

Machine Vision Systems SIMATIC MV

for quality assurance and increased productivity

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SIMATIC Sensors

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Machine Vision Systems

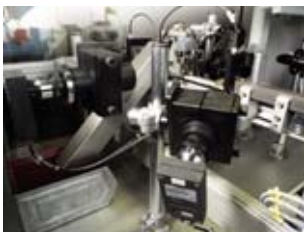
for quality assurance and increased productivity

Productive manufacturing processes have to be flexible. Batch sizes are getting smaller, cycles faster and quality requirements ever more stringent. Conventional inspection techniques are at their limits here. This is not the case with industrial image processing. Thanks to its enormous potential, it is becoming a standard discipline in automation engineering – especially since intelligent vision systems have made them easier to use.

A broad spectrum is available for all fields of application – from code reading systems for 1D/2D codes, vision sensors for application-specific machine vision, intelligent cameras for universal applications through to PC-based machine vision systems for extremely fast applications using several cameras.

Highlights

- Quality assurance
 - Fewer rejects
 - Automatic visual inspection objective, fast, and reliable: Checks dimensions, shapes, and detects whether parts are missing, checks correct mounting, position and completeness of parts, which can even be microscopically small (e.g. chip structures)
- Increased productivity
 - Automatic component recognition: The components are assigned to different pre-defined categories on the basis of shape, dimension, patterns, codes and markings
 - Even suitable for use at high clock-pulse rates



NERLITE – precise lighting for image processing

The better the lighting solution the better your machine vision system will work. Precise, reliable and repeatable performance means greater productivity at lower costs.

Thanks to innovative NERLITE lighting products, machine vision and auto-ID systems work reliably in simple as well as complex applications

Our NERLITE product range includes:

- Area arrays, spot lights, linear arrays, ring lights or dome illuminators
- Backlight and dark-field illuminators
- DOAL & COAL (Diffuse On-Axis Light & Collimated On-Axis Light) lights
- SCDI (Square Continuous Diffuse Illuminator)
- CDI (Continuous Diffuse Illuminator)
- MAXlite – Multi-axis lights and customer-specific solutions for OEMs

Highlights

- Cost-effective: Complete lighting solutions offer savings in the areas of research and installation
- Turnkey: Standard solutions for hundreds of applications
- Proven: Thousand of NERLITE lighting solutions find application on a worldwide basis
- Modular and compact: Saves installation effort and space in the machine
- Reliable: Durable, minimal service, LED-based design and worldwide support



Portfolio overview

Code reading systems – Flexible reading and verification of 1D/2D codes

Stationary code reading systems, hand-held reading systems, sector-specific code reading systems and verification systems are available for reading and verifying 1D/2D codes (e.g. barcode, data matrix code). Reading and verifying of codes located on directly marked parts (Direct Part Marking) is also possible with these reading systems.



Vision Sensors – Simple and intelligent

The intelligent vision sensors of the SIMATIC VS100 series as well as the SIMATIC MV220 color mark sensor and the SIMATIC MV230 surface profile sensor are specially designed for application-specific image processing.

The product line impresses customers by a simple operating concept and easy teaching of the inspection tasks.



Intelligent cameras – For universal applications

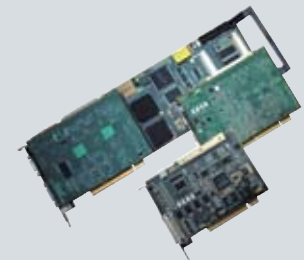
These general-purpose image processing systems are ideal for flexible manufacturing. They allow the user to keep an eye on the production process for reliable round-the-clock production. The intelligent cameras offer scalability for different inspection tasks, analysis rates, resolutions, applications with monochrome or color recognition – the perfect image processing solution for every sector.



Vision systems – Quality inspection at maximum speed

Constantly increasing production speeds, identification of smaller and smaller faults, inspection of complex objects or inspection from several perspectives place more and more stringent demands on today's image processing systems. This is where the SIMATIC Visionscape product line comes in, designed for extremely high-speed applications requiring several cameras and/or powerful image processing.

The powerful SIMATIC Visionscape software with an extensive range of proven image processing tools and the graphic user interface support the simple and quick implementation of PC-based image processing applications, e.g. with SIMATIC PC.



Code reading systems

Marking – verifying – reading – communication (MVRC)

Four key elements are required for implementing DPM traceability: Marking, verification, reading and communication – MVRC. Siemens covers all four key elements with a variety of products, systems, and provides support for the creation of applications.

Marking

Marking a product is normally done very early on in the production process so that all following steps can be controlled using the product identity. Marks are often applied to parts with a method called *Direct Part Marking (DPM)*.

Verification

By using verification systems, the readability of marks is ensured throughout the entire production process regardless of any possible contamination or when using different read devices. Moreover, the marking can continue to be read after the production process throughout the lifespan of the product.

For example, the SIMATIC HawkEye 1500 series provides the capability to monitor marks in real-time with its DPM verification options. Measuring the code quality results in cost advantages due to marking cycle time optimization, the prevention of plant downtimes and the prevention of additional handling overhead. The Vision Sensor VS130-2 can also measure code quality according to the AIM standard.

Reading

If ease of use and safe function are the priorities, then the reading devices must have a high degree of flexibility regarding design, interfaces, etc. to satisfy the various sector-specific requirements. In this area, the SIMATIC range with the compact HawkEye 1500 series, the Vision Sensor VS130-2 with separate sensor head and the HawkEye hand-held readers are the ideal choice.

Communication

For communication between reading device and process control, the reading devices have different interfaces such as PROFIBUS, PROFINET, Ethernet, RS232 as well as expanded digital inputs and outputs as standard features. These interfaces not only ensure fast and secure transmission of the trigger signal to start the read process but they also ensure fast and reliable transmission of the reading results.

MVRC means:

- **Marking:**
Placing the code directly on the object (DPM)
- **Verifying:**
Checking the quality of the marks on the object
- **Reading:**
Reading the mark in production or when servicing
- **Communication:**
Visualizing and interpreting the reading results

What is Direct Part Marking (DPM) ?

Direct Part Marking (DPM) refers to the application of a mark directly on the surface of a product without the use of a separate carrier material, such as an adhesive label. This makes it possible to identify products in production and to trace them after delivery as well. With 2D codes a coding method is available that meets these user requirements. 2D codes consist of easy to implement, point-shaped basic elements. Laser and needle marking technologies are outstanding regarding durability, marking speed and material independence. For example, because of mechanical deformation, 2D codes can still be read after multiple processing steps on metallic work pieces. 2D codes also provide the advantage of being able to encode data in more limited spaces than with comparable barcodes or plain text.



Flexible reading and verification of 1D/2D codes

For state-of-the-art production systems, tracing products and parts with machine-readable identification is a central requirement. A unique coding system permits the planning of each and every step of production for every part manufactured and changes within the production process or in the materials used can be documented. Direct marking of products also allows the implementation of specified legal requirements for tracing production batches throughout the production system.

Marking plays an important role not only in the production process, but also for liability issues, for example. Other special applications, e.g. military inventories, are covered by other products (UID).

Highlights

- Unique identification of products or product parts – Direct Part Marking is the key technology for tracing products
- Part-specific documentation of the production process
- Automation of the manufacturing process
- Verification for product liability cases (e.g. recall actions)

Stationary code reading systems

The stationary code reading systems either consist of high-performance read devices or a PC-based code reading system. The devices read various two-dimensional (2D) codes as well as one-dimensional (1D) barcodes. The PC-based system is a fast, powerful code reading system for various two-dimensional (2D) codes, one-dimensional (1D) barcodes, and OCR (text recognition). Many readers, including the PC-based code reading system, use data matrix print-quality monitoring (verification) of the codes for process control.



Hand-held reading systems

These hand-held reading systems are powerful, high-resolution read devices for either two-dimensional (2D) data matrix codes and/or one-dimensional bar codes (1D). The devices can communicate with a host computer using RS232, USB, PS2 and Bluetooth depending on the selected variant.



Verification systems

By using verification systems, the readability of marks is ensured throughout the entire production process regardless of any possible contamination or when using different read devices. Moreover, the marking can continue to be read after the production process throughout the lifespan of the product. Verification systems also make it possible to increase or optimize the marking speed because readability is constantly verified.



Code reading systems

Stationary code reading systems overview

The stationary code reading systems are powerful, intelligent reading devices for many different two-dimensional (2D) codes and one-dimensional (1D) barcodes. They can read printed, laser-inscribed, drilled, stamped or needled codes on many different surfaces. Reading the codes is possible on moving and stationary parts, regardless of the orientation of the object (360°).

Application areas

- Automotive industry
 - Marks on various power train components (cylinder heads, cylinder blocks, manifolds, etc.)
 - Laser marks on various power train components (cam shafts, crankshafts, pistons, piston rods, gearbox components, etc.)
 - Laser marks on electronic components, PCBs or enclosures
- Aerospace industry
 - Marks on gas turbine blades or on different aluminum driving gear components, e.g. to protect against counterfeit parts
- Medical devices
 - Laser marks on pacemakers and other implantable devices, e.g. to protect against counterfeits
 - Laser marks on various medical equipment components and enclosures
- Electronics
 - Laser marks on PCBs, parts or components
- Semiconductors
 - Laser marks on enclosed semiconductor components, heat sinks or heat dissipaters

SIMATIC DMx AutoID+ PC-based code reading system

SIMATIC DMx AutoID+ is a fast, high-performance code reading system for various two-dimensional (2D) codes, one-dimensional (1D) barcodes and OCR (text recognition). It has a built-in verification option for all data matrix symbols which is used for analyzing all important code parameters from each individual data matrix code in real time.

Fast image processing and a software interface for Windows 2000/XP makes DMx AutoID+ a system that is flexible, powerful, and still easy to operate, ideal for any application in which a PC is used.

Highlights

- Fast, powerful code reading system for various two-dimensional (2D) codes, one-dimensional (1D) barcodes, and OCR (text recognition).
- Up to 1800 reads per minute in high-resolution mode, and even faster in low-resolution mode
- Reads multiple symbols in the same field of view
- Supports up to four cameras individually, triggered or synchronously triggered, via I/O board, with flash-light output
- Real-time verification of the data matrix symbols
- Screen display and data display for each camera input



SIMATIC HawkEye 1500

The SIMATIC HawkEye 1500 devices are powerful, stationary read devices for data matrix codes and barcodes. The special format in the size of an intelligent camera makes the HawkEye 1500 the perfect replacement for a barcode scanner. Uncomplicated setup and the advanced programming capabilities ensure user-friendliness and universal application at the same time.

Highlights

- Compact configuration for easy integration in plants
- Universally usable
- Unique direct part mark verification options for in-process mark quality monitoring.
- Automatic photometry and automatic training for accommodating a wide variety of parts without any parameter adjustments or programming
- Powerful graphical user interface (GUI) for advanced setup and remote monitoring of several readers
- Extended saved image diagnostics for highest possible read rates
- QuicSet function: audio-visual alignment for fast startup without PC

SIMATIC VS130-2

The SIMATIC VS130-2 code reading system was developed especially for reading data matrix codes (DMC) ECC200 and various 1D/2D codes in an industrial environment. The complete package comprises lighting, evaluation unit, sensor and cables. They are installed and commissioned with a flick of the wrist. They are so easy to operate that no training is necessary and the system is "trained" instead of programmed, so even untrained personnel can use it instantly. Thanks to standardized interfaces, the systems can be flexibly integrated into the plant automation. For simple conveyor units, a stand-alone solution is available without an additional PLC.

Highlights

- Separate lighting unit for extended reading distances
- PROFIBUS, Ethernet and DI/DO on board; PROFINET I/O functionality
- Web-based user interface
- Commissioning without software installation on the PC
- Web-based remote maintenance concept
- Integrated error image memory
- Access protection with password.

Stationary code reading systems

	HawkEye 1500	VS130-2
		
Enclosure	Compact (IP40) with integrated lighting	Modular (sensor head and lamps), IP65
Commissioning and operation	Setup software, QuicSet, alignment tools, language: E	Integrated web server, on-board operator controls, auto-optimizing of parameters, languages: E/G/F/I/S/CH
Communication	Ethernet (ASCII), RS232	PROFIBUS, PROFINET, Ethernet
Verification standards	AIM, Siemens-DPM-Verification	AIM

Code reading systems

Hand-held reading systems overview

SIMATIC HawkEye 40/40T

- Hand-held reading devices that are powerful and suitable for high resolutions
- Reading (2D) data matrix codes and barcodes (1D)
- Complex image processing functions and lighting technology to read codes on many different surfaces
- HawkEye 40 is suitable for labels with high contrasts
- SIMATIC HawkEye 40T is designed for codes with low contrasts, such as are made by dot peen, laser printers or inkjet printers
- Versatile interfaces: RS232, USB, PS2 and Bluetooth
- The HawkEye 40T is also certified as a "Department of Defense Unique Identifier (UID) String Validator"



SIMATIC HawkEye 45/45T

- Hand-held reading devices with display for read data and settings
- Reads large linear and highly compressed data matrix codes as well as barcodes without any time delay
- Continuous adaptation of resolution, lighting and image field to any code and to the scanned surface, the size of the characters, and to the ambient light
- High reading speed when decoding data matrix symbols
- HawkEye 45 is suitable for labels with high contrasts
- SIMATIC HawkEye 45T is designed for codes with lower contrasts, such as are made by dot peen, laser printers or inkjet printers
- Versatile interfaces: RS232, USB, PS2 and Bluetooth
- The HawkEye 45T is also certified as a "Department of Defense Unique Identifier (UID) String Validator"



SIMATIC HawkEye 50T/51T

- Powerful, high-resolution reading devices for detecting low-contrast two-dimensional (2D) direct-part-mark (DPM) data matrix codes
- Reading codes that e.g. are applied by lasers, print or needles on a wide variety of surfaces
- Contact or near-contact readers
- The LytePype lighting system enables increased reading power and reading speed for data matrix codes
- Connectable via USB or RS232
- Models with ESD protection: Suitable for applications in environments that react with sensitivity to electrostatic discharge



SIMATIC HawkEye 52T/53T

- Powerful, high-resolution read devices for detecting low-contrast two-dimensional (2D) direct-part-mark (DPM) data matrix codes and larger barcodes (1D)
- Reads symbols that are applied with lasers and inkjet on many different surfaces, as well as barcodes with the built-in laser scanner
- Contact or near-contact readers
- The LytePype lighting system enables increased reading power and reading speed for data matrix codes
- The user can switch over between DPM and barcode reading
- Easily connectable to RS232



SIMATIC HawkEye hand-held reading systems				
	HawkEye 40/45	HawkEye 40T/45T	HawkEye 50T/51T	HawkEye 52T/53T
Operating range				
■ Minimum (code-dependent)	50 mm (1.9")	50 mm (1.9")	HawkEye 50T: 0 mm (0") HawkEye 51T: 3 mm (0.125")	0 mm (0")
■ Maximum (code-dependent)	375 mm (14.8")	375 mm (14.8")	HawkEye 50T: 25 mm (1") HawkEye 51T: 51 mm (2")	51 mm (2")
Image field				
■ Near	25 mm x 15 mm (0.98" x 0.6") at 50 mm (1.9") distance	25 mm x 15 mm (0.98" x 0.6") at 50 mm (1.9") distance	HawkEye 50T: 13 mm x 13 mm (0.5" x 0.5") with contact HawkEye 51T: 19 mm x 19 mm (0.75" x 0.75") at 3 mm (0.125") distance	HawkEye 52T: 24 mm x 24 mm (0.95" x 0.95") HawkEye 53T: 19 mm x 19 mm (0.75" x 0.75")
■ Far	150 mm x 90 mm (5.9" x 3.5") at 375 mm (14.8") distance	150 mm x 90 mm (5.9" x 3.5") at 375 mm (14.8") distance	HawkEye 50T: 19 mm x 19 mm (0.75" x 0.75") at 25 mm (1") distance HawkEye 51T: 36 mm x 36 mm (1.4" x 1.4") at 51 mm (2") distance	HawkEye 52T: 43 mm x 43 mm (1.7" x 1.7") HawkEye 53T: 28 mm x 28 mm (1.1" x 1.1")
Decoding capability				
■ 1D	Code 128, Code 39, Code 93, Int 2 of 5, Codabar, UPC/EAN/JAN, RSS, Composite, Postal, Codablock F, Code 11, Matrix 2 of 5, MSI Plessey, NEC 2 of 5, Pharmacode, Telepen	Code 39, Code 128, Codabar, Code 93, I2of5, UPC/EAN, UPC-E, UPC Supplementals	–	Code 39, Code 93, Code 128, UPC/EAN/JAN/SUP, I2of5
■ 2D	Data Matrix, PDF417, Micro PDF 417, QR Code, MicroQR Code, Maxicode, Aztec, GoCode	Data Matrix, PDF417, QR Code	2D codes	Data matrix
Code generation	Laser, print	Laser, print or needles	Laser, print or needles	Laser, print or needles
Interfaces	USB, RS232, PS2, Bluetooth Class 1 (90 m, 300 ft)	USB, RS232, PS2, Bluetooth Class 1 (90 m, 300 ft)	USB, RS232	RS232

Applications

Applications of the hand-held reading systems include industrial and commercial applications in which individual parts must be identified/localized and in which the part is identifiable through a hand-held reader for data matrix codes or barcodes.



This applies for a wide range of applications in many industries:

- Automotive industry:
Identification of various power train components (e.g cylinder heads, cylinder blocks, manifolds, etc.)
- Aerospace industry:
e.g. codes on turbine blades
- Medical devices:
e.g. laser marks on a wide variety of medical components and enclosures
- Electronics industry
e.g. laser marks on hard disks, PCBs, and other components.

Code reading systems

Verification systems overview

By using verification systems, the readability of marks is ensured throughout the entire production process regardless of any possible contamination or when using different reading devices. Moreover, the marking can continue to be read after the production process throughout the lifespan of the product.

For example, the SIMATIC HawkEye 1500 series provides the capability to monitor marks in real-time with its DPM verification options. Measuring code quality generates cost advantages through optimization of cycle times in the marking process, prevention of plant stoppage or avoidance of additional handling expense. The VS130-2 Vision Sensor likewise has a function for measuring the code quality in accordance with the AIM standard.

HawkEye Direct Part Mark Verifier

SIMATIC HawkEye Direct Part Mark (DPM) Verifier assures the quality of data matrix codes on directly marked parts. This involves a software option for the cameras of the SIMATIC HawkEye 1500 series. Siemens Direct Part Marking (DPM) technology is utilized here. Thus a 100% check for DPMs can be executed and the marking system can be set correctly before illegible marks are applied to the parts.

Highlights

- Wide application range through support of the following verification standards: Siemens DPM, AS9132, ISO 15415 and ISO 16022 (AIM)
- Unique SIEMENS DPM quality measurements overcome the limitations of other verification standards.
- Integrated (A/B/C/D/F) grading levels enable easy interpretation of results.
- User-configurable good/fair/poor quality alarm ranges for each measurement
- Direct connection to a PLC or stack lights through on-board I/O
- Graphic interface for advanced setup and in-line monitoring of the verification results and output of statistics.



