DATASENSING
easing automation challenges

AbN automation

IP67

NEW!

# Smart-VS

## AI-POWERED SMART SENSOR

AI-powered smart photoelectric sensor with machine learning algorithms. The smart solution for all presence, orientation and quality verification applications in industrial automation.

- No vision tool programming required
- No need of machine vision skills
- Deterministic response time
- Reduced cost of ownership and maintenance
- Electronic focus control
- Up to 400mm operating distance
- Bright and visible Red LED pointer
- Powerful white polarized light illuminator
- Green/Red LED Spot for GOOD/NO-GOOD part
- Ethernet TCP/IP communication
- Easy and Intuitive WEB Server GUI for maintenance and job setting

CE UKCA

## CODE DESCRIPTION

**SMART-VS** - MR - 5 - 150 - WH - 0 - AA

| | | |
|---|---|---|
| series | **SMART-VS** | Smart-Vision sensor |
| type | **MR** | Metal housing radial optic STANDARD |
| | **PL** | Metal housing radial optic PLUS |
| | **EV** | Metal housing radial optic EVOLUTION |
| connection | **5** | M12 connectors Power I/O + Ethernet |
| | **6** | M12 8 pin connectors Power I/O + Ethernet |
| operating distance | **150** | Maximum operating distance 150 mm |
| | **400** | Maximum operating distance 400 mm |
| illuminator type | **WH** | Polarized white |
| output type | **0** | 3 digital output |
| platform type | **AA** | Enhanced platform |

# TECHNICAL SPECIFICATIONS

| | Smart-VS-MR-5-150-WH-0 | Smart-VS-PL-5-150-WH-0 | Smart-VS-EV-5-400-WH-0-AA |
|---|---|---|---|
| **GENERAL DATA** | | | |
| Operating principle | Object detection classification<br>2 classes | Object detection classification<br>3 classes | Object detection classification<br>6 classes + Anomaly detection |
| Imager | 6 (total) | 20 (total) | 50 (total anomaly),<br>50 (total classifier) |
| **DETECTION CAPABILITIES** | | | |
| Nominal sensing distance | 50 ... 150 mm | 50 ... 400 mm | |
| **EMISSION DATA** | | | |
| Emission | LED white 4 polarized white H.P. LEDs + 2 LED red aim + 1 LED green spot + 1 LED green spot | | |
| **FUNCTIONS** | | | |
| Sensitivity adjustment | TEACH-IN push button + WEB based GUI (through Ethernet) | | |
| **INPUT/OUTPUT** | | | |
| Response time | 0 ... 50 ms (deterministic) | 15 ... 50 ms (deterministic) | 15 ... 50 ms (deterministic classifier)<br>200 ms max (non det. anomaly) |
| Output type | 3 NPN/PNP/PP, 1 Ethernet 10/100 (M12 8-pin X-coded) | | 4 NPN/PNP/PP,<br>1 Ethernet 10/100<br>(M12 8-pin X-coded) |
| **HMI/UI** | | | |
| LED indicators | 6 LED yellow (output, run, trigger, good, bad, not used) + 2 on back (1 blue power, 1 yellow Ethernet) | | |
| **ELECTRICAL DATA** | | | |
| Supply voltage | 10 ... 30 Vdc | | |
| Maximum residual ripple | 1000% | | |
| Leakage current | ≤ 400 µA | | |
| Maximum No-load absorption | 0.14...0.4 mA@30V...10V (4W) | | 0.17...0.5 mA@30V...10V (5W) |
| Maximum DC output voltage drop | 3 V @ IL=100mA | | |
| Maximum DC load current | 100 mA | | |
| Short circuit protection | Yes | | |
| Reverse polarity protection | Yes | | |
| Impulsive overvoltage protections | Yes | | |
| Protection to capacitive loads | Yes | | |
| Insulation resistance | >20 MΩ 500 Vdc, between electronics and housing | | |
| Ground resistivity | 500 Vac 1 min., between electronics and housing | | |
| **MECHANICAL DATA** | | | |
| Dimensions | 47 x 58 x 38 mm Cubic | | |
| Housing material | Aluminium / PMMA | | |
| Active part material | PMMA | | |
| Optical location | Radial 90° | | |
| Weight | 175.00 g Connector | | |
| Connector material | Metal | | |
| **CERTIFICATIONS** | | | |
| Certifications | CE, UKCA, CSA | | |
| Electromagnetic compatibility | EN 60947-5-2 | | |
| **ENVIRONMENTAL DATA** | | | |
| Operating Temperature | 0 ... 50 °C | | |
| Mechanical Protection | IP67 | | |
| Storage temperature max. | -25 ... 70 °C | | |
| Shocks and vibrations | 0.5 mm amplitude, 10 ... 55 Hz frequency, for every axis (EN60068-2-6) | | |
| Ambient light immunity | according to EN 60947-5-2 : 2020 | | |

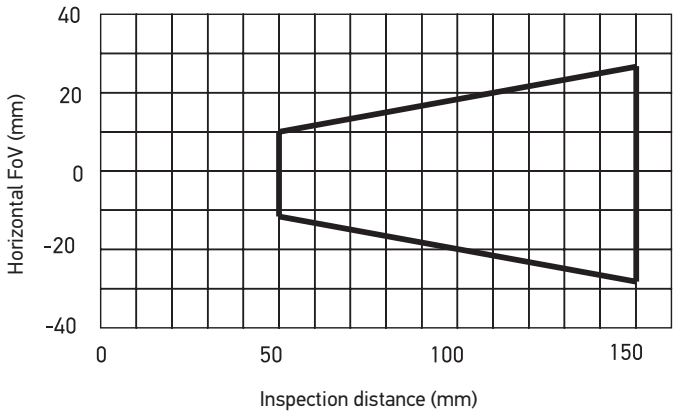
1 The embedded Ethernet interface is intended for configuration only through connection to the device IP. Point-to-Point connection is recommended.
2 High ambient temperature applications should use metal mounting bracket for heat dissipation.
3 When correctly connected (fully tightened) to IP67 cables with seals.

# AVAILABLE MODELS

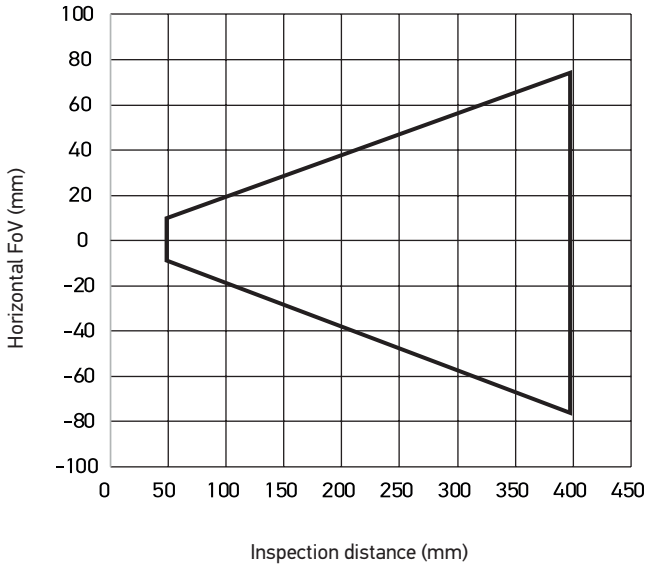
| Operating principle | Nominal sensing distance | Sensitivity adjustment | I/O | Connections | Output type | Model |
|---|---|---|---|---|---|---|
| Object detection classification 2 classes | 50 ... 150 mm | TEACH-IN push button + WEB based GUI (through Ethernet) | 3 Out + 2 In + ETH | M12 plug 17 pin | 3 NPN/PNP/PP, 1 Ethernet 10/100 (M12 8-pin X-coded) | **Smart-VS-MR-5-150-WH-O** (959971320) |
| Object detection classification 3 classes | 50 ... 400 mm | | | | | **Smart-VS-PL-5-150-WH-O** (959970005) |
| Object detection classification 6 classes + Anomaly detection | | | 4 Out + 2 In + ETH | M12 plug 8 pin | 4 NPN/PNP/PP, 1 Ethernet 10/100 (M12 8-pin X-coded) | **Smart-VS-EV-5-400-WH-O-AA** (959970009) |

# RESPONSE DIAGRAMS

**Smart-VS-MR-5-150-WH-O Inspection area**

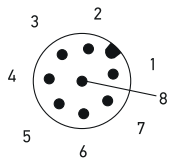



**SMART-VS-**-5-***-**-O-* Inspection area**




# CONNECTIONS

**Smart-VS-EV-5-400-WH-O-AA**




MALE M12
8 pins Smart-VS EVO

| | | |
|---|---|---|
| 1 | White | Teach (IN2) |
| 2 | Brown | 10...30 Vdc |
| 3 | Green | OUT1 (I/O) |
| 4 | Yellow | OUT2 (I/O) |
| 5 | Grey | XTRIG (IN1) |
| 6 | Pink | OUT3 |
| 7 | Blue | 0 Vdc |
| 8 | Red | OUT4 |

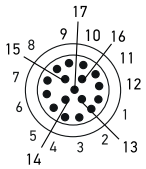
**Smart-VS-EV-5-400-WH-O-AA**


FEMALE M12
8 pins ETH Giga

| | |
|---|---|
| 1 | TX+ |
| 2 | TX- |
| 3 | RX+ |
| 4 | RX- |
| 5 | NOT CONNECTED |
| 6 | NOT CONNECTED |
| 7 | NOT CONNECTED |
| 8 | NOT CONNECTED |

# CONNECTIONS

**Smart-VS-**-5-150-WH-O**




MALE M12
17 pins Smart-VS
Power I/O

* The wire colors are referred to cables P/N 95A900052 and 95A900053

| | | |
|---|---|---|
| 1 | Brown | +24 Vdc |
| 2 | Blue | 0 Vdc |
| 3 | White | IN2-B REMOTE TEACH |
| 4 | Not Used | NOT CONNECTED |
| 5 | Pink | IN1-B TRIGGER INPUT |
| 6 | Yellow | IN1-A TRIGGER INPUT |
| 7 | Not Used | NOT CONNECTED |
| 8 | Gray | OUT GOOD PUSH PULL |
| 9 | Red | OUT DATA VALID PUSH PULL |
| 10 | Not Used | NOT CONNECTED |
| 11 | Not Used | NOT CONNECTED |
| 12 | Not Used | NOT CONNECTED |
| 13 | Green | IN2-A REMOTE TEACH |
| 14 | Not Used | NOT CONNECTED |
| 15 | Not Used | NOT CONNECTED |
| 16 | Black | OUT NO GOOD PUSH PULL |

**Smart-VS-**-5-150-WH-O**


FEMALE M12
8 pins ETH Giga

| | |
|---|---|
| 1 | TX+ |
| 2 | TX- |
| 3 | RX+ |
| 4 | RX- |
| 5 | NOT CONNECTED |
| 6 | NOT CONNECTED |
| 7 | NOT CONNECTED |
| 8 | NOT CONNECTED |

# INDICATORS AND SETTINGS

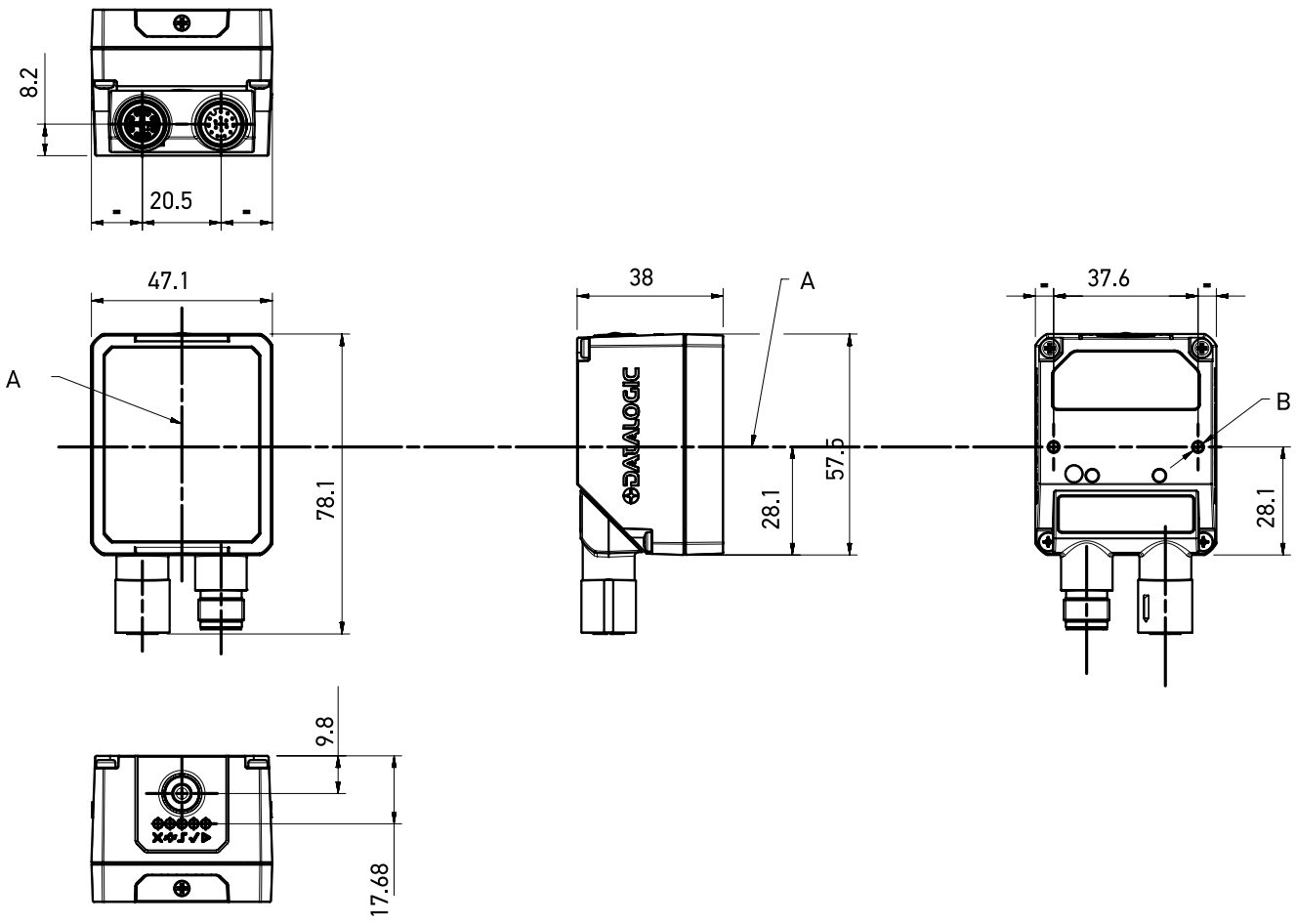

| ITEM N. | DESCRIPTION |
|---|---|
| 1 | Illuminator with 4 powerful White LEDs with polaroid filter |
| 2 | 7mm lens with automatic focus system |
| 3 | Aiming system with 2 powerful Red LEDs |
| 4 | Red Spot illuminator LED for NO GOOD detection object |
| 5 | Green Spot illuminator for GOOD detection object |
| 6 | 2 holes for direct mounting or bracket |
| 7 | Blue Power Supply LED |
| 8 | Yellow Ethernet connection LED |
| 9 | M12 Ethernet X-coded female connector |
| 10 | Rotating connector block |
| 11 | M12-17 Pin Power Supply and I/O male connector |
| 12 | 5 bright LED for User Interface signalization |
| 13 | Yellow TEACH-IN button for sensor set-up |

# INDICATORS AND SETTINGS

| HMI CONFIGURATION | |
|---|---|
|  | **NO GOOD object**<br>• blinking: NO GOOD object teaching<br>• in Run phase: NO GOOD object detected |
|  | **For future use** |
|  | **Trigger**<br>• trigger received |
|  | **GOOD object**<br>• blinking: GOOD object teaching<br>• in Run phase: GOOD object detected |
|  | **Run**<br>• device in RUN phase |

# MECHANICAL DRAWINGS

**Smart-VS-**-5-***-WH-****




(mm)

| Model | A | B |
|---|---|---|
| Smart-VS-**-5-***-WH-** | Optical Axis | M3 n°2 depth 4 mm |

# FIELD OF VIEW Calculation

Use the data in the following table to calculate the FOV for your application, referring to the draw and the formula below.

| $D_0$ | View angle horizontal | View angle vertical | View angle diagonal | Min Reading Distance mm |
|---|---|---|---|---|
| 11 mm | 19° | 14,5° | 24° | 50 mm |

The viewing angle has a tolerance of ±1° depending on the reading distance.

$$FOVx = 2 [ (d + d0) * \tan (\alpha x/2) ]$$

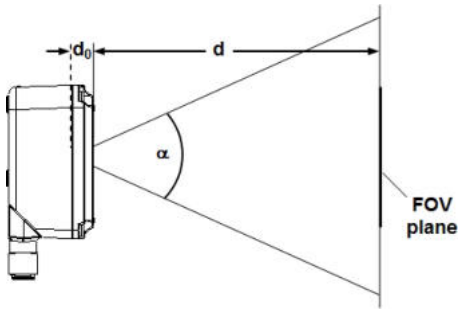
where:

**FOVx** = horizontal, vertical or diagonal FOV

**αx** = horizontal, vertical or diagonal viewing angles.

**d** = reading distance (in mm) from window surface to code surface

**$d_0$** = offset (in mm) from center of lens to external window surface




Example:

The FOV at a reading distance of 100 mm is:

FOVH = 2[(100 mm + 11mm)*tan(19°/2)] ≅ 37 mm

FOVV = 2[(100 mm + 11 mm)*tan(14,5°/2)] ≅ 28 mm

# OPERATING PRINCIPLES AND APPLICATIONS

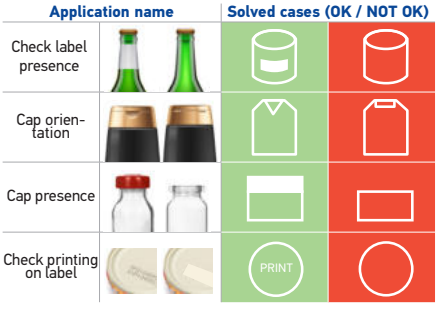
## Smart-VS simply clever

The Smart-VS is a Smart vision sensor simple and clever. It is simple outside since it can be handled and used like a standard photoelectric sensor but powerful and smart inside with a multiprocessor platform supporting and embedding the Artificial Intelligence technology. Its customized machine learning algorithms power the core of the detection system, enabling very complex and accurate object classification, while ensuring a very simple user setup procedure.

The user does not have to take care about programming or setting threshold of different vision tools, all these complex functionalities are operated by the Smart-VS "brain".

The detection function is accomplished with three easy and fast steps: (1) GOOD condition teaching (2) NO-GOOD condition teaching (3) start learning and run! Ready to detect OK vs NG objects. All the user has to do is place the objects in front of the sensor and press the button to move through the configuration steps until the sensor starts to think and act.


The sensor is especially suited for all the applications where it is needed to solve detection between two well specified object condition classes, like presence or absence of a specific feature or object orientation respect two sides, teaching the sensor with OK vs NG condition.
This working principle makes the sensor setting easy and independent by the type, material, color of the object that needs to be detected.



# OPERATING PRINCIPLES AND APPLICATIONS

## Smart-VS simply clever

| Application name | |
|---|---|
| Check label presence |  |
| Cap orientation |  |
| Cap presence |  |
| Check printing on label |  |

The main application targeted for the best use of the Smart-VS is mainly related to print and apply where it is needed to detect presence or absence of labels or text printing.

Liquid filling machines where it is necessary to detect the presence/absence of any type of closure on any type of bottle, vial, flask, jar of any material, whether glass, plastic or with light/dark colored shiny/mat surfaces. Just make the sensor teach and learn the OK/NG condition and it will work. You do not need to set vision tools, sensitivity thresholds, image exposition, focus, sensor positioning or sensor sensitivity.

Bottling machines where it is needed to check if the label is present or not on the object making the sensor learning the presence/absence and then make it work immediately without additional settings, just pressing a push button or building up different recipes for different formats with an effective and easy WEB GUI interface.

## A great value for all the applications

The Smart-VS redefines the standards of detection eliminating all the concerns regarding the use of standard sensors about unstable detection or complex installation layouts to perform the presence/absence or orientation applications. A Smart-VS ensures:

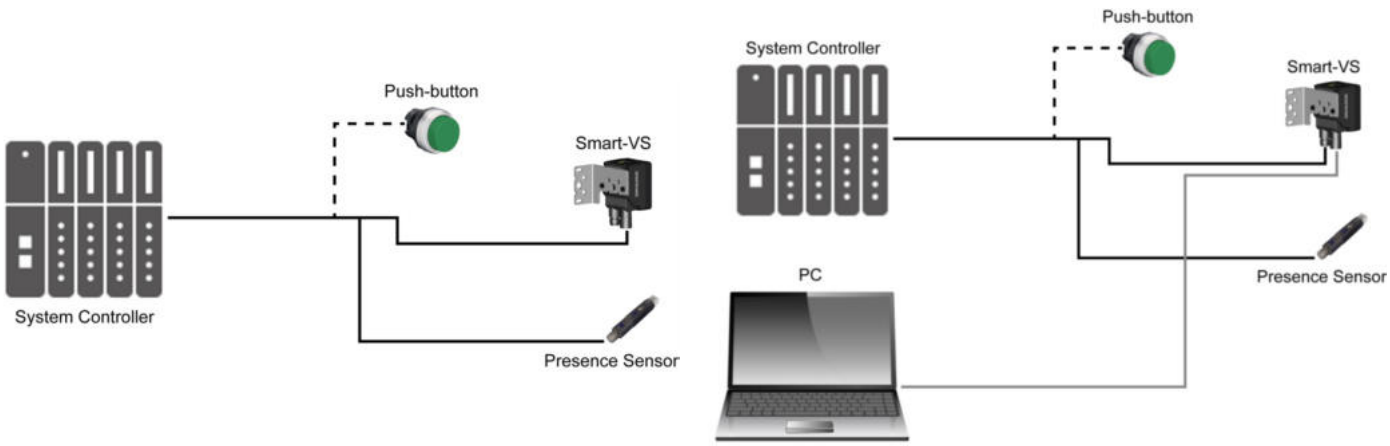
- more stability in terms of different object materials and shape
- excellent stability on glass and metal parts
- easier system installation
- more flexibility and adaptability to different production formats
- easy setting avoiding more expensive and complex devices
- lower total cost of ownership and maintenance

# SMART-VS SETTING METHODS

## Easy and Comprehensive system integration

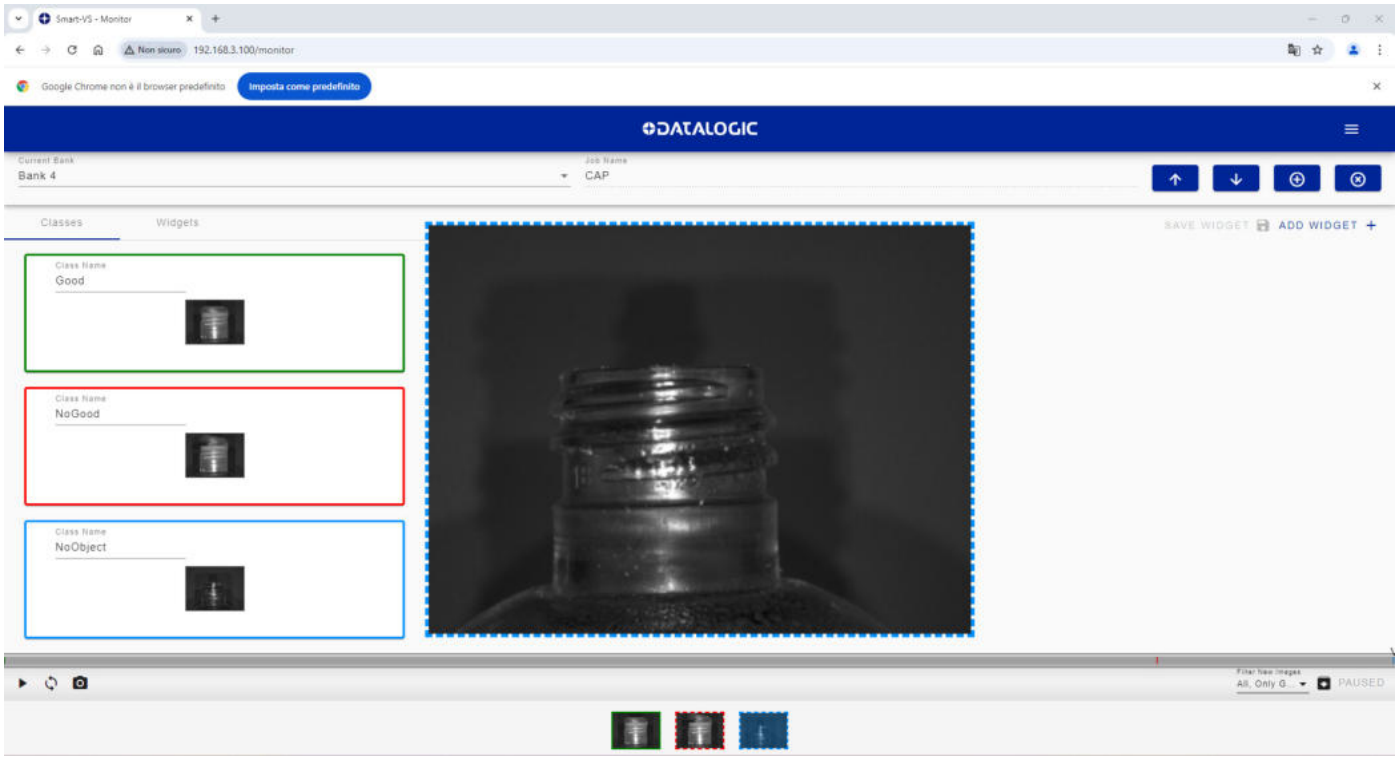
The Smart-VS is very easy and simple to integrate in any application, it can be implemented like a traditional sensor product, but it is much simpler than a smart camera or an ordinary smart sensor.

It is required to provide a trigger signal by machine electrical phase or an external simple sensor or encoder. The PC or Ethernet based terminal is an option needed to change configuration of the sensor or for more complex set-up where it is needed to change and/or add job setting through the web interface with a browser. The web interface can also be a useful tool in case of trouble shooting.



# WEB INTERFACE

## SMART-VS-**-5-150-**-0

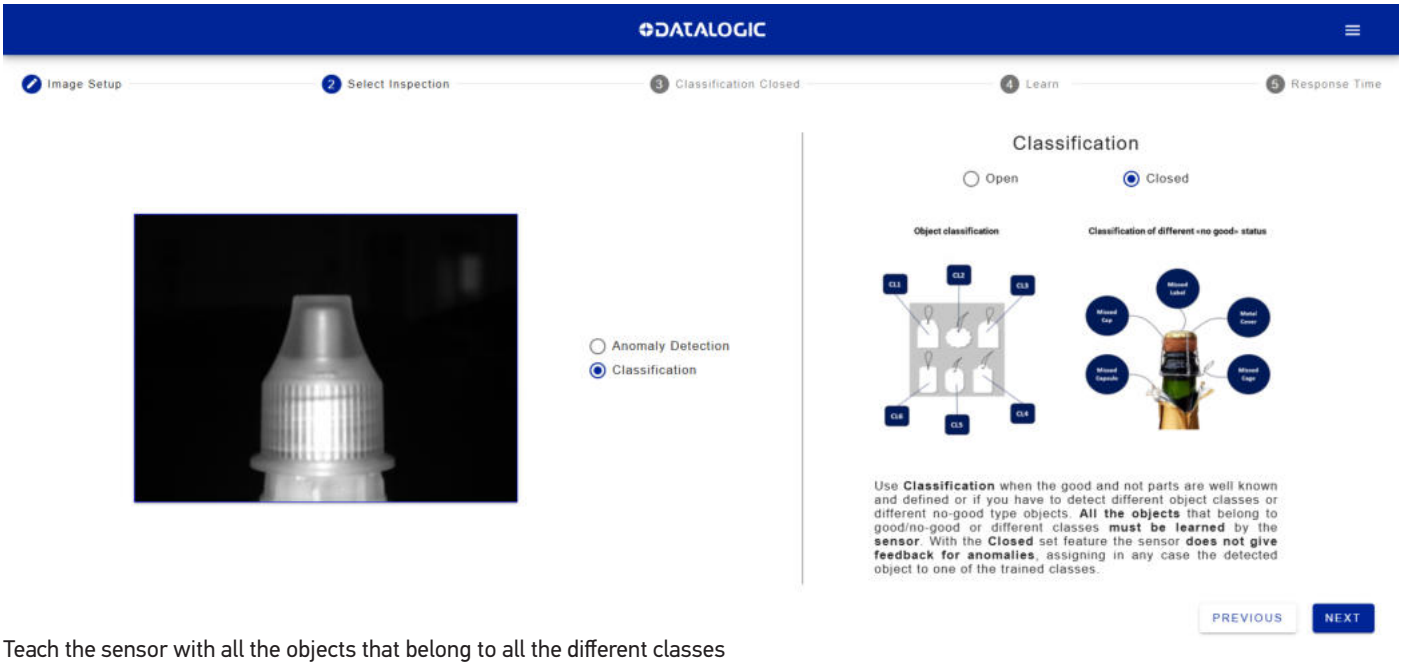




The Smart-VS is equipped with a WEB Server User interface for easy set-up and setting. This is an excellent tool when it is needed to setup and change different production configuration jobs depending on variable production format. The information are complete and shown in a clear layout.

## Smart-VS-EV-5-400-WH-O-AA
## ANOMALY DETECTION

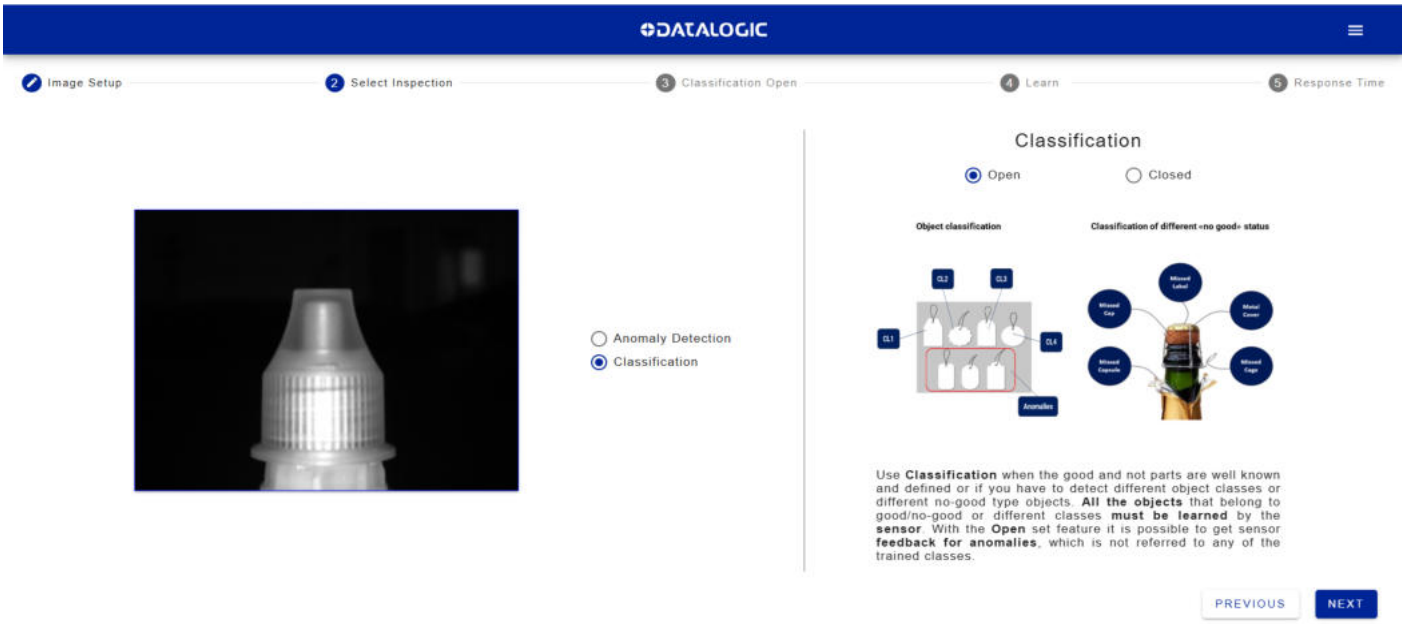

Teach the OK object to detect any type of anomaly that may be present in the object for quality or integrity issues (NG).

## Smart-VS-EV-5-400-WH-O-AA
## CLASSIFICATION CLOSE SET




Teach the sensor with all the objects that belong to all the different classes
Closed set will assign in any case, the detected object, to one of the trained classes.

## Smart-VS-EV-5-400-WH-0-AA
## CLASSIFICATION OPEN SET




Teach the sensor with all the objects that belong to all the different classes
Open set will find anomalies, which are not referred to any of the trained classes.

## MANUALS

| Smart-VS-**-5-**0-WH-0-** | | |
|---|---|---|
| 806000510_SMART-VS_plus_prg_eng.pdf (4.02 Mb) | 806000490_SMART-VS_PLUS_WebApp.pdf (1.43 Mb) | 806000510_SMART-VS_plus_prg_ita.pdf (4.04 Mb) |

## SOFTWARE

| Smart-VS-**-5-**0-WH-0-** | |
|---|---|
| 1.5.0.8_Package_For_SmartVS-Plus (22/08/2024). 1.5.0.8_Package_For_SVS-Plus.zip (22,36 Mb) | 1.2.0_package for SMART-VS (22/08/2024) SMART-VS_1.2.0.zip |

## ACCESSORIES

| | Model | Description | Article code |
|---|---|---|---|
| **Cables** | CS-A1-06-U-03 | Cable M12 8 poles axial female unshielded 3m UL 2464 | 95ASE1220 |
| | CS-A1-06-U-05 | Cable M12 8 poles axial female unshielded 5m UL 2464 | 95ASE1230 |
| | CAB-ETH-X-M01 | CAB-ETH-X-M01 M12-IP67 GETH-X CAB 1 m | 93A050122 |
| | CAB-ETH-X-M03 | CAB-ETH-X-M03 M12-IP67 GETH-X CAB 3 m | 93A050123 |
| | CAB-ETH-X-M05 | CAB-ETH-X-M05 M12-IP67 GETH-X CAB 5 m | 93A050124 |
| | CAB-GD03 | Cable, power and I/O for Smart-VS M12 17P 3 m stripped wires | 95A900052 |
| | CAB-GD05 | Cable, power and I/O for Smart-VS M12 17P 5 m stripped wires | 95A900053 |
| **Mounting brackets** | BK-22-000 | FIXING BRACKET M220 BODY | 93A050230 |





Revision number: 2 - Revision date: 2025-03-04