



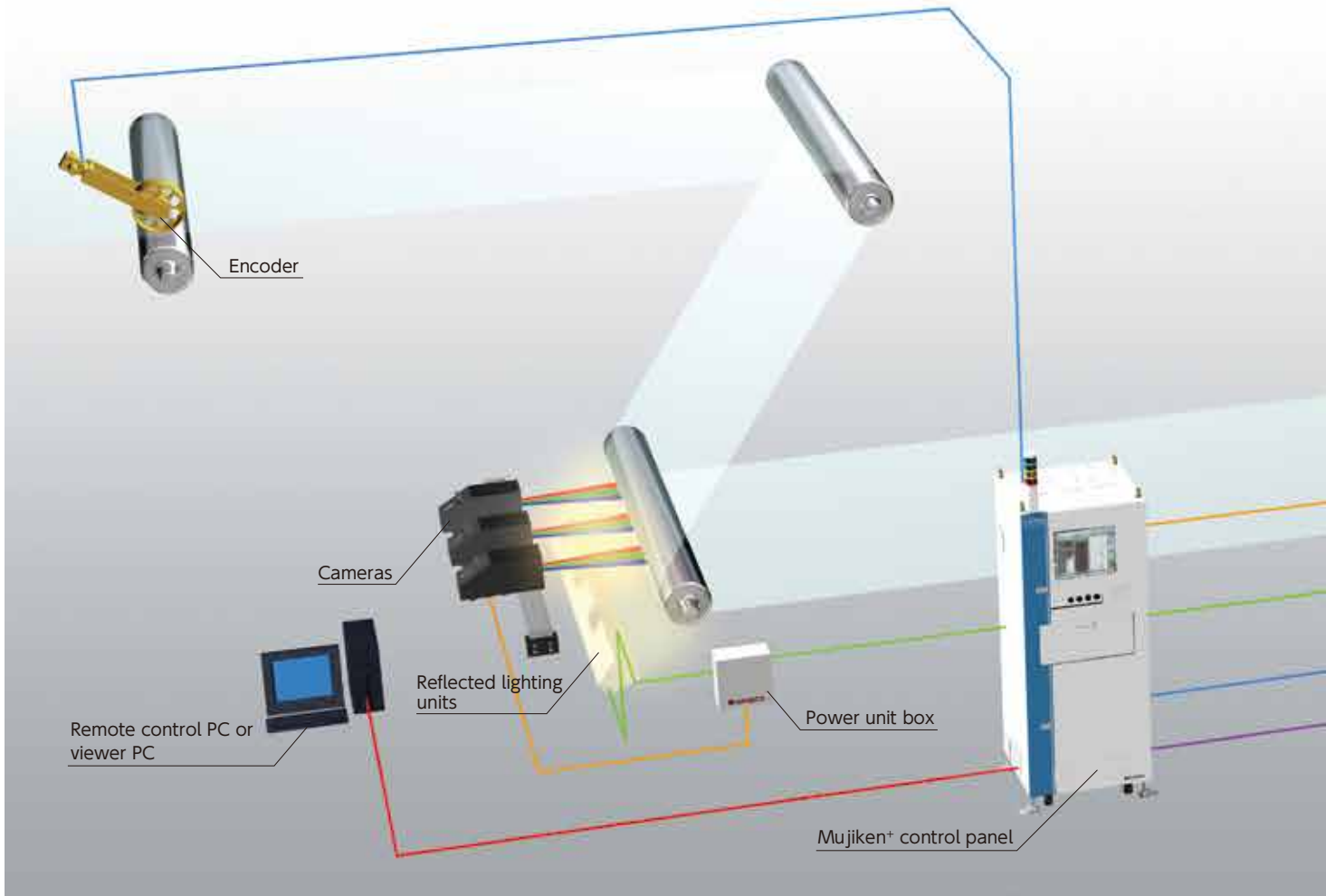
Mujiken⁺_{PLUS}

Defect Inspection System for Plain Surfaces

It won't miss defects, even on a high-speed line.



Mujiken⁺: the pinnacle of high-performance



Mujiken⁺ features

Image processing (even faster image-processing functions and a full range of algorithms)

- System hardware includes Nireco's proprietary high-speed image processing boards dedicated to inspections. This offers an image processing speed that is around twice as fast as conventional boards
- High-performance processor for high-speed image processing (up to 640 MHz) at a low clock rate.
- Improved "labeling function" for more accurate length measurements
- Improved "shading correction function" and "filter function" to compensate for unevenness and noise.
- Newly developed "subtle soiling" and "horizontal line" inspection circuits deal with hard-to-detect defects such as unevenness, subtle soiling, and horizontal lines.
- Enhanced "vertical line" inspection circuit with streak-emphasizing processing.

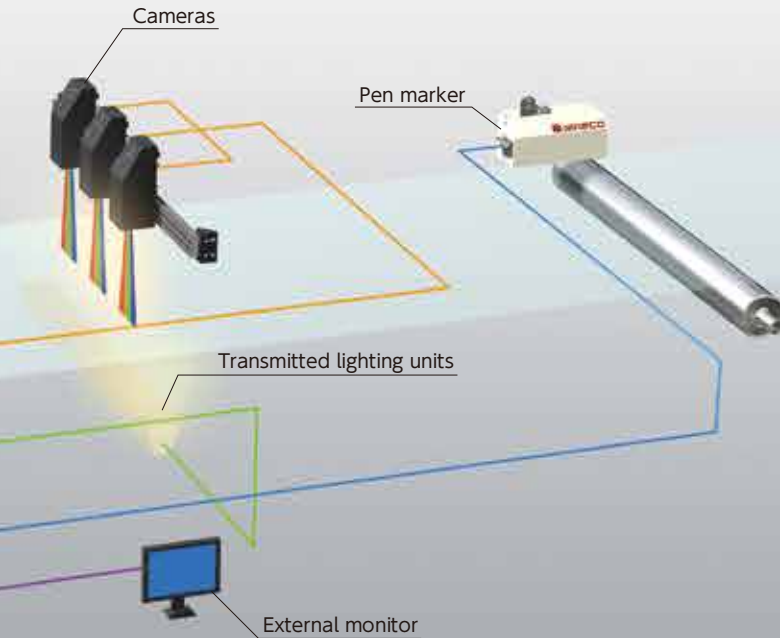
Optics (greater camera compatibility and optical advancements)

- Ultra-high-speed monochrome cameras 640 MHz, 320 MHz (10-bit) have been newly added to our product line up.
- Contact image sensors and color cameras have been added to our product line up.
- In addition to ordinary LED illumination, you can also use special light sources such as near infrared or near ultraviolet. These progressed optical systems make formerly hidden defects visible and greatly widen the detectable defect range.
- The dual-input function makes multiple optical systems more compact.
- Mujiken⁺ offers cameras and lighting systems that are expandable—at a very reasonable cost.

Wide range of system configurations

- Mujiken⁺ offers a wide range of systems to meet various user needs.
- We offer a space saving and built-in-type processor unit.
- A wide variety of marking devices are available, such as labelers, pen markers, IJPs, and PMs.
- The defect data can be unified by networking.
- You can remotely control Mujiken⁺ via an external PC. Remote assistance and monitoring functions with a viewer are also available.

film inspection systems



Defect Inspection System for Plain Surfaces

What is "Mujiken+"?

Mujiken+ is a system to detect defects on the surface of a continuously running sheet at high speed. Any materials can be inspected, as long as they are web/sheet products. The main defects to be detected are foreign materials, holes (pinholes), streaks, and incomplete coatings.

In today's world, the customer's requirements of product quality, production yield ratio, and productivity have become higher than ever before. An inspection system such as "Mujiken+" is necessary to maintain product quality and prevent defective products from entering the market.

Mujiken+ specifications

No. of cameras	Max. 128	Main processor operation	Pixel scanning function	Real-time display of scanning conditions Map display, inspection data display Overall control, instructions for starting/stopping inspection, etc.
Input systems	Max. 8		External memory	DVD, HDD, etc.
Sensors	Monochrome sensors: 160 MHz, 320 MHz, 640 MHz Color sensors: 80 MHz (common), 160 MHz		OS	Windows 7 Embedded 64 bits
Pixels	16,384, 8,192, 4,096, 2,048		Signal system	Digital line sensor
Image processing	Gradation conversion, edge enhancement, labeling, isolated point removal Density accumulation, density histograms Real-time spatial filter (for emphasis, differential, smoothing, etc.)	Cameras	Ultra-high-speed sensor (monochrome)	8,192 pixels 640 MHz (Max. 10-bit) 8,192 pixels 320 MHz (10 bit, Max. 12 bit) 8,192 pixels 160 MHz (10 bit, Max. 12 bit) 4,096 pixels 320 MHz (10 bit, Max. 12 bit) 4,096 pixels 160 MHz (10 bit, Max. 12 bit)
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)		CIS camera	600dpi 300dpi
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		3-line color type	4,096 pixels 160 MHz (8 bit) 4,096 pixels 80 MHz (8 bit) 8,192 pixels 160 MHz (8 bit) 8,192 pixels 80 MHz (8 bit)
Defect detection	Foreign bodies (dots, streaks and bubbles) Scratches (continuous, discontinuous) Color changes (localized, wide-area) Stains (monochrome, pale spots), etc.		Signal cable length	Up to 15 m (standard) Up to 100 m (using an optical link)
			External interface	Marking output, cutter signal input, warning output, keyboard, mouse, touch-screen panel, barcode input
			Operating tools	Keyboard, mouse, touch-screen panel Real-time spatial filter (for emphasis, differential, smoothing, etc.)

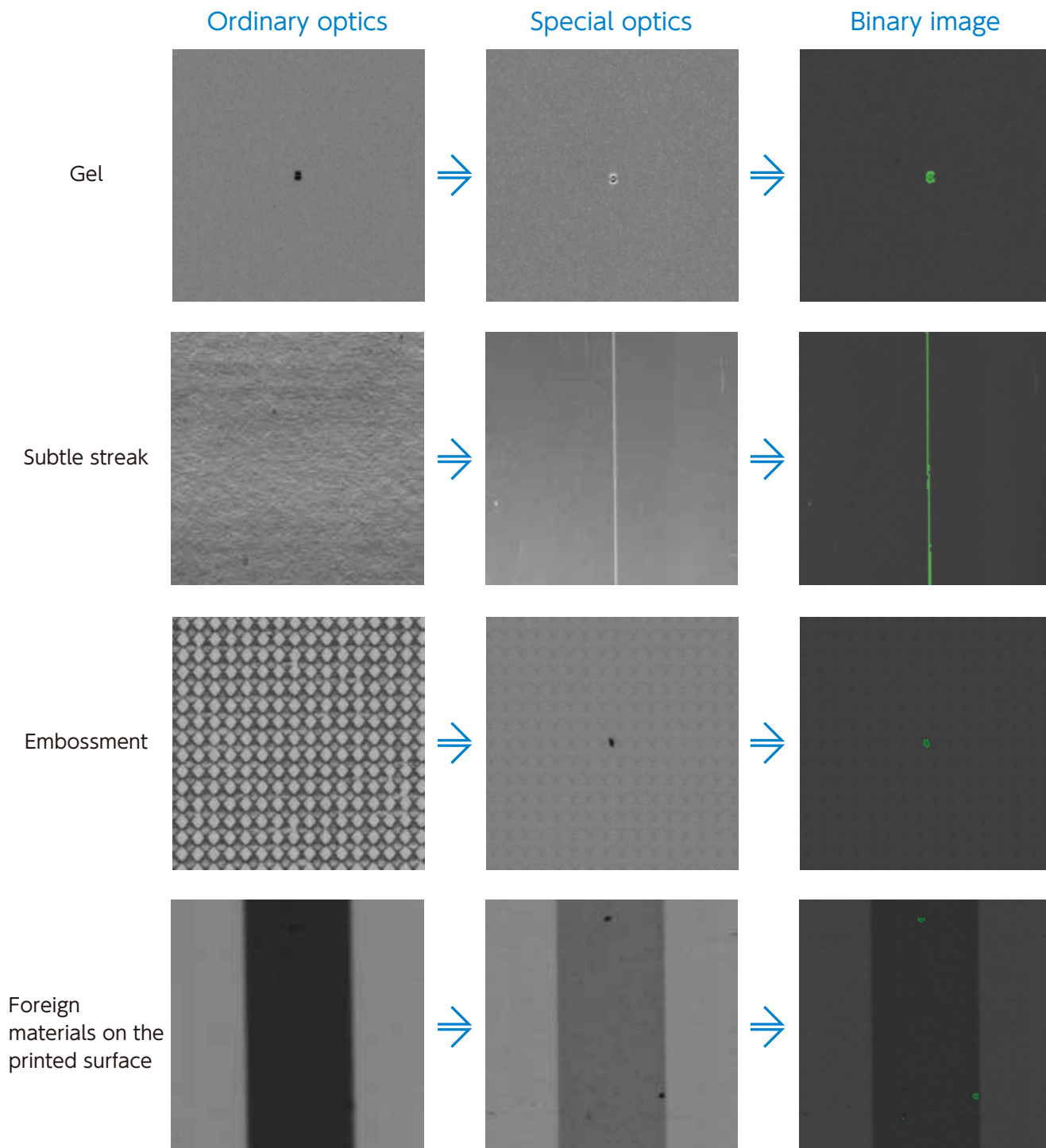
Mujiken+ achieves a high degree of consistent inspections

Quick data analysis

Mujiken+ enables highly accurate detection of defects that used to be difficult to spot on plain materials such as high-performance films, ordinary films, paper, and foils.

Monochromatic images captured at high speeds are processed using our proprietary algorithms, and defects are displayed. Sections where there are defects are labeled to prevent defective products from being passed on to the next process.

Examples of inspections



Usable in a range of applications

- Films ● Coated paper ● Processed paper ● Metal foil films
- Nonwoven fabrics ● Glass sheets ● PET and PE films ● AR films
- Polarizing films ● Sputter - deposited / plated copper foil
- Rolled copper foil ● Electrolytic copper foil, etc.

New inspection algorithms added

We have added newly developed inspection circuits to the Mujiken+ systems that can inspect hitherto hard-to-find defects such as unevenness, subtle soiling and horizontal lines.

We have improved the longitudinal-line inspection circuits for image processing that emphasizes streaks.

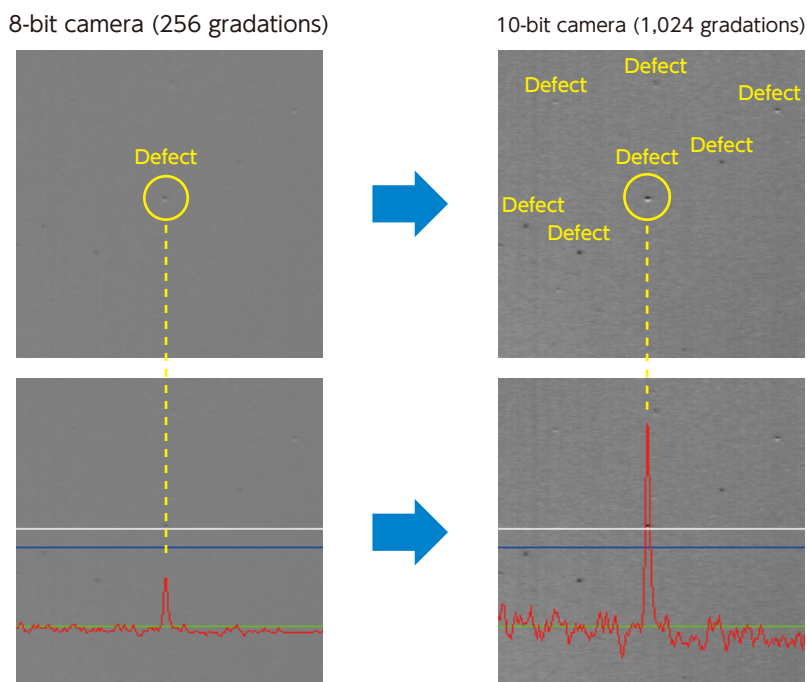
and visibility on your production line.

Greater camera compatibility and optical advancements

Ultra-high speed monochrome camera 640 MHz, 320 MHz (10 bits) are now supported, brings about double processing speed.

More than that, the image processing capacity has been greatly improved so you can make high-precision inspections even when using ultra-high-speed monochrome cameras. Mujiken+ is ideal for high-speed lines and for webs such as high-performance film that require high resolution.

The image sharpness that Mujiken+ offers (image)



Color cameras

Not only have color cameras been added to the line-up, but also combinations with special lighting (in addition to ordinary LED) such as near-infrared and near-ultraviolet are now available.

Due to this progress in optical systems, Mujiken+ has increased its range of detectable defects by making hidden defects visible and by significantly improving its detection performance.

Examples of detection methods by color

There are two methods of color analysis: the RGB absolute value method and the IHP (intensity, hue and purity) vector method. Very faint color areas that could not be handled with the conventional RGB method are now possible to inspect using the IHP method, making highly accurate color detection of shading and very subtle color differences easy. The color detection function makes it possible to differentiate defects by their color characteristics. Our patented IHP method, which matches the color sensitivity of the human eye, enables Mujiken+ to identify color as accurately as the naked eye.



Results of detection using a color camera

User-friendly operating interface

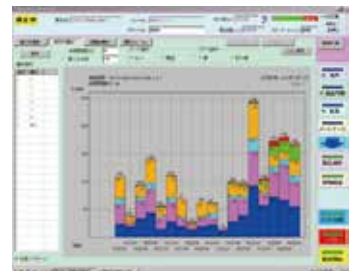
Defect inspection screen



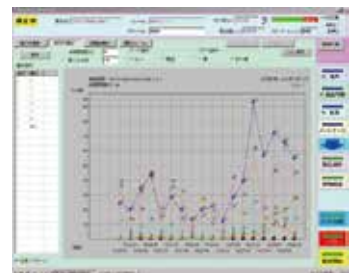
Defect inspection screen



Defect image multi-display



Defect trend graph display①



Defect trend graph display②

The viewer automatically generates defect-classification criteria.

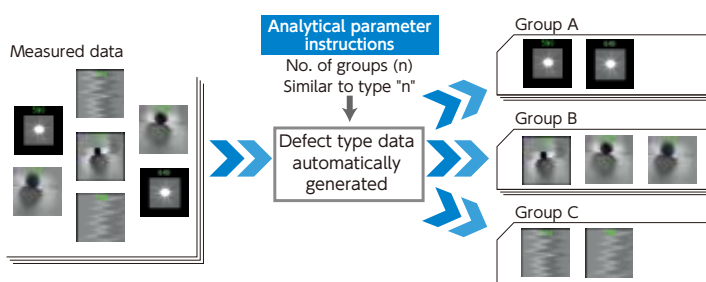
The system makes a statistical analysis based on the target defect data* and automatically generates defect-type data in which similar defects are grouped together.

* The system automatically takes random samples (using a linear extraction method) from the entire set of defect data to narrow down the target data.

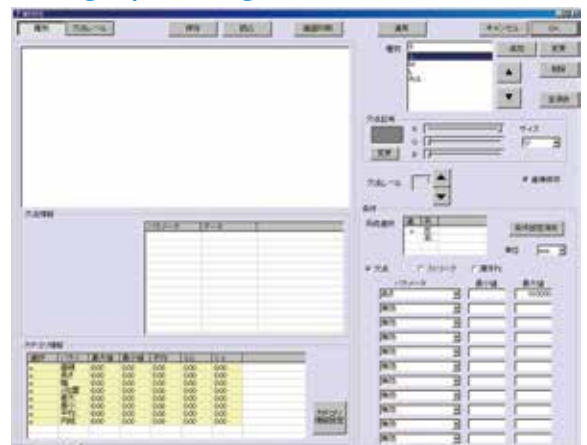
A range of inspection/display/analytical functions

- Plain-surface web defect inspections
- Display and saving of defect data per column
- Display and saving of defect images
- Output of alarms, output of labeler (marker) signals
- Surface inspections of films, metal foils
- Defect map display
- Display and saving of defect data
- Defect display by type

Grouping by statistical analysis



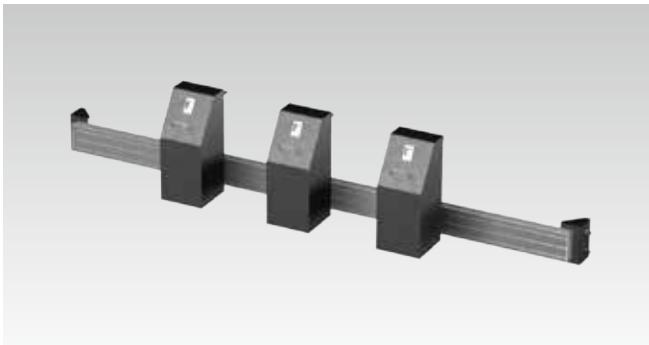
Category settings screen



You can have more detailed classification types by registering in advance a variety of parameters to be used as defect evaluation criteria.

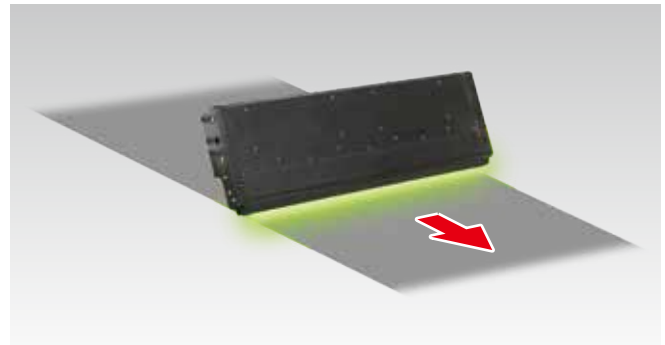
Original devices created through our own technology and know-how

A full line-up of peripherals



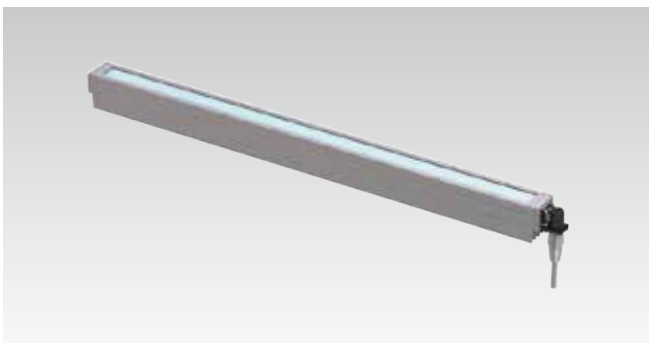
Camera units (monochrome line scanning cameras)

- Perform high-resolution and high-speed scans of continuously running webs.
- Equipped with gain-adjustment function to compensate for lens aberrations and irregularities in illumination.
- Color cameras are also available in our product line.



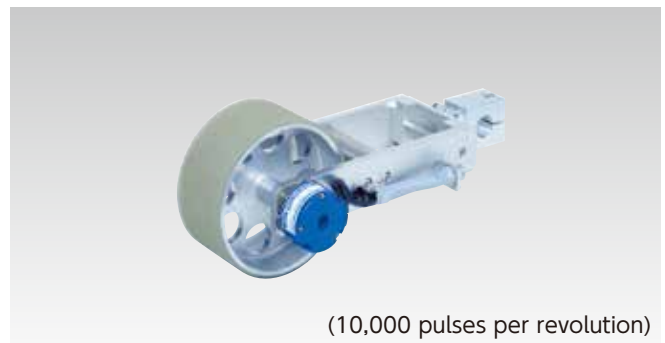
Contact image sensor

- Ideal for situations where there is limited installation space.
- Equipped with a special lens that is free of distortion.



Lighting units

- Our standard LED lighting unit is self-developed and is specifically for our inspection system. With its high brightness that eliminates unevenness, this lighting provides excellent uniformity.
- Equipped with a dual-input function.
- Mujiken+ can be used together with special lighting such as ultra-high brightness types, high-diffusion types, tube lights, near infrared, and near ultraviolet lights as well as our self-developed LED lighting.



Encoder

- Synchronizes Mujiken+ with the running web line to monitor the web speed and the length of travel.
- Achieves high resolution of 5 μm in the web flow direction.
- Can be externally synchronized with cameras or scanners. Enables steady inspections at both high and low speeds, and under web acceleration and deceleration.



Pen marker/labeled

- Automatically uses a marking pen or places a label to indicate the location of the detected defect. Can also be used for specialized marking.

Examples of options using an external PC

- Remote control
- Viewer functions (re-editing of defect data)
- Remote Assistant service

Defect Inspection System for Plain Surfaces

Mujiken+ Type S

Heralding the arrival of a low-cost Mujiken—the same concept, but with limited functions.

The Type-S model is a compact inspection unit, using the same Mujiken+ concepts.

Specifications	
No. of cameras	Max. 8
Monitor(s)	Supports one or two screens
—	Other specifications conform to those of the Mujiken+.



Defect Inspection System for Plain Surfaces

Mujiken+ LT

A compact and affordably priced model maintaining the same performance level of Mujiken+

The LT model is an inspection unit that offers Mujiken+ detection performance. You can put it in the PC rack so it is easy to arrange the system layout.

Specifications	
No. of cameras	Max. 8
Input systems	Max. 2
Lighting unit	High luminance white LEDs Length of light-emitting part: 200 to 1600 mm (a length of up to 2400 mm is optional)



Off-line Sheet Quality Inspection System Ev-01

An off-line quality inspection system designed for cut sheets, such as optical film, glass substrate, and copper foil CCL. Not only does this quality inspection system output inspection data of foreign materials, scratches, discoloration, and stains on a sheet; it can also aggregate all the sheet data and make a graph that shows their defect trend by each lot.

These data can be used as product quality data to show to your customer.

Specifications	
Sheet sizes	From A4 upwards (please discuss your requirements with us)
Lighting units	Transparent mode, reflective mode
Commands	Start inspection, image input, manual movement (+/-), set inspection range, etc.
Data analysis functions	Defect image multi-display, defect map output, CSV inspection data (XY coordinates, size, type), numerical density (number/m ²), particle size distribution data, frequency graph for each type of defect



The details contained in this catalog are subject to change without notice. Please contact us at the following address when considering a purchase.



● Hachioji Office
2951-4, Ishikawa-machi, Hachioji, Tokyo, 192-8522, Japan
Telephone : +81-42-660-7330 Facsimile : +81-42-644-6658

Inquiries to: