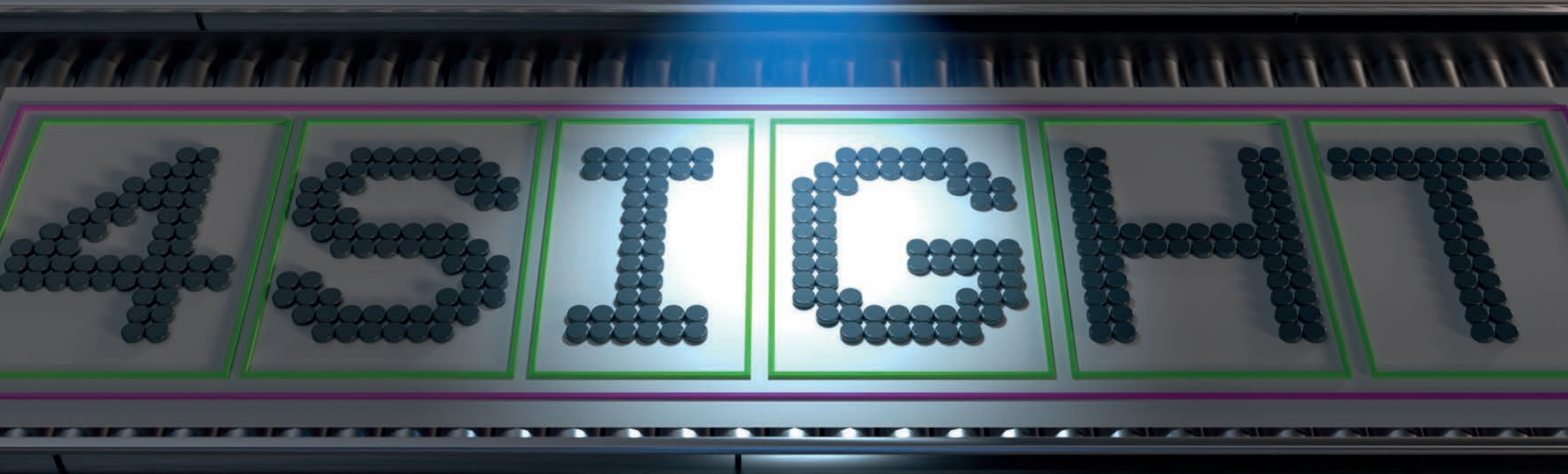# Automatic in-line print inspection

4Sight is a powerful vision application using a completely new approach to assessing the print quality of inline printed messages.

4Sight's unique feature, known as Inspection Depth, sets it apart from OCR/OCV, allowing users to identify the level of quality they deem acceptable for their application.

Global partnership

The global partnership between AutoCoding Systems and SICK has resulted in the development of an innovative automatic print inspection solution, 4Sight.

The 4Sight software solution developed by AutoCoding Systems resides inside SICK AppSpace, as part of their InspectorP camera hardware range.

This unique innovation in code inspection (patent application pending), brings together SICK's expertise in vision and AutoCoding's focus and deep understanding of industrial printer behaviour and print characteristics.

AutoCoding Systems already has an extensive library of printer drivers to enable integration of 4Sight with any brand or type of printer. This unique relationship between the 4Sight software and the printer has created a simple and hugely reliable method for print inspection.

SICK
Sensor Intelligence.

4Sight is a complete all-in solution that saves days in installation time and technical resource to set-up

Powerful

What is 4Sight?

4Sight is a powerful vision application, using the SICK AppSpace environment and the InspectorP range of 2D cameras to create a camera-based software solution for multiple inspection methods. The application supports print inspection, packaging verification and barcode reading.

What does the solution comprise?

- The 4Sight software is wholly resident on any SICK Inspector P camera unit
- The application comes with a dedicated HMI suitable for the specific environment
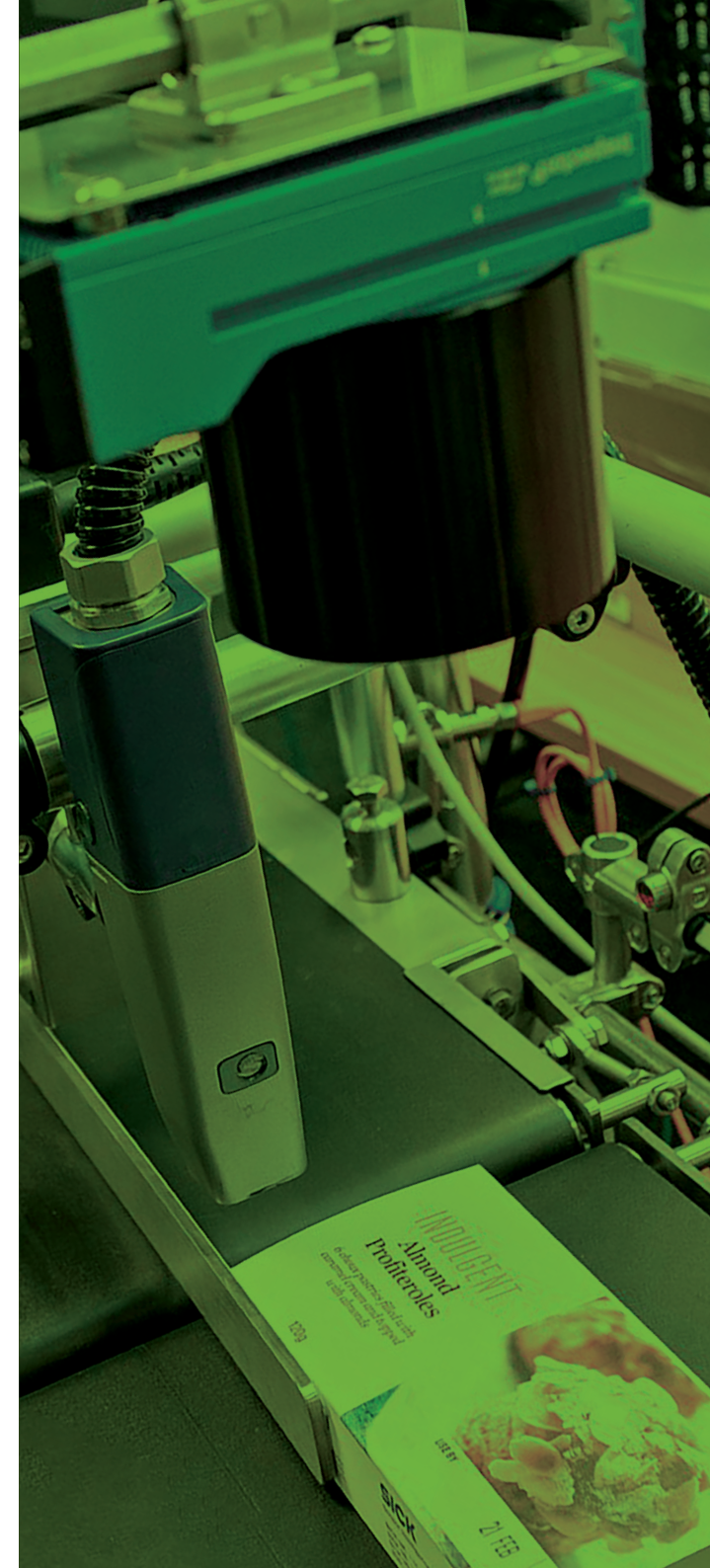
Why is 4Sight different to other print inspection solutions?

AutoCoding Systems' extensive knowledge of printers and print characteristics has resulted in a new innovative inspection methodology known as **Inspection Depth**.

- **Inspection Depth is a unique feature of 4Sight**

  Users can decide what level of inspection they require, from basic code presence through to a stricter quality inspection of the whole code including the location of the message.

- **4Sight is not a conventional OCR/OCV/Deep Learning solution**

  Although OCR is available as an option within Inspection Depth, it is not required for inline code inspection where line speed and natural variations are factors.

- **Decisions on print quality can be made on a per product basis**

  4Sight automatically calculates the best parameters to differentiate between a Good Read, a Bad Read and a Poor Read – but the user can adjust these according to their own specific print quality criteria.

No font teaching or fixturing

Conventional vision systems rely on font matching technologies which require the user to "teach" the vision system a library of font information. Set-up also requires precise "fixturing" to construct where the printed code area is, (usually a rectangle within the artwork) in relation to a feature on the packaged product.

The 4Sight methodology requires no font teaching or fixturing because the 4Sight application is simply inspecting actual print.

Different

Adaptable

With 3 different set-up options,
4Sight can be adapted to your particular needs

1. Stand Alone

There is no direct connection between the 4Sight camera and the printer. An image of the code to be inspected is taken by the camera prior to job start and the application is automatically configured to inspect the code throughout the job run.

- A quick, easy to install, portable option.

- No requirement for a printer driver to connect to the relevant printers.

- An opportunity to test the application prior to roll-out to other lines.

- Ability to upgrade to either of the Printer-Led or Integrated modes at a later stage as required.

2. Printer-Led

The 4Sight camera is connected, via ethernet, directly to the printer and the printer message is used to automatically set-up the correct configuration settings of the camera. The camera therefore does not require any adjustments to be made by the operator.

- Specific message parameters are automatically handled via the applications' integrated printer driver.

- When the printer's message changes, the matching camera configuration is automatically selected on the camera.

- No requirement to take another image upon product changeovers; just select the correct message on the printer – 4Sight does the rest.

- Real time changes printed on packaging, such as date/time, can be easily accommodated.

Accurate

3. Integrated

When 4Sight is integrated with code deployment software, such as AutoCoding, the accuracy of the code content is guaranteed because the message in the printer has been automatically derived by a separate system.

- The 4Sight application uses the code deployment system's interface to retrieve the message's parameter details and select the required camera configuration.

- When integrated to AutoCoding, the 4Sight camera becomes one of the devices on the packaging line under AutoCoding's control, along with the printing equipment.

- The camera then operates in the same way as printer-led set-ups, checking the presence, legibility and location of the printed code.
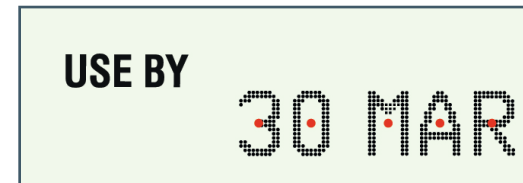

CODE DEPLOYMENT SYSTEM
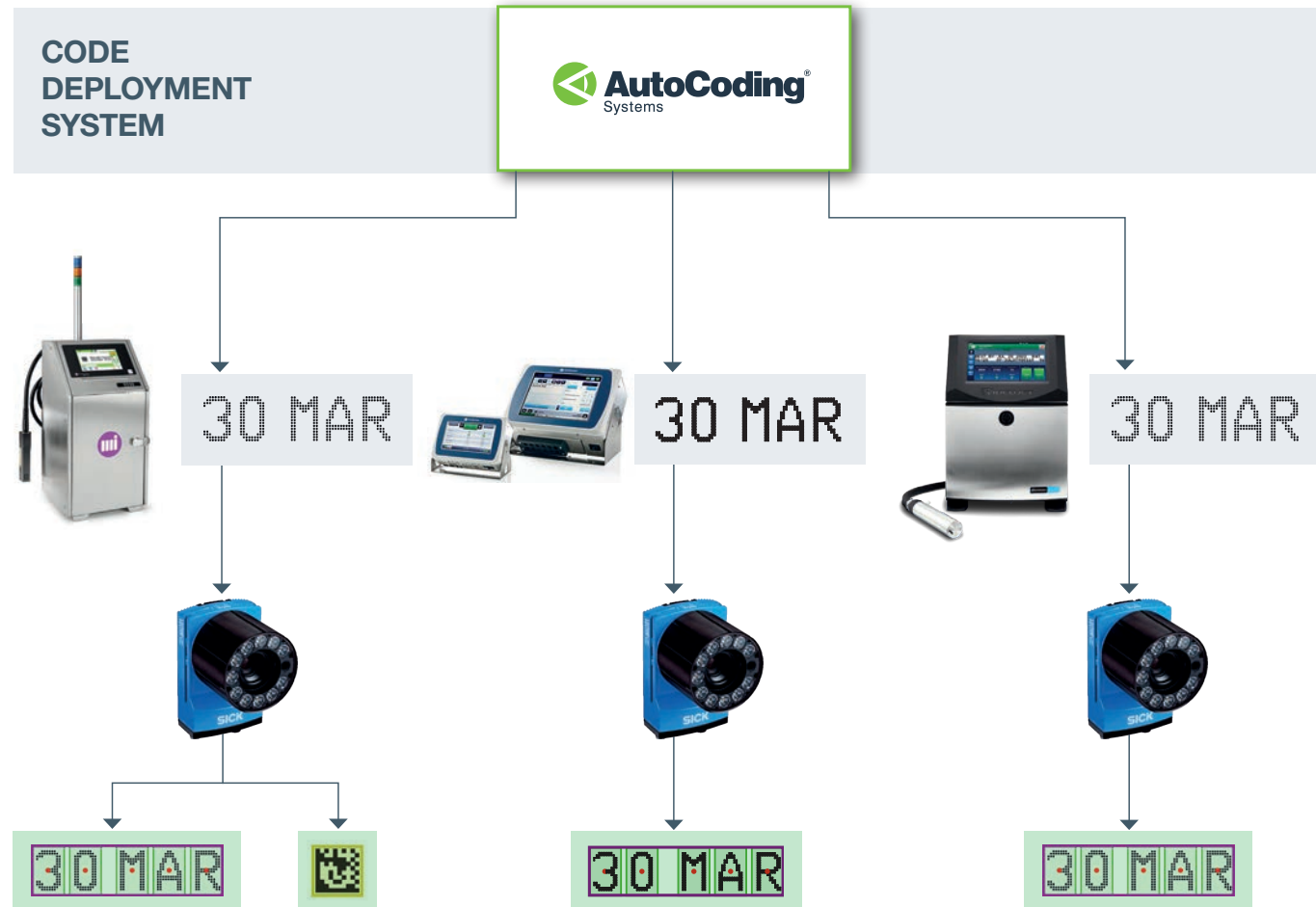
Configurable

Inspection Depth

This is a unique feature of 4Sight and sets it apart from OCR/OCV/Deep Learning technologies.

Inspection Depth allows users to decide, based on their specific application, what degree of inspection they require.

USE BY 30 MAR
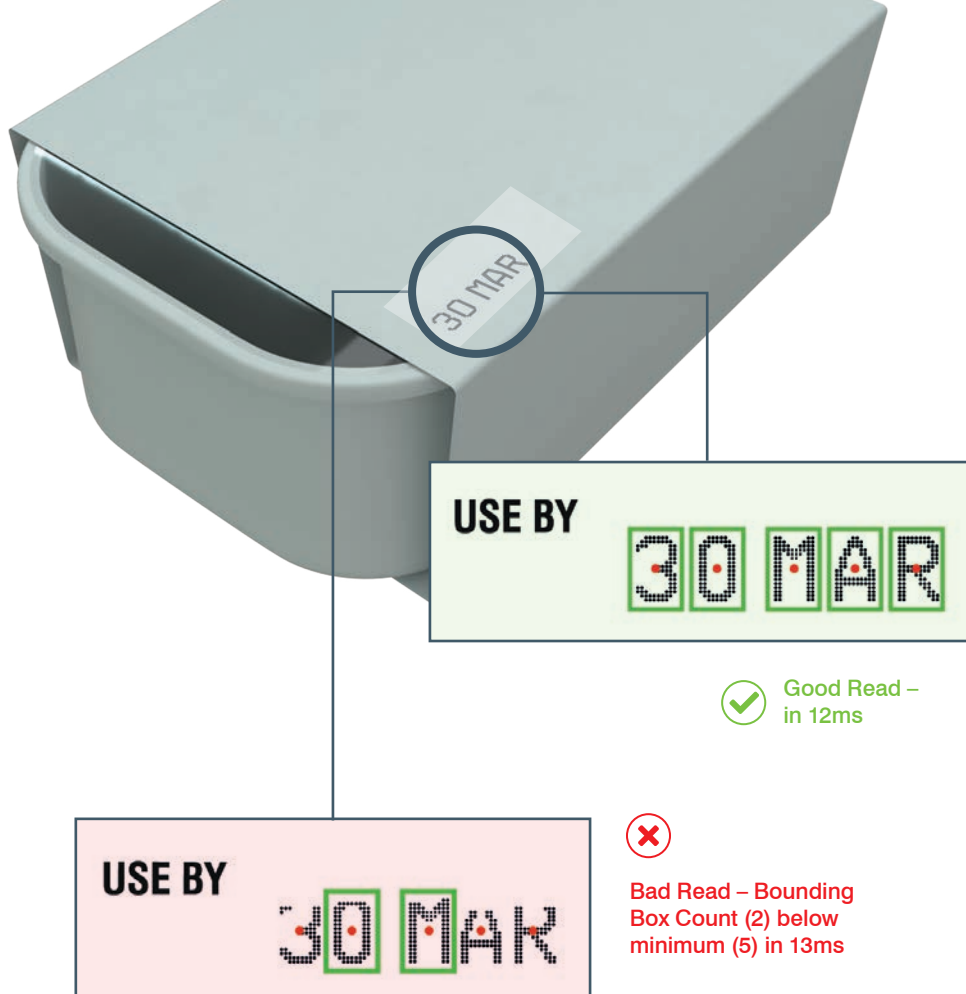
✓ Good Read – in 12ms

Character Candidates ●

Simple identification of character presence within a selected region of interest (ROI). This level of Inspection Depth would be used for basic presence detection; perhaps for very high-speed applications, because the 4Sight application can return its inspection result very quickly.

- Character candidates are determined by a unique combination of inspection techniques optimised for code printing.

30 MAR

USE BY 30 MAI

✗ Bad Read – Candidate Character Count (4) below minimum (5)

**Good Read –
in 12ms**

**Bad Read – Bounding
Box Count (2) below
minimum (5) in 13ms**

Bounding Box Detection

Determines the number of individual Good Character Candidates in the Region of Interest and puts a rectangle Bounding Box around each one.

This Inspection Depth is fast and can be used as a more secure method than simple presence detection.

- Results are based on the minimum and maximum number of bounding boxes identified.

Print Box Detection

This Inspection Depth applies even more precision to the quality of print being inspected, examining whether the right number of "Good Candidate Characters" are consistent of the right quality standard.

- All the Good Character Candidates in their Bounding Boxes are grouped together into a Print Box.

- Correct height and width dimensions of characters, with adjustable tolerances, are added to the inspection, as well as the minimum and maximum number of Good Character Candidates.

Good Read – in 18ms

**Bad Read – Print Box
Width (548) above
maximum (523) in 16ms**

Flexible
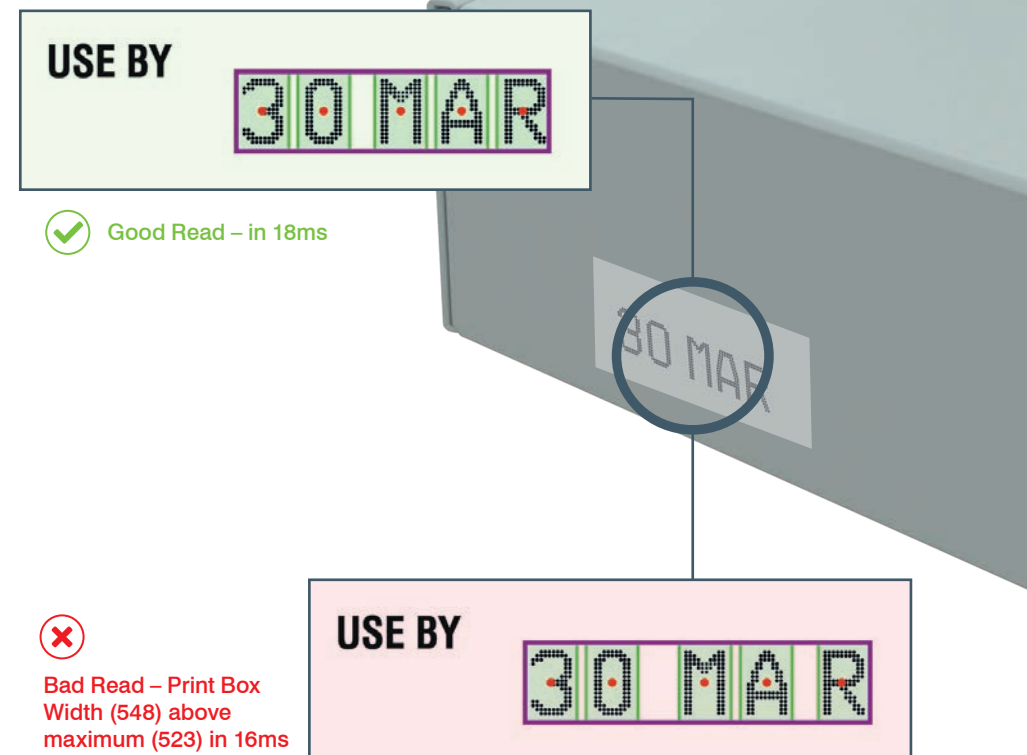
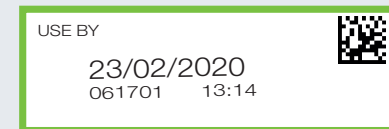# Benefits for the Code Printing Application

One of the main reasons why codes are rejected is because of problems with the printing application itself.

Throughout a production run, during normal use, the parameters of a printing application may change, due to vibration, condition of ink/solvent, inconsistent pack triggering and, of course, natural variation of the printing process.
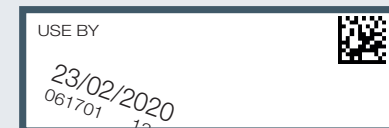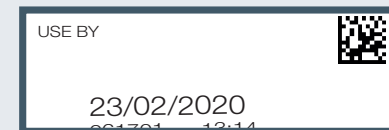
4Sight immediately captures instances where the printing is fundamentally inadequate. This could be location of print or legibility issues associated with the print quality.

4Sight allows for easy correction of these basic coder set-up errors.
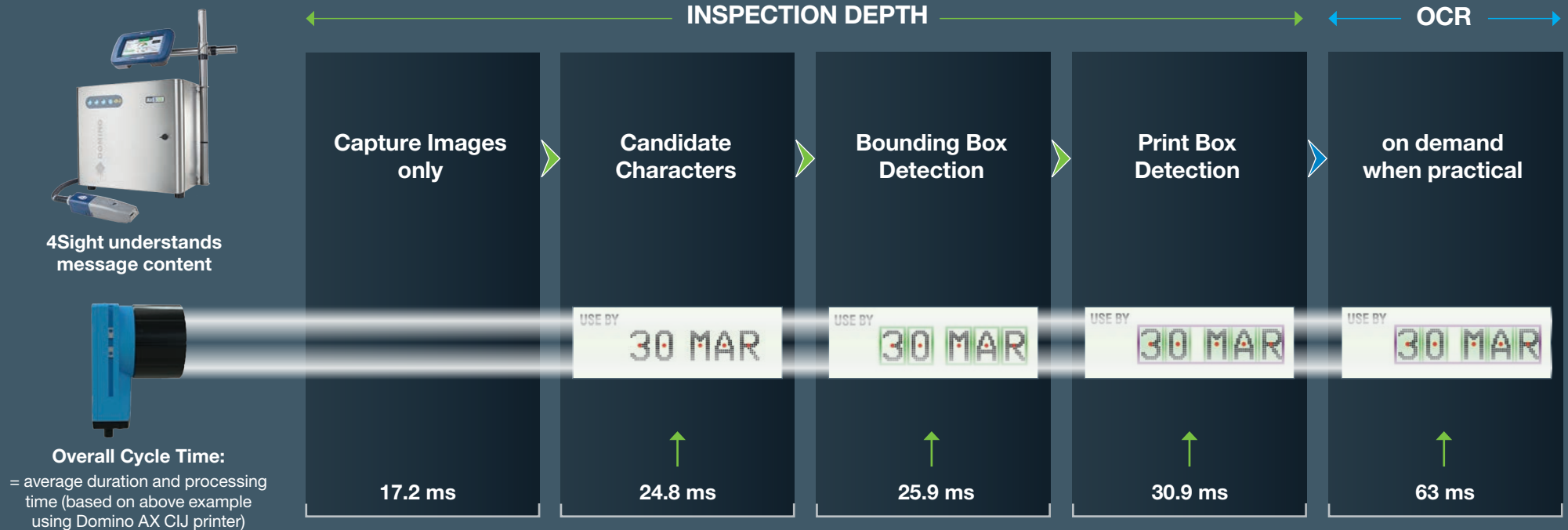
✓ Accepted by 4Sight

USE BY
23/02/2020
061701   13:14

✗ Rejected by 4Sight for code printing setup problems

USE BY

USE BY
23/02/2020
061701   13:14

USE BY
23/02/2020
061701

USE BY
23/02/2020
01   13:14

Although 4Sight's Inspection Depth does extend to OCR, it is not recommended for inline print inspection applications. This is due to the reliability challenges of using OCR-based algorithms. By using Print Box Detection, 4Sight delivers exceptionally reliable results at a fraction of the processing time.

INSPECTION DEPTH — **OCR**

4Sight understands message content

Capture Images only	Candidate Characters	Bounding Box Detection	Print Box Detection	on demand when practical
USE BY 30 MAR	USE BY 30 MAR	USE BY 30 MAR	USE BY 30 MAR	USE BY 30 MAR
17.2 ms	24.8 ms	25.9 ms	30.9 ms	63 ms

Overall Cycle Time:
= average duration and processing time (based on above example using Domino AX CIJ printer)

Keep refrigerated

Use by

30 MAR

In this example, two of the characters are slightly touching. With OCR these characters would not be recognised and the product would be rejected. With 4Sight, this could be classified as a "poor" read, but if there was additional overlap with the characters throughout the print run, it would become a "bad" read and stop the line.

Accessible

The 4Sight Interface

Accessibility to certain menus depends on the user permissions granted.

Clear page navigation and user-friendly controls with pull-down menus allow users to work through camera and inspection configurations logically.
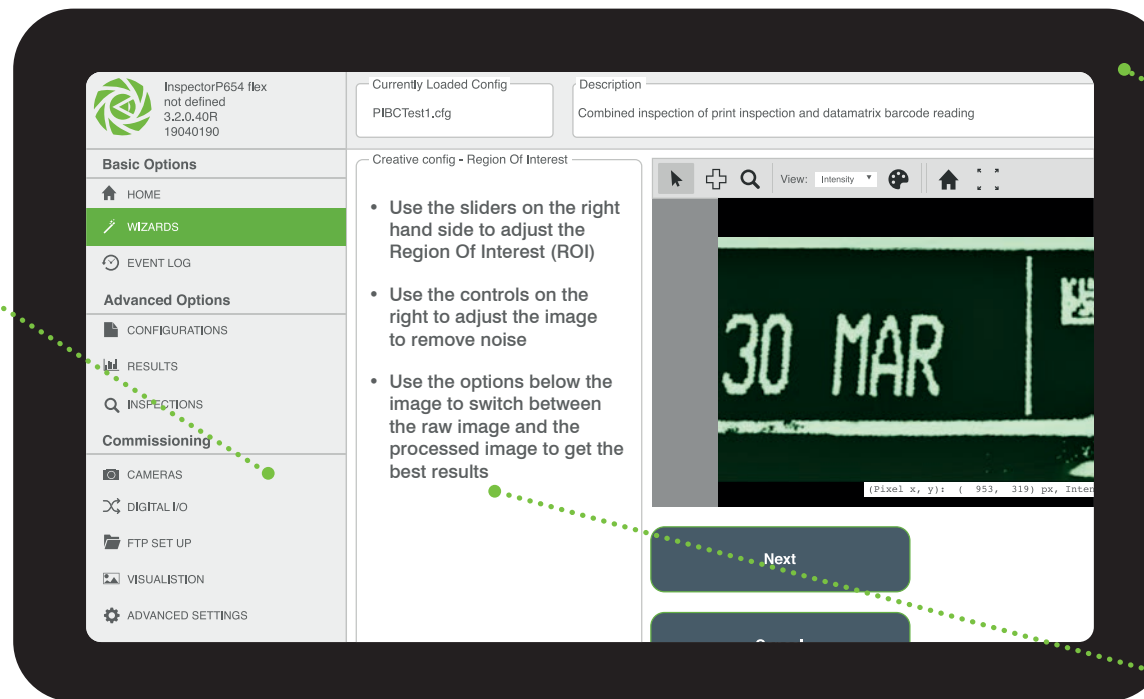
HMI options suitable for wet or dry environments

Navigation Wizards facilitate the creation of new message configurations and loading of existing configurations with clear step-by-step instructions.

Versatile

4Sight can be configured to control up to 4 cameras and up to 4 different inspections across any of the 4 cameras, including print inspections, barcode inspections and packaging inspections.

This means that users can set up multiple inspections in one configuration, to look at different objects in a specific field of view, each with their own region of interest, for example:
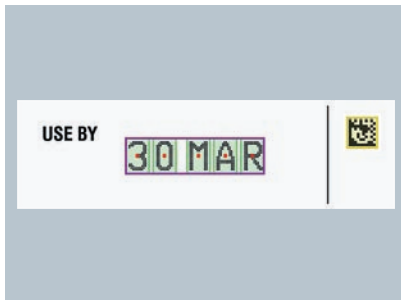
- One camera could inspect a date code and a 2D code, both in the field of view but each with their own region of interest. This is a very cost effective method for checking both date code and artwork.

- Using the SICK SIM4000, 4 cameras can carry out 4 different inspections.

This image shows the 4Sight Calibration Wizard performing initial set-up of the camera
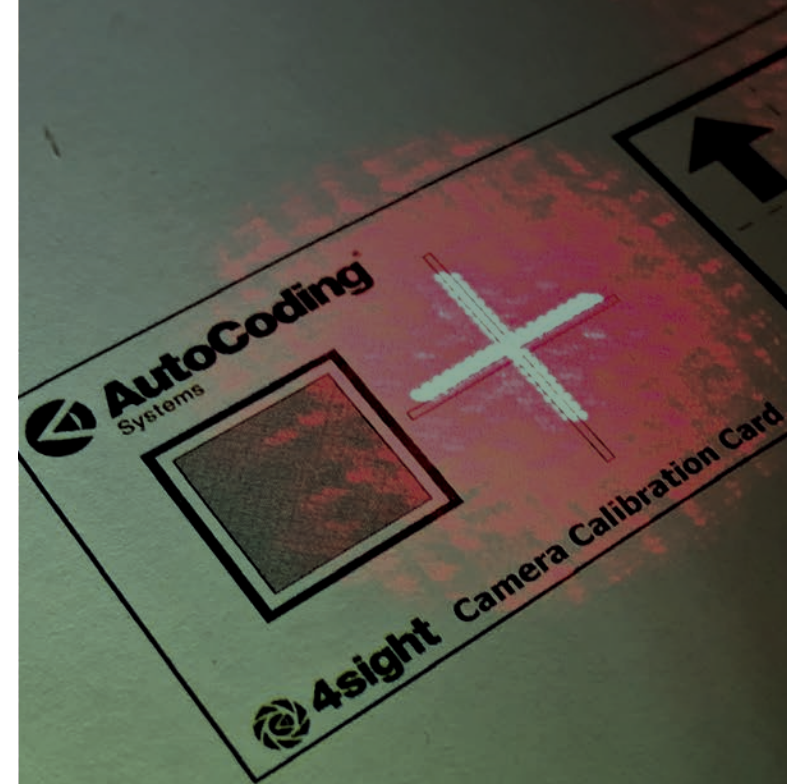
Support

AutoCoding Systems can provide
dedicated support for all customers globally.

Support packages typically are Monday to Friday business hours or a full 24/7, 364 cover.

The support service includes a permanently manned Helpdesk for fielding telephone support requests and direct contact with our customers.

In addition, all 4Sight systems can be remotely accessed facilitating diagnostic support, as well as provision of upgrades and maintenance.

Our partner, SICK, also provides full warranty for camera hardware and offers a wide range of maintenance packages to support hardware lifetime use.
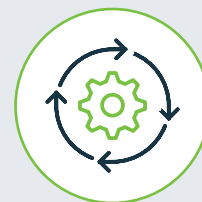
24/7 Helpdesk
(with a valid
support contract)

**Remote system
telephone support**
(via VPN)

On-site support,
when required

**Free software
updates** to ACS
products

**System health
checks** and
training,
as required

Highlights

1. Connects to any brand and technology of industrial printer, including Continuous Inkjet.

2. Three options for use: Stand alone, Printer led or Integrated.

3. In Printer led and Integrated modes; automatically adjusts to the correct camera settings required when the printer's message changes – no operator involvement.

4. Not a conventional OCR/OCV solution – nor an AI based deep learning application. Works by inspecting only what the printer has actually printed; no need for 'font teaching' or 'fixturing'.

5. Required print quality is decided by user with configurable "inspection depth" feature; allows for increasing levels of inspection from simple 'whole message present' through to precise inspection of actual code quality – always based upon what the printer has actually printed.

6. Can control up to 4 cameras and allows up to 4 inspections across any of these cameras enabling combined inspections of date code, barcode and artwork.

7. Seamlessly connects to AutoCoding software as well as other code management systems to ensure message content is always correct.

8. A complete engineering solution: using 'wizards' and simple menus to completely manage every aspect of the application, including setting up a printer connection, sending off resultant images and setting up digital IO for pack rejection in the event of a 'bad read'.

" "

The 4Sight automatic print inspection solution from AutoCoding Systems allows the camera inspection system to run seamlessly on our line without set-up support from our operators.

The 4Sight method has proved to be more reliable and robust and performs far better than previous conventional vision trials using OCR technology.

We had an ongoing problem with interim coding of our BBE dates with inkjet. Prior to 4Sight, we were checking these inkjet codes on an hourly basis, but this was obviously only a snapshot. The 4Sight system now checks 100% of the product and rejects any packs if the code is missing, illegible, partially printed or in the wrong location.

Lee Arkinstall
Projects & Improvements Manager,
Consumer Foods

KEPAK

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