



Optical Measuring Systems

CAMERA CLUSTER SYSTEMS (CCS)

Width Gauges, Hole and Edge Crack Detectors

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DIFFERENT TASKS – ONE SOLUTION!

Our optical measuring systems are used **in many production lines** (from pickling, rolling and finishing lines to slitting and cut-to-length lines). There they measure strip width and detect centre and edge position.

They serve quality assurance so that you can prove the quality of your products to your customers. They also determine the mechanical and thermal necking deformation to enable appropriate intervention in the process parameters. When used before and after trimming shears, they guarantee optimal trimming results.

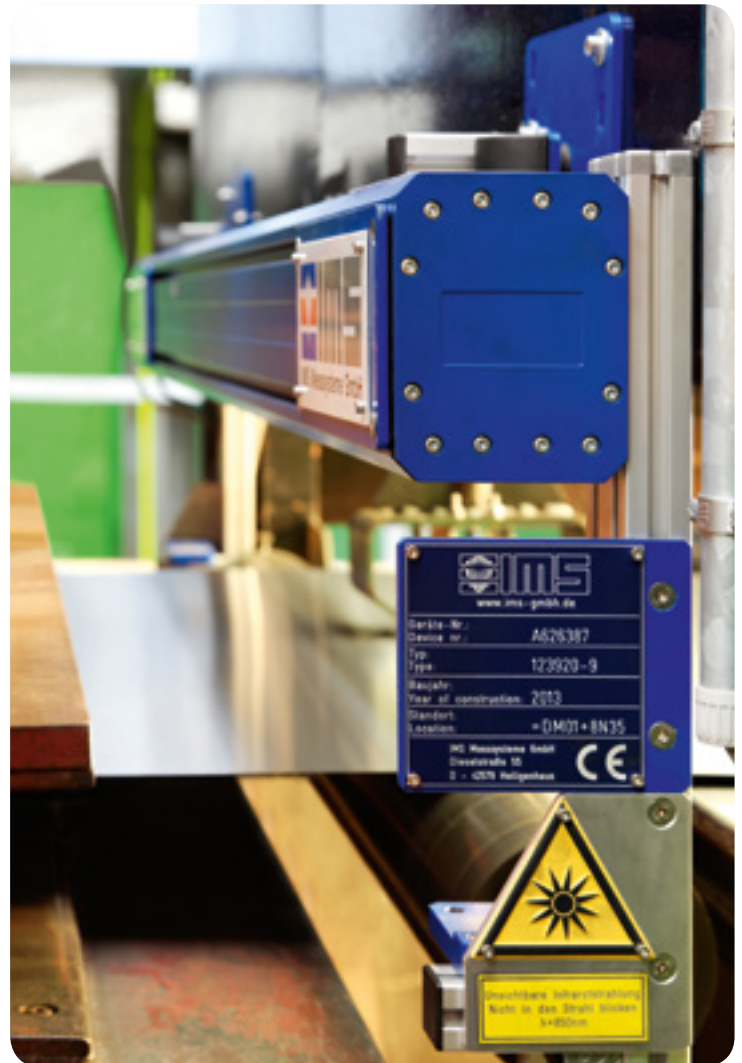
In rolling and processing lines they also detect side shift and strip edge position and pass this information on to the strip centering control systems.

The Deciding Pros!

With a software add-on, the system can be extended by an edge crack and/or hole detector. Information on defects is extremely important not only for quality assurance, but also to avoid broken strip.

The most common cause of broken strip is damage at the edges of the material. Holes in the strip, particularly in the area of the strip edges, also cause strip to break. Exact information on defects help to avoid strip breaks in mill stands and processing lines.

Data on the *location*, *size* and *shape* of the cracks and holes found is interesting for subsequent processes.



Our systems detect the *exact position* of the flaws along the length and across the width of the material and guarantee *full inspection of the strip*. The defects are classified by size. Optionally, a photo of every hole and edge crack can be saved in the MEVInet-Q quality data management system.



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Modular, Light, Compact – 60% Smaller than Our Previous Systems

The space available in your production lines for measuring equipment is often limited. The system should therefore be *easy to install*, regardless of whether the strip is running horizontally or vertically. Later calibration monitoring of measuring equipment must be easy to perform.

A gauge basically consists of two components – a camera unit beam and a backlight unit beam. Thanks to *modular construction*, it is trouble-free possible to covering every strip width.

Another deciding pro:

The measuring beams can be fastened to existing parts of the line or on a fixed O-frame or mobile C-frame (with and without drive). The distance to the strip is independent of the strip width and can be implemented according to your requirements.

Long Service Life, Highest Precision in Adverse Conditions

The LED technology used in the backlight unit beams guarantees operation of the measuring systems over years without replacement of components. Optical filters *eliminate the influences of extraneous light almost completely*.

Camera Cluster Systems use the *stereoscopic effect* to compensate changes in strip position – measurement errors due to vertical changes in strip position, slopes or edge shape are minimised.

The measuring system is equipped with an *automatic dirt detection system* that warns your operating personnel in good time before measuring errors occur. The intelligent backlight is equipped with an Ethernet interface; physical LED ageing processes are compensated. An air wipe system is deployed in difficult ambient conditions such as those found in rolling lines.

Traversing Cameras Were Yesterday

You resent the higher investment costs and regular maintenance work that come with traversing cameras?

NOT WITH US! We do *not use any moving parts* in the transmitter and receiver beams of our Camera Cluster Systems.

Thanks to the innovative camera cluster technology, 50 cameras are used per 1000 mm inspection length to perform the measuring tasks. Every change in width is detected immediately. In contrast to mobile camera systems, incorrect target strip width specifications do NOT result in false measurements with Camera Cluster Systems.

The strip width is measured *fully and continuously* in the case of strip width changes (e.g. continuous lines).



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IMPORTANT DECISION CRITERIA:

Conventional Multi-Camera Systems Have Many Disadvantages:

- Very costly
- High computing power for data processing
- High amount of cabling
- High space requirement above the strip
- Standard solutions difficult to implement

The Solution: Camera Cluster Systems from IMS

Our Camera Cluster Systems use mini cameras known from many everyday applications such as rear view cameras in the automotive industry. Due to mass production, they are so cheap nowadays that they can also be used economically in measuring systems.

High-performance FPGAs see to fast embedded image processing. Computers with high computing power are not needed.

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- ✓ Measurement of strip width, detection of middle and edge position
 - ✓ Safeguarding the quality of your products. Proof of your product quality for your customers
 - ✓ Determination of necking deformation
 - ✓ Optimal trimming cut through use before and after the trimming shears
 - ✓ Transfer of centre position and edge position to the centreline control systems
 - ✓ Reduction in edge cracks and improvement in quality through detection of edge cracks and holes
 - ✓ Installation in the smallest of spaces (horizontal and vertical installation position possible)
 - ✓ Long service life and highest precision

The distance to the strip can be dimensioned customer-specifically and is not dependent on the strip width.





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Your Challenges:

- High investment costs due to use of conventional camera systems
- High maintenance costs due to traversing camera systems
- Measuring errors due to vertical strip position changes, slopes or edge shape
- Measuring errors due to extraneous light influences
- Failure of measuring equipment due to dirt
- High maintenance costs from use of fluorescent lamps
- Physical ageing processes of light sources
- High space requirement above the strip for conventional camera systems
- Unsatisfactory width accuracy
- Unsatisfactory detectability of holes and edge cracks

Our Solution for You:

- ✓ Camera Cluster Systems use hundreds of mini cameras that can be deployed in measuring systems economically
- ✓ Stationary Camera Cluster Systems require no maintenance
- ✓ Camera Cluster Systems use the stereoscopic effect to compensate changes in strip position
- ✓ Optical filters eliminate the influences of extraneous light almost completely
- ✓ Automatic dirt detection and warning
Air wipe systems are implemented at locations where there is a high risk of soiling
- ✓ High lifetime of the LED modules
- ✓ Intelligent light source with light intensity control
- ✓ High number of cameras enables small strip spacing
- ✓ Very high resolution
Fifty cameras are used per metre inspection length
- ✓ High sampling rates by embedded FPGA image processing
Using small visual ranges per camera, the inspection area is close to the optical axis



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Performance Data of the Width Measuring Systems

Measuring accuracy	from $\pm 0,1$ mm (2σ) ^{*)}
Sampling rate	to 28 kHz
Max. permissible strip height fluctuations	max. ± 3 % of distance between the material and camera unit
Distance between material and camera unit	350 mm or 800 mm (standard) other distances possible on request
Distance between material and backlight:	150 mm or 300 mm (standard) other distances possible on request
Strip width	not limited
Strip thickness	not limited
Strip speed	not limited

^{*)} The measuring accuracy depends on the distance between the material and camera unit.

The above specifications are valid at a maximum distance of up to 400 mm between the material and camera unit.



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Performance Data of the Hole and Edge Crack Detectors

Size of hole/edge crack	from $\geq 0,2 \text{ mm} \times 0,2 \text{ mm}$ (hole size) ^{*)} from $\geq 1 \text{ mm} \times 1 \text{ mm}$ (edge crack)
Sampling rate	to 28 kHz
Max. permissible strip height fluctuations	max. $\pm 3 \%$ of distance between the material and camera unit
Distance between material and camera unit	350 mm or 800 mm (standard) other distances possible on request
Distance between material and backlight	150 mm or 300 mm (standard) other distances possible on request
Strip width	not limited
Strip thickness	not limited
Strip speed	not limited

^{*)}The detectable hole size depends on the thickness and speed of the material. Exact details are specified on a system basis.