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

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.

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**Applications with ordinary steels and special metals**

- **Energy**
  - Solar cells
  - Fuel cells
  - Rechargeable batteries
- **Semiconductors and electronic components**
  - Copper foil / aluminum foil
- **Other applications**
  - MLCC
  - Memory discs
  - Leadframes
  - Steel plate
  - Power lines
  - Electrical and electronic components

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**Example of system configuration and measurement functions**

- **Camera**
  - The cameras provide fine resolution of the materials moving in a transverse direction (TD).
  - Maximum speed 2048 to 8000 pixels, at a frequency of up to 320 MHz.
  - Supports a 10-bit CIS (Contact Image Sensor) line sensor.

- **Lighting units**
  - LEDs, transmission rods, line fibers, fluorescent lamps, etc.

- **Measurement length encoder**
  - Outputs detailed measurements of the materials flowing in the machine direction (MD).

- **Remote communications functions**
  - You can check defect data via the viewer terminal.

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A defect between rolls

A defect on a sheet
Examples of images of detected defects

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

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.

Basic specifications

<table>
<thead>
<tr>
<th>No. of cameras</th>
<th>Max. 128</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input systems</td>
<td>Max. 8</td>
</tr>
<tr>
<td>Sensors</td>
<td>Monochrome: 160 MHz, 320 MHz, 640 MHz, 160 MHz Color: 80 MHz (common), 160 MHz</td>
</tr>
<tr>
<td>Pixels</td>
<td>2048, 4096, 8192, 16384</td>
</tr>
<tr>
<td>Image processing</td>
<td>Gradation conversion, edge enhancement, labeling, isolated point removal, density accumulation, density histograms, real-time spatial filter (for emphasis, differential, smoothing, etc.)</td>
</tr>
<tr>
<td>Scanning</td>
<td>Automatic correction to maintain the image density at a constant level (AGLC) Shading compensation (off-set, automatic tracking correction) Binary detection, multi-level detection Color detection (RGB luminance method, IHP vector method)</td>
</tr>
<tr>
<td>Data processing</td>
<td>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</td>
</tr>
<tr>
<td>Defect detection</td>
<td>Foreign bodies (dots, streaks and bubbles) Scratches (continuous, discontinuous) Color changes (localized, wide-area) Stains (monochrome, pale spots), etc.</td>
</tr>
</tbody>
</table>

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

Camera
- 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 160 MHz (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)

Operating tools
- Keyboard, mouse, touch-screen panel, real-time spatial filter (for emphasis, differential, smoothing, etc.)

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