

COGNEX ViDi Edge Learning ve smart kamerách COGNEX In-Sight

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Moderní metody rozpoznávání a zpracování obrazových informací 2024

Technická univerzita v Liberci

26. 4. 2024

APPLIC s.r.o.

APPLIC s.r.o.

- 1992 – APPLIC s.r.o.
- 1996 – 1. vlastní budova
- 2002 – výrobní hala I.
- 2005 – COGNEX PSI The logo for PSI COGNEX, featuring the text 'PARTNER SYSTEM INTEGRATOR' in a small font above a stylized 'PSI' in large, bold letters, with 'COGNEX' in a smaller font below it.
- 2015 – výrobní hala II.
- 2022 – 30 let od založení APPLIC s.r.o.
- 2023 – certifikace ISO 27001

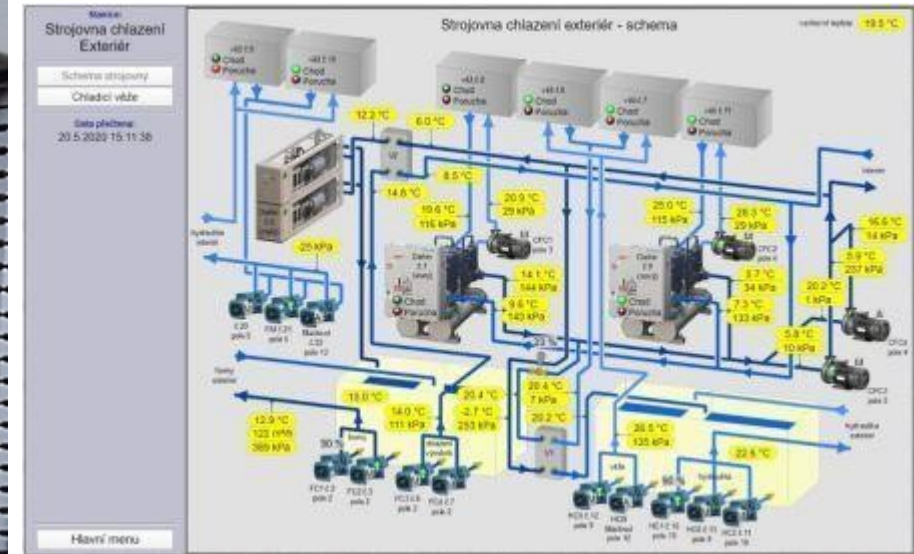


APPLIC s.r.o.

- **>1600m² výrobních a kancelářských prostor ve 3 vlastních budovách**
- **40 zaměstnanců**
- **Projekce strojní a elektro**
- **Výroba strojní a elektro**
- **Software**
- **Vývoj elektroniky**
- **Servis**
- **Obrat 80 - 100mil. Kč**

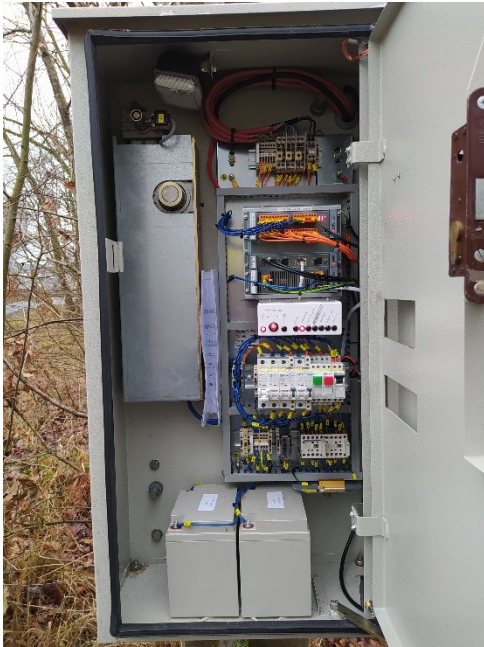


- **MaR + dispečerské systémy**
 - **Jablonecká energetická a.s., Teplárna Liberec a.s., Home Credit Aréna Liberec, Magna Liberec, Krajská nemocnice Liberec**



APPLIC s.r.o.

- Energetika – dálkové ovládání UO, TS + dispečerské řízení OZE, LDS, SVR – ČEZ a.s. , EG.D a.s., PRE a.s.



- PC aplikace včetně databázových systémů

Dimension Jg MRAC4

PLC stroje: PŘIPOJENO OK, Stav kamerového testeru: Čekání na příjezd výrobku, PROVOZ V LINCE, Układání dat: Hotovo

3D kamery: VENTIL, TRUBKY, MRAC4, LHD, LH Auto dual, BRS 1234yf, 1 loy, Sériové číslo: 9795, Produktové číslo: 8161

Obsluha: operator [OPERÁTOR], Pokyny pro obsluhu: Čekajte na příjezd výrobku..., Číslo palety: 108, Počet testů: 1

Výsledek: OK, KONEKTOR, SERVO-MODUL

Měření ventilů a trubek

VENTIL L	VENTIL S	TRUBKA OUTLET	TRUBKA INLET
X: 1,42	X: 0,94	X: -0,10	X: 0,29
Y: -0,16	Y: 0,16	Y: 0,84	Y: 1,59
Z: -0,70	Z: -0,80	Z: 1,30	Z: 0,81

Výsledek 3D měření: OK

OPAKOVAT TEST, Datum a čas posledního testu: 27.11.2022 9:31:12, POTVRDIT NG KUS

VISIONPRO Vision Software

PLC: OK, Bezpečnost: VISION, Obsluha: Denso Administrátor [ADMINISTRÁTOR], Robot: EMG STOP, AUTO, Anulační čas: 20.11.2017 13:27:43,616

WAGO IO: PŘIPOJENO, VISION DVEŘE: Stav stroje, Motory: MOTOR ON, Kontrolér: OK, Čas posledního testu: 20.11.2017 13:27:23 (39,5 s)

LINKA: LINKA N2, Pokyny pro obsluhu: Čekám na příjezd výrobku, Układání dat: Hotovo, Počet kusů od 20.11.2017 10:27:15: OK 36, NG 26, Celk.: 62

Testy	Výsledky	NG pozice
CAM_UKL_T3_075 DUCT Levá - Klip 1		
CAM_UKL_T1_DZ Poloha		
CAM_UKL_T1_010 Test 1		
CAM_UKL_T2_020_TXV Ventil TXV		
CAM_UKL_T2_040 Šroub 1		
CAM_UKL_T2_040 Šroub 2		
CAM_UKL_T2_050 BLW con 1		
CAM_UKL_T2_050 BLW šroub 1		
CAM_UKL_T2_050 BLW šroub 2		
CAM_UKL_T2_060 Face-Def packing		
CAM_UKL_T2_100 Grid guide L		
CAM_UKL_T2_110_DZ Face sensor 1		
CAM_UKL_T2_110_DZ Klapka		
CAM_UKL_T2_120 Klapka		
CAM_UKL_T2_180 Grid guide R		
CAM_UKL_T2_180 Face-Def packing		
CAM_UKL_T2_200 Face-Def packing		
CAM_UKL_T2_200 RPS L		
CAM_UKL_T2_220 Face-Def packing		
CAM_UKL_T2_240 Face-Def packing		

Product number: 8207, Serial number: 29322, Kód chyby: 3-050-1, Čas: 13:37:42, Počet chyb: celkem: 1, zkontrolovat: 0

Obrázek, Master obrázek

21 True, Test: 824 0185, 3-050-1, AcquisitionTime

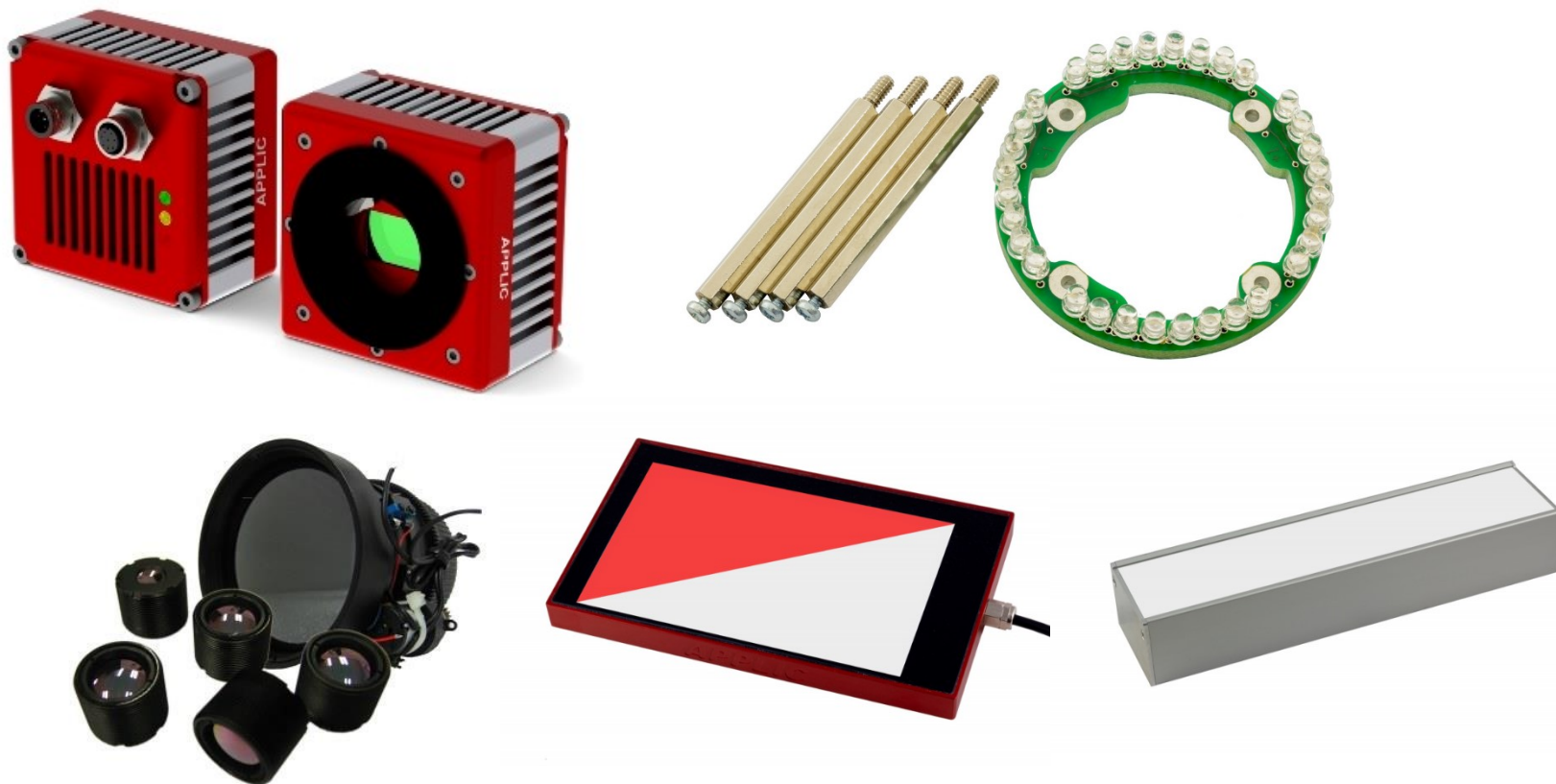
- **Průmyslová automatizace výrobních linek v různých výrobních odvětvích**



- Kamerové systémy pro kontrolu výrobků
- Robotická pracoviště s kamerovým systémem
- Jednúčelové stroje pro kompletaci nebo kontrolu výrobků
- Značení čárovými kódy/2D kódy, vč. kontroly potisku kamerou



- **Vývoj vlastní infra kamery a světel pro kamerové systémy + dodávky speciálních infra objektivů**



COGNEX VisionPro ViDi Suite (Deep Learning)

COGNEX
ViDi Suite



Cosmetic Inspection

Surface Inspection
Functional defect detection



Part location

Deformable part location and counting
Path following for robot

Pre-Assembly verification

Pre-assembly clearance check
Part Correctness and Orientation
Kitting & Palletizing



Classification

Bulk/batch identification
Defect classification



Hard-to-solve OCR

Distorted character detection

Post Assembly

Placement check
Final assembly & packaging
verification

AI technologies in industrial automation



Edge learning

Designed for **ease of use**

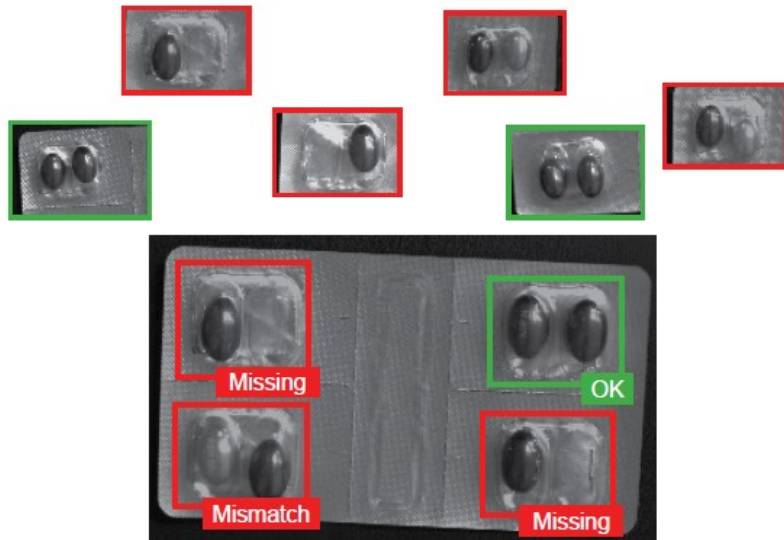


Deep learning

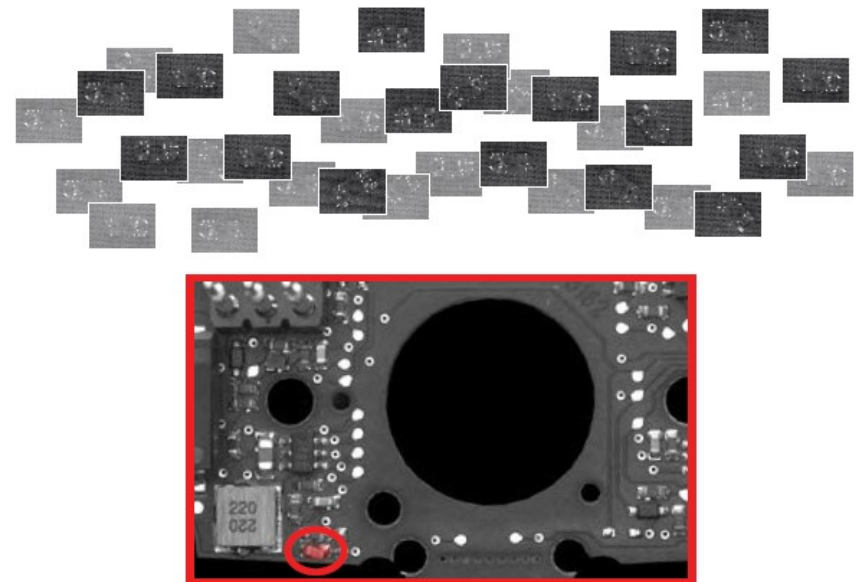
Designed for **complex applications**

AI technologies in industrial automation

Edge learning: For ease of use



Deep learning: For complex tasks



Recommended uses

Rule-based vision



Measurement and gauging



Location and fixturing



Robotic guidance

Edge learning



Classification



Assembly verification



Character reading

Deep learning



Complex defect detection

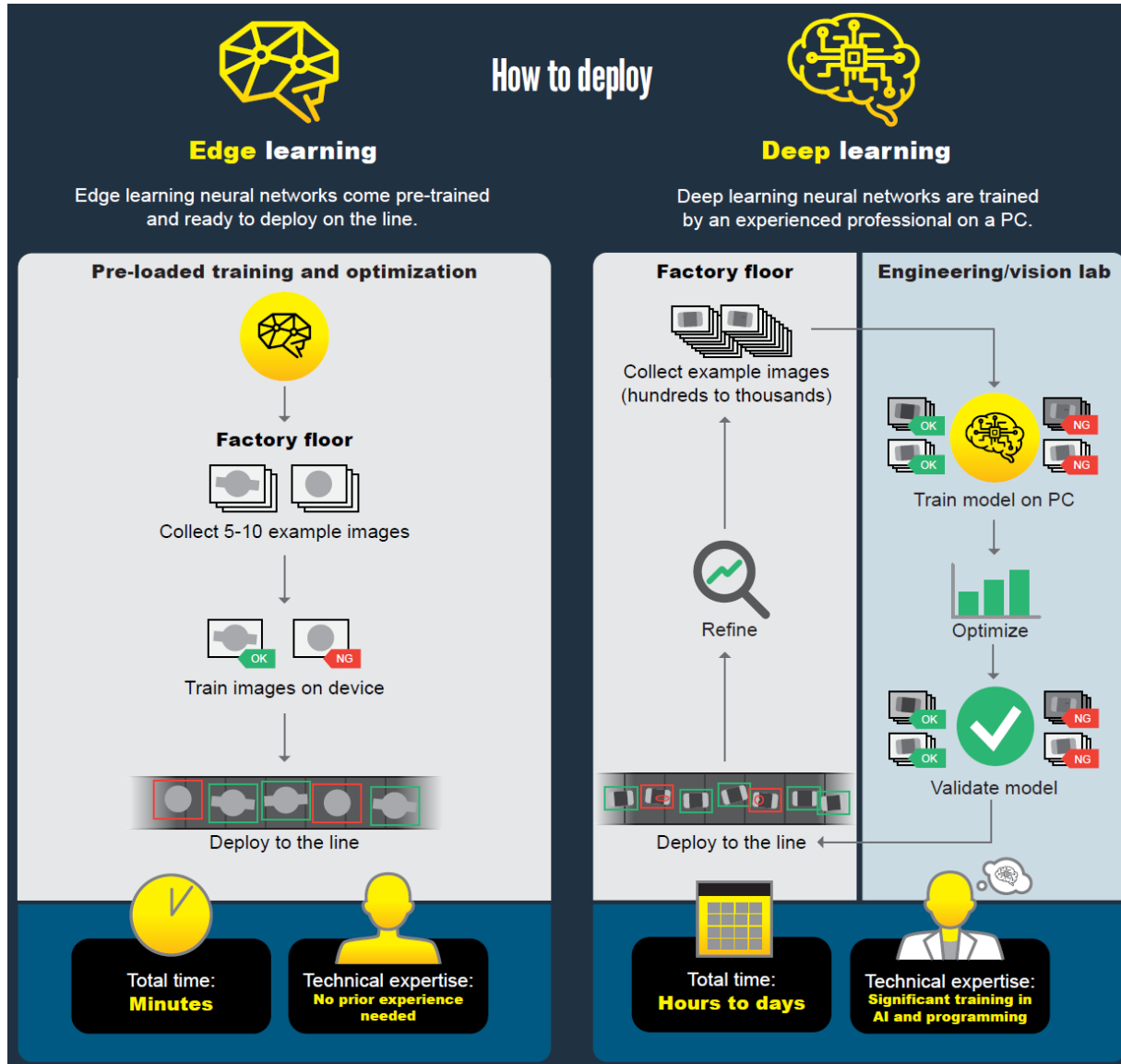


Tasks with significant variation



Highly customized jobs

How to deploy



In-Sight D900 Series

In-Sight D900 Series

The In-Sight D900 vision system leverages advanced AI-based tools to solve challenging OCR, assembly verification, and defect detection tasks. Processing takes place on-device, which eliminates the need for a PC, simplifying application deployment.

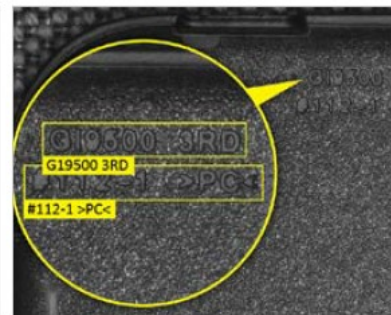
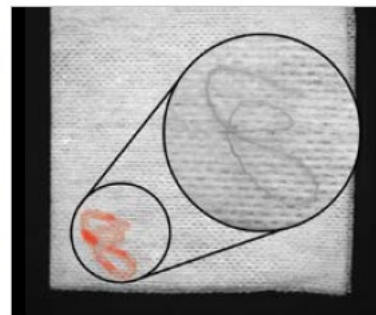
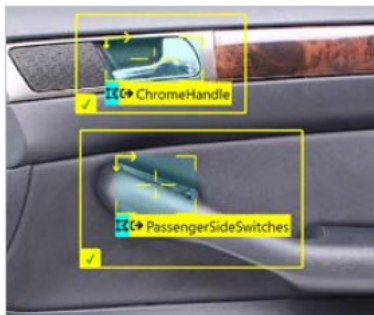
TOOLSET



RESOLUTION

Up to 5MP

FEATURES



In-Sight 2800 Series

In-Sight 2800 Series

The In-Sight 2800 vision system combines edge learning technology with traditional rule-based vision to solve a range of error-proofing tasks. From presence/absence detection to sortation and character reading applications, this fully integrated vision system offers an easy-to-use solution for automating inspections.

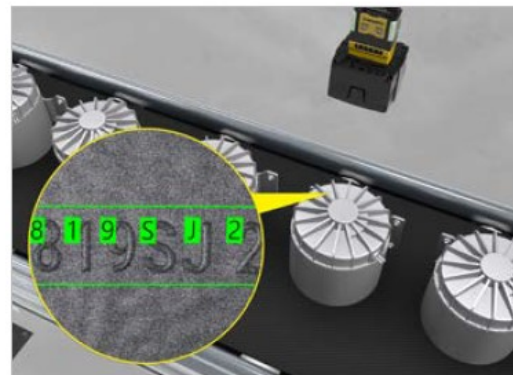
TOOLSET



RESOLUTION

Up to 2MP

FEATURES



In-Sight 3800 Series

Designed for high-speed applications, In-Sight 3800 delivers a fully integrated solution for manufacturing automation. Beyond speed, this powerful system is embedded with the latest vision technologies and offers high flexibility and high resolution, allowing users to maximize throughput, scale their solution, and run more accurate inspections.

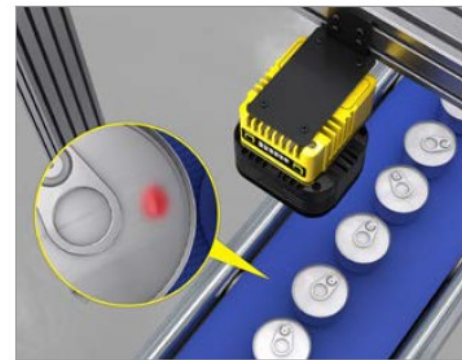
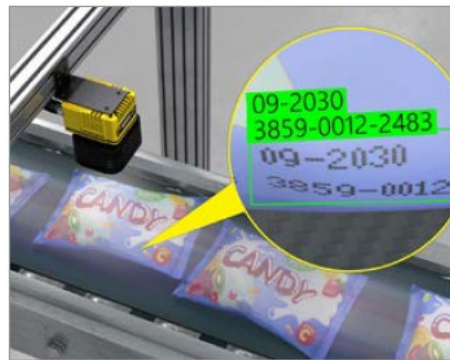
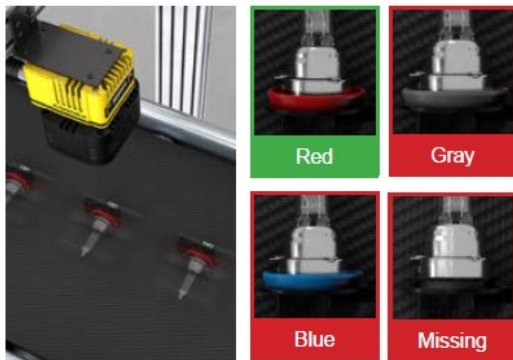
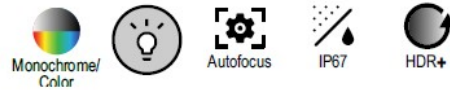
TOOLSET



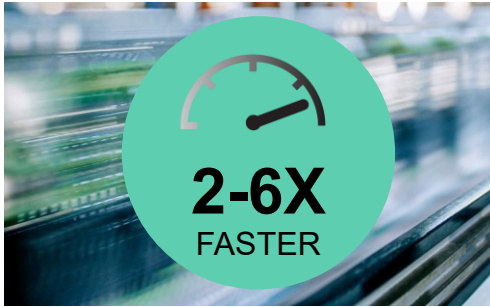
RESOLUTION

Up to 16MP

FEATURES



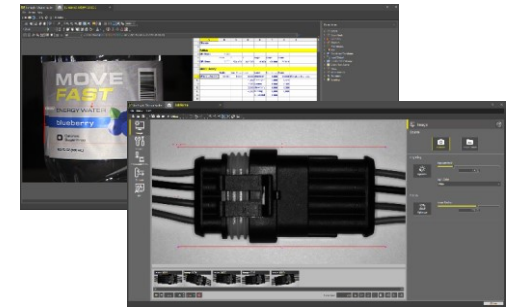
In-Sight 3800 Series Advantages



High speed



High accuracy



Scalable software



High-Performance Hardware

1.6MP, 3MP, 5MP, 8MP, 12MP and 16MP resolution options meet a wide range of application requirements

Field-interchangeable optical accessories allows users to solve a variety of applications

IP67-rated housing ensures reliable operation even in the most demanding environments

Powered by **24V**

HDR+ mono and color creates high-quality, high-contrast images for more accurate defect detection

Indicator lights for operator feedback

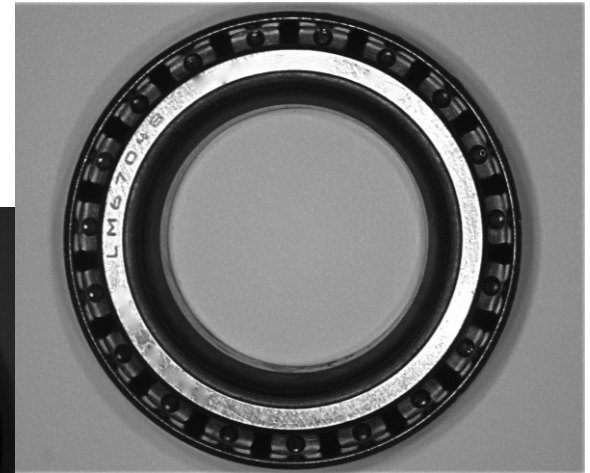
Integrated multi-color lighting (RGBW and IR) optimizes image formation for more accurate inspections



HDR+ Mono and Color

With higher image quality and contrast, HDR+ allows users to:

- See features not visible before
- Increase depth of field
- Accommodate faster line speeds



ViDi EL Tools

Power and performance

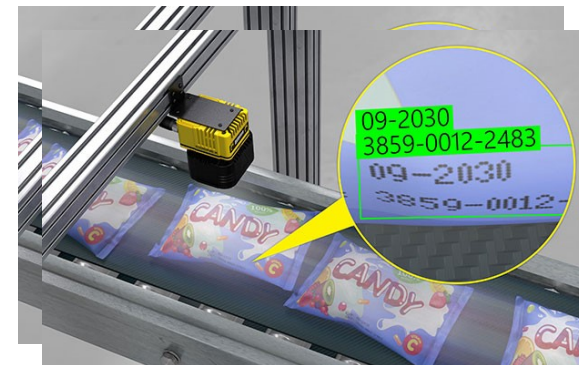
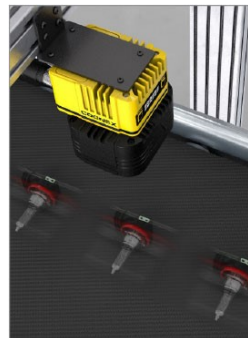
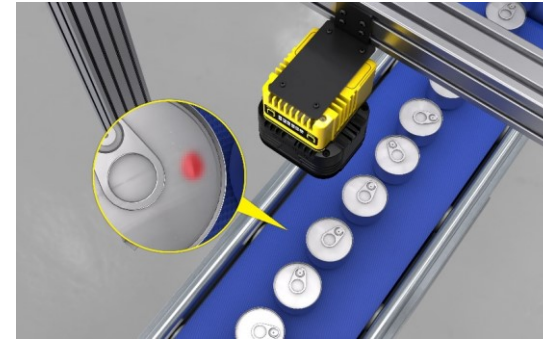
Leverage AI-based technology

Fast training

Train in minutes with as few as 5 images

Flexible functionality

Solve a wide range of applications



ViDi EL Segment Tool

Advanced segmentation and classification

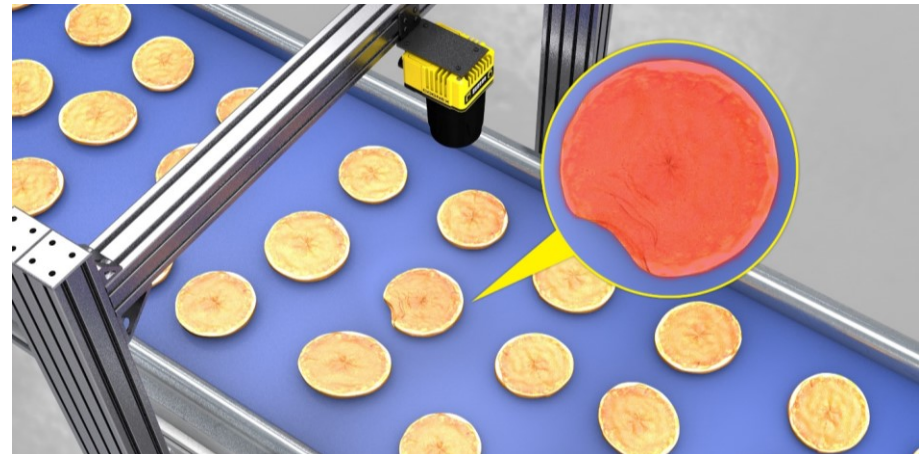
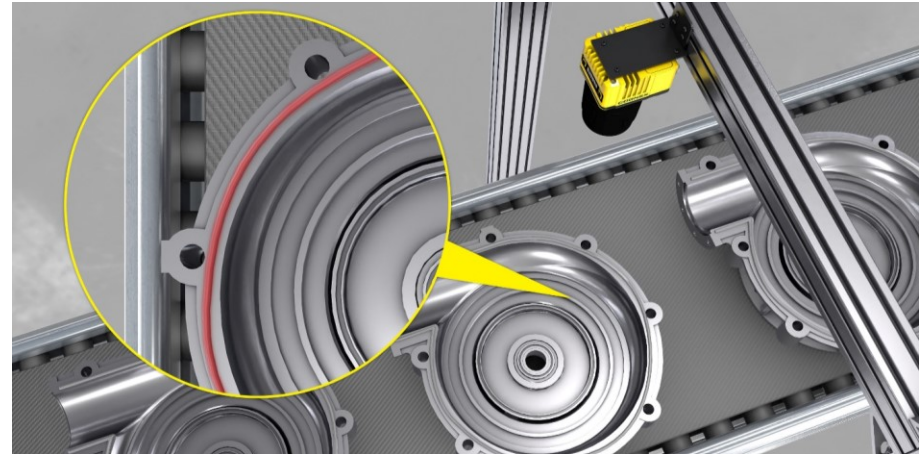
Extract regions and parts for targeted inspection

Intuitive training

Mark the feature or defect of interest directly on the image during training

Subtle defect detection

Reliably identify defects on complex parts with variable backgrounds



ViDi EL Classify Tool

Multi-class functionality

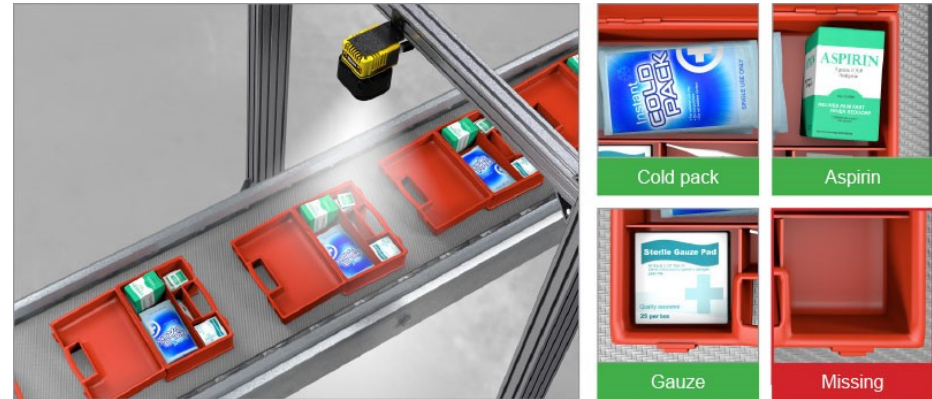
Go beyond OK/NG results

Fast training

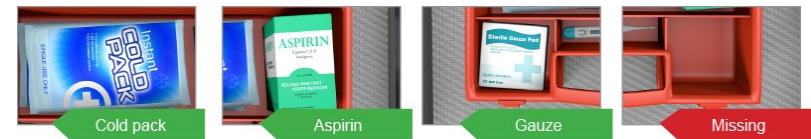
Train classes in minutes using as few as 5 images per class

Application flexibility

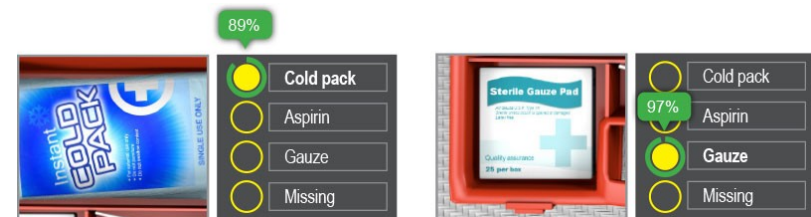
Detect presence/absence or classify parts based on multiple user-defined features



Training



Confidence score



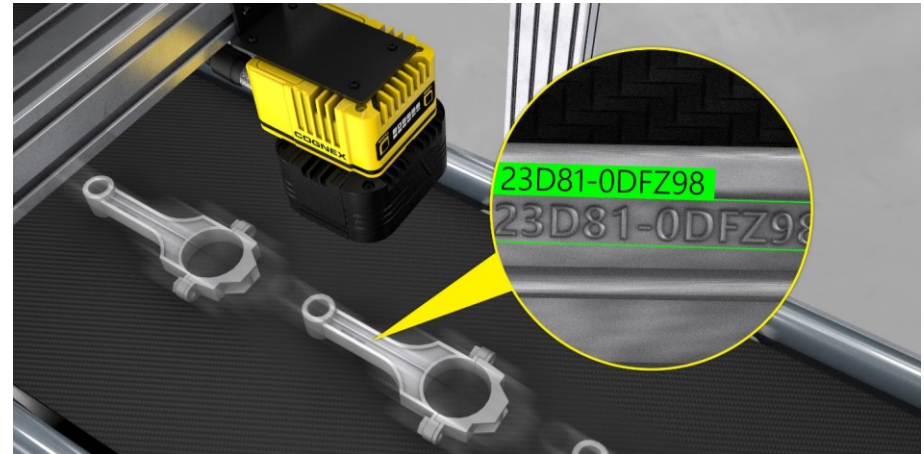
ViDi EL Read Tool

Pre-trained OCR

For simple applications: Read characters right out of the box

User-trained OCR

For complex applications: Train tool to recognize characters with different font types



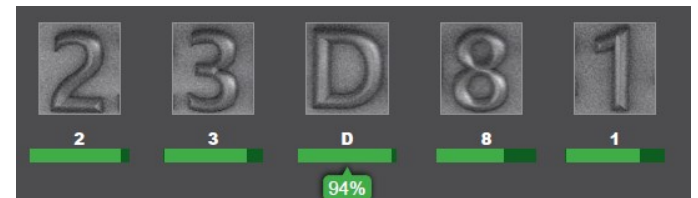
Multi-line reading

Read multiple lines of text at the same time

Training



Confidence score



ViDi EL Read Tool

Pre-trained OCR

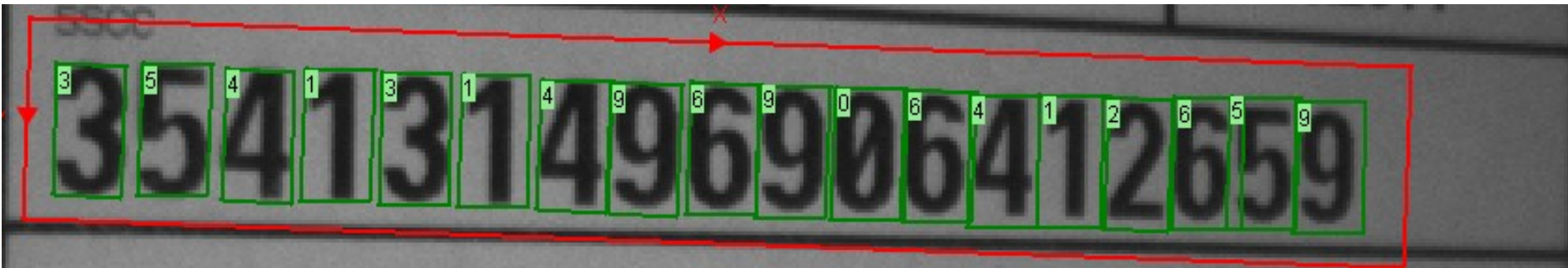
For simple applications: Read characters right out of the box



ViDi EL Read Tool

Pre-trained OCR

For simple applications: Read characters right out of the box



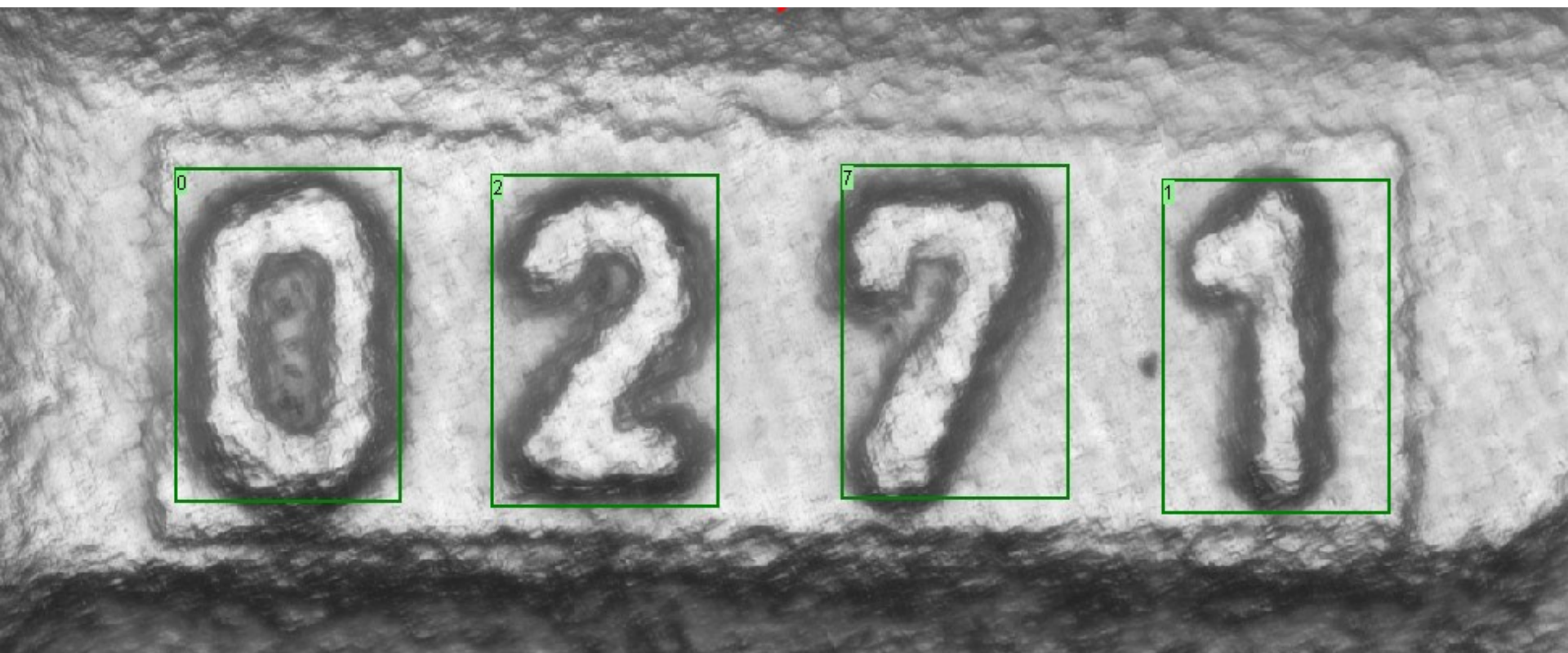
ViDi EL Read Tool



ViDi EL Read Tool

User-trained OCR

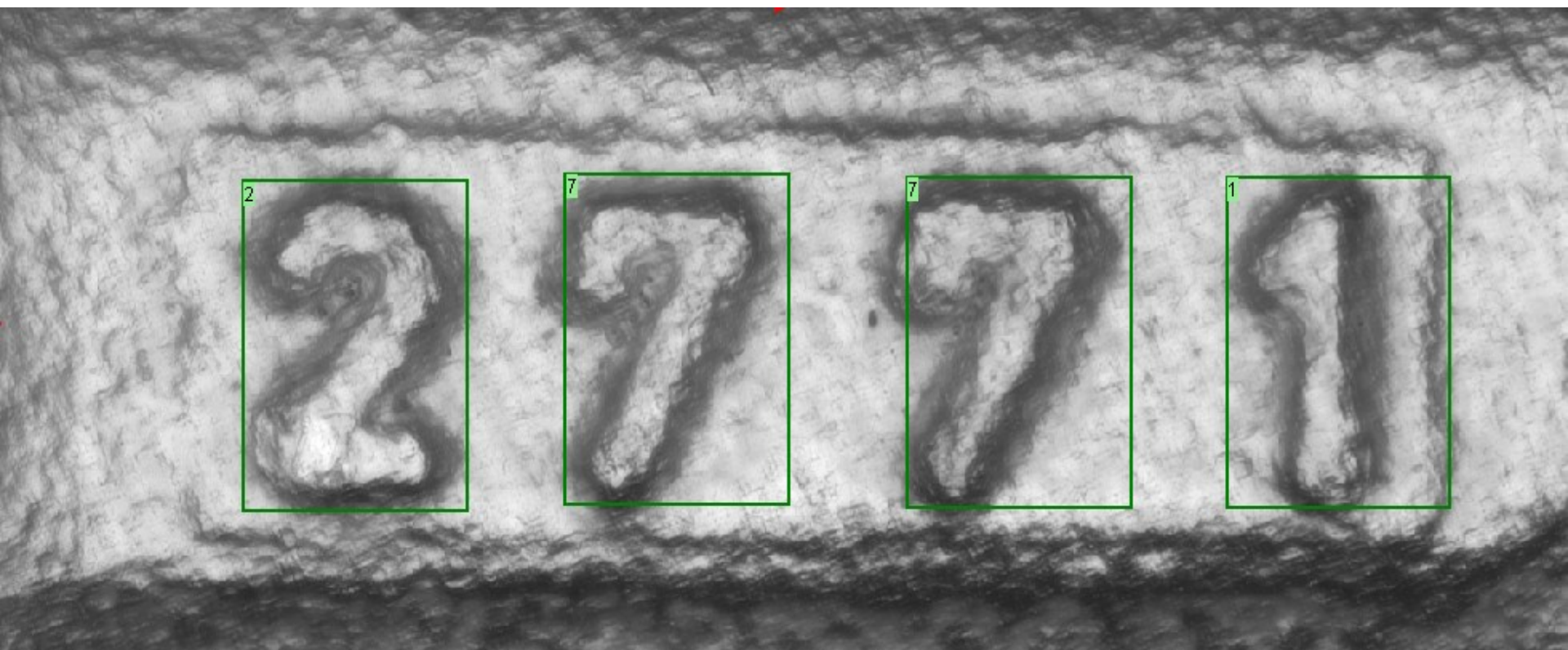
For complex applications: Train tool to recognize characters with different font types



ViDi EL Read Tool

User-trained OCR

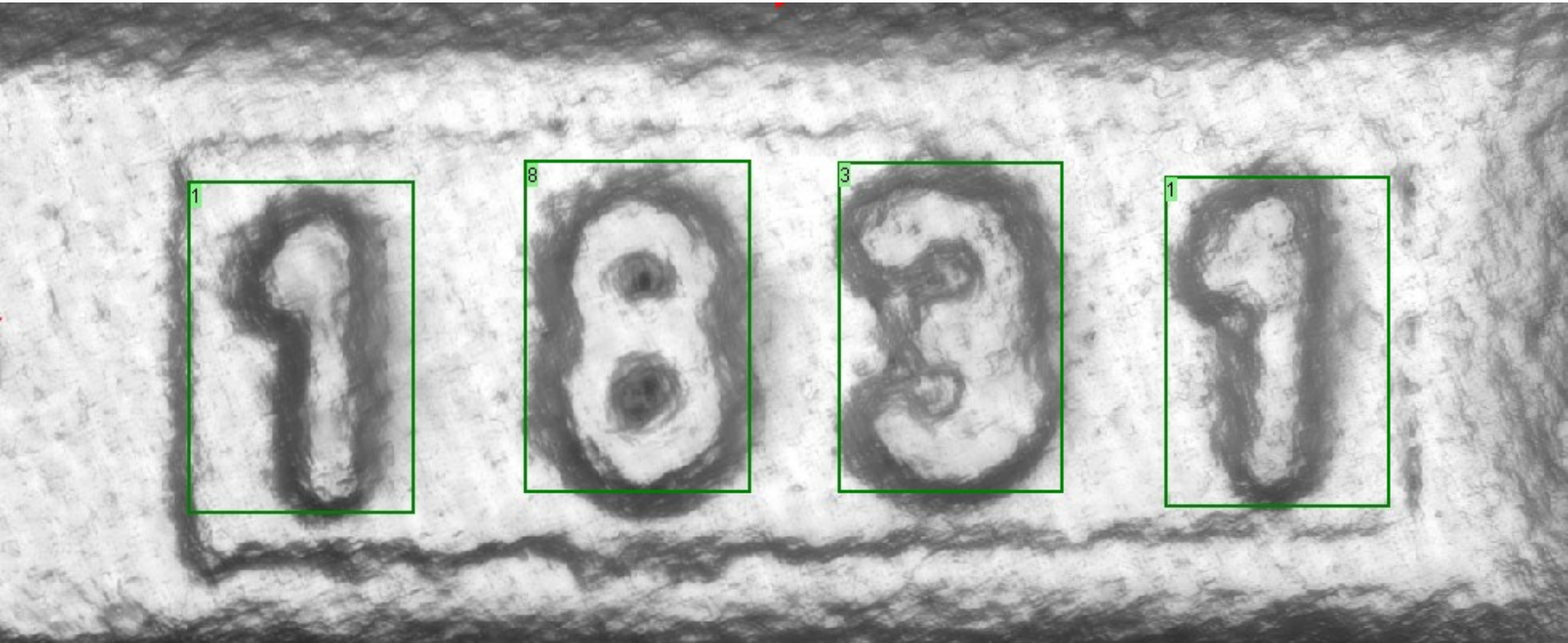
For complex applications: Train tool to recognize characters with different font types



ViDi EL Read Tool

User-trained OCR

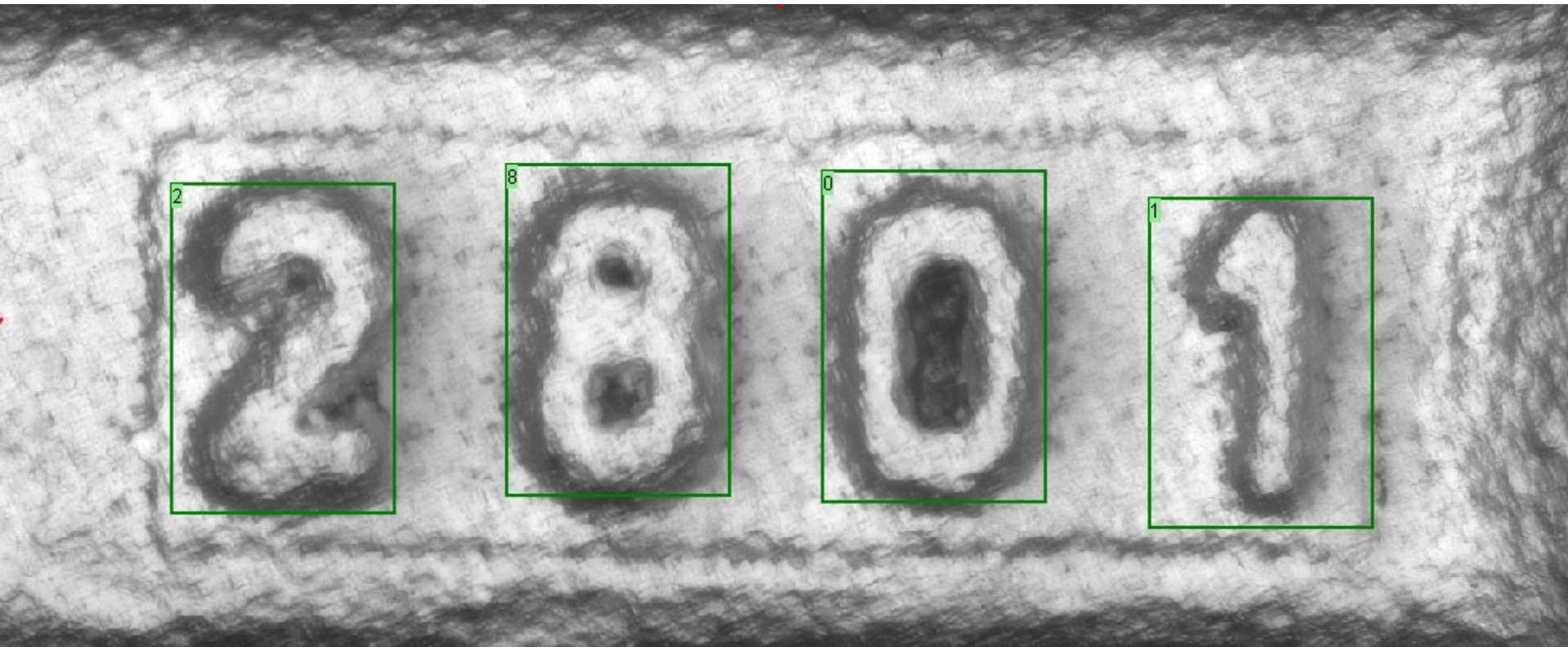
For complex applications: Train tool to recognize characters with different font types



ViDi EL Read Tool

User-trained OCR

For complex applications: Train tool to recognize characters with different font types

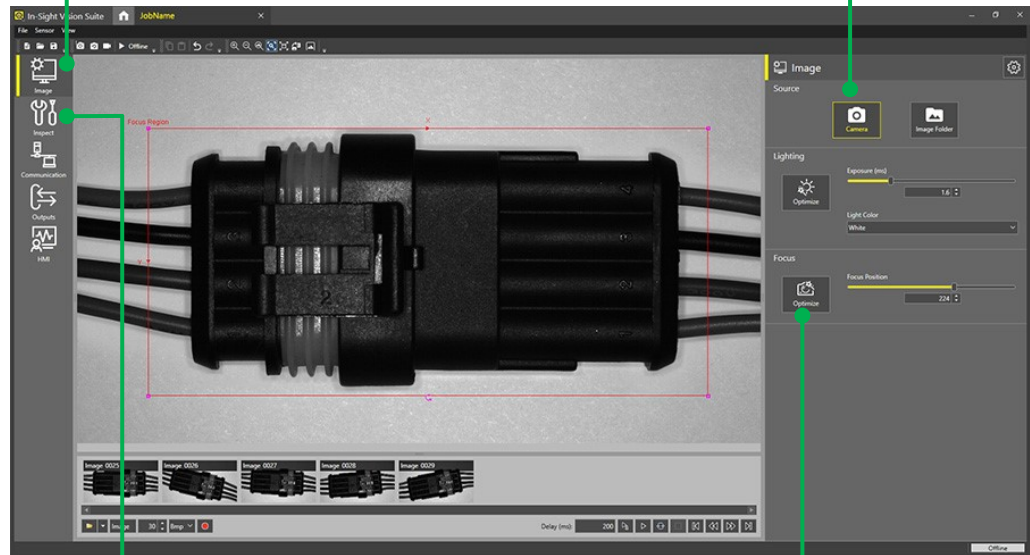


Simple EasyBuilder Interface

- Intuitive, graphical training enables easy job setup
- Ideal for deploying simple or common jobs
- Accessible to both new and advanced users, no experience needed

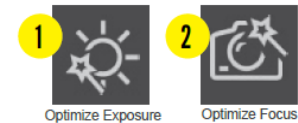
Easy **step-by-step** application setup

Image-centric **point-and click** functionality allows users to quickly setup tools



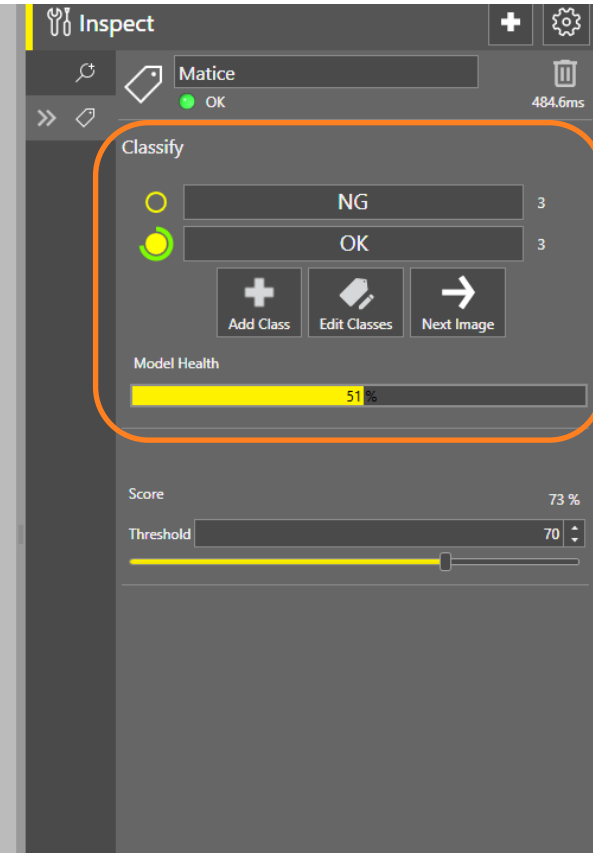
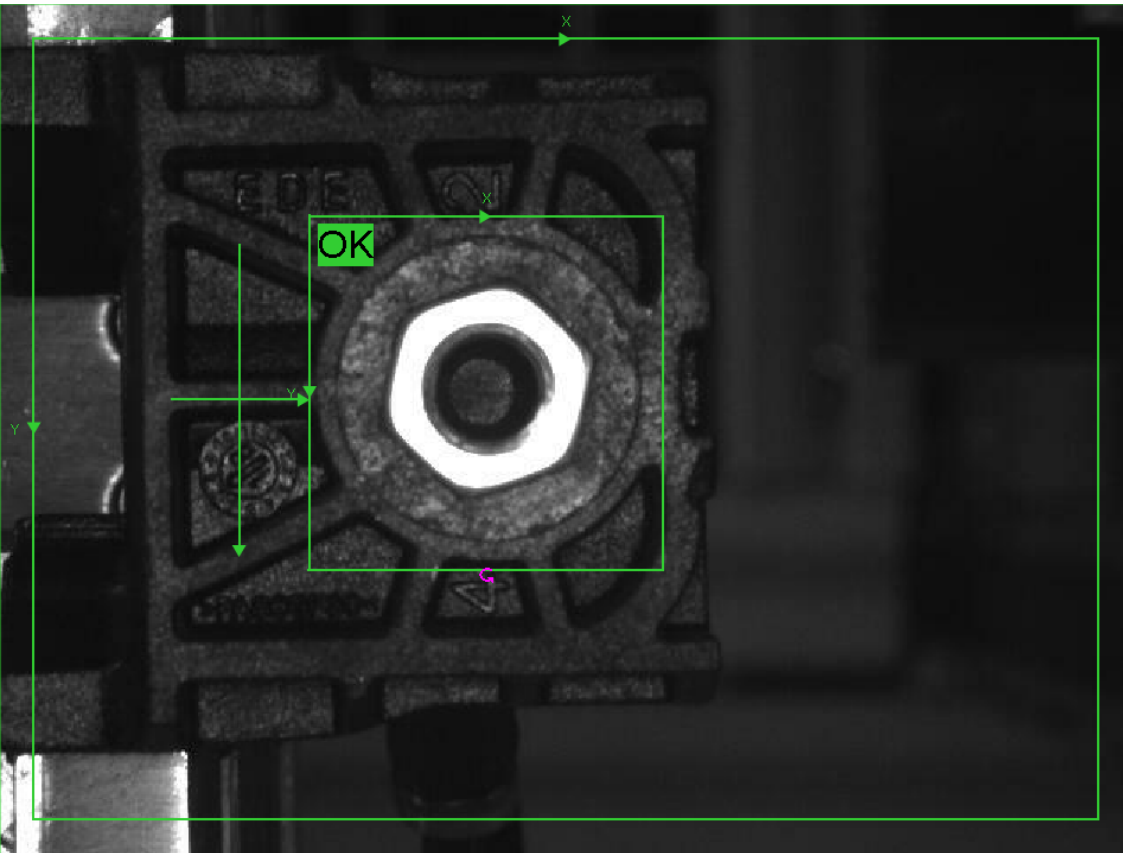
Comprehensive set of traditional and rule-based vision tools & **innovative edge learning tools**

Fast, **2-click** image formation



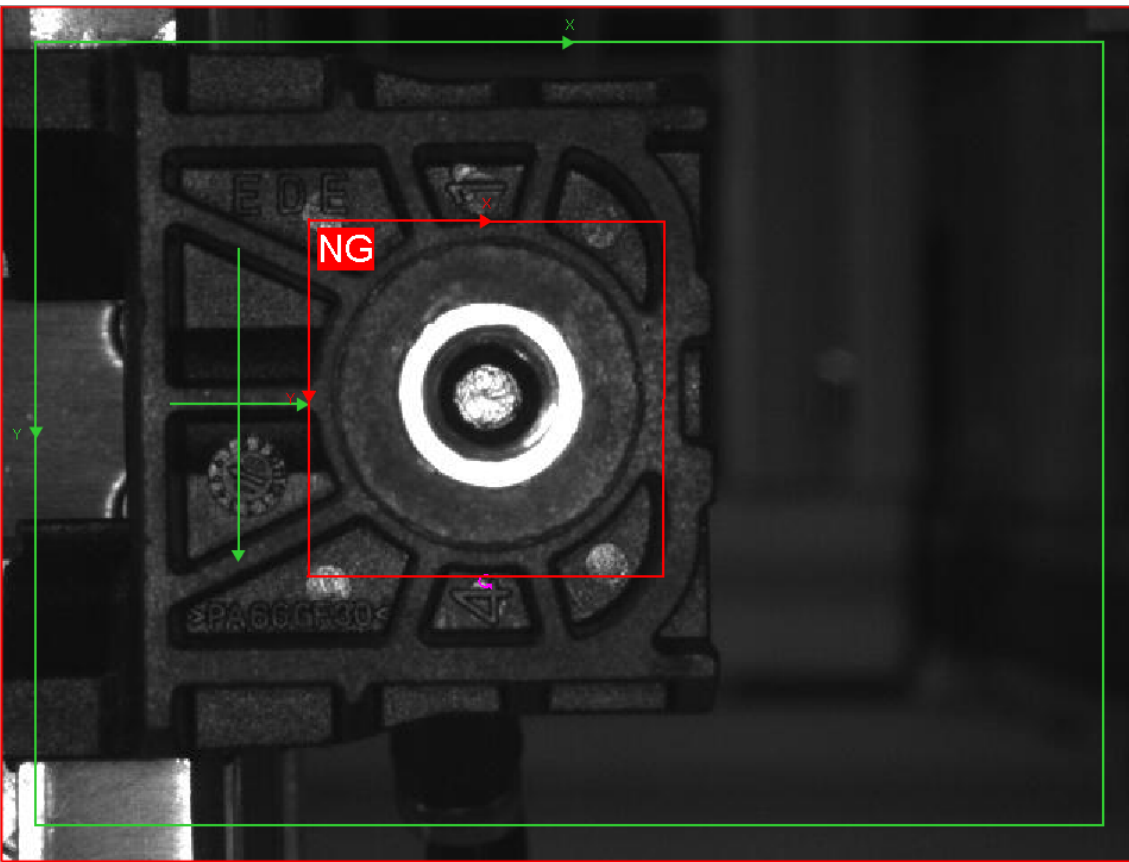
Simple EasyBuilder Interface

Fast training process with instant feedback



Simple EasyBuilder Interface

Fast training process with instant feedback



Inspect

Matrice

NG 14.5ms

Classify

	NG	3
	OK	3

+ Add Class

Edit Classes

Next Image

Model Health

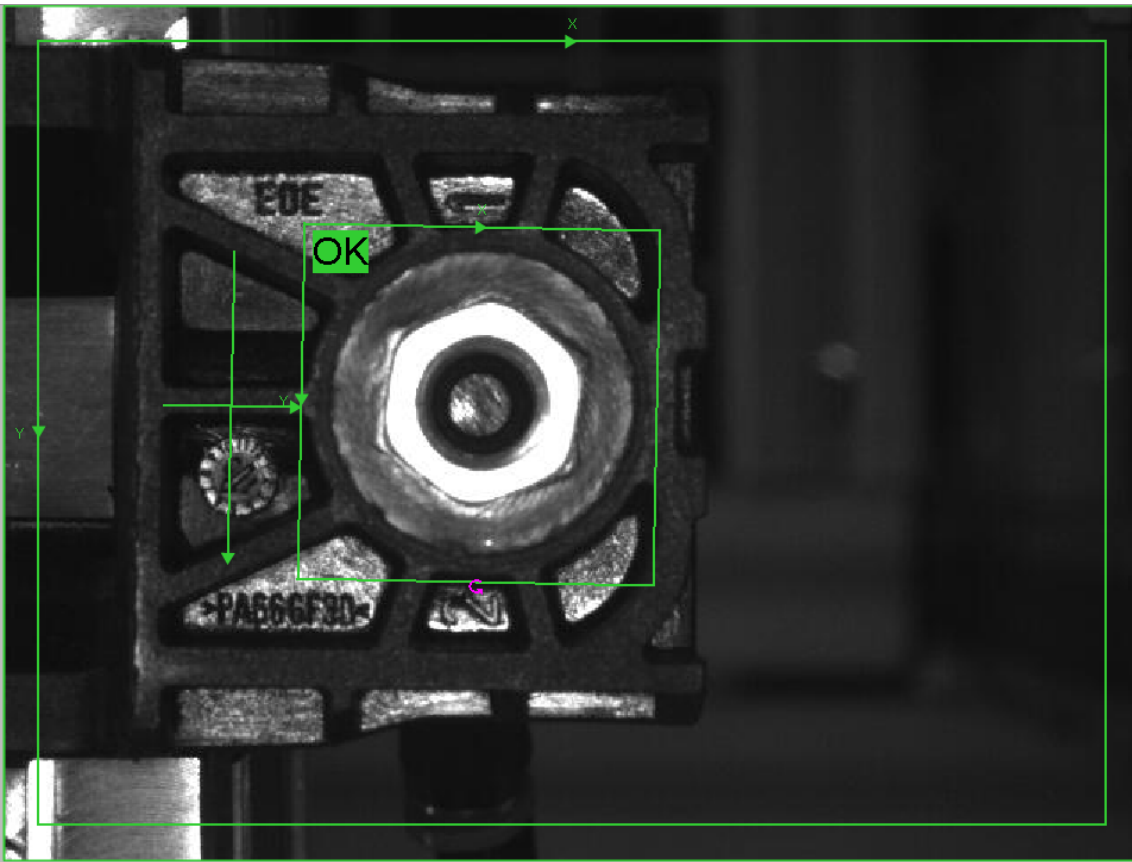
51%

Score 57%

Threshold 70

Simple EasyBuilder Interface

Fast training process with instant feedback



Inspect

Matrice

OK 18.5ms

Classify

○	NG	3
●	OK	5

+ Add Class - Edit Classes → Next Image

Model Health

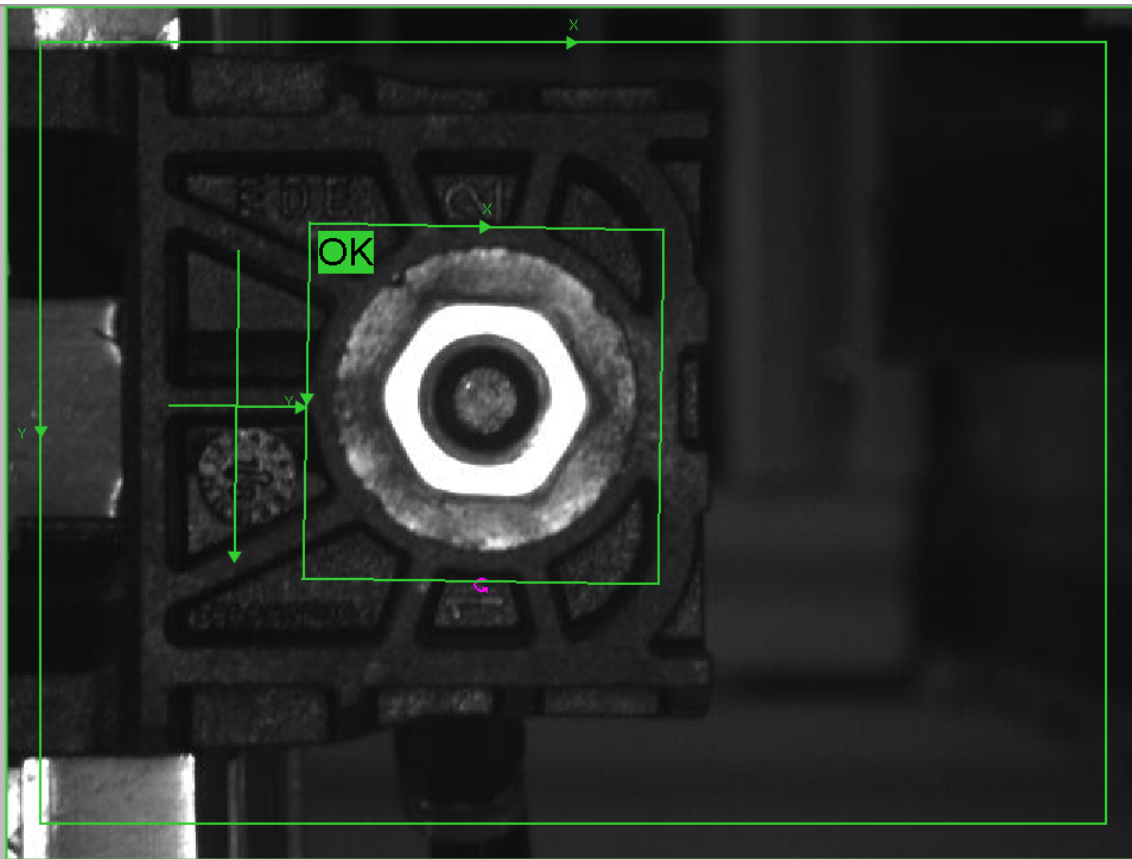
72 %

Score 94 %

Threshold 70 %

Simple EasyBuilder Interface

Fast training process with instant feedback



A screenshot of the 'Inspect' software interface. The interface is dark-themed. At the top, there is a header with the word 'Inspect' and a plus sign. Below the header, there is a section for 'Matice' with a green dot and the text 'OK', and a trash icon with '14.5ms'. Below that is a 'Classify' section with two rows: 'NG' with a value of 5 and 'OK' with a value of 6. The 'OK' row is highlighted with a green circle. Below the classification section are three buttons: 'Add Class', 'Edit Classes', and 'Next Image'. Below that is a 'Model Health' section with a yellow progress bar showing 81%. At the bottom, there is a 'Score' section with a value of 96% and a 'Threshold' section with a value of 70% and a slider.

Powerful Spreadsheet Interface

- Robust development environment allows users to finetune job parameters
- Ideal for developing complex or customized applications
- Guides users through setup, no programming needed

Full I/O and communications function set streamlines factory integration

Spreadsheet interface allows users to solve complex applications

Full suite of vision tools

The screenshot displays the In-Sight Vision Suite software interface. On the left, a camera view shows a bottle of 'MOVE FAST' energy water with 'blueberry' flavor. On the right, a spreadsheet interface shows classification data for the bottle. The spreadsheet includes columns for 'Health', 'Num Class/Index', 'Label', 'Num Image/Score', and 'Collect Samples'. The data is as follows:

Health	Num Class/Index	Label	Num Image/Score	Collect Samples
99.882	5.000	0.000 Blueberry	8.000	98.949 <input checked="" type="checkbox"/>
		1.000 Damaged	5.000	0.373
		2.000 Lemon	6.000	0.369
		3.000 Strawberry	6.000	0.309
		4.000 Missing	6.000	0.000
		Unlabeled	0.000	

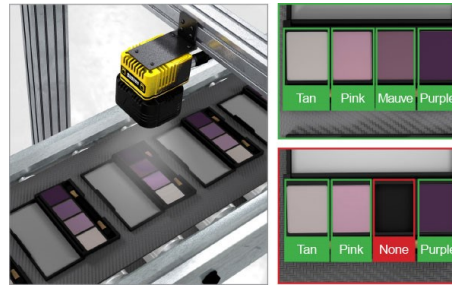
Image playback enables easy review and file recall

Full vision application solved in just a few lines

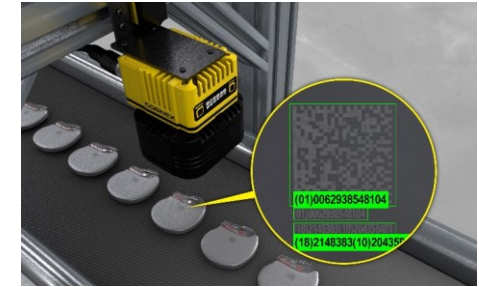
Target Applications



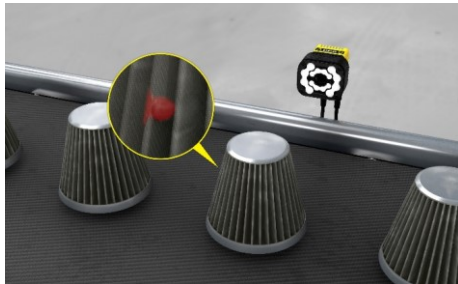
Read multi-line text
on printed labels



Inspect the assembly
of a multicolor part



Run an OCR and ID
inspection simultaneously



Extract and classify
subtle defects

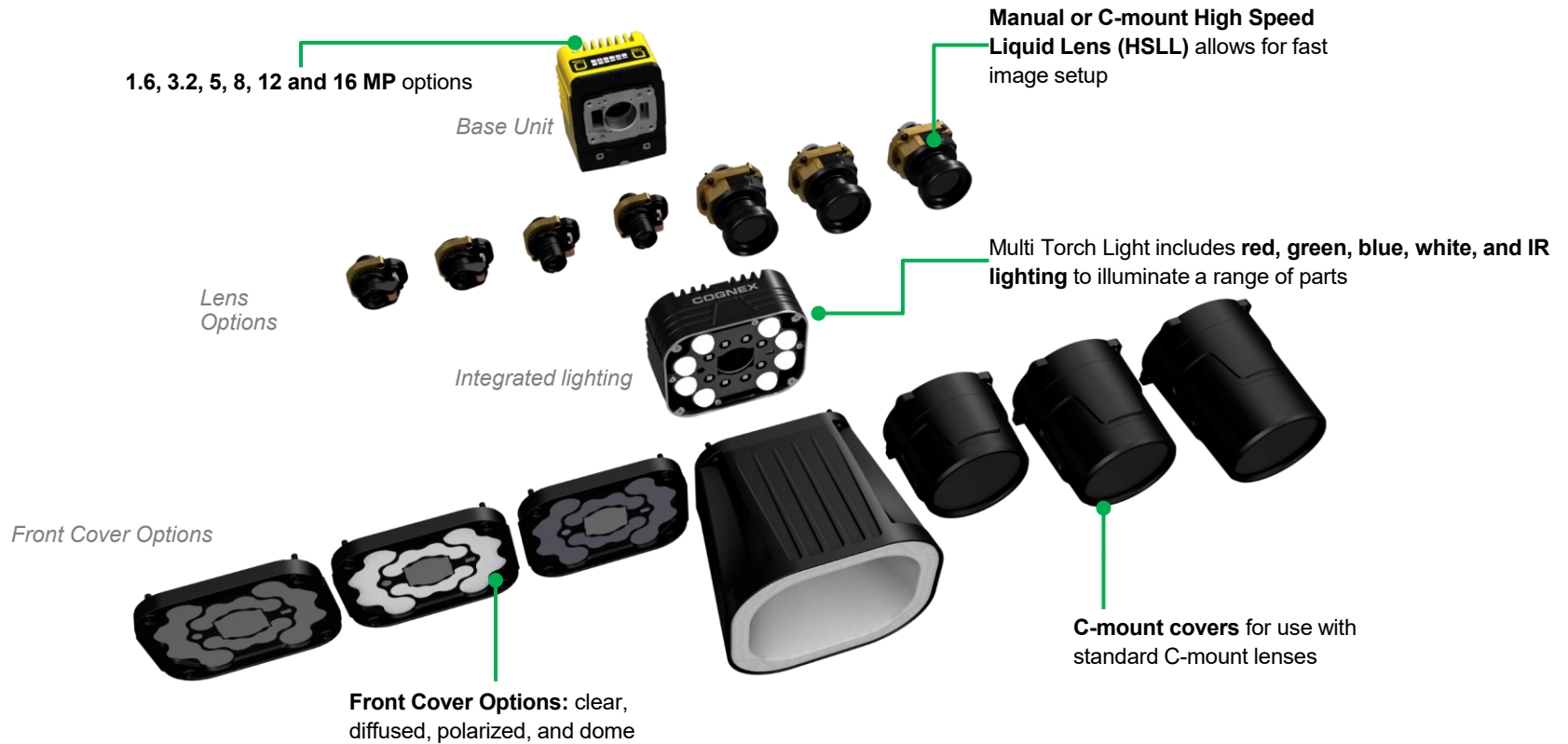


Read UPC-A codes
on curved surfaces



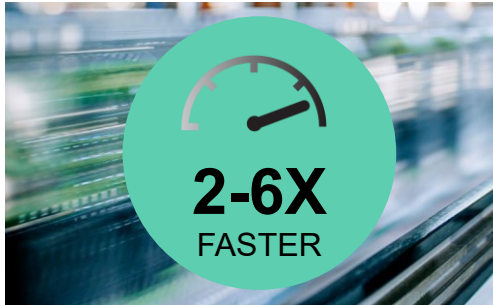
Read codes on metallic
surfaces

Modular Architecture



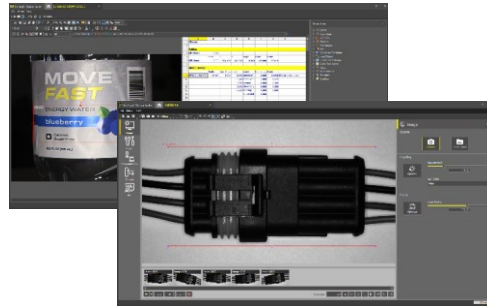
In-Sight 3800 Series Summary

2-6X faster tool speed than previous generation systems



Run more inspections
in less time

Solve jobs from easy to complex with a common software



Seamlessly scale
your solution

Detect even the most subtle defects



Improve the accuracy
of your results

In-Sight L38 Series

In-Sight L38 Series

Powered by AI, the In-Sight L38 is a next-generation 3D vision system that allows manufacturers to perform highly reliable inspections. Using a combination of embedded AI, powerful optics, and industry-proven vision technology, the system captures detailed 3D images to detect subtle features and measure them against pass/fail thresholds.



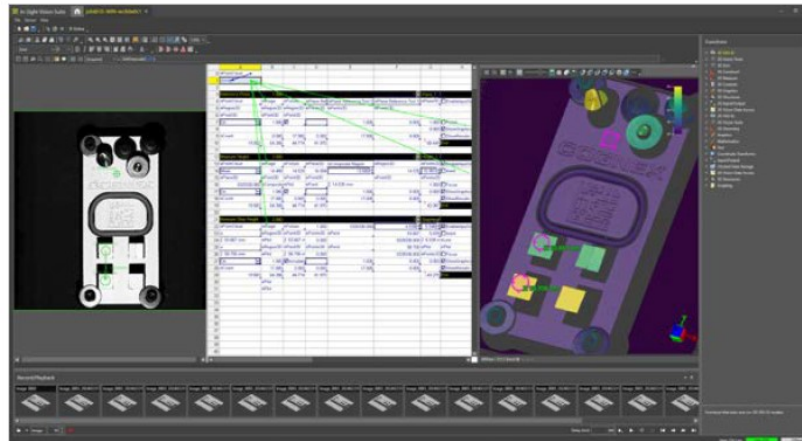
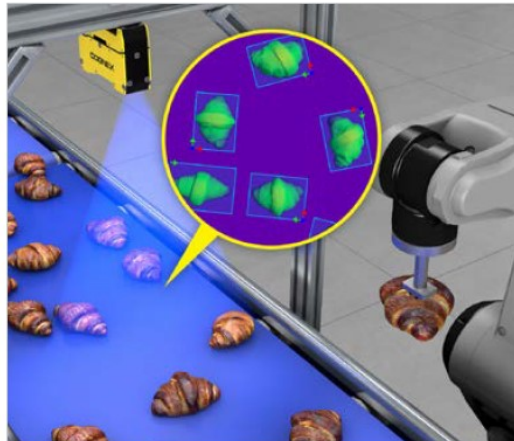
TOOLSET



RESOLUTION

1920 points

FEATURES



In-Sight L38 Series



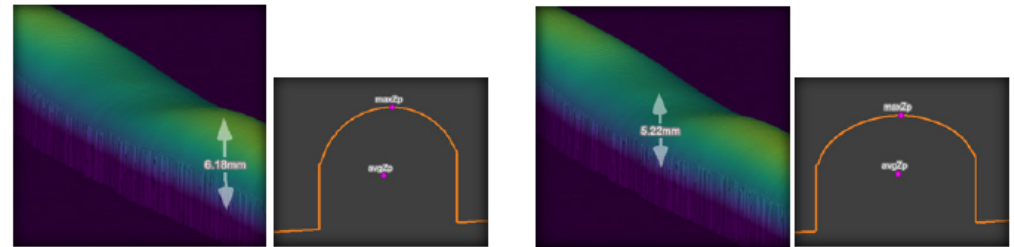
Rule-based vision tools

In-Sight L38 is also equipped with a library of industry-proven traditional vision tools that allow users to measure distance and blobs, count pixels, and patterns, read codes, guide robots, perform math and logic, and more.



3D BeadInspect Tool

In-Sight L38 comes equipped with the 3D rule-based BeadInspect tool, purpose-built to inspect gaskets and glue beads. The tool allows users to gauge width and height along the entire length of a gasket or glue bead to detect defects, measure variances against thresholds, and deliver results in three dimensions.

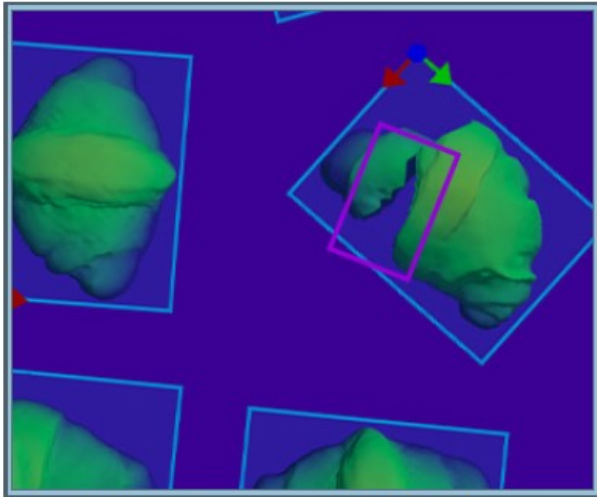


In-Sight L38 Series



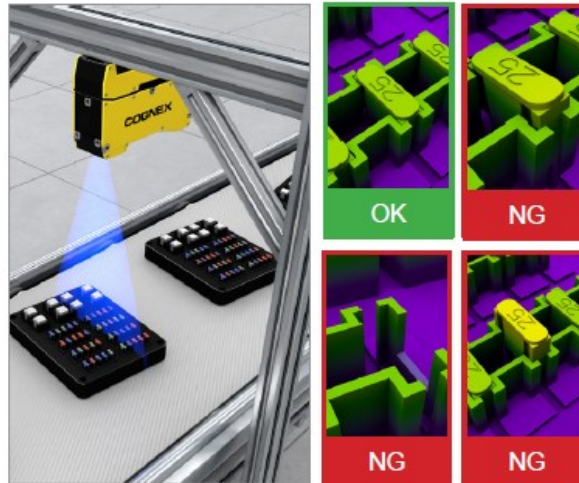
AI tools

The In-Sight L38 uses AI-powered edge learning tools to process images directly on device and deliver accurate results in real time. The system features 2D AI tools that process 2D images, as well as 3D AI tools that process 3D point cloud images. With example-based training and no experience needed, these tools simplify the development of both 3D and 2D applications for fast implementation.



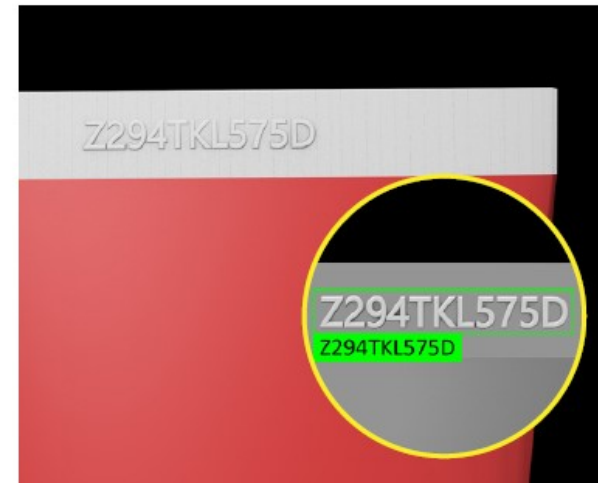
ViDi™ EL Segment (3D/2D)

Locate and extract defects, regions, and objects from complex parts and backgrounds in real-world units.



ViDi EL Classify (3D/2D)

Detect and sort parts based on multiple features or characteristics.



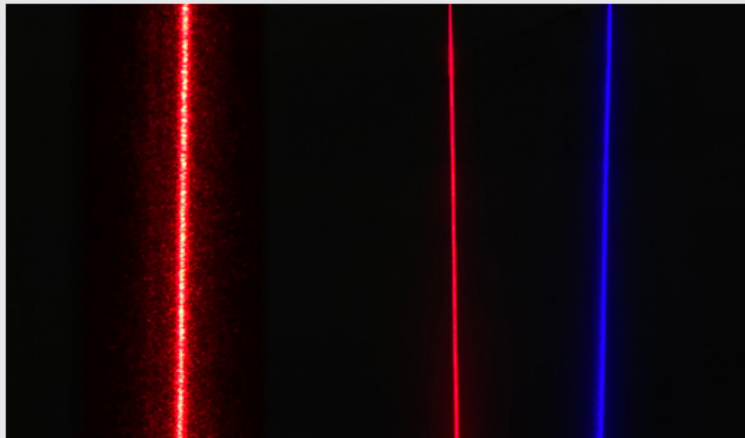
ViDi EL Read (2D)

Read characters on reflective, low-contrast, and non-flat surfaces, including multi-line text.

In-Sight L38 Series

Patented, speckle-free laser

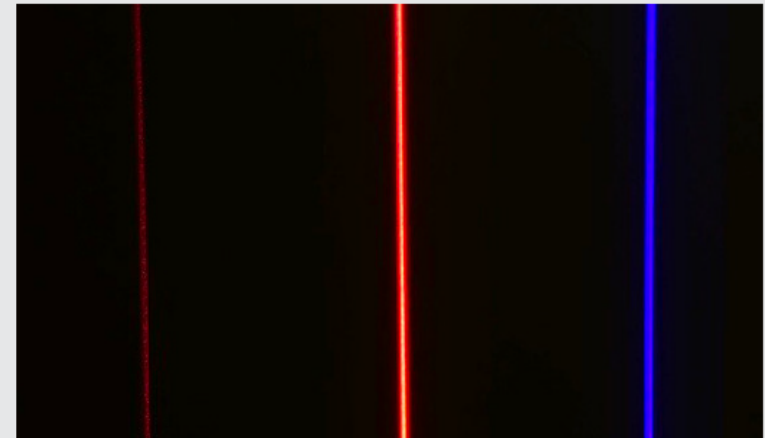
- Minimizes speckle and glare, common problems for 3D laser systems
- Captures higher resolution images than traditional laser displacement sensors
- Delivers the most consistent laser line in the industry for more reliable scanning
- Available on the following models: ISL38-33, ISL38-50, ISL38-100, and ISL38-300.



Conventional laser line (left) and speckle-free laser line red and blue (right)

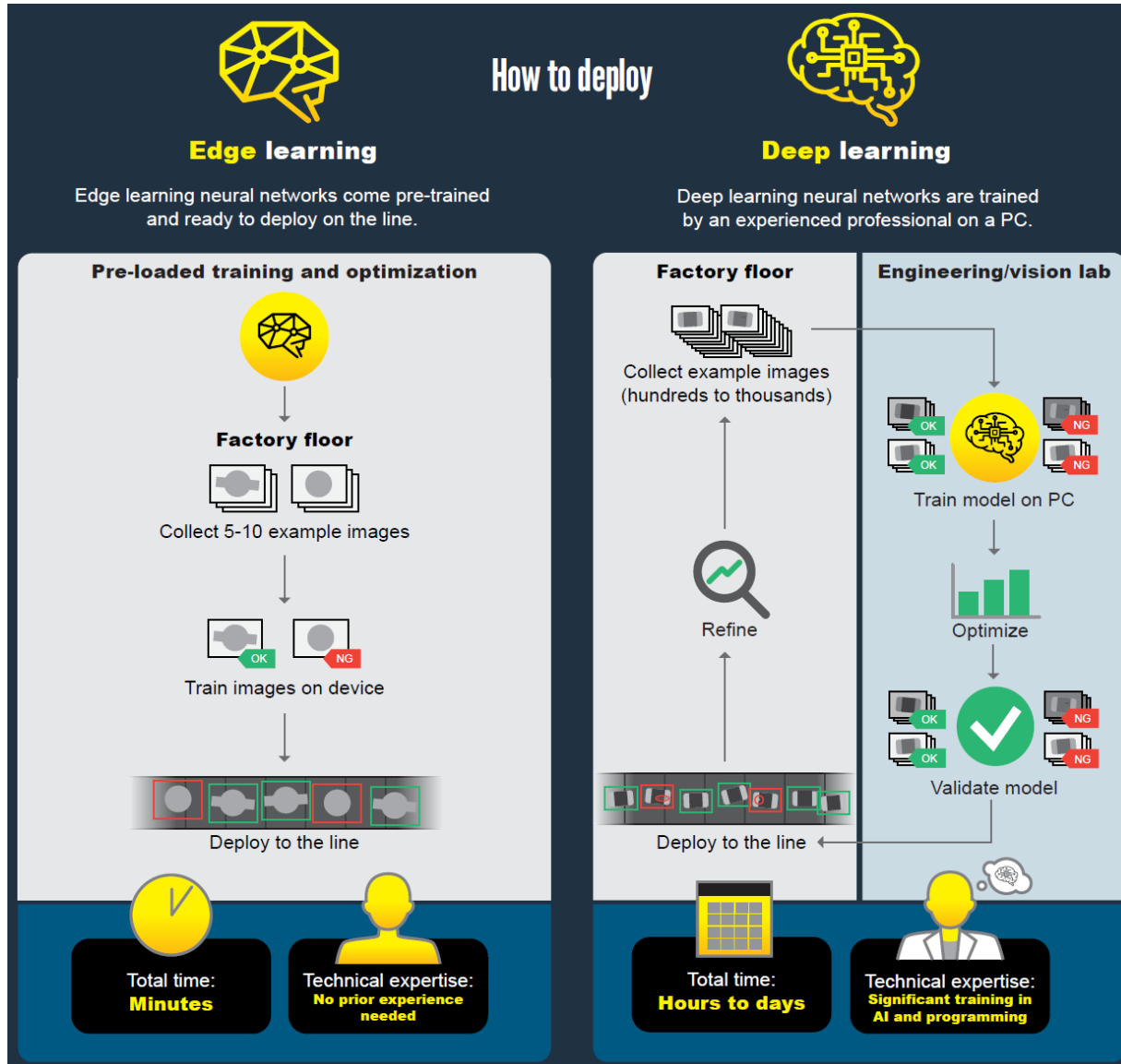
High-powered laser

- Delivers fast acquisition rates to support high line speeds
- Meets Class 2 safety standards, eliminating the need for expensive enclosures and allowing users to make adjustments without stopping the line
- Offers 5X more light than conventional lasers to enable image acquisition at greater distances
- Available on the following model: ISL38-500.



Conventional laser line (left) and high-powered laser line red and blue (right)

Why Edge learning?



Děkuji za pozornost

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