SmartVision MX

User's Guide

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Table of Contents

Chapter 1: Introduction

1.1 Product Description

The SmartVision MX is a Windows® 7 Embedded industrial PC designed to run ACE software. It is compatible with the SmartController line of products, or can be used with our robots that don't use a SmartController.

For inspection applications, the SmartVision MX industrial PC is designed to be a "plug-and-play" vision system. Using a USB or GigE camera, along with ACE's PC-based vision software, the unit is a complete industrial vision solution.

When used with a SmartController, the SmartVision MX provides expanded vision processing power for vision-guided robotics or inspection.

Figure 1-1. The SmartVision MX Industrial PC

Features

The SmartVision MX provides the following features:

- Compatibility with the SmartController line of products

- Intel PC platform, with Core i7 processor

- Windows 7 Embedded OS

- Ports for both Gigabit and USB 3.0 cameras

  Four Gigabit ports provide Power over Ethernet.

- Standard Gigabit LAN

- Standard RS-232 interface

- Both DVI-D and DVI-I ports

- USB ports can support a keyboard and mouse, for standalone operation

- DVI-D or DVI-I ports can support a monitor, for standalone operation

What Comes with a SmartVision MX?

Hardware

The SmartVision MX includes:

- Intel® Core i7

- 8 GB DDR3 memory

- 64 GB mSATA SSD drive

  The drive is partitioned into a C: drive and a D: drive. By default, the C: drive uses a file-based write filter, to protect the Windows operating system and ACE software. We recommend that you leave this write filter enabled for C: in normal use.

  Because the OS and ACE software are on C:, you should be very cautious about using C: for any other purpose, particularly for other applications.

- Matching connector for VDC input power

- A USB license dongle, which enables licenses for one of the following:

  - ACE Sight software, 2 camera support

  - ACE PackXpert, 1 controller support

  - ACE PackXpert with ACE Sight software, 2 camera and 1 controller support

  - Any additional camera or controller licenses that you purchased

  - Other licenses can be purchased to increase the number of cameras and controllers supported.
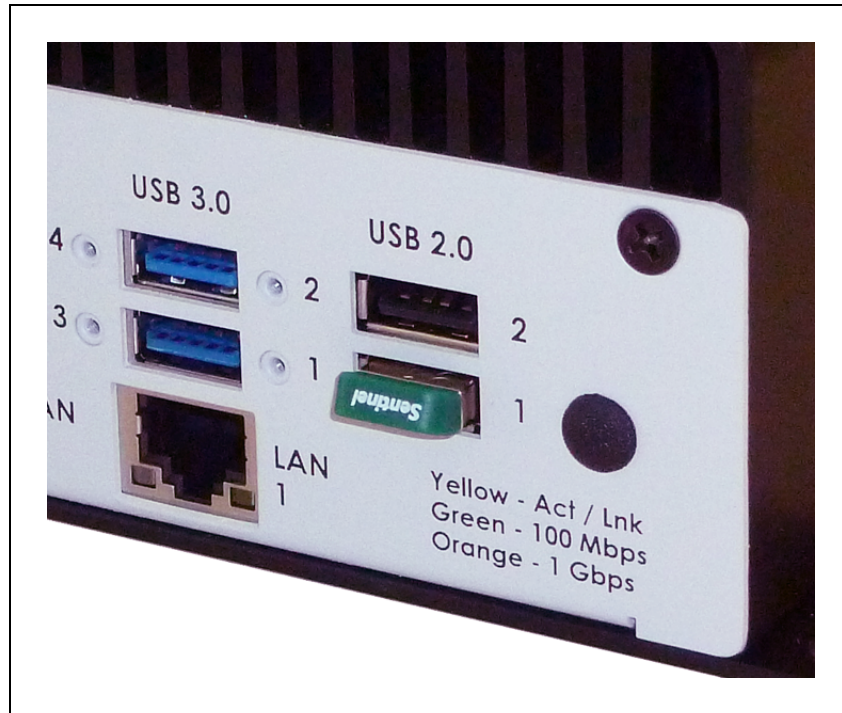
Figure 1-2. USB License Dongle in USB 2.0 Port 1

A SmartVision MX can support a total of eight cameras and four controllers.

> **NOTE**: If you are going to use a SmartVision MX industrial PC with ACE Sight, but without ACE PackXpert, the SmartController needs to have a motion license.

Software

The following software is pre-loaded on the hard drive:

- Windows® 7 Embedded

- ACE

- ACE Sight 3 (ACE-based vision software)

- Drivers for Basler ACE cameras (USB and GigE)

The SmartVision MX is designed to run ACE software. We do not support applications other than ACE.

Options

For details on options, see Options on page 27.

- Extended licenses, enabled on the USB license dongle

- Stack-mounting brackets

What Doesn't Come with a SmartVision MX?

- 24 VDC power supply to power the SmartVision MX industrial PC (see External Power Supply on page 14).

  If you are using the SmartVision MX with a SmartController, you can generally use 24 VDC power from the SmartController to power the SmartVision MX. See Connecting to a SmartController on page 17.

- Cameras and camera cables

- Keyboard, mouse, and monitor

  These should be user-supplied, so you can run the ACE and ACE Sight applications, and well as control shutting down the industrial PC.

- If power interruption is a concern, a UPS is recommended. Contact Omron Adept Technologies, Inc. for more information.

1.2 How Can I Get Help?

For details on getting assistance with your software or hardware, you can access the corporate website:

http://www.ia.omron.com

Related Manuals

This manual covers the installation and startup of an SmartVision MX. The following manuals provide information on safety, related products, advanced configurations and system specifications.

Table 1-1. Related Manuals

Manual Title	Description
Robot Safety Guide	Contains safety information for our robots.
ACE User's Guide	Instruction for the use of the ACE software.
ACE Sight User's Guide	Instruction for the use of the ACE Sight software.
SmartController EX User's Guide	Contains information on the installation and operation of the optional SmartController EX and sDIO products.

Chapter 2: Safety

2.1 Warnings, Cautions, and Precautions

There are six levels of special alert notation that are used in our manuals. In descending order of importance, they are:

DANGER: This indicates an imminently hazardous electrical situation which, if not avoided, will result in death or serious injury.

DANGER: This indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING: This indicates a potentially hazardous electrical situation which, if not avoided, could result in serious injury or major damage to the equipment.

WARNING: This indicates a potentially hazardous situation which, if not avoided, could result in serious injury or major damage to the equipment.

CAUTION: This indicates a situation which, if not avoided, could result in damage to the equipment.

Precautions for Safe Use: This indicates precautions on what to do and what not to do to ensure using the product safely.

NOTE: Notes provide supplementary information, emphasize a point or procedure, or give a tip for easier operation.

2.2 Safety Precautions

DANGER: An industrial robot can cause serious injury or death, or damage to itself and other equipment, if the following safety precautions are not observed.

- All personnel who install, operate, teach, program, or maintain the system must read this guide, read the *Robot Safety Guide*, and complete a training course for their responsibilities in regard to the system.

- All personnel who design the robot system must read this guide, read the *Robot Safety Guide*, and must comply with all local and national safety regulations for the location in which the system is installed.

- The robot system must not be used for purposes other than described in the robot user's guide. Contact Omron Adept Technologies, Inc. if you are not sure of the suitability for your application.

- The user is responsible for providing safety barriers around the robot to prevent anyone from accidentally coming into contact with the robot when it is in motion.

- Power to the robot and its power supply must be locked out and tagged out before any maintenance is performed.

2.3 What to Do in an Emergency or Abnormal Situation

Press any E-Stop button (a red push-button on a yellow background) and then follow the internal procedures of your company or organization for an emergency or abnormal situation. If a fire occurs, use CO_2 to extinguish the fire.

2.4 Additional Safety Information

Omron Adept Technologies, Inc. provides other sources for more safety information:

Manufacturer's Declarations

This lists the standards with which our robots and controllers comply. The Manufacturer's Declarations are in the *Manufacturer's Declarations Guide*.

Robot Safety Guide

The *Robot Safety Guide* provides detailed information on safety for robots. It ships with each robot.

Chapter 3: Installation

The SmartVision MX should be shipped and stored in the supplied packaging, which is designed to prevent damage from normal shock and vibration. You should protect the package from excessive shock and vibration. For environmental specifications, refer to Environmental Specifications on page 25.

3.1 Inspecting

Carefully inspect all packaging for evidence of damage during transit. If any damage is indicated, request that the carrier's agent be present at the time the package is opened.

Compare the actual items received (not just the packing slip) with your equipment purchase order, and verify that all items are present and that the shipment is correct. Inspect each item for external damage as it is unpacked. Contact Omron Adept Technologies, Inc. immediately if any damage is evident. See "How Can I Get Help?" section on page 15.

Retain all containers and packaging materials. These items may be needed in the future to settle a damage claim.

Remove the SmartVision MX. Mount it near the robot.

3.2 Transport and Storage

The SmartVision MX must be shipped and stored in a temperature-controlled environment, within the range -25° to +60° C (-13° to 140° F). The recommended humidity range is 5 to 90%, non-condensing.

It must always be stored and shipped in a clean, dry area that is free from condensation.

3.3 Mounting the SmartVision MX

NOTE: The SmartVision MX is not intended for use in hazardous environments (explosive gas, water, dust, oil mist).

Space Around the Chassis

When the SmartVision MX is installed, allow adequate space around the unit for air circulation.

Desk-top Mounting

The base of the industrial PC has tabs with holes for screwing it to the top of a flat surface.
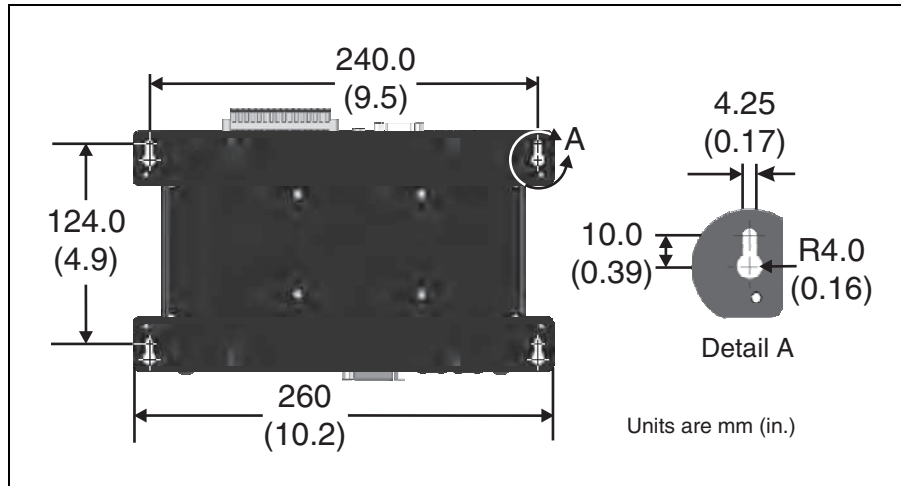
Figure 3-1. Dimensions for Desk-top Mounting

NOTE: Use 6-32 UNC screws, or screws of similar length and specifications, for mounting the processor to other equipment. The recommended screw length is 1/8 in. or 3.2 mm.

Stack Mounting

The SmartVision MX industrial PC can be stack-mount on top of a SmartController motion controller, using two mounting brackets available as an option with the industrial PC. Two views of one is shown in the following figure.
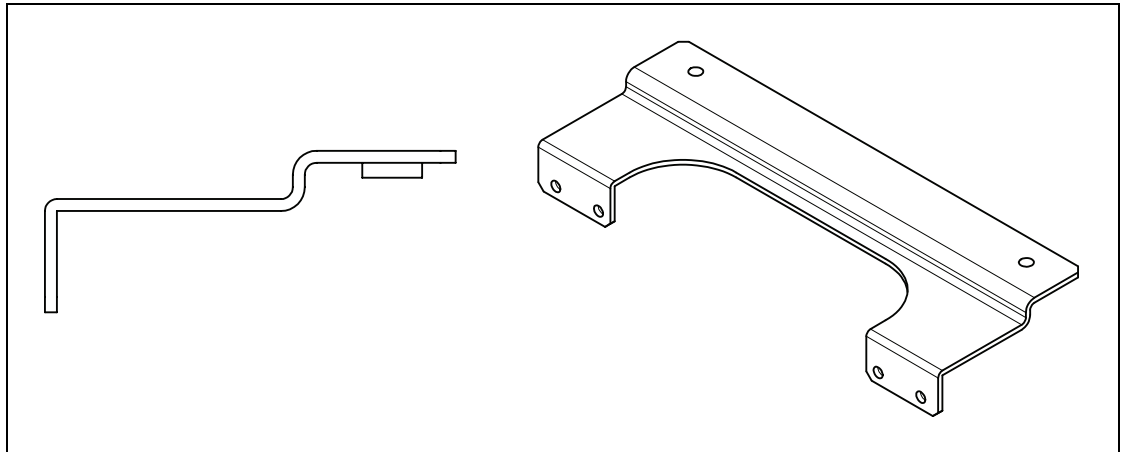

Figure 3-2. Side and Iso Views of SmartVision MX-SmartController Mounting Bracket

The mounting brackets are strictly a mechanical attachment. No electrical connections are involved.

1. Screw one bracket to each end of the SmartController motion controller.

    Use four of each of these connectors for each bracket:

    - ○ M3x10 stainless socket-head cap screws

    - ○ M3 high-collar split lock washers

    - ○ M3 stainless flat washers

    Tighten the M3 screws to 1.2 Nm (10.6 in-lbf).

    There are two sets of two threaded holes on each side of the ventilation holes on the sides of the SmartController case. See the following figure.

2. Screw the SmartVision MX industrial PC to the top of the brackets, using the mounting tabs on the bottom of the SmartVision MX.

    The SmartVision MX tabs go on top of the brackets.

    Use two of each of these connectors at each bracket:

    - ○ M4x8 stainless socket-head cap screws

    - ○ M4 stainless split lock washers

    - ○ M4 stainless flat washers

    Tighten the M4 screws to 4.6 Nm (40.7 in-lbf).

Figure 3-3. SmartVision MX Mounted on a SmartController EX

NOTE: Connectors on the SmartVision MX are not shown in this graphic.

3.4 Connecting Power

Connect 24 VDC power to the input of the SmartVision MX.

External Power Supply

The SmartVision MX takes 4.2 A at 24 VDC. It requires filtered 24 VDC power.

NOTE: You must provide your own power supply. Make sure the power cables and power supply conform to the specifications in the following table.

Customer-Supplied Power Supply	24 VDC (-10%, +5%), 150 W (6 A)
Circuit Protection	Not more than 8 A (below the amperage rating of the cable used)
Power Cabling	1.5 - 1.85 mm^2 (16-14 AWG), full-cover, braided shield cable, maximum length 10 meters
Shield Termination	Braided shield connected to the left wire slot of the VDC connector on the power side of the SmartVision MX. On the other end of the cable, the shield should be connected to the power supply chassis.

CAUTION: Make sure you select a 24 VDC power supply that meets the specifications in the preceding table. Using an under-rated supply can cause system problems and prevent your equipment from operating correctly. See the following table for a recommended power supply.

Table 3-1. Recommended 24 VDC Power Supply

Vendor Name	Model	Ratings	Mount
OMRON	S8JX-G15024C	24 VDC, 6.5 A, 150 W	Front Mount
OMRON	S8JX-G15024CD	24 VDC, 6.5 A, 150 W	DIN-Rail Mount

NOTE: The power requirements for the user-supplied power supply will vary depending on the configuration of the SmartVision MX industrial PC and connected devices. A minimum configuration requires 3.0 A at 24 VDC. However, a 24 V, 6 A power supply is recommended to allow for additional current draw from connected external devices and digital I/O loads.

Installing 24 VDC Connector

In order to maintain compliance with EN standards, DC power must be delivered over a shielded cable, with the shield connected to the frame ground at both ends of the cable. Conductors should be 1.5 mm^2 - 1.85 mm^2 (16 to 14 AWG). The maximum length for the 24 VDC cable is 10 meters.

Use the supplied connector to connect the user-supplied 24 VDC power supply to the SmartVision MX.

1. Locate the 24 VDC connector that is shipped with the SmartVision MX industrial PC. See the following figure.

2. Strip 7 mm of insulation from the end of the wire that connects to the positive output of the 24 VDC supply.

3. Insert the stripped end of the wire into the opening on the right side of the connector.

4. Using a small, flat-blade screwdriver (2.5 mm), tighten the screw clamp on the connector.

5. Visually inspect the connection to ensure that the clamp has closed on the wire, not on the insulation.

6. Gently pull on the wire to confirm that it is securely attached to the connector.

7. Repeat this process to connect the wire from the negative side of the power supply to the center of the connector.

8. Repeat this process to connect the braided shield to the left side of the connector.

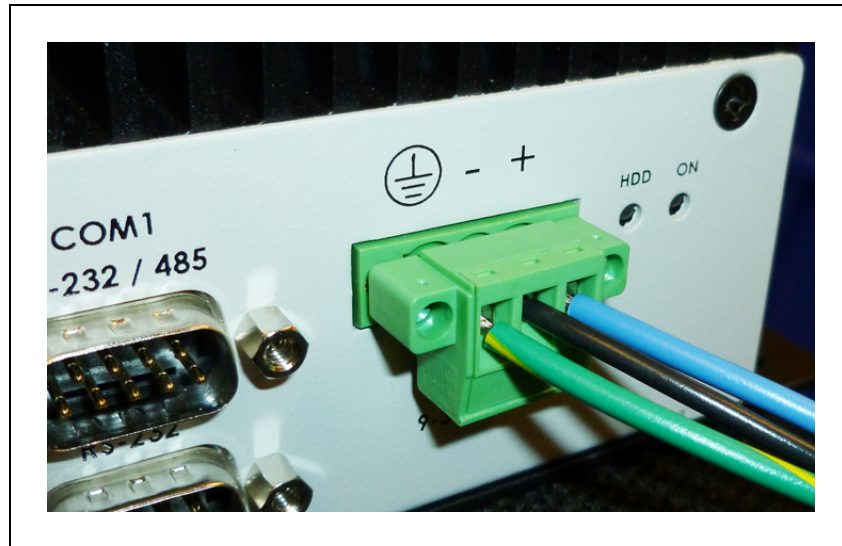9. Plug the connector into the SmartVision MX industrial PC.
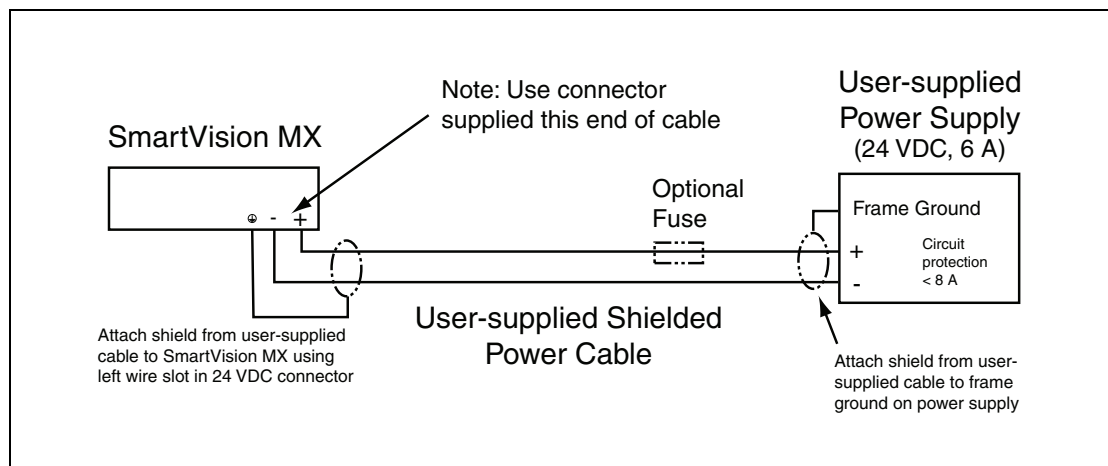
Figure 3-4. DC Connector with Wires

Figure 3-5. Ground for 24 VDC Cable Connections

Connecting to a SmartController

The 24 VDC can be obtained from a SmartController if you are connecting the SmartVision MX to one. The total current, used by both the SmartController and the SmartVision MX, as well as any peripherals attached to them, must stay within the limits of your 24 VDC power supply.

The 24 VDC power cable is user-supplied.

1. Connect a 24 VDC cable from XDC1 or XDC2 on the controller (whichever is not used) to the 24 VDC connector on the SmartVision MX industrial PC.

2. Follow the instructions in the previous section for connecting VDC to the SmartVision MX industrial PC.

If your system has sDIO or sMI6, these need to be placed between the SmartController and the SmartVision MX industrial PC, so the power can be daisy-chained. The SmartVision MX industrial PC has only one 24 VDC plug. The other units have two.

If you are connecting peripherals to the SmartVision MX industrial PC, you may need to run a dedicated 24 VDC cable to the SmartVision MX industrial PC, rather than tapping power from the controller or your power supply. Make sure you are not exceeding the current capacity of the controller 24 VDC plug.

3.5 Connecting Display, Keyboard, and Mouse

To connect a display to the SmartVision MX industrial PC, use either of the DVI- ports. If you have a VGA display, you will need to use the DVI-I port with a VGA adapter.

Connect your keyboard and mouse to USB ports.

Chapter 4: Connectors and Indicators

The SmartVision MX, shown in the following figures, can connect to many different peripherals. This section describes the connectors and indicators available.
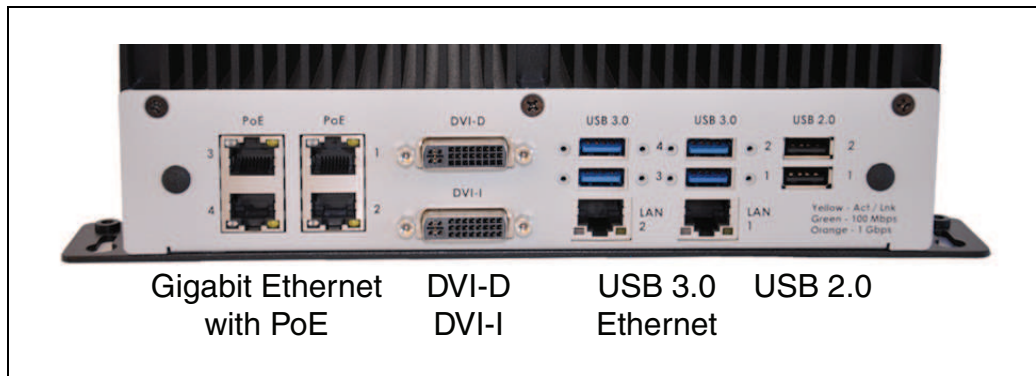
Camera Side

Figure 4-1. SmartVision MX Camera-side Connectors

- Gigabit Ethernet ports with Power over Ethernet x 4

  These can supply 15.4 W/port.

- DVI-D output

- DVI-I output

- USB 3.0 ports x 4

- Gigabit Ethernet ports x 2

- USB 2.0 ports x 2

  One is used for the USB license dongle.
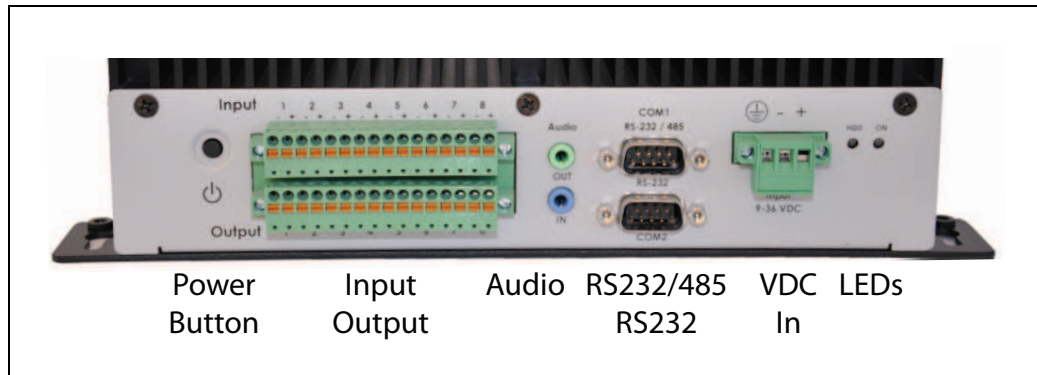
Power/IO Side

Figure 4-2. SmartVision MX Power-side Connectors

- Power button

- Digital inputs

  up to 9 V tolerant

- Digital outputs

  100 mA max @ 24 VDC

- Audio In and Audio Out ports

  These are not used by the software.

- RS232/RS485 port

- RS232 port

- Power input

  9 to 36 VDC, nominal 24 VDC @ 4.2 A

- HDD LED

- Power ON LED

4.1 Ethernet Ports

Any of the Ethernet ports can be used to connect to Ethernet devices. Four of the ports provide Power over Ethernet, intended to provide the power needed for a GigE camera, though they can also be used as general-purpose Ethernet ports.

To attach the industrial PC to a network or broadband device, connect an Ethernet cable between the device and one of the Ethernet ports on the industrial PC.

CAUTION: Do not connect the SmartVision MX directly to the internet. If the SmartVision MX is on a LAN that has Internet access, make sure there is a firewall between the LAN and the Internet in order to prevent unwanted and unauthorized network traffic from reaching the SmartVision MX.

We recommend that you use Category 5 or better wiring and connectors for your network.

> **NOTE**: If you are using a camera with a USB 2.0 connector or with an Ethernet connector that is not designed for PoE, you will need to provide DC power to the camera through a separate cable.

4.2 USB Ports

For a USB 3.0 camera, use one of the USB 3.0 ports.

To attach a USB peripheral, plug the peripheral cable into any one of the USB ports on the SmartVision MX industrial PC.

> **NOTE**: The bottom-right USB 2.0 port is used for the license dongle, which is needed for the industrial PC to function. Do not remove the dongle.

4.3 DVI- Ports

To connect a monitor with a DVI connector:

- Connect the monitor to the DVI-I port on the SmartVision MX

  or

- Connect the monitor to the DVI-D port on the SmartVision MX.

Connecting a VGA monitor requires using the DVI-I port with a user-supplied VGA adapter.

4.4 I/O Connections

8 inputs and 8 outputs are available.

4.5 Audio and Serial Ports

The Audio In, Audio Out, and the two RS232(/485) ports are fully functional, but are not used for vision processing.

Chapter 5: Operation

This chapter describes how to operate the SmartVision MX. Before proceeding, you need to have performed the steps covered in the Installation chapter.

5.1 Operating Environment

- Ambient operating temperature: 0 to 50° C (32 to 122° F)

- Operating humidity: 10 to 90% (non-condensing)

5.2 Turning Power ON and OFF

The power button is a toggle. If the processor is on, pressing the button will turn it off. If the processor is off, pressing the button will turn it on.

The power button is on the power side of the processor, where 24 VDC is connected. When power is on, the ON LED will be lit.

5.3 Checking the Licenses on the Dongle

You can see what has been enabled on a dongle with the following procedure:

1. Turn on the SmartVision MX industrial PC and wait for it to finish booting.

2. Double-click the ACE icon on the desktop.

3. Select Create Example Workspace, then click Open.

4. Click **Help > Diagnostic Summary**.

   ACE will display a list of all options that can be licensed by the dongle, and indicate which ones have been enabled.

Chapter 6: Technical Specifications

6.1 Processor Specifications

Table 6-1. Processor Specifications

CPU	Intel® Core i7 dual core with hyperthreading
PCH	Intel® HM76 Platform Controller Hub
Memory	8 GB DDR3
Operating System	Microsoft® Windows® Embedded Standard 7, 64 bit
Hard Drive	64 GB SSD

6.2 Environmental Specifications

The SmartVision MX must be shipped and stored in a temperature-controlled environment. Refer to the following table.

Table 6-2. Environmental Specifications

Ambient temperature	0° to 50° C (32° to 122° F)
Storage and shipment temperature	–25° to +60° C (–13° to +140° F)
Humidity range	10 to 90%, non-condensing

6.3 Power Requirements

Table 6-3. Power Specifications

Power Input	9 to 36 VDC
Typical Power Consumption	4.2 A at 24 VDC
Maximum Power Consumption	7.0 A (with 4 cameras)
Circuit Protection	Not more than 8 A

6.4 Dimensions

Table 6-4. Physical Specifications

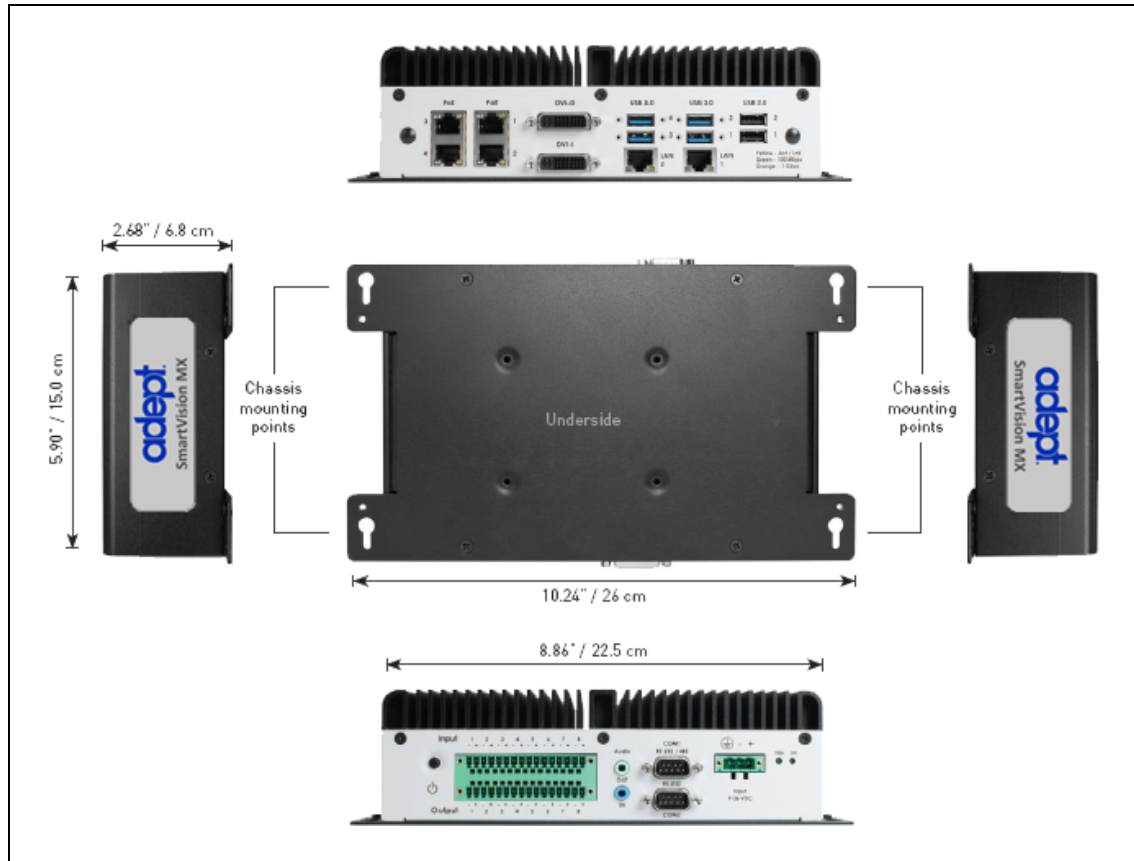| Width	260 mm (10.24 in.)
Depth	150 mm (5.9 in.)
Height	68 mm (2.68 in.)

Figure 6-1. Dimensions

6.5 Connections

- 10/100/1000 Ethernet x 6

  4 are PoE, up to 15.4 W/port

- USB 3.0 x 4

- USB 2.0 x 2

  One of these is used for the license dongle.

- DVI-D output

- DVI-I output

- RS232/RS485 port

- RS232 port

- 8 digital inputs

  up to 9 V tolerant

- 8 digital outputs

  100 mA max @ 24 VDC

7.1 License Options

The following license bundles can be enabled on the USB license dongle:

- ACE PackXpert (includes support for 1 controller)

- ACE Sight (includes support for 2 cameras)

- ACE PackXpert with ACE Sight (includes support for 1 controller and 2 cameras)

Other licenses can be purchased to increase the number of cameras and controllers supported. The SmartVision MX can support a total of 8 cameras and 4 controllers.

NOTE: If you are going to use the SmartVision MX with ACE Sight, but without ACE PackXpert, the SmartController needs to have a motion license.

7.2 Mounting

The SmartVision MX industrial PC can be ordered with brackets that let the user mount the industrial PC on top of a SmartController motion controller.