Defect Inspection System for Plain Surfaces

The Mujiken+ is essential for ferrous and nonferrous metal production

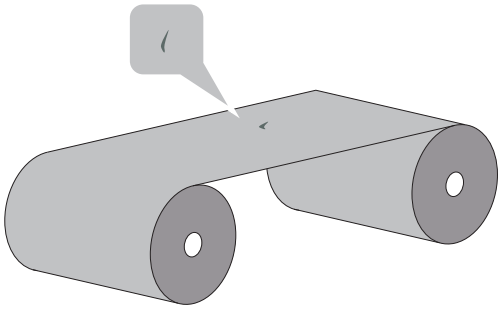
Metals are all around us!
The Mujiken+ is an inspection device that checks metal surfaces during the manufacturing process.

Applications with ordinary steels and special metals

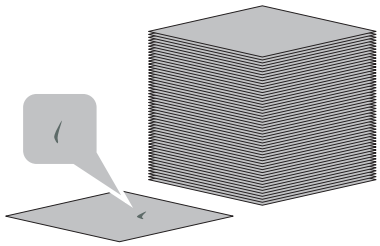
Energy
- Solar cells
- Fuel cells
- Rechargeable batteries
- Copper foil / aluminum foil

Semiconductors and electronic components
- MLCC
- Memory discs
- Leadframes

Other applications
- Steel plate
- Power lines
- Electrical and electronic components



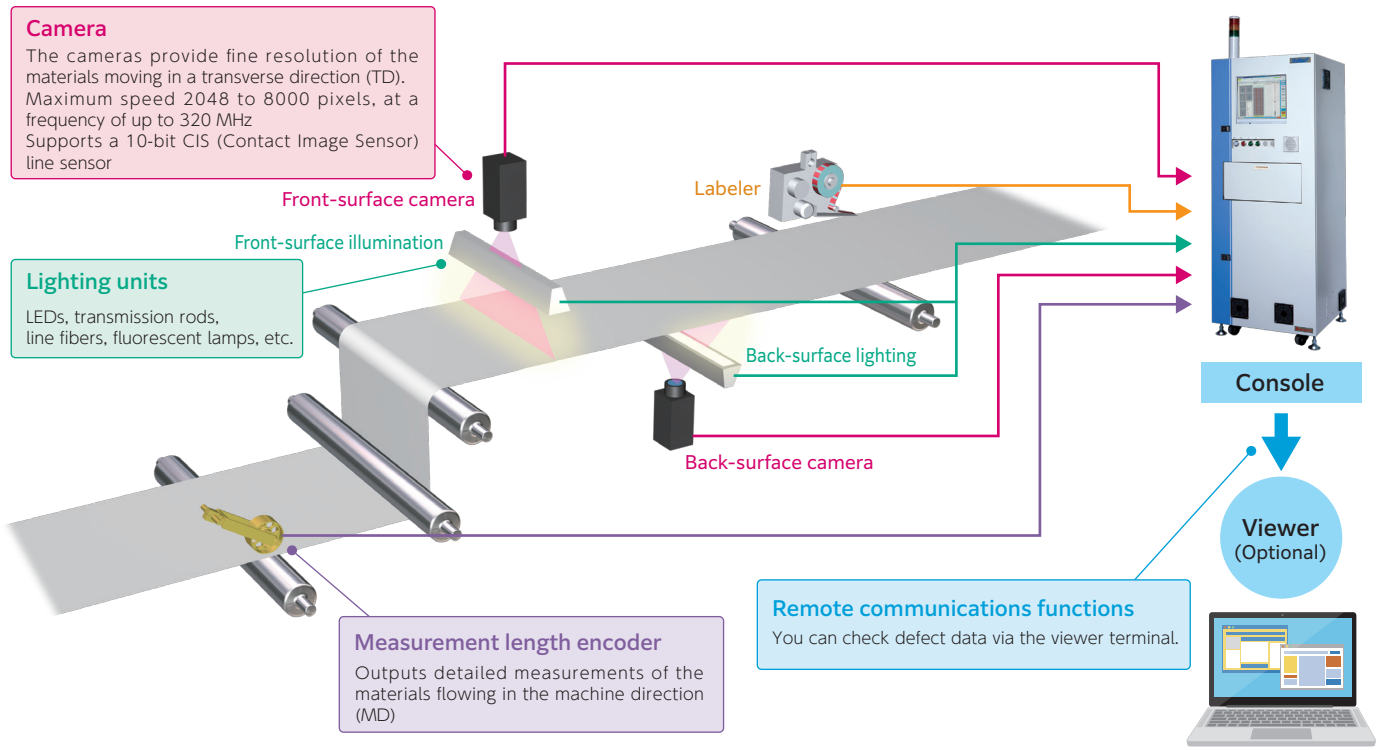
A defect between rolls



A defect on a sheet

Since the substrates classified here as "ordinary steels and special metals" are metals that gain extremely high added values from their performance and characteristics, any defects or pin holes on their surface will harm these properties and performance and lead to considerable economic losses.
During the manufacturing process of these ordinary steels and special metals, **Nireco's Mujiken+ defect inspection system** can closely check their entire surface for defects and manage the results.

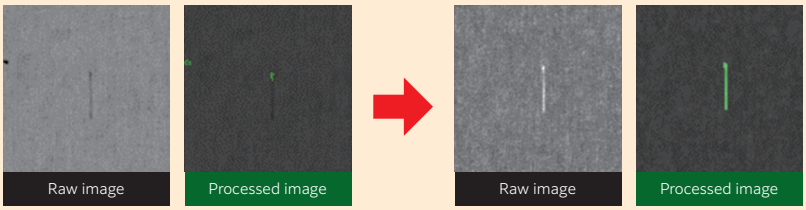
Example of system configuration and measurement functions



Examples of images of detected defects

Mujiken+ can detect minor defects, using the latest optics and advanced image processing

Examples of minor blemishes detected on steel plate using oblique Illumination

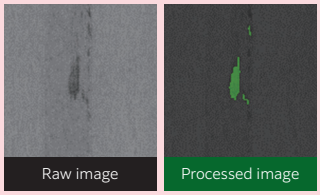


Ordinary reflection detection (the detection level is low)

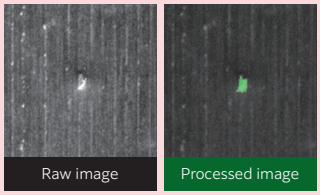
Oblique reflection detection (the detection level is high)

Examples of the defects that Mujiken+ can detect

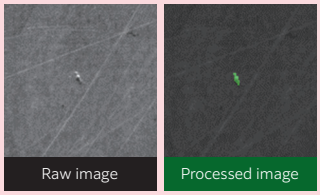
● Scratches and wrinkles (scratches, linear scratches, dimples) ● Unevenness (dents, raised protrusions) ● Dirt (oily stains, foreign bodies), etc.



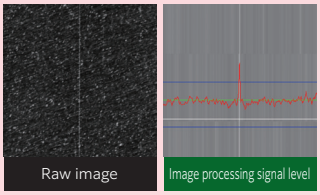
Dirt on steel plate (regular reflection)



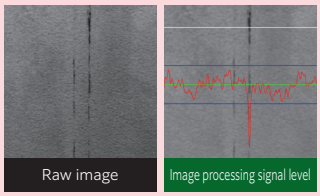
Dent in copper plate (diffuse reflection)



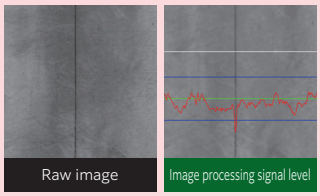
Raised protrusion in copper plate (diffuse reflection)



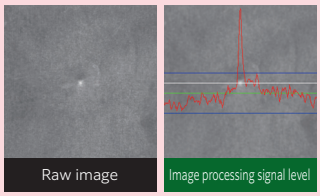
Linear scratch



Linear scratches



Scratches



Dimples

● Examples of materials that Mujiken+ inspects
Prepainted (color) steel sheet, SGLCC, SPCC, aluminum sheet, galvanized steel sheet, copper plate, SUS, etc.

● Examples of production lines where the Mujiken+ is installed
Inspection device lines, shearing lines, slitter lines, annealing lines, pickling lines

Basic specifications

No. of cameras	Max. 128
Input systems	Max. 8
Sensors	Monochrome sensors: 160 MHz, 320 MHz, 640 MHz Color sensors: 80 MHz (common), 160 MHz
Pixels	2048, 4096, 8192, 16384
Image processing	Gradation conversion, edge enhancement, labeling, isolated point removal, density accumulation, density histograms, real-time spatial filter (for emphasis, differential, smoothing, etc.)
Scanning	Automatic correction to maintain the image density at a constant level (AGLC) Shading compensation (offset, automatic tracking correction) Binary detection, multi-level detection Color detection (RGB luminance method, IHP vector method)
Data processing	Defect image display, defect image files Defect map (specified range, entire span) Defect data list output (CSV) Defect image discrimination function (viewer function option) Measurement parameters (area, width, length, density, etc.) Identification of defect cycles, judgment of defect groupings
Defect detection	Foreign bodies (dots, streaks and bubbles) Scratches (continuous, discontinuous) Color changes (localized, wide-area) Stains (monochrome, pale spots), etc.

Operating unit main processor	Pixel scanning function	Real-time display of scanning conditions Map display, inspection data display Overall control, instructions for starting/stopping inspection, etc.
	External memory	DVD, HDD, etc.
	OS	Windows 7 Embedded 64-bit
Cameras	Signal system	Digital line sensor
	Ultra high-speed type (Monochrome)	8192 pixels 640 MHz (Max. 10-bit) 8192 pixels 320 MHz (10-bit, Max. 12-bit) 8192 pixels 160 MHz (10-bit, Max. 12-bit) 4096 pixels 320 MHz (10-bit, Max. 12-bit) 4096 pixels 160MHz (10-bit, Max. 12-bit)
	CIS cameras	600 dpi 300 dpi
	3-line color cameras	4096 pixels 160 MHz (8-bit) 4096 pixels 80 MHz (8-bit) 8192 pixels 160 MHz (8-bit) 8192 pixels 80 MHz (8-bit)
	Signal cable length	Up to 15 m (standard) Up to 100 m (using an optical link)
	External interfaces	Marking output, cutter signal input, alarm output, keyboard, mouse, touch-screen panel, barcode input
	Operating tools	Keyboard, mouse, touch-screen panel, real-time spatial filter (for emphasis, differential, smoothing, etc.)

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