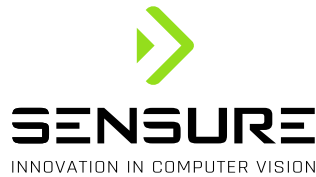


INNOVATION IN COMPUTER VISION



Since 2007, **SENSURE** has been designing and developing both **on-line and off-line vision inspection systems** with **artificial intelligence** that work through **self-learning**. The SENSURE solutions can be applied to all needs, including:

- **Automating quality control processes** to identify and reject non-compliant products.
- **Supporting continuous process improvement activities** through real-time display and monitoring of measured values, historical reports, root cause analysis tools, and more.
- **Optimizing Pick & Place** by providing product gripping coordinates to the Robot and PLC, as well as communicating quality information for automatic sorting.

The SENSURE technology is designed to be used on **highly variable products**, such as:

- Biscuits, cookies, crackers, rusks, and more.
- Bread products, including pancakes, waffles, baguettes, buns, muffins, bagels, and more.
- Pastries, such as donuts, croissants, pretzels, and more.
- Cakes and pies.
- Pizza, focaccia, tortillas, and more.
- Snack and confectionery products, such as snack bars, chocolates, candies, chewing gum, ice cream, and more.
- Other food products, including meat and poultry, cheese, seafood, and more, as well as non-food products.

SENSURE also produces **optical instruments** for particle size distribution (granulometry) and for analyzing dots in various sectors, such as food, agriculture, coffee, and mining.

SENSURE Care

Always at Your side

We advise and support our Customers from the initial quotation and throughout the life of our systems with our services, which include Helpdesk, Remote and Onsite assistance, and Spare parts management.

150+ systems
installed worldwide

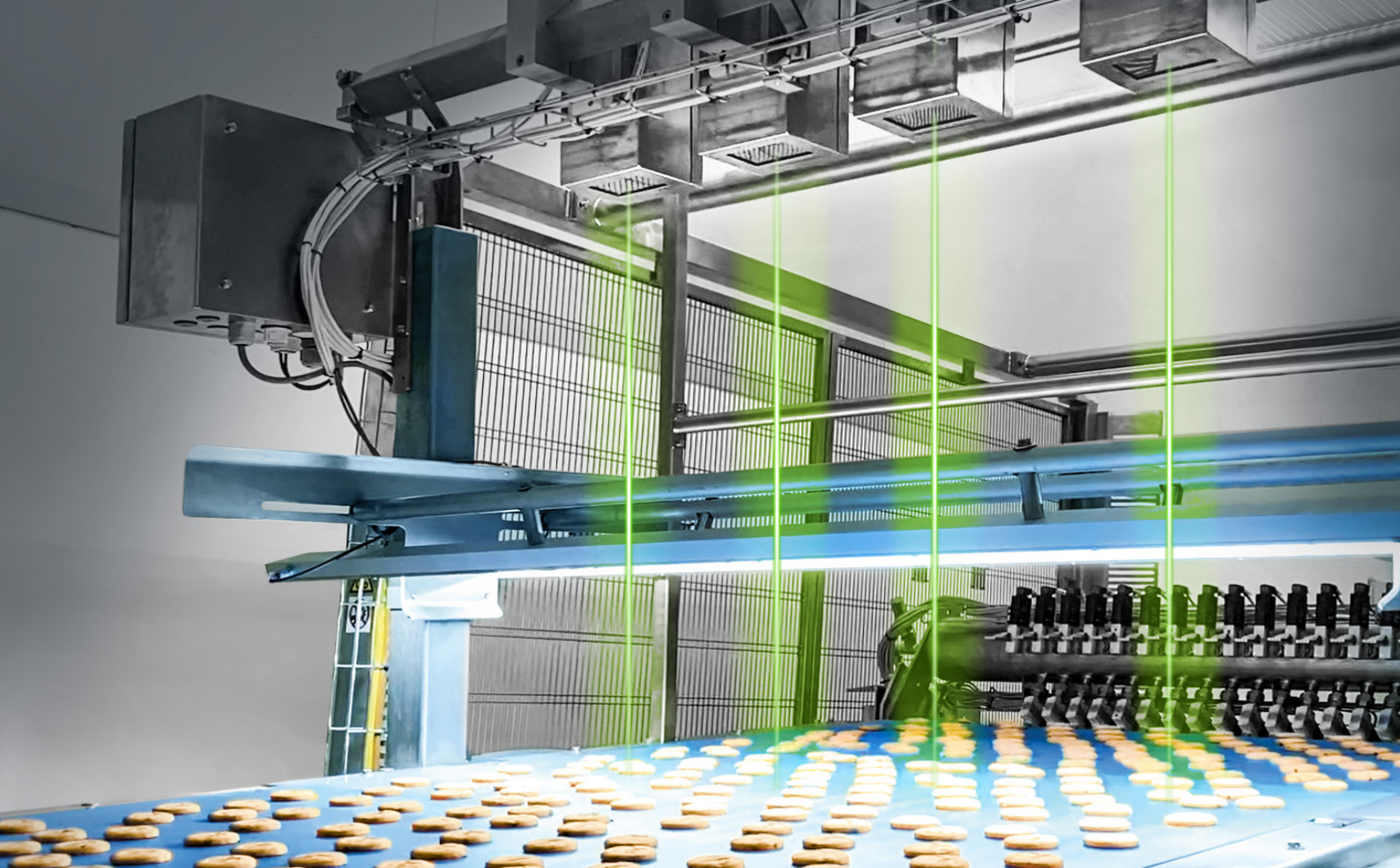
Experience and Competence

The over ten years of experience we have acquired working with highly variable products has allowed us to develop the best quality control features using 2D and 3D vision technologies.

4.0 ready

Industry 4.0

SENSURE vision systems meet the requirements for Industry 4.0, including real-time data analysis, machine learning capabilities, and seamless integration with other automated systems.



WHICH ARE THE **MAIN BENEFITS** OF USING A **SENSURE VISION** **INSPECTION SYSTEM?**

+ **HIGHER PRODUCTIVITY AND LINE EFFICIENCY**

Product data can be used to support a continuous improvement process.

+ **IMMEDIATE SAVINGS**

Reduction in labour costs and operating expenses.

+ **HIGH BRAND REPUTATION**

Fewer complaints from Customers due to higher product quality.

+ **REDUCED DOWNTIME**

The removal of non-compliant products guarantees continuous operation of the line.

+ **TOTAL CONTROL OF PRODUCTION**

Knowing the process and making the best operational decisions.

+ **RELIABLE, REPEATABLE, AND ACCURATE MEASUREMENTS**

Quality standards are ensured even with different operators of the line.

+ **MAXIMUM LINE SPEED**

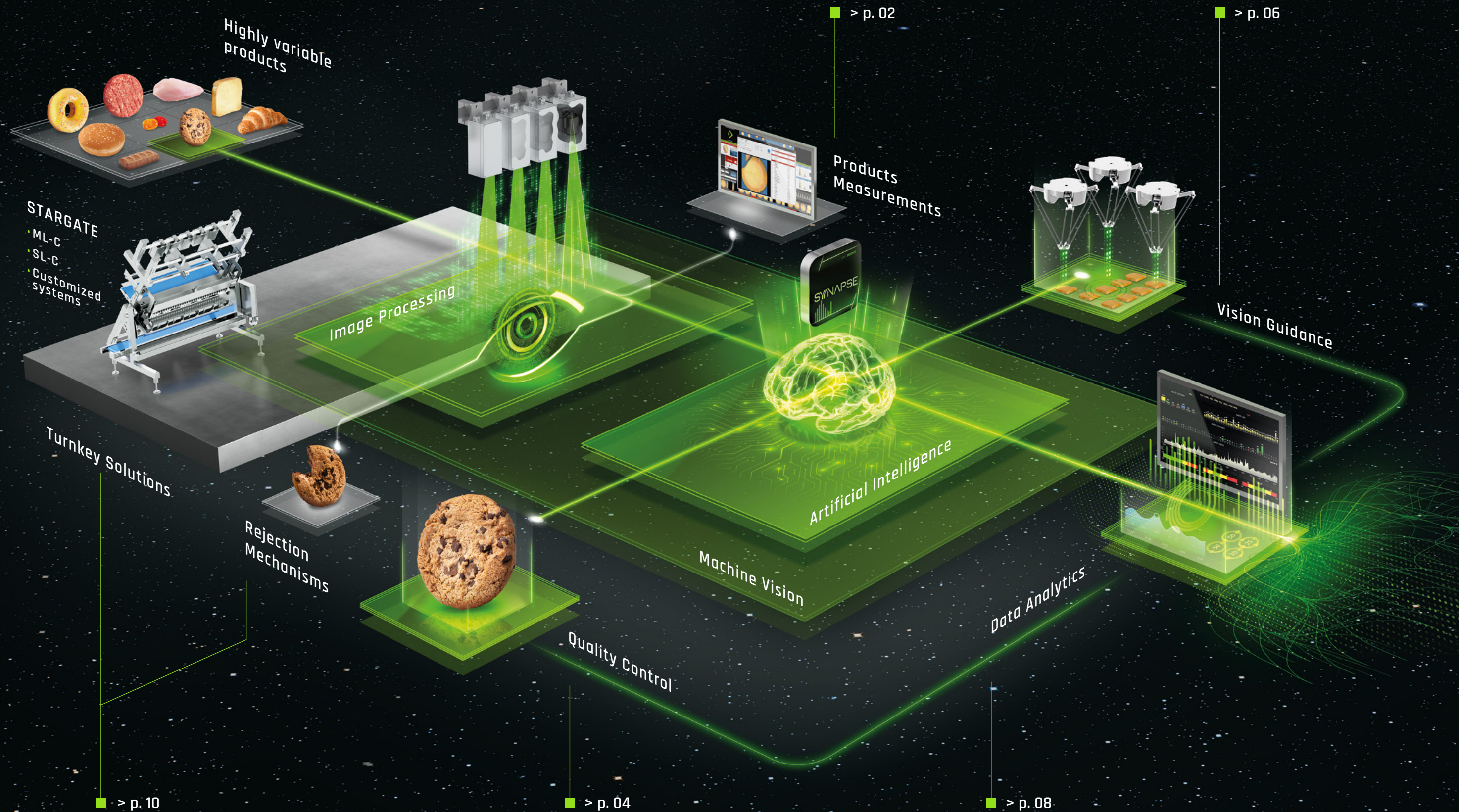
Performing analysis and inspection of objects faster than the human eye and without direct contact.

+ **IMPROVED SUSTAINABILITY**

Reducing food waste, energy, and packaging costs.



VISION INSPECTION SYSTEMS



S E N S U R 3 ■

■ ■ 1 N N O V A

7 I O N ■ I N ■

C O M P U T 3 R

■ V I 5 I O N ■



SENSURE vision inspection systems are designed to provide total control of production at high-speed, ensuring continuous monitoring of key product attributes before and after each production process step, as well as process repeatability, high performance, cost savings, and no product contamination.

SYNAPSE

PRODUCTS MEASUREMENTS

- + RELIABLE
- + REPEATABLE
- + ACCURATE

MEASUREMENT AND DEFECT DETECTION CAPABILITIES

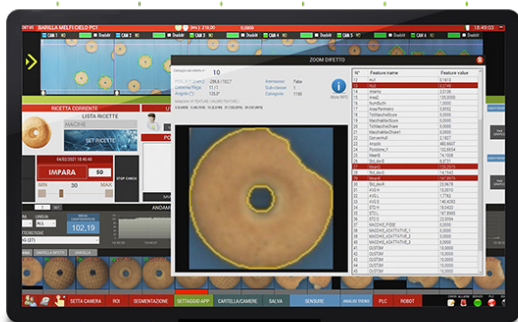
With SENSURE SYNAPSE, it is possible to **measure numerous product features** (a wide set is included in the system), such as shape, size, and colour, using **2D technology (industrial camera)** and perform a full 3D product profile using **3D technology (laser profilometer)**.

Thanks to the use of **thermal imaging** and **infrared cameras**, it is also possible to identify features in addition to the visible ones.

SENSURE SYNAPSE can also be configured to analyse features thought to be impossible to manage, such as pattern variations, topping conformity, average colour, slope, and much more, even on the bottom parts of the products.

Using SENSURE SYNAPSE ensures **reliable, repeatable, and accurate measurements**, even at **high line speed**, with the added benefit of all data being saved in a SQL database.

The SENSURE SYNAPSE system is flexible and can be **customized to meet specific needs** through the development of additional features after a feasibility analysis. Additionally, SENSURE solutions can be integrated with third-party systems like metal detectors, checkweighers, moisture analysers, ovens, etc.



What are the main components of the SENSURE vision system?

- **Image sensors and lenses** are the essential components for image capture.
- The **lighting source** and its placement are important for correct illumination of the products.
- The **processing unit**, which is the PC responsible for running the image processing software and analysing the images.
- The **SENSURE SYNAPSE software suite**, which is the most flexible and easy-to-configure software, using Artificial Intelligence and self-learning mode.

What are the main quality parameters measurable with SENSURE vision system?

- **Shape and Size** (min/max/average diameter, perimeter, length, width, roundness, area, etc.).
- **Compactness.**
- **Colour on top** (bake colour, spot detection, etc.) **and/or bottom** (bake colour, burnt areas, flour marks, spot detection, foreign colour anomalies in general).
- **Topping and seeding conformity** (quantity, distribution, and colour).
- **Texture analysis.**
- **Edge/Contour defects.**
- **Cracks and holes** and their conformity.
- **Foreign body detection** (identification is possible if the dimension and colour differences of the inclusions are detectable in the camera).
- **Height/Thickness** (min/max/average height/thickness).
- **Volume and slope/symmetry.**
- **Flatness and planarity.**
- **Temperature.**



SYNAPSE
QUALITY

+ **QUALITY** CONTROL

ARTIFICIAL INTELLIGENCE AND SELF-LEARNING APPROACH



In industries where product variability is high, such as in the food production sector, **Artificial Intelligence can play a significant role in quality control.**

The many variables that can impact a production line, such as oven drifts, ambient light fluctuations, raw material variations, recipe inconsistencies, and conveyor belt cleanliness, make it challenging to establish accurate analysis thresholds.

SENsure SYNAPSE QUALITY utilises **Artificial Intelligence** algorithms and **self-learning approach** to **classify products as compliant or non-compliant and identify defects and irregularities.** As a result of these technologies, **SENsure SYNAPSE QUALITY** provides **best-in-class quality control** with a system that can **automatically select features to be controlled in products and optimise tolerances for controlled measurements.** This approach eliminates the complex setup process that is typically associated with traditional systems, making installation and setup fast and straightforward due to the self-learning ability of **SENsure SYNAPSE QUALITY.**

SYNAPSE

QUALITY

Main features

- **Multi quality control approach for every feature:** Artificial Intelligence (LEARN and AUTOLEARN) and/or fixed thresholds.
- **Extensive set of quality features** with possibility to add customised ones.
- Capability to **detect misaligned products in lanes**.
- **Speed- and light-agnostic system** (independent on variable belt speed and area light conditions).
- **One single-graphic interface.**



LEARN

You are in charge of deciding when the system needs to adapt to the production process

Thanks to the **LEARN** button on the intuitive graphic interface of SENSURE SYNAPSE QUALITY, the line operator decides when to have the **system adapted to continue to guarantee the best quality standards while respecting production volumes**.

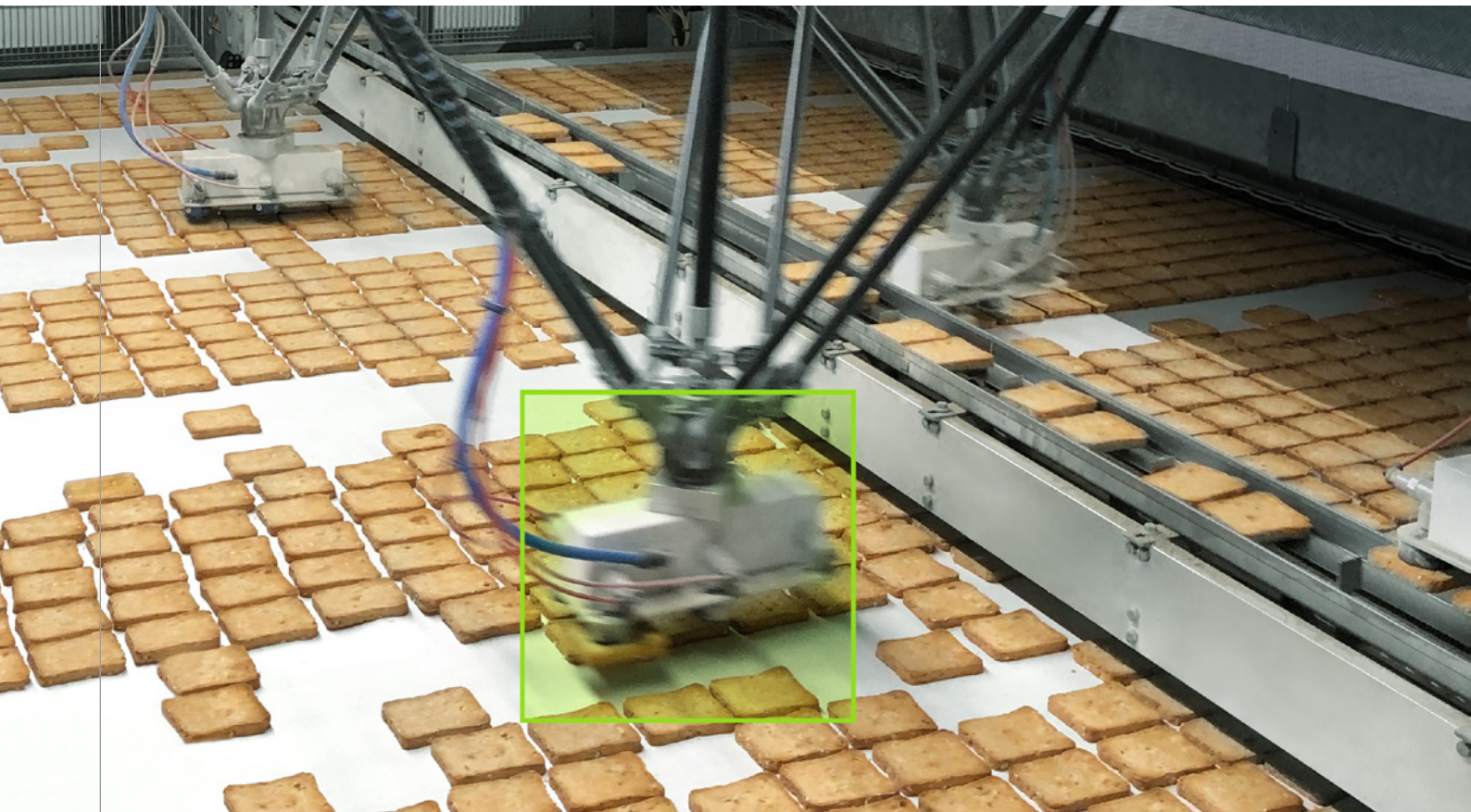
The system itself, thanks to its ability to work in self-learning, **automatically proposes a quality recipe and tolerances thresholds** (without requiring samples for a manual classification of non-compliances), allowing the operator to **make subsequent modification**.



AUTOLEARN

The system is designed to automatically adapt to changes in production at the most appropriate time

Thanks to its ability to learn from previous experiences and saved data over time, **SENSURE SYNAPSE QUALITY can independently adapt to further improve the efficiency of the production line**. It can identify and report any production drifts without compromising the system's proper functioning.



SYNAPSE
GUIDANCE

+ VISION GUIDANCE

COMMUNICATION OF PRODUCT AND QUALITY INFORMATION TO ROBOT/MACHINE CONTROLLER

SENSURE SYNAPSE GUIDANCE can locate the centre of mass (X, Y, Z coordinates) and orientation of a part, and transferring those to a robot or machine controller (PLC, I/O board, etc.).

Machine vision guidance achieves far greater speed and accuracy than manual positioning in tasks such as arranging or aligning parts on a conveyor belt.

SENSURE SYNAPSE GUIDANCE can not only send guidance instructions to robot or machine controllers of different brands, but it can **also communicate quality information for automatic sorting**. This is done by applying different selection criteria, ranging from simple fixed thresholds for product area and colour (a functionality included in SENSURE SYNAPSE GUIDANCE), to the most advanced artificial intelligence algorithms that work through self-learning (a functionality included in SENSURE SYNAPSE QUALITY).

Main features

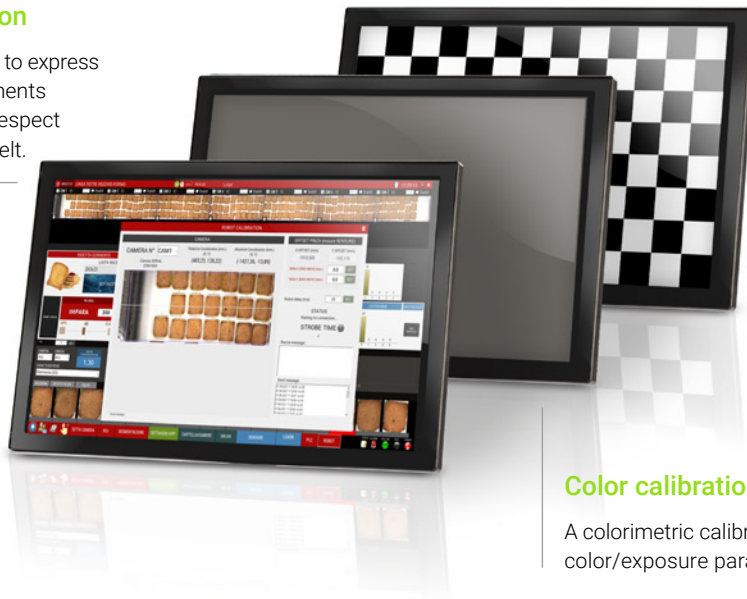
- Detection and communication of the product's centre of mass and orientation to Robot/Machine Controller (with customizable definition of the centre of mass and orientation).
- Detection and communication of the product's quality features (area and colour with fixed thresholds) to Robot/Machine Controller.
- Management of products in contact.
- Creation of unlimited customized recipes per product.
- Display of statistical data.
- Saving of images of defects and rejection causes.
- Upgradability with other SENSURE SYNAPSE packages.



Absolute and repeatable metric or imperial system

Position calibration

An X, Y calibration tool to express all position measurements in mm (or inch) with respect to a "O" point on the belt.



Measurement calibration

A calibration tool to convert pixels to mm (or inch). All dimensional measurements are expressed in mm (or inch).

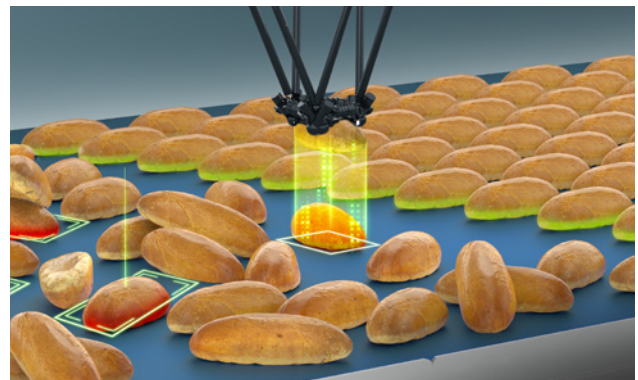
Color calibration

A colorimetric calibration tool to set the color/exposure parameters of the cameras.



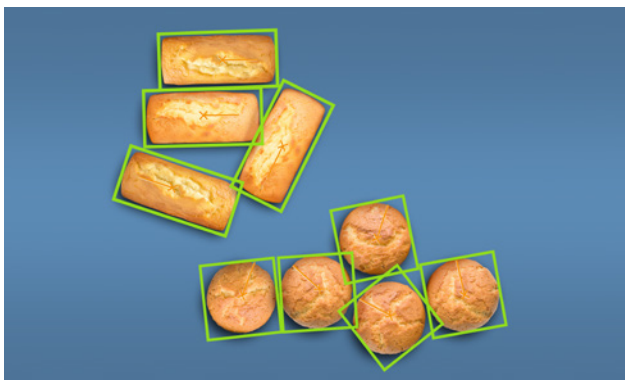
Intelligent product management

The software allows for the precise placement of products on the same belt without overlapping, ensuring that products are arranged in perfect rows.



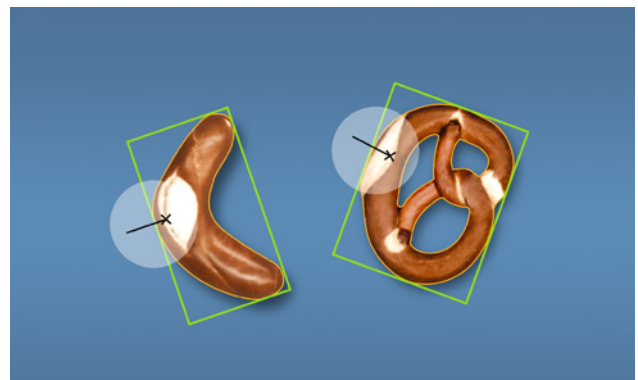
Smart management of products in contact

The software provides different user-configurable methods to manage products in contact, improving the efficiency of the production line.



Customization of grip parameters

The software is designed to provide customized definitions of the gripping point and angle on products with a particular shape, which allows it to adapt to different robot grippers. This feature is made possible through DLL ad-hoc for both barycentre and angle.





SYNAPSE

DATAVIEW — DATALIVE — DATAMIND

+ DATA ANALYTICS

CONTINUOUS PROCESS IMPROVEMENT WITH DATA ANALYTICS

Food manufacturers can benefit from a larger scope of product and process improvement through **data collection** and SENSEURE systems provide **continuous and precise monitoring**, which can help ensure that data is reliable and represents the current production status.

With the help of **Machine Learning** and **Artificial Intelligence**, **more value can be extracted from product data**. With accurate and reliable **real-time product data** acquired through SENSEURE **vision inspection systems**, the SENSEURE SYNAPSE analytics tools can provide reports, graphs, tables, and **advanced data analytics** to guide managers' decisions for overall improvement in many ways.

The **SENSEURE SYNAPSE** software suite offers **three different modules** designed to provide customized historical reports, display and monitoring of live measured values, and real-time operating procedures, as well as support for continuous improvement activities through data analytics aimed at **reducing waste, increasing plant efficiency, and improving process performance**.

All **collected data** are **stored in a SQL database** and can also be used as input for any third-party software for OEE, SPC, or can be interfaced with MES and SCADA systems.



DATAVIEW

Historical product data can be used to make important strategic decisions about the present and future.

Through the development of intuitive visual reports, charts, and graphs, it is possible to **immediately use 100% of product information** that would otherwise be hidden under large amounts of data. Simple machine learning data models can also be applied by reviewing historical products data in **combination with data coming from other sources**.



DATALIVE

A quality dashboard that operates in real-time is a powerful tool for analysing, tracking, and reporting on the live product data.

By utilising real-time product data visualisation, any **anomalies can be detected at an early stage**, which helps to prevent unexpected food waste and downtime. The **values are displayed on large dashboard screens** located at various positions on the production line, ensuring that all employees can view products data and status in real-time. DATALIVE allows users to set “good state” and “warning state” intervals for each feature, with a dashboard using green, orange, and red colours to display data within, nearing, or exceeding those intervals. This transparency allows for quick, effective action on product or process issues.



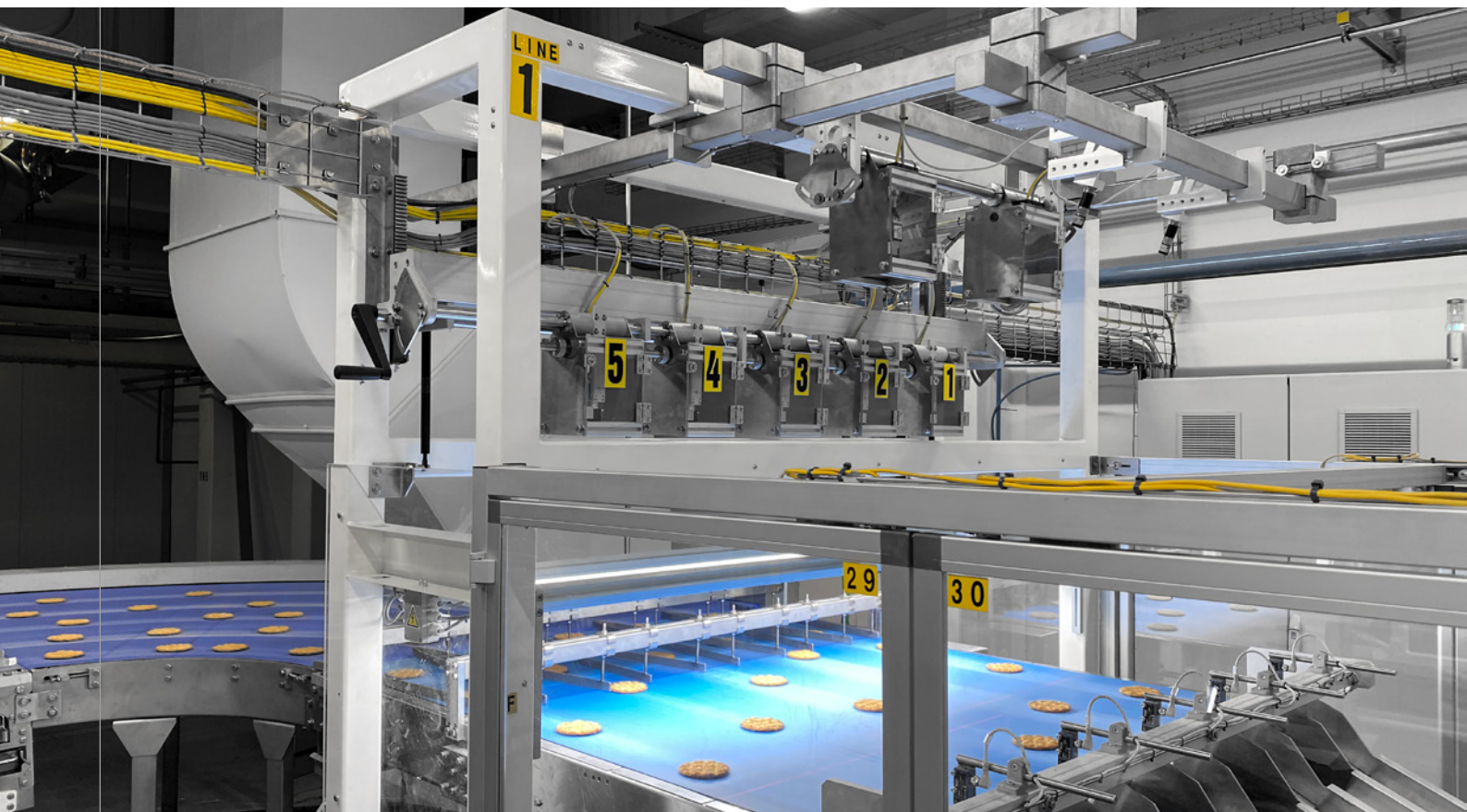
DATAMIND

Intelligent system that alerts operators in real-time of specific events and provides corrective operating procedures.

DATAMIND serves as an **intelligent alarm system**. It is programmed to **alert the operator in case of certain events or warnings**. Once triggered, the operator is given recommended actions that are pre-defined based on defined rules (root cause): the “Easy Alert Setup” tool allows for **customizing messages (checks and instructions) depending on measured values for different features**. The operator can



also interact with the tool and provide details on the actions taken following the messages: thanks to this interaction, it is possible to understand whether the corrections made have led to improvements. SENSURE SYNAPSE DATAMIND can also be integrated with data from other line equipment.



STAR GATE

+ TURNKEY SOLUTIONS

COMPLETE AND CUSTOMISED VISION INSPECTION SYSTEMS

Thanks to the **modular and customised hardware of SENSURE STARGATE** and with the **SENSURE SYNAPSE software suite**, it is possible to configure a **complete on-line vision inspection system** that fulfils any operational requirements, even on already existing lines.

The **SENSURE STARGATE** can be tailored to **suit the specific application and production line**.

Main features

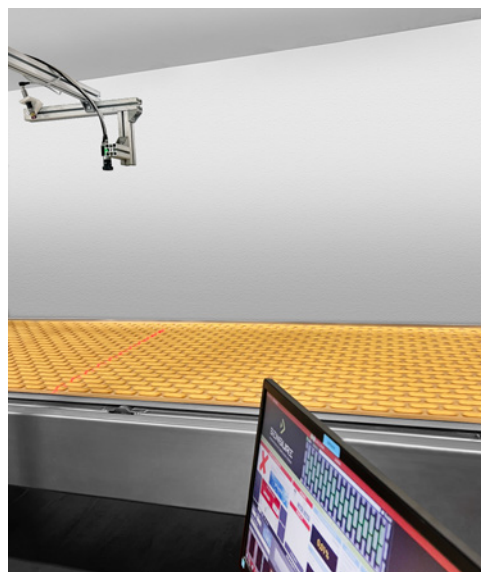
- **Compact and solid mechanical frame.**
- **Electrical control cabinet** with state-of-the-art operator interface.
- **Dedicated hardware** and **SENSURE SYNAPSE** software suite for **vision inspection**.
- **Customized single or multiple rejection mechanism** (air nozzles, traps, retractable belts, pushers, etc.).
- The modular design of STARGATE enables **flexible integration of various vision types, licenses, and rejection mechanisms** based on production line changes.
- **Fully food grade and ready for harsh wash-down environment.**
- **Exchange signals and information** with conveyors and/or other machines/ systems.
- **Easy installation, calibration, and operation** into new or existing production lines.
- **Collaboration with local system integrators or OEM** for the integration of vision inspection systems.



Different rejection mechanisms



Preliminary test



The appropriate approach for every products

Thanks to the self-learning capabilities of SENSURE SYNAPSE, it is possible to **carry out tests in SENSURE's laboratory or directly in-line** with dedicated equipment and SENSURE's vision experts, with very short setup times.

+ OFF-LINE VISION SYSTEMS



SENSURE also offers a comprehensive **off-line systems** which **instantaneously measures product attributes**, with the results displayed on an easy-to-use interface. The installed software is a comprehensive suite that includes **measurement, analysis, reporting, and archiving functions**, all of which are designed to cater to the requirements of plant and quality managers. The systems can be **integrated with weight, moisture and temperature monitoring devices**, and **real-time QC reports are generated** with data stored in a SQL database.

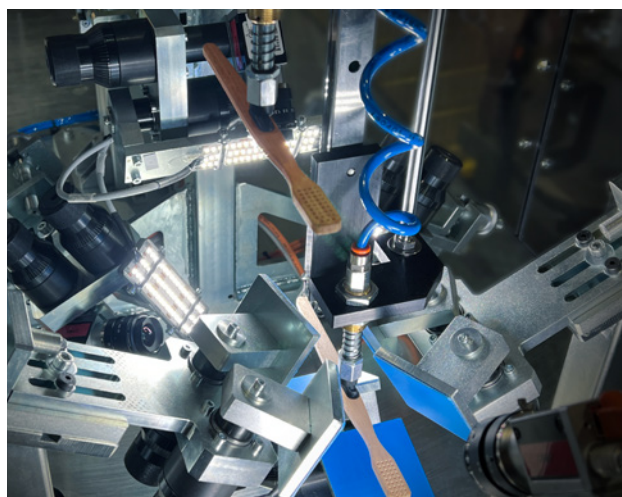
Main features

- **Plug it in and ready to use.**
- Possibility to **measure product attributes after single production process steps** (forming, proofing, baking, frying, topping/decoration deposition, etc.).
- **Easy to use operator interface.**
- Possibility to **connect to external devices with USB ports.**
- **Usable in laboratory or directly in production.**
- **Extensive set of features already included** (Possibility to add customized quality features).

MULTIPLE APPLICATIONS IN MANY SECTORS

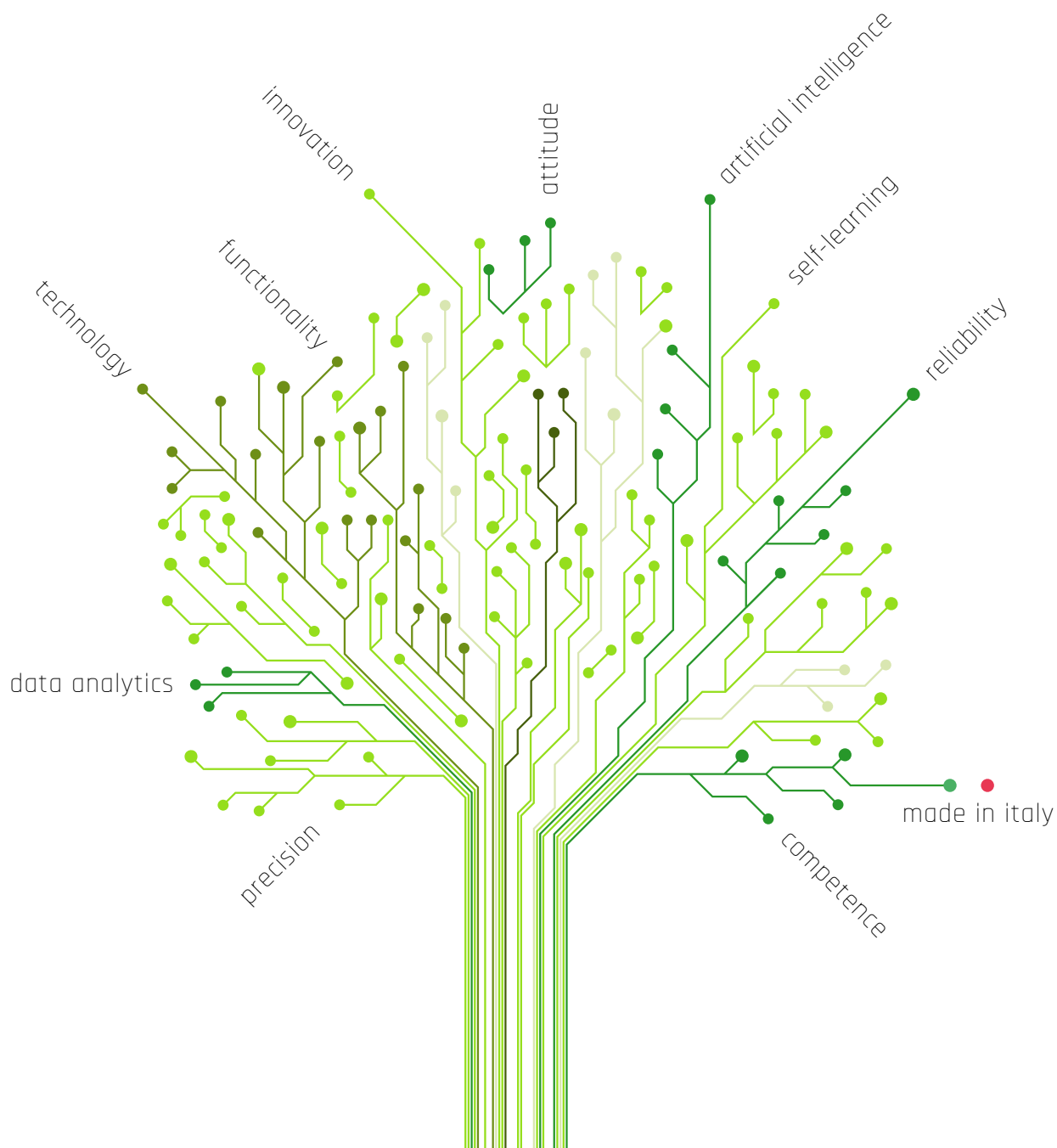
SENSURE vision systems can be used in various industrial sectors for the inspection of highly variable products.

Among the many implemented applications, SENSURE has developed applications for the inspection of wood products (dimensions, presence of knots, etc.), printing controls on tiles, inspection of products at the entrance of an automated warehouse, etc.





NEVER STOP LEARNING

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