Technical Report – Vision sensors in washdown design with IP 69K rating

Noble, helpful and good: the vision sensor

You likely have seen this headline before – this statement is a matter of common knowledge. Vision-based object inspection is without doubt both "helpful and good". Living proof is the human eye perceiving around 80% of the ambient information. But "noble" vision sensors? We explain this concept below.

Cost-efficient visual inspection nearly always calls for an automated process which by itself requires profound experience and expertise. Vision sensors as easy-to-operate and all-in-one image processing systems are intended to overcome this entry barrier. From content and quality of 1D/2D codes to human-readable text, detecting positions, distance, object contours or presence checks – visible inspection can do a lot. Several, completely different characteristics can be evaluated by a single image. Hence, vision sensors provide universal capabilities and have gained significant popularity throughout many industries.
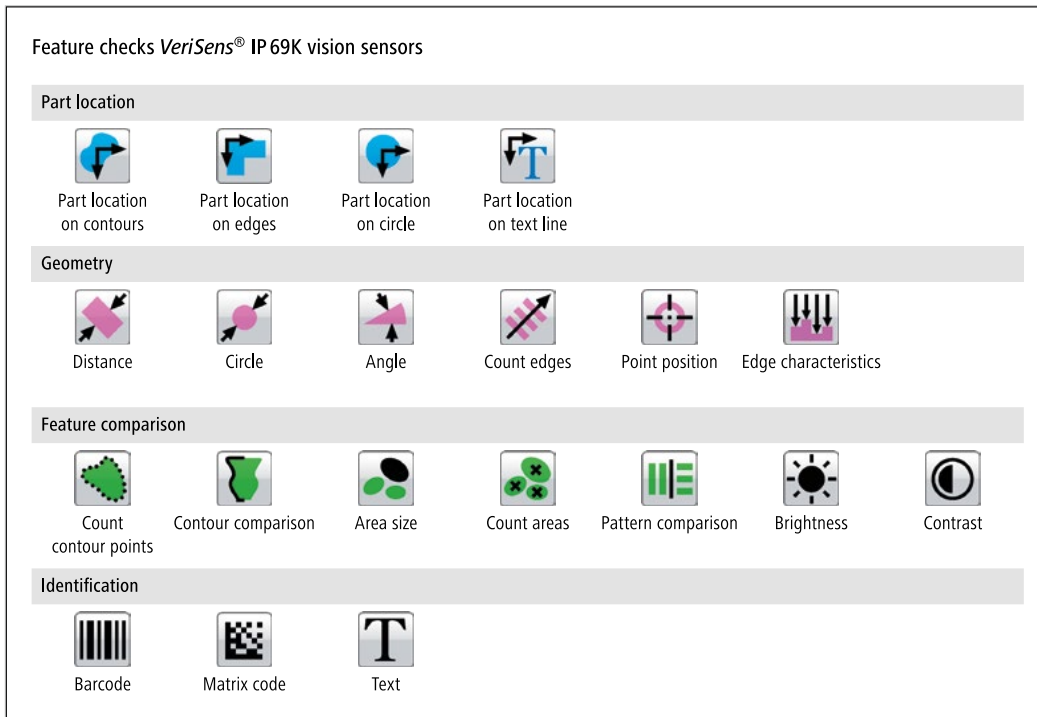
Sensitivity versus harsh ambient conditions

Universal in use, vision sensors are ideal for the pharmaceutical industry, in food processing and cosmetics. However, these industries pose demanding requirements by hygiene directives which must be observed. In so-called "sensitive areas", the vision sensor must be protected against the object which is to be detected – and vice-versa. Protec-


VeriSens® models of the XF series are the only vision sensors on the market in washdown design with IP 69K protection (stainless steel 1.4404, left with infrared and integrated daylight filter, right with white LED).

Feature checks *VeriSens®* IP 69K vision sensors

Part location

Part location on contours	Part location on edges	Part location on circle	Part location on text line

Geometry

Distance	Circle	Angle	Count edges	Point position	Edge characteristics

Feature comparison

Count contour points	Contour comparison	Area size	Count areas	Pattern comparison	Brightness	Contrast

Identification

Barcode	Matrix code	Text

20 different tools for up to 32 feature checks with every inspection task: device-specific tools can be tested free-of-charge by product simulation which can be accessed without prior software installation.

tion against the ingress of dust and water is of vital importance, even during short-term "endurance tests" when sensors are exposed to high-pressure cleaning with up to 80°C and 100 bar. Standard present-day protection ratings of cameras (IP 30) and vision sensors (IP 54 and higher) would not suffice in these cases, since they are not compliant to the prevailing hygiene requirements and sooner or later the product would fail in a cleaning cycle.

Design-related points of attack are susceptible to soiling which may contaminate the object to be inspected. Machine designs in the various industry sections come under numerous standards, guidelines and recommendations. For food processing equipment standard DIN EN 1672-2 separates the related areas into food section, splash zone and non-food section with particular restrictions. This separation is based on potential contact with
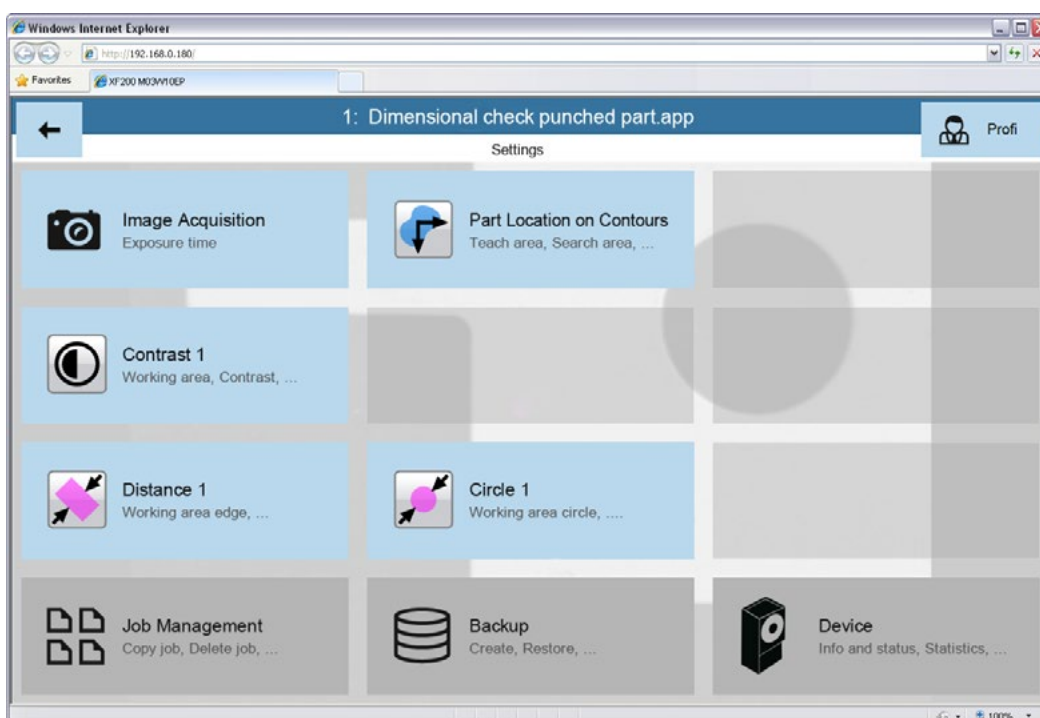
At all times, the configurable web interface provides a live view of the running process and allows any necessary adaptation to be directly made.

food and its possible return into the product main-stream. Manufacturers in food processing and machine engineering are legally obliged to comply with requirements of hygiene, cleaning and disinfection. Such hygiene design requirements include the sensors:

- smooth surface (Ra = 0,8 μm or better) without any dead spots
- materials resistant against agents of cleaning and disinfection
- fluids must be able to run off
- stainless steel 1.4404 (316L)
- minimum radius 3 mm

IP 69K vision sensors in a "noble" steel design

The "steam-cleaning resistant" IP 69K protection class is mandatory. In principle, there are two ways to comply: Either through the use of an additional protective housing, or, simpler and more convenient, using a vision sensor which is inherently washdown design compliant to the needed high IP rating. Baumer vision sensors are so designed. The new *VeriSens*® XF models are the only vision sensors on the market in IP 69K-rated design. Featuring both white and IR illumination, they are capable of checking up to 32 features simultaneously – including codes and text (OCR/OCV). They are therefore a convenient and easy solution for even complex applications in "sensitive areas".

VeriSens® vision sensors operate in any position and are contour based, meaning the products needn't be precisely positioned to obtain reliable results, even under demanding lighting conditions. A switch to other inspection tasks for a different batch is easily done by software. Visualization (and job modification) is by a configurable web interface which runs in the existing browser of the machine control system and allows for any necessary adaptation to be made directly in the running process. Thanks to user-friendly configuration software, the implementation of image-processing technology is easy and fast also to the novice.

Unlike additional protective housings, IP 69K-rated vision sensors ensure safe heat dissipation at low product volume. Additionally, focus alignment, indicators and connections remain easily accessible at all times. Now even industries with demanding hygiene requirements can benefit from the advantages of visual inspection. Product simulators for first customer evaluation are accessible without prior software installation within the Baumer configuration software "*VeriSens*® Application Suite" which is available for download free of charge on the Baumer website.

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