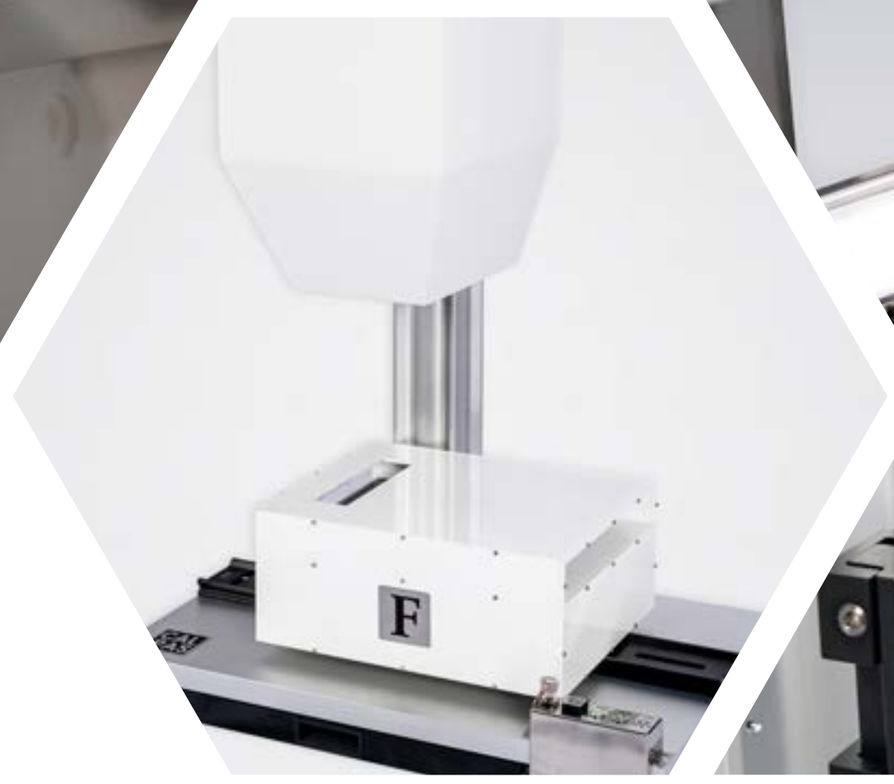
SCIGETEC
Particlize the Imagination



CAL
PAS

CALPAS

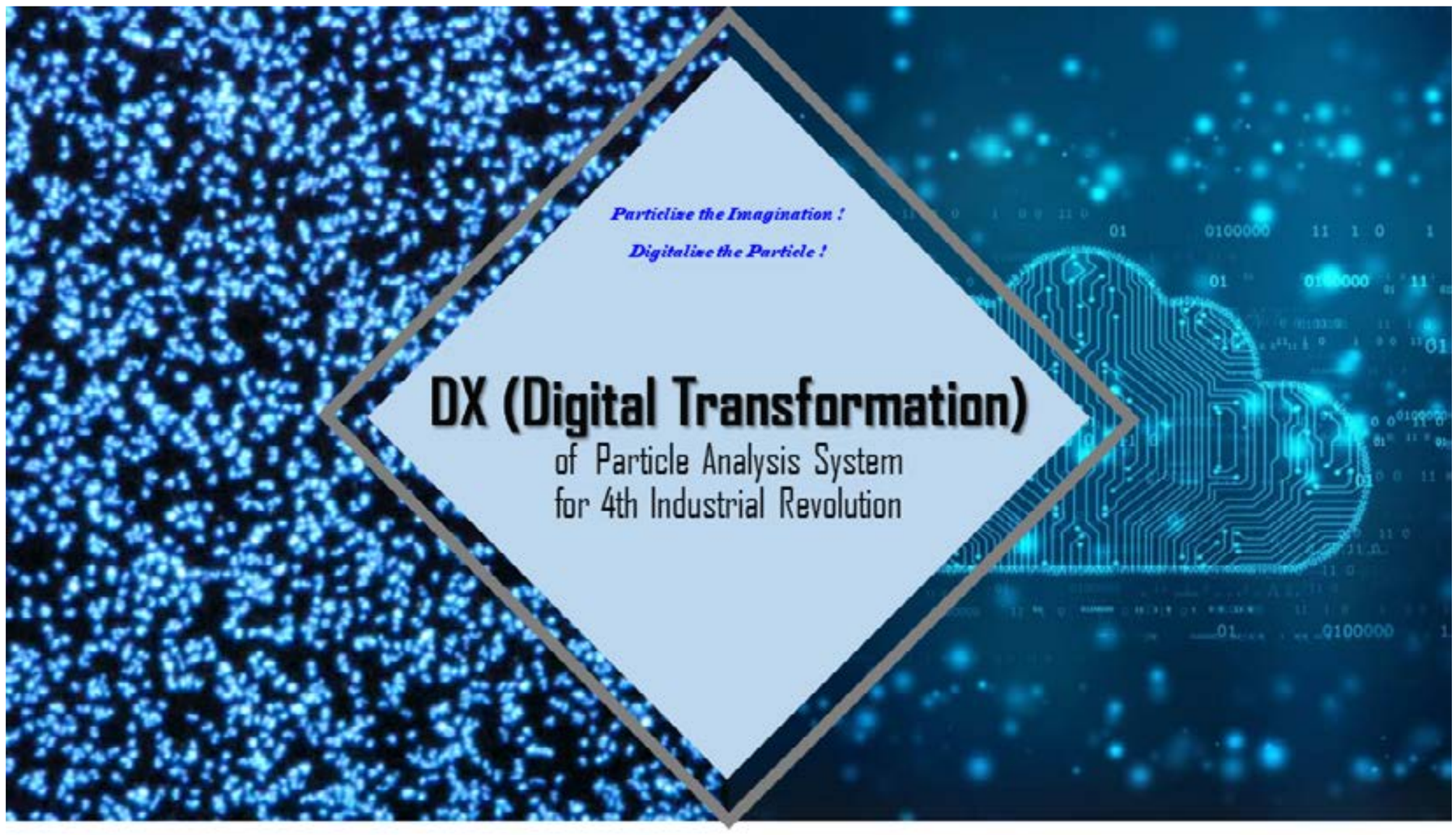
Artificial intelligence detection

Automatic Foreign Particle Scanning
Analyzer & Sorting Machine

CE FC KC

SCIGENTEC
Realize the Imagination

www.scigentec.com



www.scigentec.com

SCIGENTEC CO., LTD.

Scigentec Co., Ltd., founded in 2007, specializes in particle analysis and offers expertise in precision optical instruments. Scigentec manufactures specialty scientific instruments using accumulating particle image analysis and associated technologies. The company and its team have long-term experience in the field and are expanding its applications to maintain competitiveness through technical innovation.

With the technology and know-how accumulated for decades in the field of particle analysis, it is a company that targeting to analyze the particulate matters which has a wide variety of behavior and optical properties which is not like a standardized materials such as semiconductors or displays.

In addition to the offline method, in which a person, the method that has been used by default so far, goes to the production site, brings a sample and analyzes it in front of the device, the Development of online type device (model name: CALPAS-K) that automatically conducts sample collection-analysis and transmits the results in real time by the device installed in the production site is accelerating the development of devices that meet the 4th industrial revolution, the keynote of a new era.

The CALPAS foreign particle scanning analyzer with its unique technology and techniques was released in 2013; it secured the leading position in this field and received superior reviews for convenience of customer usage. To expand domestic and international markets, Scigentec securing a networks in the US, China, Japan, and Taiwan, and are expanding our market presence. CALPAS is in operation worldwide, and support for those devices is a top priority. Professional support can be customized for each customers' business and technology needs. CALPAS is recognized as highly effective in for improving product quality.

In accordance with customers' analytical needs, Scigentec can customize hardware and software preparation as well. By growing quality improvement through development of state-of-the-art technology, the company can help meet customer needs for quality.
In order to promise to provide more reliable products and services, we will do our best to continuously improve technology and build an improved customer support system.

Scigentec Co., Ltd. is developing a new concept particle analysis system that meets the needs of the new era, the 4th industrial revolution, while keeping the basics of the analysis technology of the traditional concept of the past. Launched in 2014, all products produced by Scigentec Co., Ltd. are based on the technology of CALPAS products, which have been highly evaluated at home and abroad as a customized technology that supports specialized devices to meet the customer's technical requirements.

In terms of research and development, the experience and technology of Scigentec Co., Ltd. are developed in cooperation with related research institutes in Korea to develop technology that utilizes terahertz and ultrasonic technology for particle analysis to develop future-oriented and highly practical devices.

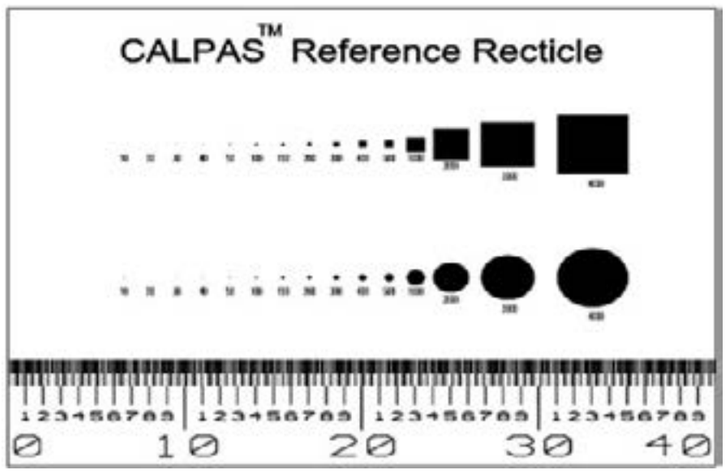
We are doing our best to meet the quality requirements of our customers through quality improvement through the development of state-of-the-art technology that customizes hardware and software according to the customer's analysis needs As a company specializing in domestic particle analyzers, a firm recognition in the international community has been established, and following this, we are accelerating the development and production of high value-added products through the development and supply of devices that are in increasing need worldwide. “Particlize the Imagination”, which is the motto of the company, which means not just thinking, but making it into particles, that is, realistic objects, expresses many good and ingenious ideas into reality, creating high performance We will do our best to contribute to the industry through our products.

CALPAS, Intelligent Foreign Particle Analyzer

In recent years, the direction of industrial technology has required not only product performance but also management of the unexpected micro objects that have a big influence on ensuring the product's sustainable performance and clean external appearance. An increase in high-value-added products must be accompanied by a higher level of quality management.
CALPAS (Color [Component] AnaLysis for PArticulate System) is designed to analyze the foreign materials that arise unexpectedly in pellet and powder systems from the petrochemical, plastic, Vehicle battery, food, and pharmaceutical industries.
A quality management system must monitor impurities from production in order to ensure high-quality outcomes. Measurement of foreign objects is an important factor in determining a product's quality standard, and only continuous

analysis can immediately determine quality. Passive sample analysis performed by humans requires a lot of manpower, and due to human limitations, such analysis is often difficult to conduct. Maintaining stable and consistent product quality—monitoring and controlling the entire process to determine product grade change for "grade pass"—requires a continuous and consistent grasp of quality to optimize production. In the Fourth Industrial Revolution, the recording and sharing of processes and real-time information through the control process is becoming an essential element in the emerging smart manufacturing industry.

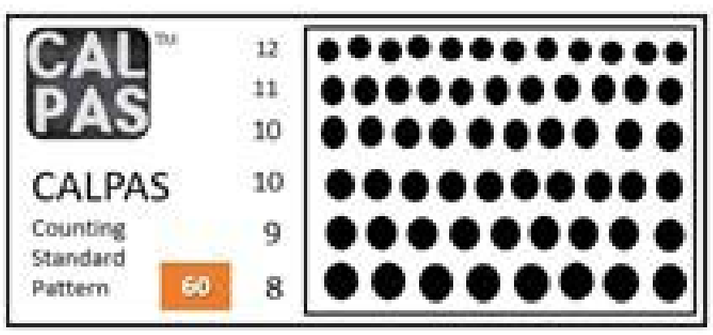
Validation System



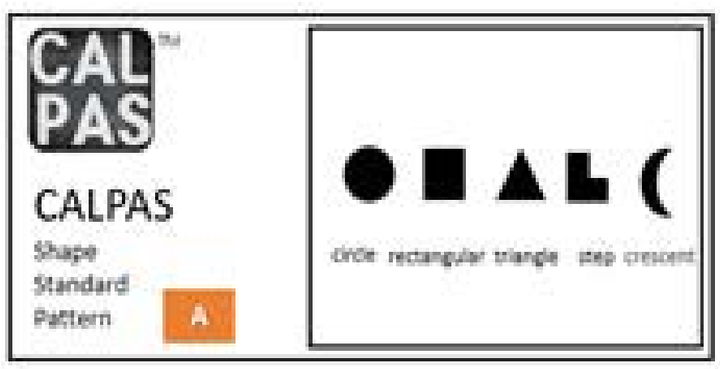
Size Standard (50 micron)

Standard Digital Color Pattern (256 colors)

Standard Size Pattern (>5 micron)

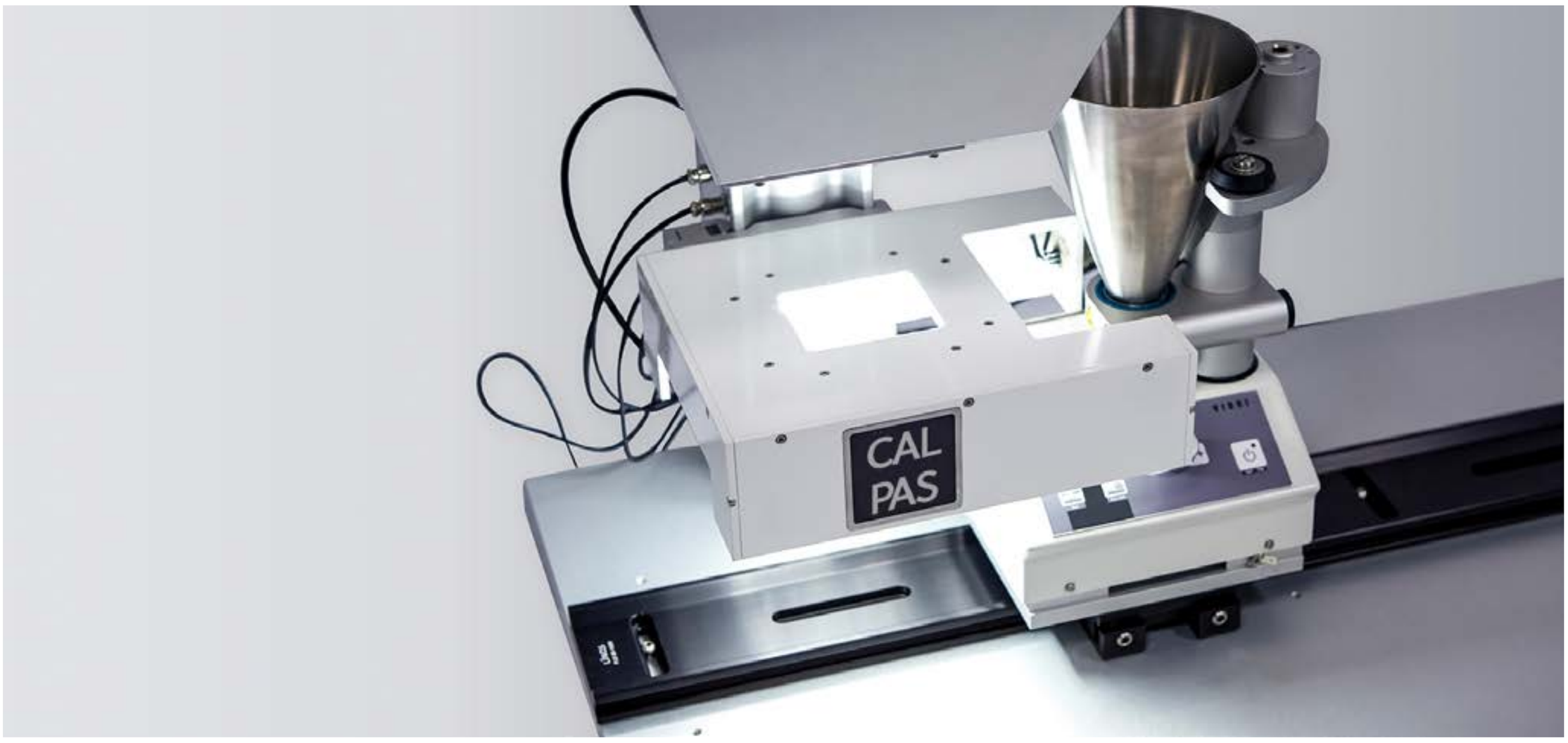


Counting Standard Pattern (60ea)



Shaping Standard Pattern (5 ea)

The problem of establishing a standard for color by preparing particulate matter with various components, sizes, and shapes for camera conditions such as various lighting conditions and resolutions is a very complex problem, and, predictably, it will be difficult to establish forever. Therefore, CALPAS system configures digital color standards (256 colors, excluding black and white) as standard and applies them to devices to detect or classify colors.
Above all, there is a point that exotic foreign matter that occurs in actual production sites is not necessarily proportional to this color. Not only the color of the foreign object, but also the size, shape, and conditions of the adjacent environment must be considered, and if unexpected phenomena such as shadows are added to this, the process of defining the foreign object will become very complicated.
Accordingly, CALPAS is based on a basic image extraction technique that excludes environmental influences such as 4- and 5-dimensional lighting and pollution, where shadows do not occur, and the color, contrast, size, shape, and neighboring environment of foreign objects. We are using an artificial intelligence type foreign body definition technique applied to definition. Of course, there is also a function that allows you to define foreign objects only by color definition.



CALPAS Sensor

CALPAS consists of a high-precision camera, a long working-distance lens, a multidimensional LED illumination system, and software that enables detection of unusual colored particles of dirt and modified variants, or carbonized material differences. It is available to customize CALPAS via modular hardware combinations to cover a variety of options, depending on the application.

In addition to analyzing material by color and using the same equipment, CALPAS also detects the size and shape of foreign material—characterizing it as long, twin, snakeskin, and other shapes.

CALPAS improves quality management by detecting and diagnosing foreign colored material such as black dots and red, yellow, and other impurities. Unexpected colored particles can greatly impede high-quality appearance and performance.

In addition to general analyses, such as of normal pellets, the device can be configured to analyze transparent pellets—opaque pellets that are very difficult to study without adding AVIDOM, a device specially designed to perform this function. Options can set the minimally detectable amount to 10 μm, at which it is difficult to find foreign bodies in the existing equipment (default specification are 50μm).

Through the system's modularity and flexibility with regard to light source type and sample supply, precise measurement can take place according to different applications such as with high transparent or opaque pellets and powder. The process of analysis consists of: **(1) a reliable supply of the sample, (2) five-dimensional LED illumination composed of four channels with dimming options, (3) high-definition, high-speed cameras, and (4) an intelligent image analysis program that applies an automatic analysis algorithm.** All this hardware and software are under the real-time control and analysis process, viewable only a mouse click away.

Supply samples derived from manual or automatic control of the feed rate and speed are available in a very short time. CALPAS provides various information about foreign materials including color, size, and shape in real time and in a report format. The equipment is useful for industries that use PVC, PP, PE, PC, and PMMA from petrochemicals, including the pharmaceuticals, foods, and bulk material industries.

Foreign bodies are detected in real time and registered in a special bin. Each foreign body size, shape, color, and other information is also analyzed in real time. The system is designed so that this data is available for reanalysis at any time. The reanalysis function can be adapted to various additional conditions and other different analysis settings.

Image acquisition and analysis algorithms are optimized using dedicated tools to detect and analyze images collected by hardware in real time for faster processing speed. The separate report function to manage the data from the analyzed results relies on a fast reanalysis speed to apply various detection conditions to measured images in the database.

Detection Limit	20 μm (10μm as an option)
Particle Size & Shape Range	3.45~ 60,000 μm
Measurement time (Foreign Color, 50 μm)	Pellet (Opaque) – 2 min. (1 kg), Pellet (Transparent) – 5 min. (1 kg), Powder – 15 min. (1 kg)
Measurement time (Foreign Shape	Pellet – 15 min. (1 kg)
Sample Amount	150ml, 1000ml, 2400ml, 5000ml (Option available)
Material	High precision Aluminum Profile, Stainless Steel
Dimension & Weight	1130 x 700 x 340 mm, 75kg
I/O	RS232C, Ethernet, RS485

CALPAS-V

CALPAS-R

CALPAS-F

CALPAS-VR

CALPAS-T

CALPAS-K

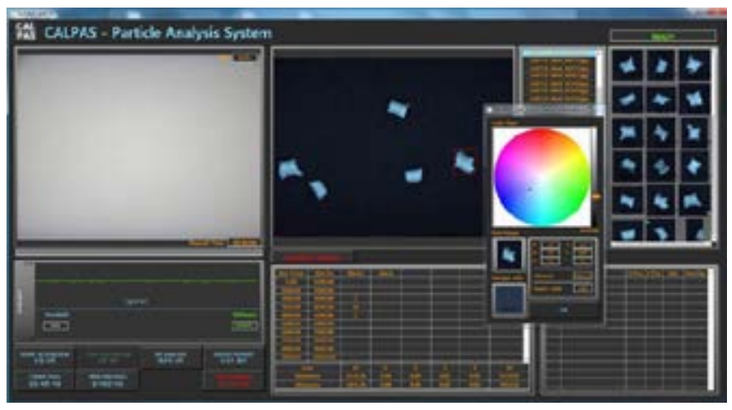
CALPAS-W

CALPAS Program

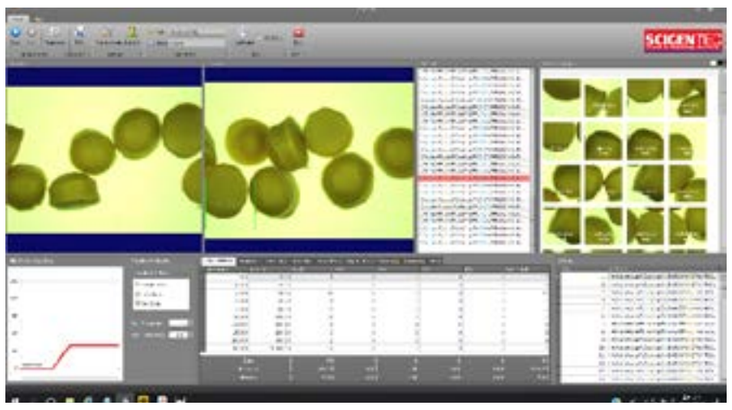
Intelligent CALPAS software enables users to define the values for foreign color and foreign shape according to market and product quality requirements. The detailed setting function is available in the software as a foreign input and can be set from the stored settings, or the user can choose them in advance. This software programming can provide more precise foreign definition management; a user with only one hardware device available can undertake more direct and detailed management of the foreign body and control and manage the foreign body sustainably according to its requirements.

Features

- Real-Time Analysis
- Auto Start and Stop
- Real-Time Gallery Function
- Real-Time Information on Size and Shape
- Real-Time Statistics
- User-Specific Scaling
- Tracing and Deleting of Doublets
- Coarse Tuning & Fine Tuning
- Size Definition by User or Standard
- Various Size and Shape Evaluation Functions (Feret Max, Feret Min, Feret Mean, EQPC, Aspect Ratio, Sphericity, Convexity, Fiber)
- Foreign Shape Analysis
- Online System Using Sampler and PLC
- Result Data Transfer (PLC)
- Both Side Detection
- Foreign Pellet Sorting



CALPAS-Basic Program



CALPAS-Pro Program

CALPAS-AI Program

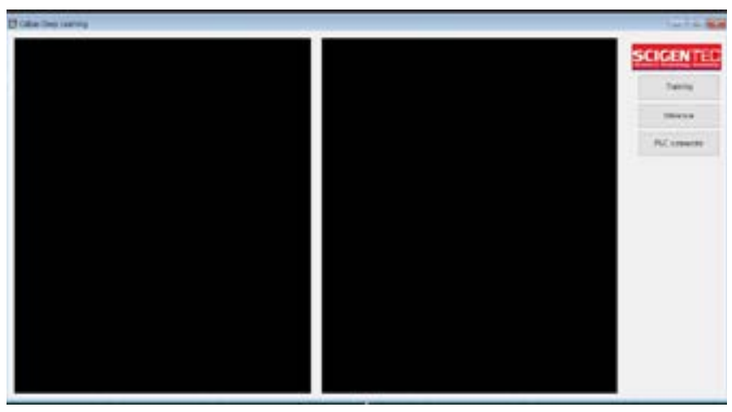
CALPAS AI Software

Based on the experience of longtime experts, we have successfully developed CALPAS AI—an artificial intelligence foreign object analysis program—in order to respond to the market demand for differentiated and complicated foreign materials that arise in automotive production. It is possible to eliminate micro-shadows on products with very high levels of foreign object detection, and to identify dust rather than foreign objects in pellets.

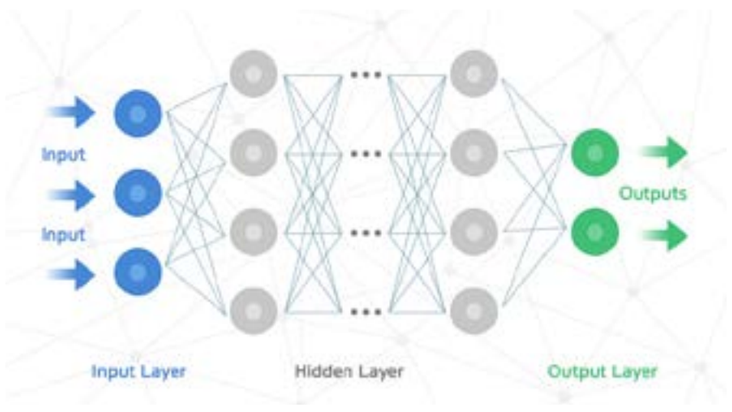
The artificial intelligence algorithm applied to CALPAS is a deep-learning method using CNN (Convolutional Neural Networks) that excellently performs image analysis. This technology has improved performance compared to the accuracy and speed of existing methods of analysis. With this feature, the main purpose of CNN is to effectively detect the visual characteristics or features of the image—such as borders, lines, and colors—through various feature maps defined in each layer.

CALPAS has secured algorithms with different dimensions by using our unique image extraction method (CALPAS illumination) and CNN method. In addition, we have introduced an algorithm that satisfies the need for accuracy and speed by setting input and output according to the purpose required by the market and providing an optimized hidden layer design technique accordingly.

The CALPAS AI training algorithm based on the user-provided label image is programmed to automatically adjust the weights of the CNN filters corresponding to the hidden layer, so that no additional manual operation by the user is required. In addition, recognition of the pellet type is possible, and the presence of foreign colors or foreign shapes in one device can prevent an excessive investment in technical cost



CALPAS Deep Learning Function



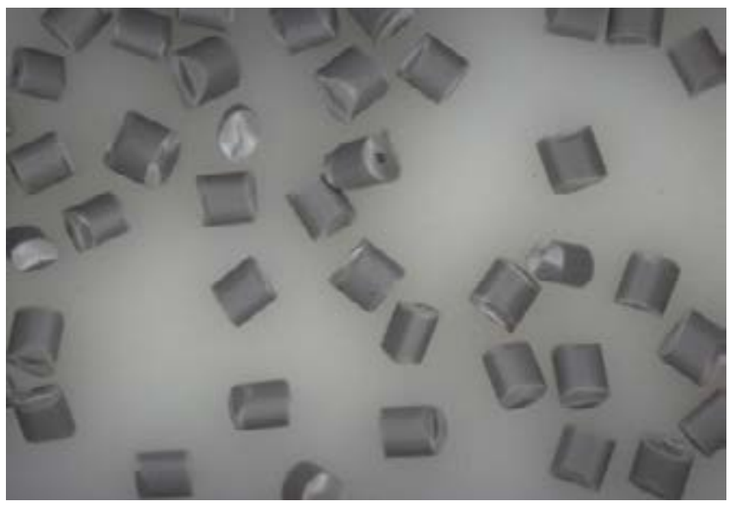
CALPAS Deep Learning Mechanism

Discrimination Foreign Dot and Dust

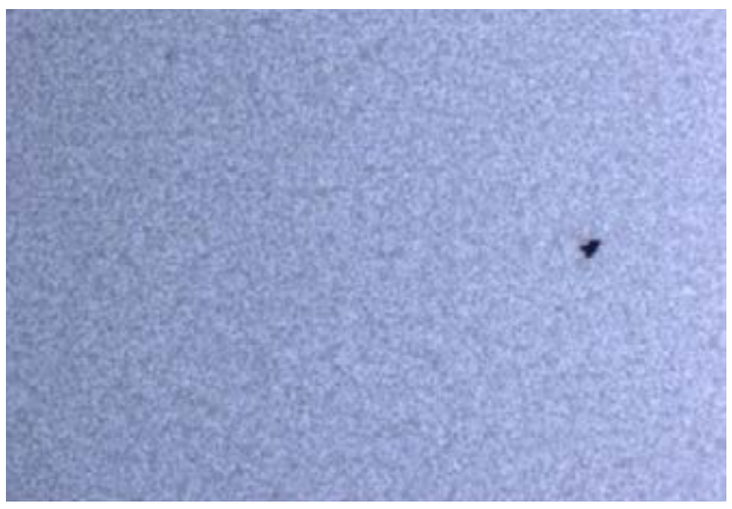
CALPAS-V

Application for Normal Pellet, Opaque Pellet,
Powder (Free-Flowing)

Pellet Image



Measurement Video

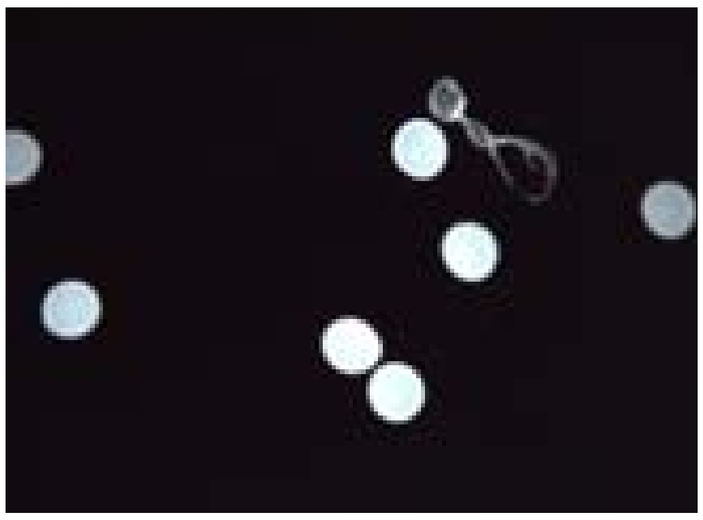


VIBRATION UNIT	
3-dimensional movement for the constant mass flow with Bottom Illumination Function	
Movement repeat	50 times/second
The amplitude of vibration	100 kinds
Height control	0.5 ~ 15 mm(resolution 0.1 mm)
Amount of Feed for dry sample	mg to 50kg, depends on Hopper capacity
Material for Shute & Hopper	SUS, coated, non-conducting
Dimension & Weight	255 x 158 x 241 mm, 8.5kg

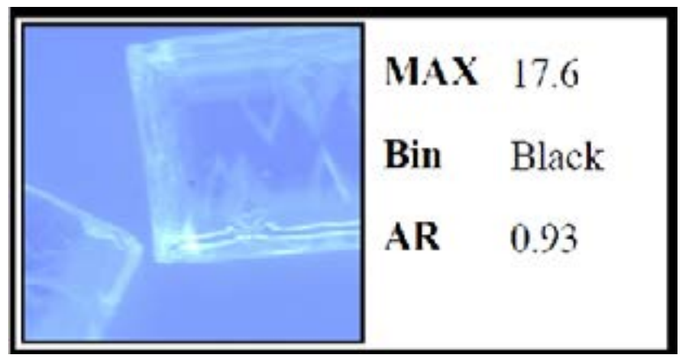
CALPAS-R

Application for Normal Pellet, Opaque Pellet, Transparent Pellet & another application for Foreign Shape, Particle Size & Shape Analysis

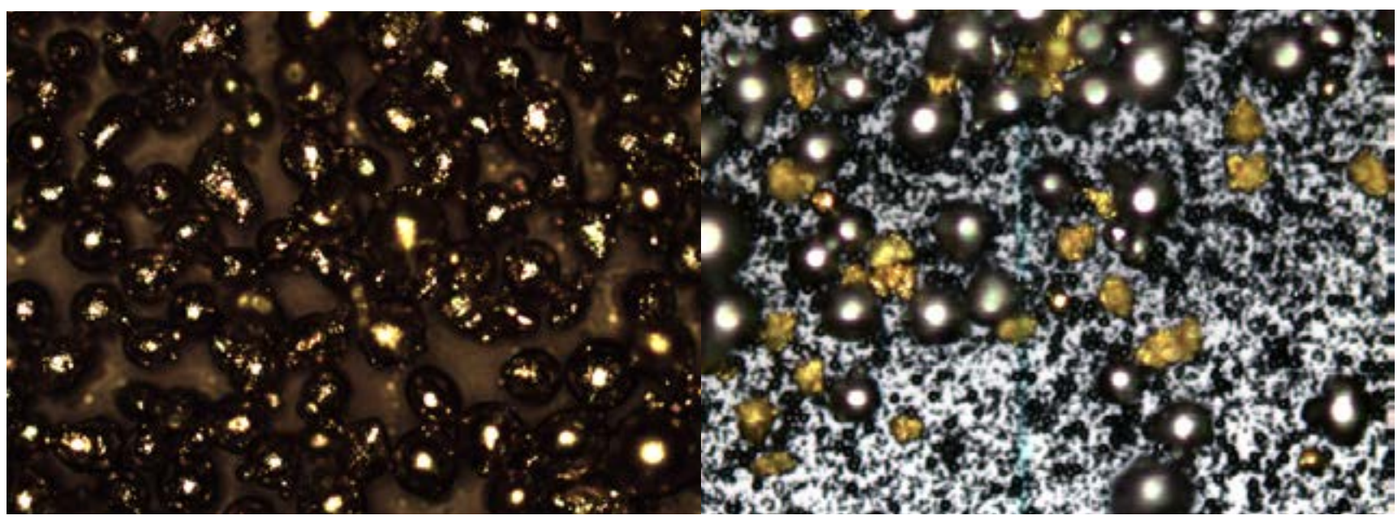
Image of Transparent Pellet



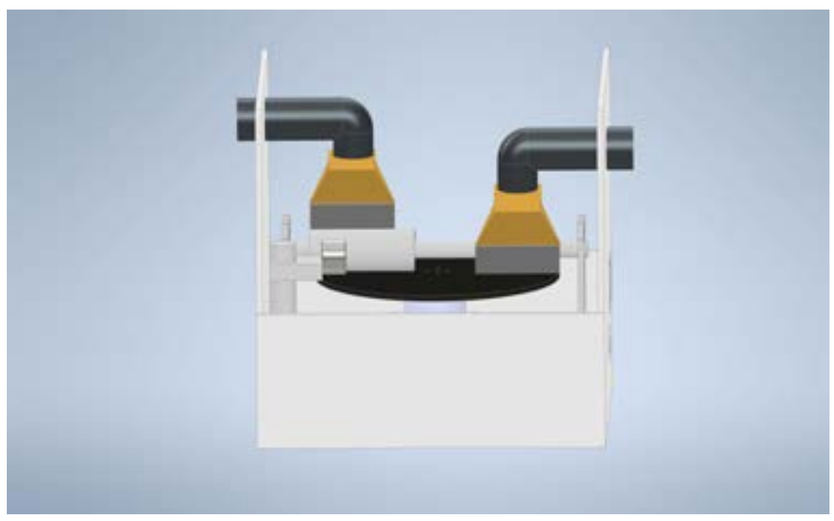
Foreign Shape Analysis



10 micron detection (PC)



Foreigns in Cathode Powder



R2 system

TURN-TABLE ROTATION UNIT		
Standard for Transparent pellet with Foreign Shaping Function		
Basic Step Angle (Full/Half)		0.072o/0.036o
Max. Torque		50kgf.cm
Rotor Inertia Moment		280g.cm2
Wound Resistance		1.1Ω
Rated Current		1.4A/Phase
Reduction Gear Ratio		1:10
Protection		IP30
Speed Range		0~180rpm
Backlash		+20’(0.33’)
Electro-Magnetic Break	Rated Excitation Voltage / Current	24VDC +10% / 0.33
	Rotor Inertia	29 x 10-7kgf.cm2
Lost Motion		+20’(0.33’)
Dimension & Weight		420 x 420 x 110 mm, 22kg

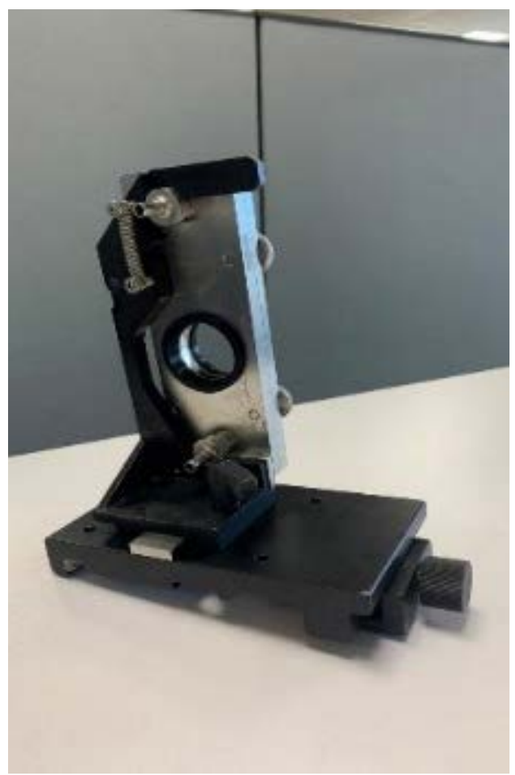
CALPAS-VR



ROTATIONAL VIBRATION UNIT	
Rotational Hopper for free flowing with Bottom Illumination Function	
Movement repeat	50 times/second
The amplitude of vibration	100 kinds
Height control	0.5 ~ 15 mm(resolution 0.1 mm)
Amount of Feed for dry sample	mg to 50kg, depends on Hopper capacity
Hopper Rotational Function	1~11rpm (control 0.5rpm)
Material for Shute & Hopper	SUS, coated, non-conducting
Dimension & Weight	255 x 158 x 241 mm, 8.5kg

CALPAS-W



Foreign Detection in Wet Suspension	
Cuvette Material	Quartz
Cuvette Width	2mm
Pump	Peristaltic
Peristaltic Material	Marprene, Silicon…
Dimension & Weight	240 x 140 x 150 mm, 11.0kg

CALPAS-F

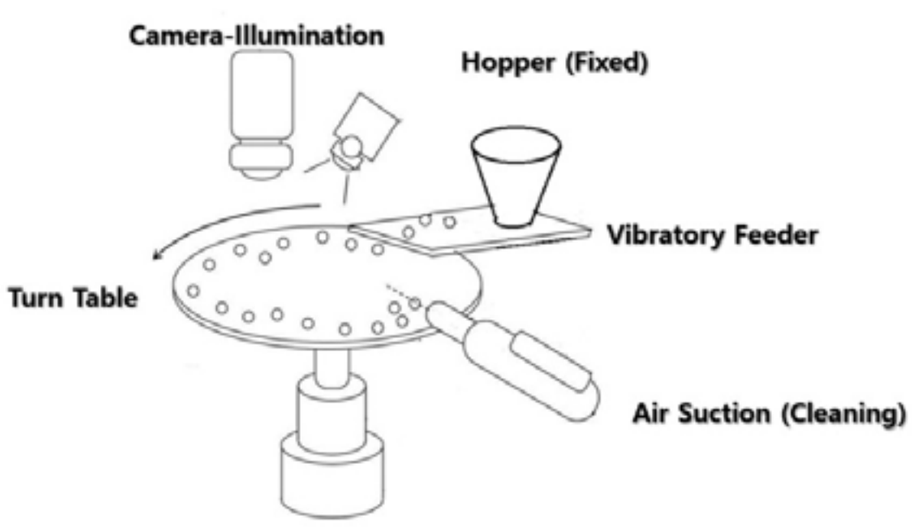
FILM INSPECTION UNIT	
Coaxial Illumination with Stage Motor for Black/White Dot, Fisheye on Film & Sheet	
Step Angle	1.8o/Step
Voltage	5.25V
Current	1.5A/Phase
Resistance	3.5+10% ohm/Phase
Inductance	2.8+20%(REF) mH/Phase
Holding Torque	3800 g.cm
Detent Torque	250 g.cm
Insulation Class	B
Life	6000 H
Dimension & Weight	600 x 190 x 190 mm, 25kg

CALPAS-T

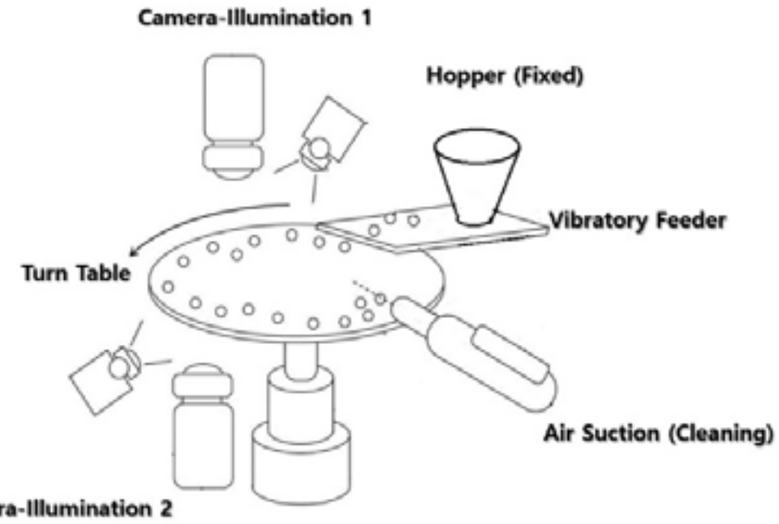
Simultaneous Both-sides Foreign
Particle Analyzer

Options

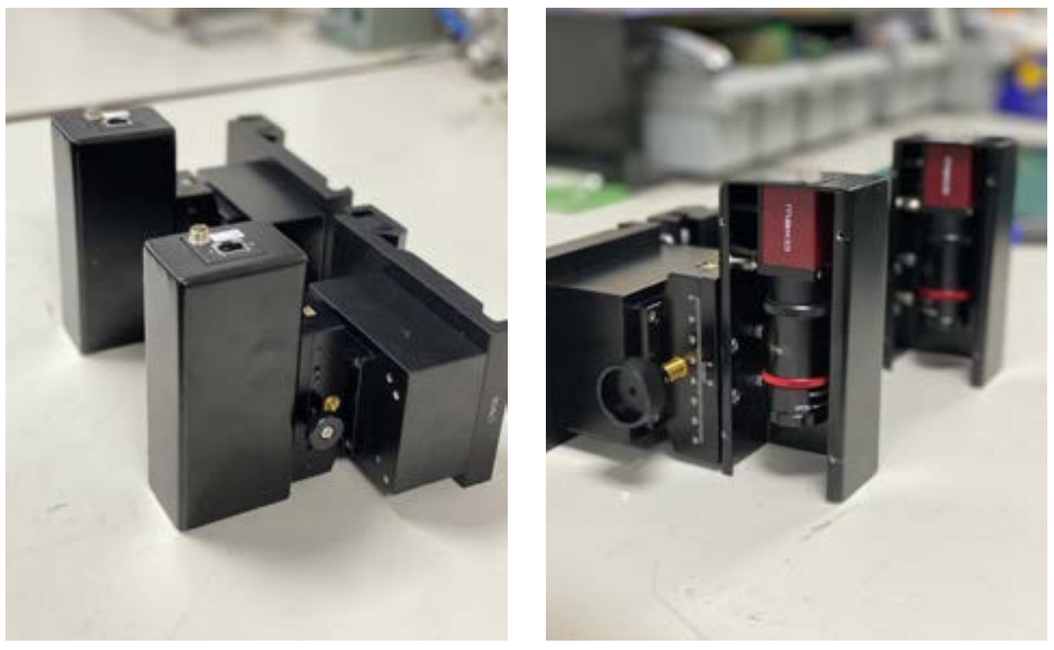
- 10 micron detection
- Data Transfer to PLC & Others
- Sorting by High- Speed Diverter
- Hopper Size can be upgrade up to 9 Liter (Offline)
- Real-Time Online Purpose by Connection with Online Isokinetic Sampler
- Extension to AI (Artificial Intelligence) Functional Software (Deep Learning)



Foreigns in Cathode Powder



Double Camera Structure



Foreigns in Cathode Powder

CALPAS-K

Online Real-time Foreign Particle Analyzer

CALPAS-K online System

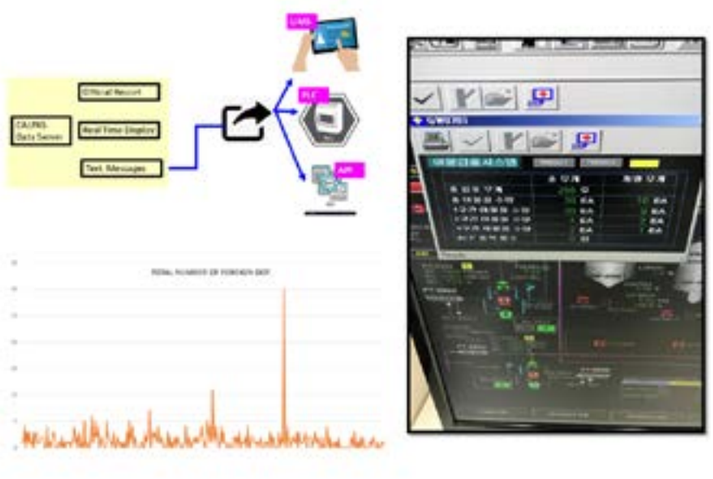
Semi-AutoLine Structure

Offline Use

Features

- Robust & Convenient Design
- Free Movement
- Automatic Balancing
- Rigid Industrial PC and control Process Sampler
- Automatic Ionized Air Control Cleaning System
- Analysis Speed : 1kg/10min.
- Hopper Size can be upgrade up to 9 Liter (Offline)
- Real-Time Online Purpose by Connection with Online Isokinetic Sampler.
- Various Sample Measuring Stage Selection, Vibrator : Powder & Pellet, Turn Table : All (incl. Transparent) Pellet
- Various Camera Selection : 5micron, 10 micron, 3CCD….
- Extension to AI (Artificial Intelligence) Functional Software (Deep Learning)

Online System



Data Transfer

Installation

CALPAS-TERMINAL

Simultaneous
Both-sides Foreign
Particle Sorting
Machine

CALPAS
Artificial Intelligence
Foreign Particle Sorting System

The measurement and sorting of foreign substances are important factors in determining the quality of a product and the level of customer trust. Recently these issues have become related not only to appearance but also to safety. However, the ability to suppress the occurrence of the original foreign particles is limited, and the demand for a foreign material measuring eliminator has been continuously increasing.

In the meantime, the method of measuring and sorting foreign matters has been focused on measurement speed, revealing limitations with accurate measurement and problems such as a remarkably low yield in sorting particles with foreign matter. In addition, the lower-limit size of foreign particles has recently been required to be significantly smaller, so the measurement of fine foreign substances must be accurate and processed quickly, and the efficiency of removal must be secured.

To meet this industrial requirement, Scigentec Co., Ltd. has released CALPAS-TERMINAL products. The CALPAS-TERMINAL foreign particle measurement and sorting system basically applies a high-speed rotating turntable to the sample transfer instead of the gravity sedimentation method that can create a mass failure.

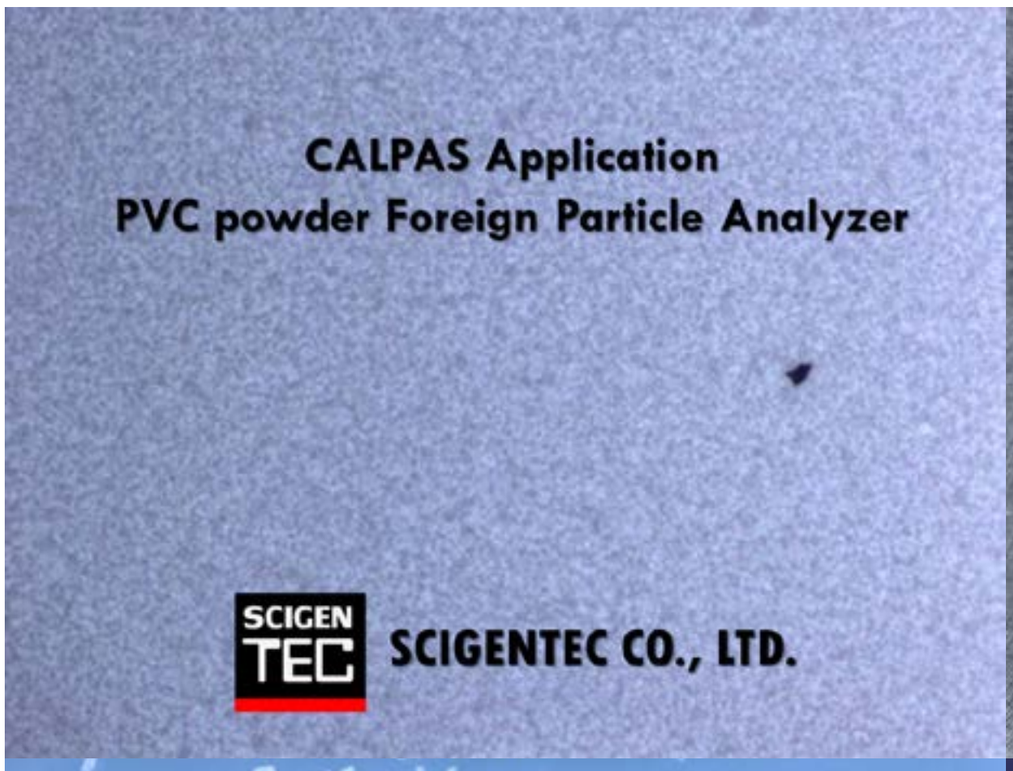
The dual-camera illumination system placed on the top and bottom of a special tempered glass turntable can perform the duplicate measurement of foreign matter from both sides at the same time, ensuring accurate and stable measurements up to at least 10 microns.

To significantly reduce optical misjudgments from basic properties of particles (e.g., shadow, perforation, colored reflection), CALPAS works with an artificial intelligence program that accurately judges only foreign matter and is optionally configured to perform very stable and accurate foreign matter measurement and removal simultaneously by real-time merging with foreign matter removal devices such as the high-speed Diverter.

Simultaneous dual-sided measurement from the CALPAS-TERMINAL system has the capacity to analyze up to 200kg per hour on a 50-micron basis. The product can be applied in a very simple way for use in production, quality control, and final product control.

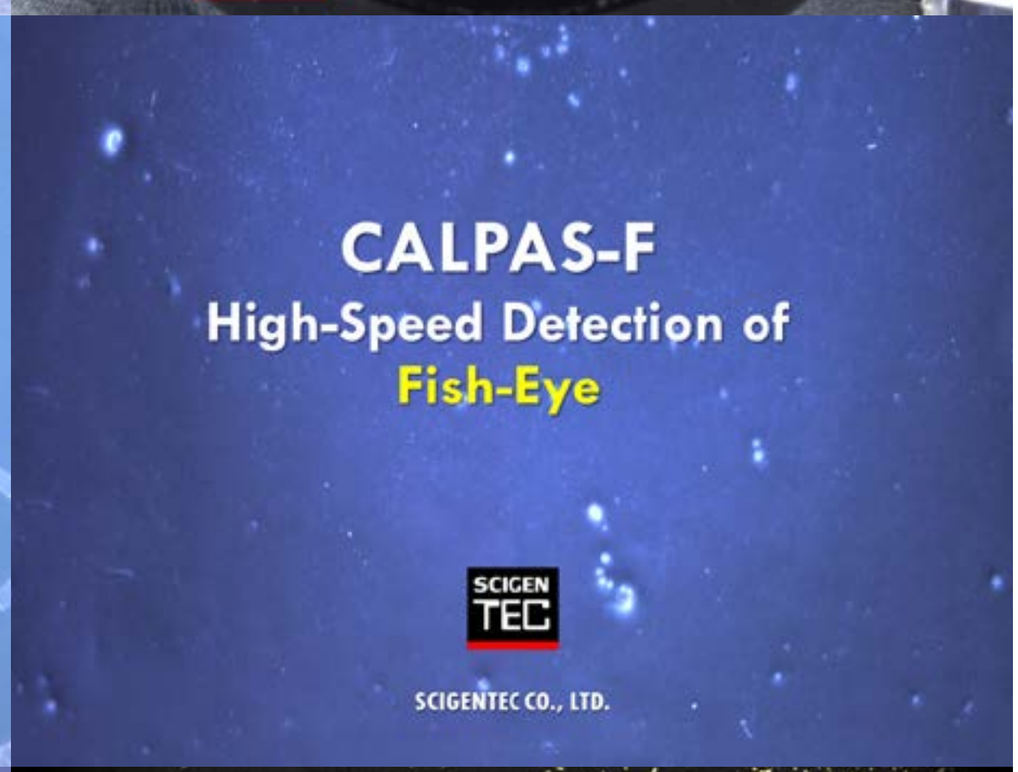
Features

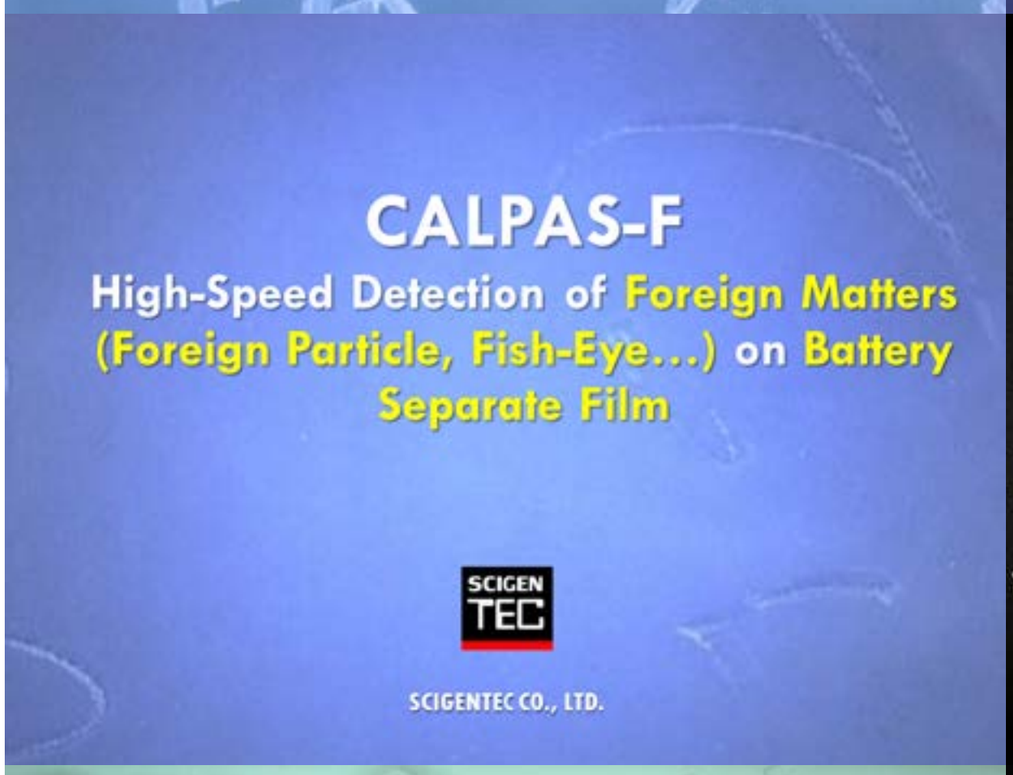
- Dual Detection System
- Foreign Color or Foreign Shape Purpose
- Various Illumination Control
- Robust & Convenient Design
- Free Movement
- Automatic Balancing
- Rigid Industrial PC and control Process Sampler
- Automatic Ionized Air Control Cleaning System
- Detection Limit : 20 μm
- Analysis Speed : 200kg/1hour.


CALPAS Application
PVC powder Foreign Particle Analyzer
SCIGEN TEC
SCIGENTEC CO., LTD.


CALPAS Application
Wet Foreign Particle Analyzer
for Suspension
SCIGEN TEC
SCIGENTEC CO., LTD.


CALPAS Application
PVOH pellet & Powder
Foreign Particle Analyzer
SCIGEN TEC
SCIGENTEC CO., LTD.


CALPAS-F
High-Speed Detection of
Fish-Eye
SCIGEN TEC
SCIGENTEC CO., LTD.


CALPAS-F
High-Speed Detection of Foreign Matters
(Foreign Particle, Fish-Eye...) on Battery
Separate Film
SCIGEN TEC
SCIGENTEC CO., LTD.


CALPAS-R2
Foreign Particle (Cu, Fe, Metals..)
on Battery Cathode Powder
SCIGEN TEC
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CALPAS Application
PET pellet Foreign Particle Analyzer
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Introduction of
CALPAS-M
Static Foreign Particle Analyzer
For sub-micron foreign particle
By using conventional microscope
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33, Gangnam-daero 101an-gil, Seocho-gu, Seoul, 06525, Republic of Korea