

Nuwa-HP60C

Depth Camera Product

Product specification

Revise the history

version number	time	Repair record	remarks
V 1.0	2022.06.30		
V 1.1	2022.07.16	Update power consumption	
V 1.2	2022.07.20	Update the structure diagram	
V 1.3	2022.11.28	Update the fill rate description	
V1.4	2023.03.23	<ol style="list-style-type: none">1. Update the product function and feature description2. Update the parameters after the alignment of the depth maps and the RGB maps3. Update the ROHS and human eye safety laser certification report4. Update the product packaging information	
V 1.5	2023.07.21	<ol style="list-style-type: none">1. Update the maximum frame rate of the depth map2. Update the ESD specifications	

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1. Product description and product function

1.1 Product Description

Nuwa-HP60C original deep camera uses structured light 3D imaging technology to obtain deep images, which meets different human-computer interaction functions such as robot navigation, obstacle avoidance, depth information modeling, gesture control, human body scanning and motion capture. The built-in HD RGB camera meets the needs of texture mapping, object recognition, video surveillance and other applications.

Nuwa-HP60C original deep camera is compact, USB 2.0 standard output interface, easy to integrate, providing flexibility for system integrators, can be adapted to indoor complex environments such as strong light and weak light.

1.2 Product function and features

- ❖ The range measurement accuracy is high
 - ❖ Strong perception
 - ❖ Depth and RGB images merge seamlessly
 - ❖ Deep image level for a large FOV
 - ❖ Multiple cameras work simultaneously
 - ❖ High environmental adaptability
- 1) High ranging accuracy: 60cm wide baseline design, professional deep computing chip and algorithm, accuracy leading the industry level, improve the performance of robot small object detection, narrow channel obstacle avoidance and other performance;
 - 2) Strong perception ability: the algorithm optimizes the perception performance of black objects, highly reflective objects and semi-transparent objects to lead the industry;
 - 3) Seamless fusion of depth and RGB images: temporal and spatial alignment of depth map and RGB images to meet the intelligent detection requirements of multi-scene image fusion;
 - 4) Multi-camera work at the same time: 640 * 480 / 160 * 120@5 / 8 / 10 / 15 / 20 fps depth image output, which occupies less bandwidth and makes multiple cameras work at the same time;
 - 5) Deep image horizontal large FOV: depth image horizontal direction FOV 73.8° to meet the requirements of robot large FOV;
 - 6) High environmental adaptability: -10~50°C wide temperature working, 940nm wavelength, good resistance to environmental light and dust interference performance.

1.3 Safety instructions

1. This product is a precision device, which should avoid collision, fall and vibration to avoid the motherboard components or damage inside the lens components, resulting in functional problems or affecting the performance of the product.
2. Optical components of the product need to be protected during packaging and transportation, such as using bubble bag or pearl foam package. Avoid hand or other items with dust and water stains directly contact the surface of the component, so as not to affect the product accuracy or performance.
3. This product shall avoid the unprotected exposure to the environment that the human body can directly contact with, so as to prevent the electrostatic hazards caused by the human body touch.
4. The product and the customer's equipment shall be equipped with a grounding protection device.
5. All the constituent materials of this product are in accordance with the ROHS 2.0 certification.
6. Meet the IEC 60825-1:2014 Class 1 laser safety standard.

2. Terms

Table 1 Terms

Baseline	Baseline: The distance between the imaging center of the infrared camera and the optical projection center of the infrared projector.
Depth	Depth: Similar to color video streaming, the difference is depth image each pixel has a value representing the distance from the camera, called depth.
FOV	Field of view angle (Field of View): describes the angular range of the camera imaging. Including the horizontal FOV (HFOV: Horizontal Field of View), vertical FOV (VFOV: Vertical Field of View), and diagonal FOV (DFOV: Diagonal Field of View).
Depth processor	Deep computing chip, a dedicated ASIC chip used to realize depth computing and output depth images.
IR camera	Infrared camera.

RGB camera	Color camera.
Dot Projector	The lattice projector projects the invisible infrared laser lattice into the scene, and calculates the depth information of the scene according to the relative shape variables of the laser lattice.
Lens	Optical lens set: used for imaging in the infrared camera, color camera. For the projection in the laser projector.
ISP	Image signal processor, Image Signal Processor: a unit for signal processing of the front-end image sensor output. You can match the image sensors from different manufacturers. Can achieve such as automatic exposure, automatic focus, automatic white balance and other functions.
M IPI	The MIPI Alliance, or the Mobile Industry Processor Interface (Mobile Industry Processor Interface). The MIPI Alliance initiated an open standard and a specification for mobile application processors.
S oC	Chip-level system, System on Chip. Is an integrated circuit with dedicated objectives, which contains the complete system and has the entire content of the embedded software.
I2C	The I2C bus is a simple, two-way second-line synchronous serial bus. It requires only two wires to transmit information between devices connected to the bus.
HDR	High dynamic range images, High-Dynamic Range.
PCBA	Printed Circuit Board Assembly, Bearing depth computing processor, memory and other electronic device components.
Plane accuracy	Measure the specific plane, obtain the plane depth, cut off 5% of the depth up, bottom, left and right respectively, take the area of the middle 81% to fit the plane, and calculate the root mean square value of the distance between the pixels of the depth map and the fitted plane.
filling rate	Measure the specific plane, obtain the plane depth, cut off 5% of the depth up, bottom, left and right, take the middle 81% of the area, and take the effective depth point as a percentage of the total pixels.
UVC	USB Video Class USB video, is a protocol standard defined for USB video capture devices.
Angstrong	Shenzhen Ansijiang Technology Co., Ltd., referred to as "Ansijiang" in Chinese.

3. Introduction to the original deep camera technology

3.1 Imaging technique

The original deep camera mainly includes an infrared camera (IR camera), a dot-matrix projector (Dot projector), and a deep computing processor (depth processor). The dot matrix projector is used to project a structured light pattern (speckle pattern) to the target scene (Scene). The infrared camera collects the infrared structured light image of the target. The depth computing processor receives the infrared structured light image and performs the depth computing algorithm and outputs the depth image of the target scene.

Depth calculation processor in the depth calculation, the pre-calibration of infrared reference pattern and the current acquisition of infrared real-time pattern comparison calculation, according to the relative displacement between the two, can obtain the pixel deviation between the image (d), then based on the structure light triangulation principle, calculated by the deviation value d distance, namely "depth".

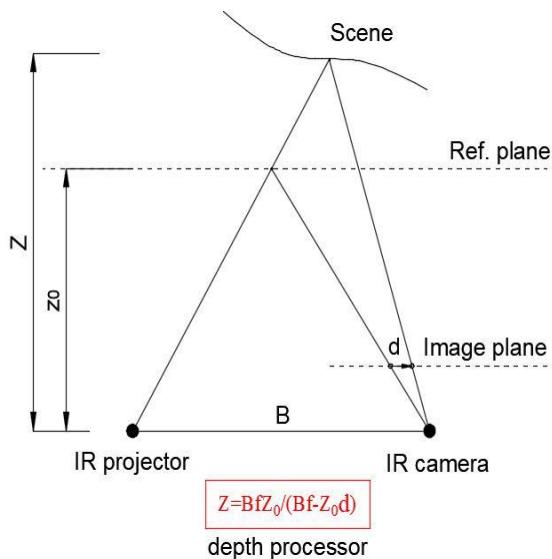


Figure 1. Schematic diagram of the monocular structural optical imaging principle

3.2 System framework

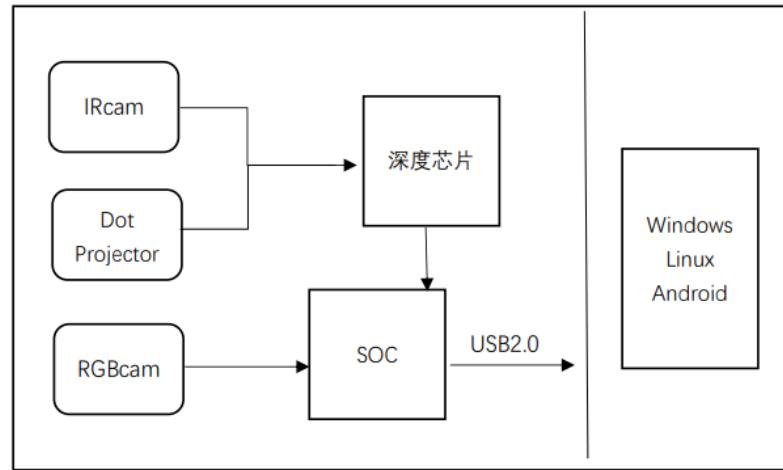


Figure 2. System framework diagram

4. Specification and parameters of the original deep camera

4.1 Physical products



Figure 3. Physical picture

4.2 Product specifications

Table 2. Product Specifications

name		specifications
model		Nuwa-HP60C
essential parameter	product size	89.8mm × 19.0mm × 25.0mm
	power dissipation	<2W
	joggle	Type C USB 2.0
	operating distance	0.2~4m (within 2m)
	working temperature	-10~50°C
	storage temperature	-30~80°C
	Working humidity	0~90%RH
	power supply mode	USB
	VBUS	4.75~5.25V
Deep precision	Plane accuracy	<2mm@1000mm
	Filling rate (middle 81% area)	>99.5%@1000mm

Deep image	Resolution / Frame Rate	640×480@20fps (Max)
	FOV	H73.8° × V58.8° × D 86.4°
	Transfer image format	RAW16
RGB picture	Resolution / Frame Rate	1920×1080@20fps (Max) Recommended: 640360 @ 20 fps, 640480 @ 20 fps
	FOV	H 80.9° × V 51.7° × D 88.9°
	Transfer image format	RGB888
After depth map and RGB map alignment, depth map FOV	RGB resolution 640 * 360 condition	H73.8° × V51.7°
	RGB resolution at the 640 * 480 condition	H64.4° × V51.7°
safety standard	ESD	± 8kV (contact discharge), > ± 15kV (air discharge)
	EMI/EMC	Meet the 3C certification performance standards
	Laser safety	Class 1
Development platform	Windows	support
	Android	support
	Linux	support
service environment		Indoor / outdoor (recommended installation height of 40–50cm)

5. Original deep camera system components

5.1 Table of system components

3Table 3 Table of system components

Original deep camera model	Nuwa-HP60C
Laser lattice projector (Dot)	✓
Infrared camera (IR Camera)	✓
Color Camera (RGB Camera)	✓
Deep Computing Chip (Depth Processor)	✓

5.1.1 Laser spot matrix projector (Dot Projector)

The laser lattice projector obtains the texture by projecting a speckle pattern. The laser lattice projector meets the class C class 1 laser safety standard under normal operation.

4Table 4 Specification of laser lattice projector

attribute	description
Encoding type	Scatter encoding
Laser chip type	Multi-lattice vertical cavity laser emitter
laser wave length	940nm
wavelengths of temperature drift	0.07nm /°C
Field of view angle (FOV)	>90°
Laser safety level	Class 1

5.1.2, the infrared camera

Infrared camera is mainly used to collect the laser lattice array projected by the laser lattice projector.

5Table 5 Infrared camera specifications

attribute	description
Effective resolution	1280×960
Focus mode	Fixed focus
Shutter type	Global exposure
angle of field	H73.8° × V58.8° × D86.4°
filter	940nm narrow band filtering

5.1.3, and the color camera

Color cameras are mainly used to collect visible light images.

6Table 6 Color camera specifications

attribute	description
Effective resolution	1920×1080
Focus mode	Fixed focus
Shutter type	Curtain exposure
angle of field	H 80.9° ×V 51.7° ×D88.9°
filter	Infrared cutoff filter

5.2 Interface description

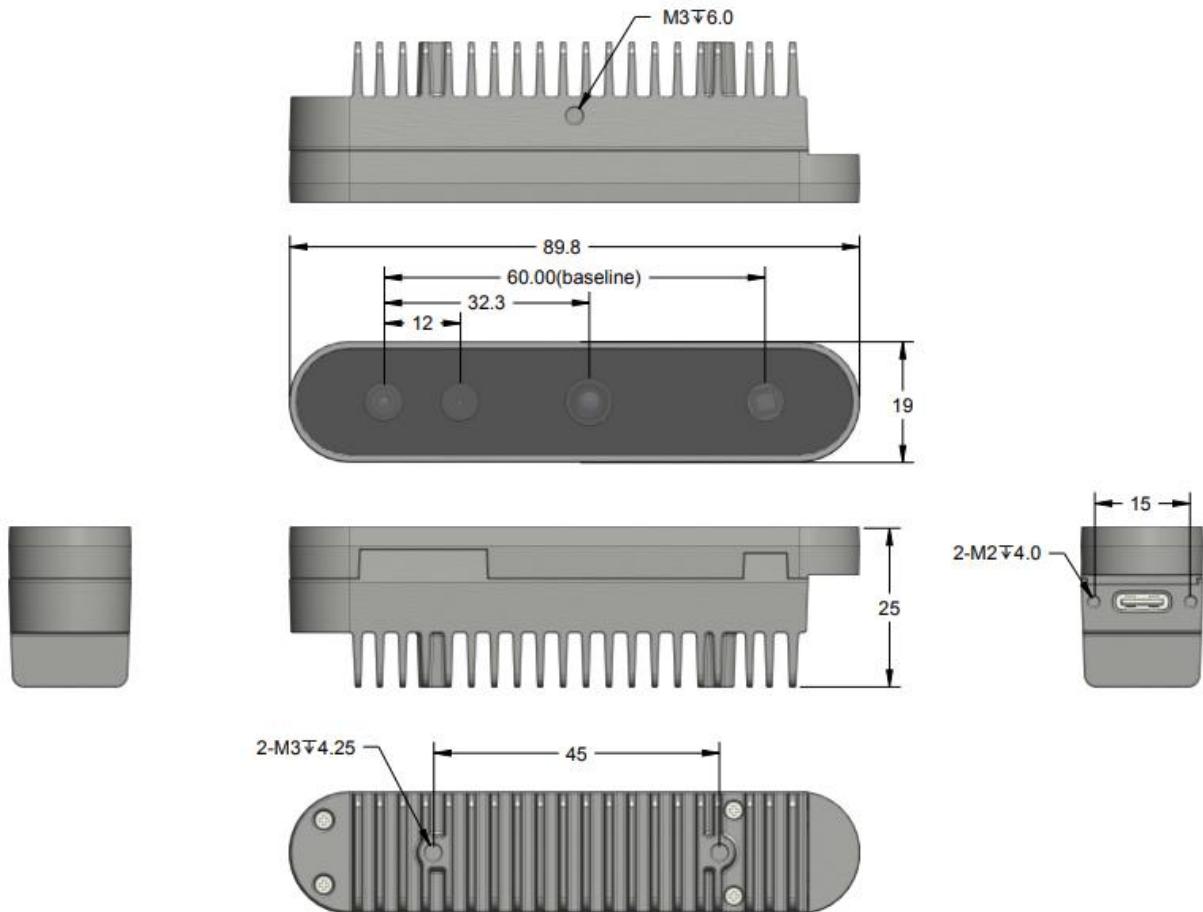
The Nuwa-HP60C original deep camera uses the USB 2.0 transmission interface. Image communication is performed for the standard UVC protocol. The interface form is in the standard Type C form.

7Table 7 Type C USB2 Definition of Type C USB2.0 interfaces

P IN#	joggle	description
A 1	G ND	signal ground
A 4	V BUS	The power supply is 5V
A 5	CC 1	NC
A 6	D P1	The data line is
A 7	D N1	Data line negative
A 8	SBU 1	NC
A 9	V BUS	The power supply is 5V
A 12	G ND	signal ground
B 12	G ND	signal ground
B 9	VBUS	The power supply is 5V
B 8	S BU2	NC
B 7	D N2	Data line negative
B 6	D P2	The data line is
B 5	C C2	NC
B 4	V BUS	The power supply is 5V
B 1	G ND	signal ground

6. Structural description

6.1 Structural drawings



4Figure 4. Structural drawings

6.2 Installation recommendations

The installation recommendations for the Nuwa-HP60C original deep camera are as follows:

1. The front and back of the original deep camera are pressed by foam, and the side is closely coordinated with the stuck position structure.
2. Reserve 2 M3 screw holes on the back side.
3. One M3 grounding treatment is reserved on the side.

6.3 Heat dissipation recommendations

Heat dissipation recommendations are as follows:

1. Connecting the bracket of the original deep camera with the metal part of the whole machine

is conducive to reducing the ambient temperature of the hardware work.

2. Try to increase the space around the original deep camera, so that the original deep camera has more space for conventional heat dissipation.

6.4 Optical requirements for the protective cover plate

The Nuwa-HP60C is integrated into the whole machine, and it is prohibited to cover the glass or other shielding objects in front of the original deep camera. If additional protective cover must be added, anjiang shall be notified to remove the glass cover plate of the original deep camera, and the following requirements should be met

1. The front protection cover plate of the whole machine shall meet the following requirements:
 - a) Protective cover plate material: glass or PC / PMMA.
 - b) The light transmission area on the protective cover plate corresponding to the Dot projector and infrared camera needs to screen the window. The size can refer to the FOV of each device in the drawing provided by our company, or according to the actual product structure, the unilateral expansion is 0.5mm on the basis of meeting the field Angle of the device.
 - c) Optical pass rate:

Dot projector Transmission area: 800–1050nm band, global minimum transmittance Tmin 92%.

Infrared camera light transmittance area: 800–1050nm band, global minimum transmittance Tmin 92%.

Color camera light transmission area: 400–780nm band, global minimum transmittance Tmin 92%.

- d) It is suggested to conduct AF coating treatment on the outer surface of the protective cover plate to prevent the fingerprint and oil pollution in the actual use scenario from affecting the product effect.

2. Structural dimension requirements of the protective cover plate:

- a) When the material is PC / PMMA, the thickness design is above 1.5mm to prevent force deformation.
- b) When the material is glass, the thickness design needs to be at 0.3–1.0mm.
- c) The air clearance between the protective cover plate and each optical device is <0.5mm.
- d) Plane requirement of protective cover plate: <0.005mm.

3. Instructions for fingerprint and oil prevention:

- a) In the process of assembling Nuwa-HP60C into the whole machine, the surface of each optical device should pay strict attention to dust prevention and antifouling.
 - b) When the whole machine is used, the outer surface of the protective cover plate should be clean, so as not to affect the product effect.
4. If there is a protective film on the outer surface of the protective cover plate, it is necessary to hollow out the window area of the corresponding two devices on the protective film, otherwise the light transmittance will be seriously affected.

7. Electronic design

7.1 Power supply and power consumption

Nuwa-HP60C original deep camera product is powered by USB, the laser peak current is high, must be powered by USB interface above 5V/1.5A. A current below 5V/1.5A may cause a failure to start the device. When the original deep camera is working, ensure that the pressure drop of the USB data line is <0.3V.

Suggestion: The client motherboard reserves the power supply of the 3D original deep camera up to 5V/2.5A design to ensure the later adaptation and product life cycle.

Table 8. Power consumption table

precondition	power dissipation W	voltage V	current A
Work average power	1.5 (Max)	5.0	0.30 (Max)
On standby	0.5	5.0	0.1

7.2 ESD handling recommendations

The original deep camera belongs to an ESD sensitive device, and ESD protection should be done in

the process of production, transportation, assembly and use, as follows:

1. Operators are recommended to wear the ESD antistatic bracelet throughout the production process.
2. The original deep camera is recommended to be placed in an ESD antistatic bag for transport or transfer.

7.3 Wire material recommendations

The communication of the original deep camera relies on the high-speed USB 2.0 signal. In order to ensure the stability and reliability of the signal transmission, it is suggested that the client make the wire according to the requirements.

Shielding: the first layer of shielding, the outer shielding metal net needs to wrap the whole line, it is recommended that the density is not less than 7 mesh, and connected with the metal shell of the two interfaces. The second layer of shielding, it is recommended that there is a layer of aluminum foil wrapped in the outer shielding metal net, aluminum foil and the metal mesh contact conduction.

Transmission line material: outer metal shielding network, USB 2.0 group inland line and other signal transmission line material recommendations are tin copper.

Thickness of transmission line: USB signal line recommended to use 28 # line, not less than 30 #, power line and ground line recommended to use 22 #, not less than 24 #.

8. Software SDK

Provided Android, Windows, Linux platform related SDK.

Please contact the relevant sales staff for the latest SDK.

9. Platform design guide

Before using the Nuwa-HP60C series original deep camera for development, users should first contact the sales staff of Shenzhen Ansijiang Technology Co., Ltd. to obtain the product specifications and apply for the SDK development package. Through evaluation, debugging, and verification steps, to determine whether the scheme meets the requirements of mass production.

9.1 Evaluation

For better user experience and product stability, we expect to evaluate application scenarios and platform performance together with device manufacturers.

9.2 Project approval

After the preliminary evaluation is completed, the project enters the project approval stage, and the customer needs to conduct phased communication and joint investigation according to the following process.

9.3 Design

In the product planning stage, the Nuwa-HP60C series original deep camera should refer to the relevant design requirements of the product manual.

1. Structural design review: in the product design stage, the relevant part of the original deep camera, the company engineers can assist in the review.
2. Electronic design review: in the product design stage, the relevant part of the original deep camera, the company engineers can assist in the review.

9.4 Development

Please contact the relevant sales personnel to obtain the detection tool of the original deep camera and the related development SDK.

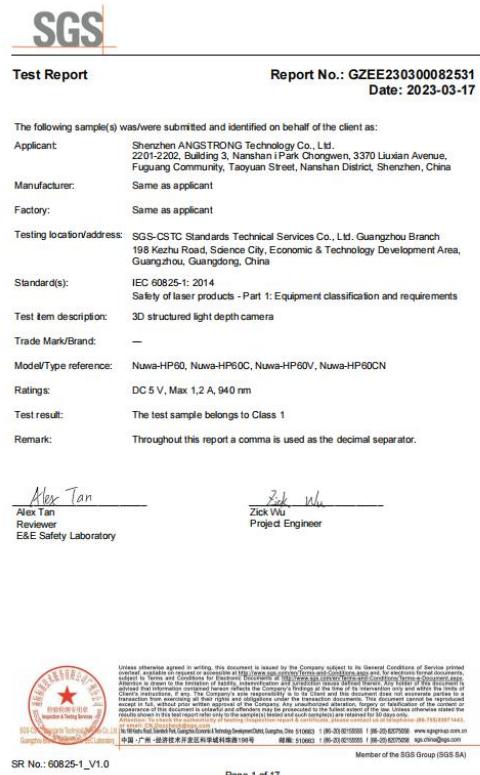
9.5 Test

In the EVT stage, at least 2 complete equipment can be provided to Ansijiang for testing and

debugging. To ensure the adaptation between the original deep camera and the client host.

10. Laws, regulations and platform implementation standards

1. Meet the Class 1 class human eye safety laser products:



5Fig. 5. Laser safety certification

- ## 2. Meet the RoHS certification standards

6Figure 6 RoHS, Certification Report

3. Meet the REACH, and certification standards

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TEST REPORT (SVHC)

Applicant	: SHENZHEN ANGSTRONG TECHNOLOGY CO., LTD.
Address	: Room 109-10, 1st Floor, Research Building, Tsinghua Hi-tech Park, West side of South Gate, No.13 Langshan Road, Songgongshan Community, Xili Street, Nanshan District, Shenzhen
The submitted sample and sample information was/were submitted and identified by/on the behalf of the client	
Sample name	: 3D Structured-light Module
Sample Model	: 比邻星(BLX), 金犀(XJ), 启明星(OMX), 天狼星(TLX), 人马座(RMX), 瓦纳德(WND), 柊牛星(MWX), 织女星(ZNX), 幕星(MX), 牵牛星(QNX), 大角星(DIX), 双子星(SZX), 北极星(BIX), 紫微星(ZWV), 老人星(LRX), 谷神星(GSX), 女娲星(NWX), 狐尾座(HLHZ), 天琴座(TOZ), 天龙座(TLZ), 仙王座(XWZ), 时钟座(SZZ), 天兔座(TEZ), 天鹰座(TYZ), 宾女星(SNZ), 小熊座(XZZ), 大熊座(DXZ), 鲸鱼座(JYZ)
Trademark	:  安思强 科技
TEST INFORMATION	
Date of Receipt	: 2020-12-29
Date of Test	: 2020-12-29 to 2021-01-13
Issue Date	: 2021-01-20
Test Method	: Please refer to the following page(s).
Test Result(s)	: Please refer to the following page(s). As requested by client, SVHC screening is performed according to: (i) Seventy three (209) substances in the Candidate List of Substances of
Test Requested	: Very High Concern (SVHC) for authorization published by European Chemicals Agency (ECHA) on and before Jun. 25, 2020 regarding Regulation (EC) No 1907/2006 concerning the REACH.

Summary

According to the specified scope and analytical techniques, concentrations of tested SVHC are $\leq 0.1\%$ (w/w) in the submitted sample. PASS

Test/Witness Engineer

Approved & Authorized

Compared with the original report HXT20211021576, this report only corrections the name of one series model, and the original report HXT20211021576 is invalid as of the date of issue of this report.

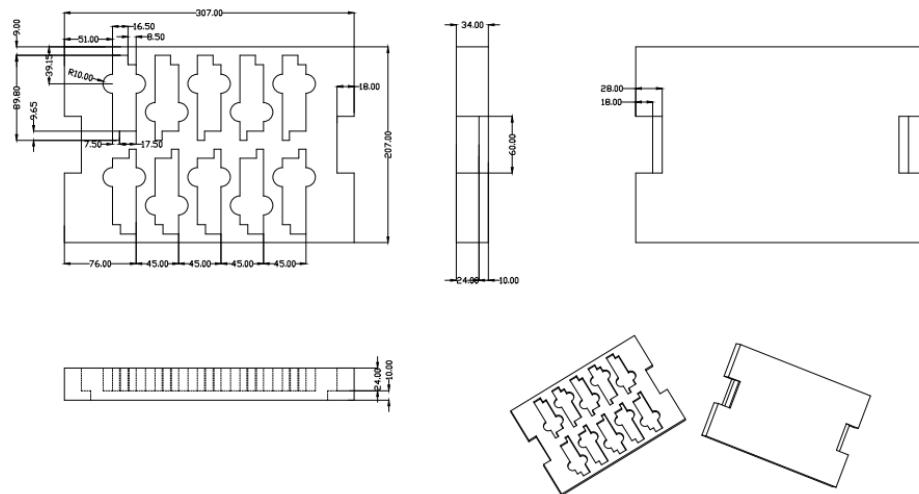
Shenzhen Huaxu Testing Technology Co., Ltd.
5/F, Building B15, Zongtai Cultural and Creative Industrial Park, Yitian Creative Park, Xixiang Town,
Bao'an District, Shenzhen
Tel: 0755-28267233, Web: www.hxt-lab.vip

7Figure 7 REACH Certification Report

11. Original deep camera packaging

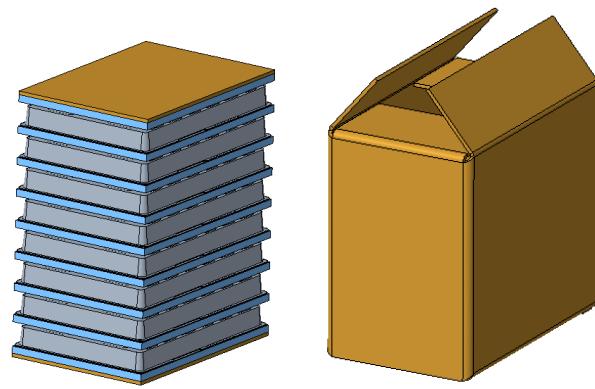
Packaging style and description of the original deep camera:

1. The original deep camera adopts anti-static foam tray, anti-static bag packaging;
2. Antistatic foam tray can be equipped with 10 PCS original deep camera, standard packing box containing 8 antistatic foam tray, total $10 \times 8 = 80$ pcs.
3. Antistatic foam tray is packed in antistatic bags.
4. The ESD bag label identifies the product name, material number, quantity, batch and other basic information.
5. The box label marks the product name, material number, order number, quantity, batch and other information, and attach the shipment inspection report.



8Figure 8 Schematic diagram of anti-static foam tray packaging

客户名称:	xxxx
供应商名称:	安思疆
订单编号:	xxxx XXXXXX
物料编号:	XXXXX-XXXXXX
物料名称:	深度摄像头 (RGBD)
物料规格:	女娲星
数量:	xx
批号:	xxxx xx xx
送货日期:	xxxx年xx月xx日
检验人员:	
备注:	



9Figure 9. Packaging schematic diagram

12. Appendix

Connect the original deep camera to the client motherboard. Note:

1. It is suggested that the USB power supply interface of the customer motherboard connected to the original deep camera should be reserved for greater than 5V&2.5A. In this way, it can be used normally under peak conditions, and it is also conducive to the compatibility of later product iteration.
2. For the selection of USB wire, the client needs to carefully evaluate the wire to ensure that there will be no unstable factors caused by the length, material and thickness of the wire. Please refer to the wire recommendations in the product specification for more details.
3. Structural design, heat dissipation design, and electronic design (including electromagnetic interference, etc.) please communicate with relevant engineers of Anjiang in advance in order to improve the product design.
4. The client motherboard is recommended to choose 4 cores (Cortex-A17, main frequency 1.8GHz) or above. Recommended for 2GB RAM or above.