

HAWK MV-4000 Smart Camera Guide



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Disclaimer

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Latest Manual Version

For the latest version of this manual, see the Download Center on our web site at: www.microscan.com.

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Statements of Compliance



FCC

HAWK MV-4000 Smart Cameras have been tested for compliance with FCC (Federal Communications Commission) requirements and have been found to conform to applicable FCC standards.

To comply with FCC RF exposure compliance requirements, this device must not be co-located with or operate in conjunction with any other antenna or transmitter.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

CE

HAWK MV-4000 Smart Cameras have been tested for compliance with CE (Conformité Européenne) requirements, and have been found to conform to applicable CE standards.

The CE Declaration of Conformity for this product is available from Omron Microscan upon request.

HAWK MV-4000 Smart Cameras have been tested by an independent electromagnetic compatibility laboratory in accordance with the applicable specifications and instructions.

UL

HAWK MV-4000 Smart Cameras have been tested for compliance with UL (Underwriters Laboratories) standards and guidelines, and have been found to conform to applicable UL standards.

Restricted Substances

See www.microscan.com/quality for Omron Microscan compliance statements related to all applicable restricted substances.

FCC Compliance Statement

Warning: Changes or modifications to these units not expressly approved by the party responsible for the compliance could void the user's authority to operate this equipment.

The use of shielded cables for connections of these devices to other peripherals is required to meet the regulatory requirements.

Note: These devices comply with Part 15 of FCC Rules. Operation is subject to the following two conditions:

1. These devices may not cause harmful interference, and
2. These devices must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for Class A digital devices, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of these devices in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his/her own expense.

Industry Canada Compliance Statement

These digital apparatuses do not exceed the Class A limits for radio noise emission from digital apparatuses set out in the Radio Interference Regulations of Industry Canada.

Ces appareils numériques n'émettent pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de Classe A prescrites dans le Règlement sur le brouillage radioélectrique édicté par Industrie Canada.

EU Notice (European Union)

WARNING: These are class A products. In a domestic environment these products may cause radio interference in which case the user may be required to take adequate measures.

AVERTISSEMENT: Ces appareils sont des produits informatiques de Classe A. Lorsque ces appareils sont utilisés dans un environnement résidentiel, ces produits peuvent entraîner des interférences radioélectriques. Dans ce cas, l'utilisateur peut être prié de prendre des mesures correctives appropriées.

This device complies with Directive 2004/108/EC for Class A digital devices. They have been tested and found to comply with EN55022/CISPR22 and EN55024/CISPR24.

Ces unités sont conformes à la Directive communautaire Directive 2004/108/EC pour les unités numériques de Classe A. Les tests effectués ont prouvé qu'elles sont conformes aux normes EN55022/CISPR22 et EN55024/CISPR24.

Directive on Waste Electrical and Electronic Equipment (WEEE)



Europe

(English) European user's information – Directive on Waste Electrical and Electronic Equipment (WEEE)

Please refer to the Omron Microscan website (www.microscan.com) for recycling information.

(Français) Informations aux utilisateurs Européens – Règlementation des déchets d'équipements électriques et électroniques (DEEE)

Se référer au site Web de Omron Microscan (www.microscan.com) pour l'information concernant le recyclage.

(Deutsch) Information für europäische Anwender – Europäische Regelungen zu Elektro- und Elektronikgeräten (WEEE)



Bitte wenden Sie sich an dem Omron Microscan-Website (www.microscan.com) für Recycling Informationen.

(Italiano) Informazioni per gli utenti europei – Direttiva sui rifiuti di apparecchiature elettriche ed elettroniche (RAEE)

Si prega di riferirsi al sito Web Omron Microscan (www.microscan.com) per le informazioni di riciclaggio.

HAWK MV-4000 Safety Warnings and Symbols Key

Before using the HAWK MV-4000 Smart Camera, you should be aware of the meanings of the safety warnings and symbols on the device. The following is a list of HAWK MV-4000 symbols and their meanings.

Symbol ^a	Description
	<ul style="list-style-type: none"> • Caution: Read the <i>HAWK MV-4000 Smart Camera Guide</i>^b (this document) before using the device. The guide contains product specifications, hardware configurations, connector and cable pin assignments, wiring instructions, accessory configuration instructions, and additional information related to the operation of the device. • This product must be used as specified. The protection provided by its components may be compromised if the product is used improperly. • Refer to the electrical specifications section in the <i>HAWK MV-4000 Smart Camera Guide</i> for voltage and current ratings. • There are no user-serviceable parts inside this product. Contact Omron Microscan for repair or replacement. • To maintain IP67 conformity, all unused connectors on the HAWK MV-4000 must be capped and the optional IP case must be screwed firmly into place. • This product meets Category 1 installation requirements per industry standards. • This product is designed for use in a Pollution Degree 2 environment per industry standards^c. • This product is designed for indoor use only. • This product is designed for operation at temperatures ranging from 0° C to 50° C. • This product is not intended for use at altitudes exceeding 2000 meters.
	<ul style="list-style-type: none"> • DC current only. • The HAWK MV-4000 can only be powered using a 24VDC power source.

a. Symbol color or shape may be slightly different on the product.

b. *HAWK MV-4000 Smart Camera Guide* available on Tools Drive (P/N 37-000010-01) or at www.microscan.com.

c. Per CAN/CSA-C22.2 No 61010-1-12, UL std. No 61010-1 (3rd edition), and EN Std. No. 61010-1 (3rd edition).

Contents

PREFACE	Welcome viii Purpose of This Manual viii Manual Conventions viii
CHAPTER 1	Introduction 1-1 Product Summary 1-2 Features and Benefits 1-3 Applications 1-4 Package Contents 1-4 HAWK MV-4000 Smart Camera Models 1-5 HAWK MV-4000 Part Number Structure 1-6
CHAPTER 2	System Components 2-1 Hardware Components and Accessories 2-2 HAWK MV-4000 Dimensions 2-6 Label Information 2-10 Mounting, Connecting, and Wiring 2-11 Connecting to the I/O Interface 2-17 Connectors and Pinouts 2-19 Outputs 2-20 Inputs 2-29 Input/Output Wiring Using Flying Lead Cable 61-9000151-01 2-38 Ground and Shield Considerations 2-39 Electrical and I/O Specifications 2-41 Environmental Specifications 2-42 Status Indicators 2-43 Adding a HAWK MV-4000 to a Network 2-44 Setting Up a Job in AutoVISION 2-45 Trigger Debounce 2-50 Setting Up Partial Scan 2-52
CHAPTER 3	Lighting 3-1 Illumination 3-2 External Illumination Control and Wiring 3-3

APPENDIX A	Selecting a Lens A-1 Lens Selection A-2 Lens Specifications A-4
APPENDIX B	Cable Specifications B-1 61-9000132-01 Cable, Adapter, HAWK MV-4000 to QX-1 B-2 61-9000134-0X Cable, Ethernet, X-Code/RJ45 CAT 6A, 1 m, 3 m, 5 m B-3 M12 to Smart Series and Camera Cables B-4 97-000012-01 Power Supply, M12 12-Pin Socket, 1.3 m B-5 99-000020-02 Trigger, M12 4-Pin Plug, NPN, Dark On, 2 m B-6
APPENDIX C	General Specifications C-1 Sensor Board C-2 CPU Board C-3 VGA/USB Port C-4 Electrical Specifications C-5 Environmental Specifications C-6 Dimensions C-7 Digital I/O and Power Adapter Cable Connector C-8 100/1000 Base-T Connector C-10 VGA/USB Connector C-11 Liquid Lens Connector C-13
APPENDIX D	MVMonitor Web Page D-1 Using the MVMonitor Web Page D-2
APPENDIX E	CloudLink Web HMI E-1 Connecting E-2 Application Overview E-3 Application Bar E-4 Pages, Panels, and Widgets E-5
APPENDIX F	Serial Commands F-1
APPENDIX G	Operating System Save and Restore G-1 Restore to Omron Microscan Factory Settings G-2 Access Omron Microscan Rescue Utility G-7 Back Up/Restore/Capture the OS Image with Omron Microscan Rescue Utility G-11
APPENDIX H	OS Config Application H-1 Global Settings Tab H-2 Write Filter Tab H-3 Capture OS Tab H-4 Languages Tab H-5 eMMC Tab H-6 EULA Tab H-7

Preface

PREFACE

Welcome

Purpose of This Manual

This manual contains detailed information about how to configure and operate the HAWK MV-4000 Smart Camera.

Manual Conventions

- Items emphasizing important information are **bolded**.
- Menu selections, menu items, and entries in screen images are indicated as: Run (triggered), Modify..., etc.

Introduction

HAWK MV-4000 Smart Camera



Product Summary

The HAWK MV-4000 is Omron Microscan's high-performance smart camera. It is the middle tier in a suite of products that includes MicroHAWK MV Smart Cameras at the lower end and Visionscape PC-Based GigE Camera systems at the higher end.

The HAWK MV-4000 is a C-Mount camera fully accessorized for use with Omron Microscan's NERLITE Smart Series of machine vision lighting products.

The HAWK MV-4000 features a full range of sensors, from 0.3 MP to 5 MP in both monochrome and color. The sensors are all based on the ON Semiconductor PYTHON CMOS series. All sensors have a 4.8 μm pixel size enabling them to capture very high-quality images at very high frame rates.

The combination of C-Mount lens, external lighting, and 0.3 to 5 MP sensors allows users to configure the system to accomplish virtually any application, from reading tiny 1D or 2D symbols on flat panel displays to inspecting entire automotive assemblies.

The processor is a Dual-Core Intel Celeron N2807 with 2 GB of RAM and 32 GB of eMMC (flash disk) storage memory. The HAWK MV-4000 is able to store, load, and run up to 50 simple or complex jobs. Processing times reach near-PC speeds, enabling the camera to keep up with line rates of up to 6,000 parts per minute and speeds of over 300 inches per second.

The camera is also equipped with real-time Digital I/O, RS-232, and GigE Ethernet ports. Through these communication channels, the user can control and trigger the unit, as well as receive results and images. The GigE port allows images to be ported to a display at nearly the same speed as the frame rate. EtherNet/IP allows seamless integration with most of the key PLC platform devices on the market.

Finally, like MicroHAWK MV or Visionscape PC-Based GigE Camera systems, the HAWK MV-4000 can be programmed through a variety of user interfaces. This includes AutoVISION, which is a highly intuitive and simple UI that can be mastered by a casual user on the factory floor. It also includes Visionscape FrontRunner, which is the full professional UI offering the entire Visionscape tool set to the user, including scripting tools that allow the user to create custom tools and algorithms. The HAWK MV-4000 can be controlled and monitored through custom web interfaces or UIs specifically designed and programmed for the application using Visionscape's powerful .NET controls.

Features and Benefits

- Standard-fidelity and high-fidelity C-Mount optics;
- Designed for use with NERLITE Smart Series machine vision illuminators;
- Full range of sensors with speeds up to 290 frames per second;
 - 0.3 MP (640 x 480), 1.3 MP (1280 x 1024), 2.0 MP (1920 x 1200), and 5.0 MP (2592 x 2048) resolution;
 - Monochrome and color versions;
 - 4.8 μm pixel size;
- Dual-Core Intel processor capable of near-PC processing speeds
- 32 GB of eMMC and 2 GB of RAM for storing and running many large and complex jobs;
- Real-time Digital I/O, RS-232, and GigE comm. channels;
- IP67-rated design (when lens cover is installed) for use in industrial environments;
- Simplified configuration with AutoVISION Software;
- Advanced configuration with Visionscape FrontRunner software;
- Custom UI creation and machine integration using Visionscape .NET controls, Rest APIs, and serial command set;
- HMI via VGA and USB connectivity, or via web using CloudLink UI;
- Scalable down to Omron Microscan's MicroHAWK MV Smart Camera;
- Scalable up to Omron Microscan's Multi-GigE Camera PC-Based Systems.

Chapter 1 Introduction

Applications

- Fast-moving consumer goods inspection;
- Automotive assembly inspection and verification;
- High-precision gauging and guidance;
- Electronics assembly verification and identification;
- Semiconductor packaging and component inspection;
- 1D, 2D, and OCR symbol reading for any size mark;
- Fast inline 1D and 2D symbol verification and validation;
- Color inspection and verification.

Package Contents

Before you install AutoVISION Software and connect the HAWK MV-4000 Smart Camera, please take a moment to confirm that the following items are present:

- HAWK MV-4000 Smart Camera;
- HAWK MV-4000 Adapter Cable, 61-9000132-01;
- Omron Microscan Tools Drive – USB flash drive containing AutoVISION Software and full recovery image for the HAWK MV-4000;
- Required accessories such as a power supply cable.

HAWK MV-4000 Smart Camera Models

The table below lists and describes the basic HAWK MV-4000 Smart Camera models not including lenses, lens caps, accessories, and lighting. **PPP** at the end of each part number represents the license level. Each model can be ordered with one of the following five license levels:

- 100** – AutoVISION Sensor (*Includes AutoVISION's machine vision tools only*);
- 101** – AutoVISION (*Includes AutoVISION's machine vision and auto ID tools*);
- 102** – AutoVISION + Visionscape (*Includes AutoVISION's machine vision and auto ID tools and full Visionscape*);
- 103** – AutoVISION + Verification/OCV (*Includes AutoVISION's machine vision and auto ID tools, symbol verification, and optical character verification*);
- 104** – AutoVISION + Visionscape + Verification/OCV (*Includes all AutoVISION and Visionscape capabilities*).

Additional part numbers that include lenses and lens caps are available in the *Omron Microscan Product Pricing Catalog* and through Omron Microscan's Order Management System. Additional accessories and lights can be purchased separately.

Part Number	Camera Name	Description
8X11-0000-PPPP	HAWK MV-4000-03	HAWK MV-4000, Monochrome, 0.3 MP (640 x 480), 1/4" CMOS Sensor
8X12-0000-PPPP	HAWK MV-4000-13	HAWK MV-4000, Monochrome, 1.3 MP (1280 x 1024), 1/2" CMOS Sensor
8X13-0000-PPPP	HAWK MV-4000-20	HAWK MV-4000, Monochrome, 2.0 MP (1920 x 1200), 2/3" CMOS Sensor
8X14-0000-PPPP	HAWK MV-4000-50	HAWK MV-4000, Monochrome, 5.0 MP (2592 x 2048), 1" CMOS Sensor
8X15-0000-PPPP	HAWK MV-4000-03C	HAWK MV-4000, Color, 0.3 MP (640 x 480), 1/4" CMOS Sensor
8X16-0000-PPPP	HAWK MV-4000-13C	HAWK MV-4000, Color, 1.3 MP (1280 x 1024), 1/2" CMOS Sensor
8X17-0000-PPPP	HAWK MV-4000-20C	HAWK MV-4000, Color, 2.0 MP (1920 x 1200), 2/3" CMOS Sensor
8X18-0000-PPPP	HAWK MV-4000-50C	HAWK MV-4000, Color, 5.0 MP (2592 x 2048), 1" CMOS Sensor

Note: All models include dual-core Celeron[®] CPU, 2 GB of memory, 32 GB eMMC storage memory, and run Microsoft[®] Windows[®] 10 IoT Enterprise (64 bit).

HAWK MV-4000 Part Number Structure

HAWK MV-4000 part numbers follow the format 8ABS-LFFA-LPPP.

8 = HAWK MV-4000 Smart Camera

(A) Enclosure

0 = No Lens Cover

1 = 50 mm Lens Cover

2 = 70 mm Lens Cover

(B) Software = 1 (Machine Vision)

(S) Sensor Type

1 = VGA, Mono

2 = 1.3 MP, Mono

3 = 2 MP, Mono

4 = 5 MP, Mono

5 = VGA, Color

6 = 1.3 MP, Color

7 = 2 MP, Color

8 = 5 MP, Color

(L) Lens

0 = No Lens

1 = 2/3" Standard Def.

2 = 2/3" High Def.

3 = 1" High Def.

(FF) Lens Focal Length

00 = No Lens

XX = Focal Length (mm)

(A) Accessories = 0

(L) Lighting = 0

(PPP) License

100 = AutoVISION Sensor

101 = AutoVISION

102 = AutoVISION + Visionscape

103 = AutoVISION + Verification/OCV

104 = AutoVISION + Visionscape + Verification/OCV

System Components

This section contains specific information about system components as well as information to help you connect your HAWK MV-4000 Smart Camera.

Note: There are no user-serviceable parts inside the camera.

Chapter 2 System Components

Hardware Components and Accessories

This section contains information about system components as well as information to help you connect the HAWK MV-4000 Smart Camera. Specific information describes connectors, adapters, cables, pinouts, and signals.

HAWK MV-4000 Smart Cameras (All cameras ship with an adapter cable.)	
0.3 Megapixel Mono	
8011-0000-0100	HAWK MV-4000-03, 0.3 Megapixel (640 x 480), Mono, AutoVISION Sensor
8011-0000-0101	HAWK MV-4000-03, 0.3 Megapixel (640 x 480), Mono, AutoVISION
8011-0000-0102	HAWK MV-4000-03, 0.3 Megapixel (640 x 480), Mono, AutoVISION + Visionscape
8011-0000-0103	HAWK MV-4000-03, 0.3 Megapixel (640 x 480), Mono, AutoVISION + Verification / OCV
8011-0000-0104	HAWK MV-4000-03, 0.3 Megapixel (640 x 480), Mono, AutoVISION + Visionscape + Verification / OCV
1.3 Megapixel Mono	
8012-0000-0100	HAWK MV-4000-13, 1.3 Megapixel (1280 x 1024), Mono, AutoVISION Sensor
8012-0000-0101	HAWK MV-4000-13, 1.3 Megapixel (1280 x 1024), Mono, AutoVISION
8012-0000-0102	HAWK MV-4000-13, 1.3 Megapixel (1280 x 1024), Mono, AutoVISION + Visionscape
8012-0000-0103	HAWK MV-4000-13, 1.3 Megapixel (1280 x 1024), Mono, AutoVISION + Verification / OCV
8012-0000-0104	HAWK MV-4000-13, 1.3 Megapixel (1280 x 1024), Mono, AutoVISION + Visionscape + Verification / OCV
2.0 Megapixel Mono	
8013-0000-0100	HAWK MV-4000-20, 2.0 Megapixel (1920 x 1200), Mono, AutoVISION Sensor
8013-0000-0101	HAWK MV-4000-20, 2.0 Megapixel (1920 x 1200), Mono, AutoVISION
8013-0000-0102	HAWK MV-4000-20, 2.0 Megapixel (1920 x 1200), Mono, AutoVISION + Visionscape
8013-0000-0103	HAWK MV-4000-20, 2.0 Megapixel (1920 x 1200), Mono, AutoVISION + Verification / OCV
8013-0000-0104	HAWK MV-4000-20, 2.0 Megapixel (1920 x 1200), Mono, AutoVISION + Visionscape + Verification / OCV
5.0 Megapixel Mono	
8014-0000-0100	HAWK MV-4000-50, 5.0 Megapixel (2592 x 2048), Mono, AutoVISION Sensor
8014-0000-0101	HAWK MV-4000-50, 5.0 Megapixel (2592 x 2048), Mono, AutoVISION
8014-0000-0102	HAWK MV-4000-50, 5.0 Megapixel (2592 x 2048), Mono, AutoVISION + Visionscape
8014-0000-0103	HAWK MV-4000-50, 5.0 Megapixel (2592 x 2048), Mono, AutoVISION + Verification / OCV
8014-0000-0104	HAWK MV-4000-50, 5.0 Megapixel (2592 x 2048), Mono, AutoVISION + Visionscape + Verification / OCV
0.3 Megapixel Color	
8015-0000-0100	HAWK MV-4000-03C, 0.3 Megapixel (640 x 480), Color, AutoVISION Sensor
8015-0000-0101	HAWK MV-4000-03C, 0.3 Megapixel (640 x 480), Color, AutoVISION
8015-0000-0102	HAWK MV-4000-03C, 0.3 Megapixel (640 x 480), Color, AutoVISION + Visionscape
8015-0000-0103	HAWK MV-4000-03C, 0.3 Megapixel (640 x 480), Color, AutoVISION + Verification / OCV
8015-0000-0104	HAWK MV-4000-03C, 0.3 Megapixel (640 x 480), Color, AutoVISION + Visionscape + Verification / OCV
1.3 Megapixel Color	
8016-0000-0100	HAWK MV-4000-13C, 1.3 Megapixel (1280 x 1024), Color, AutoVISION Sensor
8016-0000-0101	HAWK MV-4000-13C, 1.3 Megapixel (1280 x 1024), Color, AutoVISION
8016-0000-0102	HAWK MV-4000-13C, 1.3 Megapixel (1280 x 1024), Color, AutoVISION + Visionscape
8016-0000-0103	HAWK MV-4000-13C, 1.3 Megapixel (1280 x 1024), Color, AutoVISION + Verification / OCV
8016-0000-0104	HAWK MV-4000-13C, 1.3 Megapixel (1280 x 1024), Color, AutoVISION + Visionscape + Verification / OCV

Hardware Components and Accessories (continued)

2.0 Megapixel Color	
8017-0000-0100	HAWK MV-4000-20C, 2.0 Megapixel (1920 x 1200), Color, AutoVISION Sensor
8017-0000-0101	HAWK MV-4000-20C, 2.0 Megapixel (1920 x 1200), Color, AutoVISION
8017-0000-0102	HAWK MV-4000-20C, 2.0 Megapixel (1920 x 1200), Color, AutoVISION + Visionscape
8017-0000-0103	HAWK MV-4000-20C, 2.0 Megapixel (1920 x 1200), Color, AutoVISION + Verification / OCV
8017-0000-0104	HAWK MV-4000-20C, 2.0 Megapixel (1920 x 1200), Color, AutoVISION + Visionscape + Verification / OCV
5.0 Megapixel Color	
8018-0000-0100	HAWK MV-4000-50C, 5.0 Megapixel (2592 x 2048), Color, AutoVISION Sensor
8018-0000-0101	HAWK MV-4000-50C, 5.0 Megapixel (2592 x 2048), Color, AutoVISION
8018-0000-0102	HAWK MV-4000-50C, 5.0 Megapixel (2592 x 2048), Color, AutoVISION + Visionscape
8018-0000-0103	HAWK MV-4000-50C, 5.0 Megapixel (2592 x 2048), Color, AutoVISION + Verification / OCV
8018-0000-0104	HAWK MV-4000-50C, 5.0 Megapixel (2592 x 2048), Color, AutoVISION + Visionscape + Verification / OCV
HAWK MV-4000 Lenses and Lens Caps	
Standard Resolution for 2/3" Sensors (General Inspection, Reading, Some Verification)	
98-9000167-01	Lens, C-Mount, 6 mm, Standard Resolution, 2/3" Sensor
98-9000168-01	Lens, C-Mount, 9 mm, Standard Resolution, 2/3" Sensor
98-9000169-01	Lens, C-Mount, 12.5 mm, Standard Resolution, 2/3" Sensor
98-9000170-01	Lens, C-Mount, 16 mm, Standard Resolution, 2/3" Sensor
98-9000171-01	Lens, C-Mount, 25 mm, Standard Resolution, 2/3" Sensor
98-9000172-01	Lens, C-Mount, 35 mm, Standard Resolution, 2/3" Sensor
High Resolution for 2/3" Sensors (Gauging, Verification)	
98-9000192-01	Lens, C-Mount, 6 mm, High Resolution, 2/3" Sensor
98-9000165-01	Lens, C-Mount, 8 mm, High Resolution, 2/3" Sensor
98-9000166-01	Lens, C-Mount, 12 mm, High Resolution, 2/3" Sensor
98-9000154-01	Lens, C-Mount, 16 mm, High Resolution, 2/3" Sensor
98-9000164-01	Lens, C-Mount, 25 mm, High Resolution, 2/3" Sensor
98-9000163-01	Lens, C-Mount, 35 mm, High Resolution, 2/3" Sensor
High Resolution for 1" Sensors (All applications. Required for 1" 5 Megapixel Sensor)	
98-9000174-01	Lens, C-Mount, 12.5 mm, High Resolution, 1" Sensor
98-9000175-01	Lens, C-Mount, 16 mm, High Resolution, 1" Sensor
98-9000176-01	Lens, C-Mount, 25 mm, High Resolution, 1" Sensor
98-9000177-01	Lens, C-Mount, 35 mm, High Resolution, 1" Sensor
C-Mount Liquid Lens	
98-9000179-01	Lens, Liquid, C-Mount, F2.8/16 mm, 2/3" Sensor, I2C Interface
98-9000178-01	Lens, Liquid, C-Mount, F4/25 mm, 2/3" Sensor, I2C Interface
Lens Accessories	
98-9000155-01	IP67 Lens Cover for HAWK MV-4000, 50 mm Length
98-9000156-01	IP67 Lens Cover HAWK MV-4000, 70 mm Length
98-CO206	Lens Extension Tube Set, 0.5 mm, 1 mm, 5 mm, 10 mm, 20 mm, 40 mm

Chapter 2 System Components

Hardware Components and Accessories (continued)

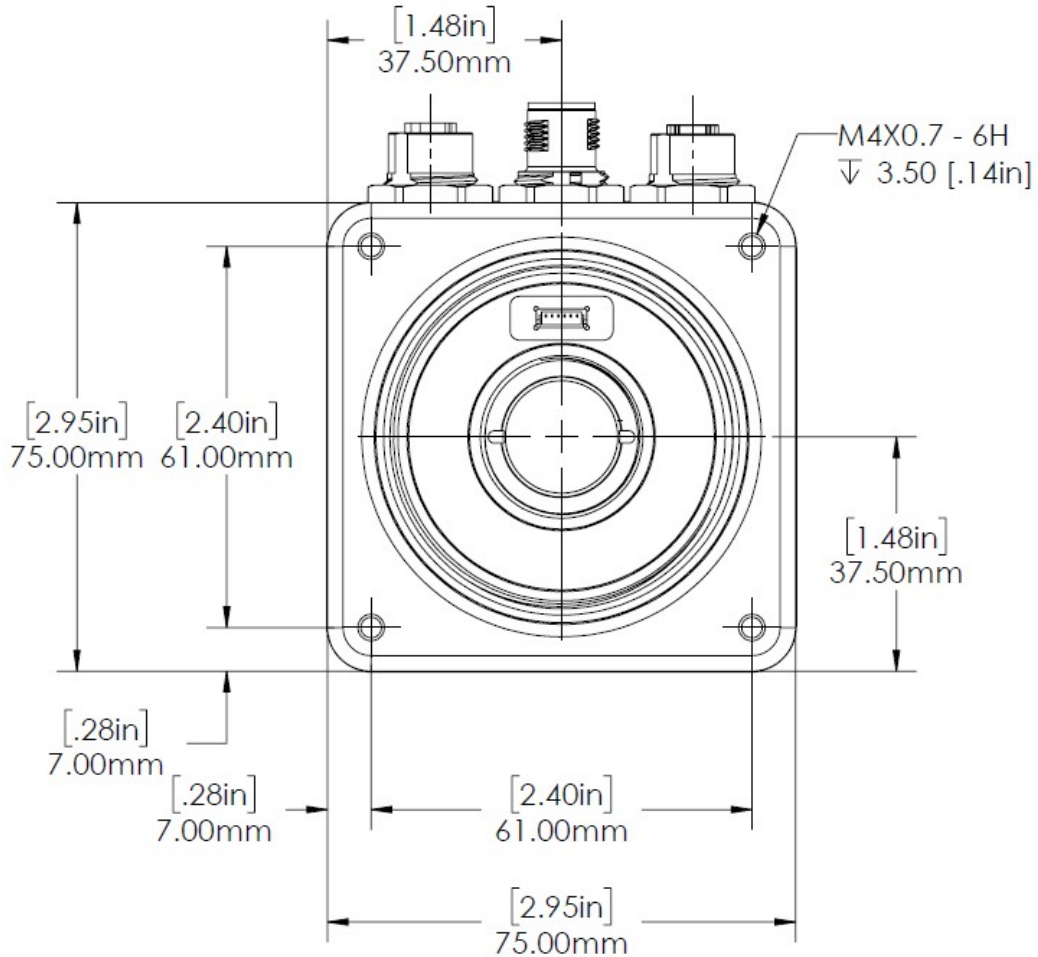
HAWK MV-4000 Cables, Smart Series Illuminator Control Cable, and Power Supply	
HAWK MV-4000 X-CODE Ethernet Port Cables	
61-9000134-01	Cable, HAWK MV-4000 Ethernet, X-CODE / RJ45 CAT 6A, 1 m
61-9000134-02	Cable, HAWK MV-4000 Ethernet, X-CODE / RJ45 CAT 6A, 3 m
61-9000134-03	Cable, HAWK MV-4000 Ethernet, X-CODE / RJ45 CAT 6A, 5 m
HAWK MV-4000 VGA / USB Port Connector Cables	
61-9000143-01	Cable, HAWK MV-4000 M12 to USB Socket, 1 m
61-9000147-01	Cable, HAWK MV-4000 M12 to VGA and USB, 1 m
HAWK MV-4000 Digital I/O Port Connector Cables	
61-9000132-01	Cable, Adapter, HAWK MV-4000 to Accessory Cables / Power Supply (Supplied with camera)
61-9000151-01	Cable, HAWK MV-4000 M12 to Flying Leads, 3 m (No Adapter Required)
QX-1 Interface Cables and Accessories	
61-000162-02	QX Cordset, HAWK MV-4000 Adapter to QX-1 M12 Plug (Screw-On), 1 m
61-000148-02	QX Cordset, HAWK MV-4000 Adapter to QX-1 M12 Plug (Screw-On), 3 m
98-000103-02	QX-1 Interface Device
99-000020-02	QX Photo Sensor, M12 4-Pin Plug, NPN, Dark On, 2 m
99-000020-01	QX Photo Sensor, M12 4-Pin Plug, NPN, Dark Off, 2 m
20-610024-01	Trigger Connector, 4-Pin Plug (Screw Terminal, Field-Wireable) (Self-Wiring)
Smart Series Illuminator Control Cables	
61-9000135-01	Y Cable, HAWK MV-4000 Adapter to Smart Series Illuminator and QX-1, Power, 1 m
61-9000137-01	Y Cable, HAWK MV-4000 Adapter to Smart Series Illuminator and QX-1, Strobe, 1 m
61-000204-01	Cable, QX-1 to Smart Series Illuminator, Continuous Power
61-000218-01*	Cable, QX-1 to Smart Series Illuminator, Strobe
Power Supply	
97-000012-01	Power Supply, 100-240VAC, +24VDC, M12 12-pin Socket
HAWK MV-4000 and Smart Series Illuminator Mount	
Standard Mount	
98-9000209-01	Universal Mount, HAWK MV-4000
Smart Series Illuminator / HAWK MV-4000 Mounting Kits	
98-9000120-01	Kit, Bracket, MAX 300 to HAWK MV-4000
98-9000121-01	Kit, Bracket, DOAL to HAWK MV-4000
98-9000122-01	Kit, Bracket, Ring 60 / 70 to HAWK MV-4000
98-9000123-01	Kit, Bracket, Ring 100 to HAWK MV-4000
98-9000137-01	Kit, Smart Series Pharamalite, HAWK MV-4000

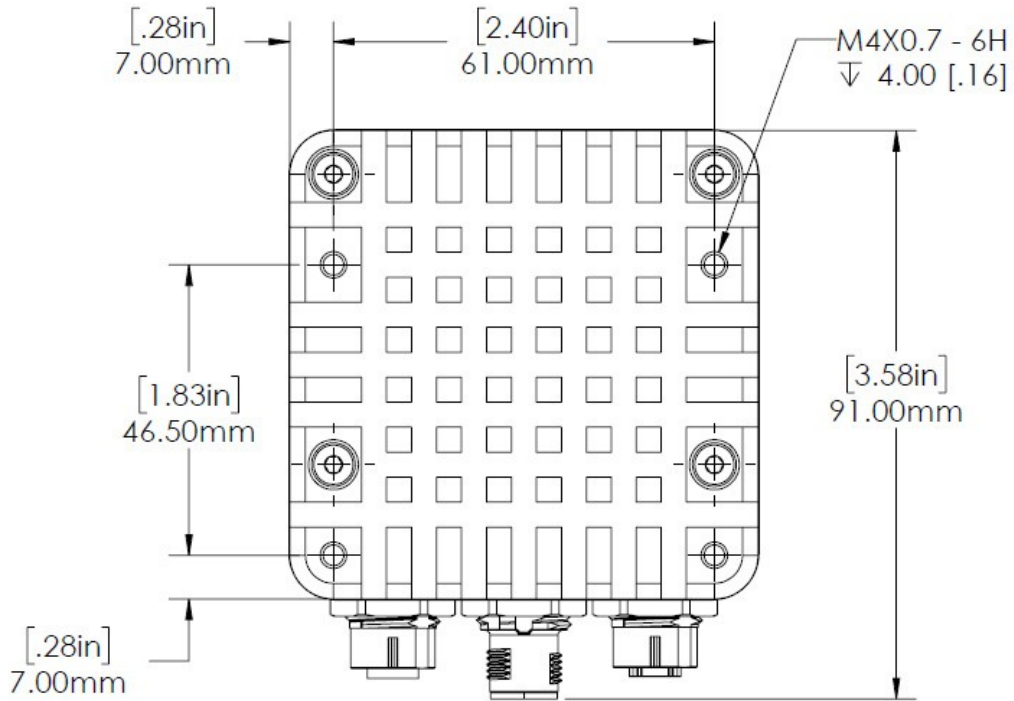
Hardware Components and Accessories (continued)

Licensing	
HAWK MV-4000 License Upgrades	
LIC-0700-003*	License, Machine Vision, AutoVISION
LIC-0700-006*	License, Machine Vision, Visionscape
LIC-0700-009*	License, Machine Vision, Verification / OCV
LIC-0700-011*	License, Machine Vision, AutoVISION Sensor
LIC-0700-325*	License, Machine Vision, Machine Vision Unlock
Camera Kits with License, Lens, IP Cover, and Mount	
0.3 Megapixel, Standard Lens	
8211-1090-0102	HAWK MV-4000-03, AutoVISION + Visionscape, 9 mm Standard Lens, IP Cover, Universal Mount
8111-1160-0102	HAWK MV-4000-03, AutoVISION + Visionscape, 16 mm Standard Lens, IP Cover, Universal Mount
1.3 Megapixel, Standard Lens	
8112-1120-0104	HAWK MV-4000-13, AutoVISION + Visionscape + Verification / OCV, 12.5 mm Std. Lens, IP Cover, Universal Mount
8112-1250-0104	HAWK MV-4000-13, AutoVISION + Visionscape + Verification / OCV, 25 mm Std. Lens, IP Cover, Universal Mount
1.3 Megapixel, High Resolution Lens	
8212-2160-0104	HAWK MV-4000-13, AutoVISION + Visionscape + Ver. / OCV, 16 mm High Res. Lens, IP Cover, Universal Mount
8212-2250-0104	HAWK MV-4000-13, AutoVISION + Visionscape + Ver. / OCV, 25 mm High Res. Lens, IP Cover, Universal Mount
8212-2350-0104	HAWK MV-4000-13, AutoVISION + Visionscape + Ver. / OCV, 35 mm High Res. Lens, IP Cover, Universal Mount
2.0 Megapixel, Standard Lens	
8113-1160-0104	HAWK MV-4000-20, AutoVISION + Visionscape + Verification / OCV, 16 mm Std. Lens, IP Cover, Universal Mount
8113-1350-0104	HAWK MV-4000-20, AutoVISION + Visionscape + Verification / OCV, 35 mm Std. Lens, IP Cover, Universal Mount
2.0 Megapixel, High Resolution Lens	
8213-2160-0104	HAWK MV-4000-20, AutoVISION + Visionscape + Ver. / OCV, 16 mm High Res. Lens, IP Cover, Universal Mount
8213-2250-0104	HAWK MV-4000-20, AutoVISION + Visionscape + Ver. / OCV, 25 mm High Res. Lens, IP Cover, Universal Mount
8213-2350-0104	HAWK MV-4000-20, AutoVISION + Visionscape + Ver. / OCV, 35 mm High Res. Lens, IP Cover, Universal Mount
2.0 Color, Standard Lens	
8117-1090-0102	HAWK MV-4000-20C, AutoVISION + Visionscape, 9 mm Standard Lens, IP Cover, Universal Mount
8117-1160-0102	HAWK MV-4000-20C, AutoVISION + Visionscape, 16 mm Standard Lens, IP Cover, Universal Mount
8117-1350-0102	HAWK MV-4000-20C, AutoVISION + Visionscape, 35 mm Standard Lens, IP Cover, Universal Mount
5.0 Megapixel, 1" Lens	
8014-3160-0104	HAWK MV-4000-50, AutoVISION + Visionscape + Verification / OCV, 16 mm 1" Lens, No Cover, Universal Mount
8214-3250-0104	HAWK MV-4000-50, AutoVISION + Visionscape + Verification / OCV, 25 mm 1" Lens, IP Cover, Universal Mount
8214-3350-0104	HAWK MV-4000-50, AutoVISION + Visionscape + Verification / OCV, 35 mm 1" Lens, IP Cover, Universal Mount

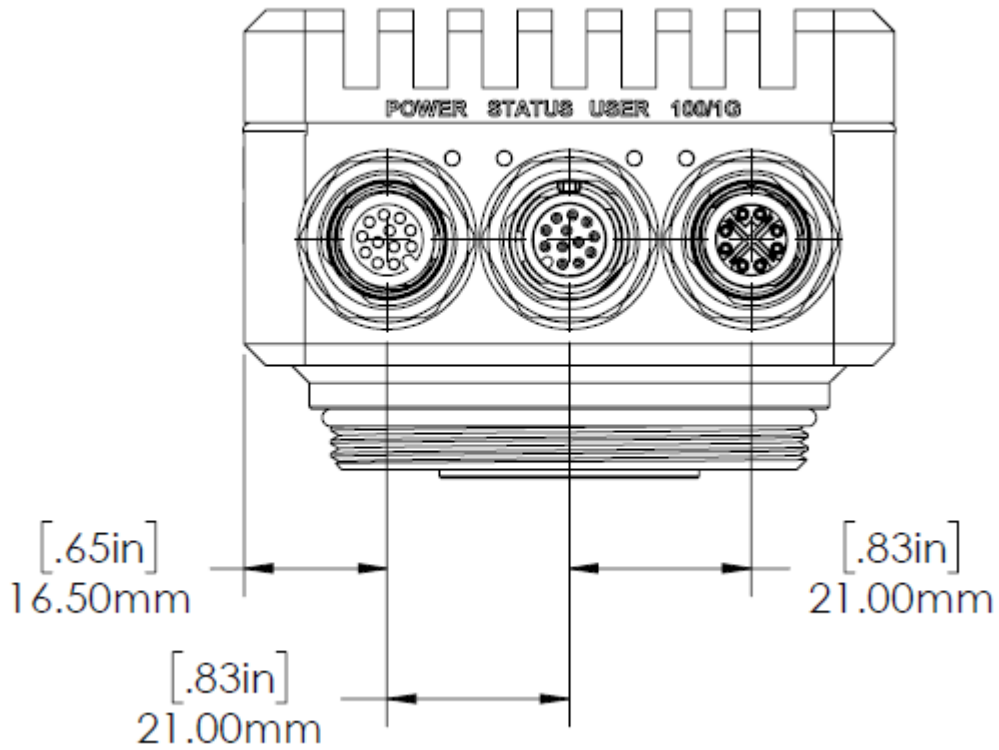
HAWK MV-4000 Dimensions

Standard HAWK MV-4000 Front



Standard HAWK MV-4000 Back

Chapter 2 System Components**Standard HAWK MV-4000 Side**

Standard HAWK MV-4000 Base

Label Information

Each HAWK MV-4000 Smart Camera has a label that contains important information about that camera.

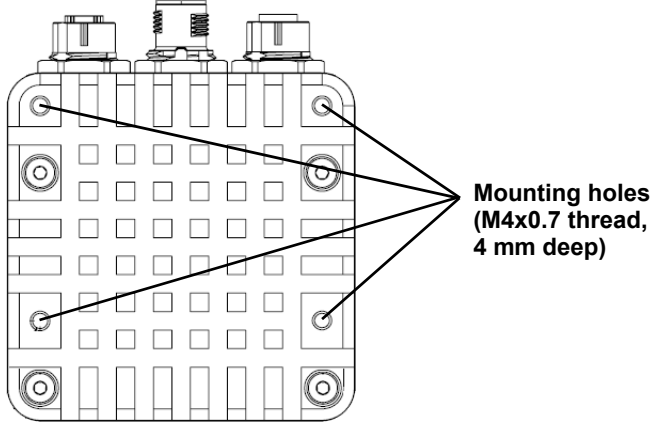


- **M/N:** The model name of the camera.
- **P/N:** The Omron Microscan part number of the camera.
- **MAC:** The MAC address of the camera.
- **S/N:** The serial number of the camera.

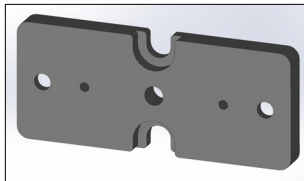
Mounting, Connecting, and Wiring

Mounting the HAWK MV-4000

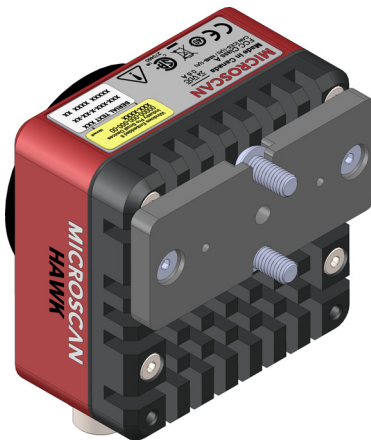
- Mount the camera (1) securely as required by the application.



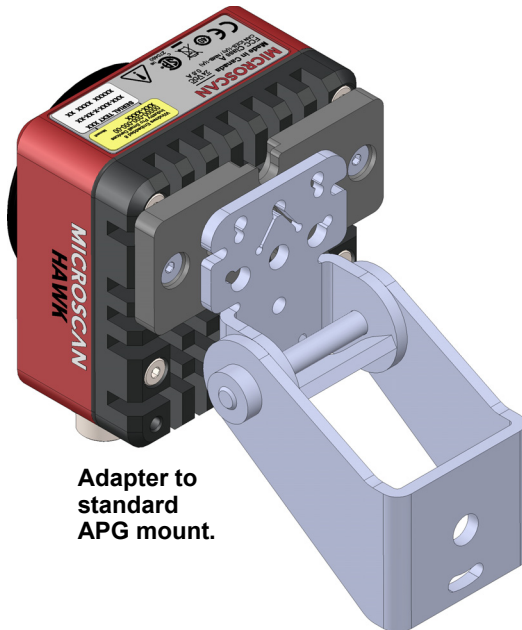
Universal Mount and APG Mount



**1/4-20 tripod
mounting hole**

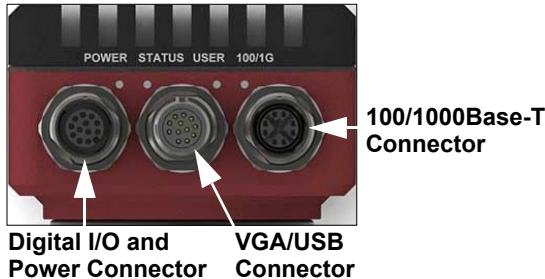


**Mounts on standard tubing
with 6 mm hardware.**



Connecting the HAWK MV-4000

- The HAWK MV-4000 Smart Camera has the following interfaces:

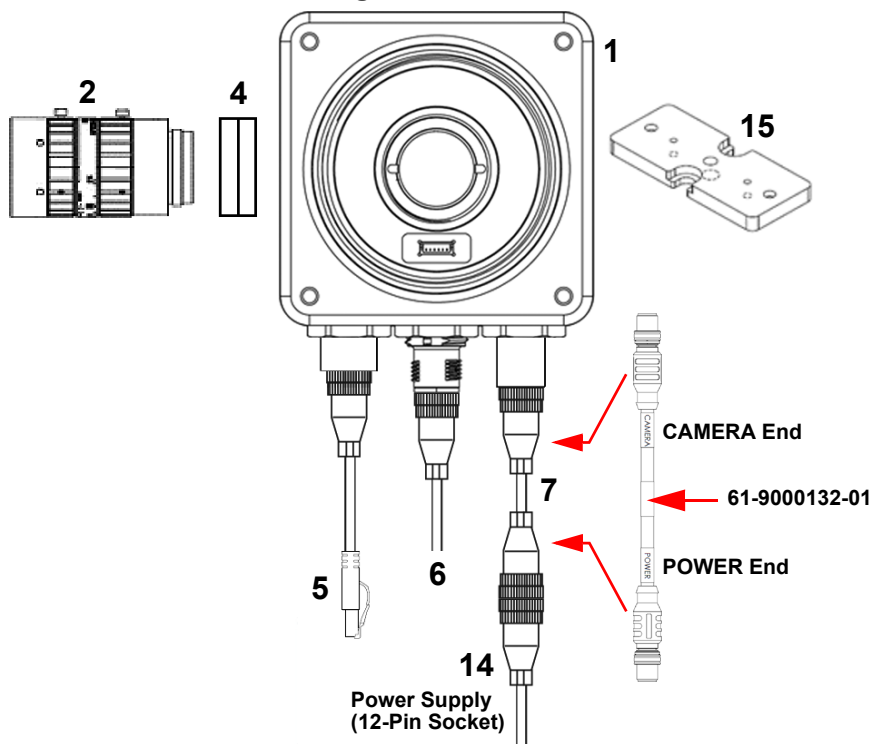


- 100/1000 Base-T Connector.** Provides connectivity between the HAWK MV-4000 and your computer or your network. The HAWK MV-4000 can gain access to a LAN via Gigabit Ethernet (GigE, 1G Base-T, or 1000Base-T), fast Ethernet (100Base-T), or twisted pair Ethernet (10Base-T).
- VGA/USB Connector.** Provides connectivity between the HAWK MV-4000 and a display device and/or USB device (such as a keyboard or a mouse).
- Digital I/O and Power Connector.** Receives power from an external power source. This connector can also receive trigger input and send/receive general auxiliary I/O signals to/from third-party I/O devices. In addition, the connector has a specialized analog dimmer output intended to be used with advanced Illumination lighting devices.

Hardware Configurations

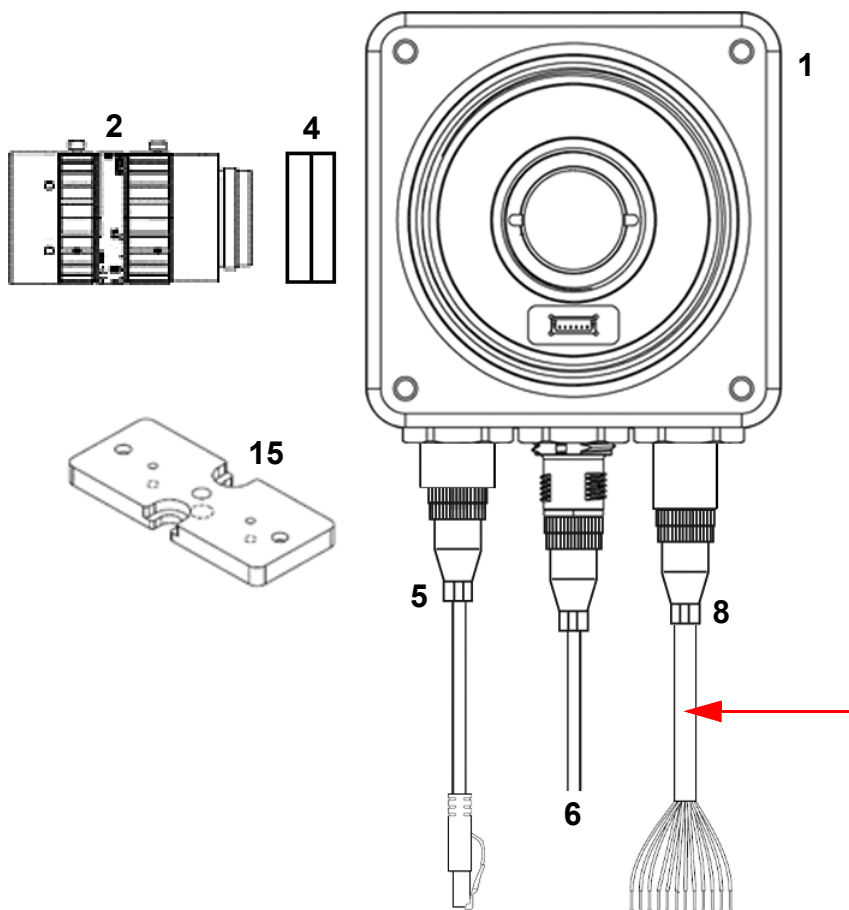
Item	Description	Part Number
1	HAWK MV-4000 Smart Camera	8X1X-XXX0-010X
2	Lens, C-Mount	98-90001XX-01
3	IP67 Lens Cover for HAWK MV-4000, 50 mm or 70 mm (not shown)	98-900015X-01
4	Lens Extension Tube Set, 0.5 mm, 1 mm, 5 mm, 10 mm, 20 mm, 40 mm	98-CO206
5	Cable, HAWK MV-4000 Ethernet, X-CODE / RJ45 CAT 6A, 1 m, 3 m, or 5 m	61-9000134-0X
6	Cable, HAWK MV-4000 M12 to USB Socket or VGA / USB, 1 m	61-900014X-01
7	Cable, Adapter, HAWK MV-4000 to Accessory Cables / Power Supply (supplied with camera)	61-9000132-01
8	Cable, HAWK MV-4000 M12 to Flying Leads, 3 m (no adapter required)	61-9000151-01
9	QX Cordset, HAWK MV-4000 Adapter to QX-1 M12 Plug (Screw-On), 1 m or 3 m	61-0001XX-02
10	QX-1 Interface Device	98-000103-02
11	QX Photo Sensor, M12 4-Pin Plug, NPN, Dark On or Dark Off, 2 m <i>or</i>	99-000020-0X
	Trigger Connector, 4-Pin Plug (Screw Terminal, Field-Wireable) (Self-Wiring)	20-610024-01
12	Y Cable, HAWK MV-4000 Adapter to Smart Series Illuminator and QX-1, Power <i>or</i> On/Off <i>or</i> Strobe, 1 m	61-900013X-01
13	Cable, QX-1 to Smart Series Illuminator, Continuous Power <i>or</i> On/Off <i>or</i> Strobe	61-0002XX-01
14	Power Supply, 100-240VAC, +24VDC, M12 12-Pin Socket	97-000012-01
15	Universal Mount, HAWK MV-4000	98-9000209-01

Standard Ethernet Configuration



Chapter 2 System Components

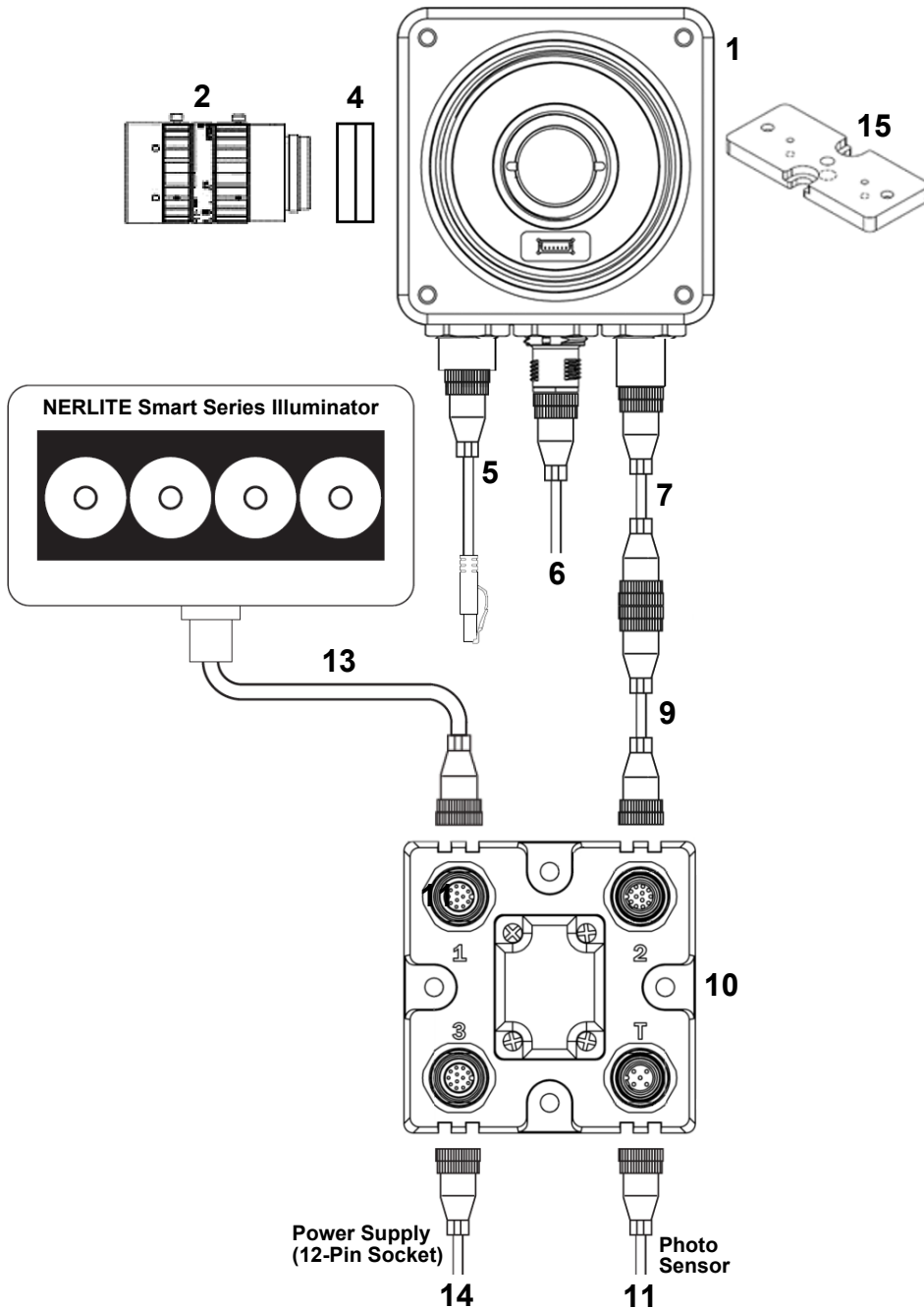
Ethernet Configuration with Flying Leads



M12 to Flying Leads Cable, 3 m – 61-9000151-01

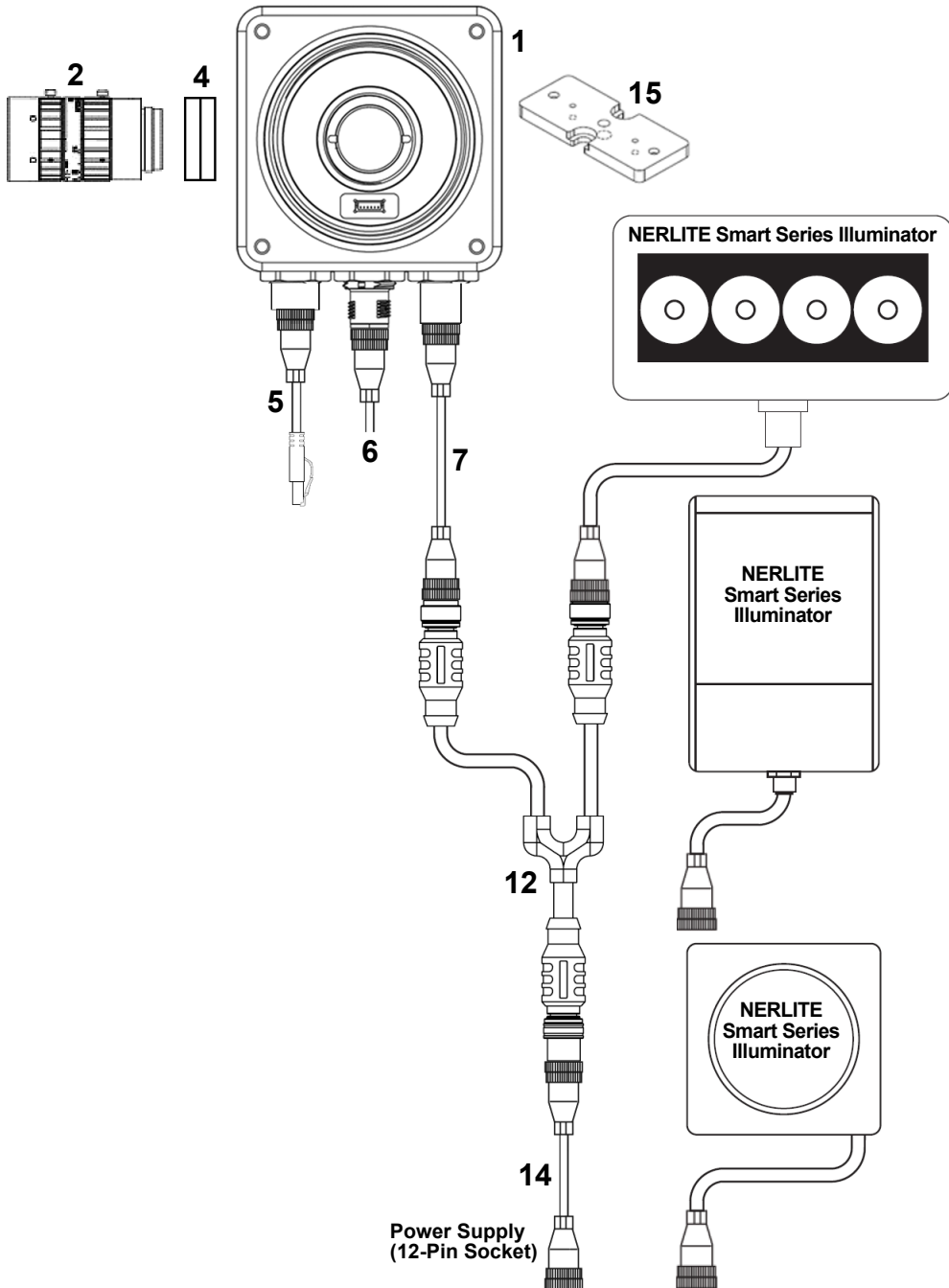
<i>Pin</i>	<i>Signal</i>	<i>Wire Color</i>
1	Output Common	Red/Blue
2	Analog Output	Black
3	Output 3	Pink
4	Power	Brown
5	Trigger	White
6	Input Common	Red
7	Input 2	Green
8	Input 3	Violet
9	Input 1	Yellow
10	Output 1	Gray
11	Ground	Blue
12	Output 2	Gray / Pink

Ethernet Configuration with QX-1 and NERLITE Smart Series Illuminator



Chapter 2 System Components

Ethernet Configuration, Y Cable for Illuminator Control and Camera Power



Connecting to the I/O Interface

The HAWK MV-4000 has a digital I/O interface with 7 optically isolated signals. There are three digital outputs and four digital inputs.

Outputs

Output Signals:

- Output 1
- Output 2
- Output 3 (External Strobe when Enabled)
- Output Common

The outputs support sinking (NPN) configurations only and operate at up to 24V nominal. All three outputs are configurable for general-purpose use, but when External Strobe is enabled in the software, Output 3 becomes dedicated to that purpose. When the HAWK MV-4000 is used with the QX-1 interface device, or with any of the NERLITE Smart Series lighting cables, the Strobe Output signal from the camera is automatically connected to strobe trigger input on the Smart Series light.

Inputs

Input Signals:

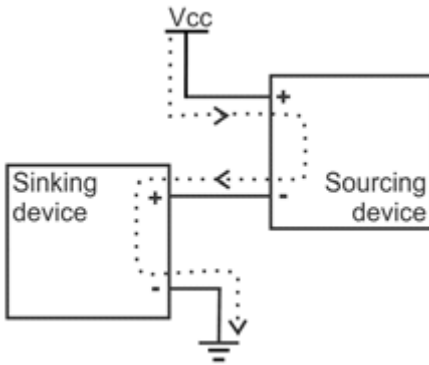
- Trigger (Sensor)
- Input 1
- Input 2
- Input 3
- Input Common

The inputs support sinking (NPN) and sourcing (PNP) configurations and can receive 11-24V. Note that sinking (NPN) or sourcing (PNP) for inputs cannot be mixed in a system because the Input Common is shared by all Inputs.

One input is dedicated as the camera trigger (sensor). The other three are configurable general-purpose inputs. When the HAWK MV-4000 is used with the QX-1 interface device and photo sensor, the trigger signal is automatically connected to the correct input channel.

Chapter 2 System Components**Sinking and Sourcing Note**

Note that sinking and sourcing concepts refer to the conventional current flow, which means current flows from the positive potential towards the negative potential. A sinking device provides a path to sink current toward ground or to the return path. A sourcing device does not provide power. A sourcing device provides a path that sources current; it provides a path from the power source. In the following diagram, the device on the right is the sourcing device, and the device on the left is the sinking device.



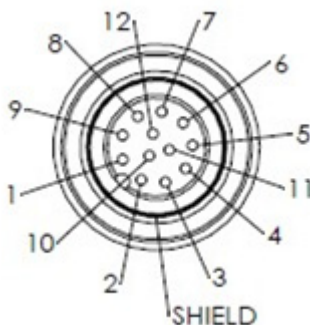
(Equivalent circuit only.)

Connectors and Pinouts

The diagram below shows the pinout for the camera's IO connector. This would typically be used with the direct flying leads cable 61-9000151-01.

The pinout for the digital I/O and power connector is as follows:

Pin	Signal Name
1	Output Common
2	Analog Output
3	Output 3
4	Power
5	Trigger
6	Input Common
7	Input 2
8	Input 3
9	Input 1
10	Output 1
11	Ground
12	Output 2

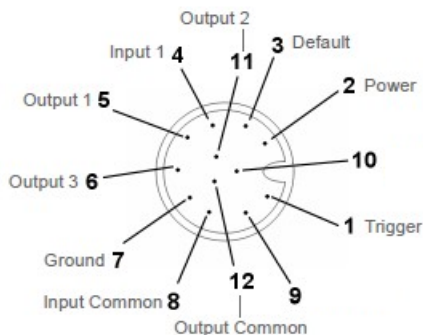


To interface with this adapter cable connector, you can use either an Omron Microscan accessory cable or you can build your own. To build your own digital I/O and power cable, parts can be purchased from:

Cable Information	
Manufacturer	Phoenix Contact GmbH and Co. KG
Part Number	SAC-12P- MS/3.0-PVC SC0 Order No: 1554788
Description	Sensor/Actuator Cable, 12-Pos., Black PVC, Straight M12 SPEEDCON Plug on Free Conductor End, 3.0 m

Adapter Cable M12 12 Pin Plug – Power, I/O and Serial (61-9000132-01)

The diagram below shows the pinout for the Adapter Cable supplied with each unit. This adapter changes the pinouts so that all of the standard MicroHAWK, Vision HAWK, and QX Hawk accessories can be used. These include the power supply and interface cables as shown earlier in this chapter.



Outputs

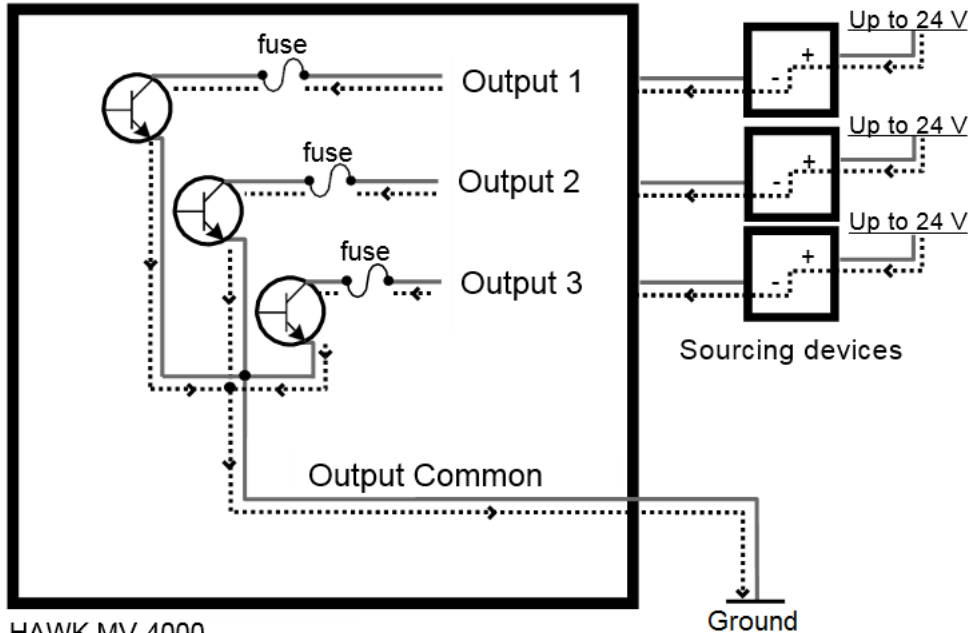
Connecting Devices to Output Signals

HAWK MV-4000 output signals can be interfaced with input modules (with sourcing input signals) found on most programmable logic controllers (PLCs) and other devices. The output signals can also be interfaced with inductive load devices (such as a relay, light stack, or a small motor).

The HAWK MV-4000's output signals are sinking output signals, based on an NPN-type transistor. Note that the HAWK MV-4000 outputs are not bi-directional outputs as they are for the Vision HAWK or MicroHAWK. These are simple switches that allow current to flow from the Output pin to the Output Common.

The outputs need to be connected to an external power source because they are not capable of providing voltage to drive a device on their own. They are typically connected in a sinking configuration because they only have one dedicated pin (Output 1, Output 2, Output 3 (External Strobe), respectively) and share their other pin (Output Common). So, typically, a sourcing device is connected to their dedicated pin and the return path is connected to the common pin. The exact connection between the output signal, the connected device, and the power source depends on the type of device to which you connect.

Connecting three sourcing devices to sinking output signals.

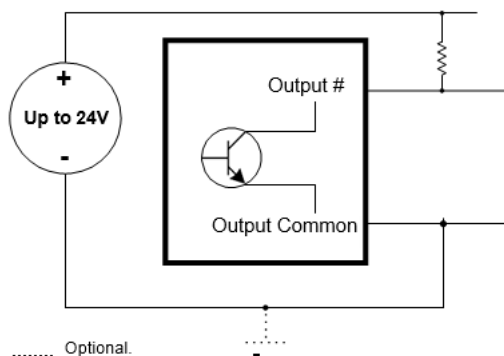


HAWK MV-4000
(NPN sinking config)
(Equivalent circuit only.)

Connecting to a Digital Device That Requires Two Predictable Voltage Levels to Operate

The output signals can only present a low voltage level in a sinking configuration. Their other output state is floating by default. So, if you need to connect to a digital device that requires two predictable voltage levels to operate, pullup circuitry must be added.

Connection required if using external pullup circuitry



(Equivalent circuit only.)

To add pull-up circuitry, attach an external pull-up resistor. A resistance value of 3 KOhms is suggested to protect your HAWK MV-4000. Since your HAWK MV-4000 output signals can sink up to 50 mA, use the documentation of your input to calculate the required resistance for your external pull-up resistor (if necessary).

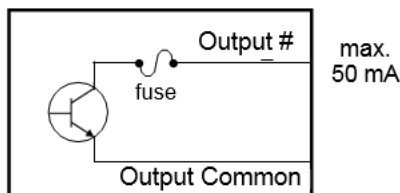
In the connections above, the pull-up circuitry causes an inversion if the input of the device is connected to the Output pin. When the output signal is on, the circuit between its Output pin and Output Common pin is closed, and current flows from the power source to the Output Common pin. The observed voltage at the Output pin will be low. When the output signal is off, the circuit between its Output pin and Output Common pin is open, and current flows from the power source to the input of the device. In other words, the output is active when it is turned off, so the output in the software must be set up as Active Low.

Chapter 2 System Components

Warning: The HAWK MV-4000 output signals are compatible with voltages up to 24V. However, by default, the output signals offer low resistance. When they are on (their circuit is closed), current flows directly through them. Ensure that the circuit created between the power source, the output signal, the connected device, and return path does not cause more than 50 mA to flow through the signal.

As a precaution, the output signals are individually fuse-protected up to 50 mA. HAWK MV-4000 uses resettable fuses. The fuses protect HAWK MV-4000 if you accidentally connect their corresponding output signal to a device that sources/sinks more current than HAWK MV-4000 can safely transmit. If more than 50 mA of current goes through your HAWK MV-4000, the fuse will eventually trip. After disconnecting your HAWK MV-4000, the fuse will reset only after it has cooled sufficiently.

The diagram below depicts HAWK MV-4000's onboard fuse.



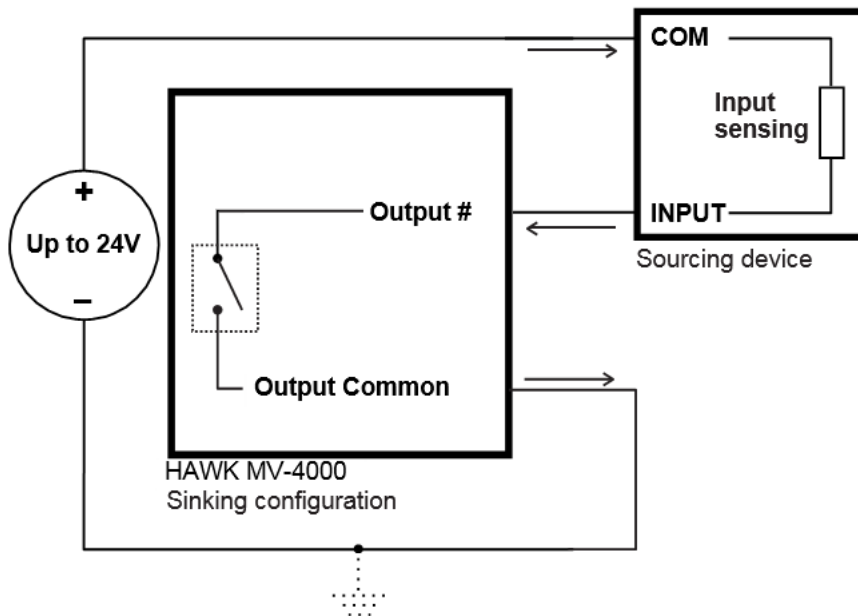
About the Connections in the Following Subsections

The following subsections detail how to connect the most common third-party devices to the HAWK MV-4000 output signals. Ground is only shown in the following subsections for reference, in case you need to reference your return path to ground.

Power, as depicted in the following diagrams, represents a nominal voltage of up to 24V (+/- 10%). For minimum and maximum voltage requirements, refer to the electrical specification of the optoisolated output signals, in Appendix C: General Specifications.

Connecting an Output Signal to a Sourcing Input

Connect a HAWK MV-4000 output signal to a sourcing input, as shown below.



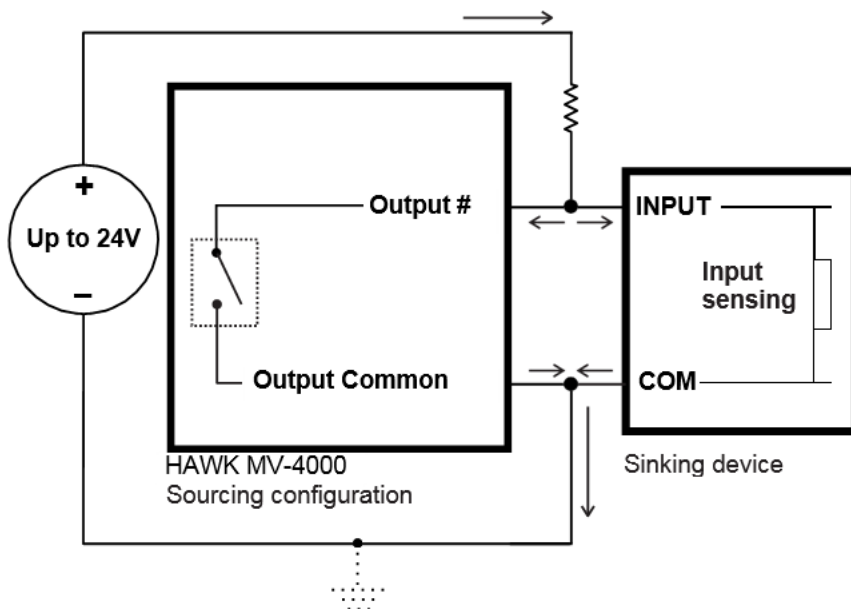
----- Optional because the output signals are optically isolated.

(Equivalent circuit only.)

Note: When connecting a resistive load sourcing device instead of an input sensing sourcing device, the same connection would be used as displayed above.

Connecting an Output Signal to a Sinking Input

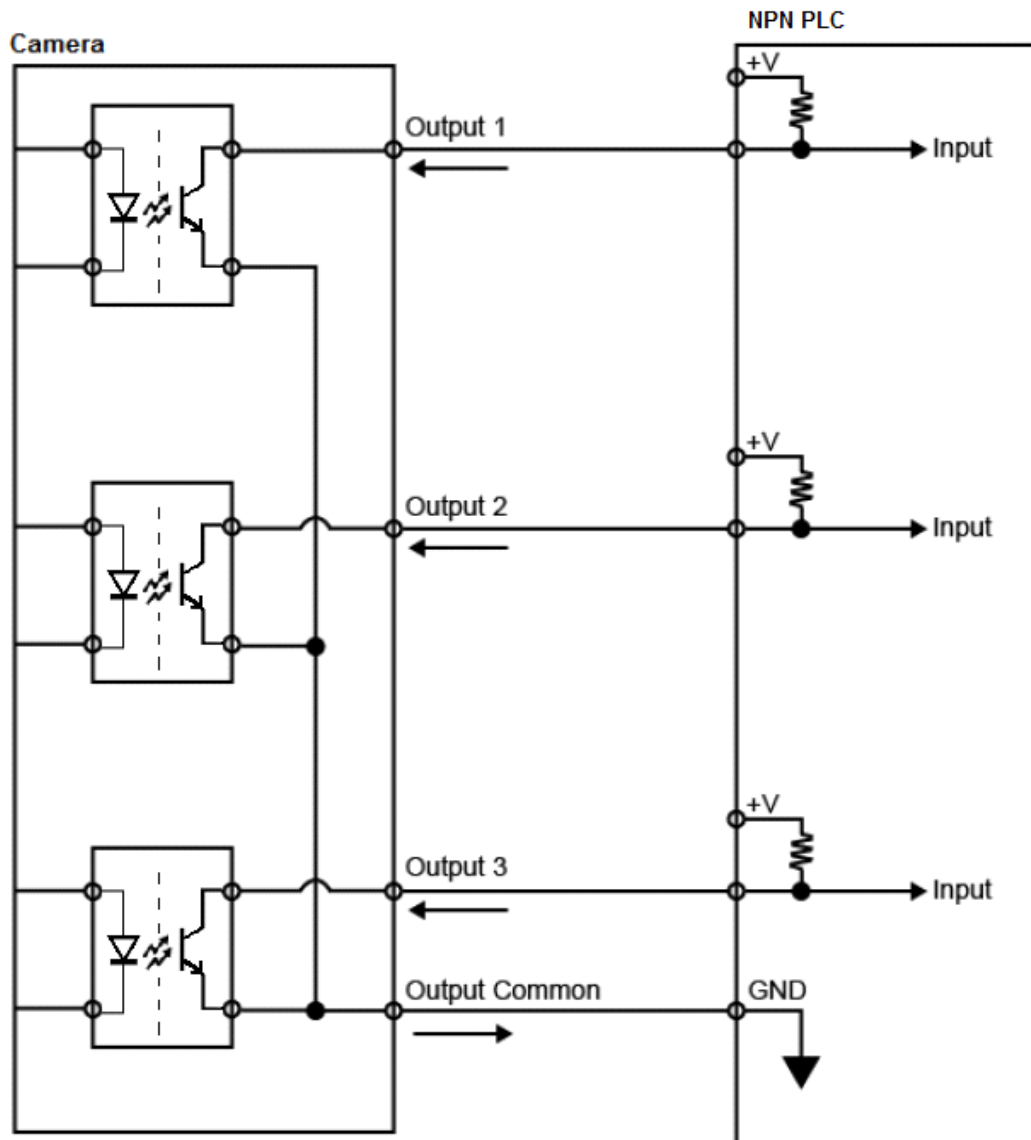
In this configuration, you need to connect an external pull-up resistor. Since your HAWK MV-4000 output signals can sink up to 50 mA, use the documentation of your sinking device to calculate the required resistance for your external pull-up resistor (if necessary). Using this method with a pull-up resistor will allow you to connect to up three sinking inputs.



----- Optional because the output signals are optically isolated.
(Equivalent circuit only.)

Connecting to a NPN PLC

NPN PLC inputs are normally pulled to high inside the PLC. Closing camera opto connects the PLC input to Ground through the camera opto making the PLC signal go low. The camera outputs should be set to Active Low so that when camera output is active (opto open), the PLC is pulled up to +V through its internal pull-up resistors.



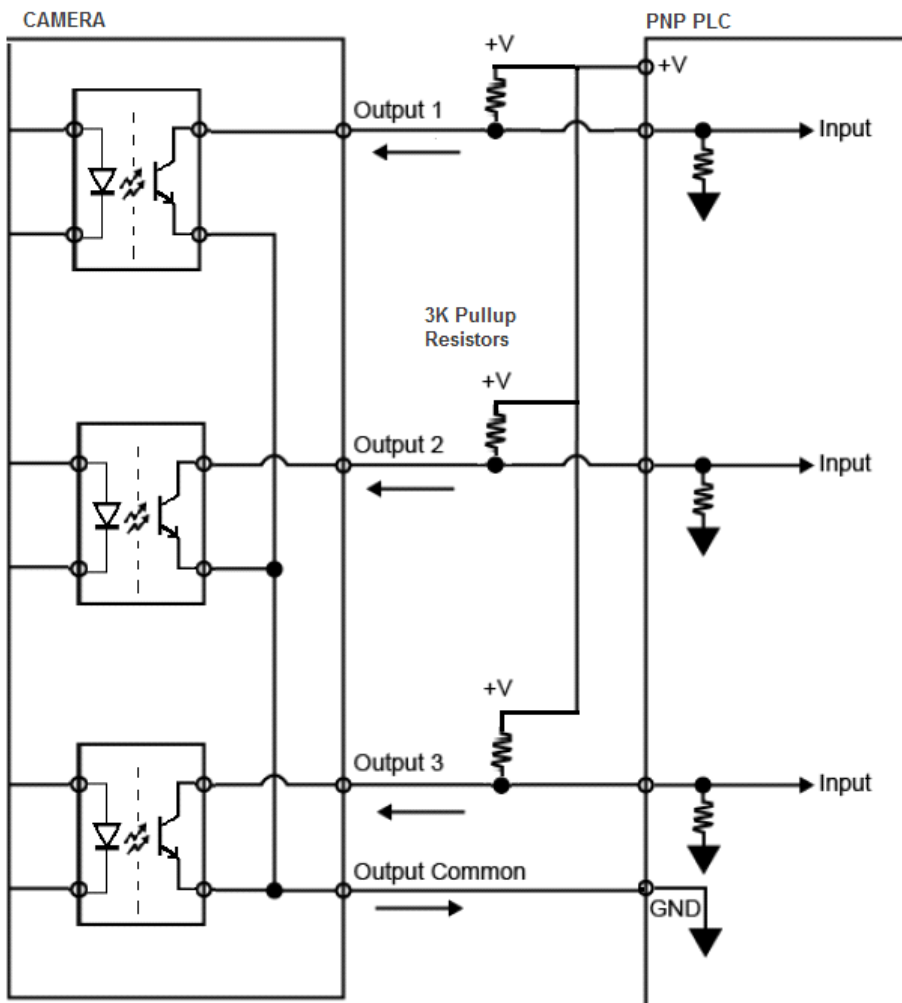
Chapter 2 System Components

Connecting to a PNP PLC

PNP PLC inputs are normally pulled to low inside the PLC. They need to be fed a voltage to make the signal go high. This is done through the use of external pull-up resistors, typically 3K Ohm.

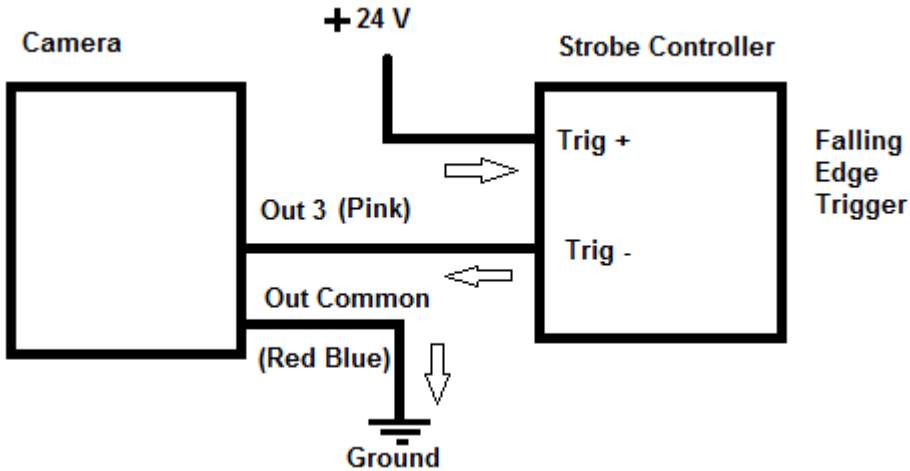
When the camera opto is open, the PLC input signal is pulled up to high through the external pull-up resistors. When the camera opto is closed, the current flows through camera instead of to the PLC inputs, making the PLC input go low.

The camera outputs should be set to Active Low so that when camera output is active (opto open), the PLC input is pulled high via the external pull up resistors.



Connecting HAWK to a Strobe Controller

To connect a HAWK MV-4000 output signal to an external strobe controller, follow the diagram as shown below. Set the trigger to “falling edge”.

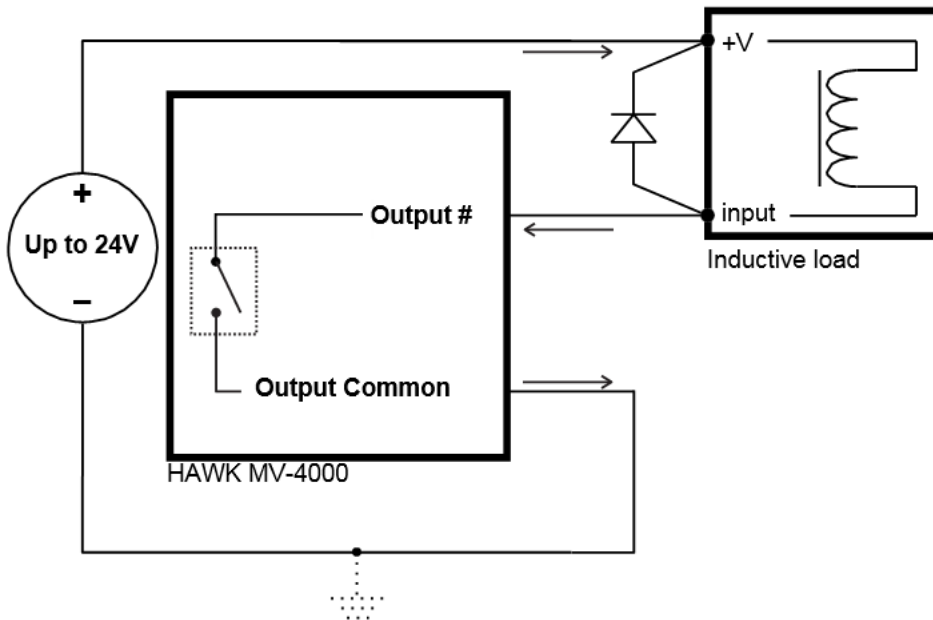


Chapter 2 System Components

Connecting an Output Signal to an Inductive Load Input

To connect a HAWK MV-4000 output signal to an inductive load input, follow the diagram as shown below.

An inductive load device, such as a traditional relay, requires that you use a flyback diode to protect HAWK MV-4000 from over and under-voltage, as shown below. This diode should be connected as close as possible to the input and voltage source of your inductive load device.



----- Optional because the output signals are optically isolated.
(Equivalent circuit only.)

Inputs

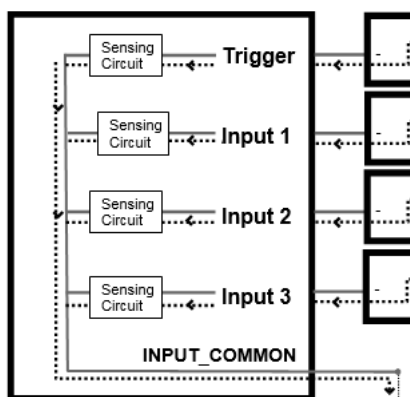
Connecting Devices to the Input Signals

HAWK MV-4000 input signals can be interfaced with a wide variety of devices (such as proximity detectors). The HAWK MV-4000 input signals only detect when current flows between their Input pin and Input Common pin. As such, an input signal must be connected to a device that controls the flow of current. When current is detected, the signal is reported as on; otherwise, it is reported as off. For information on the electrical specifications of the on and off voltage levels, see the Electrical specifications section, in Appendix C: General Specifications.

Each of the four available input signals has one dedicated pin (Trigger, Input 1, Input 2 and Input 3) and shares its other pin (Input Common) with the other input signals.

You can connect the input signals in a sinking or sourcing configuration. Since the input signals share a common pin, they must all be in a sinking configuration or all in a sourcing configuration. The exact connection between the input signal, the connected device, and the power source depends entirely on the type of device to which you connect. You should essentially connect your device respecting the following:

HAWK MV-4000 Sinking device

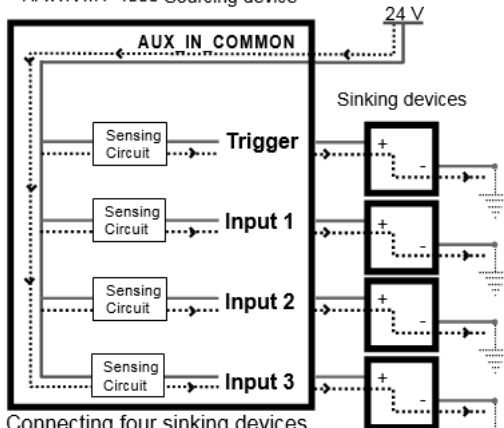


Connecting four sourcing devices to the input signal (NPN sinking)

(Equivalent circuit only.)

Sourcing devices

HAWK MV-4000 Sourcing device



Connecting four sinking devices to the input signal (PNP sourcing)

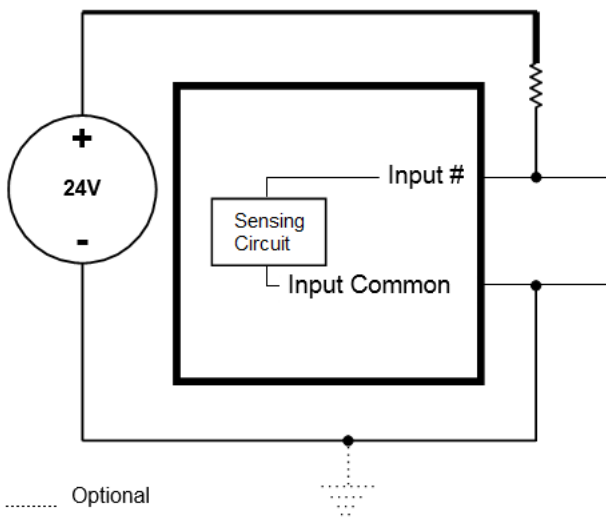
Chapter 2 System Components

Pull-Up Circuitry

In some cases, you must add pull-up circuitry to connect an output device to an input signal; specifically, you must attach an external pull-up resistor between the voltage source and the Input pin.

This is required when you connect the Input Common pin to the electrical return path and the third-party output device is in a sinking configuration. In this case, select a resistor value that will not overcurrent the output device and instead provide just enough current and voltage to your HAWK MV-4000 input signals, according to the electrical specifications subsection in Appendix C: General Specifications. Note that you should use a resistor with an appropriate power rating for your circuit.

Connection required if using external pullup circuitry

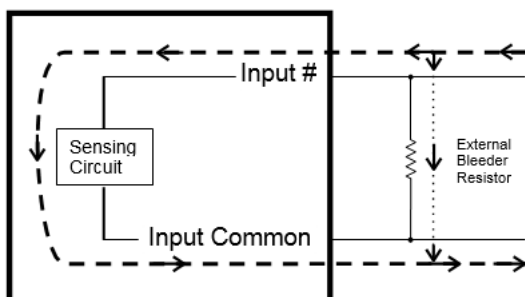


..... Optional

(Equivalent circuit only.)

Bleeding Resistor

By default, if properly configured, the current should flow from the Input pin to the Input Common pin (when connected to a sourcing device), or from the Input Common pin to the Input pin (when connected to a sinking device). In some cases, the amount of current going through the sensing circuit is insufficient for the connected output device to match its minimum current requirement when the device is in an on or off-state, depending on the configuration of the circuit. To boost the flowing current, connect a 2.2 kOhm external bleeder resistor between the Input and Input Common pins. For example:



(Equivalent circuit only.)

About the Connections in the Following Subsections

The following subsections detail how to connect the most common third-party devices to the HAWK MV-4000 input signals.

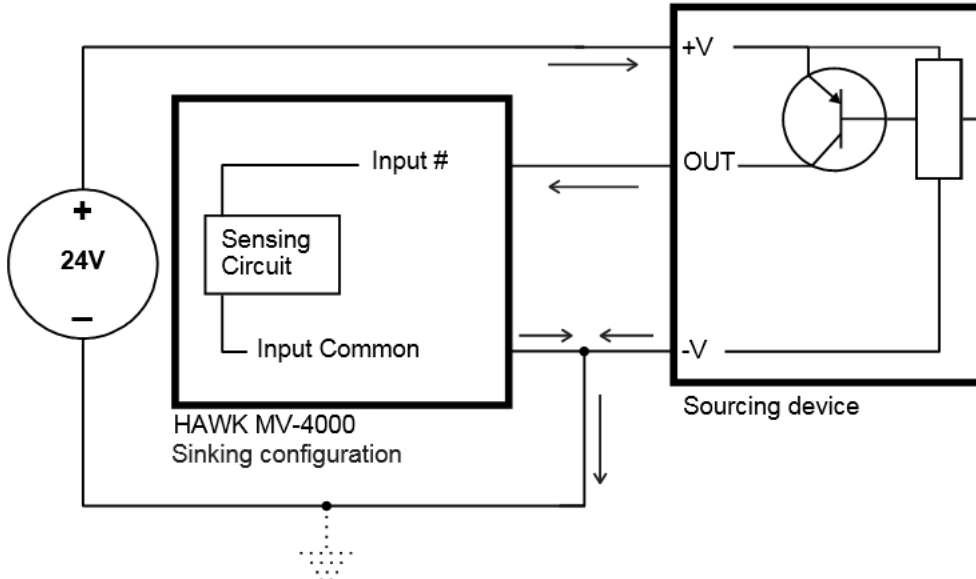
Note that HAWK MV-4000 input signals are optically isolated. Ground is only shown in the following subsections for reference, in case you need to reference your return path to ground.

Power, as depicted in the following diagrams, represents a nominal voltage of 24 V (+/- 10%). For minimum and maximum voltage requirements, refer to the electrical specification of the optoisolated input signals, in the Electrical specifications subsection in Appendix C: General Specifications.

Chapter 2 System Components

Connecting a Sourcing Output Device to an Input Signal

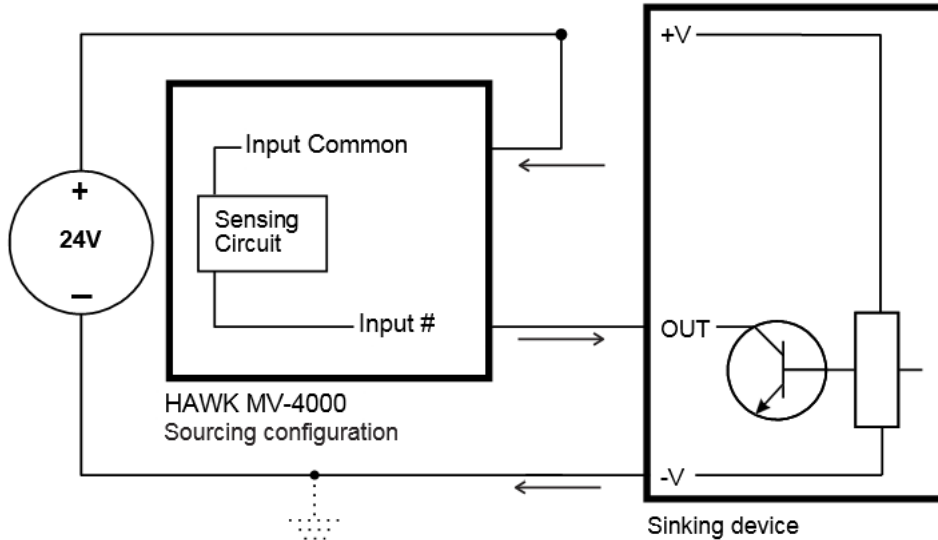
Connect a sourcing output device to HAWK MV-4000 input signal, as shown below.



..... Optional because the output signals are optically isolated.
(Equivalent circuit only.)

Connecting a Sinking Output Device to an Input Signal

Connect a sinking output device to a HAWK MV-4000 input signal, as shown below.



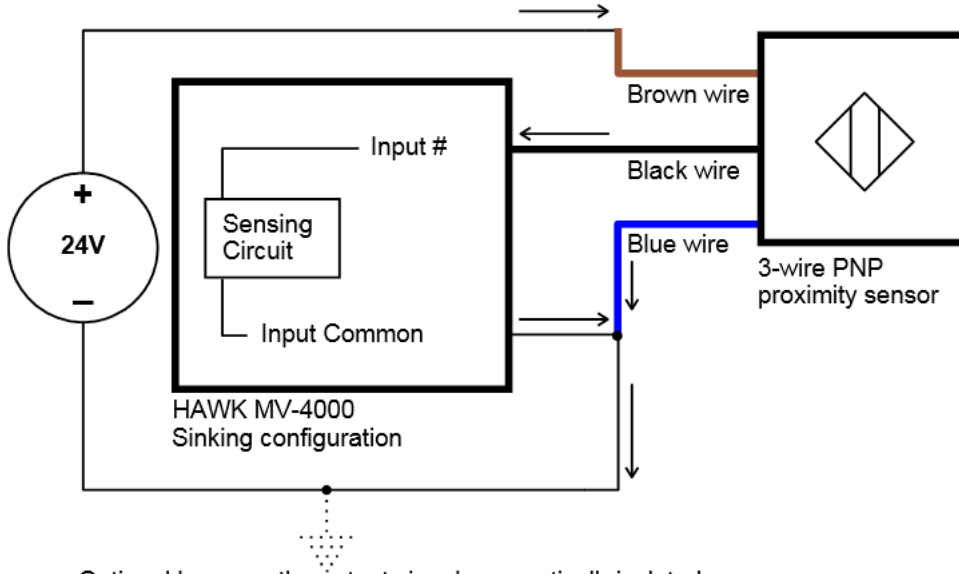
..... Optional because the output signals are optically isolated.

(Equivalent circuit only.)

Chapter 2 System Components

Connecting a 3-Wire PNP Proximity Sensor to an Input Signal

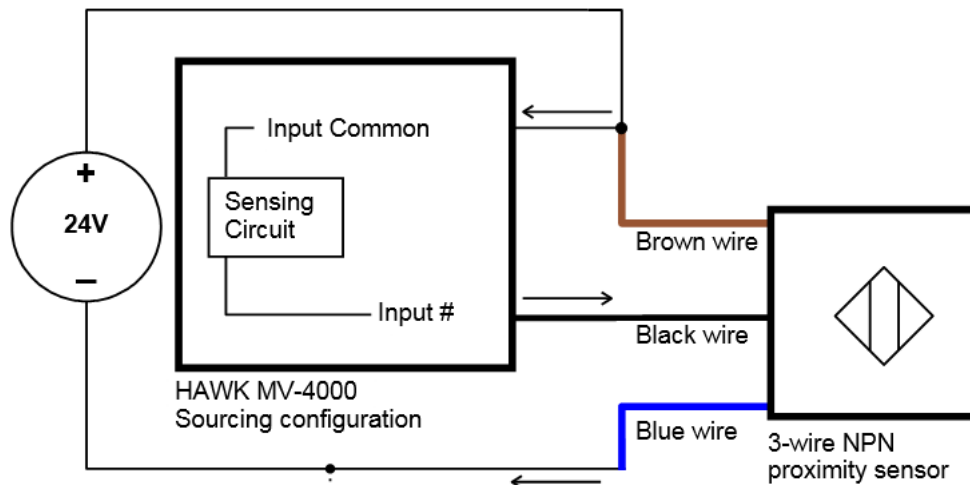
Connect a 3-wire PNP proximity sensor to a HAWK MV-4000 input signal, as shown below.



..... Optional because the output signals are optically isolated.
(Equivalent circuit only.)

Connecting a 3-Wire NPN Proximity Sensor to an Input Signal

Connect a 3-Wire NPN proximity sensor to a HAWK MV-4000 input signal, as shown below.



..... Optional because the output signals are optically isolated.

(Equivalent circuit only.)

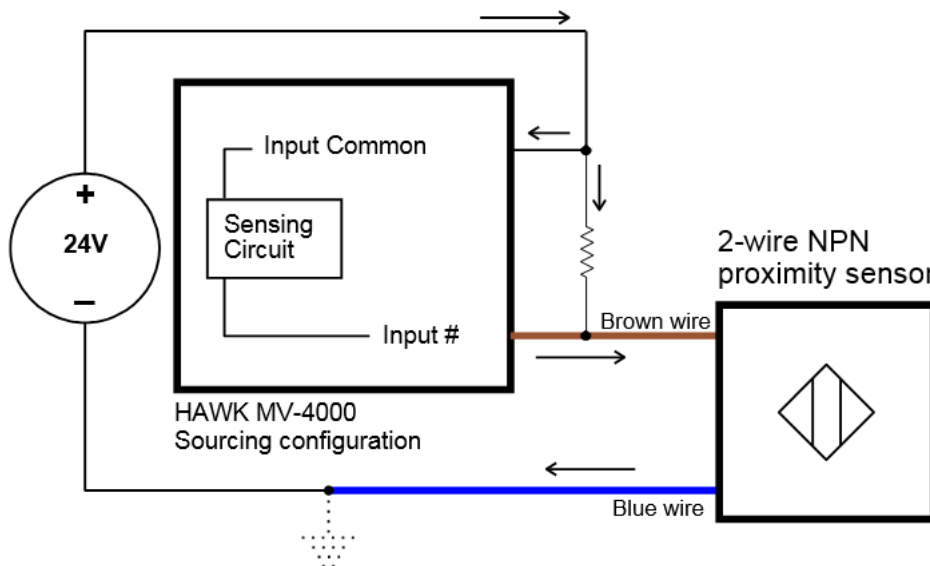
Chapter 2 System Components

Connecting a 2-Wire Proximity Sensor to an Input Signal

You can connect a 2-wire proximity sensor to a HAWK MV-4000 input signal in either a sourcing or sinking configuration (that is, on a positive or negative power wire). Note that in both cases, you will need to install an external bleeder resistor, to ensure that a minimum amount of current flows into the proximity sensor in its on-state and in its off-state.

For the input signal to source the current (that is, to connect an input signal on a positive power wire), connect the 2-wire device to the input signal as shown below.

You must also install an external bleeder resistor between the Input Common pin and brown wire of the proximity sensor.



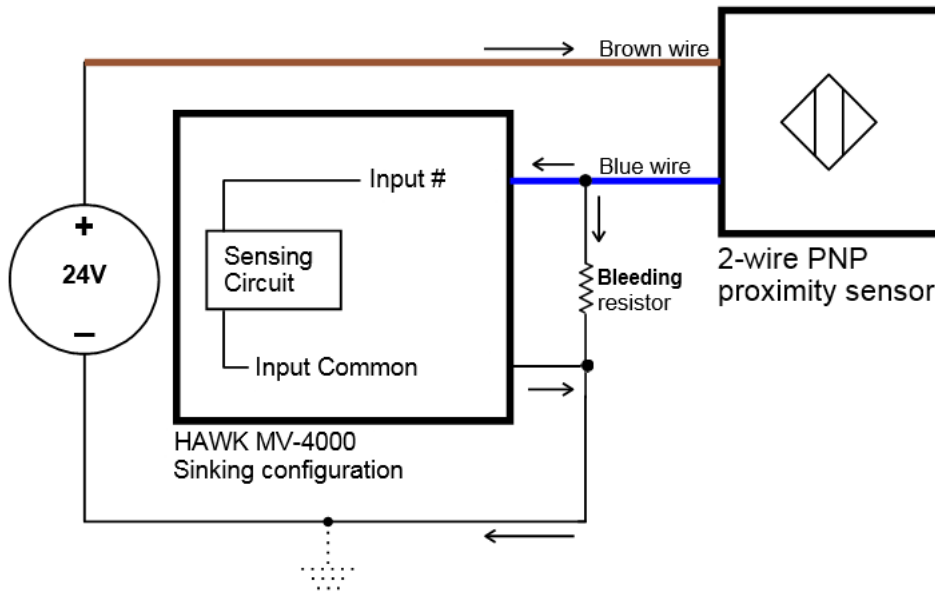
..... Optional because the output signals are optically isolated.

(Equivalent circuit only.)

The bleeder resistor's value should guarantee that the minimal required current is provided to the connected sensor (the third-party device). For details regarding the sensor's minimum current requirements, refer to its documentation. Note that you should use a bleeder resistor with an appropriate power rating for your circuit.

Note: You should use a resistor with an appropriate power rating for your circuit.

For the input signal to sink the current, connect the 2-wire device to input signal as shown below. Install the external bleeder resistor between the blue wire of the proximity sensor and the Input Common pin.

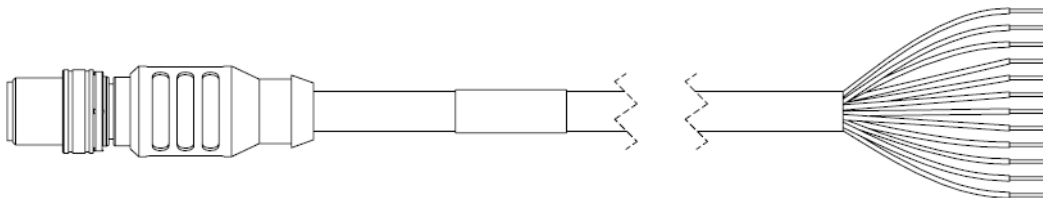


..... Optional because the output signals are optically isolated.
(Equivalent circuit only.)

Chapter 2 System Components

Input/Output Wiring Using Flying Lead Cable 61-9000151-01

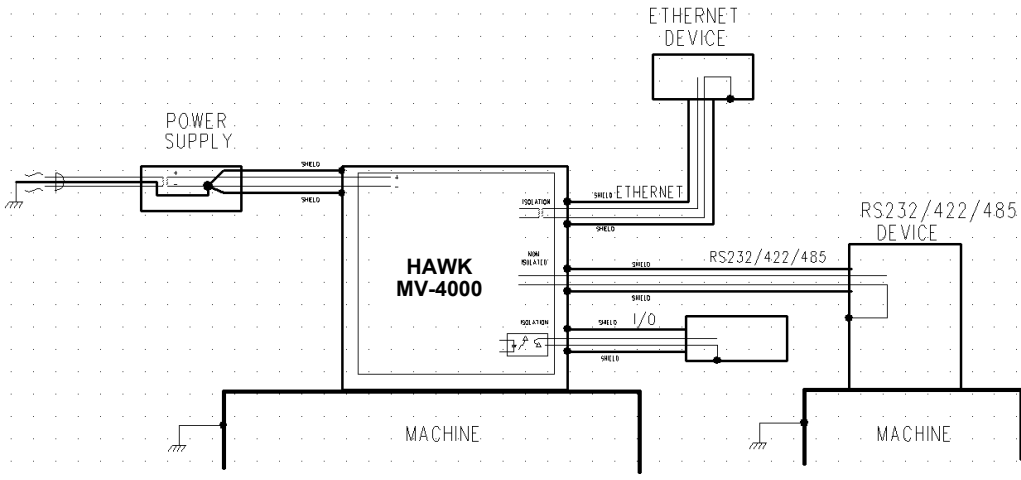
Important: This cable is connected directly to the camera connector.



M12 to Flying Leads Cable, 3 m – 61-9000151-01		
<i>Pin</i>	<i>Signal</i>	<i>Wire Color</i>
1	Output Common	Red/Blue
2	Analog Output	Black
3	Output 3	Pink
4	Power	Brown
5	Trigger	White
6	Input Common	Red
7	Input 2	Green
8	Input 3	Violet
9	Input 1	Yellow
10	Output 1	Gray
11	Ground	Blue
12	Output 2	Gray / Pink

Ground and Shield Considerations

Proper grounding is necessary for operator safety, noise reduction, and the protection of equipment from voltage transients. Buildings, including any steelwork, all circuits, and all junction boxes must be grounded directly to an earth ground in compliance with local and national electrical codes.



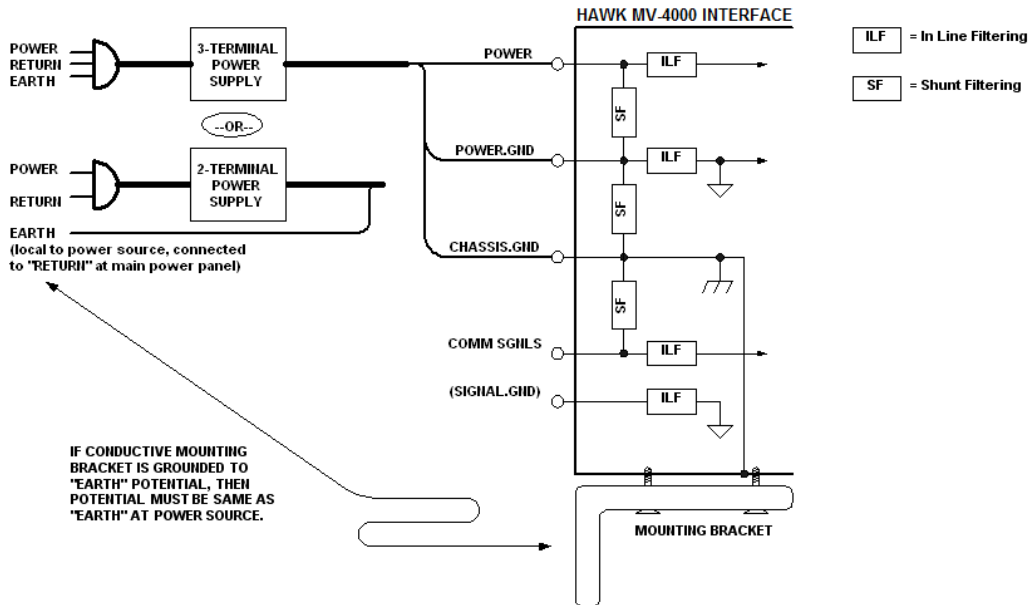
An earth ground is provided through the cable shields and chassis of the camera.

Ground Loops

Ground loops (signal degradation due to different ground potentials in communicating devices) can be eliminated or minimized by ensuring that both the host, imager, and their power supplies are connected to a common earth ground.

Chapter 2 System Components

Expected Power and Ground Connections for Proper Operation



Grounding Notes

- Ensure that mounting bracket "Earth" is at the same potential as power source "Earth".
- Supply "Return" and "Earth" ground must be stable, low-impedance reference points.
- "2-Terminal Power Supply" must still provide an "Earth" connection to the imager.
- "Signal Ground" can be used for communications and/or discrete signal ground reference. It must **not** be used as Power Ground or Earth Ground.

Electrical and I/O Specifications

HAWK MV-4000-03, -03C, -13, -13C, -20, -20C, -50, -50C		
Operating voltage for the HAWK MV-4000 under testing conditions		24 V
Rated current		600 mA
Operating voltage tolerance		± 10%
I/O Specifications		
Optoisolated Output Signals	Operating Voltage	24 V (26 V abs. max.)
	Sink Current	50 mA max.
	Maximum Leakage Current	1 mA@ 24 V
		1 mA@ 26 V
	ON Voltage	0.4 V @ 2 mA
		1.1 V @ 25 mA
		1.5V @ 50 mA
	PTC ^a Fuse Max. Time-to-Trip	1 sec @ 0.5 A
OFF-to-ON Response	2 ms to reach 4 V ^b	
ON-to-OFF Response	50 ms to reach 11 V ^c	
Optoisolated Input Signals	Operating Voltage	24 V (26 V abs. max.)
	Input Current (Sink or Source)	3.5 mA max. ^d , 1 mA min. ^e
	ON Voltage Level	> 11 V ^f
	OFF Voltage Level	< 4 V
	OFF-to-ON Response	6 ms
	ON-to-OFF Response	80 ms
0-10 V Analog Control Output Signal	Non-isolated. Supports Advanced Illumination ICS3 (inline control system) lighting devices. Note that the 0-10 V is intended for reference voltage only (< 1 mA).	
Varioptic Caspian C-39N0-160-I2C or C-39N0-250-I2C Liquid Lens		
Typical	Supplied Voltage	5 V
	Rated Current	50 mA

- The PTC is an automatically resetting fuse.
- This occurred under the following condition: output pulled to 24 V using 1 kW.
- Regardless of whether the signal is sinking or sourcing, this measurement is the same.
- Maximum input current at max. ON voltage. The connected device must not limit the current to a value lower than this.
- Minimum input current at min. ON voltage. Can be used to calculate bleeding resistor needed for 2-wire proximity sensor.
- Recommended > 12 V when using HAWK MV-4000 breakout board.

Environmental Specifications

- For indoor use only.
- Maximum altitude: 2,000 meters
- Operating temperature: 0° to 50° C (32° F to 122° F)¹
- Ventilation requirements: Natural convection
- Pollution degree: 2 environment
- Over-voltage category: I
- Ingress protection rating: IP67

1. Under current testing conditions.

Status Indicators

The base of the HAWK MV-4000 Smart Camera has multiple LEDs that indicate different power, status, user, and communication states.



The HAWK MV-4000 LEDs are:

- **POWER and USER.** The colors of these two LEDs change as your HAWK MV-4000 boots up.
- **Status.** This LED shows the general activity of your HAWK MV-4000.
- **100/1G.** This LED shows the connection status of your HAWK MV-4000.

The **POWER** and **USER** LEDs typically display one of the following sets of colors:

LED Color		Description
Power	User	
Off	Off	HAWK MV-4000 has no power.
Red	Red	Power is available but the HAWK MV-4000 is not responding.
Red	Orange	Memory initialization error detected.
Orange	Orange/Red Blinking	Thermal trip detected.
Orange	Orange	BIOS execution in progress.
Orange	Green	BIOS execution completing.
Green	Off	AutoVISION is now in control of the camera.
Green	Orange	Operating system startup in progress.
Green	Green	Camera ready.
Green	Orange/Off Blinking	Overheat detected. Temperature is above throttle temperature limit.

Adding a HAWK MV-4000 to a Network

Corporate-wide networks typically use DHCP servers to assign each connected device an IP address. If your HAWK MV-4000 is still in its factory-configured state, and your network uses a DHCP server, no configuration is required to use your HAWK MV-4000 on your network.

Default Device Name

By default, HAWK MV-4000 comes factory configured with a unique device name. The device is preprogrammed with a Class C static IP address: 192.168.0.100. This name is used when connecting to a network and is of the form:

HAWK329999

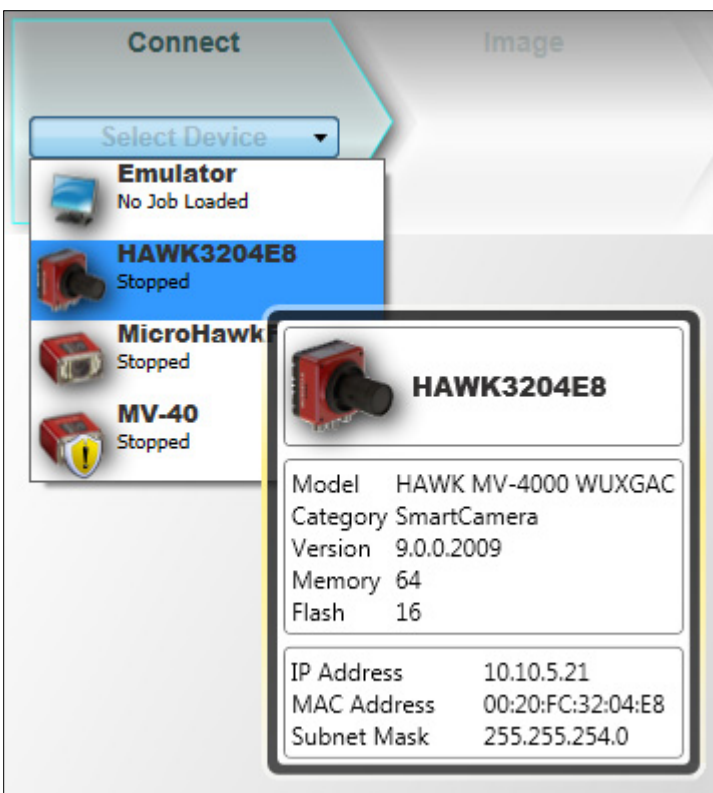
The last four hexadecimal digits of your HAWK MV-4000's MAC address are used as the numeric part of the device name. Both the network name of your HAWK MV-4000 and its MAC address are written on a sticker on your HAWK MV-4000. Note that, when dealing with the Windows version, the device name is also known as the computer name.

Setting Up a Job in AutoVISION

AutoVISION is a critical component of the HAWK MV-4000's functionality. Designed for use with the HAWK MV-4000, AutoVISION provides an intuitive interface, step-by-step configuration, and a library of presets that allow easy setup and deployment. For more complex vision applications, the system can be upgraded from AutoVISION to Visionscape.

1. Mount and connect the HAWK MV-4000 hardware.
2. Plug in the power supply.
3. Select your HAWK MV-4000 in the AutoVISION Connect view, create a job, and adjust camera settings.

AutoVISION's **Connect** view allows you to select your device and configure its settings, and to create a new job. The **Select Device** dropdown menu provides a list of available devices. Hover the mouse over a device to see its details.



Chapter 2 System Components

Click the lock icon to take control of the camera. When you have control of the camera, the Modify button will appear beneath the camera settings. Click the **Modify** button to adjust camera settings.

Important: When modifying camera settings, you will need to enter a username and password for the camera if a password has been defined.

Note: The HAWK MV-4000's default IP address is: **192.168.AA.BB** where **AA.BB** are the last 2 octets in decimal of the device MAC Address with subnet Class B 255.255.0.0. Set your PC to the same subnet (192.168.0.1, for example). To access the camera's "health status", enter the address **http://[your camera name]:8088** in a browser, where **[your camera name]** is the name of the device – **HAWK3204E8**, for example.

Modify camera settings in the **Details** area at the left of the **Connect** view. **Create**, **Load**, or **Upload** a job using the buttons in the center of the **Connect** view.

Model	HAWK MV-4000 WUXGAC
Category	SmartCamera
Version	9.0.0.2009
Memory	64 MB
Flash	16 MB
IP Address	10.10.5.21
MAC Address	00:20:FC:32:04:E8
Subnet Mask	255.255.254.0
Gateway	0.0.0.0
DHCP	Enabled
Number of serial TCP ports	4
Starting serial TCP Port	49211
Industrial Protocol	EtherNet/IP
Serial Port	COM3
Baud Rate	115200
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None
Auto Button	False

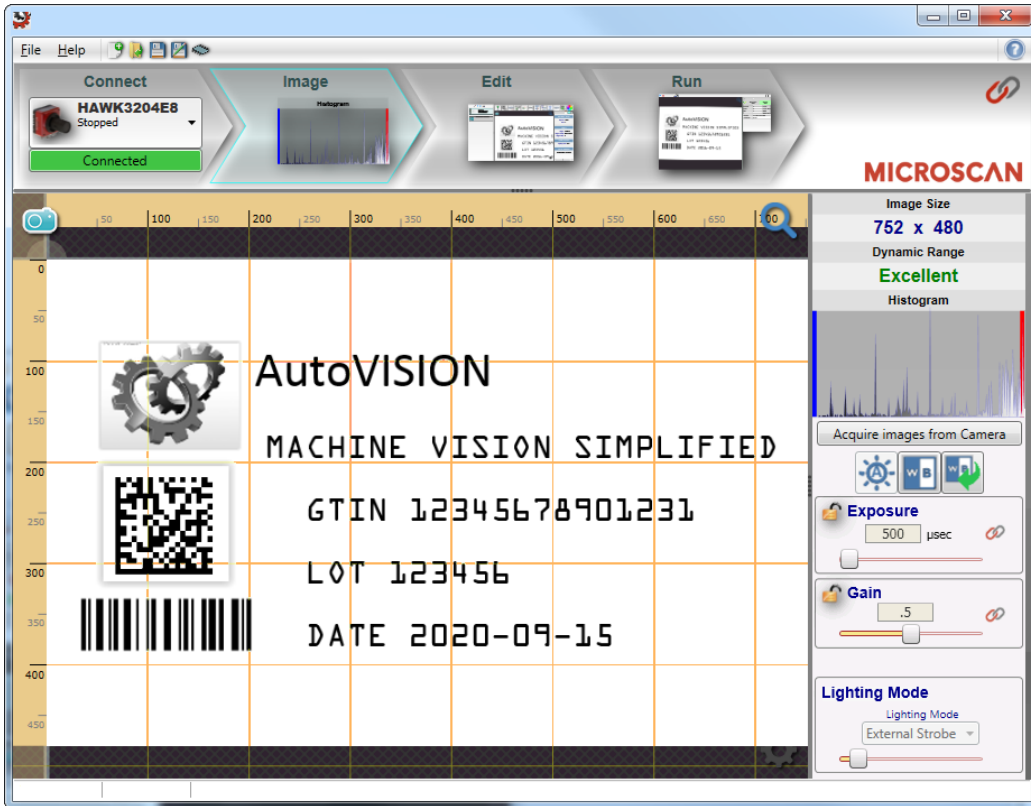
Modify

Create a New Job

Load a Job

Upload Job From Device

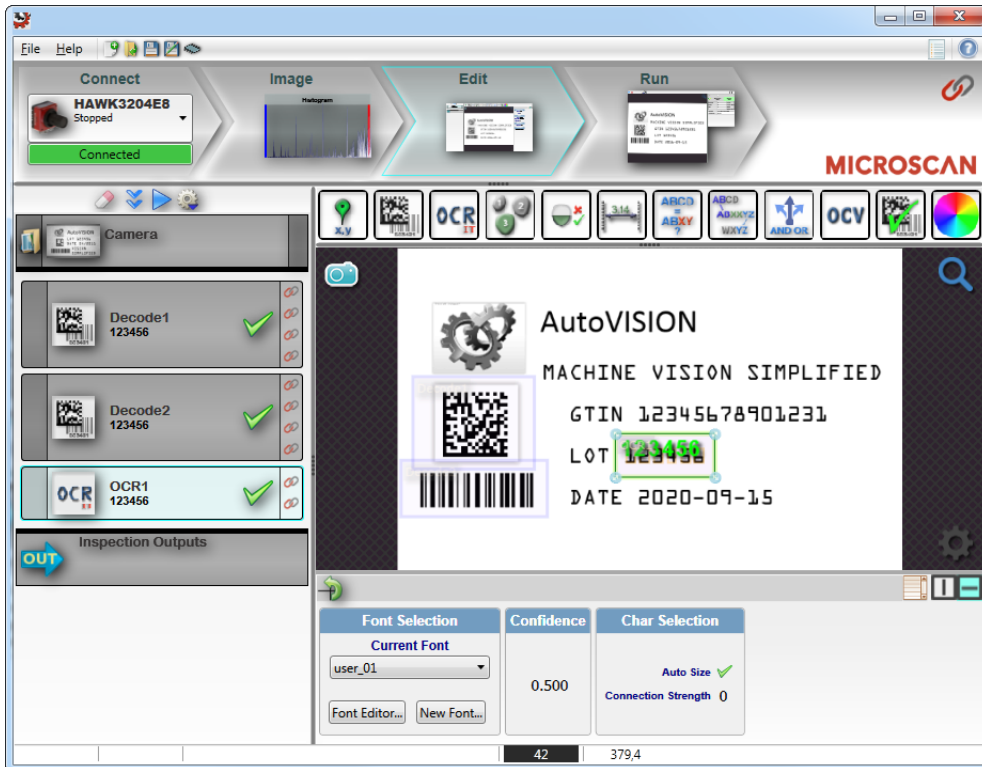
Once you have selected your camera, adjusted its settings, and created a new job, you will move to the **Image** view. This view allows you to **Auto Calibrate** the camera, and to manually adjust the camera's **Exposure**, **Gain**, and **Focus**, and also to set the **Lighting Mode** (**On**, **Off**, or **Strobe**).



Chapter 2 System Components

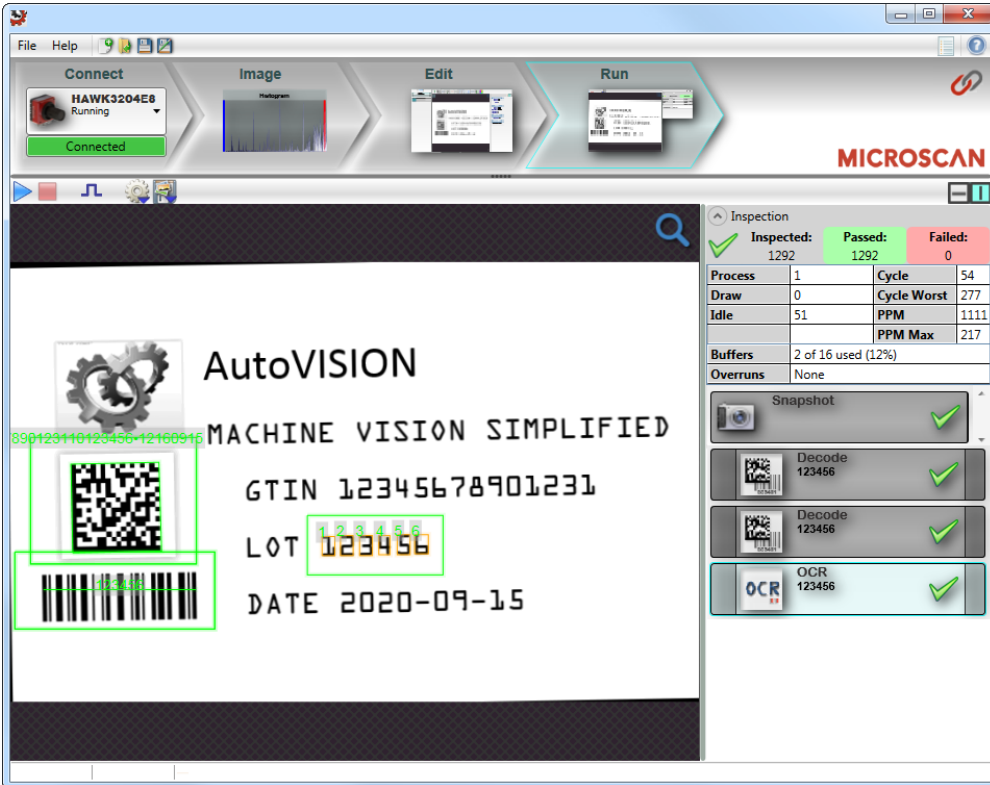
4. Edit the Job in AutoVISION.

After you have created a new job, loaded a job from your PC, or uploaded a job from the camera, you will proceed to the **Edit** view to refine your machine vision job. The Camera parameters below the captured image allow you to set Gain, Exposure, Focus, Trigger, and Lighting. Inspection Outputs options allow you to connect your job to the outside world. This is also the view where you can add multiple tools to the job. The tool icons are located above the main view area.



5. Run the Job in AutoVISION.

Going to the **Run** view will automatically download your job to the camera and start it running.



6. Save the Job.

Click the **Save to Camera** icon on the File menu bar to save the job to the camera.



Trigger Debounce

Trigger Debounce is the ability of the system to accommodate switching noise on a trigger state change – a common issue with relays that have some intermittent contact while engaging.

Trigger overruns (when the vision system is triggered faster than the device can process) can sometimes be avoided by increasing the “debounce” time in the camera definition file located in the C:\Microscan\Vscape\Drivers\CamDefs directory.

The IO Line Debounce High Time and IO Line Debounce Low Time can be added to the file as in the example below. Debounce time is 100 μ s.

The minimum value for "IO Line Debounce Time" is 0 μ s, which disables software debounce altogether. The maximum value is 268432 μ s.

Standard debounce as described for the trigger:

```
IO Line Debounce High Time 100 //usecs (valid range: 0 to 268432 such that  
debounce time * 1000 must be divisible by 16)
```

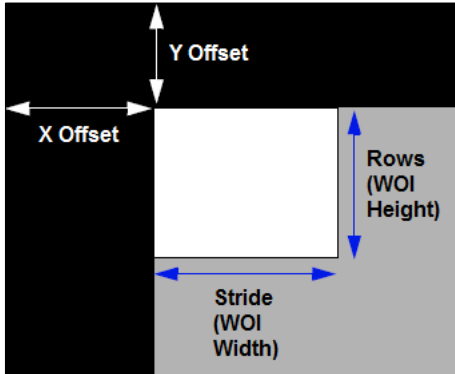
```
IO Line Debounce Low Time 100 //usecs (valid range: 0 to 268432 such that  
debounce time * 1000 must be divisible by 16)
```

Camera Definition File Example

```
// Camera Definition File
// Version: 1.10
Camera Name           HAWK MV-4000 752x480 CMOS // Name
Displayed in Camdef Selection Dialog
Digitizer Type       4000 // Number
associated with HAWK MV-4000 CMOS Camera
Stride               752 // Image Width
Rows                480 // Image Height
X Offset             0 // Image X Offset
Y Offset             0 // Image Y Offset
Bits Per Pixel       8 // Bits that represent Pixel Value
Pixel Type           0 // Type of Pixel:
MONOCHROME=0, COLOR_RGB=1, COLOR_BGR=2, COLOR_BAYGR8=3,
COLOR_BAYRG8=4, COLOR_BAYGB8=5, COLOR_BAYBG8=6, COLOR_HSI=7
Image Structure1     // Pixel Organization: Packed=1,
TwoPlanes = 2, ThreePlanes = 3
Async Control        1 // Controllable shutter time.
Usually using a pulse width specified in usecs
Usecs Per Frame      16667 // Fastest time to acquire a
frame: 60 FPS for HAWK MV-4000 CMOS Camera // -1 Disables timeout
feature
// IO Configuration
GPIO Edit Mask       0x0000
GPIO Defaults        0x0001 // 1 General Purpose Input 3
General Purpose Outputs
GPIO Count           4
GPIO Inputs          1
GPIO Outputs         3
Sensors              1 // One input
dedicated to Trigger signal
Strobes              0
Virtual IO           2048
IO Line Debounce High Time 100 //usecs (valid range: 0 to 268432 such that
debounce time * 1000 must be divisible by 16)
IO Line Debounce Low Time 100 //usecs (valid range: 0 to 268432 such that
debounce time * 1000 must be divisible by 16)
Custom External Strobe Delay Time 0 //usecs
// Focus & Photometry Ranges
Gain Dflt            20
Gain Min             0
Gain Max             100 // 0 to 100%
Exp Dflt             400
Exp Min              25
Exp Max              100000 // 1/10 to 1/40,000
Focus Dflt           400
Focus Min            100
Focus Max            4000 // 1 to 40 inches
// Lens Configuration
C-Mount              0 // 0 = false, 1 = true
```

Setting Up Partial Scan

Sensor WOI Limitations



The combination of **X Offset** and **Y Offset** determines the location of the **top left corner** of the window of interest (WOI).

Stride determines the width of the WOI.

Rows determines the height of the WOI.

```
// Camera Definition File
// Version: 1.04

Camera Name      HAWK MV-4000 1280x1024 // Name Displayed in Camdef Selection Dialog
Digitizer Type   7001 // Number associated with HAWK MV-4000 SXGA

Stride           1280 // Image Width
Rows             1024 // Image Height
X Offset         0 // Image X Offset
Y Offset         0 // Image Y Offset
Bits Per Pixel   8 // Bits that represent Pixel Value
Pixel Type       0 // Type of Pixel: MONOCHROME=0, COLOR_RGB=1, COLOR_BGR=2, COLOR_BAYGR8=3
Image Structure  1 // Pixel Organization: Packed=1, TwoPlanes = 2, ThreePlanes = 3
```

All the highlighted fields shown in the example above **must** be changed when creating a partial scan camdef. The file name must also be changed, showing the WOI size in the name.

- **X Offset:** This value must be a multiple of 32.
- **Y Offset:** This value must be a multiple of 2.
- **Stride:** This value must be a multiple of 32.
- **Rows:** This value must be a multiple of 2.

Minimum size X of 32. Maximum value to whole sensor size.

Minimum size Y of 2. Maximum value to whole sensor size.

Lighting

This section describes HAWK MV-4000 Smart Camera illumination options.

Illumination

The HAWK MV-4000 Smart Camera is a C-Mount camera and is used with external lighting. Any lighting can be used, but the HAWK MV-4000 comes with accessories and cables that allow it to connect directly with Omron Microscan's NERLITE Smart Series lights. Software control allows the lights to be operated in multiple modes: Off, Continuous, and Strobe.

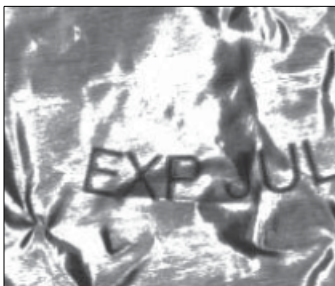
Machine Vision Lighting Principles

Proper lighting is critical to the success of a machine vision application. Depending on the requirements of your application, you may need external lighting from Omron Microscan's NERLITE family of machine vision lighting products.

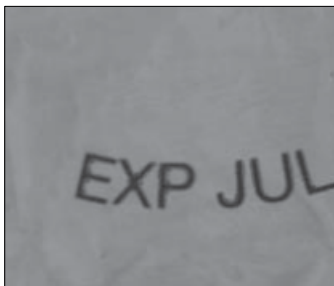
Consider the following when setting up your application:

- Is the surface of the object flat, slightly bumpy, or very bumpy?
- Is the surface matte or shiny?
- Is the object curved or flat?
- What is the color of the object or area being inspected?
- Is the object moving or stationary?

Machine vision lighting should maximize contrast of the areas or features being inspected while minimizing the contrast of everything else.



Before correct lighting



**After correct lighting with a
NERLITE Illuminator**

For more information about machine vision lighting, visit:

<http://www.microscan.com/en-us/resources/know-your-tech/microscan-lighting-selector>.

External Illumination Control and Wiring

The HAWK MV-4000 supports external lighting with Omron Microscan's NERLITE Smart Series lights. The diagrams below demonstrate how the camera and light can be configured with the QX-1 interface device and light kit Y-cables. The light is controlled using the lighting control in AutoVISION Software's camera configuration settings.

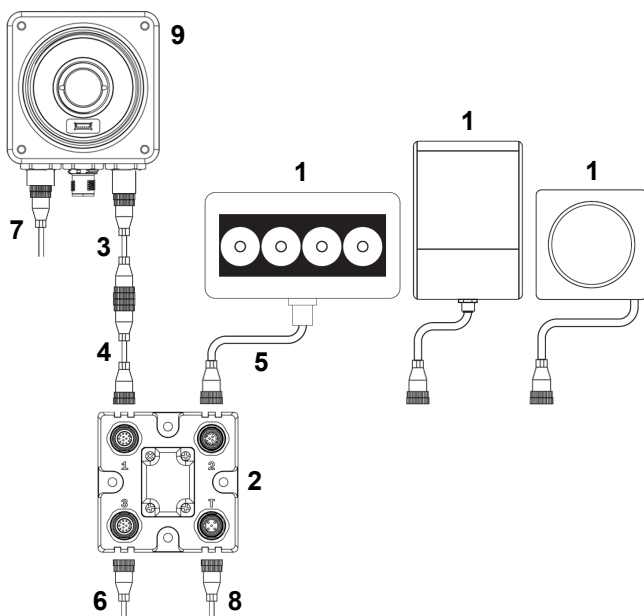
HAWK MV-4000 and Smart Series Light Configuration: QX-1

Item	Description	Part Number
1	Smart Series Light	NER-011660XXXG
2	QX-1 Interface Device	98-000103-02
3	Cable, Adapter, HAWK MV-4000 to QX-1	61-9000132-01
4	Cordset, Common, M12 12-Pin Socket to M12 12-Pin Plug, 1 m	61-000162-02
or	Cordset, Common, M12 12-Pin Socket to M12 12-Pin Plug, 3 m	61-000148-02
5	Cable, Power, Smart Series to QX-1	61-000204-01
6	Power Supply, 100-240VAC, +24VDC, M12 12-Pin Socket	97-000012-01
7	Cordset, Host, Ethernet, M12 8-Pin Plug to RJ45, 1 m	61-9000134-0X
8	Photo Sensor, M12 4-Pin Plug, NPN, Dark On, 2 m	99-000020-02
9	HAWK MV-4000 Smart Camera	

In **Strobe** mode, the external illuminator is strobed with the exposure of the camera to maximize light for the short exposure times needed in dynamic applications.

ON/OFF mode allows the external illuminator to be enabled and disabled using the HAWK MV-4000's I/O.

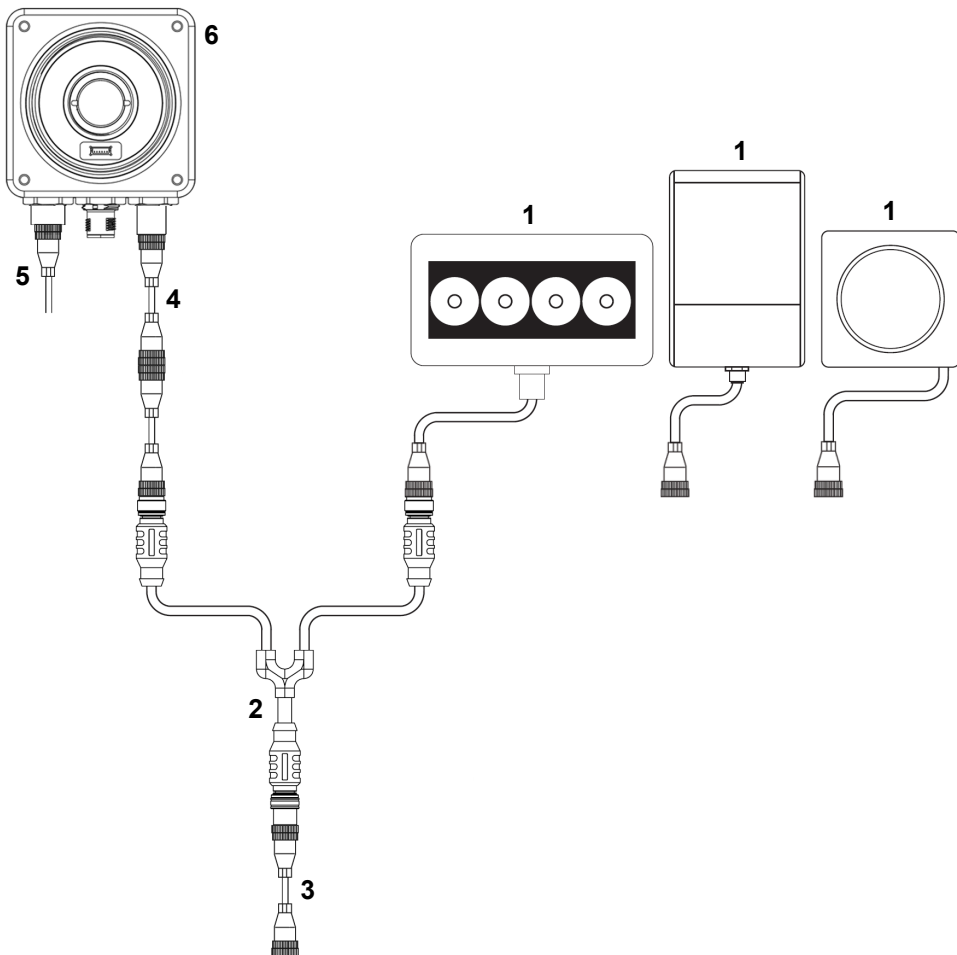
Control is achieved using **Output 3** on the camera.



Chapter 3 Lighting

HAWK MV-4000 and Smart Series Light Configuration: Y-Cable

Item	Description	Part Number
1	Smart Series Light	NER-011660XXXG
2	Assembly, Cable, QX-1 to Smart Series and Camera, Power	61-9000135-01
or	Assembly, Cable, QX-1 to Smart Series and Camera, On/Off	61-9000136-01
or	Assembly, Cable, QX-1 to Smart Series and Camera, Strobe	61-9000137-01
3	Cordset, Common, M12 12-Pin Socket to M12 12-Pin Plug, 1 m	61-000162-02
or	Cordset, Common, M12 12-Pin Socket to M12 12-Pin Plug, 3 m	61-000148-02
4	Cable, Adapter, HAWK MV-4000 to QX-1	61-9000132-01
5	Cordset, Host, Ethernet, M12 8-Pin Plug to RJ45, 1 m	61-000134-0X
6	HAWK MV-4000 Smart Camera	



A**A****APPENDIX A**

Selecting a Lens

This section contains information about choosing the best lens to suit your application.

Appendix A Selecting a Lens

Lens Selection

This section includes information on lens selection, an important consideration when building your application. The HAWK MV-4000 comes accessorized with a variety of lens types and sizes to aid you in solving your application challenges.

Choosing the Correct Lens Size for the Application

The primary consideration during lens selection is that the **focal length** of the selected lens meets your application's requirements. The choice of focal length, when combined with the **sensor size**, determines the **field of view** the camera will see at a given distance between the front of the camera lens and the object, which is called the **object distance**.

A simple formula can be used to compute any of the four parameters. The formula is:

$$\text{Sensor Size} / \text{Focal Length} = \text{Field of View} / \text{Object Distance}$$

Example: The application requirement is for a **75 mm** wide field of view at an object distance of **200 mm**, using the 1.3 MP sensor. What is the required focal length of the lens? Rearrange the equation as follows:

$$\text{Focal Length} = \text{Sensor Size} / \text{Field of View} \times \text{Object Distance}$$

$$\text{Focal Length} = 6.144 \text{ mm} / 75 \text{ mm} \times 200 \text{ mm} = 16.38 \text{ mm}$$

The closest lens to this in the price list is **16 mm**.

The sensor sizes needed for the calculation above depend on the model of your HAWK MV-4000 Smart Camera. The sensor sizes are listed below.

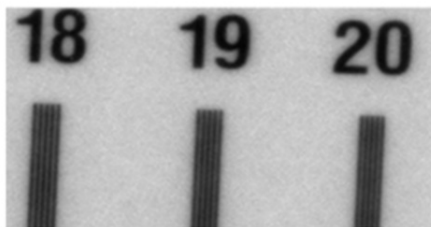
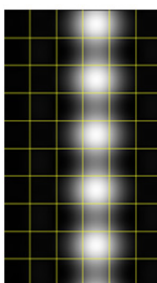
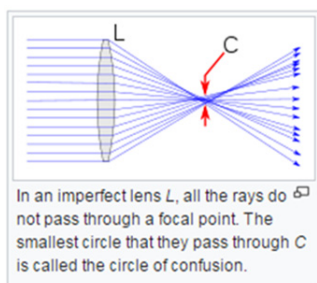
Model	Horizontal Sensor Size	Vertical Sensor Size
HAWK MV-4000-03, MV-4000-03C	3.072 mm	2.304 mm
HAWK MV-4000-13, MV-4000-13C	6.144 mm	4.915 mm
HAWK MV-4000-20, MV-4000-20C	9.216 mm	5.760 mm
HAWK MV-4000-50, MV-4000-50C	12.442 mm	9.830 mm

Choosing the Correct Lens Quality for the Application

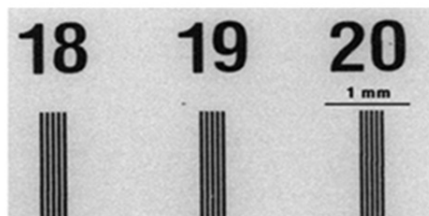
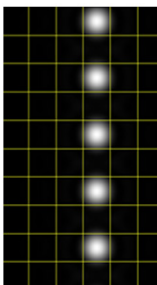
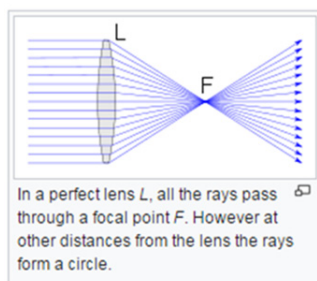
The secondary consideration during lens selection is lens quality. Not all lenses are created equal. Lenses are specified in combination with the sensor pixel size to which they are able to resolve.

The diagrams below illustrate this concept. A lower-quality, lower-cost lens will create some blur in the image, while a higher-quality, higher-cost lens will not. The choice of lens will depend on the application requirements.

The first of the diagrams below shows an image blur created by a lens not matched with the pixel size. The second of the two diagrams shows a crisp image created with a lens matched with the pixel size.



Blurred Image Created with a Lower-Quality, Lower-Cost Lens Not Matched to Pixel Size



Crisp Image Created with a Higher-Quality, Higher-Cost Lens Matched to Pixel Size

The HAWK MV-4000 sensors all have a pixel size of 4.8 microns.

The standard HAWK MV-4000 comes with 3 lens types:

- The first is a standard, low-cost lens for 5 to 7 micron pixels. This lens is adequate for most inspection and reading applications.
- The second lens type is for 3.45 micron pixels. This lens is appropriate for most gauging and code verification applications.
- The third lens type is also for 3.45 micron pixels, but is sized for the 1" sensor type used in the 5 MP sensor.

Appendix A Selecting a Lens

Lens Specifications

Part Number	Description	IP Cover	Aperture	TV Distortion (%)	Sensor	Closest Focus (mm)	Filter Thread	Pixel Size Rating
Standard Resolution Lens, 2/3" Sensor								
98-9000167-01	KIT, LENS, C-MOUNT, F1.2/6MM, 1.5MP, 2/3"	50 mm	1.2	-1.84	1/2"	100	M27 x 0.5	6.5 μ m
98-9000168-01	KIT, LENS, C-MOUNT, F1.4/9MM, 1.5MP, 2/3"	50 mm	1.4	-2	2/3"	100	M27 x 0.5	6.5 μ m
98-9000169-01	KIT, LENS, C-MOUNT, F1.4/12.5MM, 1.5MP, 2/3"	50 mm	1.4	-1.95	2/3"	100	M25.5 x 0.5	6.5 μ m
98-9000170-01	KIT, LENS, C-MOUNT, F1.4/16MM, 1.5MP, 2/3"	50 mm	1.4	-0.87	2/3"	100	M25.5 x 0.5	6.5 μ m
98-9000171-01	KIT, LENS, C-MOUNT, F1.4/25MM, 1.5MP, 2/3"	50 mm	1.4	-0.19	2/3"	150	M25.5 x 0.5	6.5 μ m
98-9000172-01	KIT, LENS, C-MOUNT, F1.6/35MM, 1.5MP, 2/3"	50 mm	1.6	0.1	2/3"	250	M25.5 x 0.5	6.5 μ m
High Resolution Lens 2/3" Sensor								
98-9000192-01	KIT, LENS, C-MOUNT, F1.9/6MM, 5MP, 2/3"	70 mm	1.9	-2.88	2/3"	100	M37.5 x 0.5	4 μ m
98-9000165-01	KIT, LENS, C-MOUNT, F1.6/8MM, 5MP, 2/3"	70 mm	1.6	-1.99	2/3"	100	M25.5 x 0.5	4 μ m
98-9000166-01	KIT, LENS, C-MOUNT, F1.6/12MM, 5MP, 2/3"	70 mm	1.6	-1.26	2/3"	100	M25.5 x 0.5	4 μ m
98-9000154-01	KIT, LENS, C-MOUNT, F1.6/16MM, 5MP, 2/3"	70 mm	1.6	-0.6	2/3"	100	M25.5 x 0.5	4 μ m
98-9000163-01	KIT, LENS, C-MOUNT, F1.9/35MM, 5MP, 2/3"	70 mm	1.9	0.1	2/3"	200	M25.5 x 0.5	4 μ m
98-9000164-01	KIT, LENS, C-MOUNT, F1.6/25MM, 5MP, 2/3"	70 mm	1.6	-0.07	2/3"	100	M25.5 x 0.5	4 μ m
High Resolution Lens, 1" Sensor								
98-9000174-01	KIT, LENS, C-MOUNT, F1.4/12.5MM, 9MP, 1"	No Cap	1.4	-0.39	1"	100	M40.5 x 0.5	3.5 μ m
98-9000175-01	KIT, LENS, C-MOUNT, F1.4/16MM, 9MP, 1"	No Cap	1.4	-0.458	1"	100	M40.5 x 0.5	3.5 μ m
98-9000176-01	KIT, LENS, C-MOUNT, F1.4/25MM, 9MP, 1"	No Cap	1.4	-0.037	1"	100	M40.5 x 0.5	3.5 μ m
98-9000177-01	KIT, LENS, C-MOUNT, F1.4/35MM, 9MP, 1"	No Cap	1.4	-0.286	1"	150	M40.5 x 0.5	3.5 μ m
Autofocus Lens								
98-9000178-01	KIT, LENS, LIQUID, C-MOUNT, F4/25MM, 2/3", I2C INTERFACE	50 mm	4.0		2/3"	120		
98-9000179-01	KIT, LENS, LIQUID, C-MOUNT, F2.8/16MM, 2/3", I2C INTERFACE	50 mm	2.8		2/3"	110		
IP Cover								
98-9000155-01	Kit, IP Cover, 50 mm							
98-9000156-01	Kit, IP Cover, 70 mm							

Cable Specifications

This section contains information about HAWK MV-4000 Smart Camera cables.

Note: Cable specifications are published for information only. Omron Microscan does not guarantee the performance or quality of cables provided by other suppliers.

Part Number	Description
61-9000132-01	Cable, Adapter, HAWK MV-4000 to QX-1
61-9000134-01	Cable, Ethernet, X-Code/RJ45 CAT 6A, 1 m
61-9000134-02	Cable, Ethernet, X-Code/RJ45 CAT 6A, 3 m
61-9000134-03	Cable, Ethernet, X-Code/RJ45 CAT 6A, 5 m
61-9000135-01	Cable, M12 to Smart Series and Camera, Power, 1 m
61-9000136-01	Cable, M12 to Smart Series and Camera, On/Off, 1 m
61-9000137-01	Cable, M12 to Smart Series and Camera, Strobe, 1 m
61-9000143-01	Cable, M12 to USB Socket, 1 m
61-9000147-01	Cable, M12 to VGA and USB Socket, 1 m
97-000012-01	Power Supply, M12 12-Pin Socket, 1.3 m
99-000020-02	Trigger, M12 4-Pin Plug, NPN, Dark On, 2 m

Appendix B Cable Specifications

HAWK MV-4000 Cables

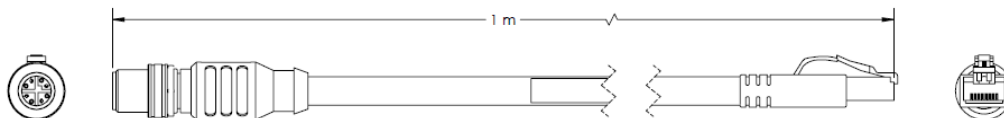
61-9000132-01 Cable, Adapter, HAWK MV-4000 to QX-1

The 61-9000132-01 Cable, Adapter, HAWK MV-4000 to QX-1 allows the HAWK MV-4000 to be connected to the QX-1 accessory and any Microhawk M12 accessory cables. The cable is directional and must be connected as labeled for proper function and to avoid potential damage to the camera.



61-9000134-0X Cable, Ethernet, X-Code/RJ45 CAT 6A, 1 m, 3 m, 5 m

The 61-9000134-01, -02, and -03 Cable, Ethernet, X-Code/RJ45 CAT 6A, 1m, 3m, 5m, respectively has an X-Code M12 Ethernet connector on one end and standard RJ45 on the other.



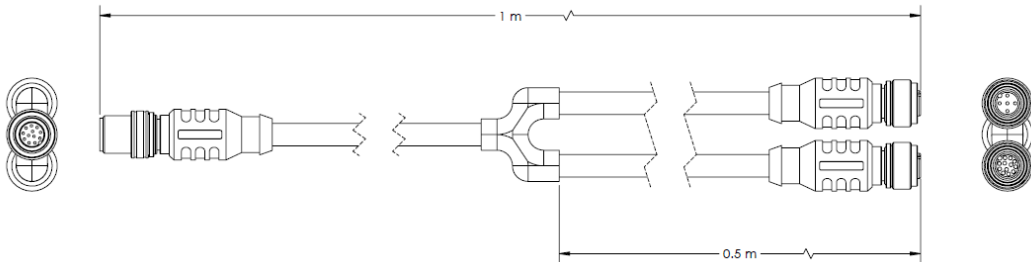
Appendix B Cable Specifications

M12-to-Smart Series and Camera Cables

There are three M12 to Smart Series and Camera cables which allow a light to be connected to the camera without the need of the QX-1:

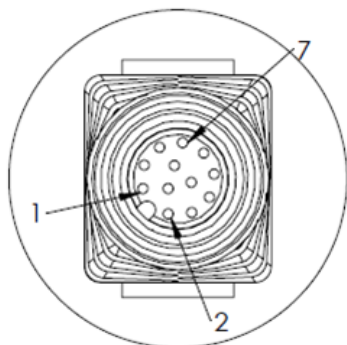
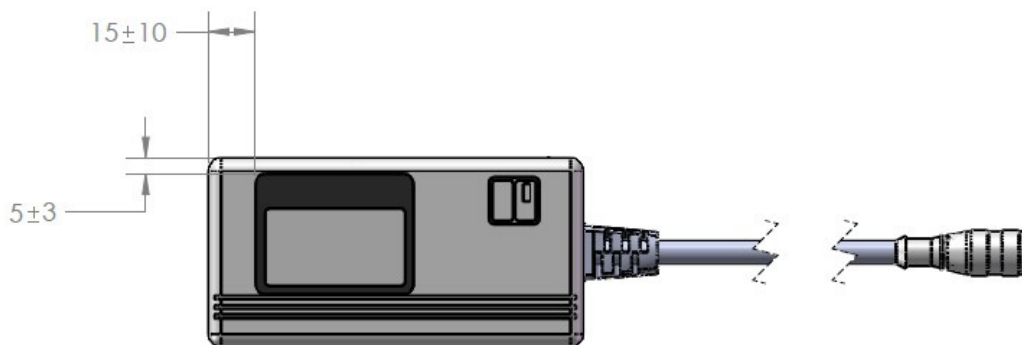
- 61-9000135-01 Cable, M12 to Smart Series and Camera, Power, 1 m
- 61-9000136-01 Cable, M12 to Smart Series and Camera, On/Off, 1 m
- 61-9000137-01 Cable, M12 to Smart Series and Camera, Strobe, 1 m

The M12 connector on the input side can then be connected directly to a flying leads cable or other control device.



97-00012-01 Power Supply, M12 12-Pin Socket, 1.3 m

The 97-00012-01 Power Supply, M12 12-pin Socket, 1.3 m is a 90-254 VAC, +24VDC power supply.

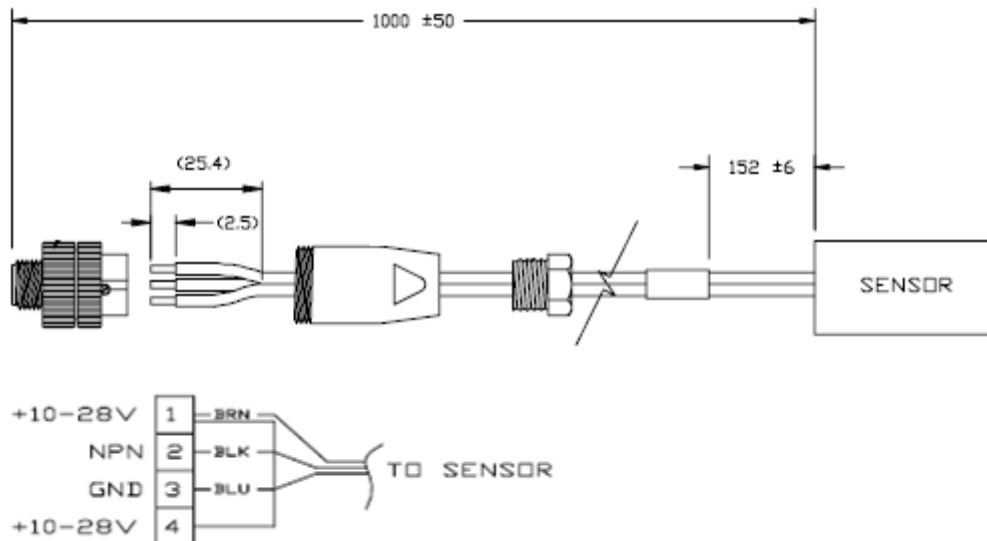


M12 12-Pin Socket

Appendix B Cable Specifications

99-000020-02 Trigger, M12 4-Pin Plug, NPN, Dark On, 2 m

The 99-000020-02 Trigger, M12 4-pin Plug, NPN, Dark On, 2 m is a photo sensor with a 4-pin M12 connector.



99-000020-02 Schematic

C

APPENDIX C

General Specifications

This section contains specifications for the HAWK MV-4000 Smart Camera.

Appendix C General Specifications

HAWK MV-4000 General Specifications

Sensor Board

Specifications		HAWK MV- 4000-03	HAWK MV- 4000-03C	HAWK MV- 4000-13	HAWK MV- 4000-13C
CMOS Sensor	Geometry	1/4"-Type		1/2"-Type	
	Format	Monochrome	Color	Monochrome	Color
	Make and Model	ON Semiconductor – Python Family (NOIP1SN or NOIP1SE)			
Effective Resolution (H x V)		640 x 480		1280 x 1024	
Frame Rate ^a		Up to 240 FPS	Up to 120 FPS	Up to 75 FPS	Up to 32 FPS ^b
Pixel Size (H x V)		4.8 µm x 4.8 µm			
Gain Range		0 to 19.4 dB			
Exposure Speeds		50 msec to 4 sec			
External Trigger Latency (Typical value from OFF to ON)		7.1 µs		7.2 µs	
External Trigger to Output Strobe Delay (Typical value from OFF to ON)		9.1 µs		9.2 µs	

- a. Frame rate is established solely upon rates of acquisition. Your results will differ when including processing time.
- b. Note that these numbers come from tests that store the grabbed images in BGR packed format. When using YUV, planar, or Mono10 packed formats, the frame rate can be significantly different.

Specifications		HAWK MV- 4000-20	HAWK MV- 4000-20C	HAWK MV- 4000-50	HAWK MV- 4000-50C
CMOS Sensor	Geometry	2/3"-Type		1"-Type	
	Format	Monochrome	Color	Monochrome	Color
	Make and Model	ON Semiconductor – Python Family (NOIP1SN or NOIP1SE)			
Effective Resolution (H x V)		1920 x 1200		2592 x 2048	
Frame Rate ^a		Up to 42 FPS	Up to 20 FPS	Up to 21 FPS	Up to 8.5 FPS ^b
Pixel Size (H x V)		4.8 µm x 4.8 µm			
Gain Range		0 to 19.4 dB			
Exposure Speeds		50 msec to 4 sec			
External Trigger Latency (Typical value from OFF to ON)		8.0 µs		8.0 µs	
External Trigger to Output Strobe Delay (Typical value from OFF to ON)		10 µs		10 µs	

- a. Frame rate is established solely upon rates of acquisition. Your results will differ when including processing time.
- b. Note that these numbers come from tests that store the grabbed images in BGR packed format. When using YUV, planar, or Mono10 packed formats, the frame rate can be significantly different.

CPU Board

The CPU board of HWK MV-4000 has the following features:

- **SOC/CPU:** Intel Celeron Processor N2807
- **Volatile Memory:** 2048 Mbytes of DDR3L SDRAM
- **Non-Volatile Memory:** 32 GB of flash disk (eMMC) memory
- **Networking:** One 100/1000 Mbits (or 100 Mbit/1 Gbit) Ethernet networking interface
- An advanced I/O engine that includes the following:
 - **Digital I/O:** 4 inputs and 3 outputs.
 - Four independent, Optoisolated, digital auxiliary input signals. Input signals have interrupt generation capabilities. The input signals are debounced (that is, configured to wait a given amount of time between accepting a signal change). The debouncing time can be configured using AutoVISION. For more information, refer to the AutoVISION online help. The input signals can sink or source. To source voltage, you must connect an voltage source to the common input signal (Input 3). For voltage expectations, see Electrical Specifications subsection of the HAWK MV-4000 specifications section, later in this appendix. Whether all the input signals are sinking or sourcing is dependent upon the connection of the common input signal.
 - Three optoisolated output signals, used to connect devices (up to 24 V). Note that these output signals are sinking signals that share a common signal. If one of these signals is used as a sourcing signal, the other two are no longer available.
- **Display:** Your HAWK MV-4000 provides a VGA/USB output to connect a monitor, keyboard, and mouse directly to the device or connect a touch display to the device. Note that a standard USB keyboard and mouse are supported natively. To connect any other device (such as a specialized keyboard or touch screen) to your HAWK MV-4000, it may require a specialized device driver. If the device has a third-party-provided driver, inquire whether a specialized device driver is necessary and/or available for your HAWK MV-4000 by contacting your local Omron Microscan representative.

Appendix C General Specifications

VGA/USB Port

The following information relates to the device that can be connected to the VGA/USB port.

- **Output:** RGB analog output.
- **Maximum supported resolution:** 1920 x 1200.
- **Maximum pixel depth:** 32-bits.
- **Maximum vertical refresh frequency:** 60 Hz - 85 Hz, depending on resolution.

Lenses

Keep the lens free of fingerprints and dust. Do not clean with an alcohol-based cleaning solution and do not spray water or cleaning fluids directly onto the lens. Instead, use a can of compressed air or a lens cleaning cloth to remove dust.

The HAWK MV-4000 works with the Varioptic Caspian C-39N0-160-I2C or C-39N0-250-I2C lens (liquid lens). This electronically focus-controllable C-mount lens fits within the optional IP lens case. The Varioptic lens connects to the liquid lens connector inside the lens case housing of your HAWK MV-4000.

General Care and Cleaning

To clean the unit housing, use a small amount of mild detergent cleaner on a cleaning cloth. Do not pour the cleaner directly onto the unit housing.

To remove dust from the lens cap, use either a can of compressed air or a lens cloth. The air must be free of oil, moisture and other contaminants that could remain on the lens cap.

To clean the glass window of the lens cap, use a small amount of isopropyl alcohol on a cleaning cloth. Do not pour the alcohol directly on the glass window.

Electrical Specifications

HAWK MV-4000-03, -03C, -13, -13C, -20, -20C, -50, -50C			
Operating voltage for the HAWK MV-4000 under testing conditions		24 V	
Rated current		600 mA	
Operating voltage tolerance		± 10%	
I/O Specifications			
Optoisolated Output Signals	Operating Voltage	24 V (26 V abs. max.)	
	Sink Current	50 mA max.	
	Maximum Leakage Current		1 mA@ 24 V
			1 mA@ 26 V
	ON Voltage		0.4 V @ 2 mA
			1.1 V @ 25 mA
			1.5V @ 50 mA
	PTC ^a Fuse Max. Time-to-Trip		1 sec @ 0.5 A
	OFF-to-ON Response		2 ms to reach 4 V ^b
	ON-to-OFF Response		50 ms to reach 11 V ^c
Optoisolated Input Signals	Operating Voltage	24 V (26 V abs. max.)	
	Input Current (Sink or Source)	3.5 mA max. ^d , 1 mA min. ^e	
	ON Voltage Level	> 11 V ^f	
	OFF Voltage Level	< 4 V	
	OFF-to-ON Response		6 ms
	ON-to-OFF Response		80 ms
0-10 V Analog Control Output Signal		Non-isolated. Note that the 0-10 V is intended for reference voltage only (< 1 mA).	
Varioptic Caspian C-39N0-160-I2C or C-39N0-250-I2C Liquid Lens			
Typical	Supplied Voltage	5 V	
	Rated Current	50 mA	

- The PTC is an automatically resetting fuse.
- This occurred under the following condition: output pulled to 24 V using 1 kW.
- Regardless of whether the signal is sinking or sourcing, this measurement is the same.
- Maximum input current at max. ON voltage. The connected device must not limit the current to a value lower than this.
- Minimum input current at min. ON voltage. Can be used to calculate bleeding resistor needed for 2-wire proximity sensor.
- Recommended > 12 V when using HAWK MV-4000 breakout board.

Appendix **C** General Specifications

Environmental Specifications

- For indoor use only.
- Maximum altitude: 2,000 meters
- Operating temperature: 0° to 50° C (32° F to 122° F)¹
- Ventilation requirements: Natural convection
- Pollution degree: 2 environment
- Over-voltage category: I
- Ingress protection rating: IP67

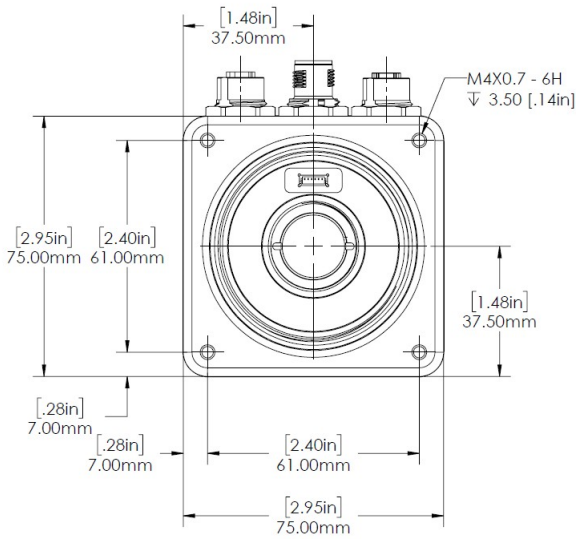
Mechanical Specifications

HAWK MV-4000-03, -03C, -13, -13C, -20, -20C, -50, -50C	
Connectors	M12 8-pin connector for 100/1000 Base-T Ethernet.
	M12 12-pin plug connector for VGA/USB.
	M12 12-pin socket connector for digital I/O and power.
Certification	IP67

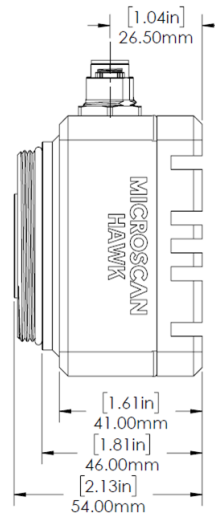
1. Under current testing conditions.

Dimensions

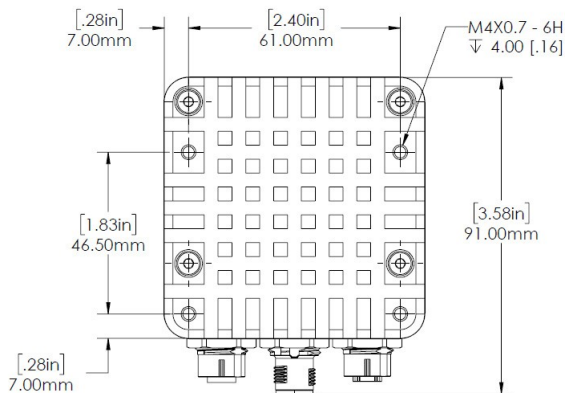
Dimensions	HAWK MV-4000-03, -03C, -13, -13C, -20, -20C, -50, -50C
Weight	460.39 g (16.24 oz)
Length (without connectors)	75 mm (2.95") x 75 mm (2.9") ± 2 mm (0.079")
Height (without lens)	54 mm (2.13") ± 2 mm (0.079")
Width	75 mm (2.95") ± 2 mm (0.079")



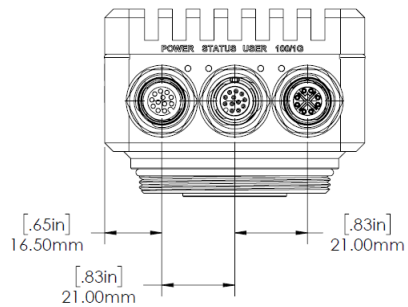
Front



Side



Back

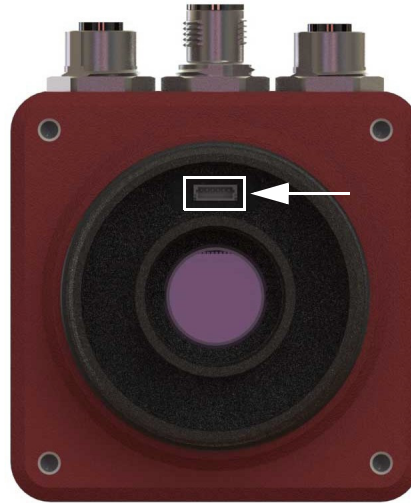


Base

Appendix C General Specifications

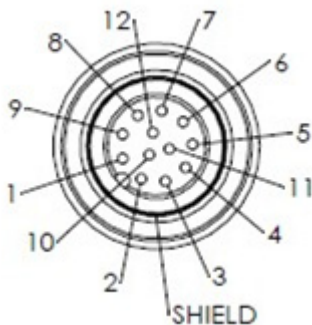
HAWK MV-4000 Connectors

The HAWK MV-4000 has several interface connectors. These are the digital I/O and power connector, 100/1000 Base-T connector, the VGA/USB connector, and the liquid lens connector.



Digital I/O and Power Adapter Cable Connector

The digital I/O and power connector of the adapter cable is an M12 12-pin plug connector that transmits and receives digital I/O signals, provides an analog reference voltage for an inline control system lighting controller, and provides power to your HAWK MV-4000.



The pinout for the digital I/O and power connector is as follows:

Pin	Signal Name
1	Output Common
2	Analog Output
3	Output 3
4	Power
5	Trigger
6	Input Common
7	Input 2
8	Input 3
9	Input 1
10	Output 1
11	Ground
12	Output 2

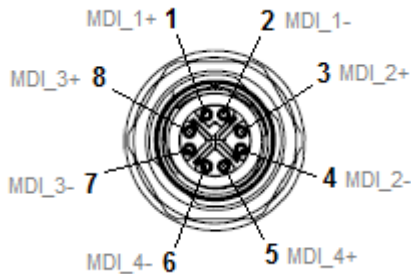
To interface with this adapter cable connector, you can use either an Omron Microscan accessory cable or you can build your own. To build your own digital I/O and power cable, parts can be purchased from:

Cable Information	
Manufacturer	Phoenix Contact GmbH and Co. KG
Part Number	SAC-12P- MS/3.0-PVC SC0 Order No: 1554788
Description	Sensor/Actuator Cable, 12-Pos., Black PVC, Straight M12 SPEEDCON Plug on Free Conductor End, 3.0 m

Appendix C General Specifications

100/1000 Base-T Connector

The 100/1000 Base-T connector is an M12 socket 8-pin X-coded connector that provides communication capabilities at 10 Mbit/sec, 100 Mbit/sec, or 1 Gbit/sec (1000 Mbit/sec).



The pinout for the Ethernet connector is as follows:

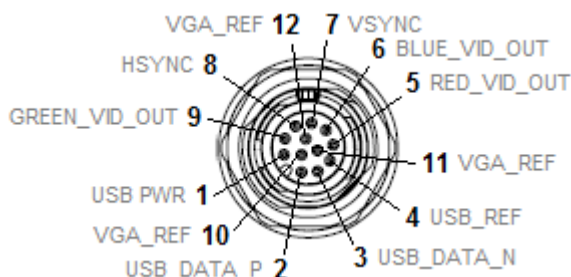
Pin	Signal Name	Description
1	MDI_1+	Bidirectional data A+
2	MDI_1-	Bidirectional data A-
3	MDI_2+	Bidirectional data B+
4	MDI_2-	Bidirectional data B-
5	MDI_4+	Bidirectional data D+
6	MDI_4-	Bidirectional data D-
7	MDI_3-	Bidirectional data C-
8	MDI_3+	Bidirectional data C+

To interface with this connector, you can use either an Omron Microscan accessory cable or you can purchase a similar cable from an alternate source. For an alternate source of 100/1000 Base-T cables, contact:

Cable Information	
Manufacturer	Phoenix Contact GmbH and Co. KG
Part Number	NBC-MSX/5.0-94F/R4AC SCO Order No.: 1407473
Description	Assembled Ethernet Cable, CAT6A, 8-Position, PUR, RAL 5021 (Water Blue), Plug Straight M12 SPEEDCON / IP67, Coding: X, ON Plug Straight RJ45 / IP20, 5 m

VGA/USB Connector

The VGA/USB connector is an M12 12-pin plug connector that transmits output video and can both transmit and receive USB signals. The output video signal is a standard RGB analog video output used to send the operating system's desktop to the connected display device. The video output can be used to display the desktop.



The table below summarizes the supported standard display resolutions:

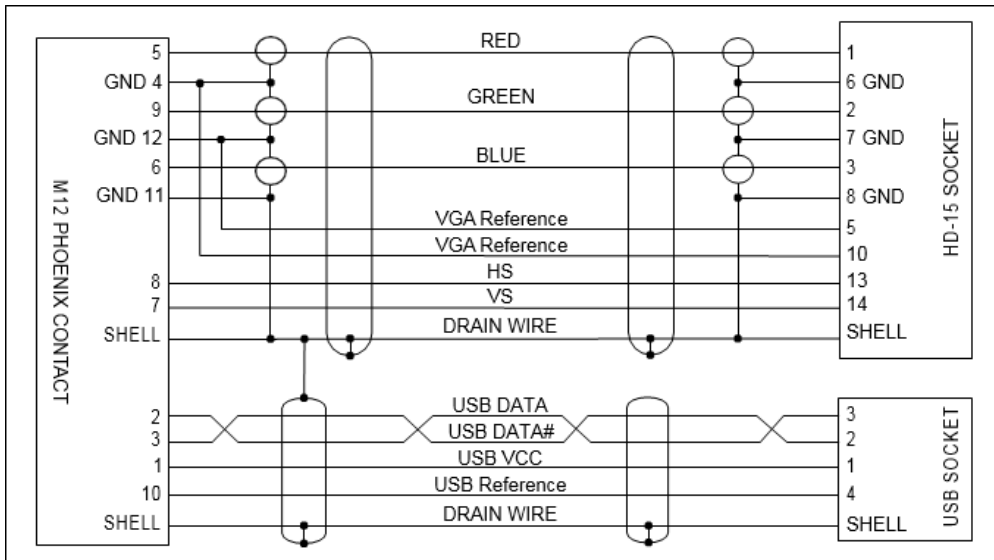
Standard Display Resolution	Analog Video	Maximum Refresh Rate
1920 x 1200	RGB	60 Hz
1920 x 1080	RGB	60 Hz
1600 x 1200	RGB	60 Hz
1280 x 1024	RGB	85 Hz
1024 x 768	RGB	85 Hz
800 x 600	RGB	85 Hz
640 x 480	RGB	85 Hz

The pinout for the VGA/USB connector is as follows:

Pin	Signal Name	Description
1	USB_PWR	5 V supplied from your HAWK MV-4000 to USB peripherals.
2	USB_DATA_P	USB data +
3	USB_DATA_N	USB data -
4	USB_REF	USB reference
5	RED_VID_OUT	R component of the RGB video output signal
6	BLUE_VID_OUT	B component of the RGB video output signal
7	VSYNC	Vertical sync of the RGB video output signal
8	HSYNCH	Horizontal sync of the RGB video output signal
9	GREEN_VID_OUT	G component of the RGB video output signal
10	VGA_REF	VGA reference
11	VGA_REF	VGA reference
12	VGA_REF	VGA reference

Appendix C General Specifications

The following is a wire-diagram of the VGA/USB cable, showing the connection between the HAWK MV-4000 VGA/USB connector on one end and the HD-15 and USB connectors on the other.

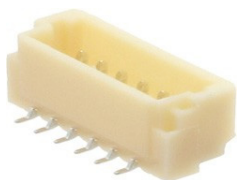


This cable can be purchased separately from Omron Microscan (61-9000147-01). A USB only cable (no VGA connector) can also be purchased from Omron Microscan (61-9000143-01).

Liquid Lens Connector

The liquid lens connector is a 6-pin shrouded connector designed to receive a 6-pin connector from a Varioptic Caspian C-39N0-160-I2C or C-39N0-250-I2C lens. The secondary, 3-pin plug connector from the Varioptic lens is not used.

This connector is located inside the lens cap housing of the HAWK MV-4000.



The pinout for the liquid lens connector is as follows:

Pin	Signal Name	Description
1	PWR	Power supply (+5 V)
2	GND	Ground
3	SDI	Serial data line signal
4	SCK	Serial data clock signal
5	Unused	Unused
6	Unused	Unused

Appendix C General Specifications

D

APPENDIX D

MVMonitor Web Page

This section explains how to connect to the MVMonitor web page and how to interpret the information displayed there.

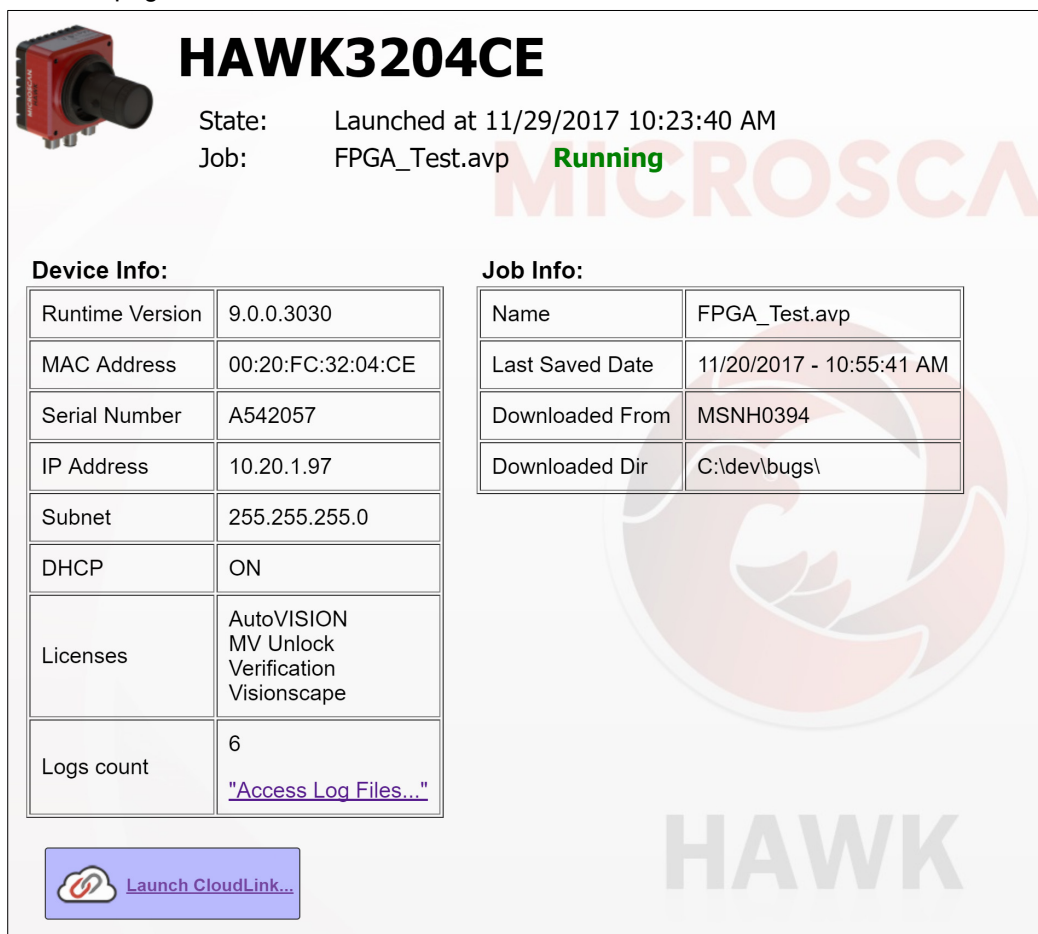
Appendix D MVMonitor Web Page

Using the MVMonitor Web Page

The HAWK MV-4000 Smart Camera provides a “health status” web page that can be viewed in a web browser of your choice. General information about the camera’s network identity and the state of the runtime is provided. To connect to the page, simply enter the name of your camera at the specific port 8088. For example, if your camera is named **HAWK3204ce**, you would connect to its web page in your browser by entering this in the address bar:

http://hawk3204ce:8088

The web page will look similar to this:



The screenshot shows the web interface for the HAWK3204CE camera. It features a red camera icon, the model name 'HAWK3204CE', and status information: 'State: Launched at 11/29/2017 10:23:40 AM' and 'Job: FPGA_Test.avp Running'. There are two tables: 'Device Info' and 'Job Info'. A 'Launch CloudLink...' button is at the bottom left. A large 'MICROSCA' watermark is visible in the background.

Device Info:

Runtime Version	9.0.0.3030
MAC Address	00:20:FC:32:04:CE
Serial Number	A542057
IP Address	10.20.1.97
Subnet	255.255.255.0
DHCP	ON
Licenses	AutoVISION MV Unlock Verification Visionscape
Logs count	6 "Access Log Files..."

Job Info:

Name	FPGA_Test.avp
Last Saved Date	11/20/2017 - 10:55:41 AM
Downloaded From	MSNH0394
Downloaded Dir	C:\dev\bugs\

[Launch CloudLink...](#)

See the next page for descriptions of the information shown above.

Top Bar

The area at the top of the page displays the following:

- **Name** of the camera.
- **State:** This shows the state of the runtime. If it is up and running, it will show the time and date of when it was launched. If it is not running, it will display an error message.
- **Job:** This shows the name of the .avp job file that is currently loaded (if any), and will show whether the .avp is running or stopped.

Device Info Area

This grid is intended to provide the following basic information about the camera:

- **Runtime Version:** The version number of the installed machine vision runtime firmware.
- **MAC address** of the camera.
- **Serial Number** of the camera.
- **IP Address** of the camera.
- **Subnet** of the camera.
- **DHCP:** Indicates whether DHCP is on or off.
- **Licenses:** Lists the licenses that are currently loaded on the camera.
- **Logs Count:** Gives a count of the number of log files that have been created in the `\VscapeRuntime\Logs` folder.
- **"Access Log Files" Link:** Clicking this link will take you to an FTP page where you can download any of the log files to your local PC.

Launch Omron Microscan

Clicking **Launch CloudLink** opens the HAWK MV-4000 Smart Camera's web-based runtime monitoring interface in a separate browser tab. More information about CloudLink can be found in [Appendix E: CloudLink Web HMI](#).

Job Info Area

- **Name:** Name of the currently loaded job.
- **Last Saved Date:** Date and time when the job was last saved.
- **Downloaded From:** Name of the host from which the job was downloaded.
- **Download Dir:** Name of the directory on the host from which the job was downloaded.

Refreshing the Page

The data displayed when you first see the MVMonitor page is only what has been captured at the time the page is loaded. The page does not self-refresh automatically, so if the job changes, or the state of the device changes, that new information will not be reflected on the MVMonitor web page unless you manually refresh it.

Appendix D MVMonitor Web Page

CloudLink Web HMI

CloudLink allows you to visualize **Omron Microscan Link** values and images from compatible Omron Microscan smart cameras and vision systems. It runs in your web browser, and is compatible with a wide variety of modern browsers including those found on tablets and smart phones.

This appendix contains information about CloudLink support for the HAWK MV-4000. Refer to *Getting Started with CloudLink* – installed in the documentation folder **C:\Microscan\Vscape\Documentation** during AutoVISION/Visionscape installation – for detailed information about configuring and using the CloudLink web HMI.

CloudLink supports Windows 7 (32-bit and 64-bit) and Windows 10.

CloudLink requires an HTML5-compatible browser:

- Internet Explorer 11 or later
- Google Chrome
- Firefox
- Mobile Safari (iPhone / iPad)
- Mobile Chrome on Android devices

The following browsers were explicitly tested for compatibility:

- Internet Explorer 11.0.2
- Google Chrome 33.0
- Firefox 28.0

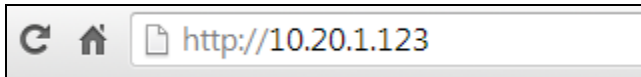
Additional Notes:

- Safari for Windows is not supported.
- Internet Explorer 11 or later and Google Chrome 33 or later are recommended for extended CloudLink sessions.

Appendix E CloudLink Web HMI

Connecting

To launch CloudLink, use your favorite web browser and enter the address of your device in the browser's address bar. For example, if you have an Omron Microscan smart camera on your network at address **10.20.1.123**, you would enter:



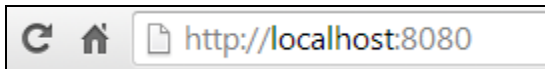
If using a HAWK MV-4000, you can also type the name of the device, as in the example **http://HAWK5E7420**.

The HAWK MV-4000 has a dedicated VGA/USB connector for attaching either a touch monitor or regular monitor with keyboard and mouse. You can open CloudLink locally on the camera by starting the shortcut available on the smart camera desktop or via the smart camera touch app. The actual address in this case is **http://localhost**.

CloudLink also works with **Visionscape Software** and with **AutoVISION's** Emulator.

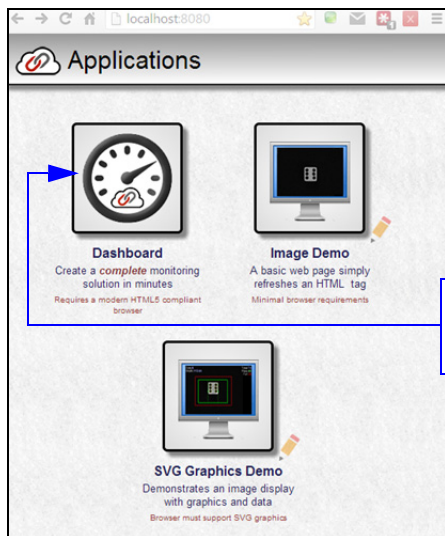
To connect to a software-based job running in FrontRunner or AutoVISION:

First, be sure the job is running, and then type the following into your browser's address bar:



Note: You must specify port **8080** for a PC-based connection. If you are connecting to a PC-based system from a different machine on the network, use the IP address or name of the PC instead of the local host. For example, use **http://10.20.1.234:8080** if the PC's IP address is **10.20.1.234**.

Once you press the **Enter** key, you should see the following home page:



Click the **CloudLink Dashboard** icon to launch the application.

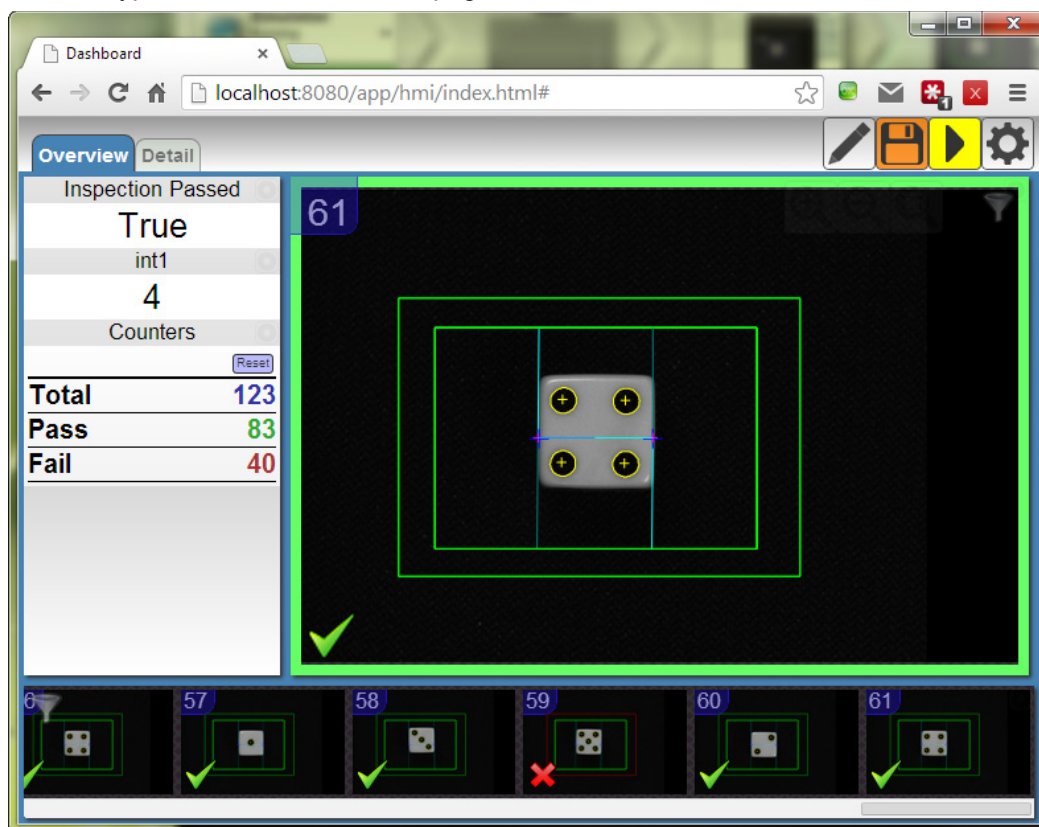
Application Overview

The CloudLink Dashboard user interface is a single page web app-style application. Most web pages show information that can typically extend beyond the bottom of the browser window, requiring the user to scroll to see it. They typically contain links to other pages, which is how the user navigates around a web site.

In contrast, CloudLink behaves more like an application, expanding to fill the browser window, and automatically adapting to any changes in the dimensions of the window. Although CloudLink allows you to define and use multiple display pages, they are all contained within a single web page.

The browser stores a maximum of 50 images. The camera stores images, image thumbnails, and data records that can be requested via the web page or API. When memory is full, the camera will first delete full-size images, then thumbnails, and ultimately the data records on a first in-first out basis.

This is a typical view of a CloudLink page.



Application Bar

The **Application Bar** is located at the top of the CloudLink interface.



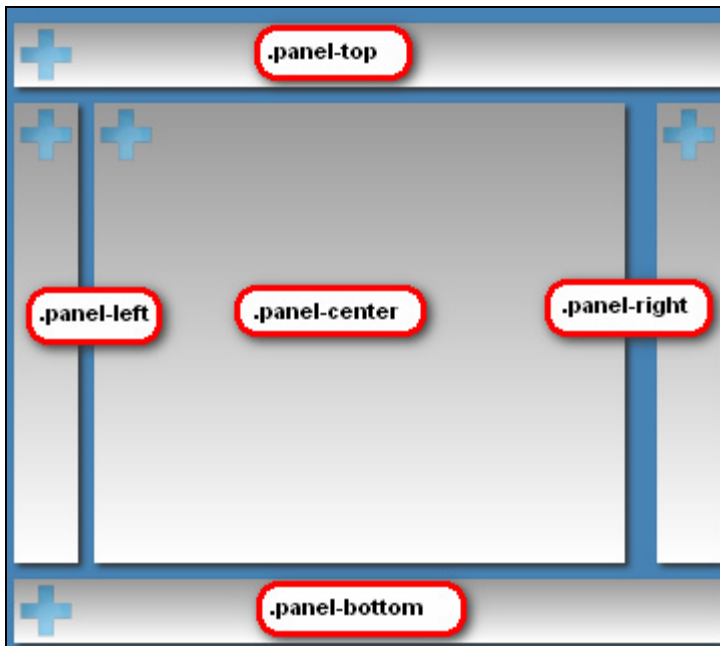
There are three components to the Application Bar:

- **A set of page selection buttons.** In the example above they appear as tabs, but the style can be customized if necessary.
- **A logo.** The position and contents of the logo can be customized.
- **A toolbar.** The toolbar provides access to various CloudLink settings and modes. The position and size of the toolbar can be customized.

Pages, Panels, and Widgets

The main area of CloudLink displays one of a number of **pages**. If there is more than one page defined, you can switch between them by using the page selection buttons on the application bar, or by using the arrow keys on your keyboard.

Each page is organized into a set of regions called **panels**. The following image shows an empty page to demonstrate the arrangement of the panels on a page.



Note the names, which start with `.panel-`. It is not necessary to know these names to use CloudLink; however they do have significance if there should be need for customization. Customizing CloudLink requires the modification of CSS (Cascading Style Sheets). The names shown correspond to the CSS class selector for that panel.

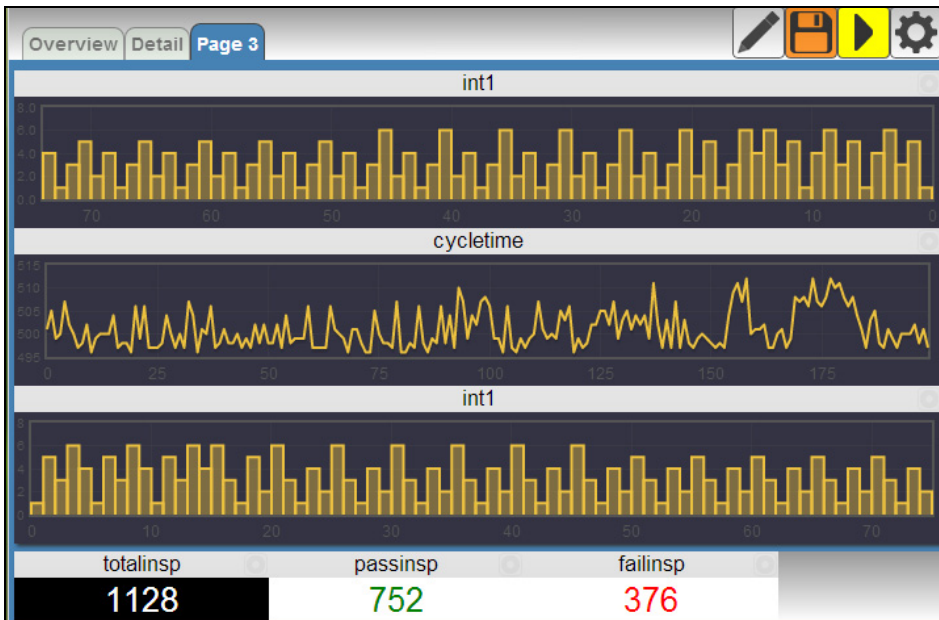
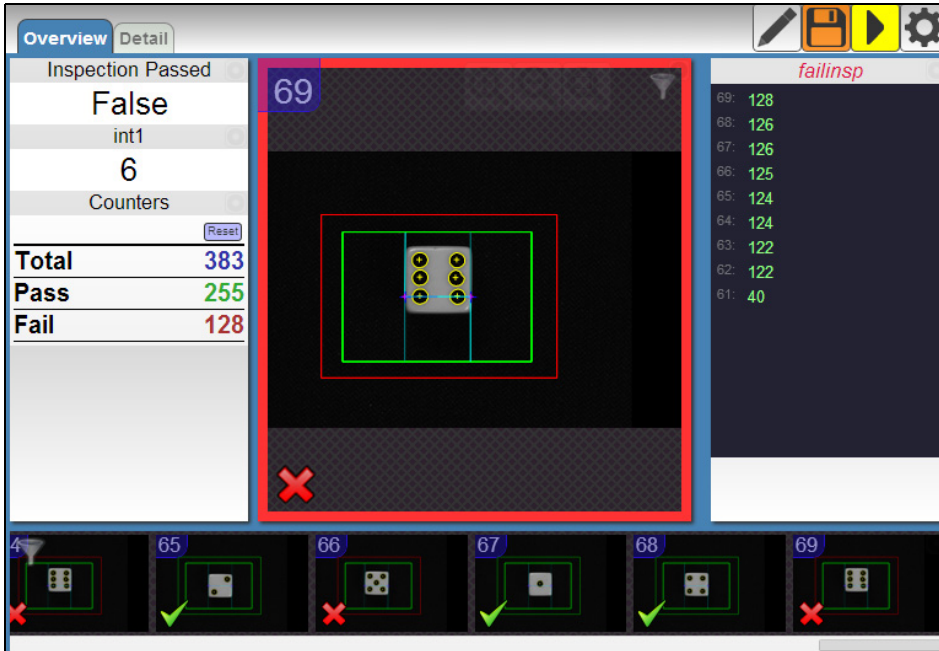
The purpose of the panels is to act as containers for a number of **widgets**. Each widget has the ability to visualize and interact with one or more items of inspection data such as Omron Microscan Link values, inspection counters, timing information, or images.

Appendix E CloudLink Web HMI

Each panel has special layout and behavior properties that can be exploited to create a wide variety of different layouts. The following table summarizes the position and properties of each panel:

Panel	Position	Properties
.panel-top .panel-bottom	Docked at the top or bottom of the page, fully stretching from the left edge to the right edge of the window.	Certain types of widgets are automatically stretched to fill the panel space horizontally. For example, if you should add a chart or a filmstrip to these panels, by default they will automatically stretch.
.panel-left .panel-right	Docked at the left or right of the page, they extend between .panel-top and .panel-bottom. The width of these panels is fixed (by default 194 pixels)	Widgets in these panels are typically stretched to fit exactly in the fixed width. If there is not enough vertical room to display all the content, scroll bars are made available.
.panel-center	This panel automatically stretches to fill the center area bounded by the other panels	An image widget placed in this panel automatically stretches to occupy the entire panel area. Any other widgets would then appear over the image.

If a panel does not have content (i.e. no widgets are placed in it), it is hidden from view, with the other panels adjusted to occupy the available space. Examples of possible page layouts:



Appendix E CloudLink Web HMI

Serial Commands

Serial commands can be sent via **TCP port**, **AutoVISION Terminal**, or **HyperTerminal**.

Important: The HAWK MV-4000 Smart Camera does not support any focus commands.

Serial Commands

Serial Command Syntax

< > = Required argument. Replace appropriately.

For example:

-u <DB_User_name> becomes **-u av** where **av** replaces **DB_User_name**.

| = Mutually exclusive arguments. Choose one from the list.

{ } = Used with | to specify a list of choices for an argument.

[] = Optional parameter.

Important: Unless otherwise stated, commands will respond with **!OK** on success and **!ERROR** on failure.

AUTOCAL [-exp={0|1}] [-expval={60-100000}] [-gain={0|1}] [-gainval={0-100}] [-focus={0|1}] [-focval{0-9999}]

Initiates camera calibration of gain, exposure, and focus. Each parameter is independent. Ranges are device-dependent.

-exp enable=1 or **disable=0** autocalibrate exposure.

-expval value of exposure in μ s.

-gain enable=1 or **disable=0** autocalibrate gain.

-gainval value of gain in percentage.

-focus enable=1 or **disable=0** autocalibrate focus

-focval value of focus in mm.

Example 1:

Command: AUTOCAL

Response: 0;4632;134;50;300 (gain=0, exposure=4632 μ s, focus=134, min allowable focus=50, max allowable focus=300)

Example 2:

Command: OFFLINE

Response: !OK

Command: QUERYAUTOCAL

Response: 0;4632;134;50;300 (Gain was 0.)

Command: AUTOCAL -exp=1 -gain=0 -gainval=18 (Fixed gain at 18%.)

Response: 18;3308;128;50;300 (Gain did not change and exposure has changed from 4632 μ s to 3308 μ s.)

Example 3:**Command:** OFFLINE**Response:** !OK**Command:** QUERYAUTOCAL**Response:** 0;3478;226;50;300 (Exposure was 3478 μ s.)**Command:** AUTOCAL -exp=0 -expval=1000 (Fixed exposure at 1000 μ s.)**Response:** 31;1000;98;50;300 (Exposure stayed at 1000 μ s and gain has changed from 0% to 31%.)**Important:** AUTOCAL only functions when the camera is OFFLINE.**GET {tagname|service|service.tagname}**

Gets value of a global tag.

The tagname must correspond to one of the supported tags within the device. Use the **INFO** command to get a full list of tags and services, as well as attributes of the tag and list of subtags. The command is terminated by a carriage return and/or line feed character.

Include an index to get a single value from an array such as **GET int1**. If the index is omitted, the full array of values will be returned in a comma-separated list of values.

Send **Get {tagname|service.tagname|service}** to get the value of a tag within the global data service. To get the value of a tag within another service, prefix the tagname with the service name. For example, a **GET <service.tagname>** command such as **GET eip.input** for the EIP input assembly.

The AVP service allows retrieval of step and datum information from the job tree using forward slash '/' in the symbolic name path. **GET avp/insp1/snapshot1/status** paths are not case-sensitive and do not need to be fully qualified if unique.

GET avp/snapshot1/status will return the same result if there is only one inspection.When issued against a step, **GET avp/snapshot1** will return the values for all datums.**Success Return:** On success will return the value stored in the tag.

For example: ABCD

Fail Return: On failure will return !ERROR followed by the reason for the failure.

For example: !ERROR Tag matchstring66 not found

Important: This command only functions when the camera is ONLINE.**GETIMAGE <-transfer=ymodem> [-format={jpg|png|tif|raw|bmp}] [-quality ={0-100}] [-woi=left,top,right,bottom] [-inspection=n]**

Initiates serial transfer of inspection image.

Note: This command always returns the last (most recent) image.**Important:** JOBDOWNLOAD only supports FTP on the HAWK MV-4000.**-transfer=ymodem** is currently not optional - only Ymodem protocol is supported.**-format={jpg|png|raw|tif|bmp}** specifies the format of the image. If omitted, the image format is JPG.

Appendix F Serial Commands

Note: For monochrome cameras, the only formats available are TIF, PNG, and JPG. For color cameras, the only formats available are RAW, PNG, and BMP.

Note: If BMP is selected, the system will return a PNG file.

Note: All image file types return complete file information that can be saved directly to disk except the RAW file type, which requires explicit conversion.

-quality=*n* specifies a JPG compression quality of *n* less than or equal to 100. The default quality is 80 if not specified. This setting is only supported for the JPG file type.

Note: **PNG**, **RAW**, **TIF**, and **BMP** formats provide lossless image compression. If **format** is set to **PNG**, **RAW**, **TIF**, or **BMP**, the **quality** setting does not apply.

woi=left,top,right,bottom specifies a rectangular area of the image to be included in the output image. If omitted, the full image buffer is returned.

-inspection=*n* specifies the inspection from which to retrieve an image. The image will be from the first snapshot within that inspection. If not specified, the image will be from the first inspection that contains a snapshot.

The following example will retrieve an image from the camera with these settings: **Protocol:** ymodem; **Format:** png; **Quality:** N/A; **Inspection:** second inspection.

GETIMAGE -transfer=ymodem -format=png -inspection=2

The following example will retrieve an image from the camera with these settings: **Protocol:** ymodem; **Format:** jpg (default); **Quality:** 50; **Inspection:** first inspection (default).

GETIMAGE -transfer=ymodem -quality=50

Important: This command only functions when the camera is ONLINE.

HELP

Returns a list of all serial commands showing correct syntax and functionality descriptions.

INFO [tagname|service]

Gets information about a tag or service.

INFO with no arguments gets a list of services.

INFO <service> gets a list of tags in that service.

INFO <service.tagname> gets attributes of the tag as well as a list of subtags.

The AVP service allows retrieval of step and datum information from the job tree using forward slash '/' in the symbolic name path. **INFO avp/insp1/snapshot1/status** paths are not case-sensitive and do not need to be fully qualified if unique.

INFO avp/snapshot1/status will return the same result if there is only one inspection.

When issued against a step, **INFO avp/snapshot1** returns properties of the step, a list of child datums, and a list of child steps. Child steps are indicated by a trailing forward slash.

JOBBOOT [-slot=]<n>

Sets bootup job slot *n* (RS-232 only).

JOBDELETE **{[-slot=*n*]-all}**

Deletes job in slot *n*, or all jobs if **-all**.

Important: Does not delete the current job loaded in camera memory.

JOBDOWNLOAD **<-transfer={ymodem|ftp}> [-size=value] [-c]**

Important: JOBDOWNLOAD only supports FTP on the HAWK MV-4000, as with the GETIMAGE command.

Downloads a **.avz** job file via the specified transfer method (ymodem supported only over RS-232; FTP supported only over network connection).

The **ymodem transfer method** only requires that the user send the **.avz** file via the ymodem protocol over RS-232, and the job will load automatically after the transfer is complete.

The **FTP transfer method** requires the user to perform the following steps to load the job:

- **JOBDOWNLOAD: -transfer=ftp [-size=avpsizeinbytes]**

Pre-creates a fixed-size /streamd0 RAMdisk to receive the **.avz** over FTP. If size is omitted, the default RAM disk size is used to create /streamd0. The size of /streamd0 is limited to (available contiguous RAM – minimum target contiguous RAM) / 2.

- User FTPs the job to /streamd0
- **JOBLOAD: -mem -r**

Loads **.avz** from /streamd0 into RAM, deletes the RAMDisk /streamd0, and optionally starts the job (if **-r** is specified).

JOBINFO **{[-slot=*n*]} [-v]**

Gets job summary or info about slot *n*.

JOBINFO with no arguments returns a list of all jobs on the device.

-v = Verbose *n*. This option shows the amount of space that would be freed if the job were deleted. It also lists the total disk space and free disk space.

JOBLOAD **{[-slot=*n*]-mem} [-r]**

Loads a job from slot *n* or from memory when used with the JOBDOWNLOAD command via FTP.

-r = Start inspections.

JOBSAVE **[-slot=*n*]-<*n*>**

Saves current job to slot *n*.

MEMAVAIL **[-cp]**

Returns available memory for device or coprocessor.

MEMCONTIG **[-cp]**

Returns maximum memory block for device or coprocessor.

Appendix F Serial Commands**MEMFRAGS [-cp]**

Returns memory fragments for device or coprocessor.

Important: MEMFRAGS is not supported by the HAWK MV-4000. It will return **!ERROR**.

MEMINFO [-cp] [-v]

Returns memory summary “avail/contig/frags” for device or coprocessor. Verbose.

OFFLINE

Stops all inspections.

ONLINE

Starts all inspections.

ONLINE? [-insp=n]

Queries if each inspection on the camera is online. Defaults to all inspections if no inspection is specified. If the camera is running in a multi-inspection job, this command will return **!1** if all inspections are online and **!0** otherwise.

-insp=n specifies the inspection to query if it is online.

QUERYAUTOCAL

Returns photometry settings: Gain, Exposure, and Focus.

QUERYFOCUSUNITS

Queries the units being used for autofocus, mm (0) or inches (1).

QUERYWHITEBAL

Returns white balance settings: RED gain, BLUE gain, and GREEN gain.

QUICKFOCUS [x] [y]

Performs an autofocus by analyzing the area around the point specified by **x** and **y**.

The response is in the format of the camera’s current focus, min. allowable focus on the camera, max. allowable focus on the camera.

Example:

Perform a quick focus on point (640,480) in the image.

Command: QUICKFOCUS 640 480

Response: 124;50;300 (Current focus is set to 124 mm with an allowable focus range of 50 – 300 mm on the current camera.)

Important: This command only functions when the camera is OFFLINE.

READY? [-insp=n]

Queries if inspection is waiting for a trigger. **!1** if all inspections are ready or **!0** if not all inspections are ready.

-insp=n specifies the inspection to query if it is ready.

REBOOT [-noload]

Reboots the device.

-noload = do not load BOOT job.

RESTOREWBAL

Restores preset white balance parameters: RED gain, BLUE gain, and GREEN gain.

SET <tagname> <value>

Sets value of a global tag.

The tagname must correspond to one of the supported tags within the device. Use the **INFO** command to get a full list of tags and services, as well as attributes of the tag and list of subtags.

The value can contain spaces.

The command is terminated by a carriage return and/or line feed character.

The value can be a list of comma-separated items to set a sequence of tags:

Send **SET int1 1, 2, 3** to set int1 = 1, int2 = 2, int3 = 3.

The AVP service allows setting of step and datum information from the job tree using forward slash '/' in the symbolic name path. **SET avp/insp1/snapshot1/acq1/gain 2.0** paths are not case-sensitive and do not need to be fully qualified if unique.

SET avp/acq1/gain 2.0 will set the same gain value if there is only one acquire.

Control tags in the AVP service such as **START**, **STOP**, and **TRIGGER** act as momentary switches. **SET avp.start 1** is equivalent to the **ONLINE** command. **avp.start** will reset immediately and always read as **0**.

Success Return: On success will return **!OK** followed by an echo of the command.

For example:

```
!OK SET matchstring1
```

Fail Return: On failure will return **!ERROR** followed by the reason for the failure.

For example:

```
!ERROR Tag matchstring66 not found
```

SETFOCUSUNITS

Sets units used for autofocus, **mm (0)** or **inches (1)**.

Important: The MicroHAWK MV-40 only supports mm so SETFOCUSUNITS will only accept **0** and anything else will respond with **!ERROR**.

Appendix F Serial Commands**TARGET {0|1|off|on}**

Turns targeting LEDs On or Off.

target 1 = Turn Target On

target 0 = Turn Target Off

TRIGGER

Triggers an inspection.

VERSION

Returns Visionscape software version.

vt [n]

Triggers an inspection by pulsing a Virtual I/O point.

For example: **vt 1**

will return pulse **VIO1**. The inspection will run if it is configured to use **VIO 1** as a trigger.

If specified, the VIO index must be in the allowed range for Virtual I/O points within Visionscape. The virtual I/O line will be set high then low.

If VIO Index is not specified, VIO1 is assumed.

Fail Return: Return **!ERROR** followed by the reason for the failure.

For example: **!ERROR No such trigger** when the index specified 'n' is out of range of virtual triggers.

WHITEBAL

Performs automatic calibration of white balance settings: RED gain, BLUE gain, and GREEN gain.

Important: This command only functions when the camera is OFFLINE.

G

APPENDIX G

Operating System Save and Restore

This section provides instructions on how to back up and restore the HAWK MV-4000's operating system. A recovery USB key with the name "Omron Microscan HAWK Recovery" is provided with each camera. This section describes in detail the process for saving and restoring the device's operating system. This includes restoring to factory settings, accessing the ResQDisk Utility, backing up your OS, restoring a backed-up OS, and capturing OS images.

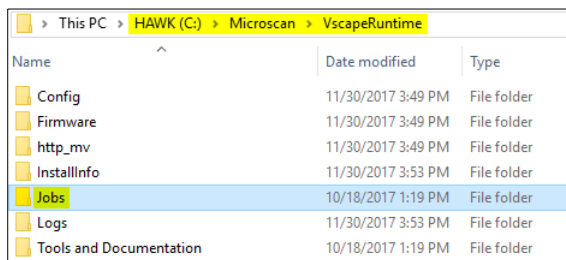
Note: All the screens depicted in this section occur in a pre-installation environment, and were therefore captured externally with a camera instead of using screen capture software.

Appendix G Operating System Save and Restore

Restore to Omron Microscan Factory Settings

Warning: This utility will **reformat** and **erase all data** currently on your hard drive. It will **restore** the original operating system, device drivers, and any other software provided by Omron Microscan to its factory-configured state. If you have external drives connected, be sure to select the correct drive or disconnect all external hard drives to prevent data being erased by accident. You must manually restore all personal data files and/or software applications that were not provided by Omron Microscan. If possible, back up all data and software applications before proceeding.

Important: It is recommended that you copy your personal data: Jobs directly onto the Omron Microscan HAWK Recovery USB key prior to restoring your camera to Omron Microscan factory settings. You can do this by copying the following folder to the USB key:



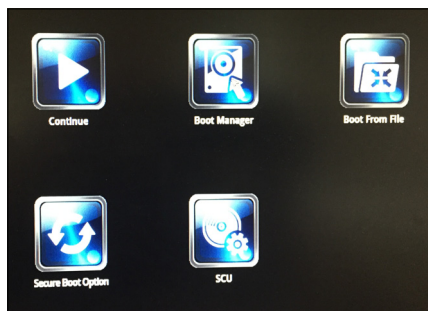
Name	Date modified	Type
Config	11/30/2017 3:49 PM	File folder
Firmware	11/30/2017 3:49 PM	File folder
http_mv	11/30/2017 3:49 PM	File folder
InstallInfo	11/30/2017 3:53 PM	File folder
Jobs	10/18/2017 1:19 PM	File folder
Logs	11/30/2017 3:53 PM	File folder
Tools and Documentation	10/18/2017 1:19 PM	File folder

The folder should be copied directly to the USB key's top level directory and restored later once you have reset your camera to factory defaults.

Note: You will also need to restore your software licenses from the USB key to your camera. To do this, copy the contents of the Licensing folder at the top level of your HAWK Recovery USB key to the following location on your camera: **HAWK (C:)\Microscan\VscapeRuntime\Config\Licensing** once restored to factory defaults.

To restore your HAWK MV-4000 to factory settings, do the following:

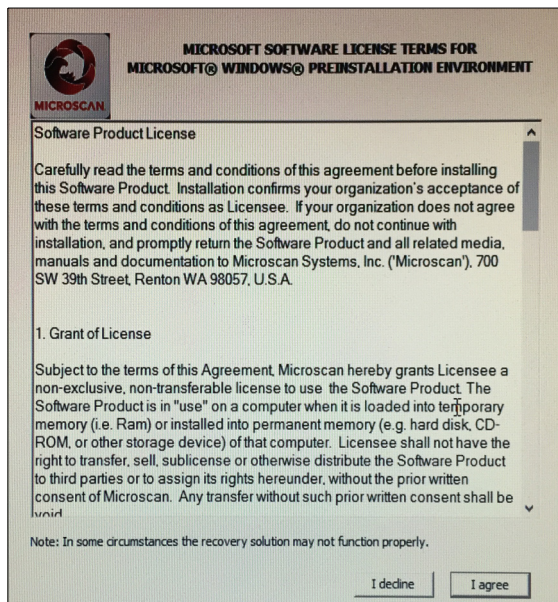
1. The HAWK MV-4000 is delivered with an **OS Rescue USB KEY**. Insert the USB key into your HAWK MV-4000. You may require a USB hub to make this connection so you can add a keyboard and mouse.
2. Boot up the unit, and press **ESC** to enter the **BIOS** menu.
3. Select **Boot Manager**. On the Boot Manager menu, select the option to Boot from Legacy USB Key, which will be Omron Microscan's Rescue USB Key.



- The **Omron Microscan ResQDisk Utility** will appear shortly. Click **Next**.

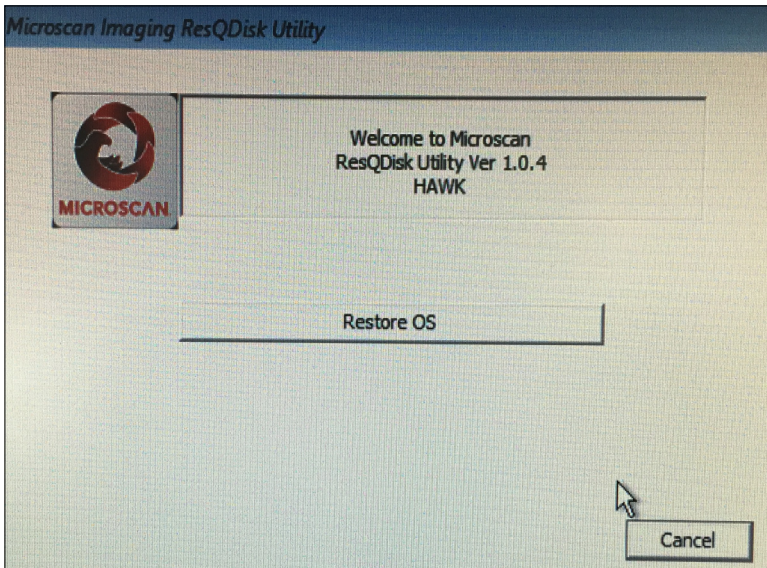


- Click **I agree** at the **Software License Terms** screen.

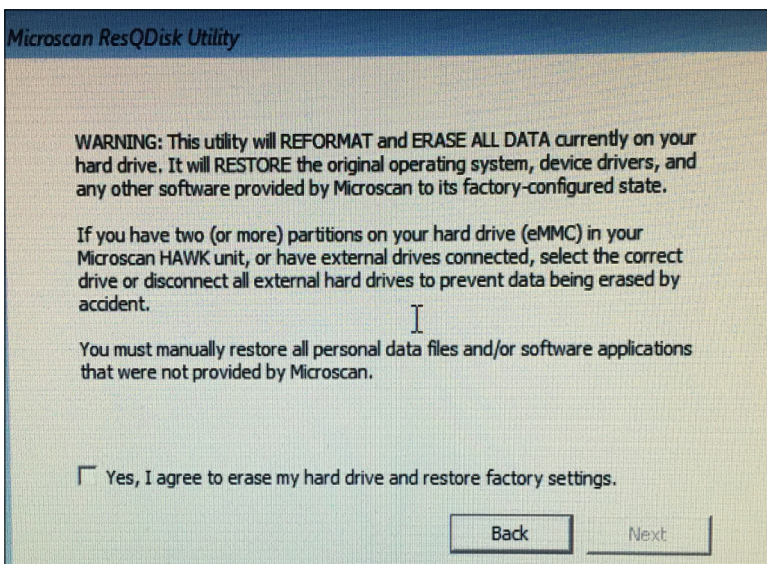


Appendix G Operating System Save and Restore

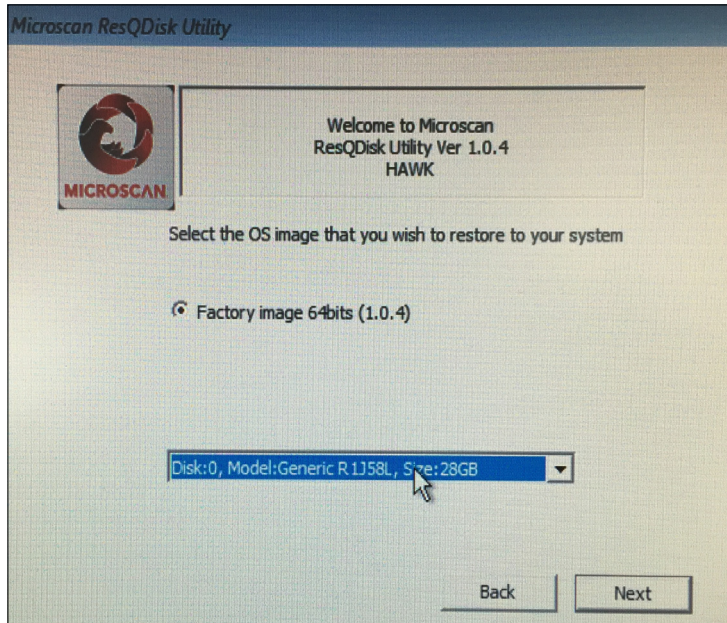
6. Click **Restore OS**.



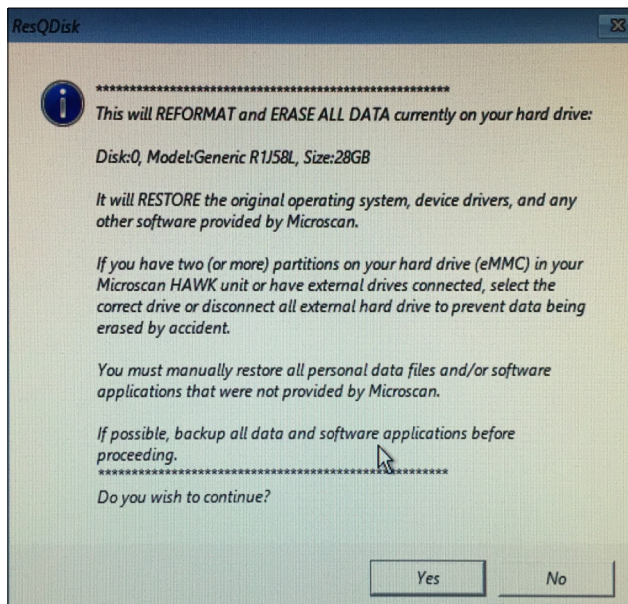
7. Click **Yes** selection box, then **Next**.



- Open the dropdown to select the drive to restore, which should say: **Disk:0, Model: Generic R1J58L, Size:28GB**, click **Next**.

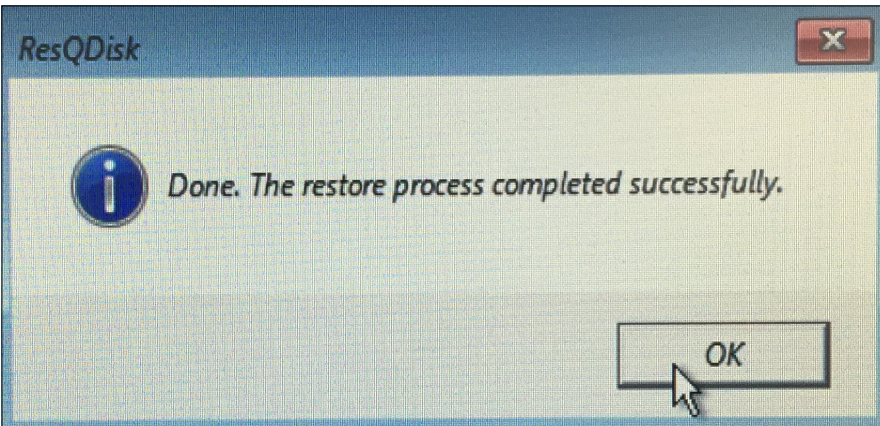


- Click **Yes**. **All data on the camera will be lost.**

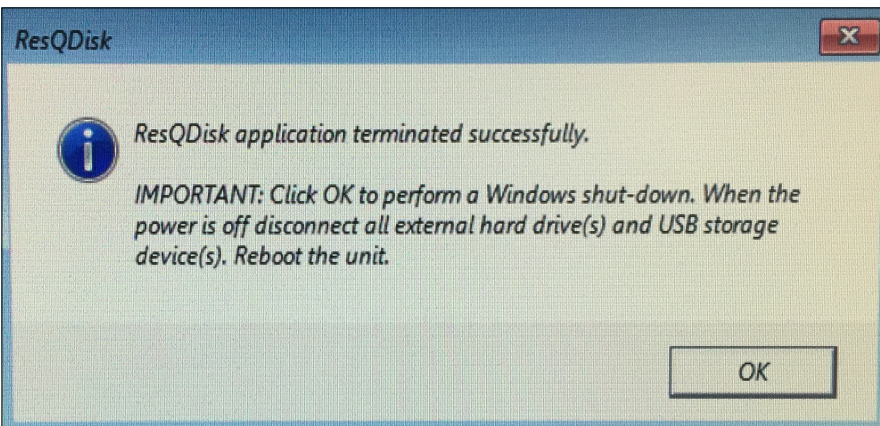


Appendix G Operating System Save and Restore

10. Wait for completion. Click **OK** and the device will power off.



11. Unplug and re-plug the device. The camera will now be restored to the FACTORY image. Click **OK**.

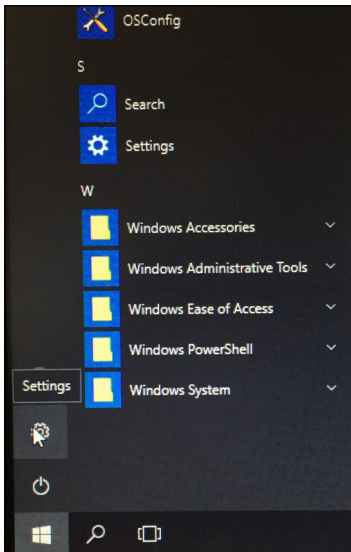


12. After the unit has rebooted, log in. Plug in the HAWK Recovery USB key. Finally, restore your licenses and Jobs using Windows Explorer as documented in [Restore to Omron Microscan Factory Settings](#).

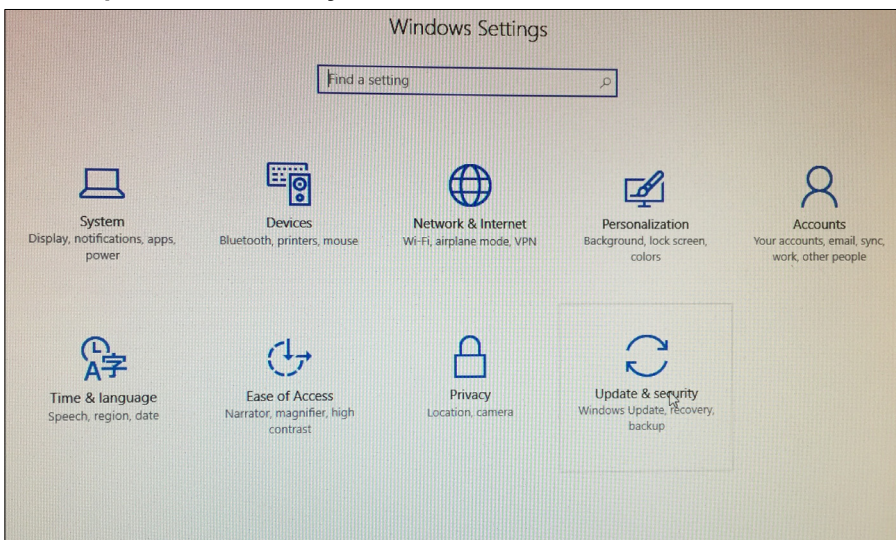
Access Omron Microscan Rescue Utility

If you can boot to Windows:

1. Select the **Start** button, then choose **Settings**.

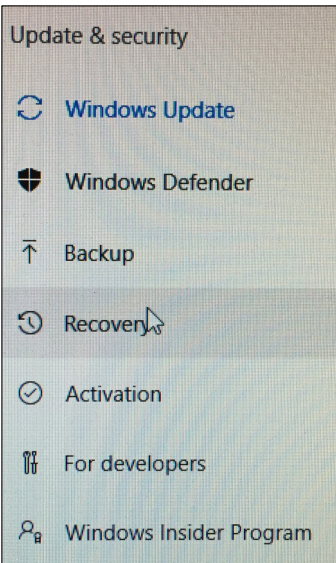


2. Select **Update and Security**.

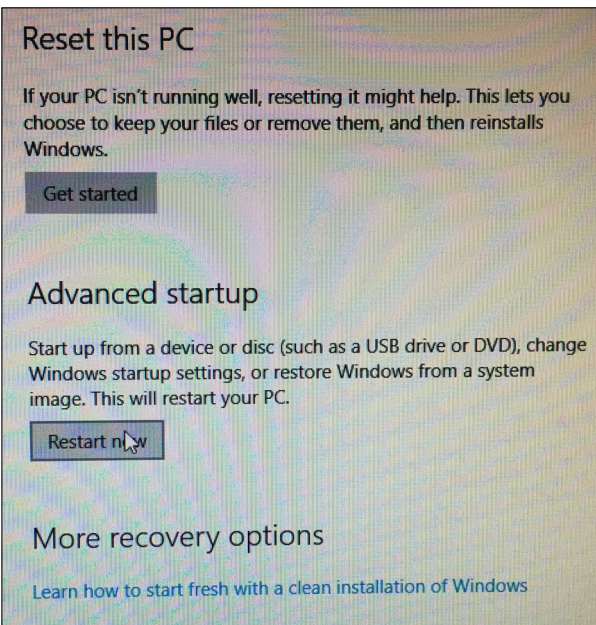


Appendix G Operating System Save and Restore

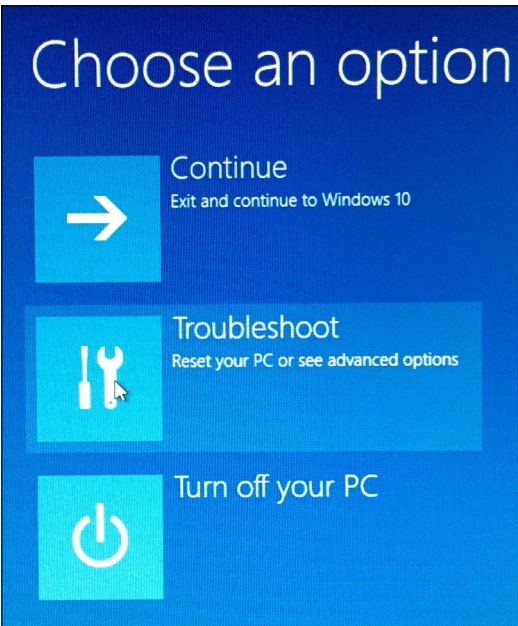
3. Select **Recovery**.



4. Under **Advanced Startup** select **Restart Now**.



5. After your PC restarts to the **Choose an Option** screen, select **Troubleshoot**.



6. Next select **Omron Microscan Rescue Utility**. Follow steps 4 – 13 in the [Restore to Omron Microscan Factory Settings](#) section.



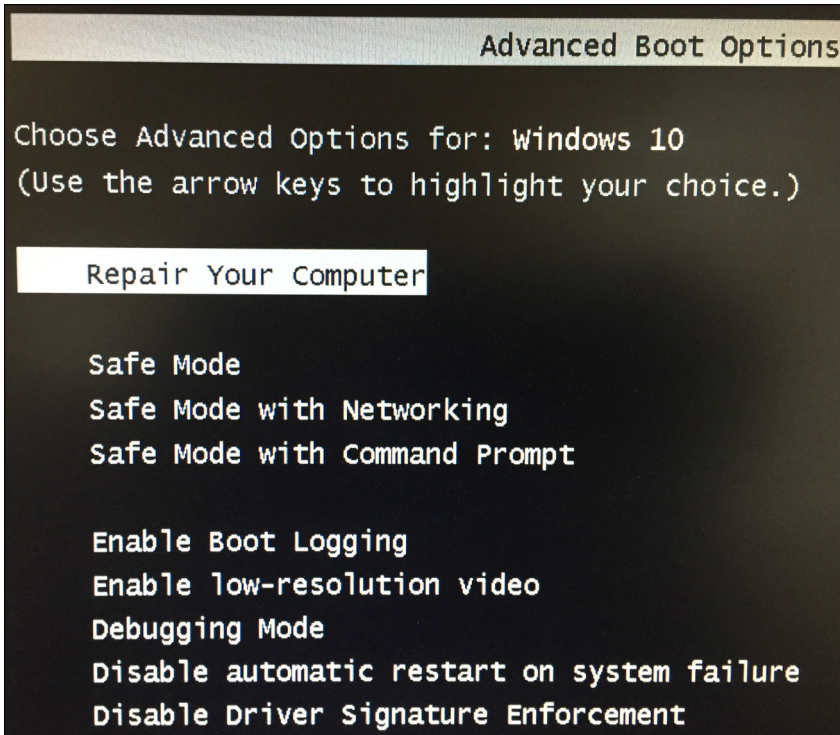
Appendix **G** Operating System Save and Restore

If you can boot to Windows but can't get to startup options from the sign-in screen:

1. On the sign-in screen, hold the **Shift** key down while you select **Power > Restart** in the lower-right corner of the screen.
2. Follow steps 5 and 6 in the [Access Omron Microscan Rescue Utility](#) section.

If you can't boot to Windows:

1. During system boot, press **F8**. This starts the **Advanced Boot Options**.



2. Select **Repair Your Computer**.
3. Follow steps 5 and 6 in the [Access Omron Microscan Rescue Utility](#) section.

Back Up / Restore / Capture the OS Image with Omron Microscan Rescue Utility

The Omron Microscan Rescue Utility offers three choices of operation:

1. Restore OS.
2. Backup/Capture OS.
3. Copy Omron Microscan Rescue Tool to USB storage device.

To access the **Omron Microscan Rescue Utility**, see the [Access Omron Microscan Rescue Utility](#) section of this document.

Note: If the hard drive is corrupted or the system cannot boot, see [Restore to Omron Microscan Factory Settings](#) for more details.

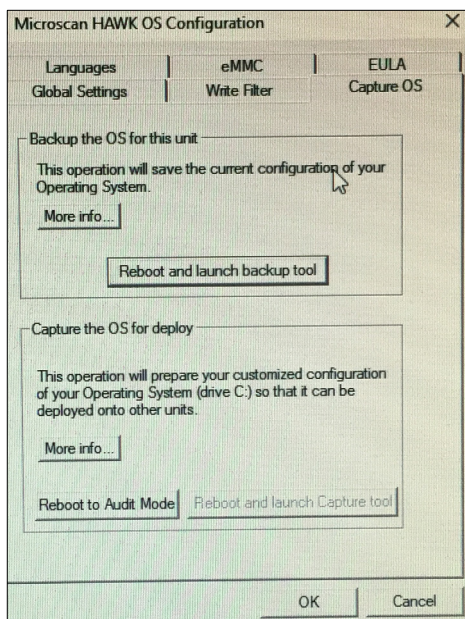
Back Up OS

This operation allows you to save (back up) your current OS to a storage device so you can restore it later using the Omron Microscan Rescue Utility's **Restore OS** feature.

Important: Before continuing this operation, disable the **Unified Write Filter (UWF)**.

To save (back up) the operating system, do the following:

1. Save all your work and close all running applications.
2. Start **OSConfig.exe** and go to the **Capture OS** tab. Click on the **Reboot and Launch Backup Tool** button. This will reboot the device. Then click **OK** on the next screen.



Appendix G Operating System Save and Restore

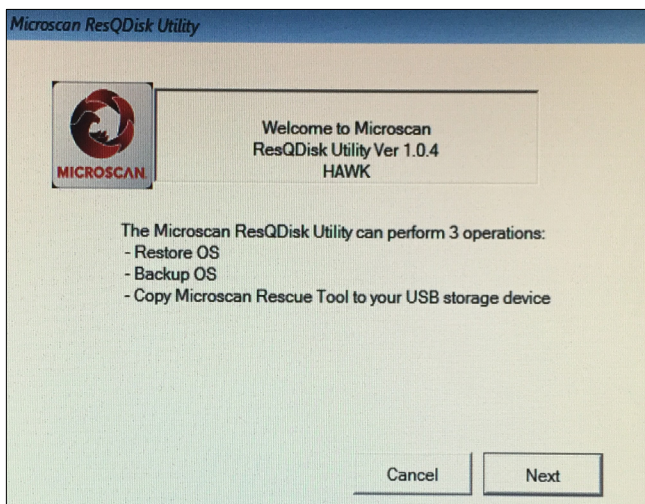
3. After your PC restarts and displays the **Choose an Option** screen, select **Troubleshoot**.



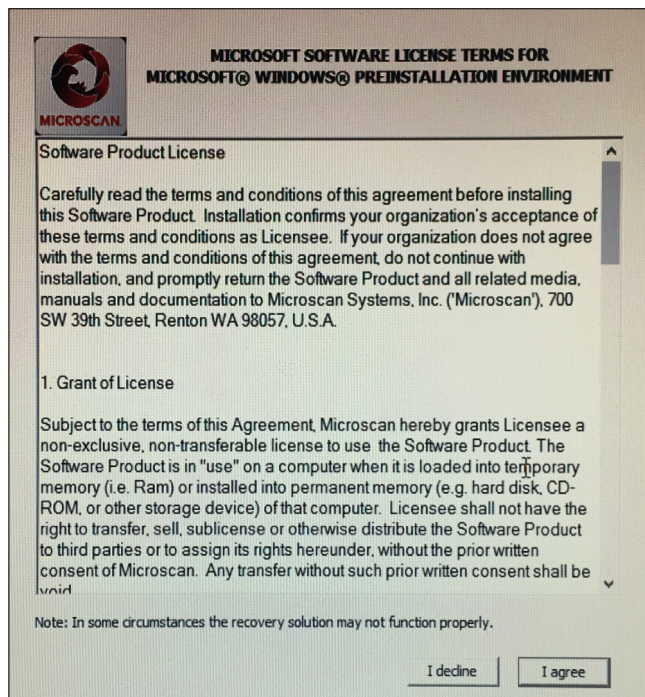
4. Select **Omron Microscan Rescue Utility**.



5. The Omron Microscan Rescue Utility will display.

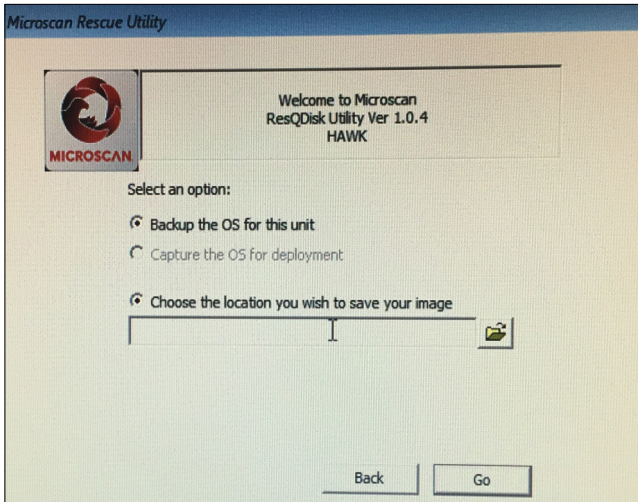


6. Accept the **License Agreement**.

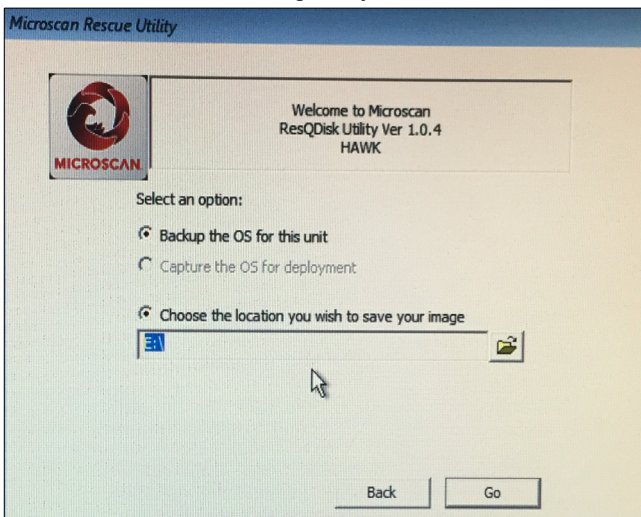


Appendix G Operating System Save and Restore

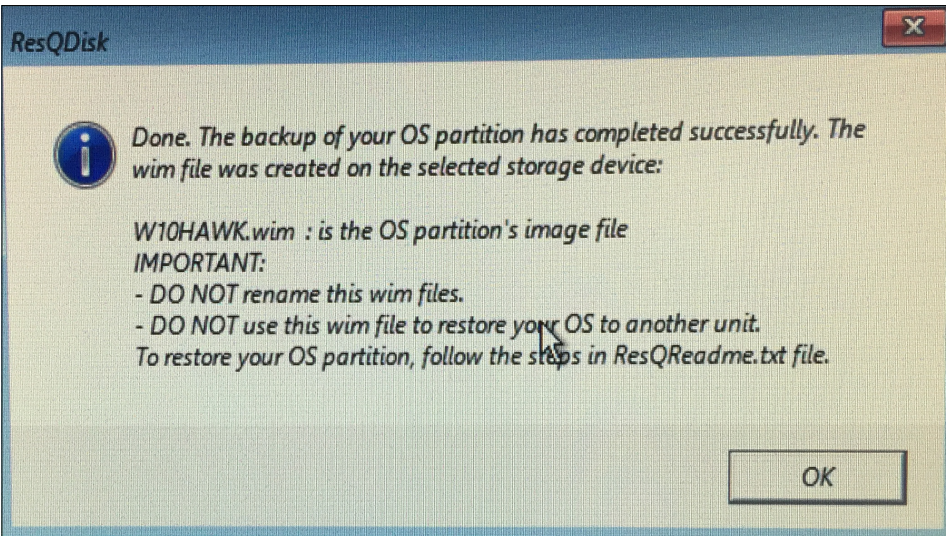
7. The window will open with the following option already selected: **Backup the OS for this Unit.**



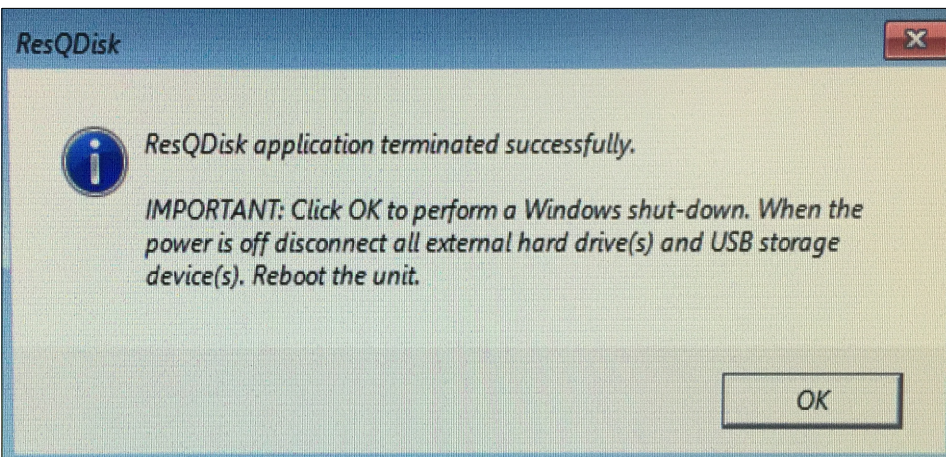
8. Select the location to store the saved backup image. It is **not** recommended to save the backup images in the OS partition or the virtual drive **X:**. Instead, insert an external USB storage device with enough space (at least 16 GB depending on the size of the OS partition). If you do not add a file name, the default file name will be W10HAWK.wim. **Important:** The device used to save the backup image should be formatted as NTFS.
9. Click **Go** to save the image to your USB drive.



10. When complete, you will see the following message:



11. Click **OK** to shut down your device.



12. Power down and then re-power the device.

Appendix G Operating System Save and Restore

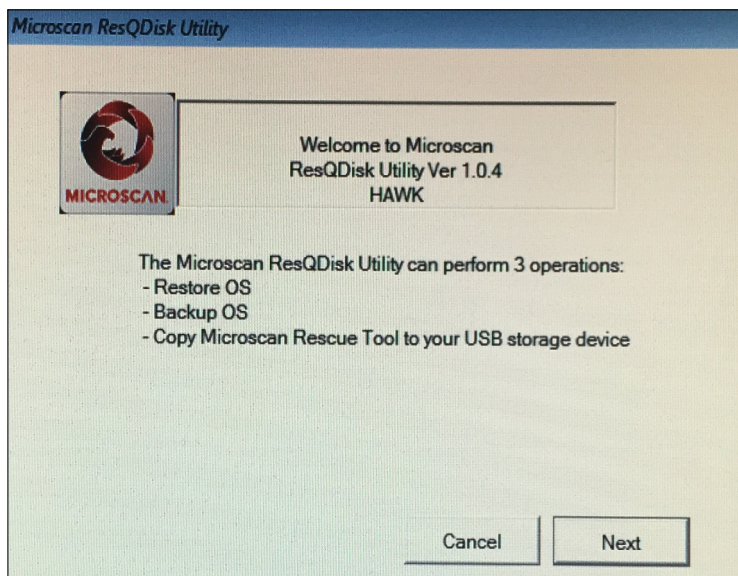
Restore OS

This operation allows you to recover the Operating System using your backup image *only for the device that was backed up*.

Warning: This utility will reformat and erase all data currently on your hard drive. If you have external drives connected, be sure to select the correct drive or disconnect all external hard drives to prevent data being erased by accident.

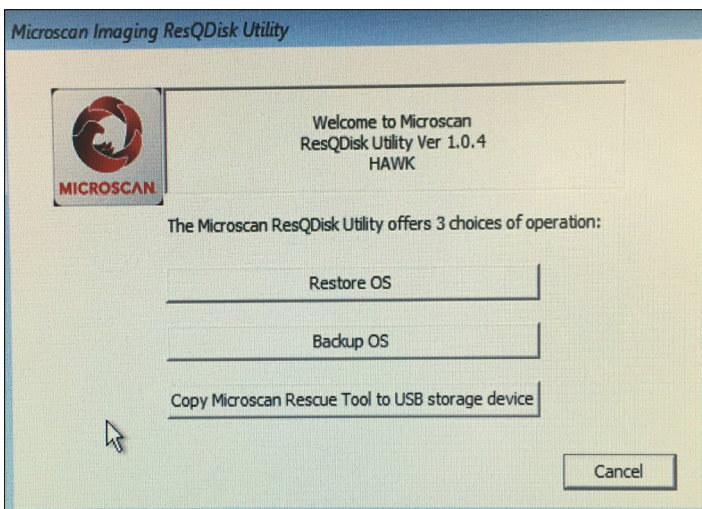
To restore your backup image, do the following:

1. Access the Omron Microscan Rescue Utility. (See previous section.)

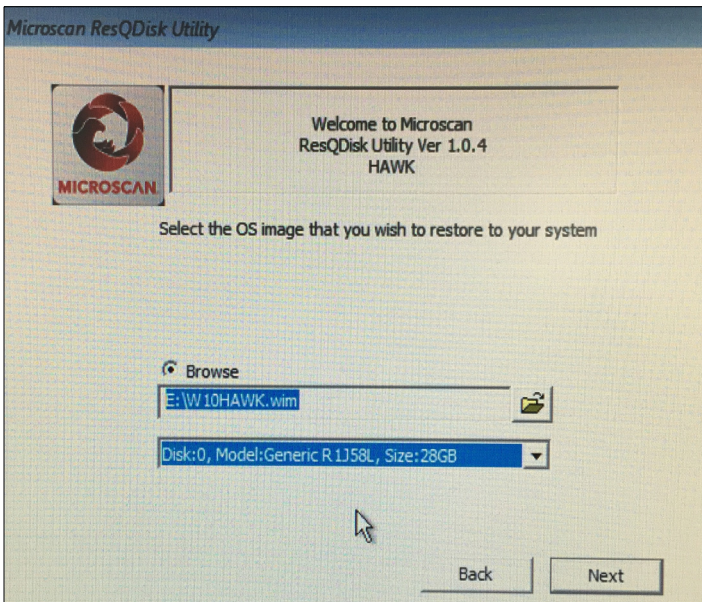


2. Click **Next** to select **Backup OS** automatically.

- Click **Back**, then click **Restore OS**.



- Select your backup **.wim** file (**W10HAWK.wim**) from where you saved it, and select **Disk 0** from the dropdown. Click **Next**.



Note that these files are created with the backup option described later in this section. This will begin restoring the OS you selected, and will shut down when complete. Re-power the device.

Appendix **G** Operating System Save and Restore

Capture OS

To customize your unit and deploy the same configuration to other HAWK MV-4000 cameras, do the following:

1. After the **Out-Of-Box-Experience (OOBE)** completes, switch to **Audit Mode as soon as possible**. This allows you to keep the multiple language capability on other units. To switch to Audit Mode, go to the **OSConfig.exe > Capture OS** tab and click the **Reboot to Audit Mode** button.
2. In Audit Mode, you are automatically logged on as the **Local Administrator**. You have full access to configure your system. Make sure the Unified Write Filter (UWF) is disabled so your settings can be saved. While you are in Audit Mode, every time you reboot, the **System Preparation Tool (Sysprep)** windows will pop up. You can ignore it or click **Cancel** to close the window.
3. When you are done configuring your unit, go back to the OSConfig.exe > Capture OS tab and click the **Reboot and Launch Capture Tool** button. Before launching the System Preparation Tool (Sysprep) to reseat the image, it will delete the **msuser** account, click **OK** to continue. The system will reboot and run Sysprep to reseat the image. When this is done, it will reboot to **System Recovery Options**.
4. After your PC restarts to the **Choose an Option** screen, select **Troubleshoot > Omron Microscan Rescue Utility**.
5. After accepting the License Agreement, the windows will show up with option already selected: **Capture the OS for Deployment**.
6. Select the location of the USB device to save the captured OS.
Warning: This will reformat the USB device and all data will be erased.
The utility will configure the USB device to be bootable with all necessary settings to restore your customized image to other HAWK MV-4000 units.

Copy Omron Microscan Rescue Tool to USB Storage Device

Omron Microscan recommends that you create a USB storage device for rescue in case the default configuration on your hard disk drive is damaged.

This operation allows you to format a USB storage device used to restore the Operating System to the Omron Microscan Factory Image or customized image for the Omron Microscan HAWK unit. To do so, you need a USB storage device with at least 16GB free.

Warning: All data on the USB storage device will be erased.

To create a USB storage device to restore one or more Omron Microscan HAWK units, do the following:

1. Access the **Omron Microscan Rescue Utility** (see the [Access Omron Microscan Rescue Utility](#) section).
2. Accept the **License Agreement**.
3. Select the **Copy Omron Microscan Rescue Tool to USB Storage Device** option from the menu.
4. Follow all on-screen instructions. Note that you must provide the Omron Microscan Factory Image or your customized image.

For Omron Microscan Factory Image: Insert the Omron Microscan USB KEY corresponding to your OS version into a USB hub attached to your HAWK MV-4000 unit. Browse to location **<USBKEY>\Ximage**.

For your Customized Image: Insert your source files (**W10x64HAWK.wim** file) into the USB port, browse to the location of the files.

5. When this operation successfully completes, use this USB storage device to restore other units.

Appendix G Operating System Save and Restore

H

APPENDIX H

OS Config Application

The OS Config application serves many purposes, each of which is described in this section. This application is used to determine OS and firmware versions, add and remove languages, turn on the hard drive write filter, show hard drive wear, show End User License Agreements, and capture your OS for backup of your system.

Appendix H OS Config Application

Global Settings Tab

The screenshot shows the 'Microscan HAWK OS Configuration' dialog box with the 'Global Settings' tab selected. The dialog box contains the following information and controls:

- Navigation Tabs:** Languages, eMMC, EULA, Global Settings (selected), Write Filter, Capture OS.
- System Information:**
 - Microscan HAWK OS - 1.0.4 (2017/10/20)
 - Windows 10 IoT Enterprise 2016 LTSB x64 Ver.1607 - B14393
 - Microscan Prod. Ver. MV-4000 BIOS Version: 1.10.023
 - Microscan HAWK Firmware - 9.0.0.3012 (2017/10/13)
- Configuration Fields:**
 - Product ID: 00380-71600-10114-AAOEM
 - Owner: HAWK Unit
 - Organization: Microscan
 - Computer Name: HAWK320530
 - IP address: 10.20.1.132
- Startup Options:**
 - Automatic popup of this dialog box at startup
 - Turn ON Windows Defender
 - ENABLE Windows Update
- Buttons:** OK, Cancel

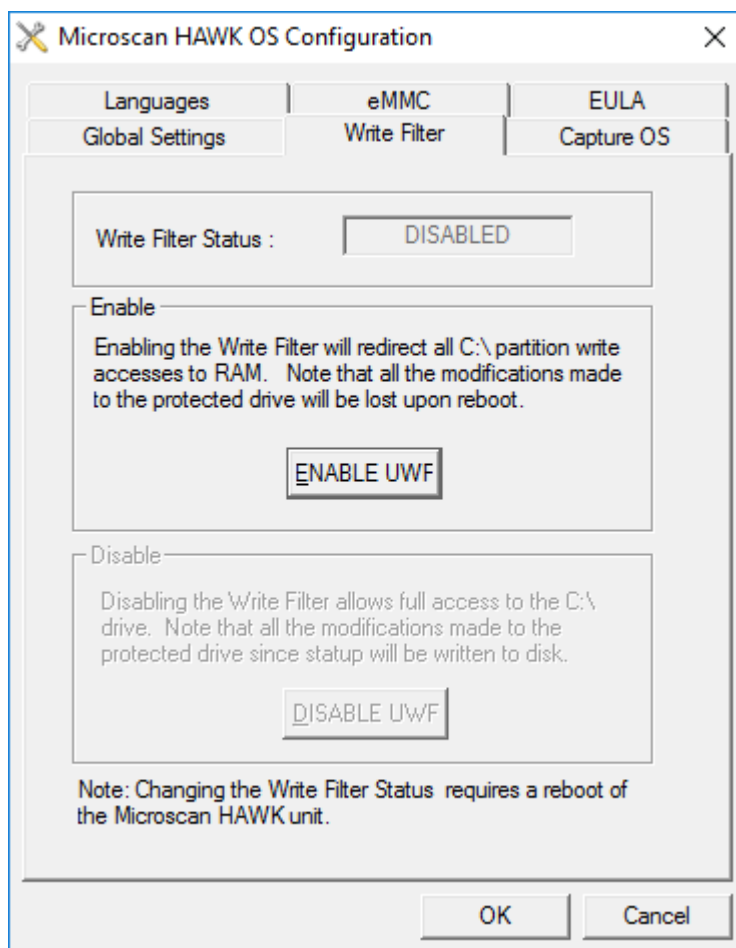
The OS version can be seen at the top, followed by the Windows version the device is running, the Product name and BIOS version, and the current firmware version.

Below this you will see the **Product ID**, **Owner**, **Organization**, **Computer Name**, and **IP Address** of the device. You may have this display open automatically on startup by checking the **Automatic popup of this dialog box at startup** checkbox.

Windows defender is disabled by default. You can enable it by clicking the Turn ON Windows Defender button.

Windows updates are also disabled by default. You can enable them by clicking the ENABLE Windows Update button.

Write Filter Tab

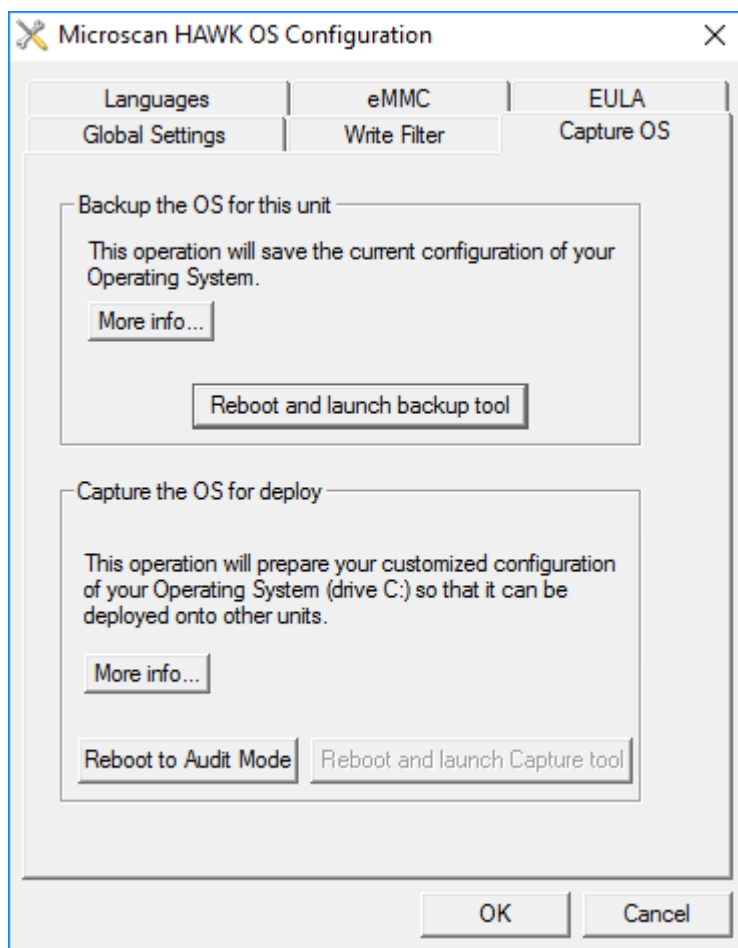


Clicking **ENABLE UWF** enables the Windows Universal Write Filter on the device. If you enable this, any changes made to the device will not be written to the hard disk, and will be lost on reboot.

Clicking **DISABLE UWF** disables the Windows Universal Write Filter again after reboot.

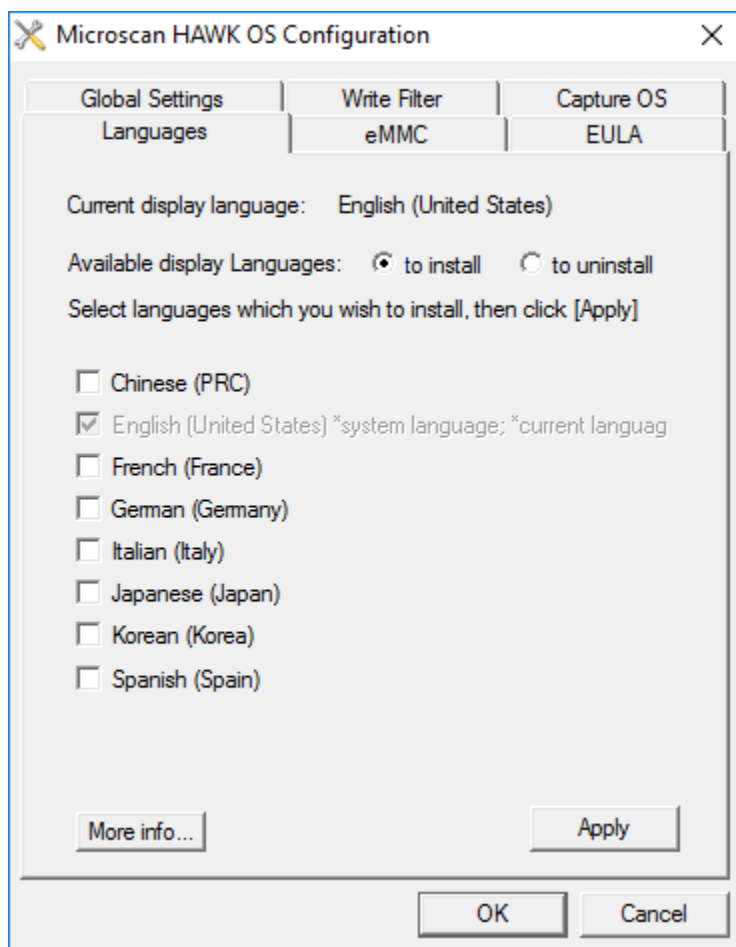
The UWF is disabled by default.

Capture OS Tab



See [Operating System Save and Restore](#) for more information about backing up the device. You can also click on the **More info...** button.

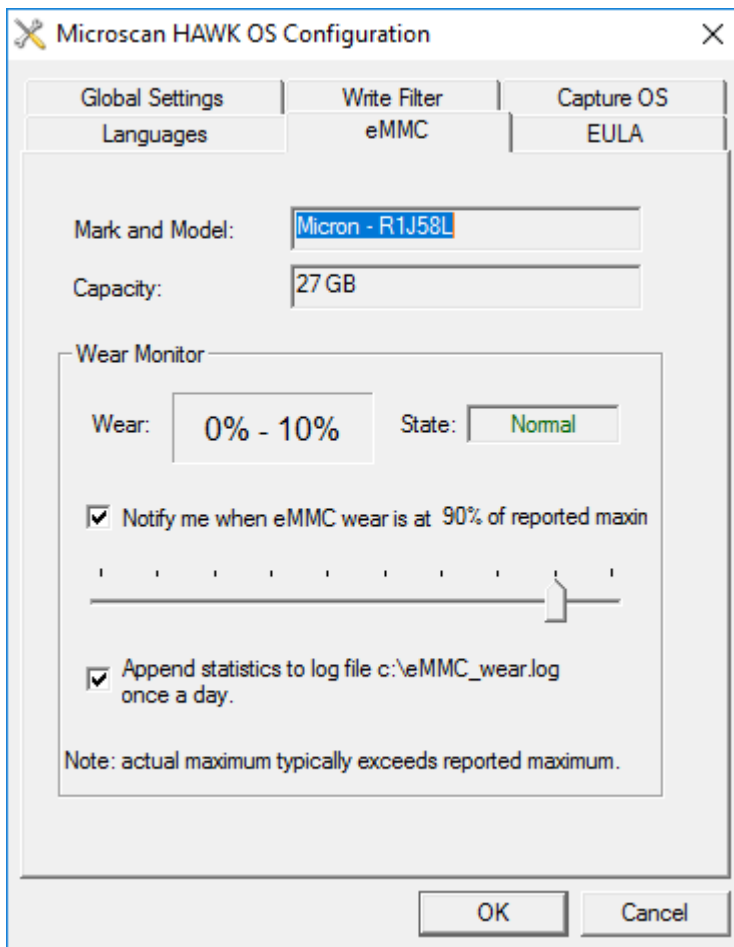
Languages Tab



Select **to install** or **to uninstall** using the **Available Display Languages** radio buttons, then select a language to add or remove from the device. Follow the screen prompts. Click the **More info...** button for instructions on enabling the language in Windows. Click **Apply** when ready.

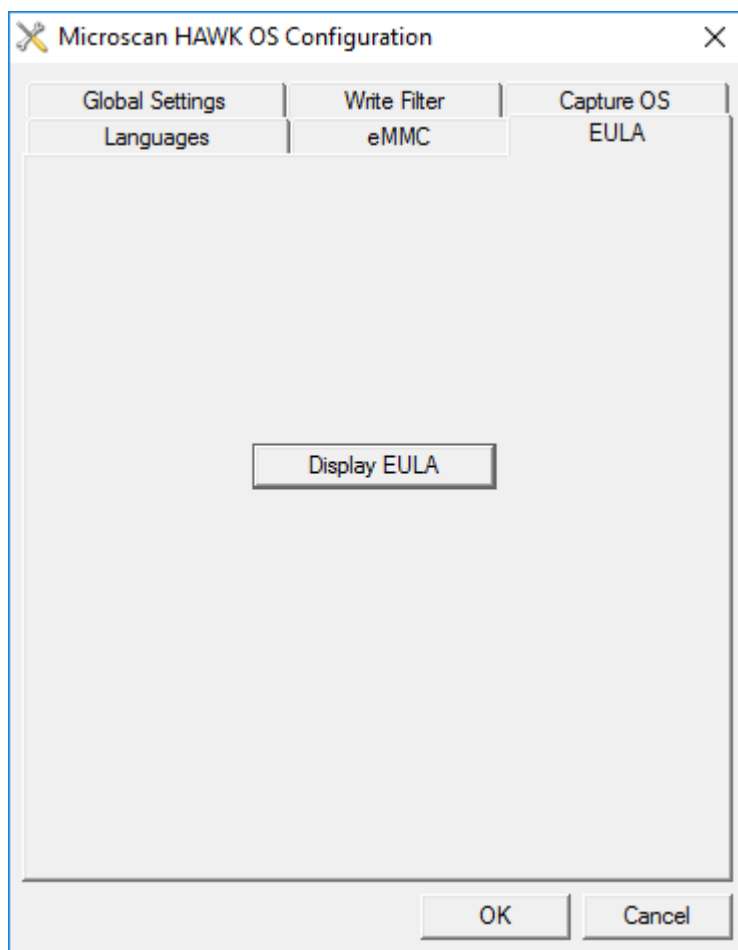
Appendix H OS Config Application

eMMC Tab



This tab shows **embedded Multi-Media Controller** information. This is a display of the type of memory used for the hard drive. It shows statistics on the wear state of the actual hardware devices, and can warn of issues with them.

EULA Tab



This tab allows you to display the Microsoft and Omron Microscan **End User License Agreements**.

Appendix H OS Config Application

You must click **I agree** on each screen to acknowledge you understand the licensing terms.

Microsoft End User License Agreement

Last updated July 2016

MICROSOFT SOFTWARE LICENSE TERMS

WINDOWS OPERATING SYSTEM

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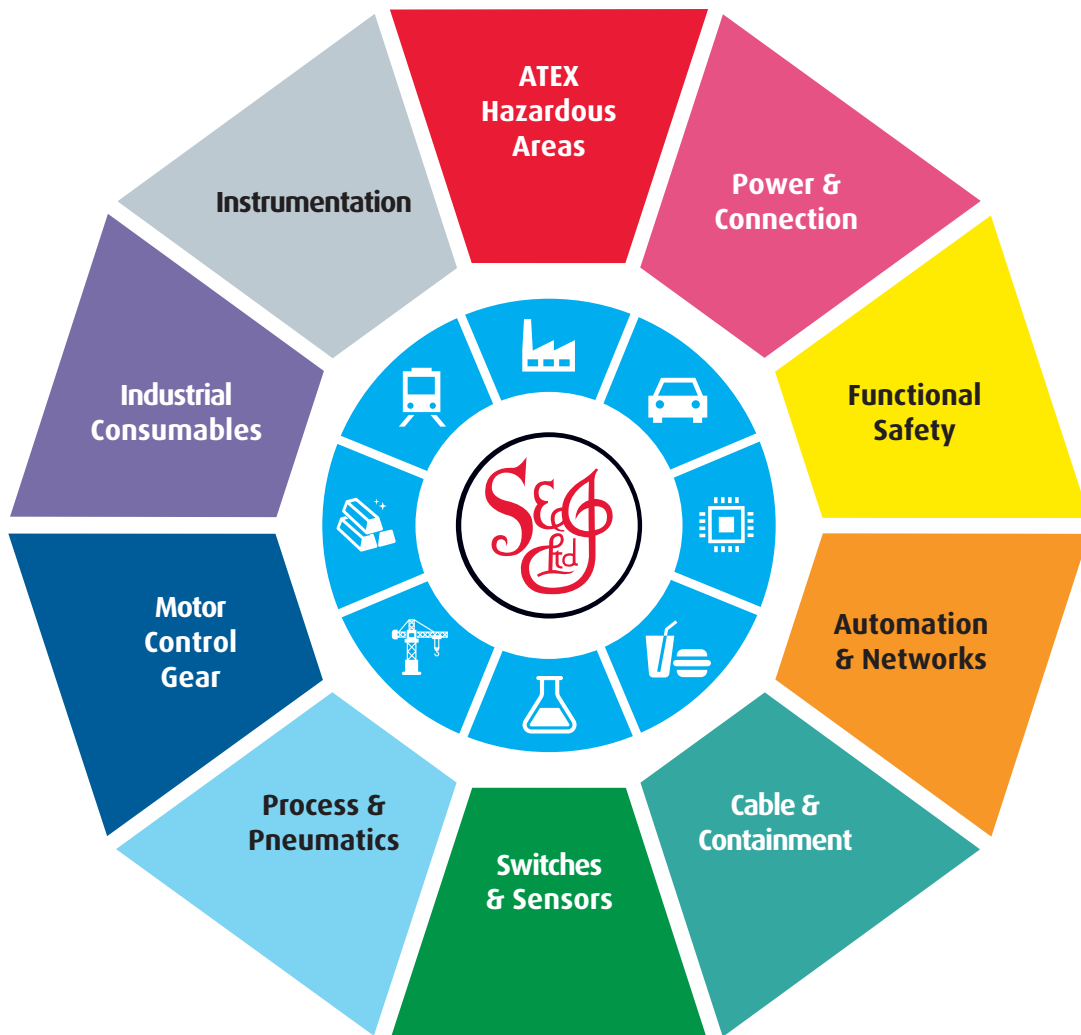
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