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Ultraviolet Light Amount Distribution Measurement Film

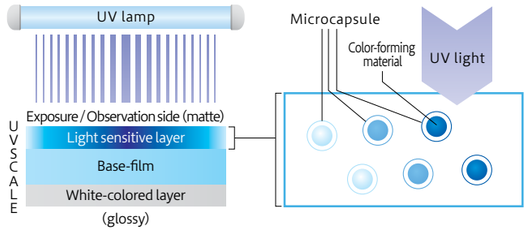
UVSCALE

Visualizes UV light amount distribution by color density

How It Works

■Structure

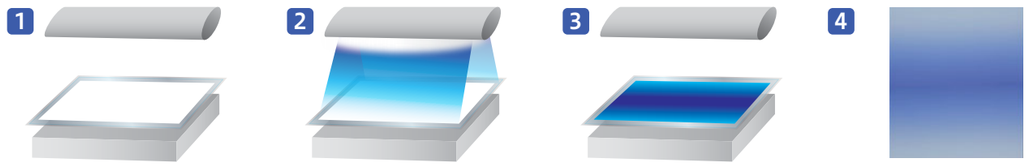
One side of the base film has a UV light sensitive layer, with the opposite side having a white-colored layer. The light sensitive layer changes color according to the amount of UV light it receives, so the amount of light distributed on the exposed surface is easily seen by observing a light sensitive layer and white-colored layer are attached to the base. Since the color density of the white-colored layer corresponds to the amount of UV light received, the light amount distribution on the light receiving surface can easily be investigated.



■Principle

The color forming material in the microcapsules reacts to the UV light and changes color.

How to Use



1 After cutting UVSCALE to the required shape (length), place it on the location that you want to measure.

2 Operate the equipment or device, and expose UVSCALE to UV light.
※The side of UVSCALE with matt surface should be exposed.

3 UVSCALE changes color in accordance with the amount of light.

4 Remove UVSCALE, and determine the distribution of light by observing the color distribution.
※Use the matte side for observing.

Check Method 1: Visual check with standard color charts

Standard Color Chart

[High-pressure mercury lamp]

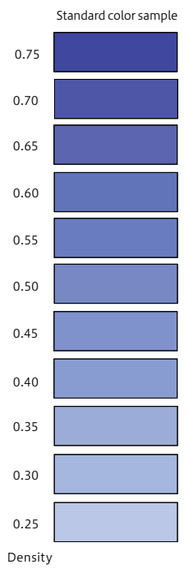
The figure on the right represents color characteristics generated by a high-pressure mercury lamp. However, please note that these color characteristics are values generated by using FUJIFILM light source and devices, so there may be differences in color density for a given amount of light due to difference and variations in individual lamps or environment.

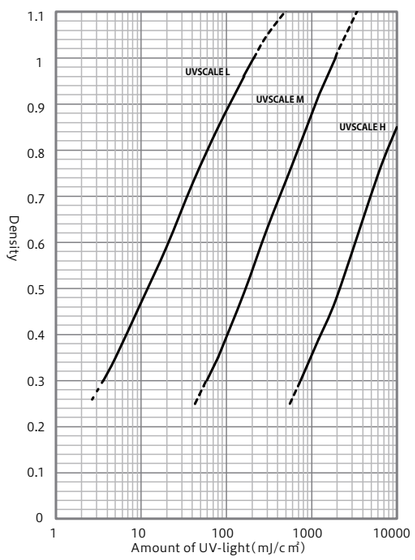
■Advantages of visual checks

■Referring to standard color charts makes it possible to visually judge accumulated light amount values in an easy way.

■Providing color samples can significantly reduce the time necessary for checking UV light amount when starting work and switching objects to be exposed.

※1 : Each density is the value measured by FUJIFILM. It is not a warranty of density level.
※2 : The amounts of UV-light are values using a 365 nm UV illuminometer.
※3 : The solid lines on the graph show the recommended measurement range. The broken lines represent values that are not as precise as the solid lines and should be used as a reference only.
※4 : Standard Color Samples show the density range for visual evaluation.





Specifications

●UVSCALE specifications

We are offering three types of UVSCALE based on accumulated light amount.

Type	Product size		Light Level	Light reduction film	Thickness
	Roll type	Sheet type			
UVSCALE LM	270mm × 5m	270mm × 200mm (5 sheets)	Low (UVSCALE L)	Non-use	0.1mm
			Medium (UVSCALE M)	use	0.1mm×2
UVSCALE H			High (UVSCALE H)	use	0.1mm×2

●Light amount measurement range

Measurable lamp	Type	Light Level	Effective light amount measurement range ※1 (mJ/cm²)
High-pressure mercury lamp	UVSCALE LM	Low (UVSCALE L)	4-200
		Medium (UVSCALE M)	50-2000
	UVSCALE H	High (UVSCALE H)	800-40000
Metal halide lamp	UVSCALE LM	Low (UVSCALE L)	6-200
		Medium (UVSCALE M)	30-1000
	UVSCALE H	High (UVSCALE H)	700-20000
Low-pressure mercury lamp	UVSCALE LM	Low (UVSCALE L)	20-3000
UV-LED lamp (365 nm)	UVSCALE LM	Low (UVSCALE L)	200-6000
		Medium (UVSCALE M)	300-7000
	UVSCALE H	High (UVSCALE H)	5000-100000

※1: The measurement ranges mentioned above is when FUD-7010E is used.
The light amount range that can be visually checked is the density on standard color samples (0.30 to 0.75).
※Applies to wavelengths in the 200 to 420 nm range ※This does not guarantee the absolute values of UV light amount values.

●FUD-7010E specifications

Product name	FUJIFILM UV LIGHT DISTRIBUTION MAPPING SYSTEM for UVSCALE
Model	FUD-7010E
Items included	Exclusive software (CD- ROM), Dedicated cover, Calibration sheet
Usable UVSCALE	UVSCALE L, UVSCALE M, UVSCALE H
Measurable UV lamp	High-pressure mercury lamp, metal halide lamp, low-pressure mercury lamp, UV-LED (365 nm)
Main functions	Analyzing UVSCALE images (measuring accumulated light amount, displaying light amount distribution, saving data, data export)
Scan size	Depending on the scanner used
Resolution	0.125mm (200dpi) 0.03125mm (800dpi)

●System requirements (software)

OS	Windows 8, 8.1, 10 (32 / 64bit)
CPU	more than 1GHz
Memory	more than 2GHz
HDD	Disk space: more than 32GB
Display	1024 x 768 60,000 colors or more

●Scanner used for FUD-7010E

Scanner	please ask your dealer or fujifilm for the information of recommended scanner type

※Scanners are sold separately and customers are to purchase them on their own.

※Please note that the specifications and performance stated in this catalog may change without prior notice as a result of improvements. The diagrams used are schematic, and differ from those for actual measurements.
※Microsoft Office Excel is a registered trademark of Microsoft US.

Check Method 2: Management by converting colors into numeric values with analysis systems

[Analysis system FUD-7010E]

In this system, exclusive analysis software is used along with a usable scanner.※ The system makes it possible to scan color of UV scales, convert it into UV light amount values, analyze UV light amount distribution, and save them.

※Scanners are sold separately and customers are to purchase them on their own.

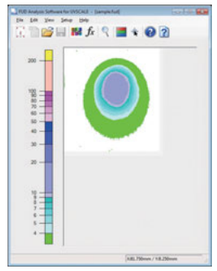
■Advantages of management with numerical values

- **Analysis** — The separation accuracy of density can be improved, so sections that cannot be visually judged can be analyzed.
- **Standardization** — Internal inspection standards can be set.
- **Sharing** — Analysis results can be shared.
- **Data saving** — Digitizing data makes it possible to compare it to past data.

[How to use an analysis system]

①Irradiate light to a UVSCALE.

②Set UVSCALE on the scanner (recommended model) and scan the color sample.



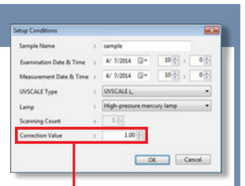
③Analyze it on a PC in which the exclusive software has been installed.

Calibration

Use a calibration sheet to correct variations caused by differences in scanners and conditions as much as possible and to stabilize measurement results.

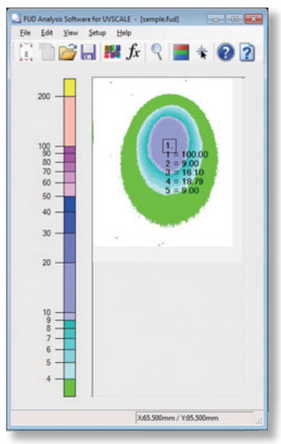
Setting measurement conditions

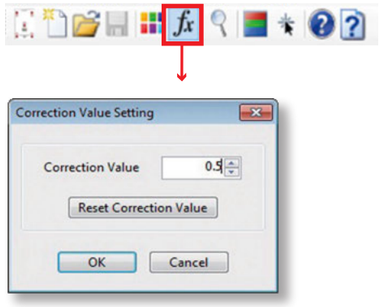
Select UVSCALE type used, light source lamp, and sample name to be saved on the new creation screen.

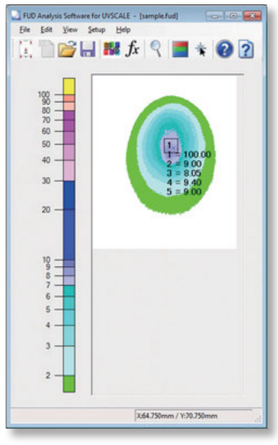


Correction Value Setting

Entering a correction value can correct differences in light amount values caused by differences in illuminometers, temperature, and other measurement conditions to obtain an appropriate value.







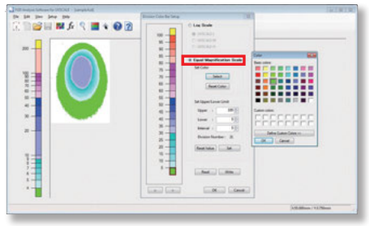
[Analysis system measurement features]

Division Color Bar Setup

Light amounts measured are illustrated in a graph by colors. Various settings, such as scale type (log scale, equal magnification scale), upper and lower limits of scale bars, intervals, and color, can be freely set based on measurement conditions.

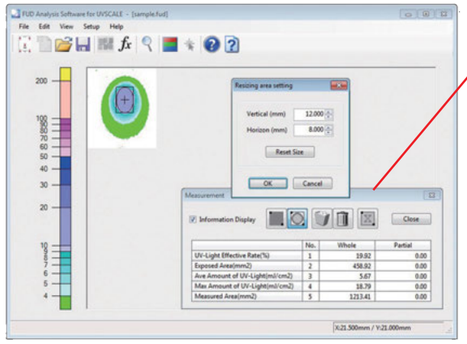
【Log scale】

【Equal Magnification scale】



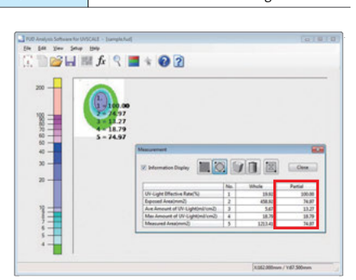
Measuring light amount

Data imported is converted into numerical values.
Measurement data of the entire section and section specified with a rectangle or circle is displayed.



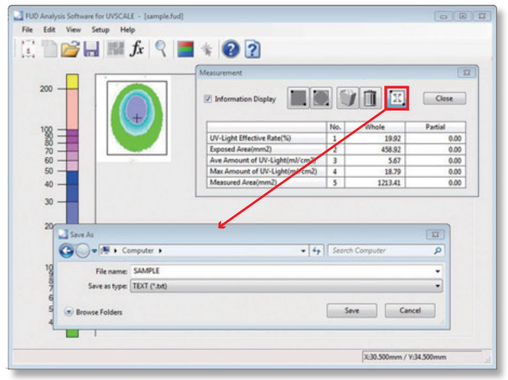
UV-Light Effective Rate (%)	Percentage of the area that is between the displayed lower-limit division color bar and the upper-limit division color bar inclusive
Exposed Area (mm²)	Area where color came out
Ave Amount of UV-light (mJ/cm²)	Average light amount in the measurement range
Max Amount of UV-light (mJ/cm²)	Maximum light amount in the measurement range
Measured Area (mm²)	Area of the measurement range

Measurement data of the specified section is displayed.

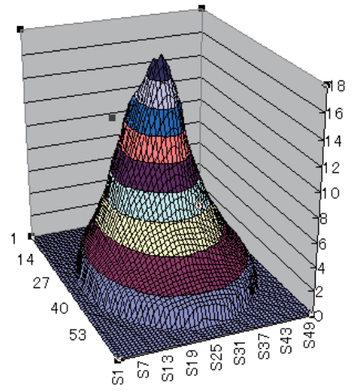


Rectangular Area Data Export Function

Results of partial measurement (rectangle) can be output in text data. Using Excel to graph the results—as shown on the right—makes it possible to see the light amount distribution in a way that is easy to understand.



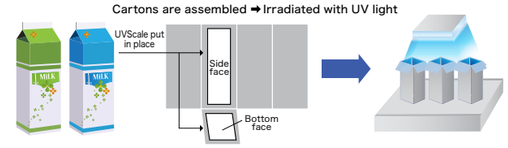
Graph on Excel generated from the data



Typical Applications

1 UV sterilization

Measuring the amount of UV light when milk cartons are sterilized.



Results		
	Insufficient amount of light	Insufficient amount of light

Benefits

- UVSCALE allows the amount of UV light on the side faces and in the bottom corners of food packages, where illuminometers cannot be used because of the reductions in light that may occur.
- Exposed UVSCALE can be stored and used to trace product quality.

2 UV painting

Checking the distribution of UV light automotive parts are exposed to

Checking the distribution of UV light smartphones are exposed to

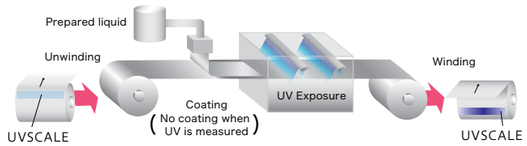
Results		
	Some sections are exposed to low amounts of UV light.	The light amount is not appropriate due to deterioration of the lamp.

Benefits

- Capable of measuring light and checking light amount distribution on three-dimensional objects for which illuminometers cannot be used to measure light, sections into which illuminometers cannot fit, and sections that are moving while light is being irradiated.
- Useful for adjusting how to place products and how to irradiate light because sections that become shadows of three-dimensional objects can be checked with density.

3 UV coating

Measuring UV light distribution in the width direction of the coating for roll conveyor systems



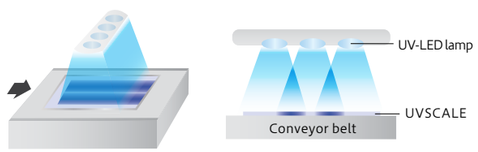
Results	
	UV light is distributed in the width direction. The light amount is small, so it is not appropriate.

Benefits

- Capable of measuring light amount during roll conveyance in which illuminometers cannot be used to measure light amount.
- Capable of measuring and checking distribution in the width direction immediately (on an entire surface), thus allowing measurement to be completed in one test and the time needed for making adjustments and assessments to be reduced.

4 UV bonding

Checking UV light distribution on a conveyer belt during the OCR attachment process of touch panels

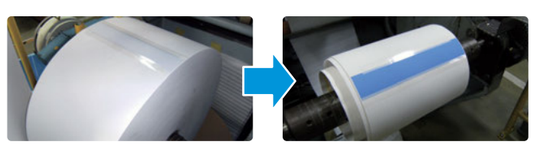


Results	
	Was able to check unevenness of UV exposure in sections where the light from multiple point sources overlap.

Benefits

- Unevenness of UV exposure and decreases in the amount of light can be checked by observing the intensity of the color.
- Allows the height and position of UV lamps to be adjusted when equipment is installed.
- Allows checking of the time for replacing lamps.

5 UV printing



Results		
	Some sections are exposed to low amounts of UV light.	The light amount is not appropriate due to deteriorated lamp.

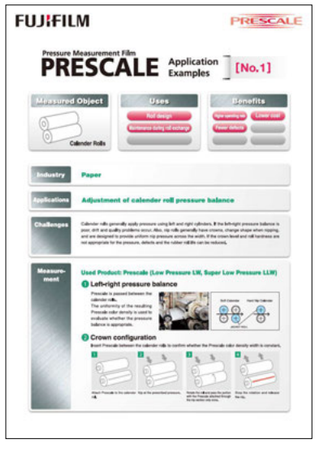
Benefits

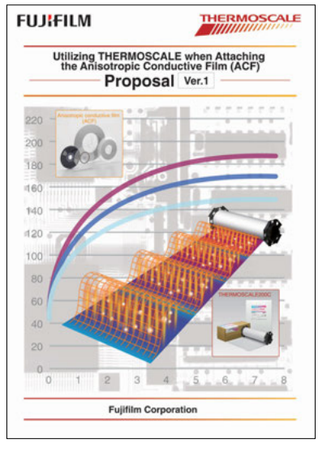
- Reduction in the accumulated light amount due to degradation of UV lamps and dirt on reflective plates can be easily checked with density, which makes it possible to confirm that the lamps and reflective plates should be replaced and identify causes of problems if they occur.
- Attaching UVSCALE to the roll width direction of sheets and irradiating UV light while feeding the sheets makes it possible to check actual UV light amount distribution in the width direction.

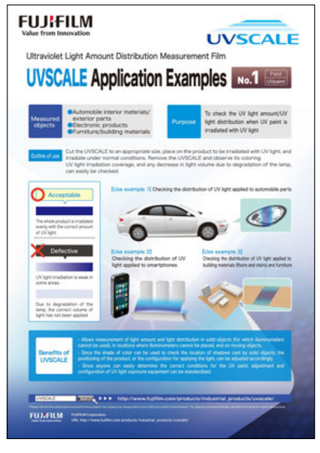
Examples of application for specific purposes and industries are available for download at the website below.

prescale SEARCH

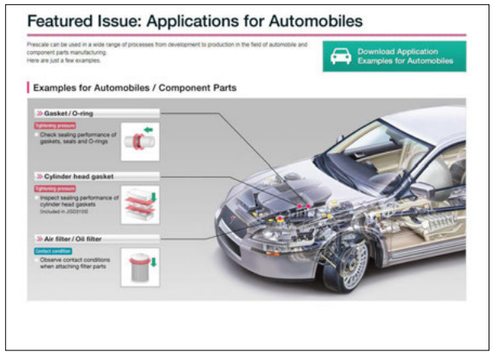
Examples of Use for Specific Purposes







Examples of Use in Specific Industries



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