



**COGNEX**

Advanced machine vision made easy

# Aerospace and Defense Applications Guide

Machine Vision for Automated Inspection, Code Reading, and Code Verification

# Machine Vision for Automated Inspection, Code Reading, and Barcode Verification

Aerospace and defense manufacturers and suppliers must comply with strict regulations for code parameters, traceability, and part quality. To consistently meet these requirements at scale, many are turning to machine vision. Machine vision systems combine cameras and processing software to automate visual tasks, enabling manufacturers to reliably read codes, verify text, and inspect components in challenging environments.

## Common Industry Challenges

- **Complex parts:** Complicated features, surface finishes, and part geometries make it hard to find defects and separate them from acceptable anomalies.
- **Intricate designs:** Assemblies can include dozens of parts, making it difficult to verify everything is correctly assembled.
- **Regulatory requirements:** Codes and parts must meet strict compliance standards and quality tolerances.
- **Manual processes and production bottlenecks:** Manually inspecting parts and transcribing codes is time-consuming, error-prone, and inconsistent.

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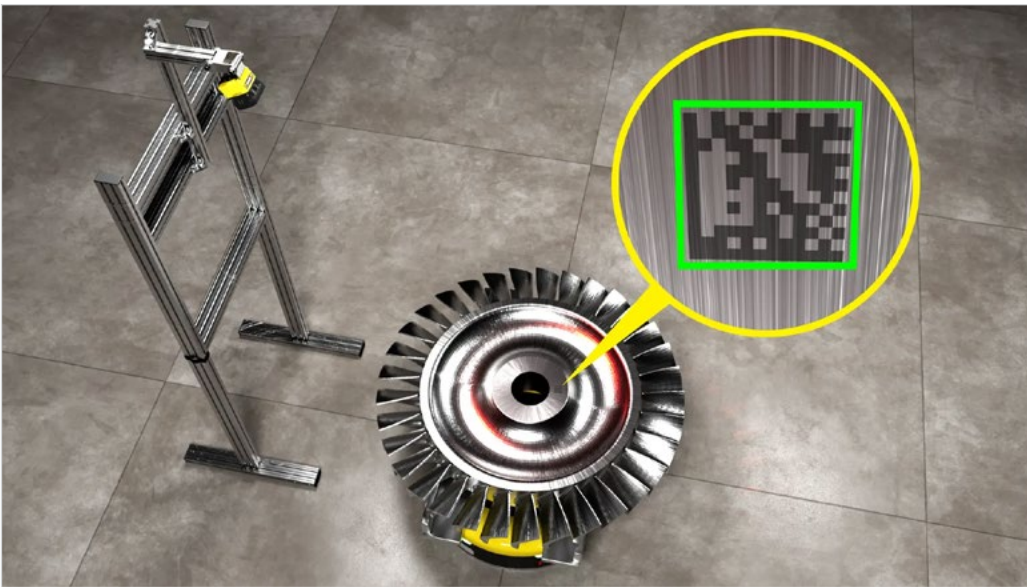


# Barcode Reading and Traceability

Failing to read barcodes can expose aerospace and defense manufacturers to risk, noncompliance, and supply chain vulnerability. Machine vision systems read various codes in challenging settings to ensure full traceability and compliance.

## Key benefits

- Mitigate risk and identify manufacturing issues
- Support compliance and audit readiness
- Reduce rework and scrap



## Fixed-mount scanning

Read 1D/2D barcodes and direct part marks (DPMs) on large parts.



## Handheld scanning

Scan barcodes on on reflective surfaces, metal, and other challenging surfaces.

# Barcode Verification and Code Compliance

Verifying that barcodes meet specific industry standards is mandatory for compliant and efficient aerospace and defense manufacturing. Barcode verifiers quickly determine whether codes meet specifications and provide actionable feedback when a code generates a poor grade.

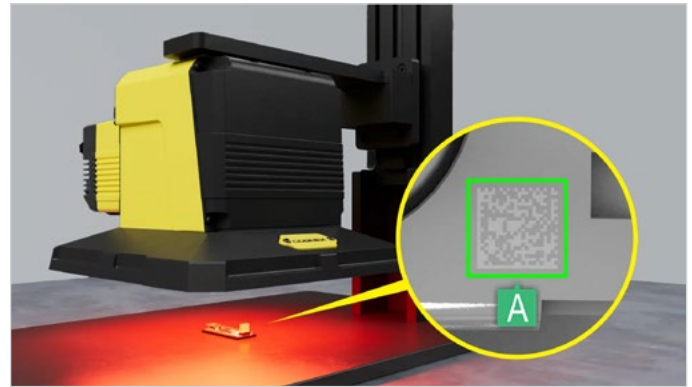
## Key benefits

- Quickly validate barcodes against industry standards, including ISO, IEC, and MIL
- Uncover and understand issues with quality feedback reports
- Detect degradation, contrast issues, or marking defects early



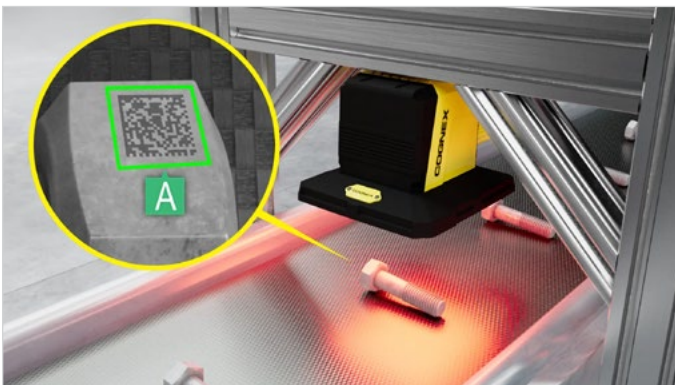
## Handheld verification

Verify DPMs on textured, curved, and reflective surfaces.



## Offline verification

Grade codes against industry standards and diagnose quality issues.



## In-line verification

Verify DPMs on high-speed manufacturing lines.

## Standards-Based Grading



Standards-based grading (SBG) is a software feature for barcode scanners and vision systems that assesses barcode quality.

[Download Barcode Verification Whitepaper](#)

# Optical Character Recognition and Text Reading

Alphanumeric codes are the foundation of serialization and traceability, relaying important part genealogy and manufacturing information. Machine vision systems can automatically read damaged codes, verify their accuracy, and ensure they are readable throughout the supply chain.

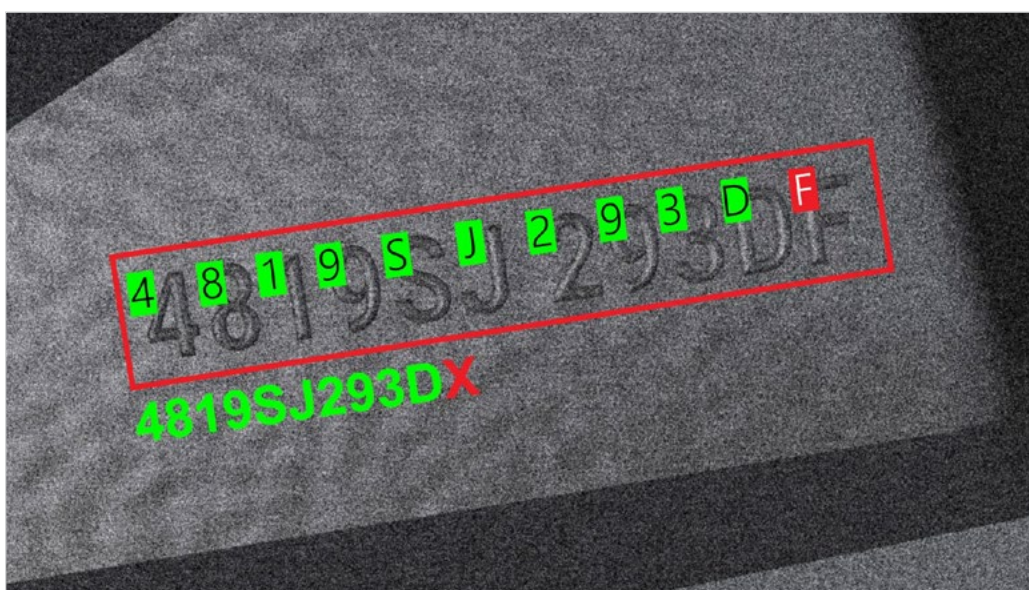
## Key benefits

- Automate manual data entry
- Improve tracking, traceability, and supply chain intelligence
- Generate digital records and reporting



## Optical character recognition

Read damaged and obscured alphanumeric codes on shiny surfaces and curved parts.



## Optical character verification

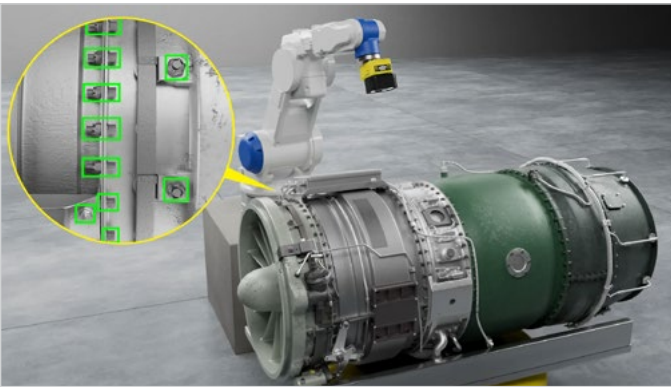
Scan codes to confirm their accuracy and readability.

# Defect Detection and Assembly Verification

Machine vision systems detect subtle defects, verify complex assemblies, measure intricate features, and quickly distinguish between acceptable and defective parts.

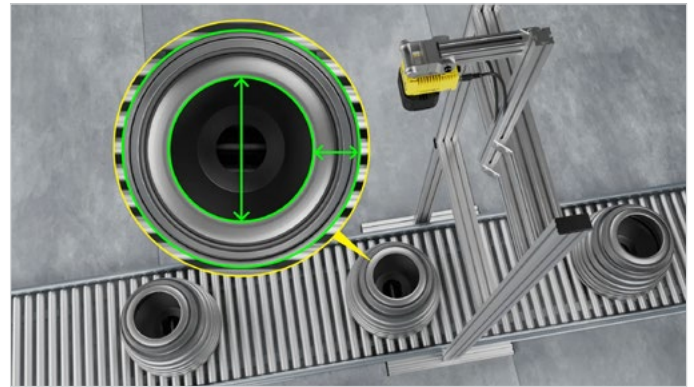
## Key benefits

- Enhance product quality and optimize processes with root-cause insights
- Expand inspection capacity and capability beyond manual methods
- Improve first-pass yield while reducing scrap and rework



## Assembly inspection

Verify parts in complex assemblies are installed correctly with robotic-mounted and stationary vision systems.



## Part verification and defect detection

Detect defects and obtain precise measurements in challenging settings.



## Cast mold inspection

Detect residual contaminants, scratches, dents, and other defects in molds.



## Heat shield inspection

Identify and classify defects on heat shields and other aerospace components.

# Why Cognex



## Automate Various Applications

Flexible machine vision tools work with powerful optics and imaging technology to automate inspection, verification, code reading, measurement, and guidance tasks with accuracy, precision, and speed.



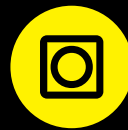
## Intuitive Setup, Training, and User Experience

Simplifies deployment with guided workflows, easy training, and a unified interface across devices.



## Fast Deployment and Easy Integration

Quickly integrates with existing PLCs, industrial protocols, MES, and quality systems to minimize downtime.



## Embedded Functionality and Modular Systems

Get reliable performance in tough environments with built-in features like pre-trained font libraries, simple job validation, and robust image formation. Interchangeable components and example-based learning help you tackle new challenges with ease.



## Flexible Lighting and High-Resolution Imaging

Maximizes contrast on reflective, grainy, and rough surfaces for efficient code reading, verification, and character inspection, even under challenging conditions.



# Customer Testimonials



“Cognex barcode scanners are compatible with mixed-line production and many applications. Their multicolor lighting options, high-speed liquid lens, and built-in AI algorithms improve the accuracy of our code scanning.”

—Feng Yingjun, Head Vision Engineer, Lyric Robotic Automation

[Watch the video](#)

“Cognex has a lot of advantages when it comes to machine vision or tracking a part, so we applied their solutions to many products on our end.”

—Daebom Park, Sr. Manager, Production Technology Team, BorgWarner

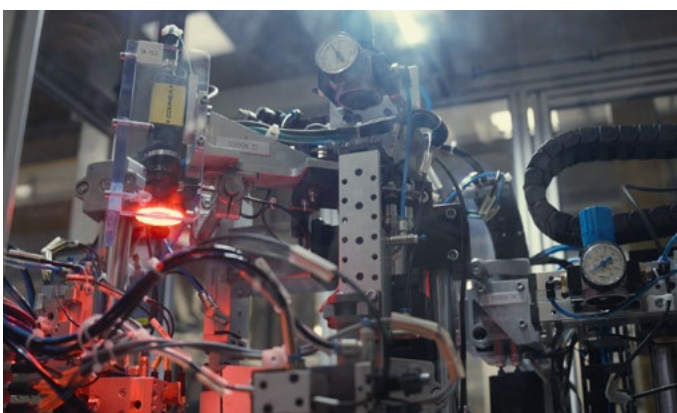
[Watch the video](#)



“We keep the world rolling, every car has some Schaeffler parts in it. And Cognex keeps us rolling with continuous innovation and versatile solutions, we’re happy to be driving toward a similar vision and mission.”

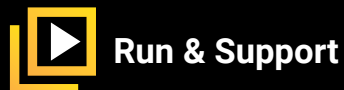
—Christoph Hildebrandt, Manager of Machine Vision and Non-Destructive Testing, Schaeffler SMB

[Watch the video](#)



# Customer Success

Industry-leading support that works the way *you* want, from self-service resources to a global network of experts

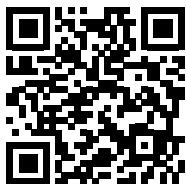


## From initial planning to full-scale implementation, Cognex makes using advanced machine vision easy.

**During planning and deployment**, you'll get curated guidance on product choices and setup, single-click registration, and image-based AI training to get going quickly.

**Once you're validated and in production**, we keep you at peak performance with connected support and self-service training to take you from beginner to expert.

**And over time**, we help you scale up through a broad portfolio of products with shared interfaces and capabilities, as well as easy access to data that helps you grow and optimize across multiple facilities.



[cognex.com/customer-success](https://cognex.com/customer-success)



# Advanced machine vision made easy



## The world's leading provider of vision systems, sensors, and software for automation

Cognex brings the power of vision to factory and warehouse automation of all kinds: detecting defects, monitoring production lines, guiding assembly robots, and tracking, sorting, and identifying parts. Our innovative technologies and focus on support throughout the customer journey make vision-based projects easier to set up, more effective, and more reliable.

Cognex machine vision solutions improve product quality and reduce costs at leading manufacturers and logistics providers worldwide, and our mature AI technology makes them more capable and easier to install, maintain, and operate.

Advancing automation is complicated enough already. We make it easier by providing industry-leading support that works the way customers want, from self-service resources to a global network of experts.

**>40 years** in business

**25K+** global customers

**500+** global customer support resources

**>1,100** technology patents

[cognex.com](https://www.cognex.com)

# Cognex Product Portfolio

## Vision Systems and Software

Optimize inspection processes with Edge and Advanced AI, ensuring accurate defect detection, assembly verification, text reading, and more.

[www.cognex.com/machine-vision](http://www.cognex.com/machine-vision)



## Barcode Readers

Achieve end-to-end traceability across production and distribution, with flexible AI-powered readers and verifiers designed for ease of use and reliability.

[www.cognex.com/barcodereaders](http://www.cognex.com/barcodereaders)



## Industry Solutions

Tackle applications across a wide range of industries with powerful AI machine vision solutions that simplify manufacturing and logistics challenges.

[www.cognex.com/solutions](http://www.cognex.com/solutions)



# COGNEX

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Corporate Headquarters  
One Vision Drive  
Natick, MA 01760 USA

Contact us or find your regional sales office:  
[www.cognex.com/sales](http://www.cognex.com/sales)

### Americas

North America +1 855 426 4639  
Brazil +1 855 426 4639  
Mexico +52 552 789 5444

### Europe

Austria +49 721 958 8052  
Belgium (FR) +33 176 549 318  
France +33 176 549 318  
Germany +49 721 958 8052  
Ireland +353 21 601 9005  
Italy +39 02 9475 4345  
Spain +34 93 220 6237  
Switzerland (DE) +49 721 958 8052  
Switzerland (FR) +33 176 549 318  
United Kingdom +353 21 601 9005  
Other Europe +353 21 601 9005

### Asia-Pacific

China +86 021 8036 5424  
India +91 7305 040397  
Japan +81 345 790 266  
Korea +82 070 4784 4038  
Malaysia +60 3 2774 6820  
Singapore +65 3158 2511  
Taiwan +886 801 492 017  
Other Asia-Pacific +65 3158 2511

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