



Optical Measuring Systems

# CAMERA CLUSTER SYSTEMS (CCS)

Flatness Measurement

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## FLATNESS DEFECTS? – NO THANKS!

The demands on the quality of your products are growing all the time. Strip shape is a key property for the quality of flat products in the metal industry.

Flatness has a big influence on strip shape. Flatness defects, which usually arise during rolling, already lead to considerable production and quality problems in your mill stands, but also later in downstream processing lines. This can result in damage to equipment, difficulties in strip guidance or broken strip, among others.



### Avoid the Consequences!

- In slitting and cut-to-length lines, flatness defects have an influence on cutting, making it impossible to achieve the required accuracies for width, length or perpendicularity.
- Flatness defects can cause damage to tools during further processing of coils in presses or stamping machines.
- Exact forming is not possible in profiling lines.
- In finishing lines, the flatness defects influence the homogeneity of the coating.

Strip flatness is an important quality feature and has a decisive influence on productivity and scrap rates in almost all production processes.

Due to the high purchase costs of conventional flatness measuring systems to date their use was mostly restricted to rolling mills. Not any longer!

### We Have Thought Further

Our CCS flatness measuring system was specially developed for use in further processing and finishing lines following the rolling line. It is used worldwide in galvanising, tinning, pickling, slitting and annealing lines, cut-to-length lines and stretcher-levellers in cold rolling mills and service centres – indeed wherever you need to determine flatness and the material is subject to low strip tension.



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## More than “Just” Measured Data

Our CCS flatness measuring system

- displays the data of the online measurement to the user at the control pulpit.
- can be integrated in flatness control systems.
- enables connection to our MEVInet-Q quality data management system for long-term storage of the measurement, production and process data. The measured data can therefore be checked and the processes analysed later at any time.

## Modular, Light, Compact – Installation in the Smallest of Spaces

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.

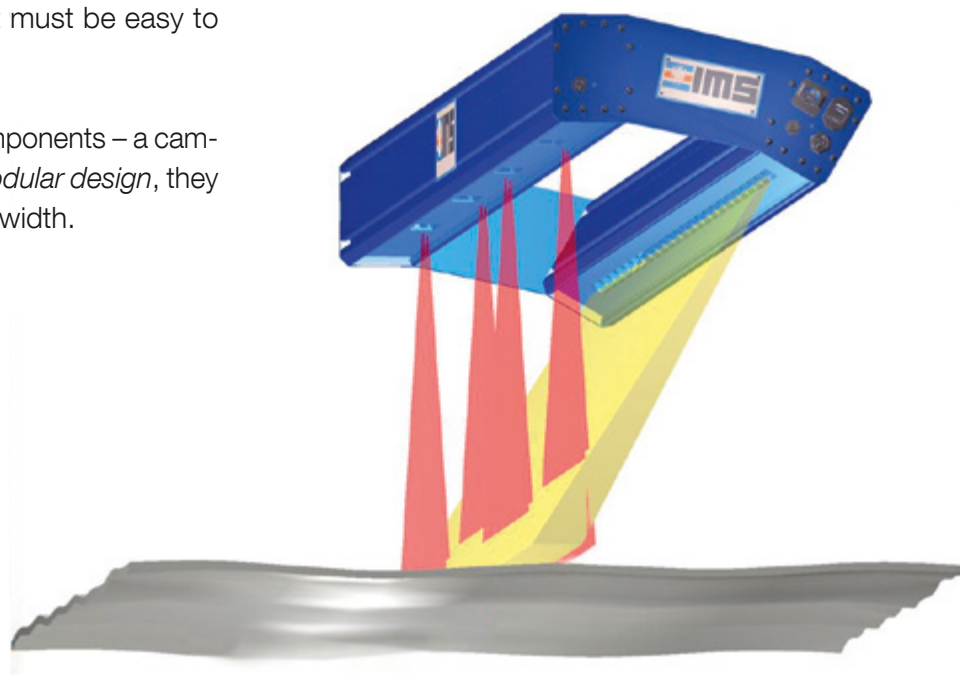
A gauge basically consists of two components – a camera unit and a laser unit. Thanks to *modular design*, they can be adapted easily to every strip width.

## Other Decisive Advantages:

The measurement beams can be fastened to existing parts of the line or to a fixed O-frame. Both installation and commissioning of the measuring system are very simple even in confined spaces.

## Long Service Life and Top Precision

The lasers developed for our measuring technique and used in the transmitter are operated at a constant ambient temperature. In this way we achieve not only the *highest precision* in measurement, but also a *very long component service life*. In addition to this, the physical ageing processes of the lasers are compensated automatically. The system design guarantees operation of the measuring systems over years without replacement of components.





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## The Solution: Camera Cluster Systems from IMS

Our camera cluster system CCS-Flatness is based on the measuring principle of laser triangulation. Multiple pairs of lasers – their number is dependent on the maximum strip width – project two parallel laser lines on to the material. Matrix cameras in the camera unit detect the laser lines on the material surface synchronously. Fifty matrix cameras are used per 1,000 mm inspection length.

Two hundred measuring zones per metre strip width and a high sampling and image processing rate up to 1 kHz guarantee *high-resolution measurement*.

You do not believe that CCS-Flatness can be used on reflective surfaces?

## WE WILL PROVE THE OPPOSITE!

Thanks to our compact design, it is possible to implement *small opening angles* for the lasers. Our unique camera cluster technology allows evaluation of very small parts of the laser lines.

These system properties mean that both matt and high-gloss surfaces can be inspected.

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- ✓ **High-precision measurement of flatness and levelness**
  - ✓ **Can be used for a variety of material surfaces (from matt to shiny)**
  - ✓ **High resolution in strip cross direction, regardless of the strip width**
  - ✓ **High sampling rates, suitable for high-speed production lines**
  - ✓ **Measurement insensitive to vertical strip roaming and vibration**
  - ✓ **Installation in confined spaces (horizontal and vertical mounting possible)**
  - ✓ **Interfaces to flatness control systems**

Our arrangement of the laser lines ensures that flatness defects with very short wavelengths can also be detected. We have also managed to eliminate almost any influence on the measurement result by vertical strip roaming and vibration.





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## Your Challenges:

- High investment costs due to use of conventional camera systems
- Incorrect measurements on high-gloss materials and various surfaces
- Measurement errors due to extraneous light influences
- High consequential costs due to replacement of lasers
- Physical ageing processes of the lasers
- Restricted space particularly in existing production lines
- Inadequate sampling rates, poor resolution

## Our Solution for You:

- Camera Cluster Systems use hundreds of mini cameras that can be deployed in measuring systems economically
- Small opening angle of the lasers  
Individually parameterisable sensors  
Small field of vision of the cameras
- Optical filters eliminate the influences of extraneous light almost completely
- Temperature control increases the lifetime of the lasers
- Automatic compensation during image processing
- Very compact and light construction enables simple integration in existing production lines
- High sampling rates by embedded FPGA image processing  
Use of mini cameras spaced at distances of 20 mm



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## Performance Data of the Optical Flatness Measuring System

Height accuracy	better than $\pm 0,1$ mm ( $2\sigma$ )
Sampling rate	to 1 kHz (dependent on the material surface)
Resolution in strip cross direction	200 measurement zones per metre (5 mm raster)
Max. permissible strip height variations	100 mm
Distance between material and gauge	approx. 350 mm
Strip width	not limited
Strip thickness	not limited
Speed	not limited
Laser safety class	2M