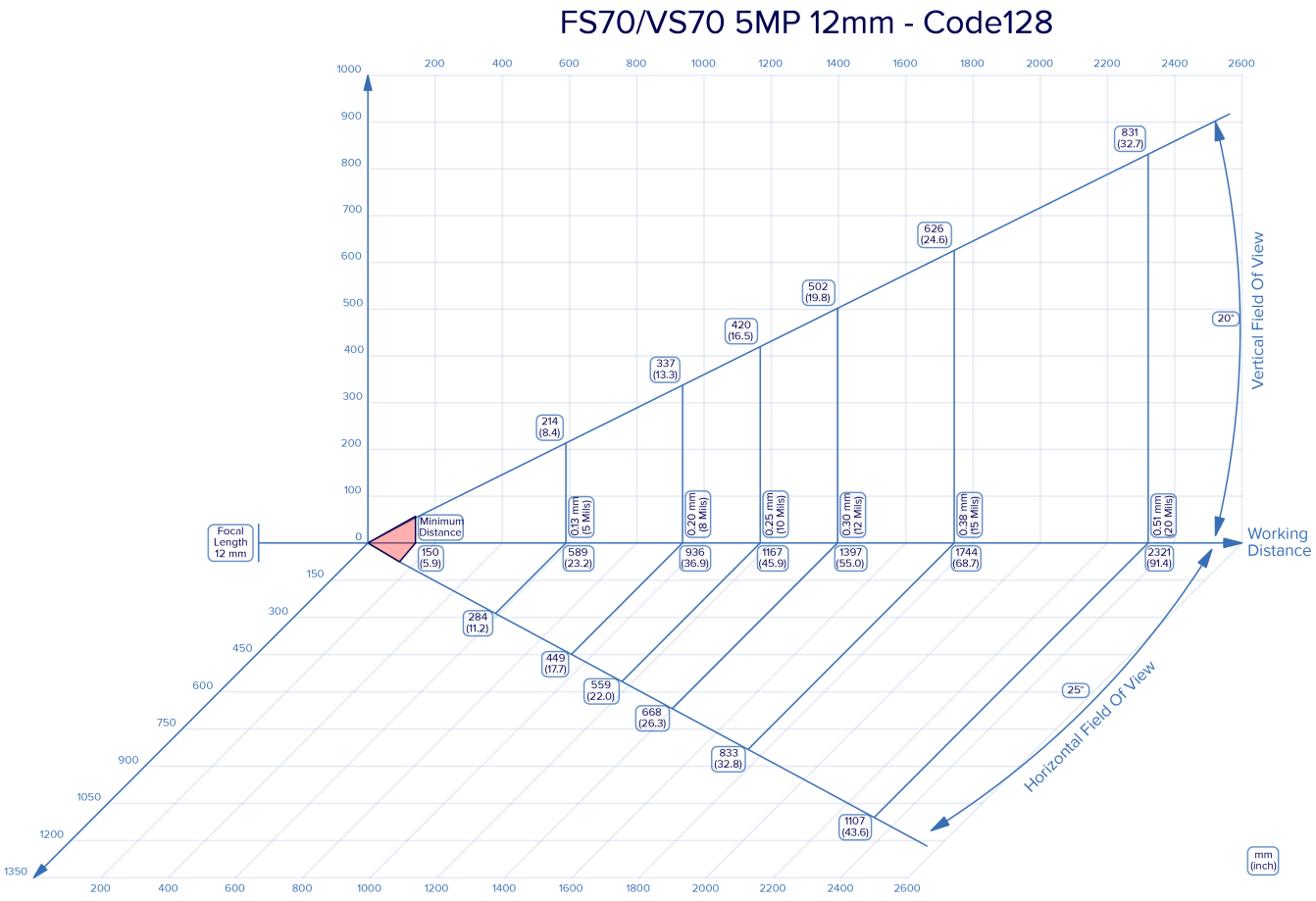
12mm

Figure 39 xS70 5MP 12mm



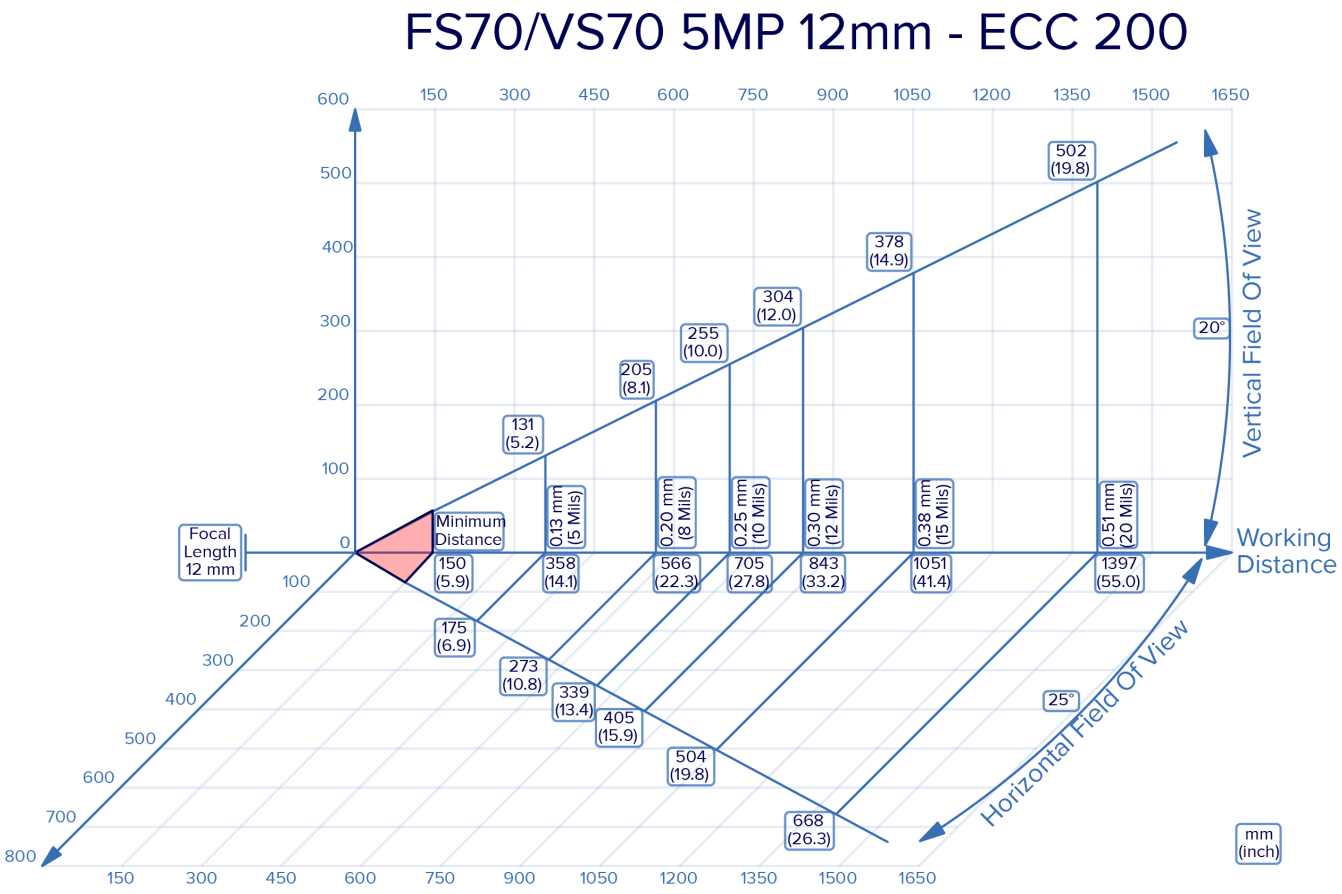
12mm - Code128

Figure 40 xS70 5MP 12mm - Code128



12mm - ECC 200

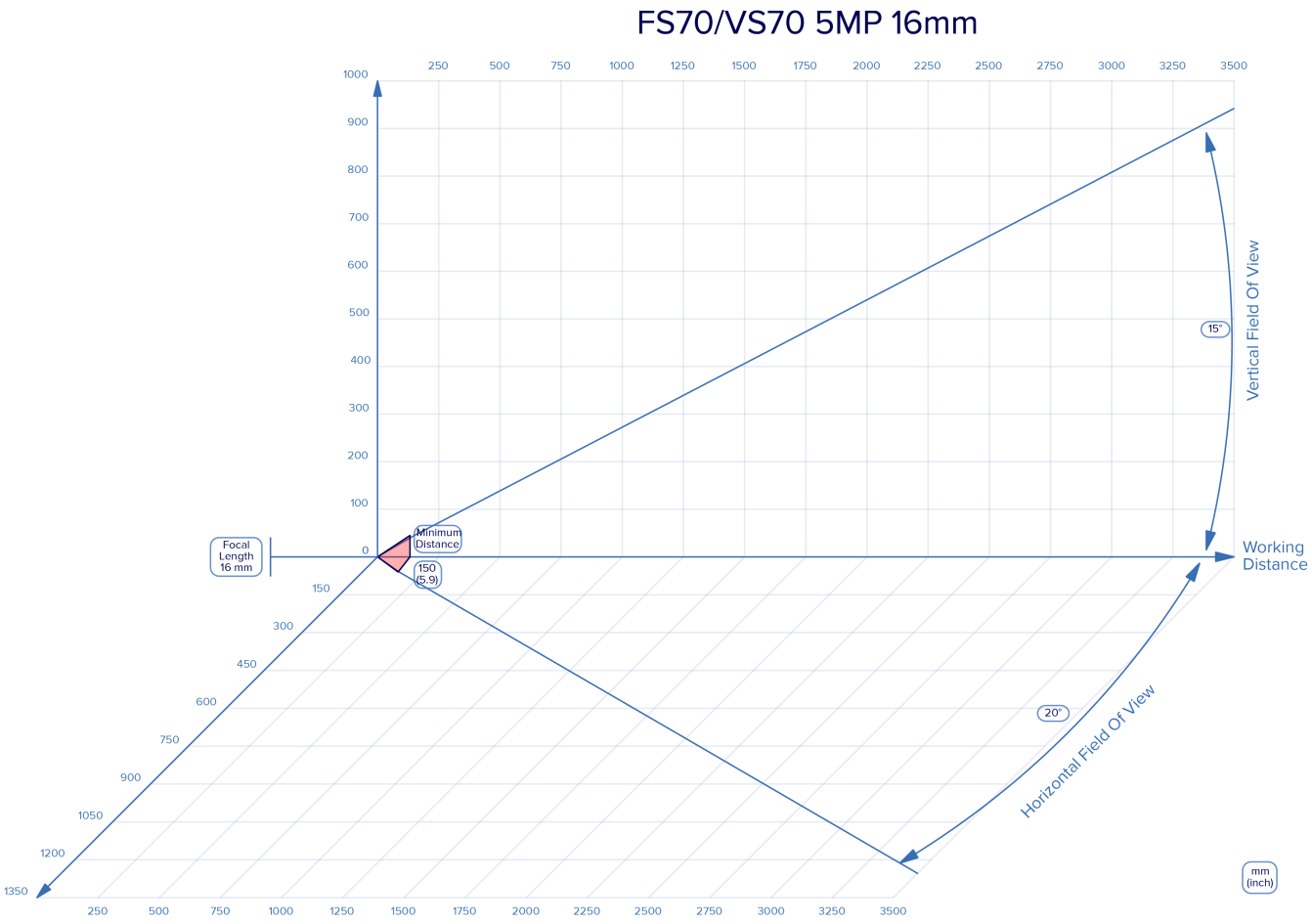
Figure 41 xS70 5MP 12mm - ECC 200



xS70 5MP 16mm

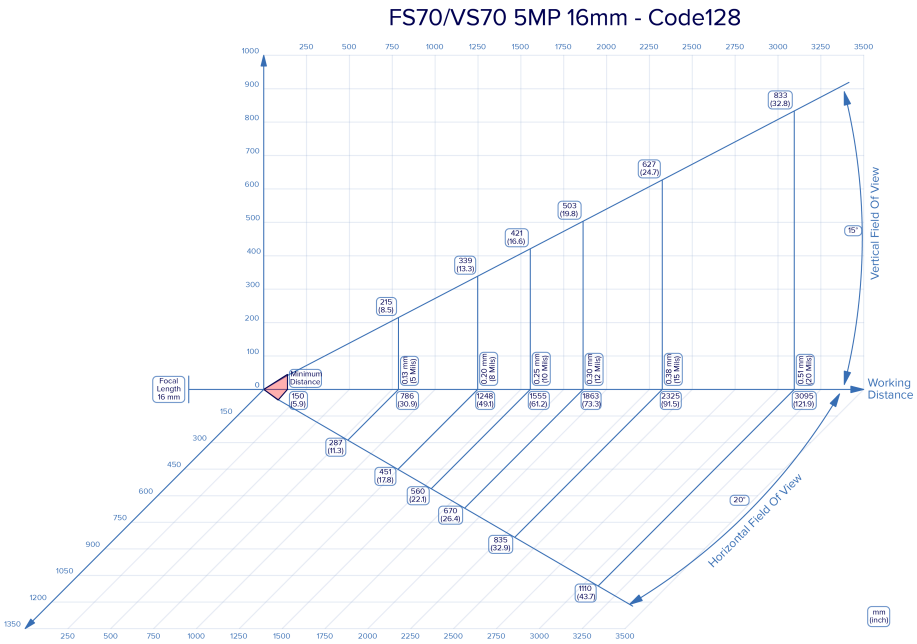
16mm

Figure 42 xS70 5MP 16mm



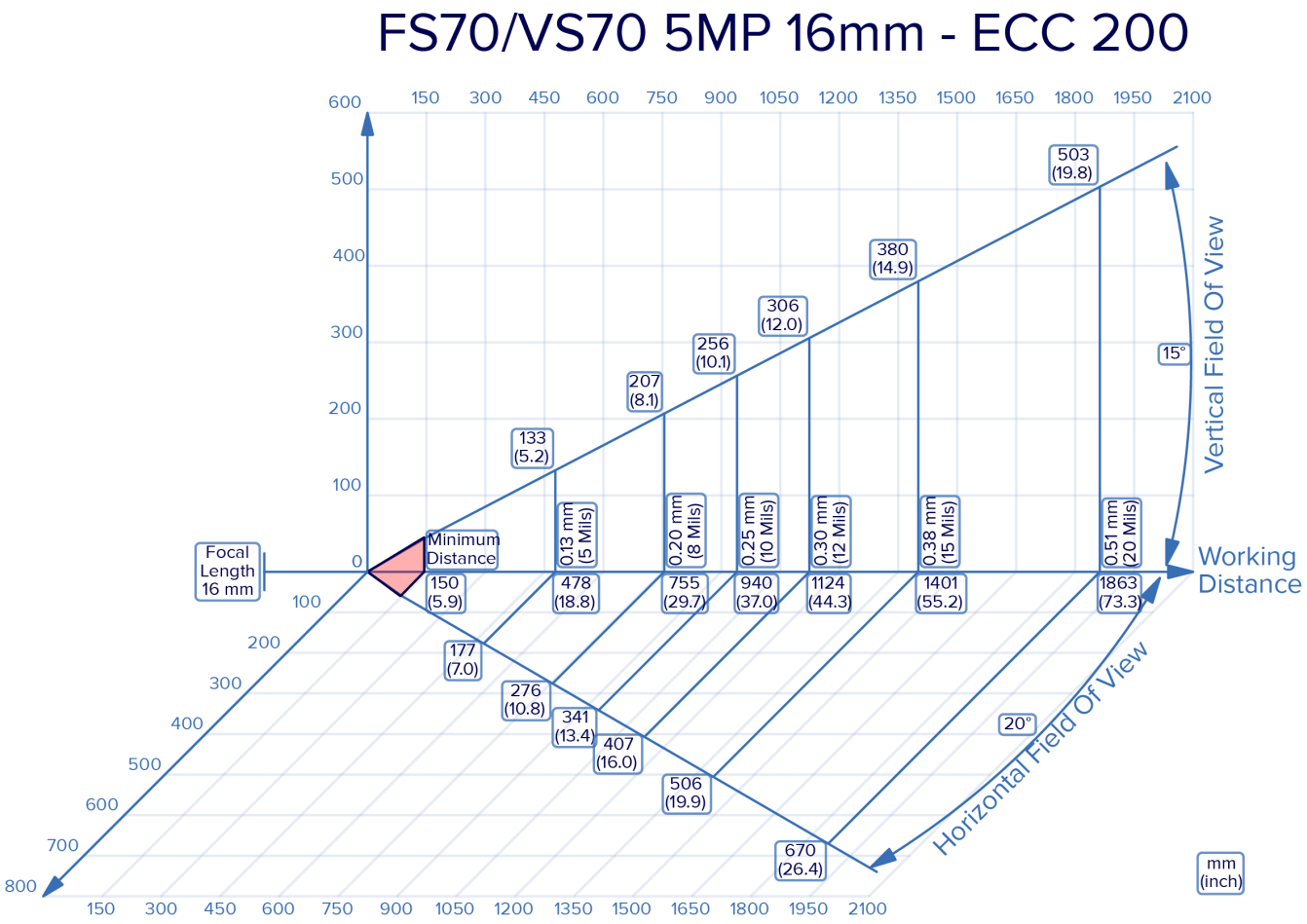
16mm - Code128

Figure 43 xS70 5MP 16mm - Code128



16mm - ECC 200

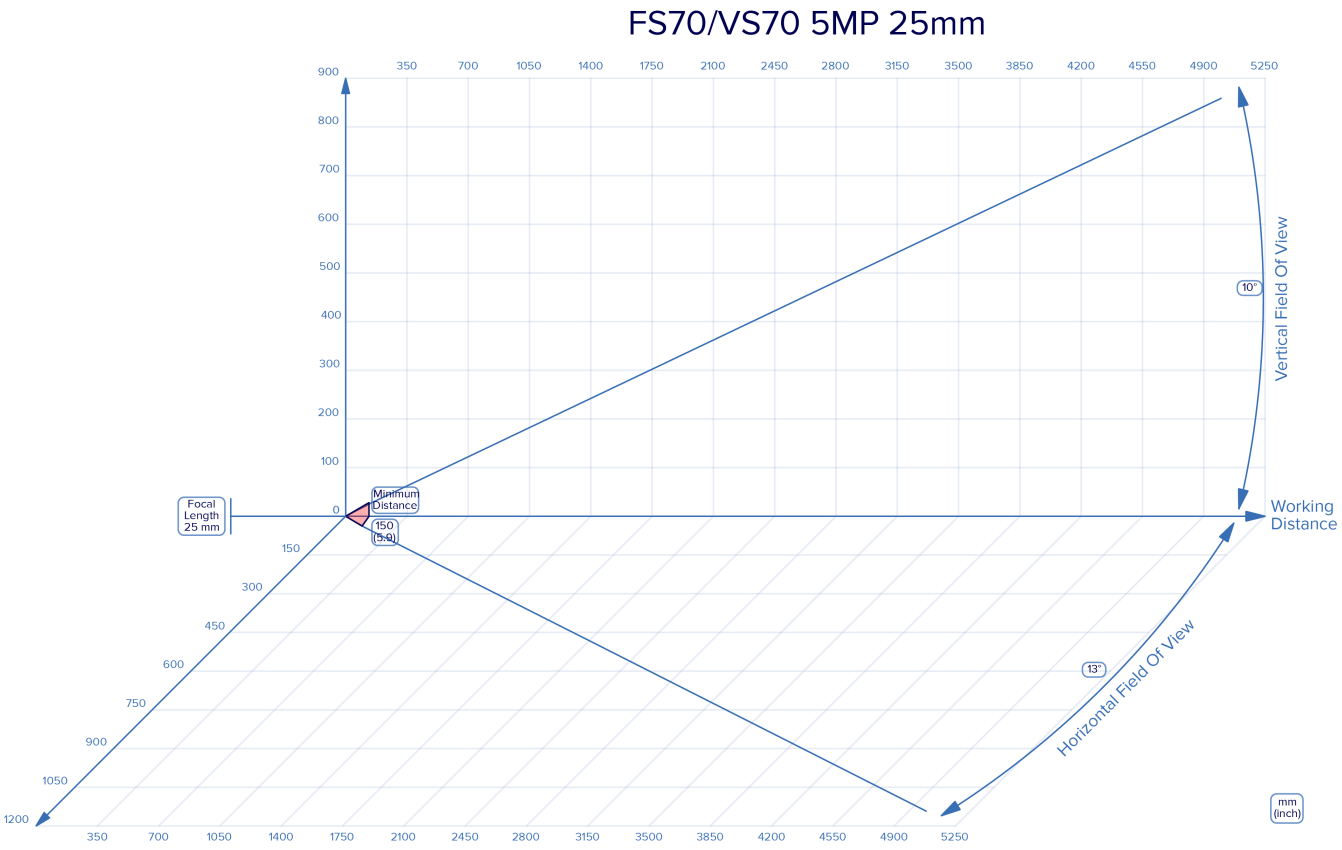
Figure 44 xS70 5MP 16mm - ECC 200



xS70 5MP 25mm

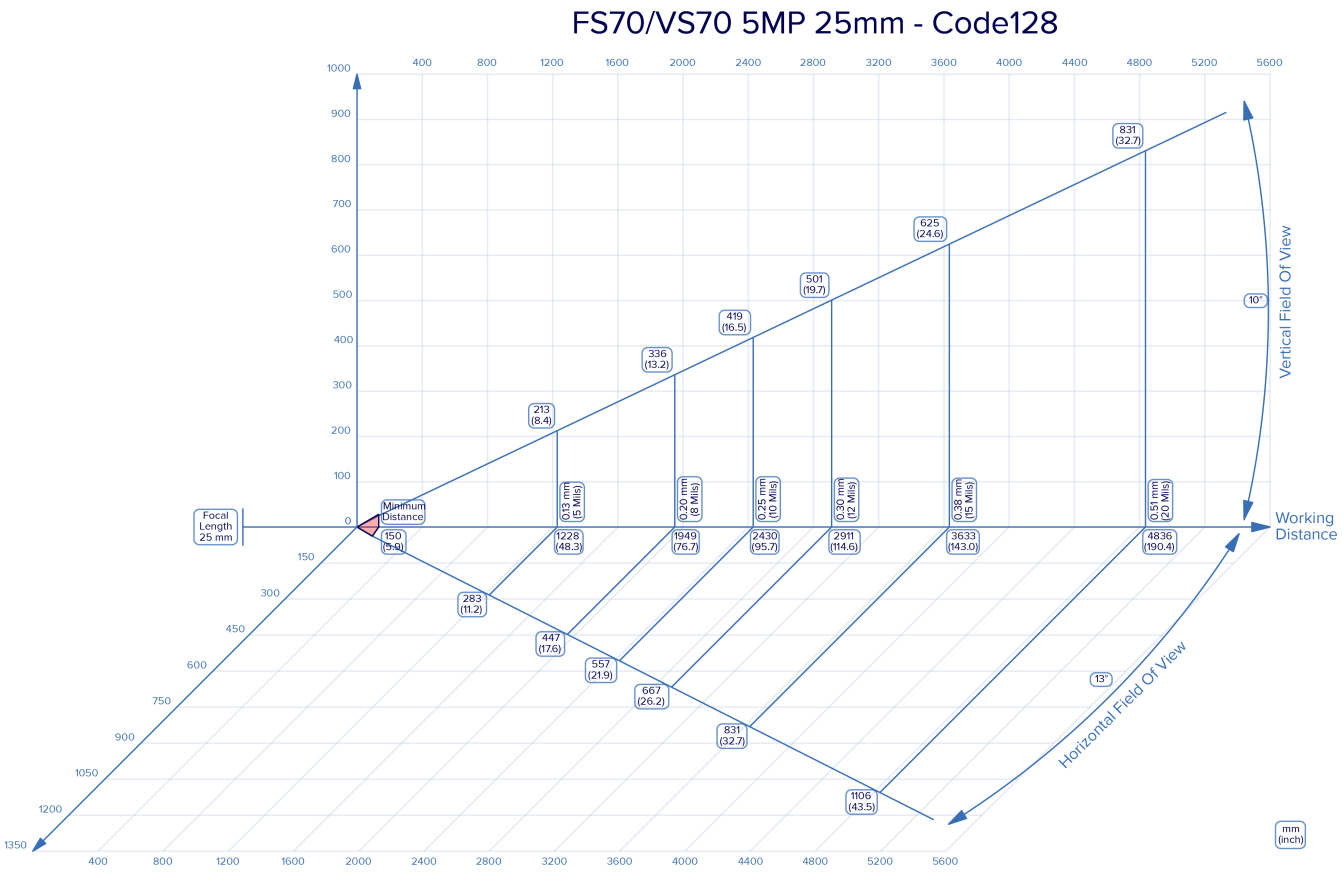
25mm

Figure 45 xS70 5MP 25mm



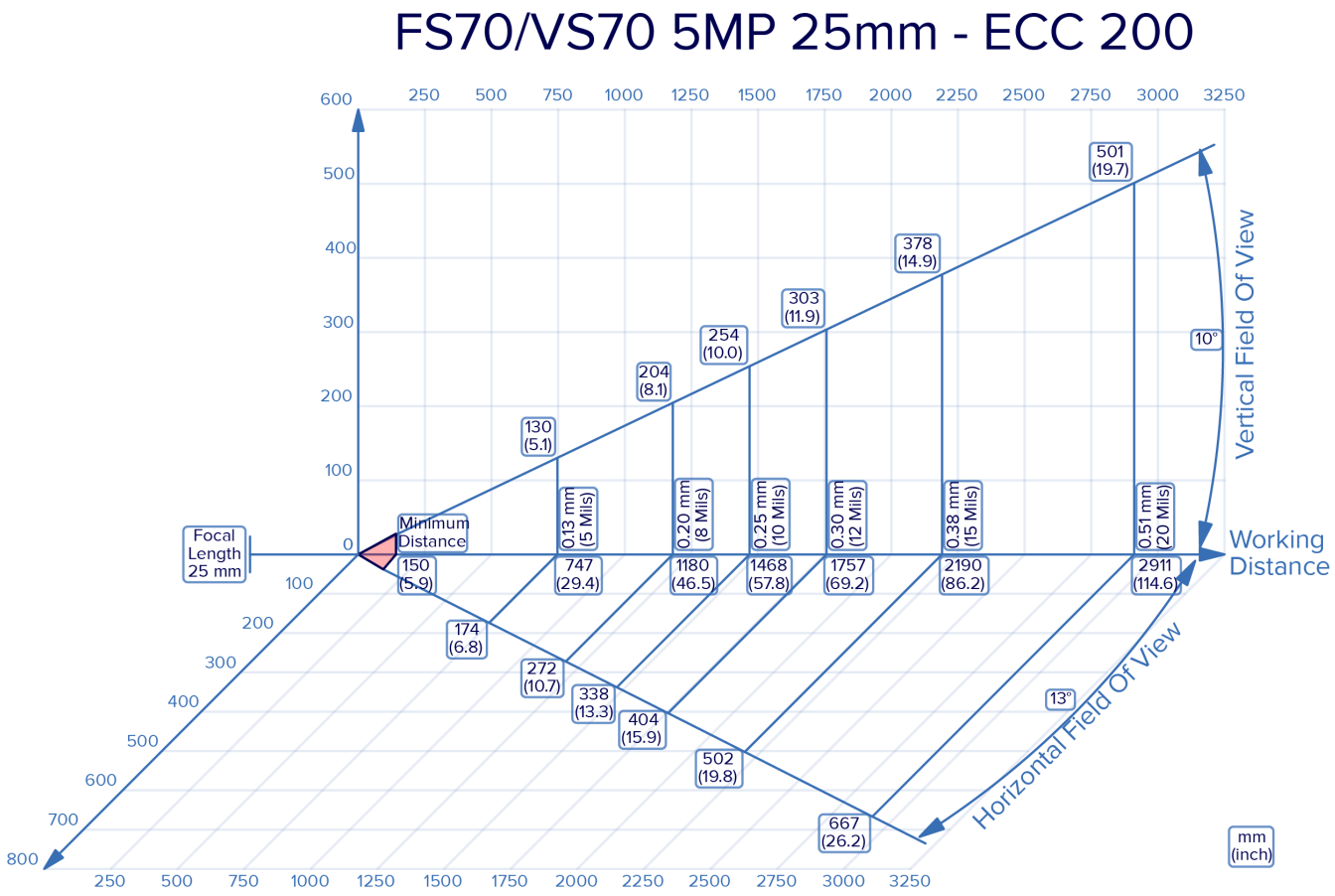
25mm - Code128

Figure 46 xS70 5MP 25mm - Code128



25mm - ECC 200

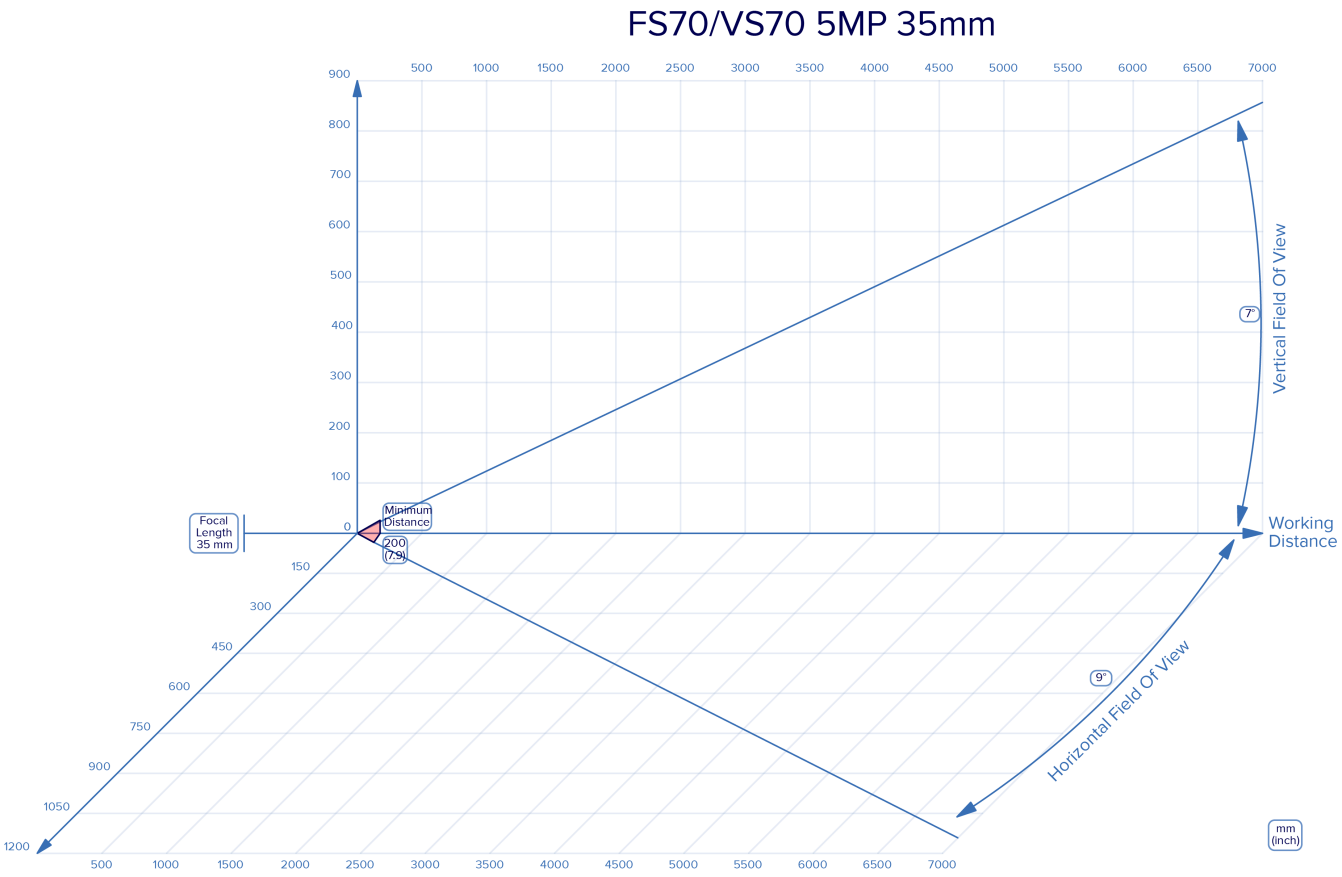
Figure 47 xS70 5MP 35mm - ECC 200



xS70 5MP 35mm

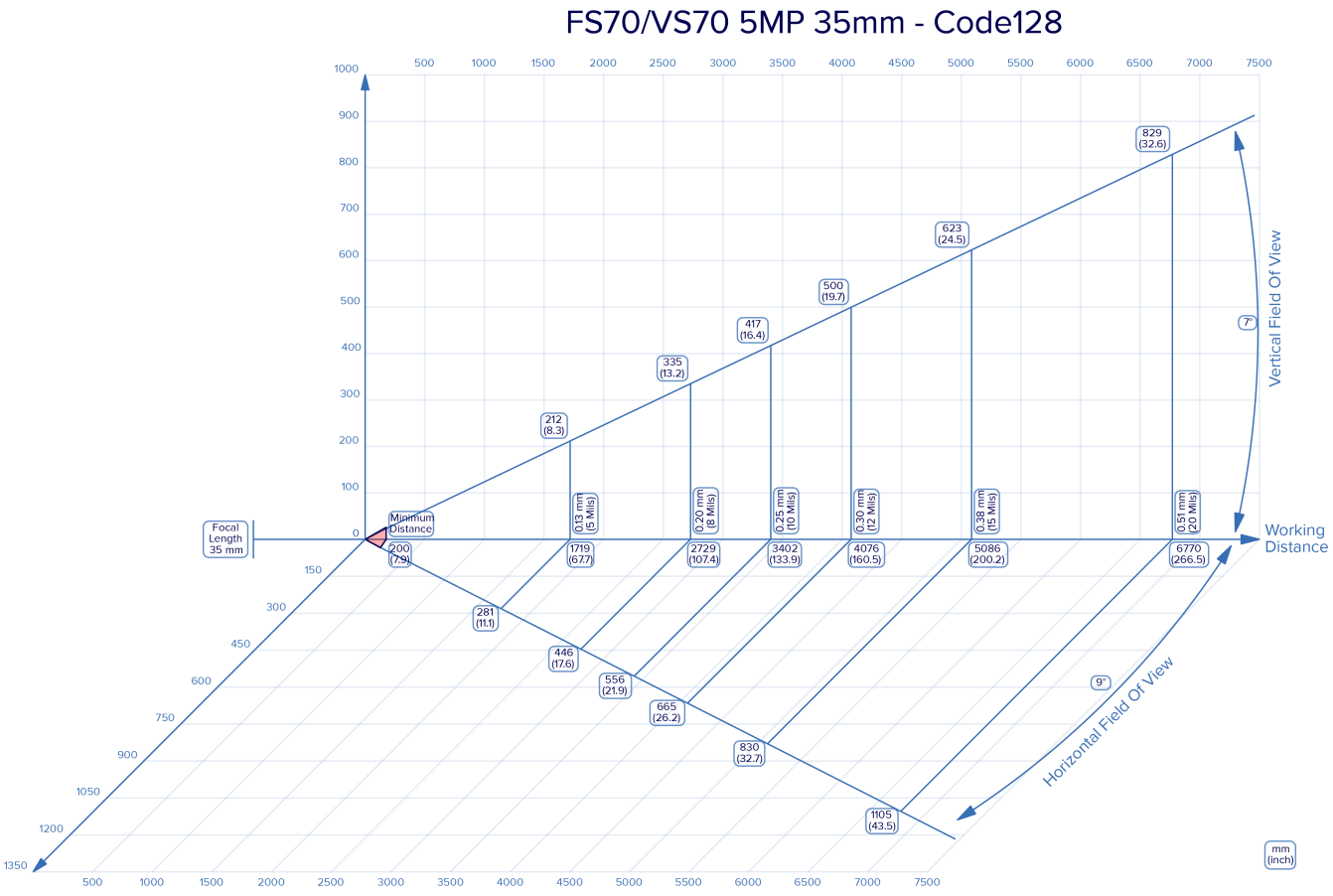
35mm

Figure 48 xS70 5MP 35mm



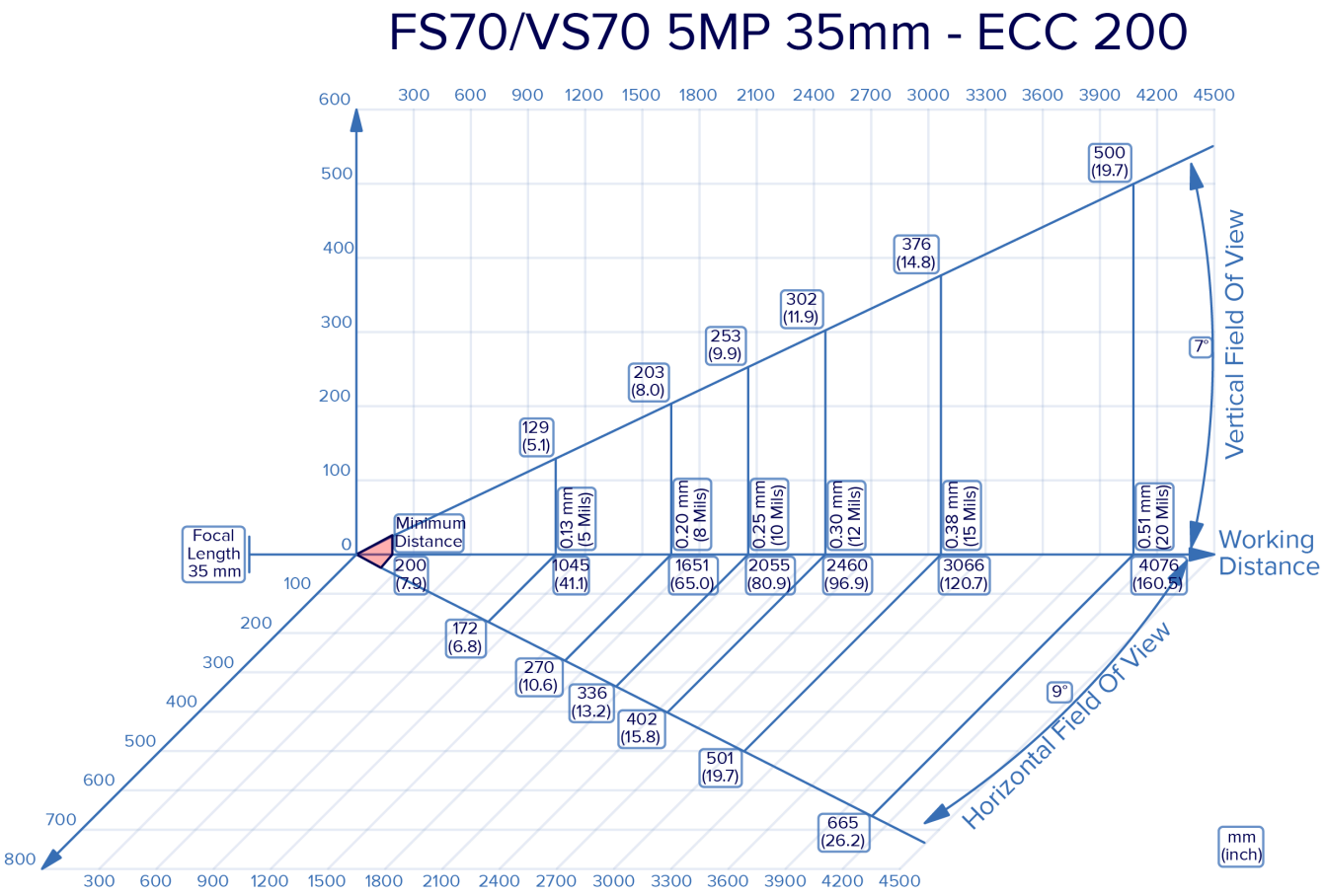
35mm - Code128

Figure 49 xS70 5MP 35mm - Code128



35mm - ECC 200

Figure 50 xS70 5MP 35mm - ECC 200



Using Parameter Barcodes

Set feature values by scanning a single barcode or a short barcode sequence. The settings are stored in non-volatile memory and are preserved even when the scanner powers down.

NOTE: Most computer monitors allow scanning barcodes directly on the screen. When scanning from the screen, be sure to set the document magnification to a level where you can see the barcode clearly, and bars and/or spaces do not merge.

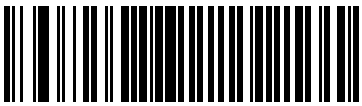
If you are not using a USB cable, select a host type after the power-up beeps sound. This is only necessary upon initial power-up when connecting to a new host.

Using Autofocus Barcodes

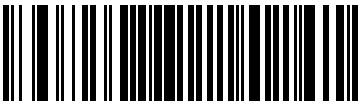
Use calibration barcodes to set the device's focus settings automatically.

NOTE: This process only adjusts the focus setting on the device and does not adjust exposure or gain.

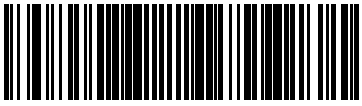
Bring one of the following calibration barcodes into the device field of view:



5s delay



8s delay



13s delay

1. Read one of the autofocus barcodes to start the focus-tuning process based on the selected delay (8s, 13s, or 18s).

NOTE: Observe the status LED flash every 500ms during the delay, providing time to bring the test barcode into the field of view to tune the focus on it.

2. During this delay, bring the desired test barcode into the field of view for the autofocus process to use as a reference. It is recommended to tune the focus of the device with a barcode type that is commonly decoded in your use case.

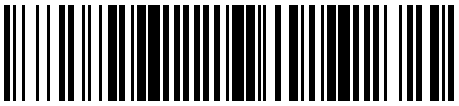
NOTE: Do not use the calibration barcode as the test barcode to calibrate focus against.

3. After the delay, the autofocus process starts and continues for 5-15 seconds.
4. Listen for the confirmation beeper sequence indicating the focus calibration process is complete.

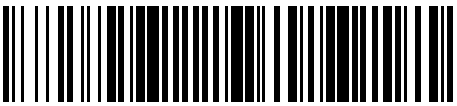
HID Keyboard Configuration

Parameter #65704

Scan a barcode to enable or disable a HID keyboard



Enable HID Keyboard (Disables CDC Serial)

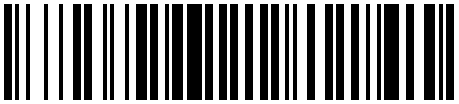


Disable HID Keyboard

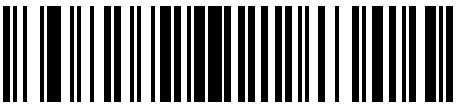
HID Keyboard Language

Parameter #65843

Scan a barcode to select a HID keyboard language.



US English



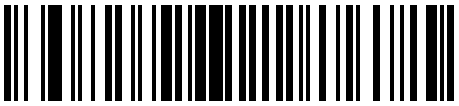
French

German

Spanish

Italian

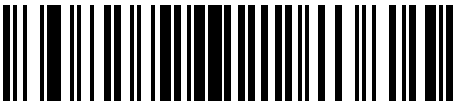
German Linux



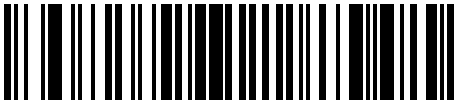
Czech Linux

Polish Linux

Portuguese (Brazil) Linux



UK English Linux



Japanese Linux

HID Keyboard Keystroke Delay

Parameter #65705

Scan a barcode to select a predetermined keystroke delay

Predefined Keystroke Delay 0s

Predefined Keystroke Delay 5ms

HID Keyboard Special Keystroke Delay

Parameter #65706

Scan a barcode to select a predefined special keystroke delay.

Predefined Special Keystroke Delay 0s

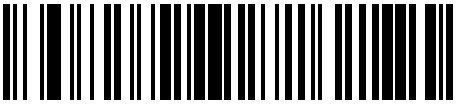
Predefined Special Keystroke Delay 5ms

HID CDC Serial

Parameter #66934

Scan a barcode to enable to disable CDC serial.

Enable CDC Serial (Disable HID)

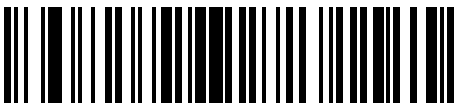


Disable CDC Serial

HID CDC Serial Results

Parameter #66933

Scan a barcode to enable or disable HID CDC Serial results on the device.



Enable CDC Serial Results

Disable CDC Serial Results

USB Power Configuration

Parameter #65079

Scan a barcode to enable or disable Unrestricted USB-A power.

Enable Unrestricted USB A-Power

Disable Unrestricted USB A-Power

Input/Output (IO) Interface Configuration

TCP Result Output

Parameter #66930

Scan a barcode to enable or disable an IO interface.

Enable TCP Result Output

Disable TCP Result Output

TCP Result Control

Parameter #66915

Enable TCP Result Control

Disable TCP Result Control

RS232 Result Output

Parameter #66931

Enable RS232 Result Output

Disable RS232 Result Output

RS232 Result Control

Parameter #66932

Enable RS232 Result Control

Disable RS232 Result Control

Barcode Configuration Mode

Parameter #69035

Scan a barcode to enter or exit barcode configuration mode.

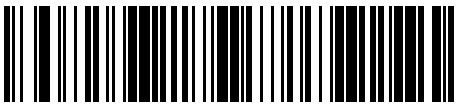
Enter Parameter Barcode Configuration Mode

Exit Parameter Barcode Configuration Mode

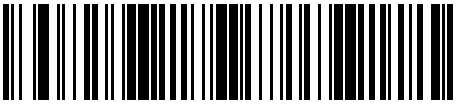
Change Active Job Slot Number

Parameter #69053

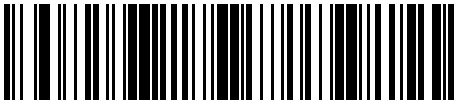
Scan a barcode to change the active job slot to the specified number.



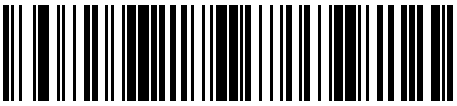
Change Active Job Slot to Number 1



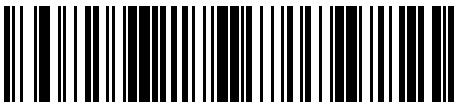
Change Active Job Slot to Number 2



Change Active Job Slot to Number 3

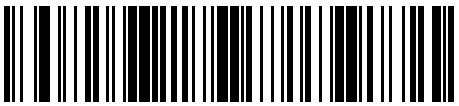


Change Active Job Slot to Number 4

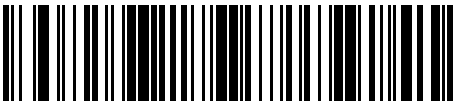


Change Active Job Slot to Number 5

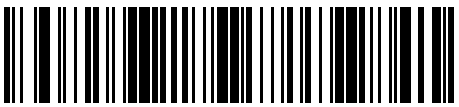
Change Active Job Slot to Number 6



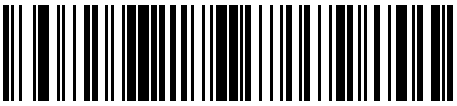
Change Active Job Slot to Number 7



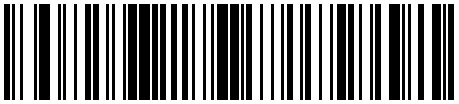
Change Active Job Slot to Number 8



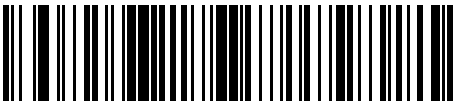
Change Active Job Slot to Number 9



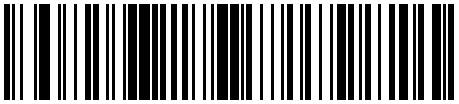
Change Active Job Slot to Number 10



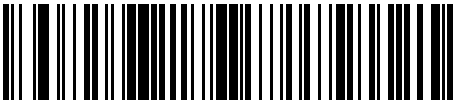
Change Active Job Slot to Number 11



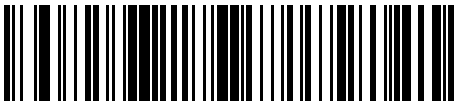
Change Active Job Slot to Number 12



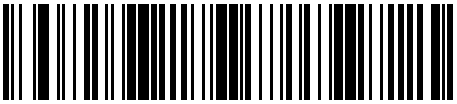
Change Active Job Slot to Number 13



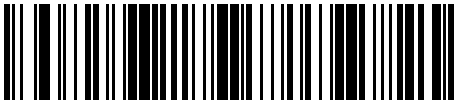
Change Active Job Slot to Number 14



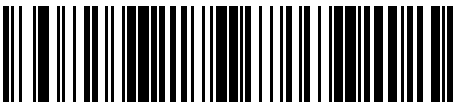
Change Active Job Slot to Number 15



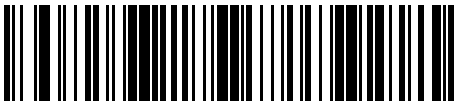
Change Active Job Slot to Number 16



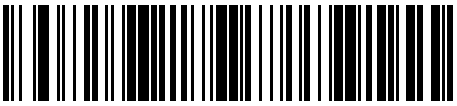
Change Active Job Slot to Number 17



Change Active Job Slot to Number 18



Change Active Job Slot to Number 19

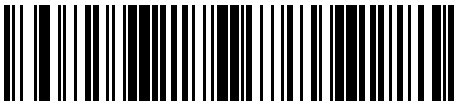


Change Active Job Slot to Number 20

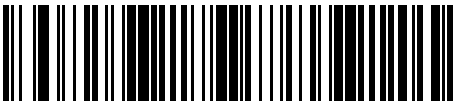
Change Startup Job Slot Number

Parameter #69054

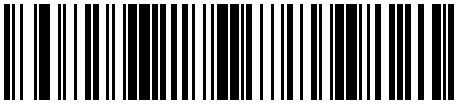
Scan a barcode to change the startup job slot to the specified number.



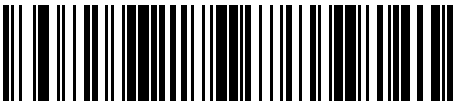
Change Startup Job to Slot Number 1



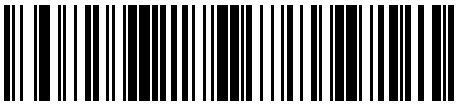
Change Startup Job to Slot Number 2



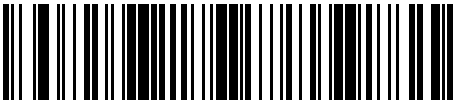
Change Startup Job to Slot Number 3



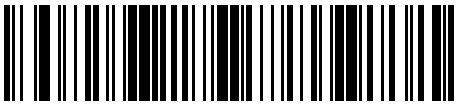
Change Startup Job to Slot Number 4



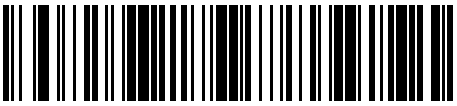
Change Startup Job to Slot Number 5



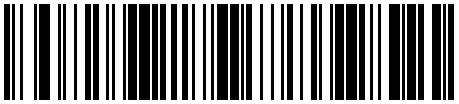
Change Startup Job to Slot Number 6



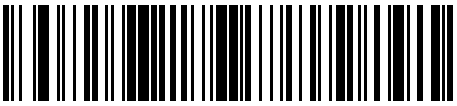
Change Startup Job to Slot Number 7



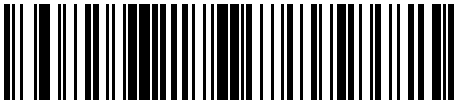
Change Startup Job to Slot Number 8



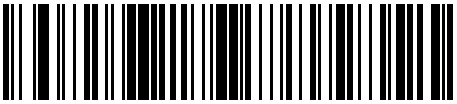
Change Startup Job to Slot Number 9



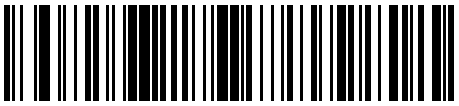
Change Startup Job to Slot Number 10



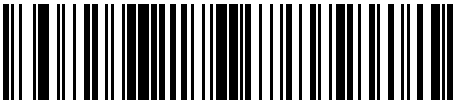
Change Startup Job to Slot Number 11



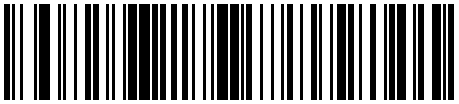
Change Startup Job to Slot Number 12



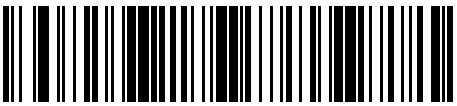
Change Startup Job to Slot Number 13



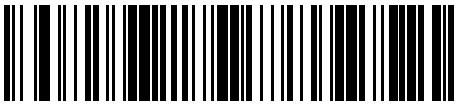
Change Startup Job to Slot Number 14



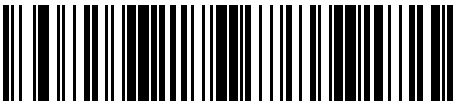
Change Startup Job to Slot Number 15



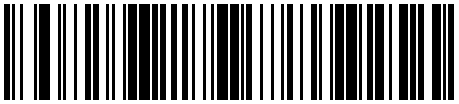
Change Startup Job to Slot Number 16



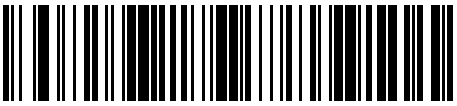
Change Startup Job to Slot Number 17



Change Startup Job to Slot Number 18



Change Startup Job to Slot Number 19

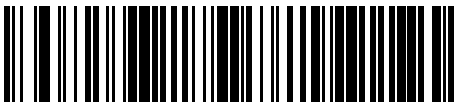


Change Startup Job to Slot Number 20

Reboot Device

Parameter #69030

Scan the following barcode to reboot the device.



Reboot the Device

Restart Core Services

Parameter #69031

Scan the barcode to restart core services.

Restart Core Services

Maintenance

This section describes the maintenance procedures that must be followed to maintain the FS/VS Smart Camera's performance.

Known Harmful Ingredients

The following chemicals are known to damage the plastics on Zebra devices and should not come in contact with the device:

- Acetone
- Ammonia solutions
- Aqueous or alcoholic alkaline solutions
- Aromatic and chlorinated hydrocarbons
- Benzene
- Bleach
- Carbolic acid
- Compounds of amines or ammonia
- Ethanolamine
- Ethers
- Ketones
- TB-lysoform
- Toluene
- Trichloroethylene

Approved Cleaning Agents

The following cleaning agents are approved for cleaning the plastics on Zebra devices:

- Pre-moistened wipes
- Isopropyl alcohol 70%

Tolerable Industrial Fluids and Chemicals

The following industrial fluids and chemicals were evaluated and deemed tolerable for Zebra devices.

NOTE: Not all fluid variants and brands have been tested.

- Motor/Engine Oil
- Automatic Transmission Fluid (ATF)
- Continuously Variable Transmission Fluid (CVT)
- Industrial De-Greaser (Engine Brite Heavy Duty)

Cleaning the Device

Routinely cleaning the exit window is required. A dirty window may affect scanning accuracy. Do not allow any abrasive material to touch the window.

1. Dampen a soft cloth with one of the approved cleaning agents listed above, or use pre-moistened wipes.
2. Gently wipe all surfaces, including the front, back, sides, top, and bottom. Never apply the liquid directly to the device. Be careful not to let liquid pool around the scanner window, trigger, cable connector, or any other area on the device.
3. Clean the trigger area by carefully wiping the surface to prevent the label from lifting from the device.
4. Do not spray water or other cleaning liquids directly into the exit window.
5. Wipe the scanner exit window with lens tissue or other material suitable for cleaning optical material, such as eyeglasses.
6. Immediately dry the scanner window after cleaning with a soft, non-abrasive cloth to prevent streaking.
7. Allow the unit to air dry before use.
8. To clean the device connectors:
   a. Dip the cotton portion of a cotton-tipped applicator in isopropyl alcohol.
   b. Rub the cotton portion of the cotton-tipped applicator back and forth across the device's connector at least thrice, leaving no cotton residue.
   c. Use the cotton-tipped applicator dipped in alcohol to remove grease and dirt near the connector area.
   d. Do not leave any cotton residue on the connectors.

Troubleshooting

This section describes potential issues that could arise while using the device and solutions that could correct the problem, such as power cycling and pinging the device.

Table 11 Troubleshooting

Problem	Cause	Solution
The device is not connecting to the network when using Device Discovery.	Specific ports that are utilized by the application are blocked by Windows Defender Firewall.	Ensure that Zebra Aurora Focus can access Domain, Public, and Private networks.
	Ensure that the device is visible in the Windows Network by viewing the File Explorer and selecting Network.	If the device is not viewable under the Network dropdown or listed under Other Devices, it is not connected.
	There is no RNDIS driver available to the device when connected via USB.	To verify that there is an NDIS driver, go to the Windows Device Manager and search under the Network Adapters drop-down.
The device is cycling power or data connection on the USB port.	The USB cable may be loose or intermittent.	Reseat the USB cable and tighten the locking screws firmly.

Device Discovery Troubleshooting Methods

Two common solutions to enable the device to re-connect via device discovery are performing a factory reset on the device and power cycling the device.

Factory Reset the Device

Perform a factory reset on the device using the hardware buttons.

1. Disconnect all power sources.
2. Press and hold the TRIG button on the device.
3. Connect to a power source.
4. Continue to hold the TRIG button.

   After 20 seconds, the device's Power LED turns yellow to green, and the Ethernet LED turns orange to amber.

5. Release the TRIG within 5 seconds after the Ethernet LED changes to amber.

Power Cycling the Device

Power cycling the device can help in troubleshooting potential network discoverability issues.

1. Remove all cables to ensure no power is being directed to the device.
2. Reinsert a power source and allow the device approximately one minute to boot up.
3. Re-attempt to:
   - Discover a device in Zebra Aurora Focus by restarting the application and clicking **View Devices**.
   - View a device in the Windows Network.
   - Access a device using the Zebra Web HMI.

If failure persists, repeat the steps above for all of the connection types being used with the device, including:

- Ethernet directly to the PC.
- Ethernet connection to a network via switch or hub.

Technical Reference

This section includes details on physical dimensions, power options, and performance features such as image sensors and illumination. Mounting instructions and installation diagrams are also provided to ensure proper setup.

Specifications

The following table describes the device's physical attributes, performance and user environment specifications, and regulatory certifications.

Table 12 Specifications

Specification	Description
Physical Characteristics	
Dimensions	2.1 in. H x 2.5 in. W x 3.6 in. D 54.0 mm H x 64.0 mm W x 91.4 mm D
Weight	14.1 oz./400.0 g
Power	10 to 30 VDC external power supply, 36W max at 24V Class 4 PoE+ source, 25.5W max Class 3 PoE source, 13W max USB Type-C host, 7.5W max at 5V 1.5A or 15W max at 5V 3.0A
Configurable IO	(4) Four optoisolated GPIO: GPIO0,1,2,3 (5) Five non-isolated GPIO: GPIO4,5,6*,7*,8* *Unavailable when External Light Mode is enabled
Interface Ports	(1) M12 X-Coded 1000/100/10 Mbps Ethernet (1) M12 12-pin Power/GPIO (1) M12 5-pin External Light Power & Control/GPIO (1) USB 3.0 SuperSpeed Type-C with DisplayPort Alt Mode
Communication Protocols	Ethernet/IP, PROFINET, CC-Link, Modbus TCP, TCP/IP
Performance Characteristics	

Table 12 Specifications (Continued)

Specification	Description
Image Sensor	Monochrome: 2.3 MP (1920 x 1200 pixels), 3.0µm pixel size CMOS Sensor Monochrome 5.1MP (2592 x 1944 pixels), 2.2µm pixel size CMOS Sensor
Acquisition Rate	Up to 60 frames/second
Aimer	Red Class II Laser; 8-point sunburst pattern **NOTE:** FS40-WA5 (5MP) configurations do not have a laser aimer.
Illumination	Field replaceable modules: (8) 660nm Red LEDs (8) 850nm IR LEDs (8) 2700K (Color Temperature) White LEDs (4) 660nm Red LEDs + (8) 850nm IR LEDs + (8) 2700K (Color Temperature) White LEDs
Imager Field of View	SR (Standard Range): 10.8mm Liquid Lens (30° H x 19° V Nominal) WA (Wide Angle): 6.8mm Liquid Lens (46° H x 29° V Nominal)
User Environment	
Operating Temperature	32° F to 113° F/0° C to 45° C (10-30VDC external power supply, duty cycle-dependent) 32° F to 104° F/0° C to 40° C (POE, duty cycle dependent)
Storage Temperature	-40°F to 158°F / -40° to 70°C
Vibration Resistance	EN 60068-2-6, 14 mm @ 2 to 10 Hz, 1.5 mm @ 13 to 55 Hz; 2 g @ 70 to 500 Hz; 2 hours on each axis
Shock Resistance	EN 60068-2-27, 30g; 11 ms; 3 shocks on each axis
Environmental Sealing	IP65 and IP67
Humidity	5% to 90% RH (Non-Condensing)
Light Immunity	The product operates in Incandescent 450 ft candles, Sunlight <6000 ft candles, Florescent 450 ft candles, LED 450 ft candles
Electrostatic Discharge	±15 kV Air, ±8 kV Contact, ±8 kV Indirect
Regulatory	
Environmental	EN 50581:2012 EN IEC 63000:2018
Electrical Safety	IEC 62368-1 (Ed.2) EN 62368-1:2014/A11:2017
Laser Safety (xS42 Only)	21CFR1040.10 & 21CFR1040.11 IEC/EN 60825-1:2014 (Ed.3)

Table 12 Specifications (Continued)

Specification	Description
LED Safety	IEC 62471: 2006 (Ed.1) EN 62471: 2008
EMI/EMS	EN 55032:2015/A11: 2020 EN 55032:2015/A1: 2020 EN 55035:2017/A11: 2020 EN IEC 61000-3-2: 2019/A1:2021 EN 61000-3-3: 2013/A2:2021/AC:2022-01 EN 61000-6-2: 2005,2019 FCC 47 CFR Part 15, Subpart B ICES-003, Issue 7
EU Declaration of Conformity	2014/30/EU; 2014/35/EU; 2011/65/EU. Refer to the Declaration of Conformity (DoC) for details of compliance with the current standards. The DoC is available at: zebra.com/doc

Accessories

This section provides details on compatible external lights, ring lights, and polarizers for the device.

External Lighting

Table 13 External Lighting Accessories

Part Number	Description	
LGHT-B100RD-0000	LED Bar light, 100MM, red-625 wavelength, 5-Pin male M12 connector, semi-diffused, includes transparent and opaque diffusers.	
LGHT-B100BL-0000	LED Bar light, 100MM, blue-465 wavelength, 5-Pin male M12 connector, semi-diffused, includes transparent and opaque diffusers.	
LGHT-B100WH-0000	LED Bar light, 100MM, white wavelength, 5-Pin male M12 connector, semi-diffused, includes transparent and opaque diffusers.	
LGHT-B100IR-0000	LED Bar light, 100MM, IR-850 wavelength, 5-Pin male M12 connector, semi-diffused, includes transparent and opaque diffusers.	
LGHT-B300RD-0000	LED Bar light, 300MM, red-625 wavelength, 5-Pin male M12 connector, semi-diffused, includes transparent and opaque diffusers.	
LGHT-B300BL-0000	LED Bar light, 300MM, blue-465 wavelength, 5-Pin male M12 connector, semi-diffused, includes transparent and opaque diffusers.	
LGHT-B300WH-0000	LED Bar light, 300MM, white wavelength, 5-Pin male M12 connector, semi-diffused, includes transparent and opaque diffusers.	
LGHT-B300IR-0000	LED Bar light, 300MM, IR-850 wavelength, 5-Pin male M12 connector, semi-diffused, includes transparent and opaque diffusers.	
Ring Lights		

Table 13 External Lighting Accessories (Continued)

Part Number	Description	
LGHT-R100BL-0000	LED Ring light, 100MM, blue-465 wavelength, 5-Pin male M12 connector, semi-diffused, includes transparent and opaque diffusers.	
LGHT-R100WH-0000	LED Ring light, 100MM, white wavelength, 5-Pin male M12 connector, semi-diffused, includes transparent and opaque diffusers.	
LGHT-R100IR-0000	LED Ring light, 100MM, IR-850 wavelength, 5-Pin male M12 connector, semi-diffused, includes transparent and opaque diffusers.	
LGHT-R100RD-0000	LED Ring light, 100MM, red-625 wavelength, 5-Pin male M12 connector, semi-diffused, includes transparent and opaque diffusers.	
Polarizers		
LGHT-A100BP-0000	100MM Bar Light Polarizer, for use with 100mm External Light Bars (LGHT-B100xx-0000). Not for use with IR-850 wavelengths or when IR image capture is required.	
LGHT-A300BP-0000	300MM Bar Light Polarizer, for use with 300mm External Light Bars (LGHT-B300xx-0000). Not for use with IR-850 wavelengths or when IR image capture is required.	
LGHT-A100RP-0000	Light Polarizer, for use with 100mm External Ring Lights (LGHT-R100xx-0000). Not for use when IR image capture is required.	

Internal Ring Lighting

The following table provides information on compatible internal lighting accessories and replacement ring light covers.

Table 14 Internal Lighting Accessories

Part Number	Description	
ZLED-XS40WH-000	For use with 100mm External Ring Lights (LGHT-R100xx-0000). Not for use when IR image capture is required.	
ZLED-XS40RD-0000	Red lighting is typically used to capture images on paper.	
ZLED-XS40IR-0000	LED IR lighting is typically used in environments where users do not want to see external lighting when detecting clear liquids or inspecting produce.	
ZLED-XS40MC-0000	Multi-Color - White, Red, IR, Blue, and Green LEDs. White LEDs are controllable in individual banks of 4 LEDs. IR and Red are controllable in individual banks of 2 LEDs.	
Replacement Ring Light Covers		

Table 14 Internal Lighting Accessories (Continued)

Part Number	Description	
ZLED-XS40PW-0000	Integrated Light Cover (Replacement) Cross Polarizer. Not for use when IR image capture is required.	
ZLED-XS40PS-0000	Integrated Light Cover (Replacement) Cross Polarizer. Not for use when IR image capture is required.	
ZLED-XS40CW-0000	Integrated Light Cover (Replacement)	
ZLED-XS40CS-0000	Integrated Light Cover (Replacement)	

Internal and External Filters

The xS70 supports various internal filters for use in between the C-Mount lens and the imager as well as External Filters that go on the end of the C-Mount lens.

Table 15 Internal and External Filters

Part Number	Description	
Internal Filters (in between the C-Mount Lens and Imager)		

Table 15 Internal and External Filters (Continued)

Part Number	Description	
FLTR-BP635-25400	Red Bandpass Filter, 635NM, 25.4MM For use between C-mount lens and imager.	
FLTR-BP850-25400	IR Bandpass Filter, 850NM, 25.4MM For use between C-mount lens and imager	
FLTR-BP550-25400	IR/UV Block Bandpass Filter, 550NM, 25.4MM For use between C-mount lens and imager.	
External Filters (on the end of the C-Mount Lens)		
FLTR-BP550-25500	IR/UV Block B Filter, 550NM, 25.4MM For use on the end of the C-mount lens.	
FLTR-BP635-25500	Red Bandpass Filter, 635NM, 25.4MM For use on the end of the C-mount lens.	
FLTR-BP850-25400	IR Bandpass Filter, 850NM, 25.4MM For use on the end of the C-mount lens. Not for use with IR lighting.	

Table 15 Internal and External Filters (Continued)

Part Number	Description	
FLTR-BP470-25500	Blue Bandpass Filter, 470NM, 25.5MM For use on the end of the C-mount lens.	
FLTR-PZ120-25500	Ultra High Contrast Polarizer Filter, 25.4MM For use on the end of the C-mount lens. Not for use with IR lighting.	

Internal Filters

Table 16 Internal Filters

Part Number	Description	
ZFLT-XS40RD-0000	Red Bandpass Zebra Filter	
ZFLT-XS40BL-0000	Blue Bandpass Zebra Filter	
ZFLT-XS40IR-0000	IR Bandpass Zebra Filter	
ZFLT-XS40MC-0000	IR Blocker Zebra Filter	

Spectral Transmission Data

The following table provides spectral transmission data while using supported internal filters for the device.

Spectral Transmission	Blue	Red	IR	RGB (IR Block)	Clear
Normal Incident Angle					
3% Maximum		400-565 nm	400-720 nm		
10% Maximum	400 nm	600 nm	755 nm		
90% Minimum	425-525 nm	625-700 nm	780-925 nm	400-700 nm	400-925 nm
Maximum (Reference)	465-495 nm	650-680 nm	855-895 nm		
10% Maximum	550 nm	725 nm	950 nm	725 nm	950 nm
3% Maximum	585-1050 nm	760-1050 nm	985-1050 nm	760-1050 nm	985-1050 nm
30° Incident Angle					
88% Minimum	465-495 nm	650-670 nm	855-890 nm	400-665 nm	465-890 nm

NOTE: Filter coating is applied to one side only.

C-Mount Lenses

The xS70 supports C-mount lenses of various focal lengths.

Table 17 Lenses

Part Number	Description
LENS-M0800-0101	C-Mount Lens, 8 mm focal length, 25.5 mm filter thread, for use with up to 2/3 in. sensors, 2.3 and 5 MP configurations
LENS-M1200-0101	C-Mount Lens, 12 mm focal length, 25.5 mm filter thread, for use with up to 2/3 in. sensors, 2.3 and 5 MP configurations
LENS-M1600-0101	C-Mount Lens, 16 mm focal length, 25.5 mm filter thread, for use with up to 2/3 in. sensors, 2.3 and 5 MP configurations
LENS-M2500-0101	C-Mount Lens, 25 mm focal length, 25.5 mm filter thread, for use with up to 2/3 in. sensors, 2.3 and 5 MP configurations
LENS-M3500-0101	C-Mount Lens, 35 mm focal length, 25.5 mm filter thread, for use with up to 2/3 in. sensors, 2.3 and 5 MP configurations
LENS-U0800-0101	C-Mount Lens, 8 mm focal length, large format, 55 mm filter thread, for use with up to 1.1 in. sensors, 8.9 and 12 MP configurations
LENS-U1200-0101	C-Mount Lens, 12 mm focal length, large format, 35.5 mm filter thread, for use with up to 1.1 in. sensors, 8.9 and 12MP configurations
LENS-U1600-0101	C-Mount Lens, 16 mm focal length, large format, 35.5 mm filter thread, for use with up to 1.1 in. sensors, 8.9 and 12MP configurations
LENS-U2500-0101	C-Mount Lens, 25 mm focal length, large format, 35.5 mm filter thread, for use with up to 1.1 in. sensors, 8.9 and 12MP configurations

Table 17 Lenses (Continued)

Part Number	Description
LENS-U3500-0101	C-Mount Lens, 35 mm focal length, large format, 35.5 mm filter thread, for use with up to 1.1 in. sensors, 8.9 and 12MP configurations
LENS-M0800-0102	C-Mount Lens, 8 mm focal length, 25.5 mm filter thread, value line
LENS-M1200-0102	C-Mount Lens, 12 mm focal length, 25.5 mm filter thread, value line
LENS-M1600-0102	C-Mount Lens, 16 mm focal length, 25.5 mm filter thread, value line
LENS-M2500-0102	C-Mount Lens, 25 mm focal length, 25.5 mm filter thread, value line
LENS-M3500-0102	C-Mount Lens, 35 mm focal length, 25.5 mm filter thread, value line

Lens Covers

The xS70 supports threaded lens covers and replacement IP67 lens covers.

Table 18 Lens Covers

Part Number	Description	
LENS-XTC70-0000	Threaded Lens Cover Adapter	
LENS-XRC70-0000	Replacement IP67 Lens Cover	

Cables

The device is compatible with various USB, Ethernet, external light control, and power cables.

Table 19 Cables

Part Number	Description
USB Cables	
CBL-USB00200-USC00	USB 2M, IP67 locking USB-C to USB C (SuperSpeed), Compatible with all FS/VS devices.

Table 19 Cables (Continued)

Part Number	Description
CBL-USB00400-USC00	USB 4M, IP67 locking USB-C to USB C, Compatible with all FS/VS devices.
CBL-USB00200-USA00	USB 2M, IP67 locking USB-C to USB-A (SuperSpeed), Compatible with all FS/VS devices.
CBL-USB00400-USA00	USB 4M, IP67 locking USB-C to USB-A, Compatible with all FS/VS devices.
Ethernet Cables	
CBL-ENT00500-M1200	5M length, X-Coded M12 to RJ45 connectors, Compatible with all FS/VS devices that include an Ethernet port.
CBL-ENT01500-M1200	15M length, X-Coded M12 to RJ45 connectors, Compatible with all FS/VS devices that include an Ethernet port.
External Light Control Cables	
CBL-LGT00000-M1200	5-pin M12 to 5-pin M12 External Light Control C, 0.3M length. Only compatible with devices that include an external light port.
CBL-LGT00200-M1200	5-pin M12 to 5-pin M12 External Light Control C, 2M length. Only compatible with devices that include an external light port.
Power Cables	
CBL-PWR00500-M1200	12-pin M12 to flying lead breakout cable, 5M length.
CBL-PWR01500-M1200	12-pin M12 to flying lead breakout cable, 15M length.

Brackets

All Zebra FS/VS devices support mounting with a standard L-Mount bracket.

Table 20 Brackets

Part Number	Description	
BRKT-LMNT-U000	L-Mount Bracket	

See Also

Mounting the Device Using the L-Bracket

Power Supplies

The device is compatible with 24VDC power supplies and PoE injectors.

Table 21 Power Supplies

Part Number	Description	
PWR-24V03A-0000	Power Supply, 24VDC 3AMP	
PWR-24V05A-0000	Power Supply, 24VDC 5AMP	
PWR-POE30W-0000	Power over Ethernet Injector, 30W POE+, AC Input	
PWR-POE60W-0000	Power over Ethernet Injector, 60W POE+, AC Input	

Dimensional Drawings

The following diagrams outline the mounting holes and dimensions of the devices.

xS40 Dimensional Drawings

Figure 51 xS40 Dimensional Drawings

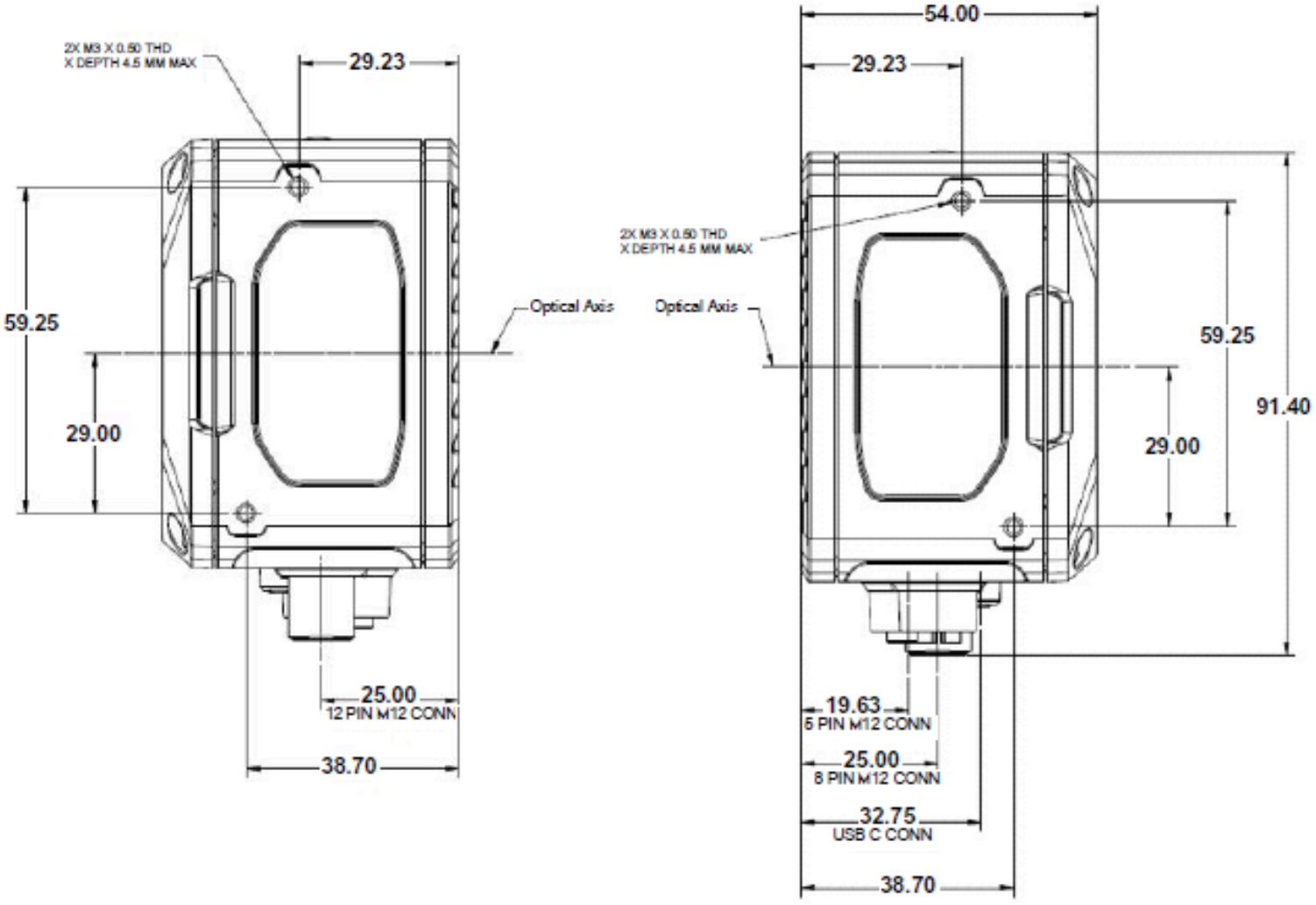
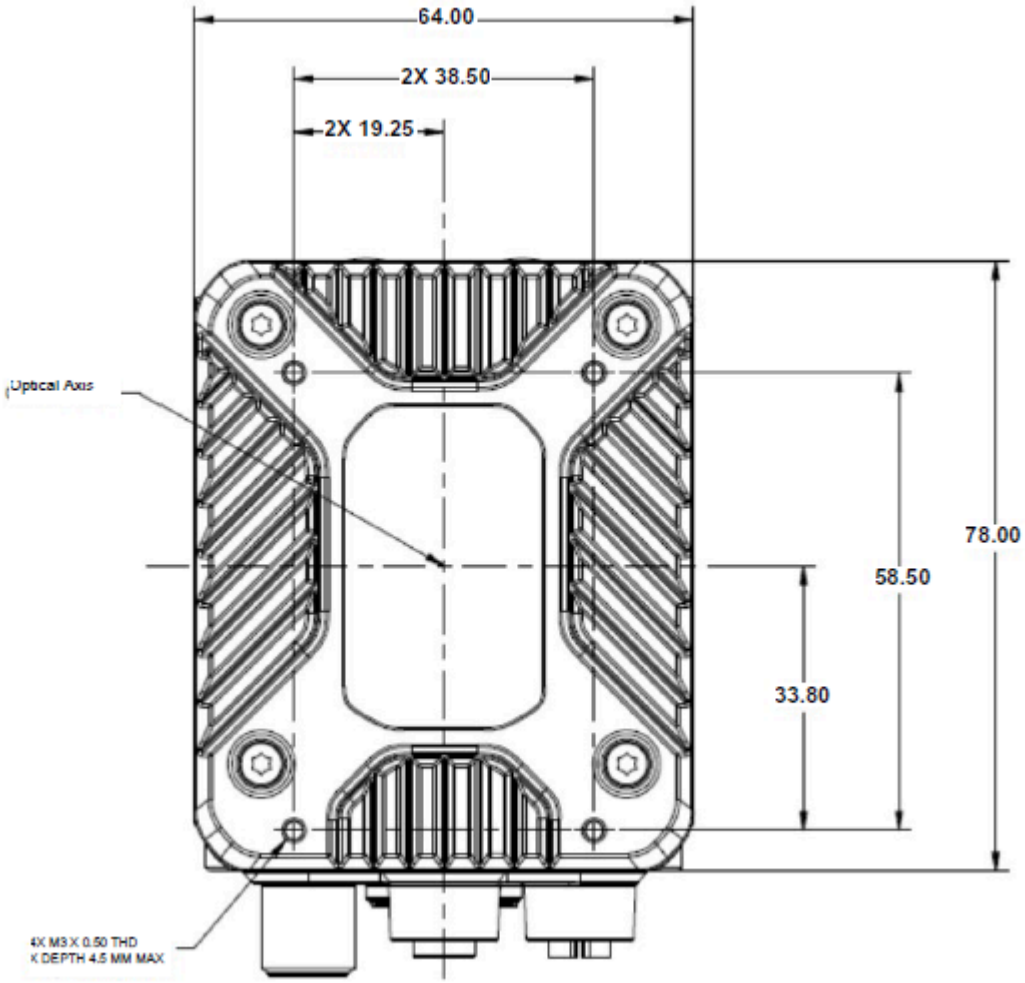


Figure 52 xS40 Front Mounting Holes



xS70 Dimensional Drawings

Figure 53 xS70 Dimensional Drawings

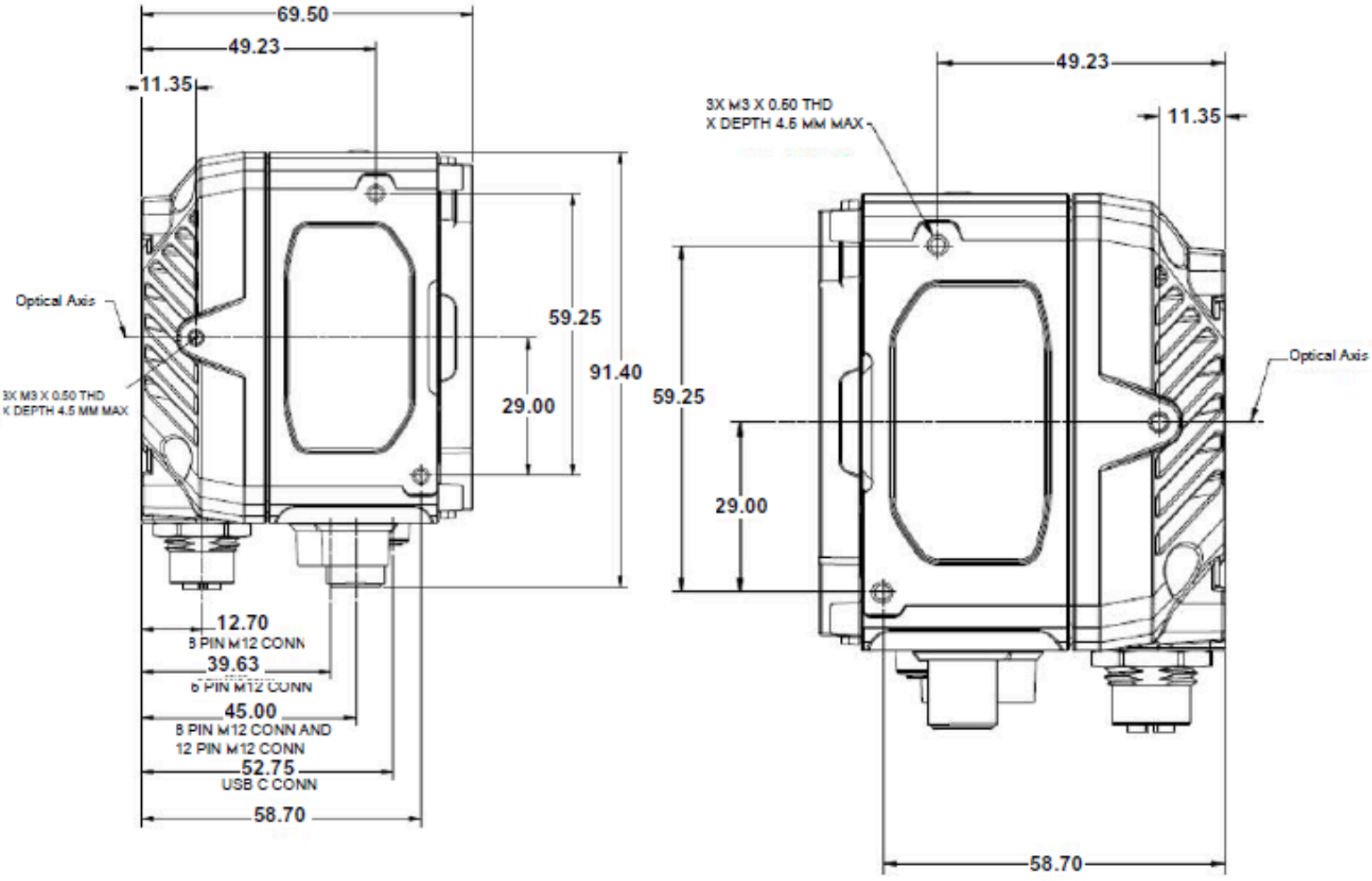
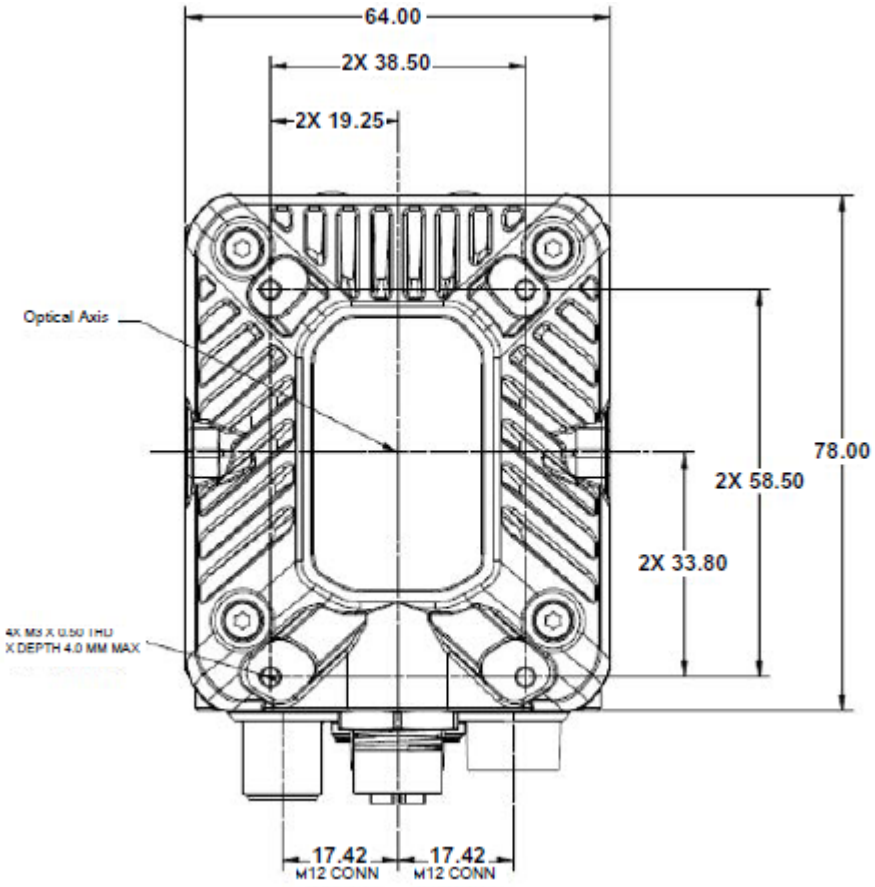


Figure 54 xS70 Front Mounting Holes



Mounting Bracket Dimensions

The following diagrams provide dimensions for the mounting bracket.

Figure 55 L Bracket Dimensions

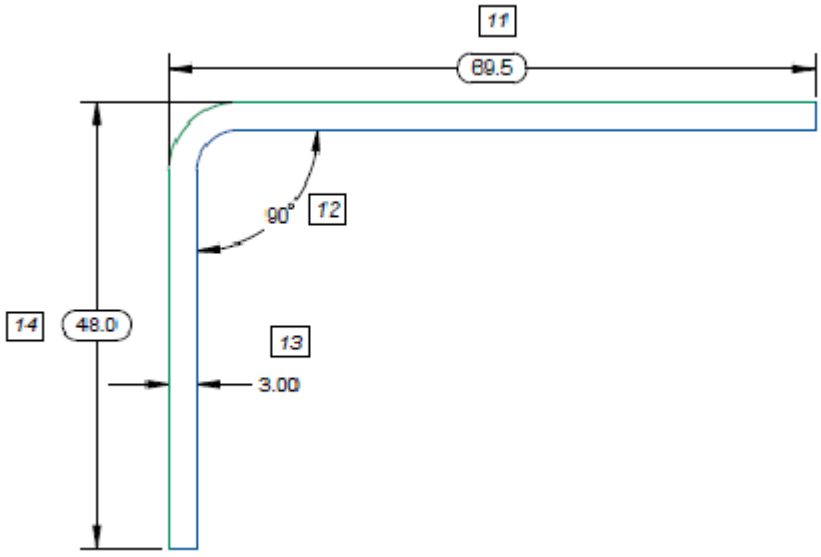


Figure 56 L Bracket Bottom Dimensions

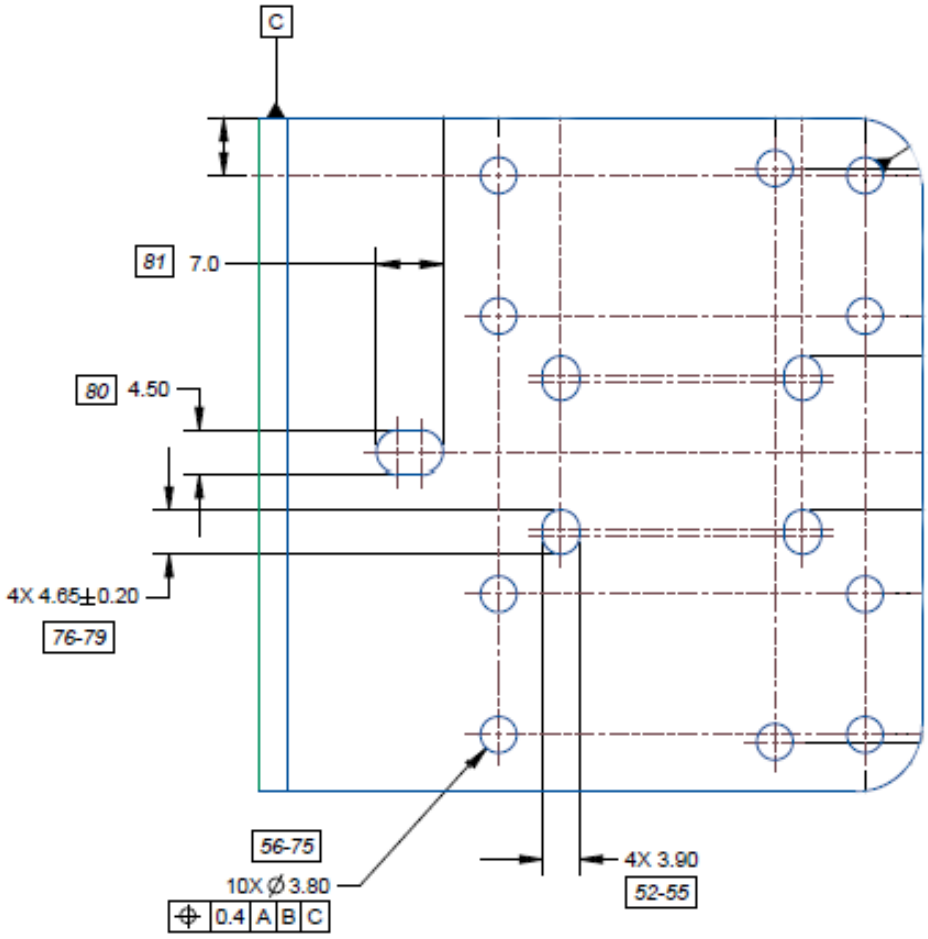
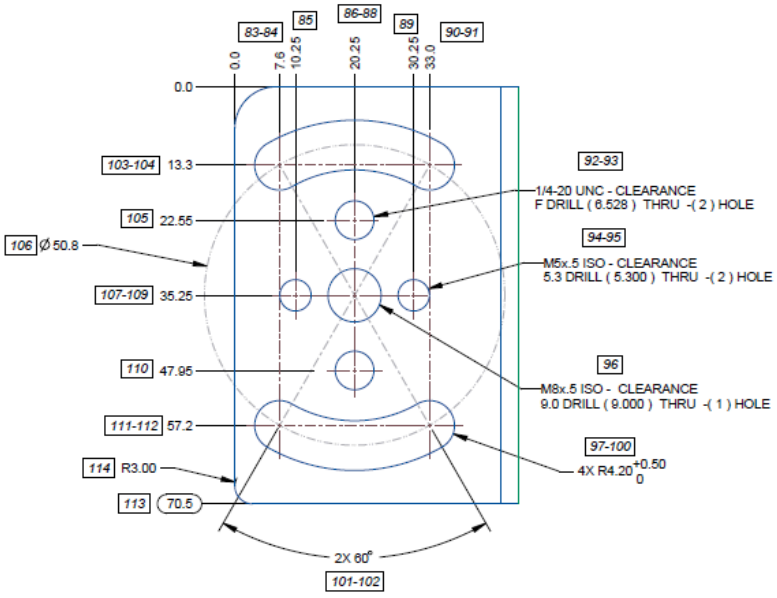


Figure 57 L Bracket Side Dimensions



Light Bracket Dimensions

The diagrams in this section describe the dimensions of the light bracket.

Figure 58 Light Bracket Dimensions

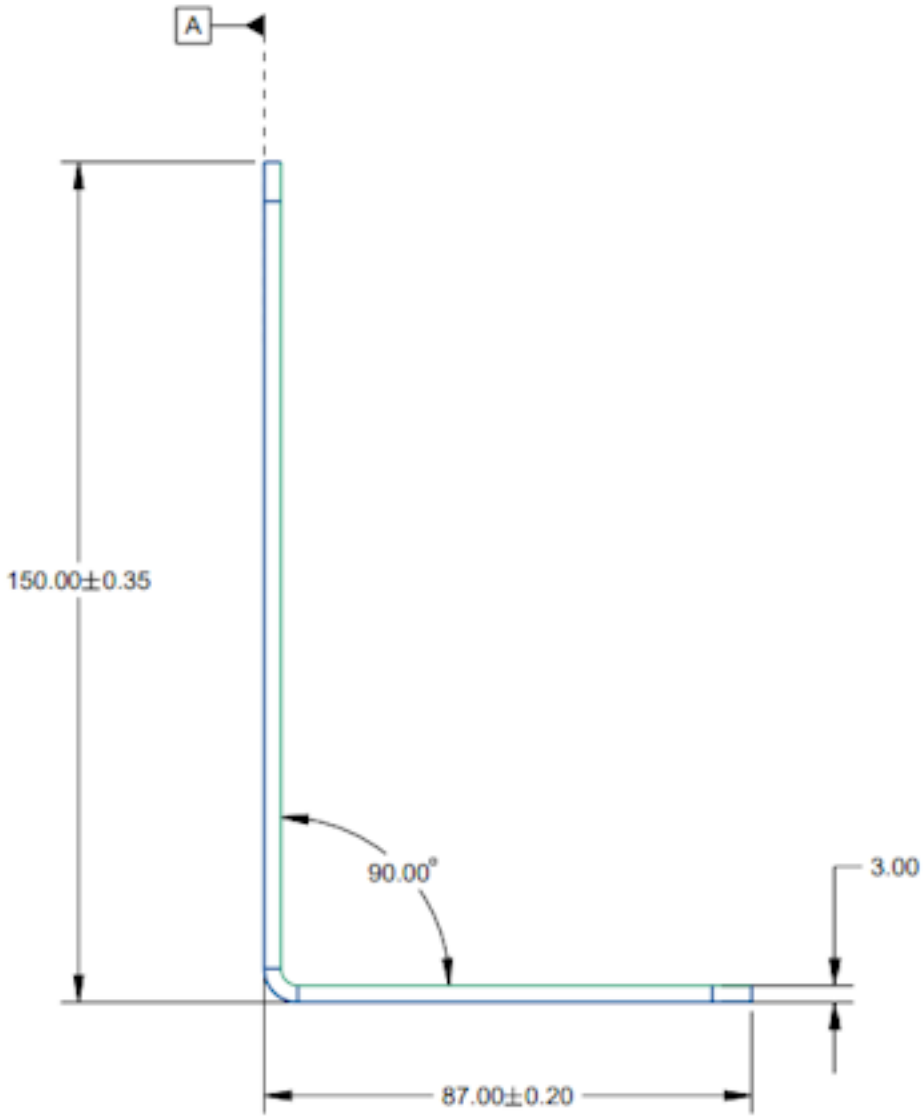


Figure 59 Light Bracket Dimensions

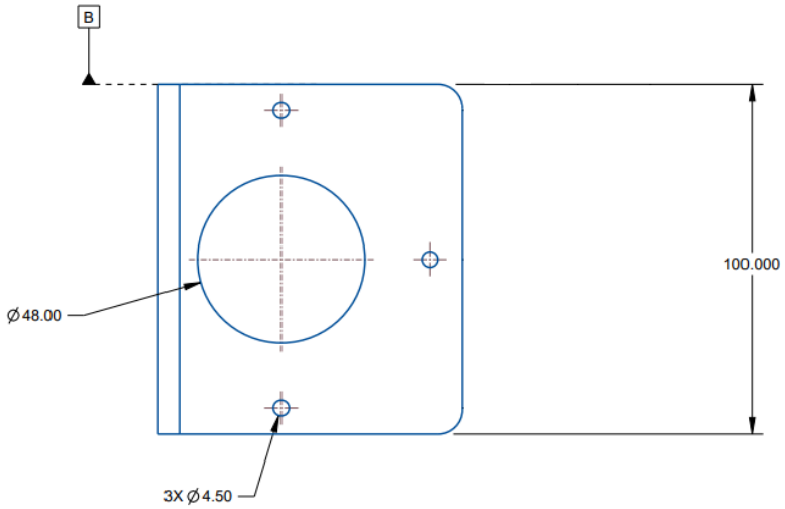
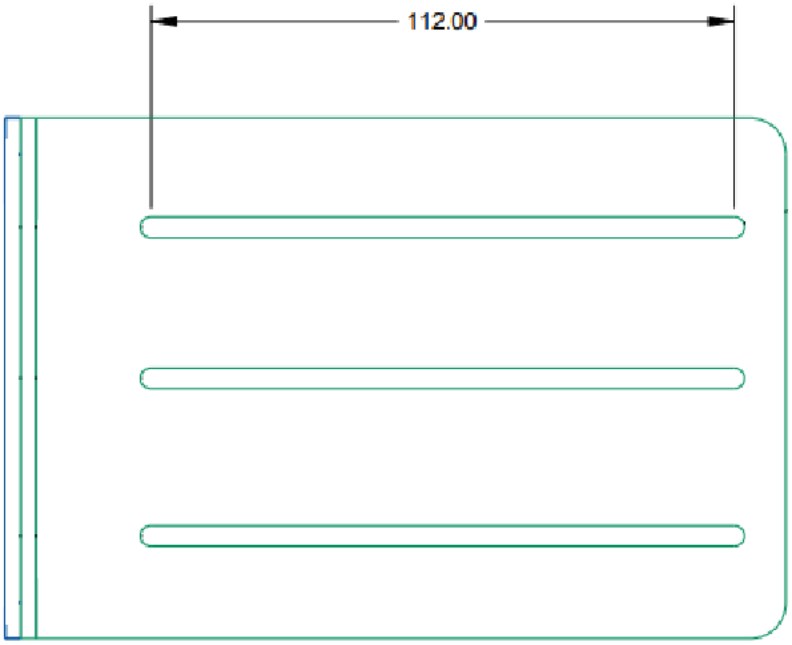


Figure 60 Light Bracket Dimensions



Cable Pin Outs

This section provides pin and cable color information for the power and I/O, Ethernet, and external lighting connectors.

Power and IO Connector

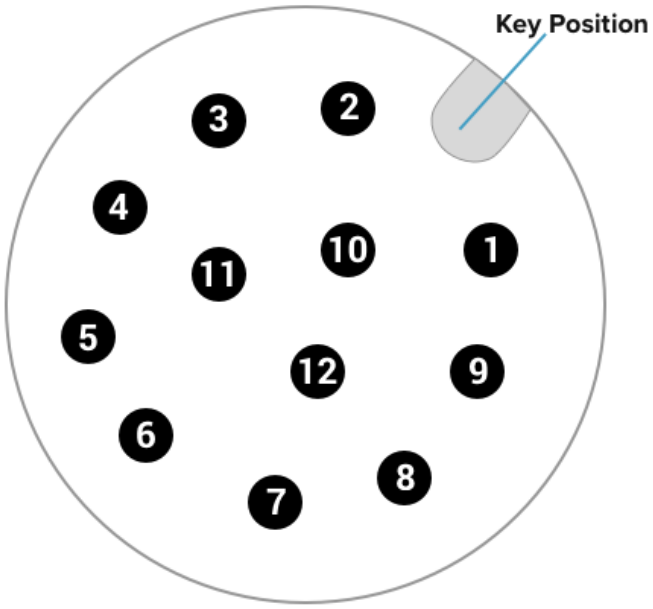


Table 22 Power and I/O Connector Pinout Diagram

Pin	Color	Description
1	Yellow	GPIO2
2	White/Yellow	TXD
3	Brown	RXD
4	White/Brown	GPIO4
5	Violet	GPIO5
6	White/Violet	COMMON_IN
7	Red	DC_IN
8	Black	GND
9	Green	COMMON_OUT
10	Orange	GPIO0
11	Blue	GPIO1
12	Grey	GPIO3
SHELL	Bare	SHIELD

Ethernet Connector

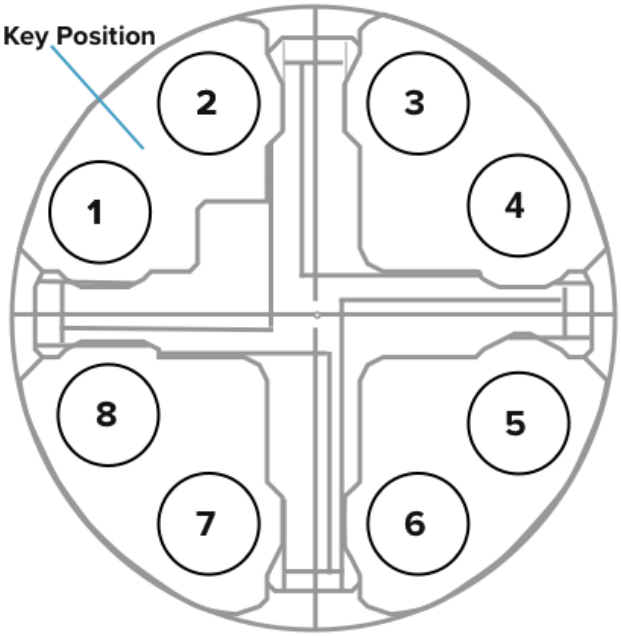


Table 23 Ethernet Connector Pinout Diagram

Pin	Description
1	TP1+
2	TP1-
3	TP2+
4	TP2-
5	TP4+
6	TP4-
7	TP3-
8	TP3+
SHELL	SHIELD

External Light Connector

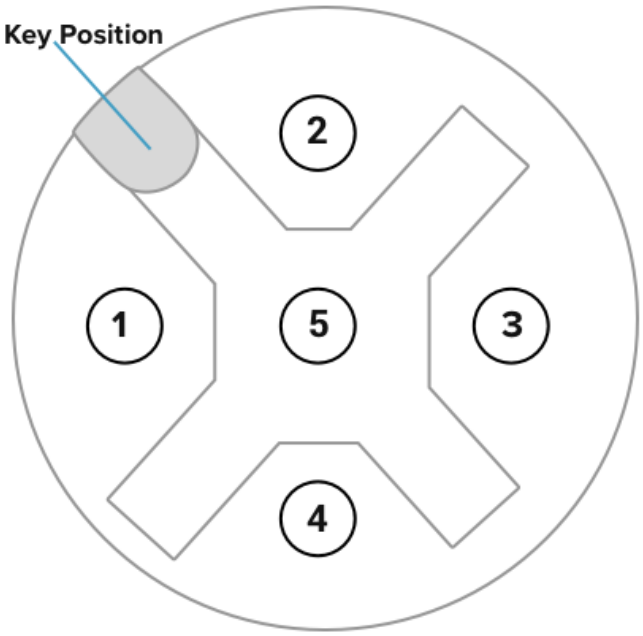


Table 24 External Light Connector Pinout Diagram

Pin	Color	Description
1	Brown	DC_OUT / GPIO8
2	White	GPIO7
3	Blue	GND
4	Black	GPIO6
5	Grey	ANALOG_OUT
SHELL	Bare	SHIELD