DATASENSING
easing automation challenges

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-O	Smart-VS-PL-5-150-WH-O	Smart-VS-EV-5-400-WH-O-AA
GENERAL DATA			
Operating principle	Object detection classification 2 classes	Object detection classification 3 classes	Object detection classification 6 classes + Anomaly detection
Imager	6 (total)	20 (total)	50 (total anomaly), 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) 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, 1 Ethernet 10/100 (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		

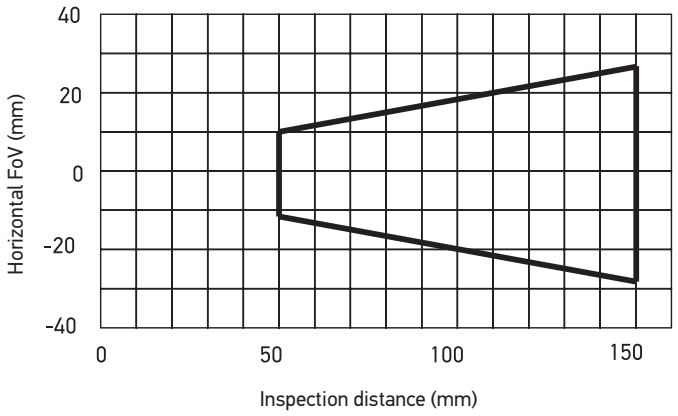
1 The embedded Ethernet interface is intended for configuration only through connection to the device IP. Point-to-Point connection is recommended.
2 High ambient temperature applications should use metal mounting bracket for heat dissipation.
3 When correctly connected (fully tightened) to IP67 cables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

AVAILABLE MODELS

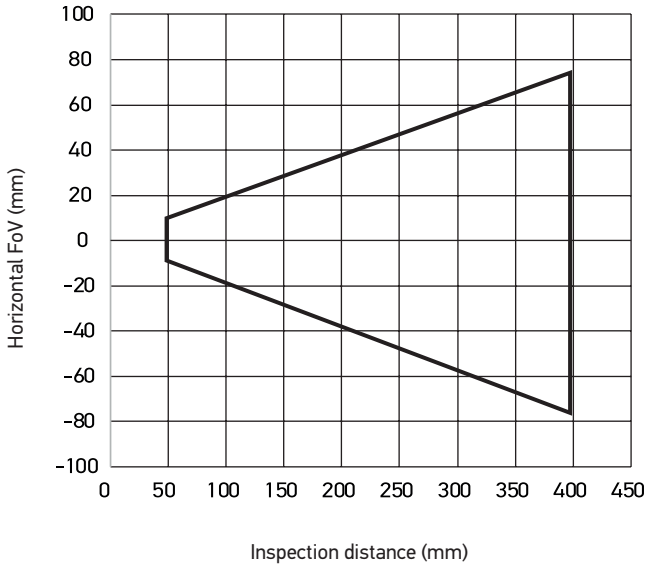
Operating principle	Nominal sensing distance	Sensitivity adjustment	I/O	Connections	Output type	Model
Object detection classification 2 classes	50 ... 150 mm	TEACH-IN push button + WEB based GUI (through Ethernet)	3 Out + 2 In + ETH	M12 plug 17 pin	3 NPN/PNP/PP, 1 Ethernet 10/100 (M12 8-pin X-coded)	**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

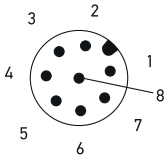


SMART-VS--5-***-**-O-* Inspection area**



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

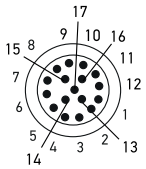
Smart-VS-EV-5-400-WH-O-AA

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

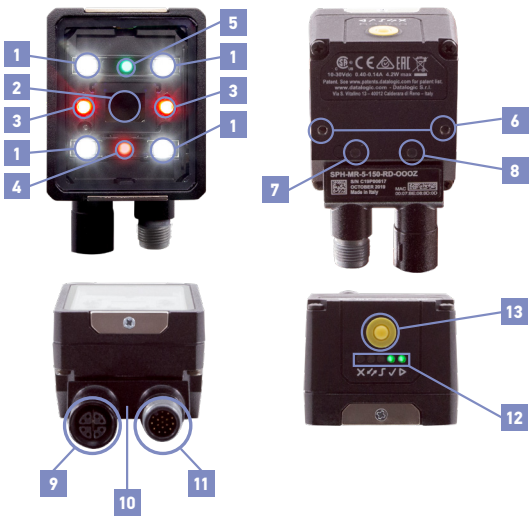
1	Brown	+24 Vdc
2	Blue	0 Vdc
3	White	IN2-B REMOTE TEACH
4	Not Used	NOT CONNECTED
5	Pink	IN1-B TRIGGER INPUT
6	Yellow	IN1-A TRIGGER INPUT
7	Not Used	NOT CONNECTED
8	Gray	OUT GOOD PUSH PULL
9	Red	OUT DATA VALID PUSH PULL
10	Not Used	NOT CONNECTED
11	Not Used	NOT CONNECTED
12	Not Used	NOT CONNECTED
13	Green	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



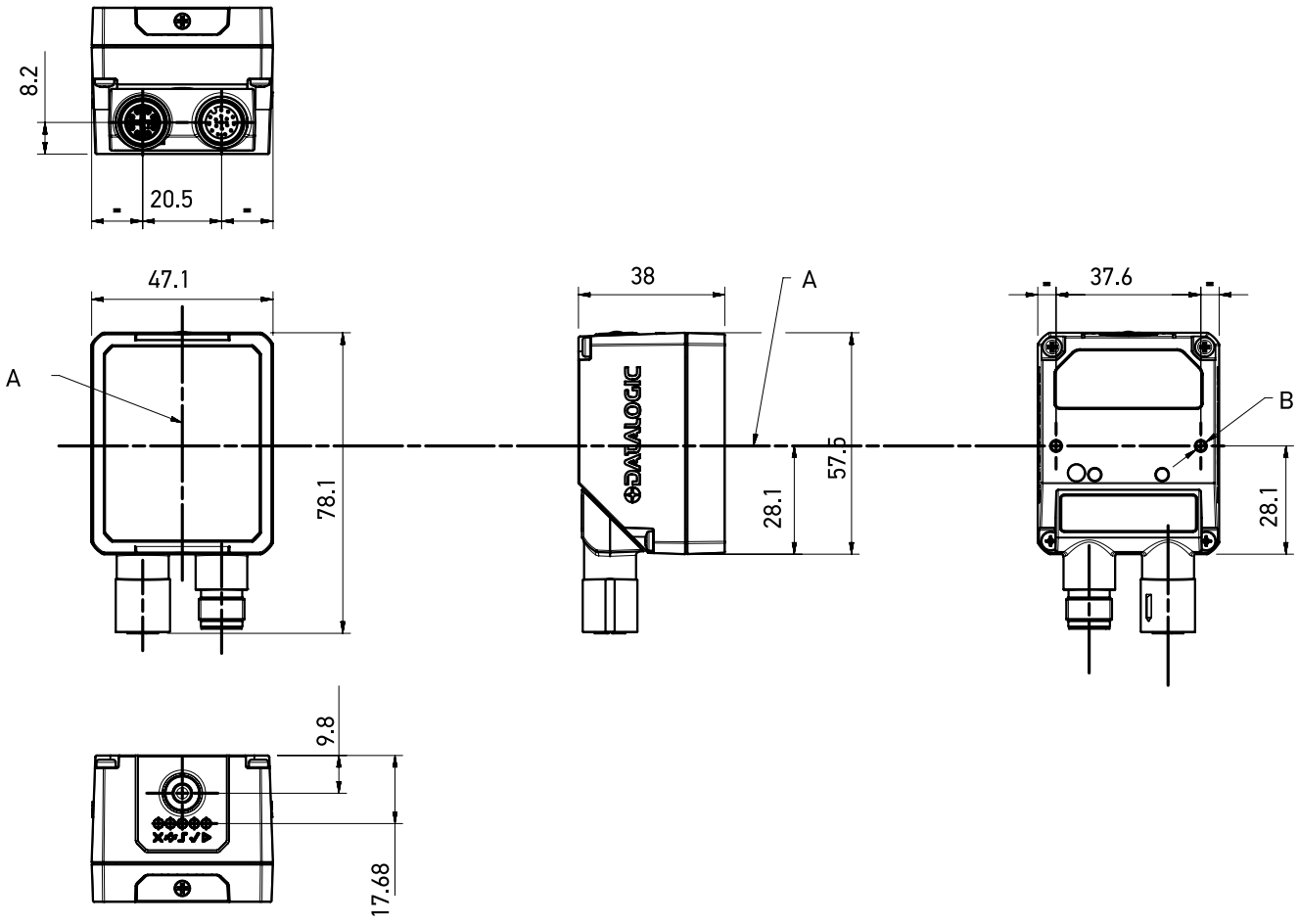
ITEM N.	DESCRIPTION
1	Illuminator with 4 powerful White LEDs with polaroid filter
2	7mm lens with automatic focus system
3	Aiming system with 2 powerful Red LEDs
4	Red Spot illuminator LED for NO GOOD detection object
5	Green Spot illuminator for GOOD detection object
6	2 holes for direct mounting or 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 • blinking: NO GOOD object teaching • in Run phase: NO GOOD object detected
	For future use
	Trigger • trigger received
	GOOD object • blinking: GOOD object teaching • in Run phase: GOOD object detected
	Run • 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.

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

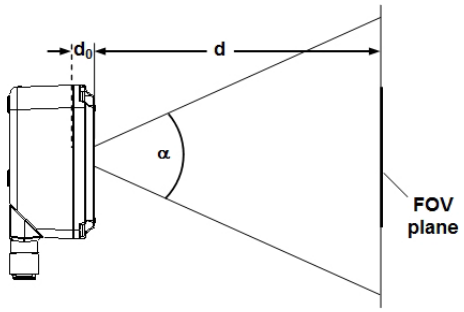
where:

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

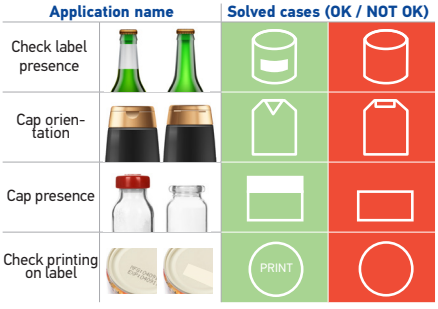
Smart-VS simply clever

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.

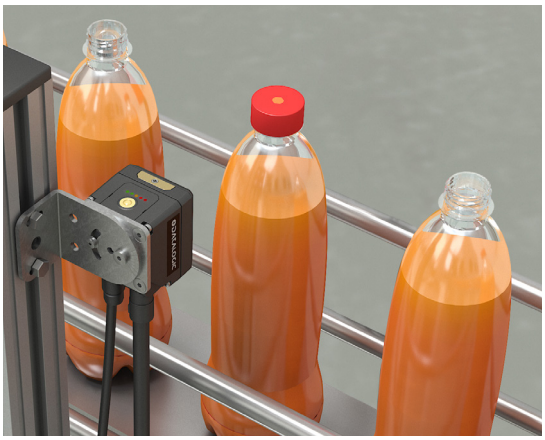
Liquid filling machines where it is necessary to detect the presence/absence of any type of closure on any type of bottle, vial, flask, jar of any material, whether glass, plastic or with light/dark colored shiny/mat surfaces. Just make the sensor teach and learn the OK/NG condition and it will work. 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

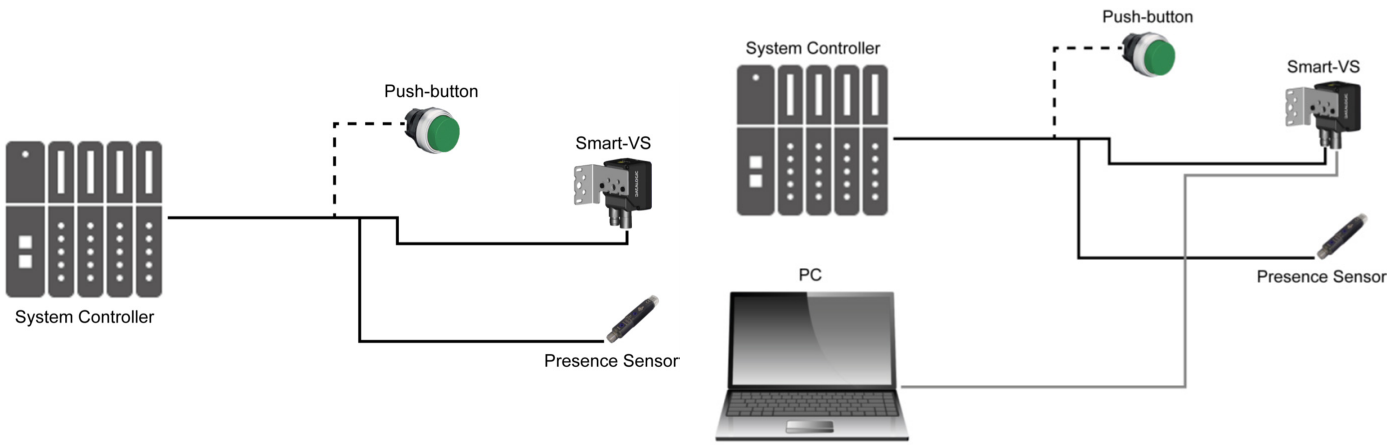


SMART-VS SETTING METHODS

Easy and Comprehensive system integration

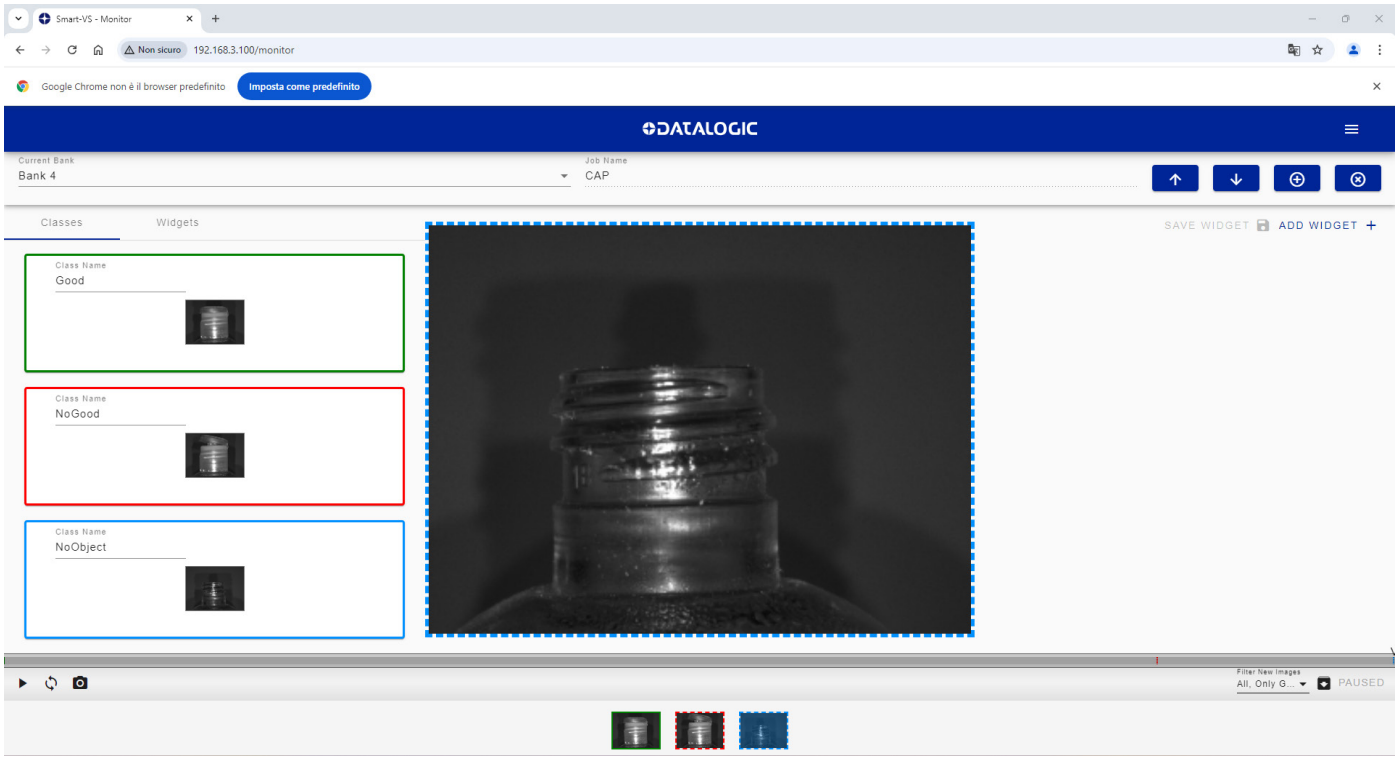
The Smart-VS is very easy and simple to integrate in any application, it can be implemented like a traditional sensor product, but it is much simpler than a smart camera or an ordinary smart sensor.

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.



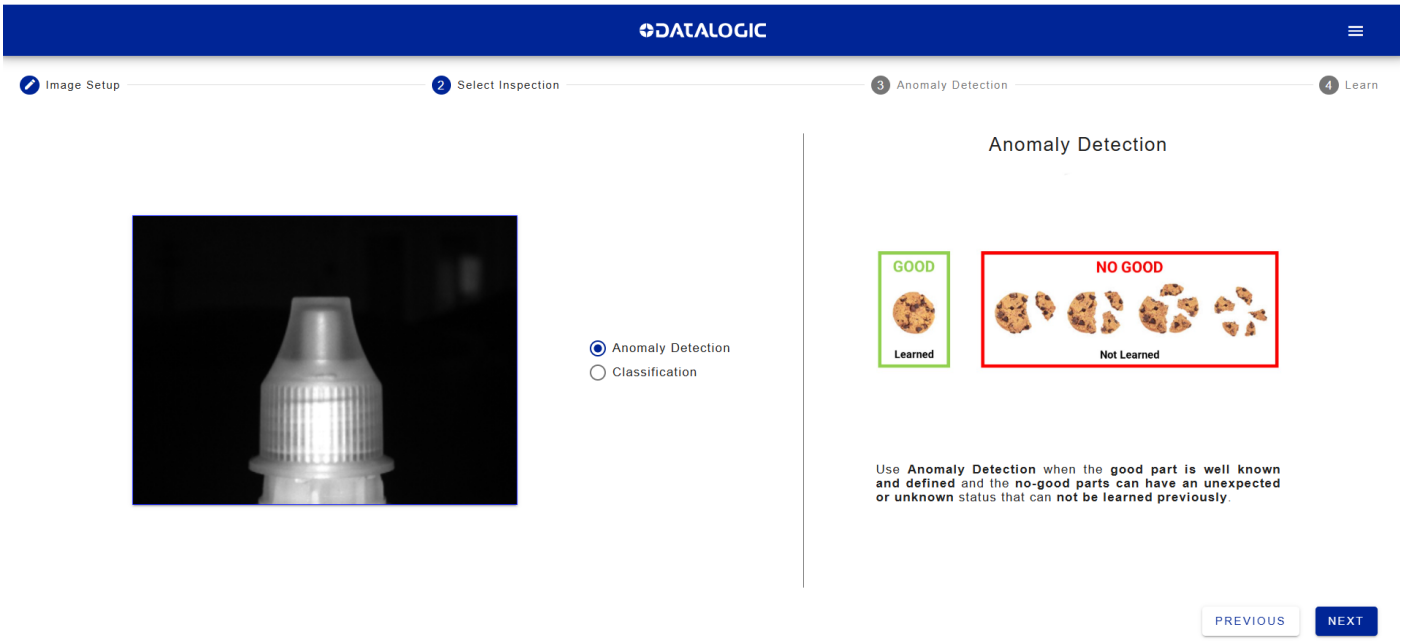
WEB INTERFACE

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



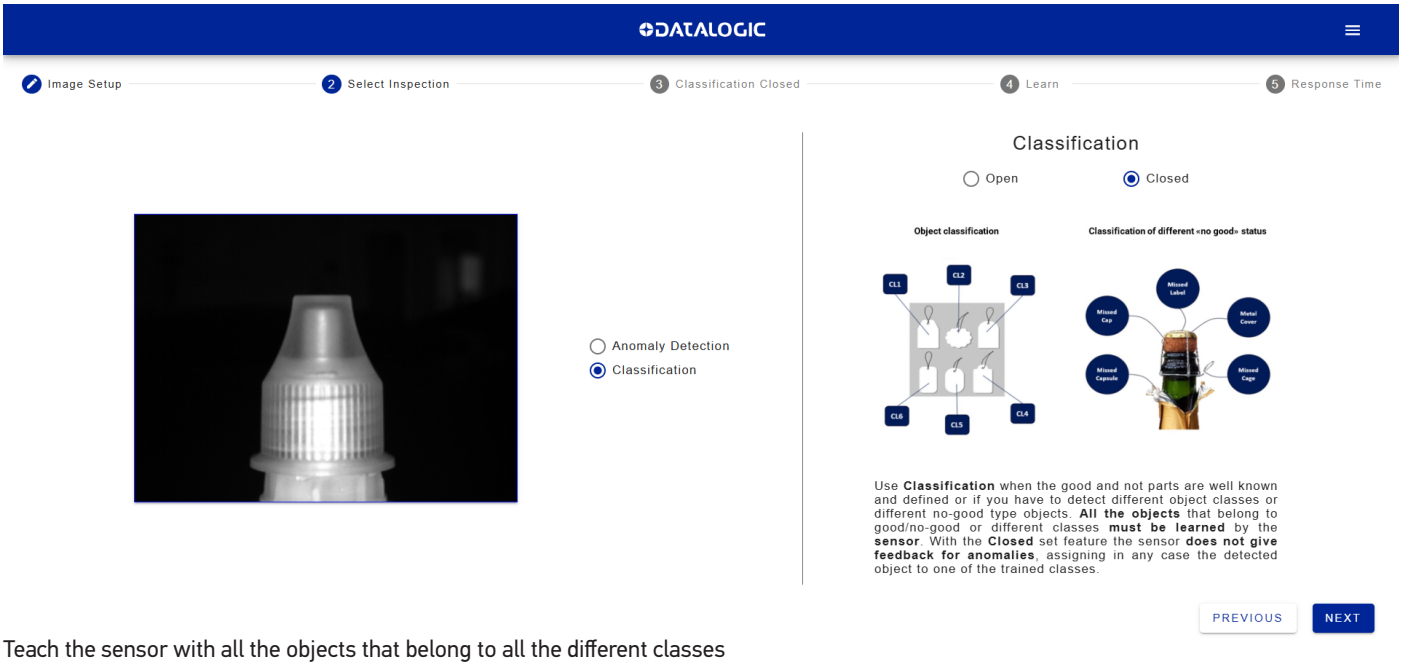
The Smart-VS is equipped with a WEB Server User interface for easy set-up and setting. This is an excellent tool when it is needed to setup and change different production configuration jobs depending on variable production format. The information are complete and shown in a clear layout.

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



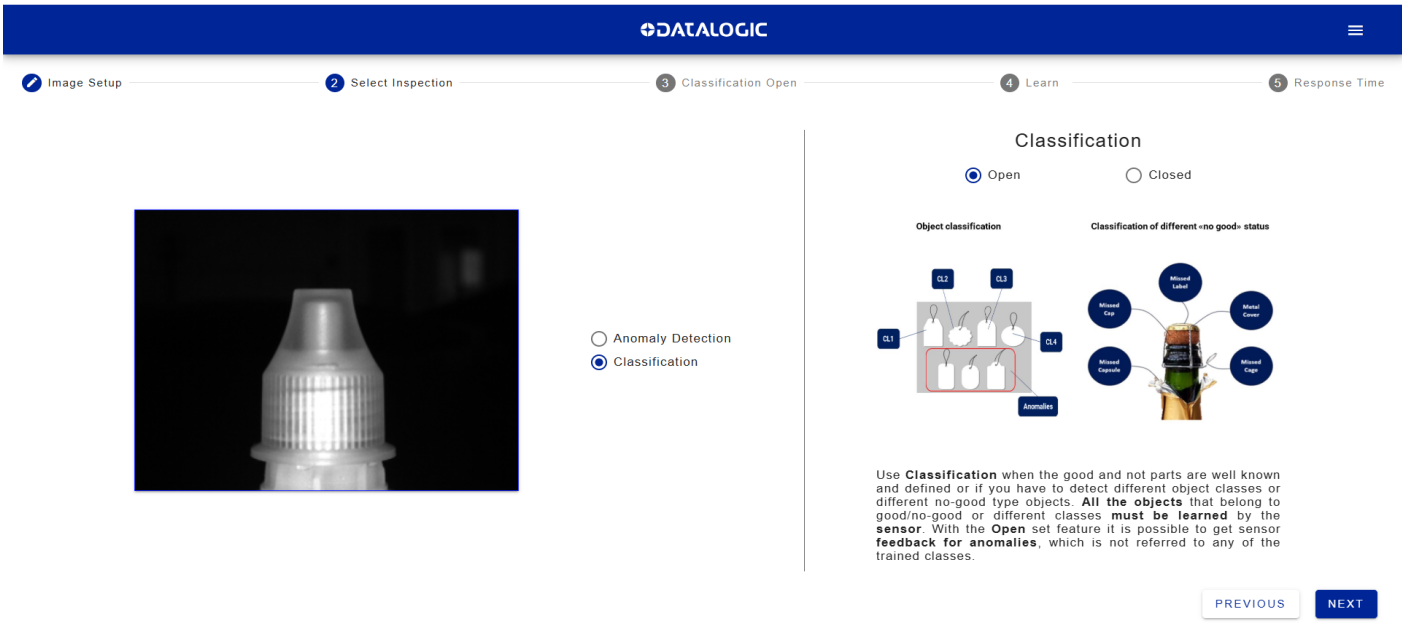
Teach the OK object to detect any type of anomaly that may be present in the object for quality or integrity issues (NG).

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