Sizector® 3D Camera

S028 & S162 Series

MEGA PHASE
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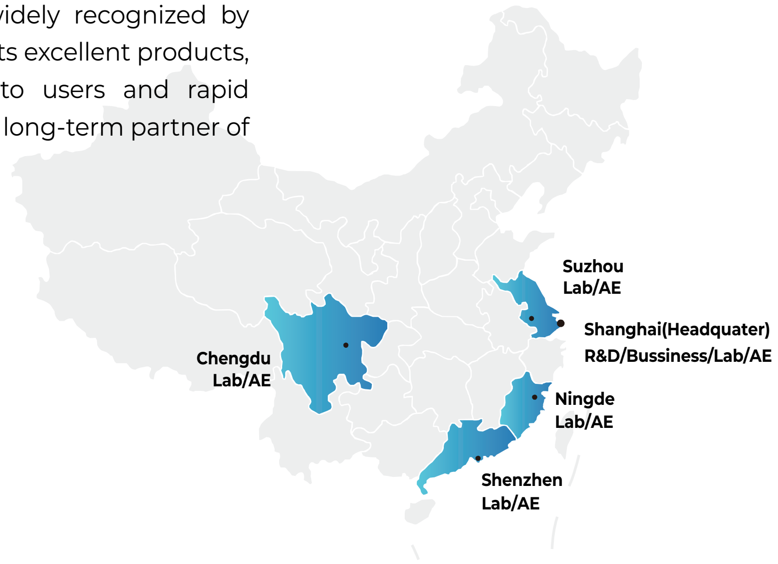
About Us

Established in 2014, Mega Phase Technology is a well-known Machine Vision Hardware Provider in the industry. Mega Phase is committed to providing excellent machine vision hardware products for end users and system integrators from 3C, Semiconductor, Electronics Manufacturing, New Energy, Automobile Assembly, Aerospace, Precision Manufacturing and other industries through hardware computation technology, powerful visual algorithm ability and innovative product definition.

With independent intellectual property rights(IPR) in the hardware computation technology, Mega Phase has rolled out more than 30 types of standardized and modular hardware computation imaging products, based on deep accumulation in industrial design, optical, mechanical, electronic circuit algorithm and firmware development. Mega Phase can help users solve many kinds of vision inspection problems. It covers various mainstream industrial applications such as defect inspection, size measurement, 3D inline inspection, robot positioning and guidance, and bin picking.

Located in Shanghai, the Headquarter of Mega Phase Technology is also the center of R&D, Production, Business Development, Technical Support, Order Delivery and Service. The local offices in Shenzhen, Chengdu, Suzhou and Ningde provide Sales, Project Evaluation, Technical Support and Training Services for local users and partners. Mega Phase has been widely recognized by domestic and global users through its excellent products, sales and service network close to users and rapid response, and has become a reliable long-term partner of top customers in various industries.

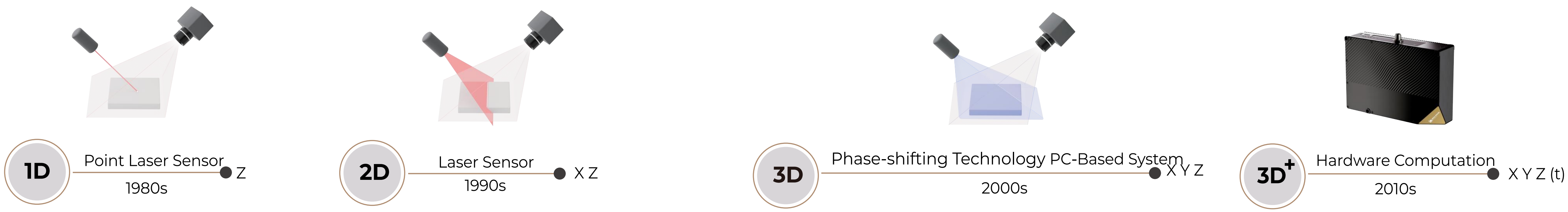
"Innovation creates value". Mega Phase stays focus on cutting-edge technology and excellent products implementation, creating the indispensable "Eye of the industry" for modern manufacturing.



Phase-shifting Structured Light Technology

- Active structured light technique is used to project a series of composite stripe light containing specific codes onto the surface of the object, and the phase of the stripe light wave is shifted several times by the phase shift method.
- Area-array CMOS sensor captures the stripe light patt multaneously and decode the captured images.
- Based on the triangulation, the decoded information is calculated and reconstructed into 3D data, thus achieve high-precision 3D point cloud output.

The Sizector® 3D camera applies phase-shifting structured light technology, which has significant advantages over laser line technology for static area array 3D inspection. Laser line 3D scanning requires the feedback signal of an encoder to continuously trigger the laser line sensor while in motion, and its inspection accuracy and speed are affected by the mechanical movement and feedback system. In the design process, it is necessary to balance and choose between speed and precision to achieve the best inspection effect. During equipment debugging, each device must be strictly calibrated and tested to ensure the accurate operation of the motion device. In the long-term operation of the equipment, it is also necessary to consider the life and maintenance of the motion device. Phase-shifting structured light technology can scan the surface without moving the probe or object, saving the material cost of high-precision moving parts and making installation, debugging, and post-maintenance more convenient.



*Brief History of Structured Light Technology Development

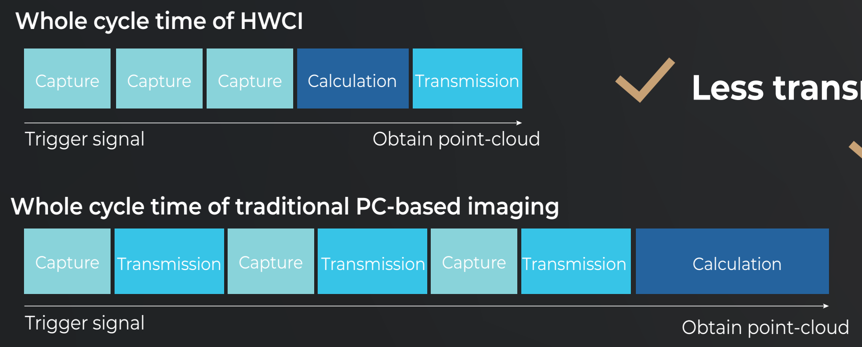
Hardware Computation Imaging

Hardware Computational Imaging (HWCI), as the name implies, is an imaging technology realized by programmable hardware circuit. From signal input to point-cloud data output, all data calculation and reconstruction processes are carried out in the camera hardware.

The original HWCI Technology of Mega Phase has shown strong performance advantages in all stages of camera imaging control, data algorithm reconstruction and point-cloud data processing. Vision projects with HWCI guarantee that no additional computer is required in the point-cloud processing, which brings about faster imaging, better image quality, simpler applications and more competitive overall cost of the system.

Comparison of whole cycle time

Between Hardware Computation Imaging and traditional PC-based imaging



*Take capturing 3 times as an example

- **Less transmission time, faster imaging**
- **Fewer computing resource, lower system cost**

High Precision

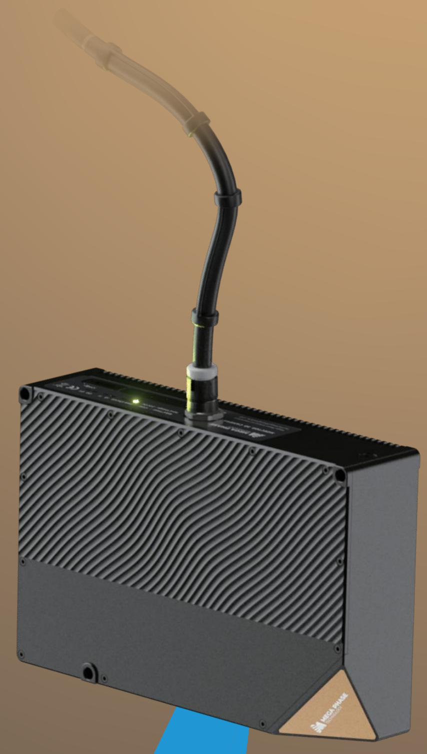
The highest native resolution has reached 16.2 million pixels, and the Z-axis repetition accuracy is up to 0.05um, which is easy to handle many kinds of vision inspection.

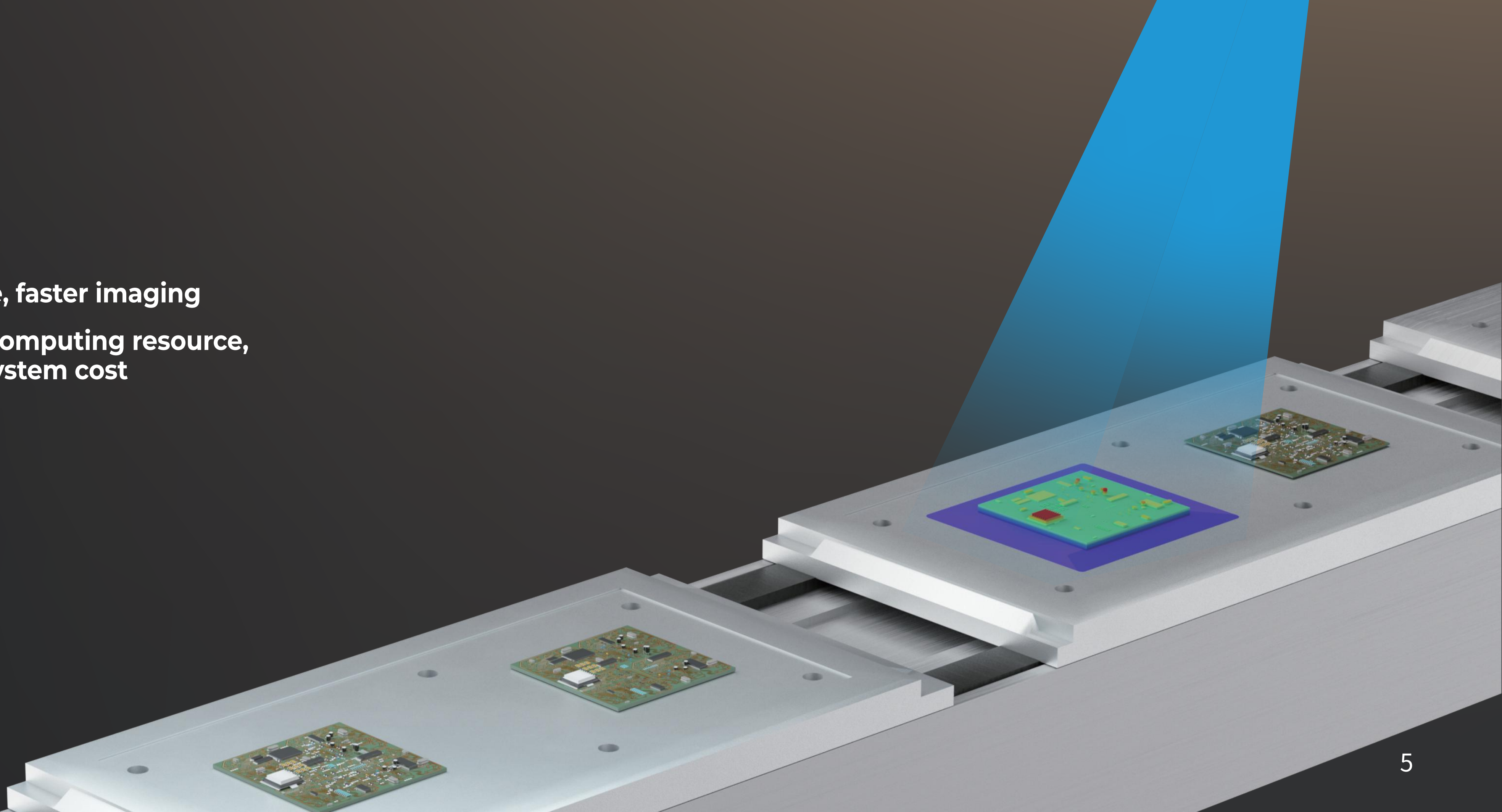
Fast Speed

The maximum whole cycle frame rate can reach 20.3 FPS. Equipped with advanced product architecture and hardware computation imaging technology, it provides faster imaging and meets the high CT requirements in various vision inspection scenarios.

Comprehensive Imaging

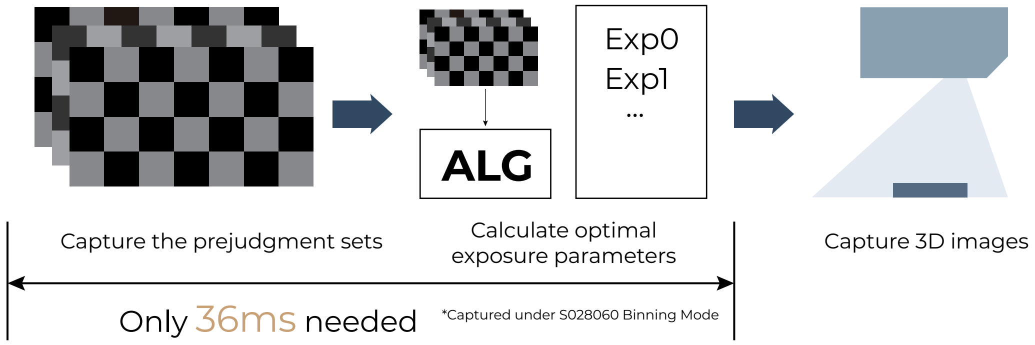
With nearly 20 hardware functions across imaging control, reconstruction, and post-processing, this product provides robust support for imaging integrity. Mega Phase Technology's diverse range of visual hardware products output high-quality images and data, enabling users to achieve precise production management quickly and efficiently when combined with industrial AI or visual applications.



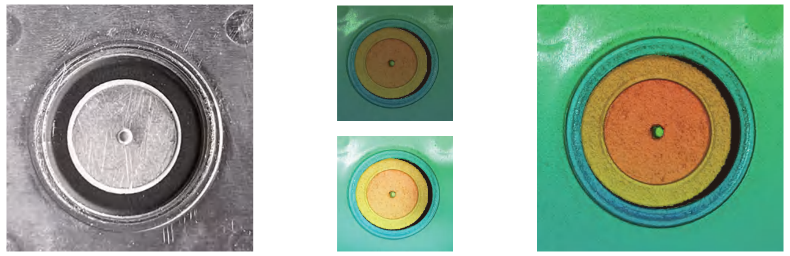


Imaging Control

Auto HDR(Patented Technology)



When implementing automatic HDR, the Sizector® 3D camera will first capture a series of predicted images on its own, and then calculate the optimal exposure parameters based on the real-time environment of the application scene to achieve real-time adaptive camera parameters under single-frame image capture. All calculations and settings are automatically completed by the camera hardware, taking only dozens of milliseconds. When users enable this feature to image products with individual or batch differences, there is no need for manual tuning, which can greatly promote project progress.



Origin Image | Unprocessed HDR | Auto HDR

Why we need Auto HDR

Auto HDR will bring:

Auto HDR will bring
Simpler project evaluation
Faster project acceptance
Less on-site maintenance

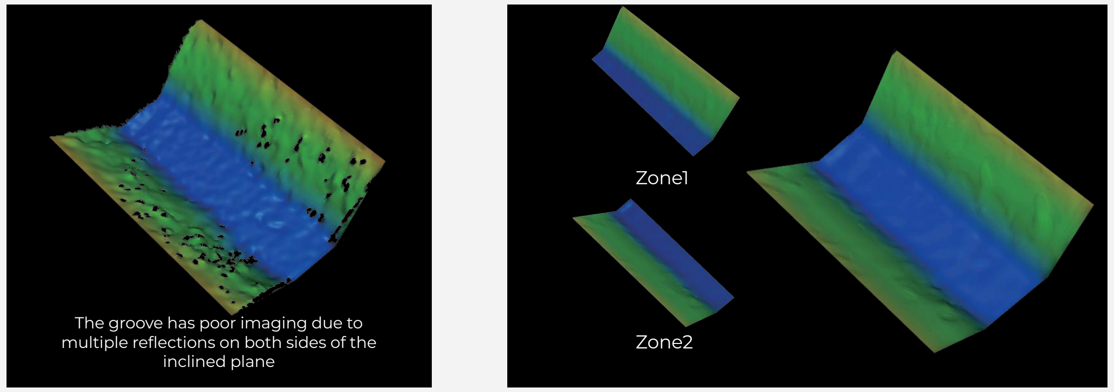
Uncertain scenarios

Differences between Individual Objects

Differences between Batches

Partition Projection

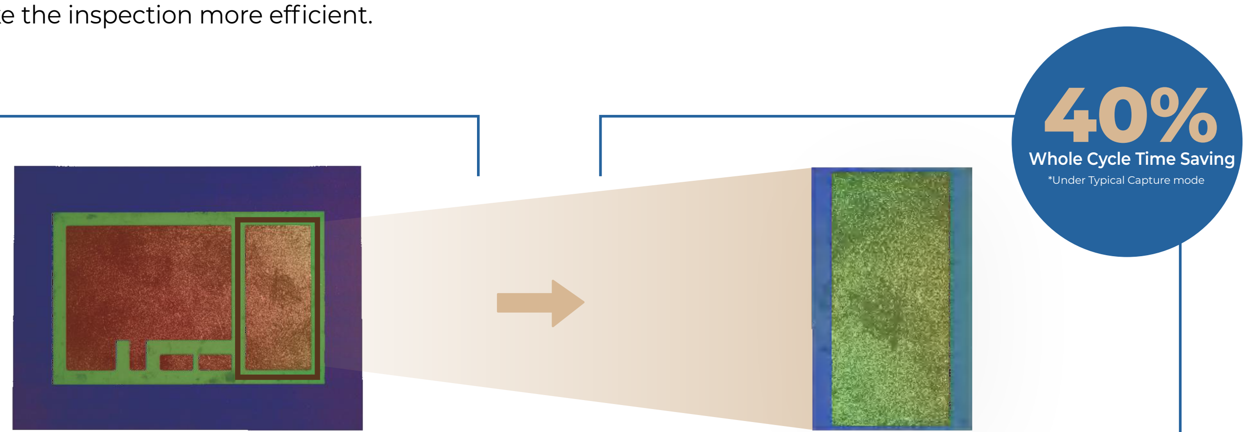
Partition Projection can avoid multiple reflection interference caused by surface material and ambient light. Users can customize the shape and size of the projection area (either rectangle or circle) and use it in conjunction with the ROI function to only project and read data in areas of interest, resulting in a substantial reduction in camera processing time.



Before | After | After Partition Projection stitching

Region of Interest (ROI)

When obtaining the point cloud image of the measured object, the original field of view can be cropped to obtain a customized field of view, also known as Region of Interest (ROI). The unpreserved part will no longer contain any data. This measure can effectively reduce the amount of data, lower the data processing time, and make the inspection more efficient.

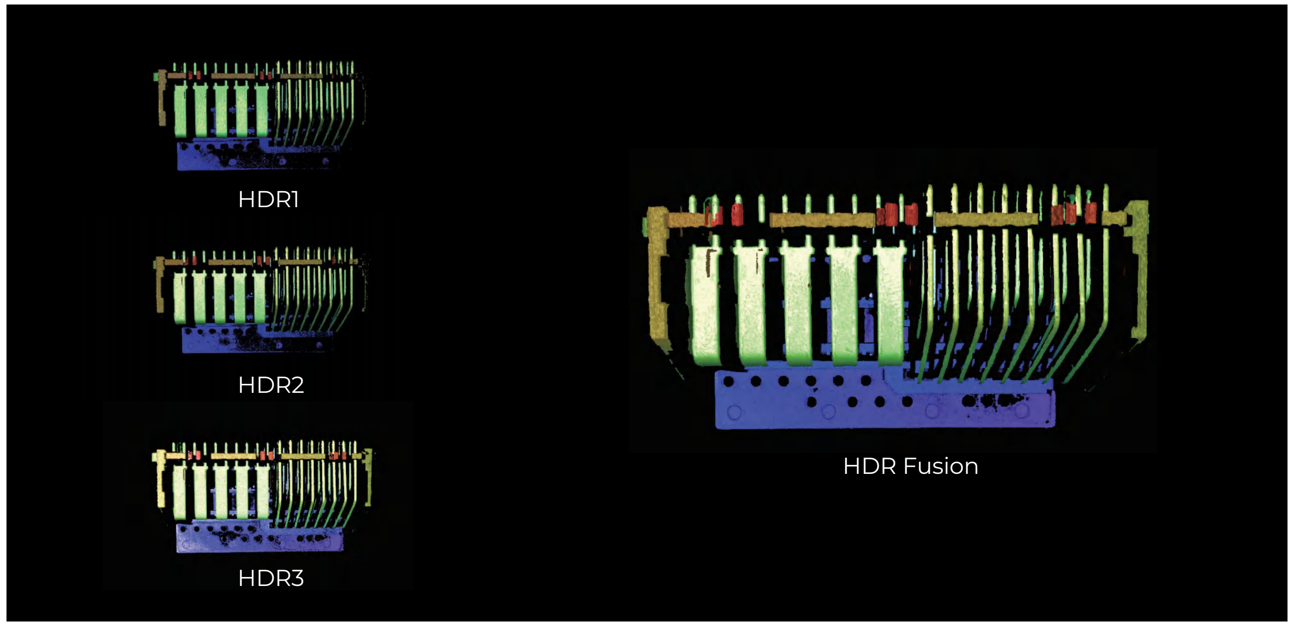


Complete image output | ROI segmented image output

Algorithm Reconstruction

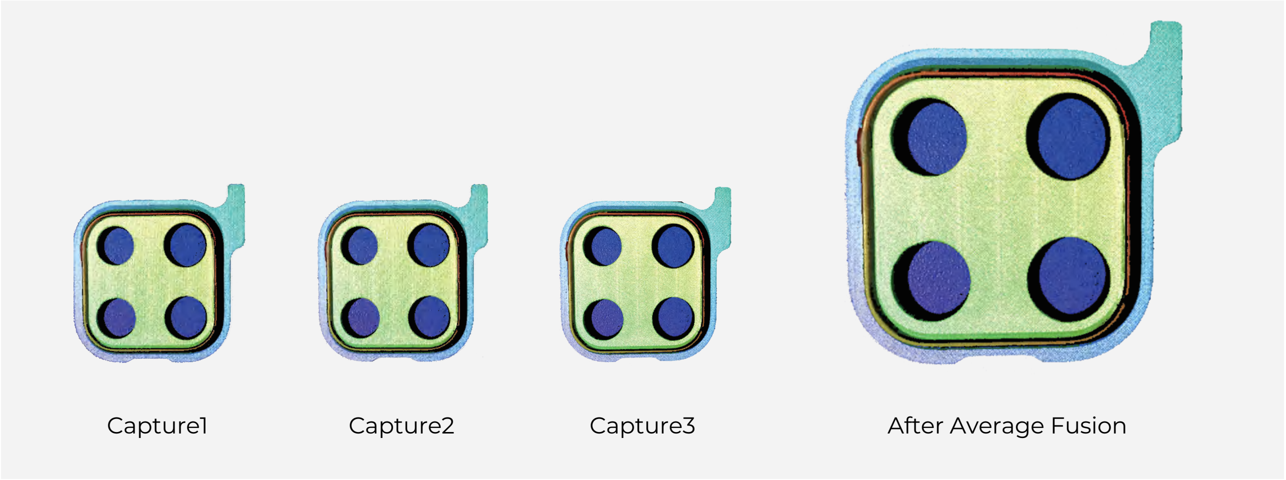
HDR Fusion

During the algorithm reconstruction stage, HDR fusion involves integrating 3D point cloud images captured under different exposure settings. Both the S028 and S162 series achieve HDR fusion through hardware implementation, which enhances image integrity with almost no additional cycle time.



Average Fusion

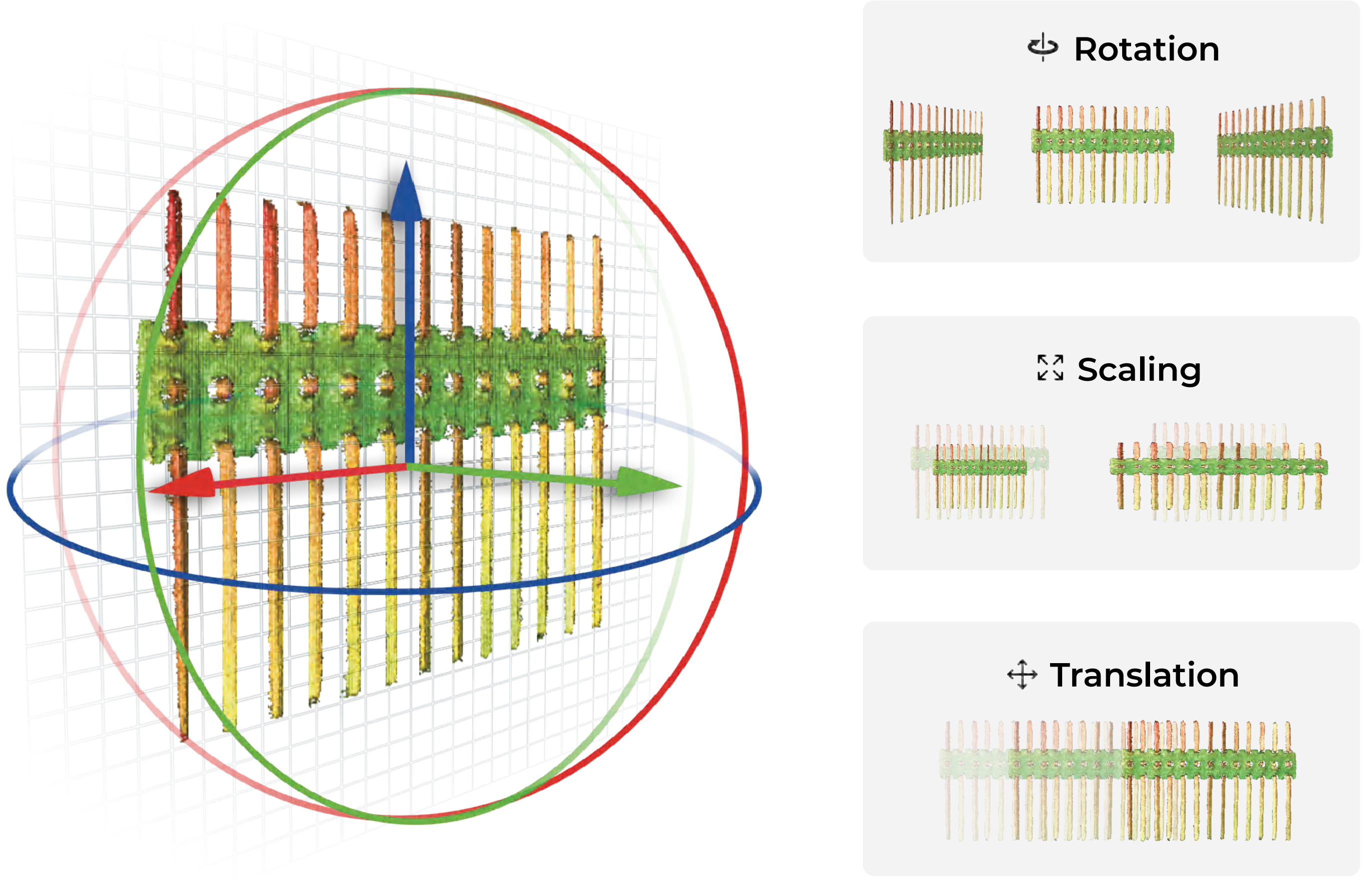
The S028 and S162 series are capable of achieving average fusion on the hardware side. This involves averaging multiple 3D data sets with the same exposure parameters to improve the repetition accuracy of the measurements. By leveraging hardware capabilities, this process is made more efficient and reliable than software-based fusion methods.



Point Cloud Hardware Processing

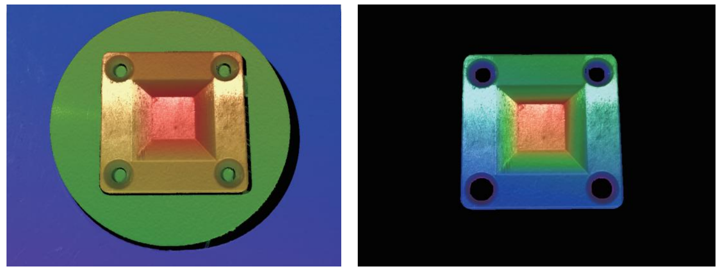
Matrix Transformation

The matrix transformation function, achieved through the setting of 3D camera hardware parameters, can effectively scale, translate, and rotate 3D point clouds in the X, Y, and Z coordinate directions. This function provides great convenience for various industrial applications such as unifying the world coordinate system for multiple 3D cameras, single-camera multi-FOV stitching, hand-eye coordination, and data difference compensation.



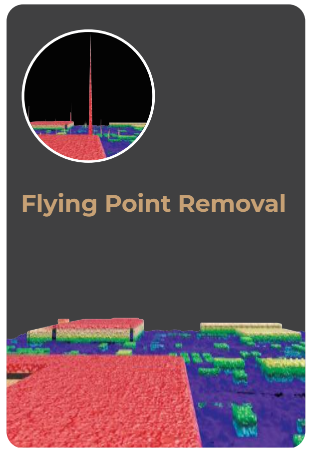
Range Check

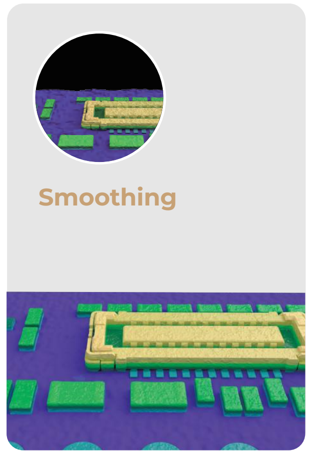
The camera can mark points that exceed the specified range as invalid points, making it easy to filter out unrelated parts such as background, tools and vehicles, and improve recognition accuracy and efficiency.

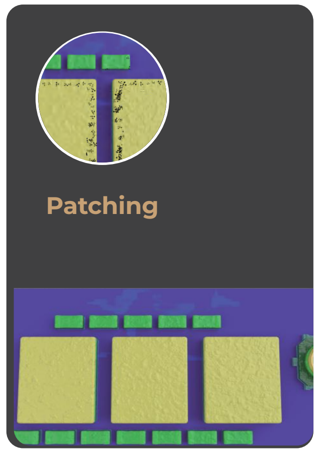


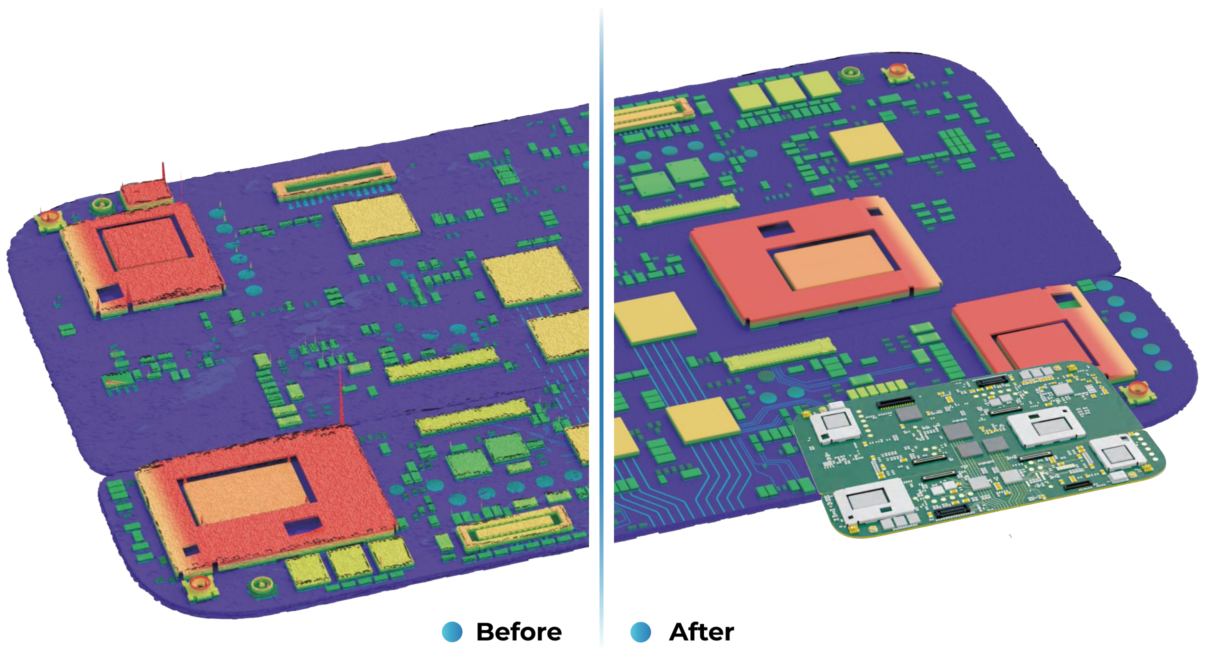
Point Cloud Filtration

Point Cloud Filtration can perform up to 5 rounds of post-processing within a 3 x 3 window, while also featuring a function for recognizing object features and preserving their original characteristics.



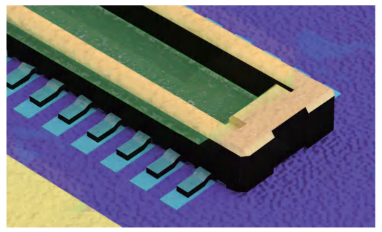


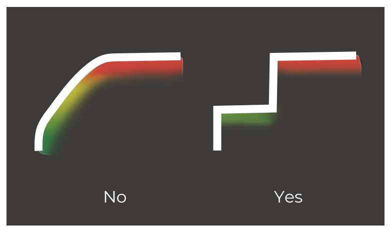




Feature Preservation

To ensure high-quality point clouds and reduce the inspection/measurement errors, S028 & S162 are capable of preserving the measured object's original characteristics without excessive deformation, which is usually caused by post-processing.

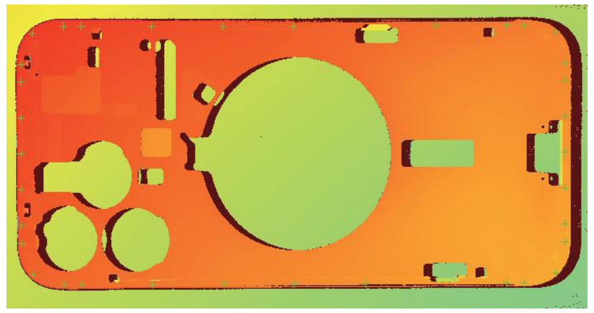




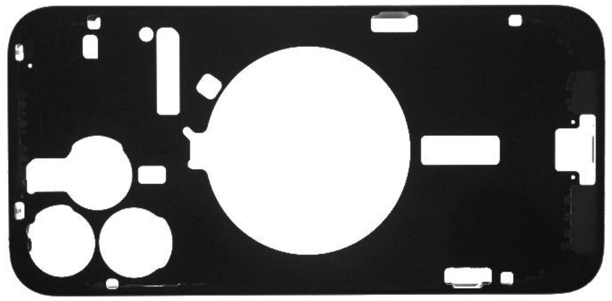
2D+3D Function

One-Stop Acquisition

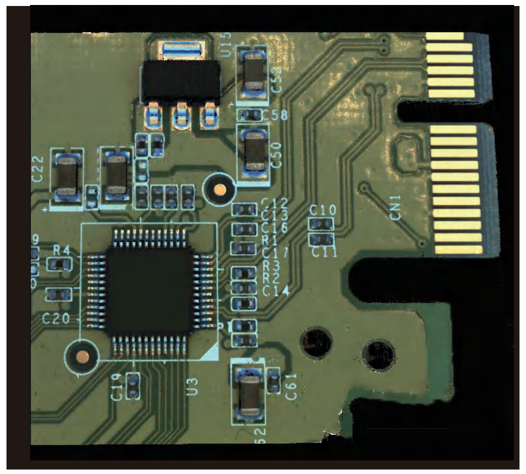
The S028 and S162 series can be connected to different external light sources, such as white light, RGB, IR, UV, etc. to achieve better contour extraction, size measurement, mark positioning, surface defect inspection, and other 2D functions. Combined with 3D depth information, customers can acquire complete inspection data in one-stop, resulting in improved inspection rates and reduced screening rates.



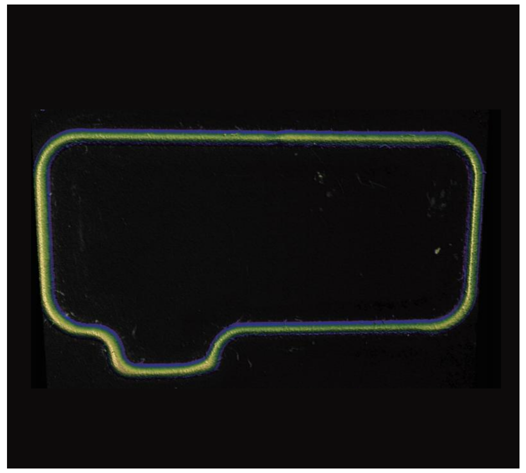
3D Depth Image



2D Image with Back Light



3D Image with RGB Light

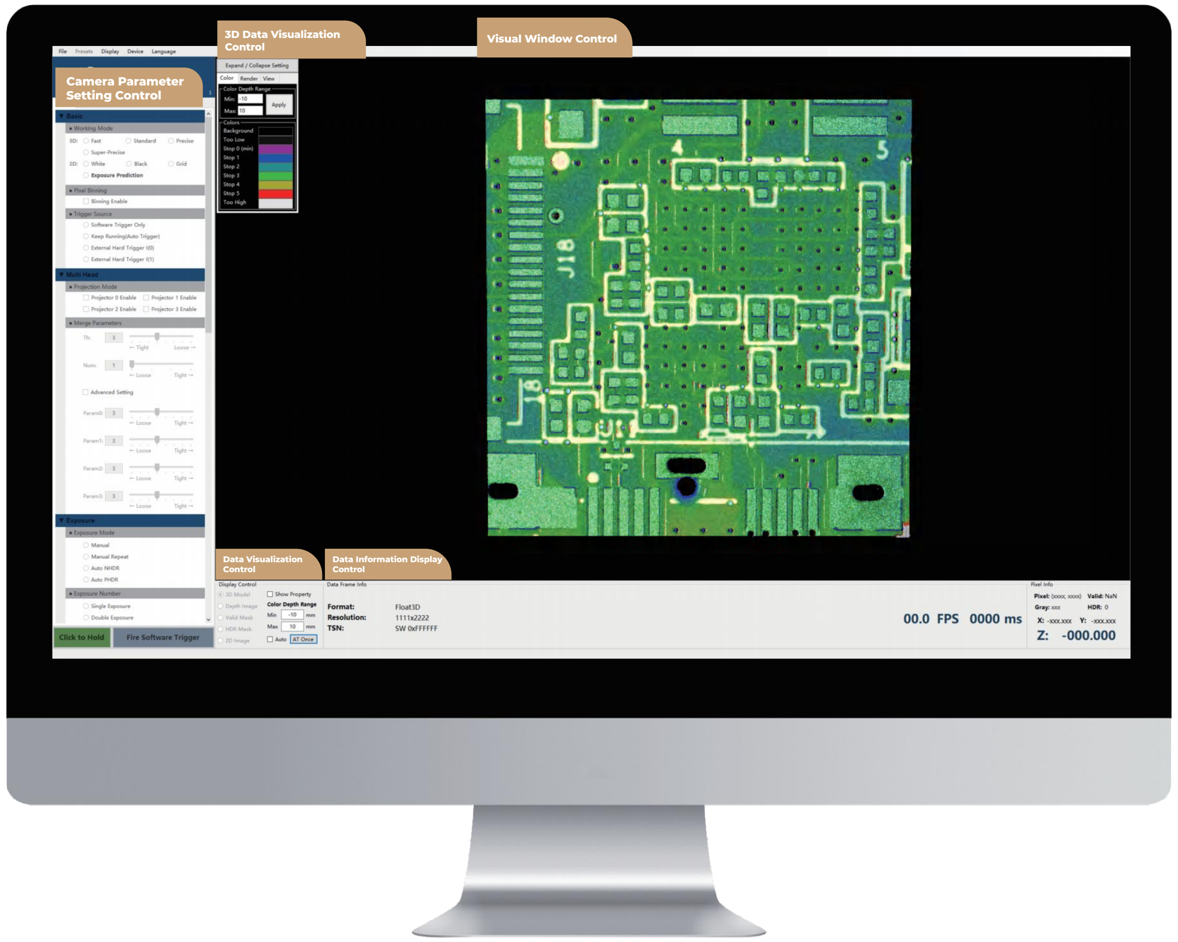


3D Image with UV

Sizector®MPS-SDK

The Sizector® MPS-SDK supports a wide range of common programming languages and platforms, providing flexible open-source code that can efficiently complete inspections in various complex scenarios and production lines. Additionally, the SDK features powerful post-processing functions that remove a series of interference data, resulting in improved inspection accuracy.

Sizector®MPS-SDK Interface



Affluent Language and Platform Supported

Supports general programming languages such as C, C++, C#, and Python, and is compatible with Windows and Linux operating systems, as well as x32 and x64 architectures. Conforms to the GenlCam communication protocol, and can be directly accessed from the Halcon graphical user interface. It also allows for data conversion to third-party visual libraries, such as Halcon and VisionPro.

Open-Source User Interface

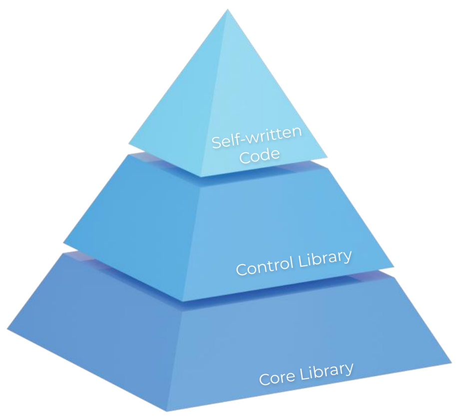
Abundant control UI, including 2D/3D data visualization controls that are user-friendly and easy for customers to design and operate.

Open-source online 3D Measurement Software

The SDK open-source mode covers framework, interface and operators.Users can develop and add new operators into SDK software, which make it convenient for later development.

Powerful Post-Processing Function

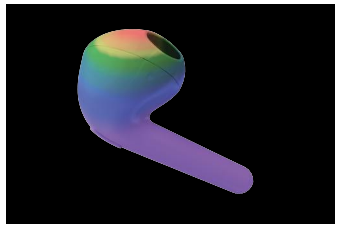
In addition to the hardware preprocessing function of the camera, the post-processing function in the SDK can also be used for filtering processing of the image after capture, such as range check, fly point removal, patching and smoothing. These powerful functions provide users with more flexible options.



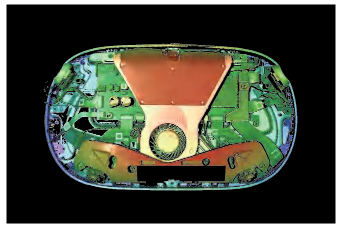
Develop Applications like Building Blocks!

The core class library of Sizector®MPS-SDK defines an open interface based on various programming languages. The control class library includes camera parameter setting, data visualization, image visualization display window and data visualization. Users can independently choose their preferred language to call the core class library and control class library for secondary development, making the writing of applications more convenient and faster, just like building blocks to develop applications.

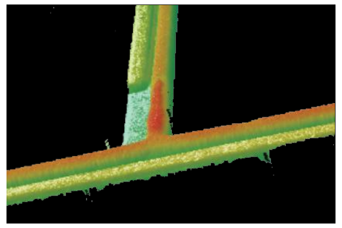
Consumer Electronics



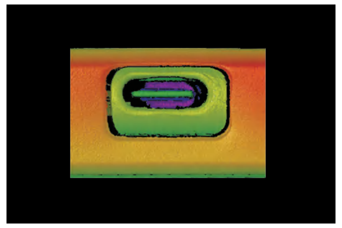
Earphone



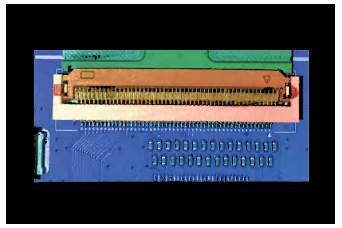
VR Glass



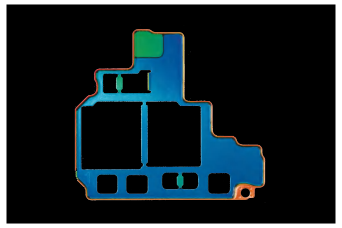
Sealant



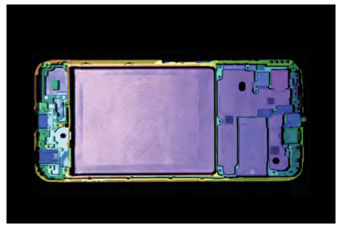
Type-C connector



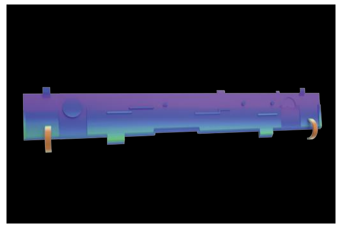
Flat Cable



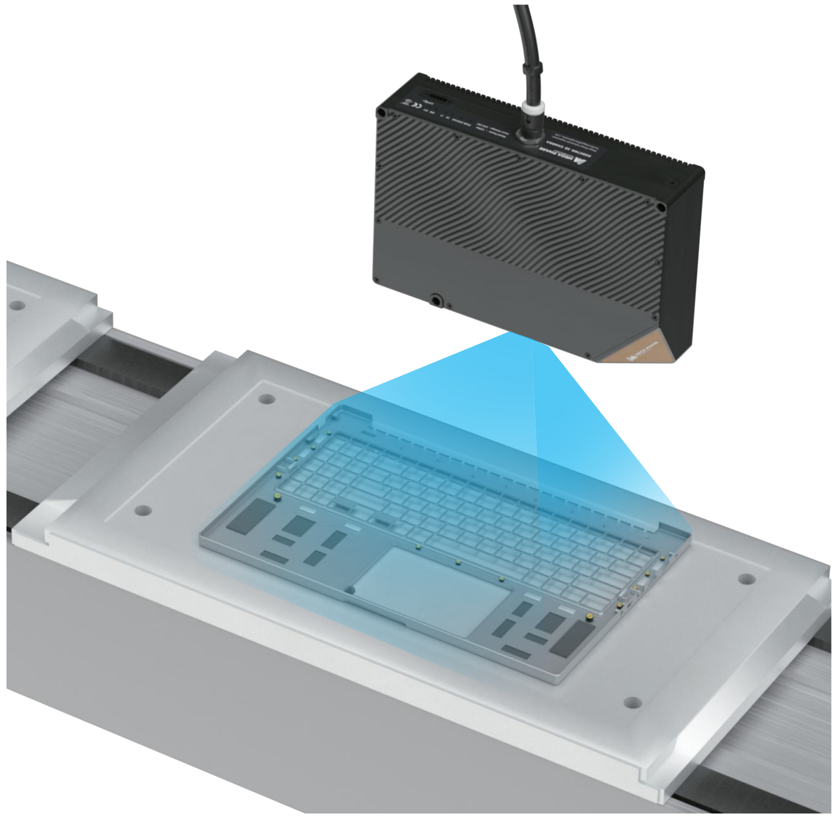
Shielding Case

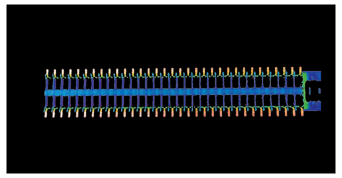


Middle plate

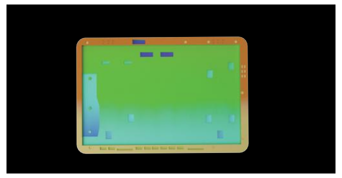


Hinge

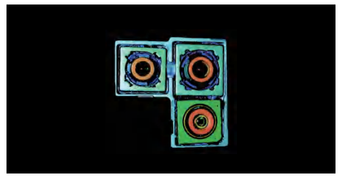




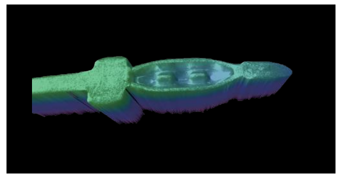
Connector



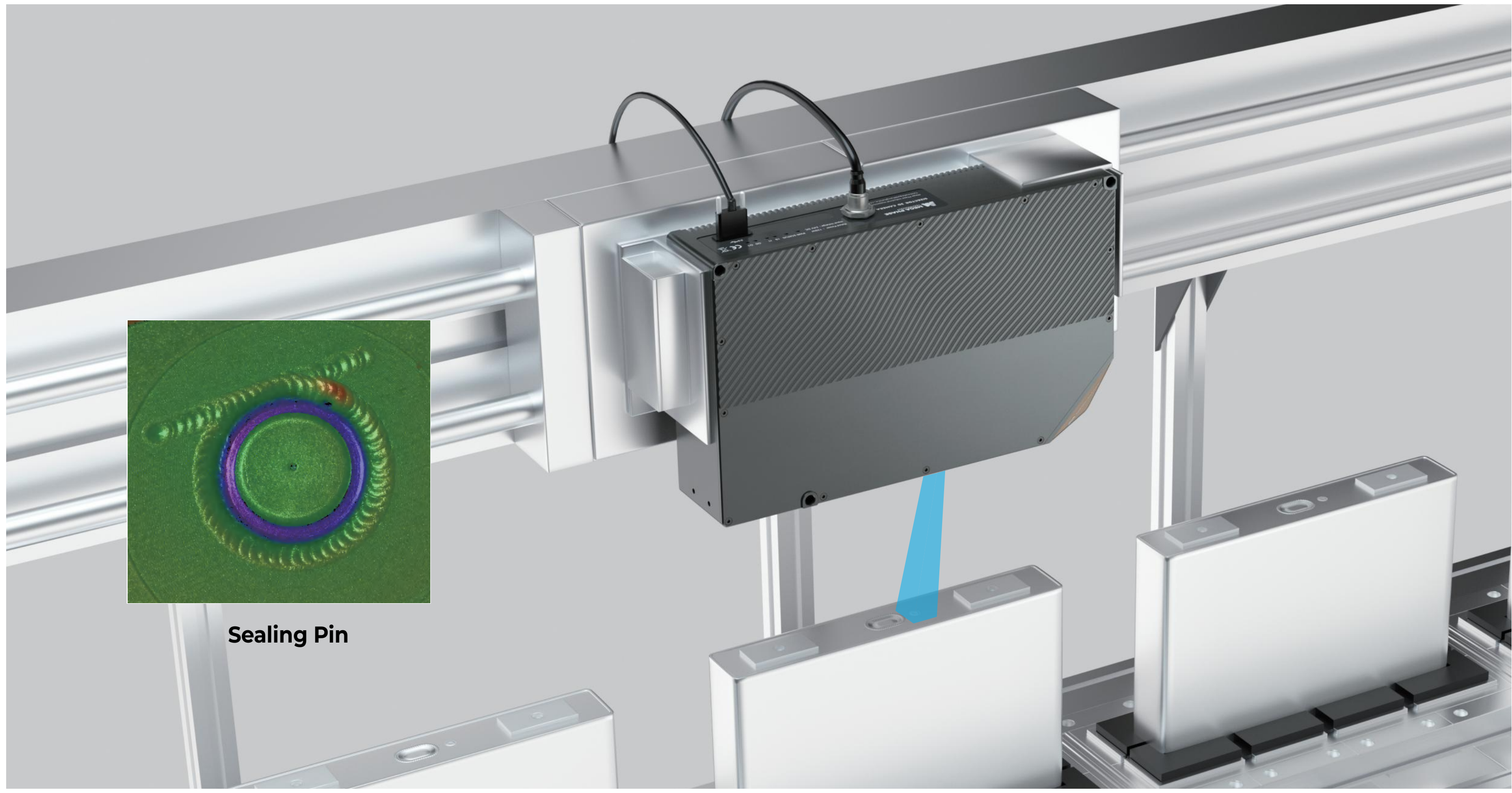
Pad Middle Plate



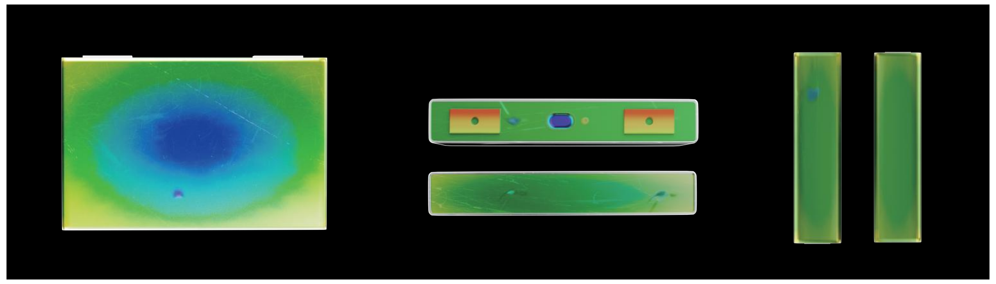
Lens Module



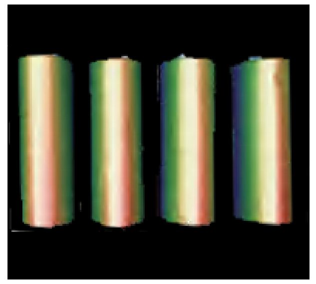
Pin



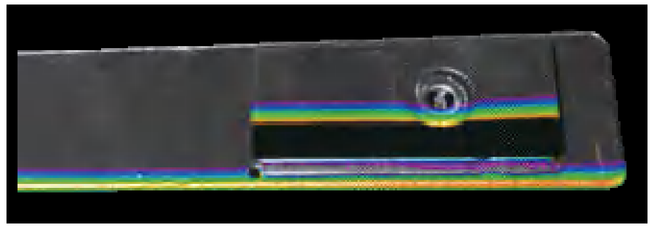
Sealing Pin



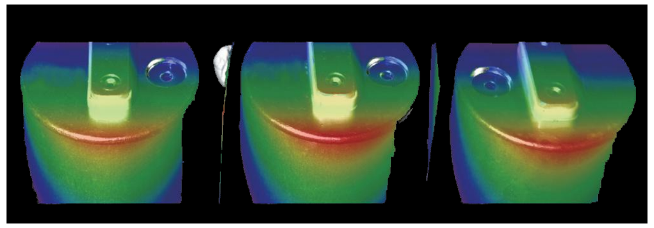
Cell Visual Inspection



Cylindrical Cell Side

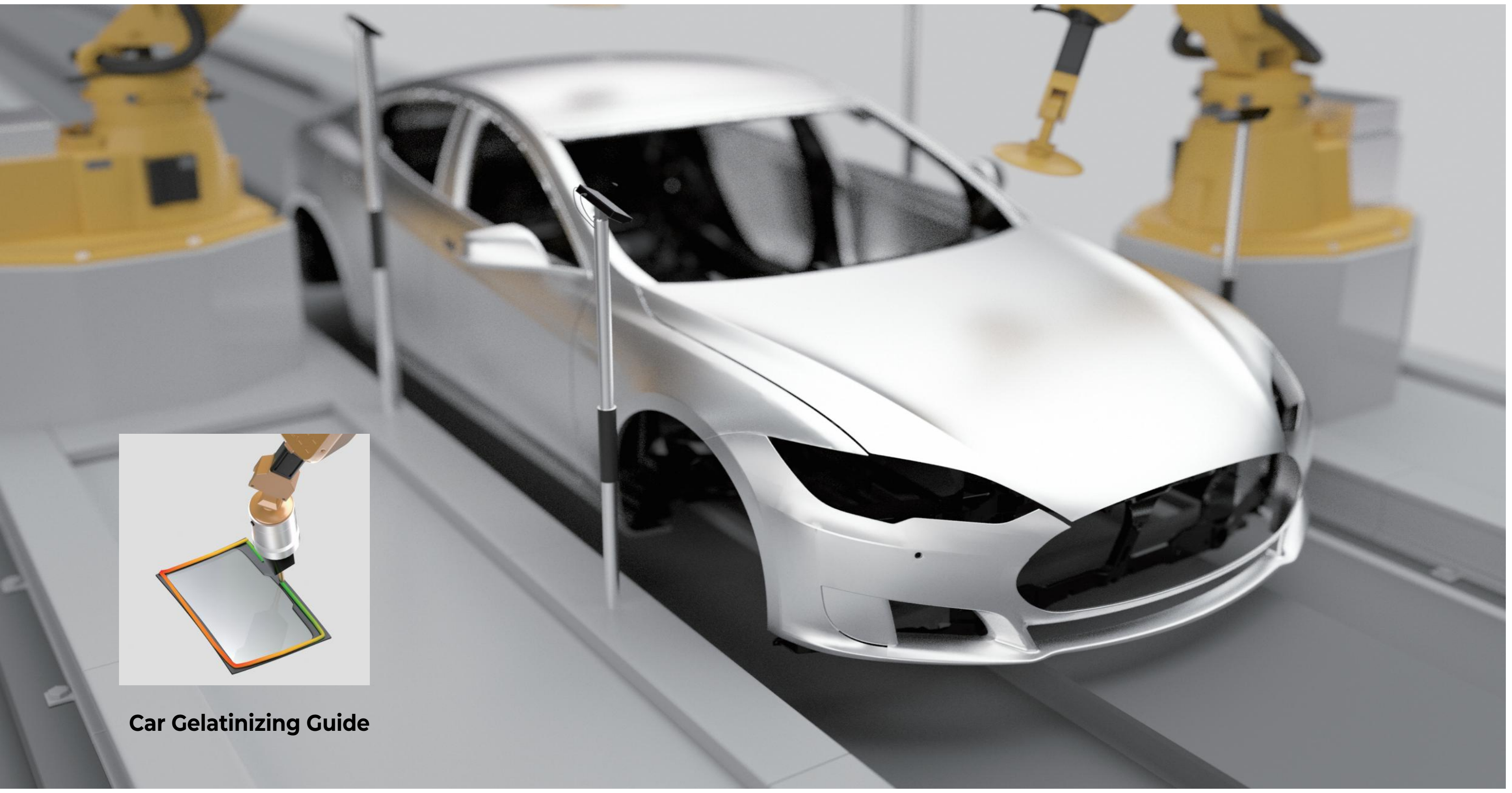


Cell Cap Plate Welding

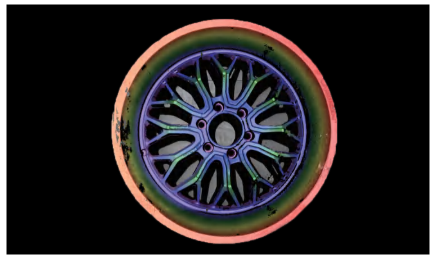


Cylindrical Cell Cap Plate Welding

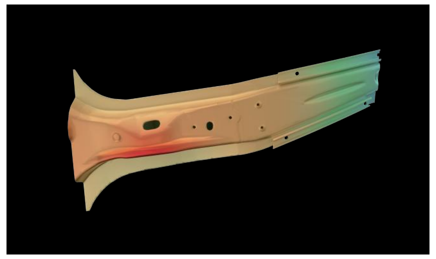
Automotive Battery



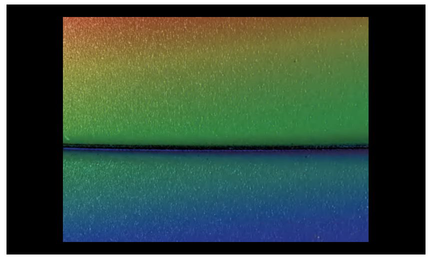
Car Gelatinizing Guide



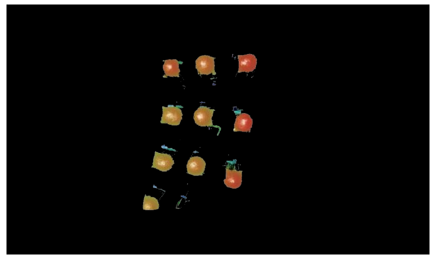
Hub



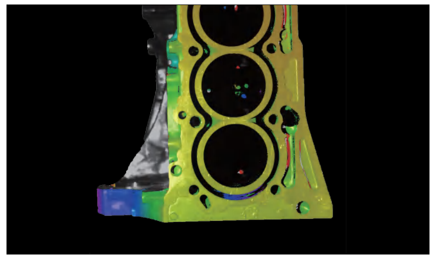
Car Frame



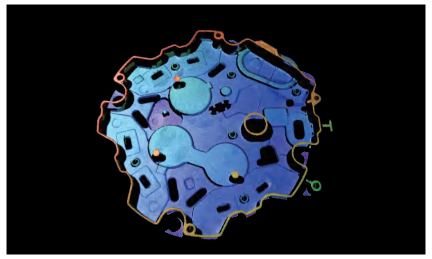
Gap



Hair-Pin



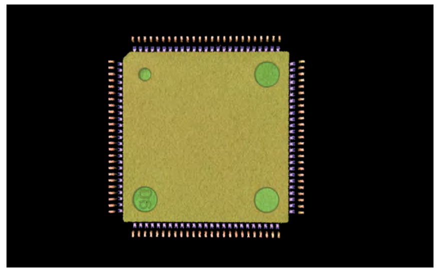
Engine Cylinder Block



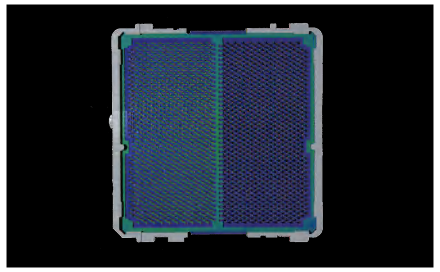
Structural Parts

Automotive Industry

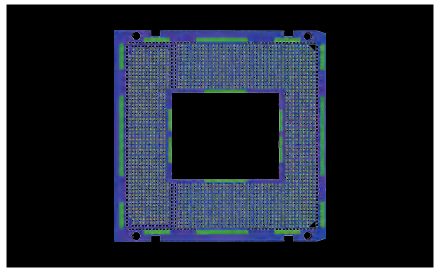
Semiconductor



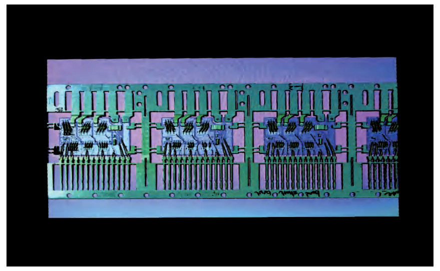
IC Components



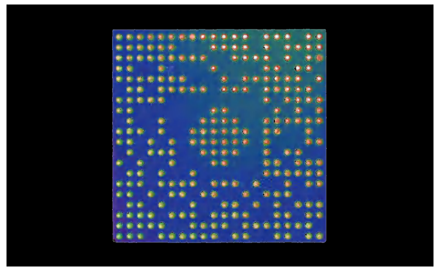
CPU Socket-Pin



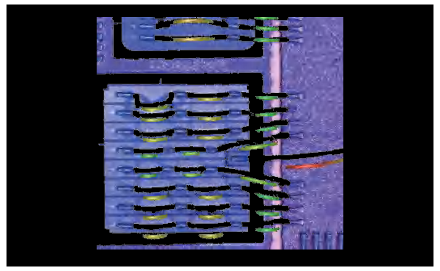
CPU Socket-Ball



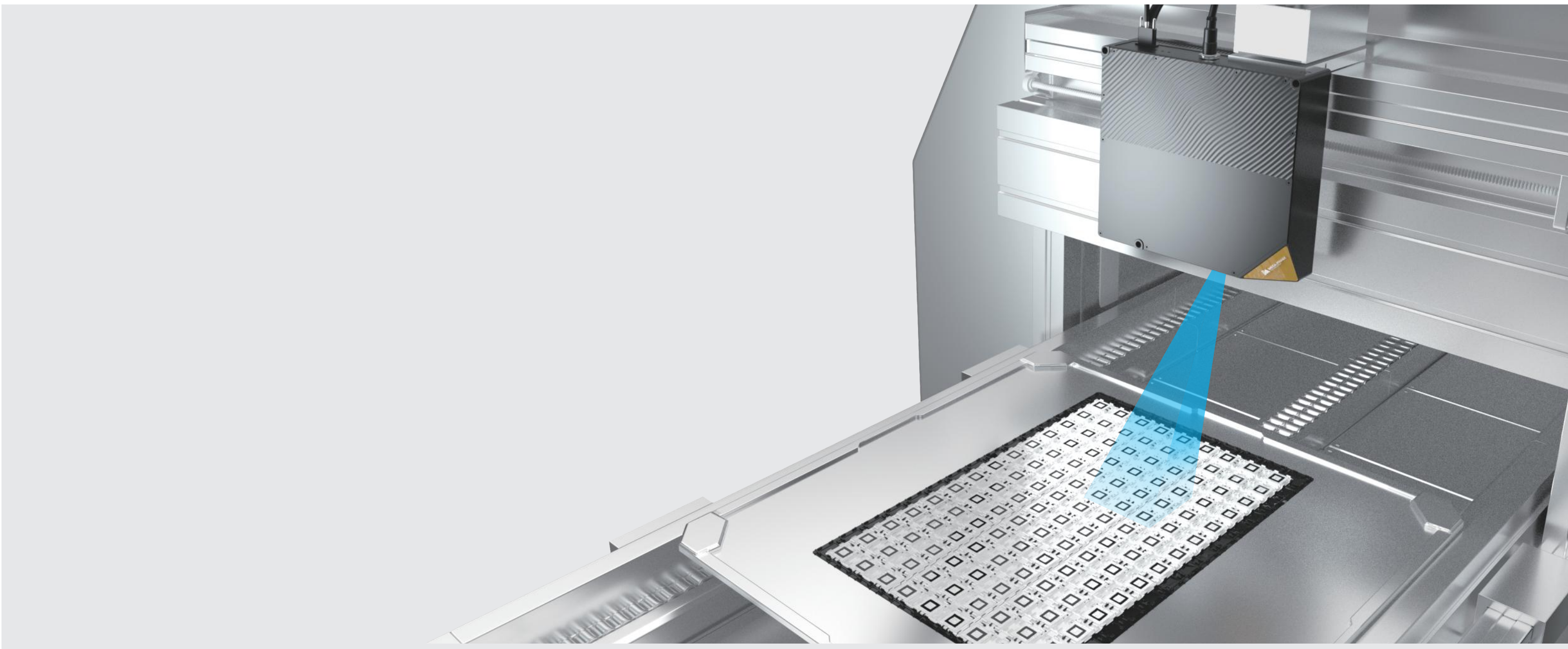
Semiconductor Wire



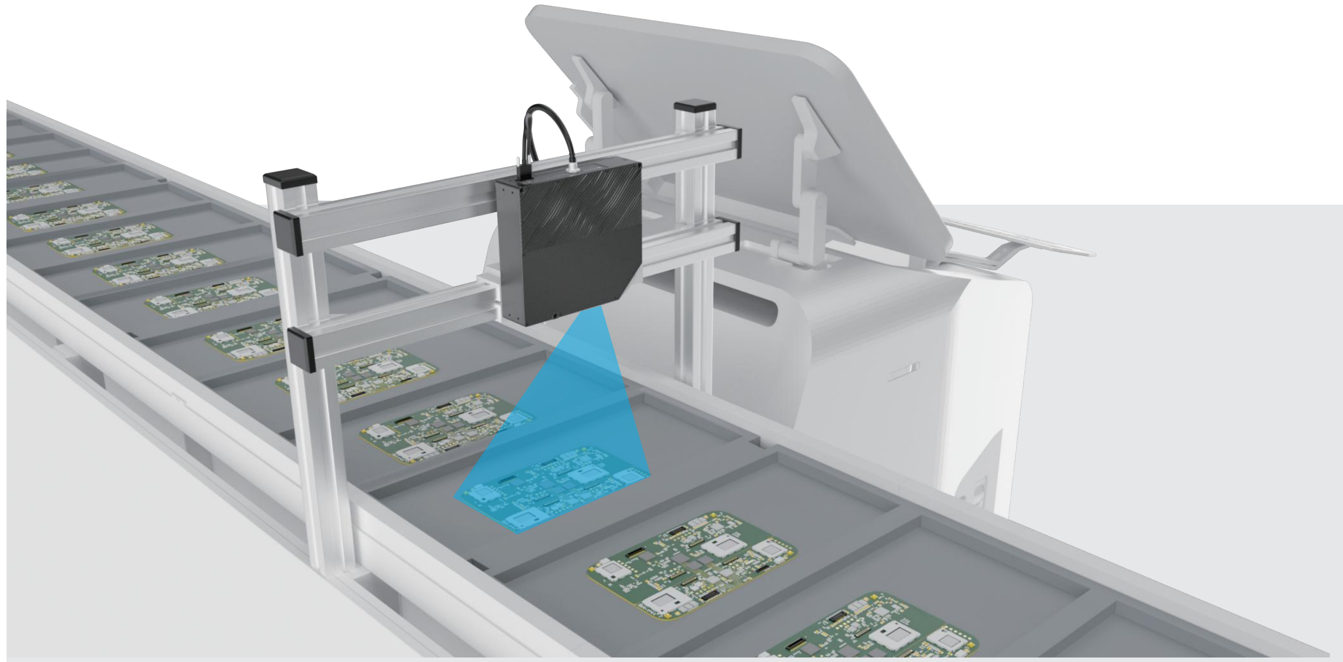
BGA

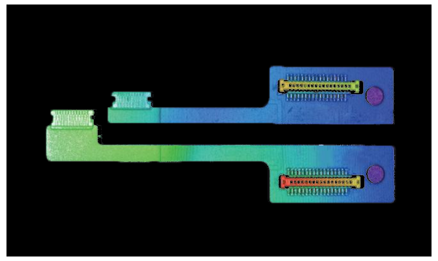


IGBT

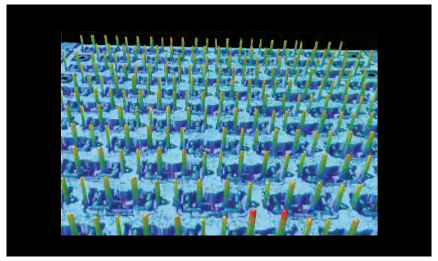


PCB/PCBA

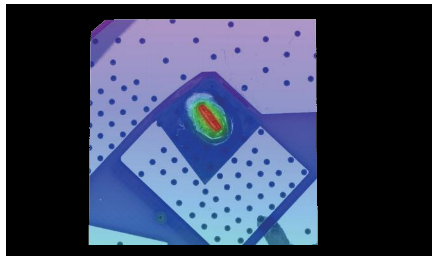




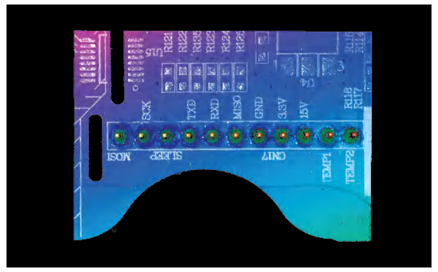
FPC



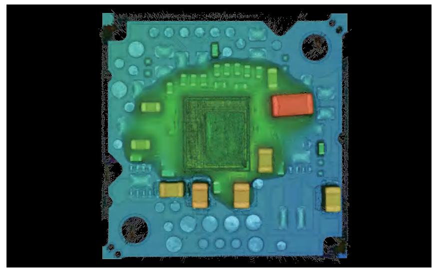
Filter Base



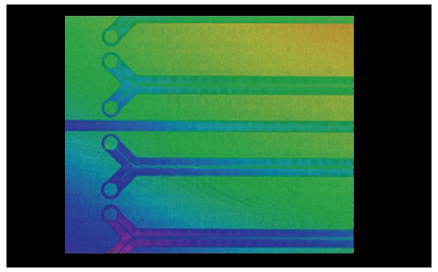
Welding Points



Pin

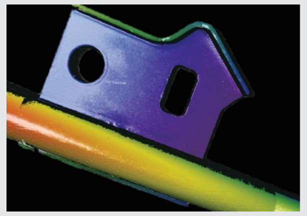


Glue Inspection

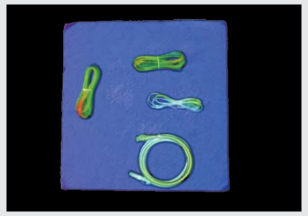


Coating Lead

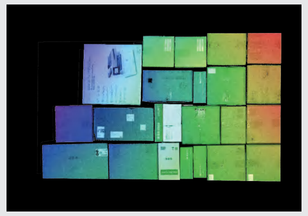
Bin-picking



Tube

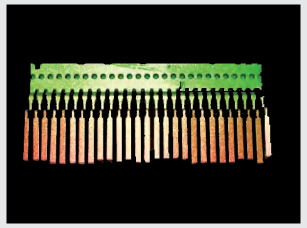


Wire/Cable

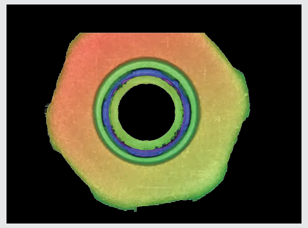


Package

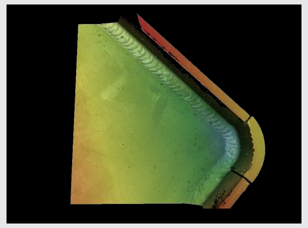
Highly Reflective Metal



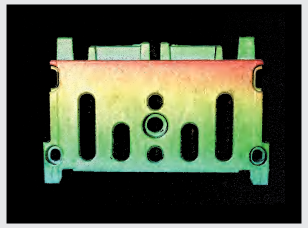
Steel Belt



Metal Groove

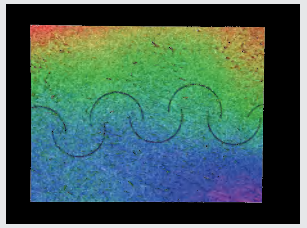


Metal Welding

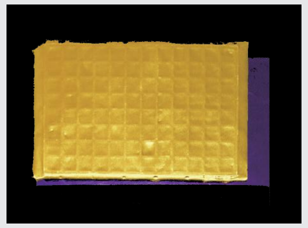


Metal Part

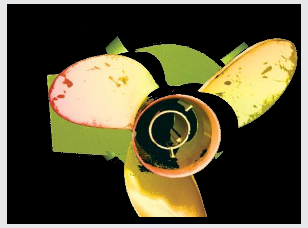
More



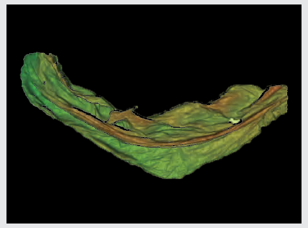
Leather



Kit



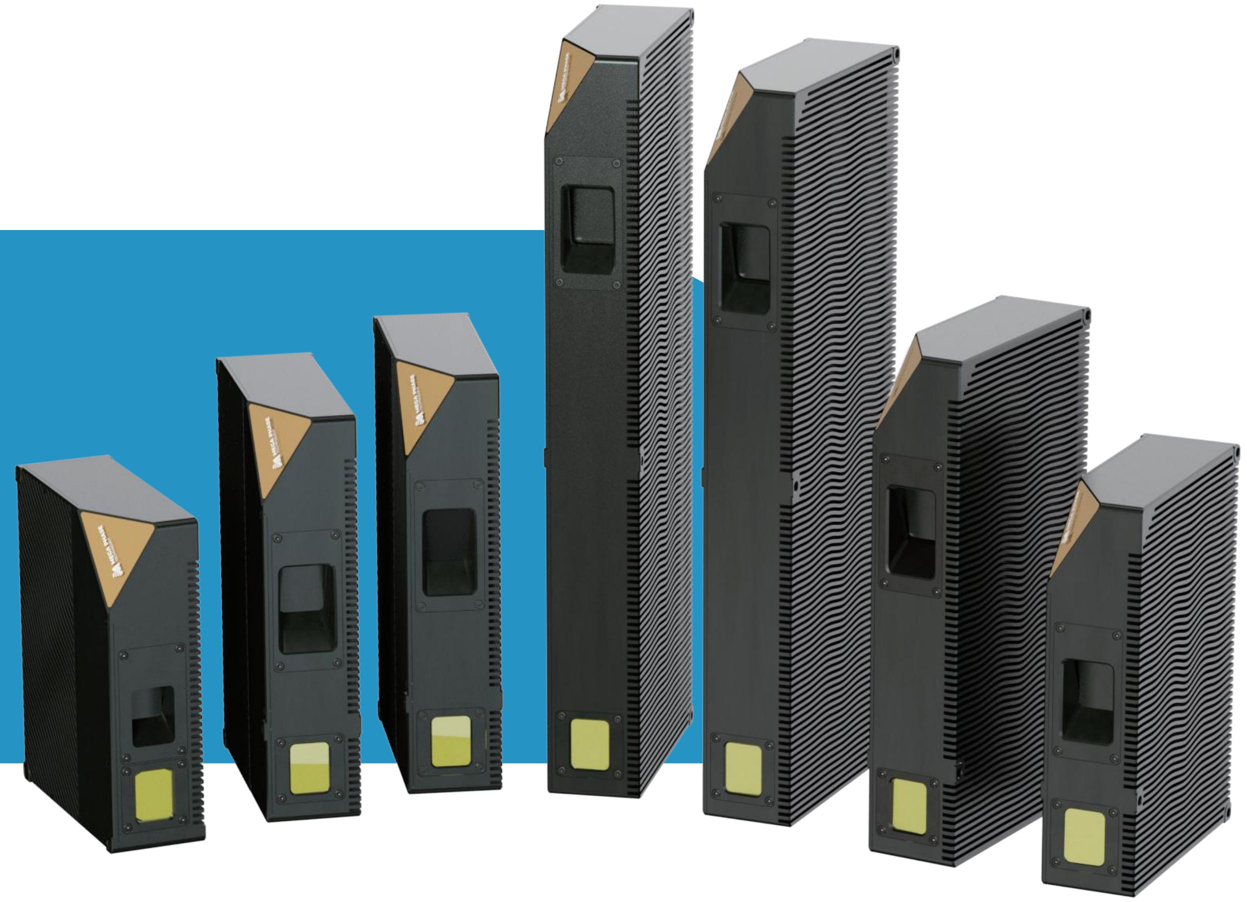
Propeller



Tobacco

Sizector®3D Camera S028 Series

Redefine the 3D camera



Redefine the 3D Camera

S028 Series can reach a maximum frame rate of 20.3FPS, covering 7 FOV types from 40mmx30.3mm to 800mmx605.8mm; Z-axis area repetition accuracy up to 50μm, a series of high frame rate, high precision and rich hardware computation functions.

Wide Applications

It is suitable for 3D visual inspection in various industrial scenarios, such as 3D inline inspection, assembly identification inspection, positioning guidance, bin-picking and other applications.

Specifications	S028040	S028060	S028120	S028180	S028240	S028360	S028800
Resolution (px)				2.8M (1944x1472)			
Framerate of Whole Cycle Time			≤20.3 FPS(@0.7M)		≤8.7FPS(@2.8M)		
Clearance Distance (mm)	95	160	200	305	423	1050	1500
Standard FOV (mm)	40x30.3	60x45.4	120x90.9	180x136.3	240x181.7	360x272.8	800x605.8
Measurement Range Z (mm)	±8	±10	±30	±45	±60	±90	+600,-1400
*1*2 Single Repeatability Z (μm)	0.5	0.6	1.2	1.7	2.3	5.6	58.2
*1*3 Area Repeatability Z (μm)	0.05	0.05	0.11	0.19	0.21	0.41	9.54
Pixel Interval (mm)	0.021	0.031	0.062	0.093	0.123	0.185	0.412
Dimensions (mm)	146x180x53.5	146x210x53.5	146x225x53.5	146x235x53.5	146x275x53.5	146x404x53.5	146x412x53.5
Weight (kg)	1.9	2.1	2.1	2.3	2.4	2.9	3.1

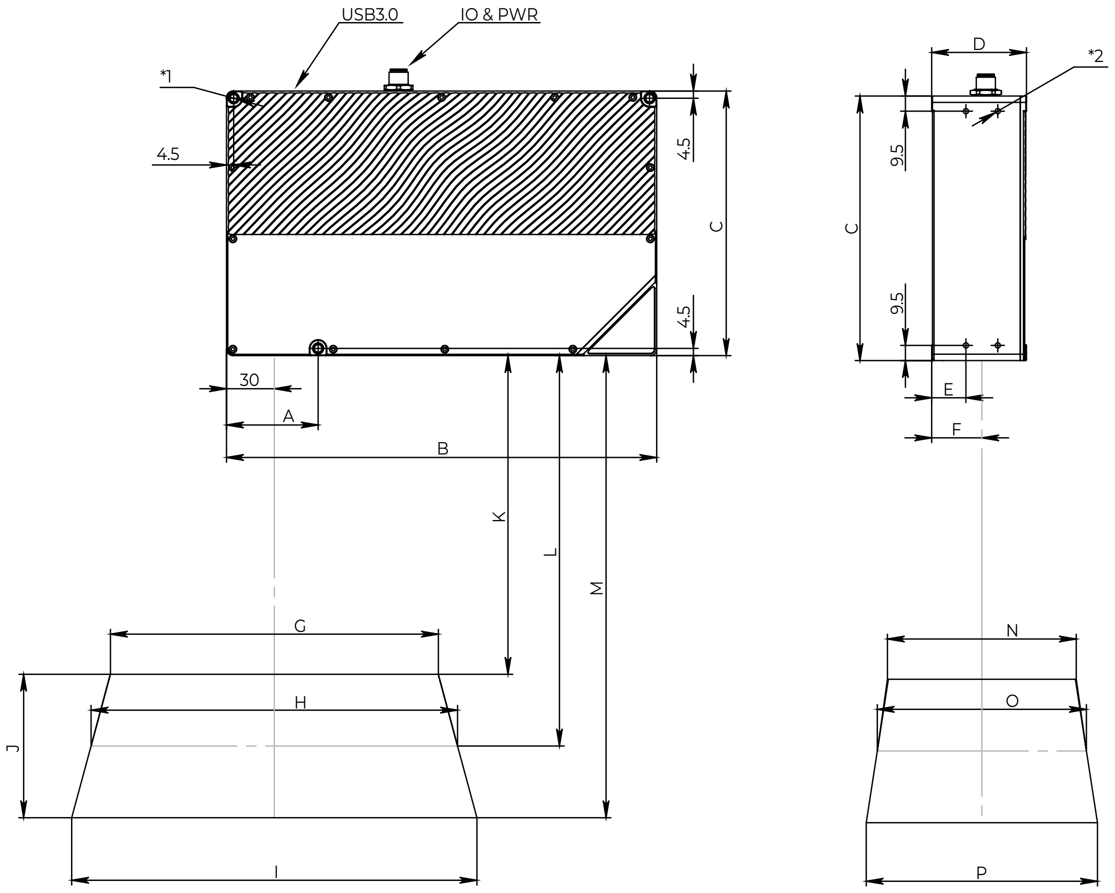
Light Source	Blue LED
Conformity	CE, GenICam
Operating Systems	Linux / Windows 7、8、10、11
Platform	C / C++ / C#/ Python
Data interface	USB3.0
Input / Output Signal	Two-channel Nonpolar Level Signal Input /Switchable Signal Output (12/24V Compatible)
Operating Voltage/Current	24V / 5A
Operating Temperature	0~40℃
Storage Temperature	0~60℃
Operating Humidity	20%~80% (No Consendation)
Standard Accessories	3m High-Felxible USB Cable , Power Adapter , 3m Power Cable and 3m I/O Cable

*1 The worst result of repeatability in full FOV & Measure Range, of which the target is a ceramics plate.

*2 Single-Pixel repeatability: $\sigma = \sqrt{\frac{1}{100}\sum_{i=1}^{100}(\overline{Z_i} - \overline{Z_A})^2}$, $\overline{Zi}$ is the height of point P, point P is at the center of area A. The size of area A is equal to1/100 of FOV, and is the average height value of all the pixels in area A.

*3 Area repeatability: $\sigma = \sqrt{\frac{1}{100}\sum_{i=1}^{100}(\overline{Z_{Ai}} - \overline{Z_{Bi}})^2}$, $\overline{ZA}$ & $\overline{ZB}$ are the average height values of all the pixels in area A and area B. The size of area A and area B is equal to 1/100 of FOV, and they are next to each other.

Installation Drawings



*1 Front Mounting①: 3x5.3 ⌀ through; Front Mounting②: 3xM6↧12;Back Mounting②: 3xM6↧12;
*2 Side auxiliary Mounting: 4xM4↧7 or parts mounting.

Dimensions（mm） / Type		S028040	S028060	S028120	S028180	S028240	S028360	S028800
A	Install screw holes(front bottom)	4.5	52.5	52.5	52.5	52.5	190.5	190.5
B	Length	180	210	225	235	275	404	412
C	Height	146	146	146	146	146	146	146
D	Thickness	53.5	53.5	53.5	53.5	53.5	53.5	53.5
E	Mounting screw holes(side bottom)	18.5	18.5	18.5	18.5	18.5	18.5	18.5
F	Distance(lens center to underside)	28.5	28.5	28.5	28.5	28.5	28.5	28.5
G	Near FOV-X direction	37.7	56.9	104.7	156.6	208.4	329.3	475.5
H	Standard FOV-X direction	40	60	120	180	240	360	800
I	Far FOV-X direction	42.3	63.1	135.3	203.5	271.6	390.7	1557.2
J	Depth of Field	16	20	60	90	120	180	2000
K	Near Object Distance	87	150	170	260	363	960	900
L	Center Object Distance	95	160	200	305	423	1050	1500
M	Far Object Distance	103	170	230	350	483	1140	2900
N	Near FOV-Y direction	28.6	43.1	79.3	118.5	157.7	249.5	360.1
O	Standard FOV-Y direction	30.3	45.4	90.9	136.3	181.7	272.8	605.8
P	Far FOV-Y direction	32	47.7	102.5	154	205.7	296.1	1179.2

Accessories List

Standard Accessories

MPS-ADP120A24
S Power Adapter

MP-PW-1500
1.5m Power Cable

MPS-PWI-3000
3m Aviation Plug Power / IO High-Felxible Cable

MP-USB-3000
3m High-Felxible USB Cable

Optional Parts

MPS-PWI-7000
7m Aviation Plug Power/ IO Flexible Cable

MPS-PWI-15000
15m Aviation Plug Power/ IO Flexible Cable

MPS-PWI-20000
20m Aviation Plug Power/ IO Flexible Cable

MPS-PWI-10000T
10m Aviation Plug Power / IO Flexible Cable (for drag chain)

MPS-PWI-20000T
20m Aviation Plug Power / IO Flexible Cable (for drag chain)

MP-OUSB-7000
7m USB3.1 Flexible Hybrid Fiber Data Cable

MP-OUSB-10000
15m USB3.1 Flexible Hybrid Fiber Data Cable

MP-OUSB-15000
15m USB3.1 Flexible Hybrid Fiber Data Cable

MP-OUSB-20000
20m USB3.1 Flexible Hybrid Fiber Data Cable

MP-PICE-U3
PIC-E Port Four ports of the USB3.0 Expansion Card Supply Independent Power

Sizector®3D Camera S162 Series

True Realization of 2D+3D Integrated Inspection

True Realization of 2D+3D Integrated Inspection

With a native resolution of 16.2 million pixels and 5328 pixel points on the long side of the field of view, S162 series can clearly capture 2D features of the object's surface, while outputting high-quality 3D point cloud data.

4.0FPS

In full pixel and whole point cloud condition(non-binning mode), the maximum whole cycle frame rate can still reach 4.0 FPS, meeting the CT (Cycle Time) requirements in most industrial applications.

Specifications	S162060	S162090	S162130	S162170	S162190	S162230
Resolution (px)	16.2M (5328x3040)					
Framerate of Whole Cycle Time	≤14.5 FPS(@4.05M)　≤4.0 FPS(@16.2M)					
Clearance Distance (mm)	200	130	302	400	300	365
Standard FOV (mm)	60x34.2	90x51.4	130x74.2	170x97.0	190x108.4	230x131.2
Measurement Range Z (mm)	±10	±25	±30	±20	±30	±45
*1 *2 Single Repeatability Z (μm)	0.55	1.09	1.19	1.30	1.70	2.05
*1 *3 Area Repeatability Z (μm)	0.03	0.05	0.08	0.09	0.10	0.12
Pixel Interval (mm)	0.011	0.017	0.024	0.032	0.036	0.043
Dimensions (mm)	215x195x53.5	200x166x59.5	245x160x53.5	280x161x53.5	245x166x59.5	270x166x59.5
Weight (kg)	2.6	2.4	2.5	2.6	2.7	2.9

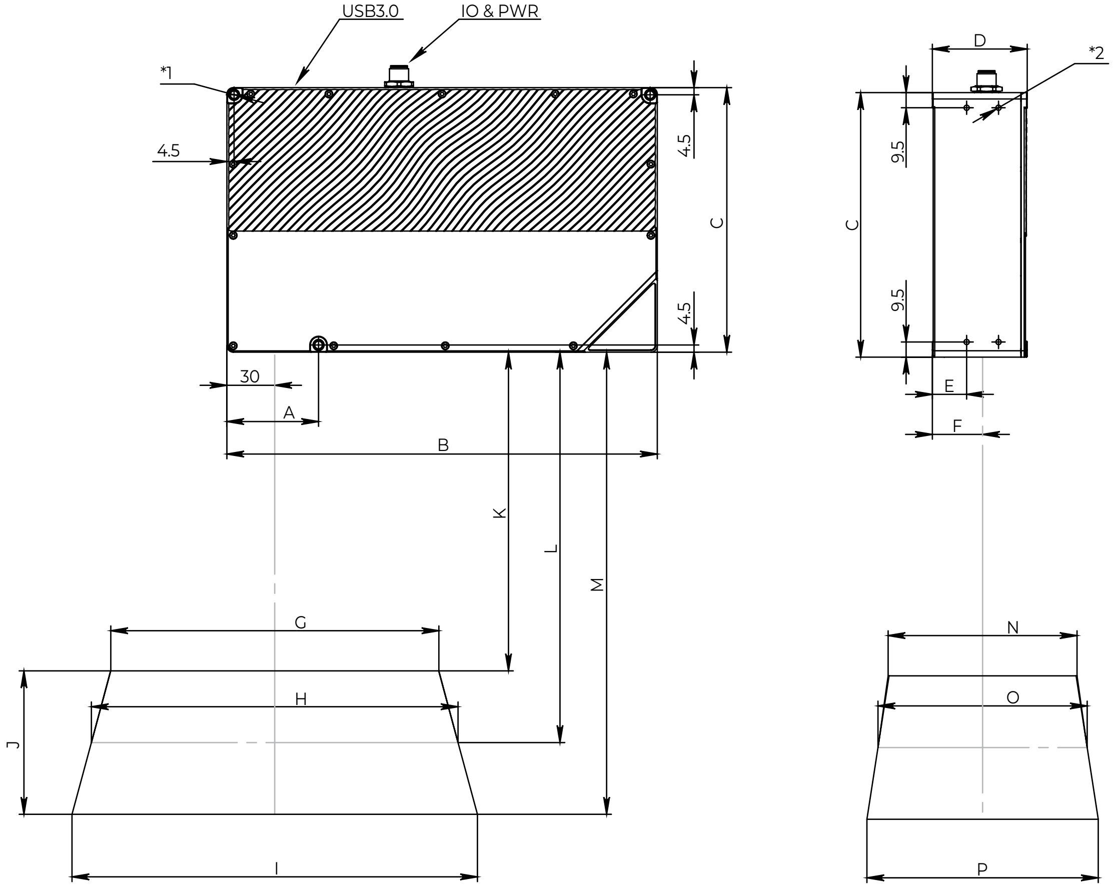
Light Source	Blue LED
Conformity	CE, GenICam
Operating Systems	Linux / Windows 7、8、10、11
Platform	C / C++ / C#/ Python
Data interface	USB3.0
Input / Output Signal	Two-channel Nonpolar Level Signal Input /Switchable Signal Output (12/24V Compatible)
Operating Voltage/Current	24V / 5A
Operating Temperature	0~40℃
Storage Temperature	0~60℃
Operating Humidity	20%~80% (No Consendation)
Standard Accessories	3m High-Felxible USB Cable , Power Adapter , 3m Power Cable and 3m I/O Cable

*1 The worst result of repeatability in full FOV & Measure Range, of which the target is a ceramics plate.

*2 Single-Pixel repeatability: $\sigma = \sqrt{\frac{1}{100}\sum_{i=1}^{100}(\overline{Z_i} - \overline{Z_A})^2}$, $\overline{Zi}$ is the height of point P, point P is at the center of area A. The size of area A is equal to1/100 of FOV, and is the average height value of all the pixels in area A.

*3 Area repeatability: $\sigma = \sqrt{\frac{1}{100}\sum_{i=1}^{100}(\overline{Z_{Ai}} - \overline{Z_{Bi}})^2}$, $\overline{ZA}$ & $\overline{ZB}$ are the average height values of all the pixels in area A and area B. The size of area A and area B is equal to 1/100 of FOV, and they are next to each other.

Installation Drawings



*1 Front Mounting①: 3x5.3 ⌀ through; Front Mounting②: 3xM6 ↧ 12;Back Mounting②: 3xM6 ↧ 12;
*2 Side auxiliary Mounting: 4xM4 ↧ 7 or parts mounting.

Dimensions (mm) / Type		S162060	S162090	S162130	S162170	S162190	S162230
A	Install screw holes(front bottom)	52.5	4.5	52.5	52.5	57.5	57.5
B	Length	215	200	245	280	245	270
C	Height	195	166	160	161	166	166
D	Thickness	53.5	59.5	53.5	53.5	59.5	59.5
E	Mounting screw holes (side bottom)	18.5	21.5	18.5	18.5	21.5	21.5
F	Distance(lens center to underside)	28.5	31.5	28.5	28.5	31.5	31.5
G	Near FOV-X direction	57.7	78.6	119.9	162.3	174.3	205.8
H	Standard FOV-X direction	60	90	130	170	190	230
I	Far FOV-X direction	62.3	101.4	140.2	177.7	205.8	254.3
J	Depth of Field	20	50	60	40	60	90
K	Near Object Distance	190	105	272	380	270	320
L	Center Object Distance	200	130	302	400	300	365
M	Far Object Distance	210	155	332	420	330	410
N	Near FOV-Y direction	32.9	45	69.3	92.6	100.3	118.5
O	Standard FOV-Y direction	34.2	51.4	74.2	97	108.4	131.2
P	Far FOV-Y direction	35.6	57.9	80	101.4	117.4	145.1

Accessories List

Standard Accessories

MPS-ADP120A24
S Power Adapter

MP-PW-1500
1.5m Power Cable

MPS-PWI-3000
3m Aviation Plug Power / IO High-Felxible Cable

MP-USB-3000
3m High-Felxible USB Cable

Optional Parts

MPS-PWI-7000
7m Aviation Plug Power/ IO Flexible Cable

MPS-PWI-15000
15m Aviation Plug Power/ IO Flexible Cable

MPS-PWI-20000
20m Aviation Plug Power/ IO Flexible Cable

MPS-PWI-10000T
10m Aviation Plug Power / IO Flexible Cable (for drag chain)

MPS-PWI-20000T
20m Aviation Plug Power / IO Flexible Cable (for drag chain)

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7m USB3.1 Flexible Hybrid Fiber Data Cable

MP-OUSB-10000
15m USB3.1 Flexible Hybrid Fiber Data Cable

MP-OUSB-15000
15m USB3.1 Flexible Hybrid Fiber Data Cable

MP-OUSB-20000
20m USB3.1 Flexible Hybrid Fiber Data Cable

MP-PICE-U3
PIC-E Port Four ports of the USB3.0 Expansion Card Supply Independent Power

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www.megaphase3d.com/en

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