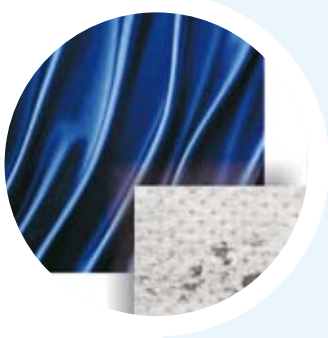


# SAC

Sirius Advanced Cybernetics GmbH



*VisionLine*



# Surface inspection system



## Sirius Advanced Cybernetics

For more than ten years, the name SAC stands for quality and innovation. We are your partner of choice for all tasks in the domain of machine vision. With our experience, we entirely place ourselves into service for our clients, so you can benefit from our know-how and services. We can offer turnkey solutions deriving one-stop from idea to commissioning.

Along with our partners, we develop individual solutions which are, thanks to the long lasting and thorough relations to our clients all over the world, constantly optimised in a process-oriented way. Therefore, we consequently enhance our continuous further development, and at the same time we ensure that our clients are equipped with the ideal solution at any time. We understand innovation as a challenge we like to meet, and thus we can take part in shaping technological progress.

In the range of surface and 3D inspection, we have acquired particular capacities due to our experience. But we also make the greatest demands on our system solutions: innovation and quality are always included in our service.

## Concept

VisionLine was developed by the SAC machine vision experts in order to meet the market requirements and to provide an innovative and modular structured system for the web inspection. All system components are unitised designed, from the optics, the hardware components up to the operating software.

## Modular design

Thus, the modularly structured system can be ideally adjusted to web widths and web speeds of different production lines in terms of mechanics and economics. We characterise webs as different materials such as plastics, metal, paper, cloth etc. The demands of these high quality materials require an efficient and 100% reliable web inspection of the surface.

## The system

VisionLine is used for detection and classification of surface defects. The cameras scan the product surface for homogeneity. If there is a local change of the surface, the system inspects for the presence of a surface defect. By classification and comparison with allowed tolerances, it will evaluate the defect and makes a decision about its nature.

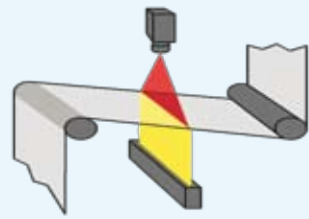
VisionLine is a system which is based on CCD line scan cameras and has been developed particularly for the inspection of fast running continuous material. Several line scan cameras can be assembled to a network. Thus, even material with ultra large line width can be inspected.

VisionLine goes beyond mere error detection since defects can be precisely classified. This means that errors can be traced back to their derivation in the production process. Particular attributes can be assigned to these defects and precisely indicated via a graphical display.

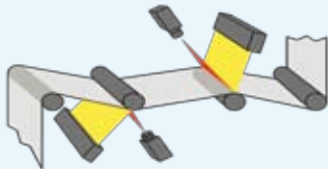


## VisionLine offers

- 100% continuous inspection of your product
- traceability at customer complaints
- error detection and classification for better production control
- optimal process control
- increasing yield



*Transmitted light illumination*



*Reflection*

## Illumination

At inspection of continuous strip material, a homogeneous illumination of the complete inspection width is essential. Depending on the application, one of the following lighting components is used with VisionLine:

- transmitted light illumination
- incident light illumination: flash controlled LED-illumination, high-frequency illumination or cold-light source
- side light: for certain kinds of errors a sideways illumination is used

## Cameras

The system itself allows the connection of line scan cameras with a resolution of 512 to 12288 pixels. The data can be read into the processing unit with a speed of up to 320MHz (pixel frequency). The maximum pixel frequency depends on the camera respectively hardware platform in use.

The VisionLine camera unit processes the incoming data with its full grey value range (256 grey values).



## Processing unit

The errors detected by the individual cameras are summarised in an error map by the processing unit. At this, the different views (transmitted/incident/side light) will be handled separately at first. Within the error map, errors will be summarised and potential multiple counts inhibited. As soon as the error map has been generated, the potential error will be classified. In addition, a coil protocol according to the criteria of the customer is compiled, which gives detailed particulars about web meter, type of defect and allows conclusions about the quality of the product.

## Frame

The cameras as well as the illumination are placed into a user-specific frame. The frames are delivered either as transmitted light version (O- or C-frame) or as reflection frame (two-part). As the requirements are different according to the process surroundings, an optimal fastening for the system components is designed for the respective project.



At this, the following marginal conditions are taken into account:

- Protection from dust and overheating (use of fans) as well as extraneous light.
- Easily replaceable components in case of a necessary service.
- Simple installation directly at the spot (modular design).
- Adjusting aid for camera and illumination, if necessary mounted directly to the frame.
- Vibration-free and secure fastening of the components.

## Fields of application



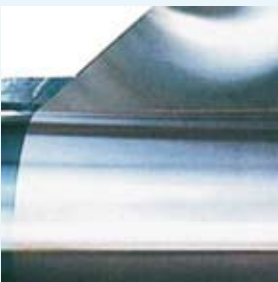
### Foil

Foil inspection can be realised for any web width, any production speed and any optical properties of the foil. The application of the system can be realised at any production and process step (extruding/winding/coating/laminating/pressing). Foil is checked for defects like spots, black dots, sockets, holes, friction streaks and dirt.



### Paper

Paper (fine paper inspection) can be inspected to ensure constant production quality. Newsprint is checked for errors like holes, dirt, impurities and ripped edges during the production process. VisionLine can also be used with calenders in order to inspect the glossy coating of the paper.



### Metal

Steel strips are checked for imprints, pinholes, reel marks, web width and web edge quality. Copper plates are inspected for holes, stains, scurf and discolourations.

Aluminium plates are checked for coating errors like dirt particles, scratches and voids, as well as for other surface defects. With VisionLine, defects as small as 200µm, can be detected.



### Textile/Non-woven

Interlinings and non-wovens are checked for thin places, stripes, formation or calender errors, tucks, holes and fuzziness. Textiles are inspected for flaw, i.e. missing threads or snarls. The system is usually applied at the outlet of the machine after solidification as well as during finishing. Furthermore inspection of strip width, centre positioning (alignment) and hole pattern is possible.



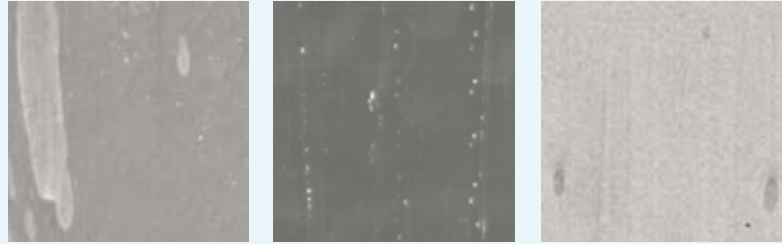
### Miscellaneous

The simple adaptability of the error detection to the production process allows its application to glass, laminate and veneer production, as well as with printed, textured and coloured materials and patterns.

Additional fields of application are optical surface inspection of glass, plastics, film, rubber, press work, and many more.

## Defect examples

Foil is reliably checked for errors like holes, spots, dirt, inclusions, sockets, friction streaks, crinkles, cords and flow lines. The inspection can be carried out on transparent, opaque or coated foil with a thickness of several millimetres.



The system detects and classifies defects like contaminations, holes, lumps, thin and dark spots, ripped edges, imperfections, crinkles and glossy coatings.



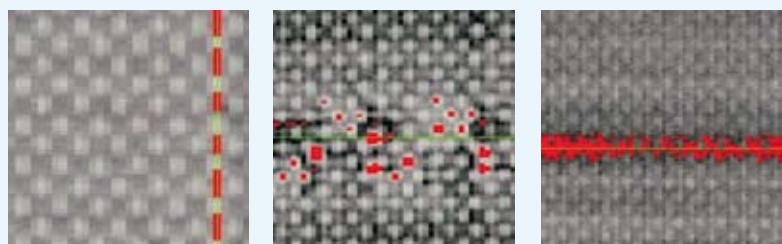
In the field of metal production, typical errors for rolling processes, i.e. imprints, cords, dents, slag remains and pinholes are detected and classified. Furthermore, errors resulting from several dynamic, chemical etching and coating processes are reliably detected.



During the production of cobweb, fleece made of styrol-/alpha-methylstyrol-, spunlace- or carding fleece, coating errors like thick and thin spots, holes, formation errors, fibre breakage and contaminations are reliably detected and classified.



The system can also be used for the inspection of woven and coated textiles. Any kind of flaws like broken threads, slings, wholes, thin spots, thick spots, formation errors and so forth, can be reliably detected.



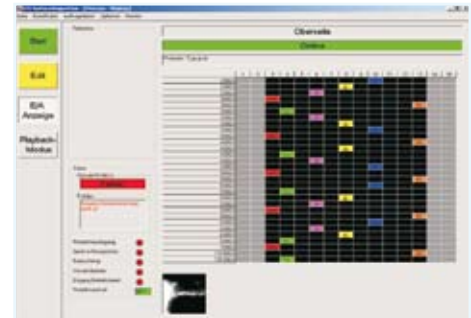
# Applications

## Detection of an error

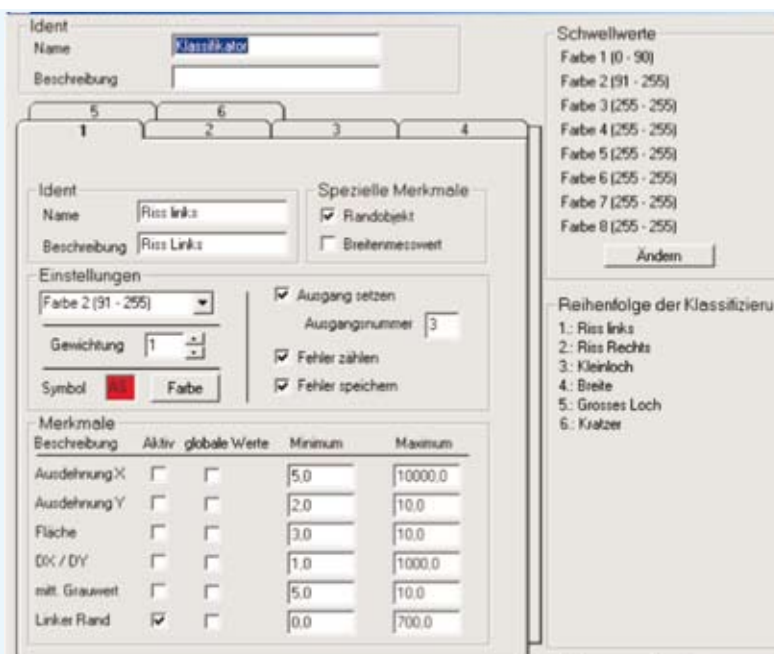
As soon as an object (imperfection) has been recognized on the material surface, its attributes (extension, position, area, dimensions, brightness, etc.) are calculated and provided in the error map.

## Classification

With these attributes the object runs through the classifier which can be adjusted according to the production needs. The classifier decides if the found object presents an error. The classifier allows the division into different error types. The user can choose how an error is to be evaluated (storage, emphasis).



Error map



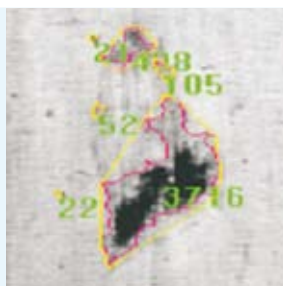
## Set-up mode

Within this mode, the user can set up the system. Functions like camera adjustment, classifier choice, calibration, choice of detection method, etc. can be adjusted here. All adjusted parameters are stored and used as production parameters during operation.

## Production mode

Within this mode the specific production parameters are called up and the system starts its operation. The SPS-interface connection to your machine is activated. VisionLine interprets the following signals by default: hide inspection, good/fail production, forward/reverse run, ready for operation, watchdog, product change, lighting active, signal in case of error (e.g. for marker control). For special applications with VisionLine, more user-specific I/O-signals will be provided.

In the production mode, the detected errors are presented by default as error map which can be configured according to the displayed errors. The errors will be shown as grey image. A trend chart of the errors in MD and CD (X-/Y-direction) will be generated. The display of the error data is linked to the inspection data. During the inspection, it is possible to pass the detected and classified errors on to a higher-ranking computer.



Defect image on playback mode

## Playback/report mode

Within this operation mode, the errors, detected and classified by VisionLine, are stored as full grey value image (256 grey values) with its attributes. This enables the user to view the errors in a playback mode and take appropriate counter measures. The attributes are filed in a standard format which can be imported. The error report is customer-specific worked out and the user can also generate his own report.

The control station is connected by TCP/IP and thus can directly communicate with your intranet. The inspection data can also be filed to a local data server. Other interfaces can be defined according to your needs.

## Project phases

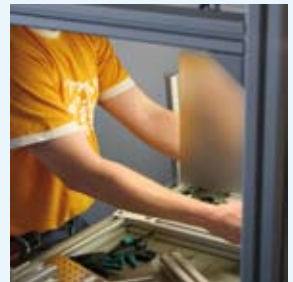
### Service

The service offered by our company range from consultation and preliminary inspection, across project planning and commissioning, up to a jointly acceptance and subsequently adaptations. During the whole process a highly qualified team of image processing experts is always at our customer's disposal.



### Consultation and preliminary inspection

In order to develop an image processing solution in close cooperation with our customers, an image processing solution which exactly complies with the particular demands, every new project starts with a detailed consultation and a preliminary inspection. This can be either carried out in our own laboratory, or on the spot at our customer's location.



### Catalogue of requirements

For every project we comply, together with our customers, a requirements specification for the respective application. Therefore, we ensure that the project satisfies all needs of our customers. The system will be dimensioned in economical and technical respect.



### Accompanying commissioning in the production process

After a successful test-phase, our staff will integrate the system into the production flow on the spot. The separate components will be integrated, calibrated and placed into operation. Our engineers make all necessary adjustments during the zero series to meet the demands of the catalogue of requirements.



### Acceptance

Before every successful project completion, the acceptance of the system occurs in compliance with the before acquired requirements specification. At the same time, for example code numbers like slip and pseudo rejections will be detected.



### Trainings

During our practically oriented trainings, our customers get an overview about our system's product-specific range of applications. According to the requirements, we convey basics of machine vision, product-specific adaptations, or the complete functionality of the system.





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