Gemini 210 Series

Datasheet

Version 1.4

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Revision History

Version	Description	Revision Date
V1.0	● Compile the first edition	2024-04
V1.1	● Revise some contents.	2024-05
V1.2	● Add the description of multi-camera synchronization function.	2024-11
V1.3	● Add the 4.8 Depth Work Mode; ● Refine and improve the content of the Product Specifications; ● Update section 4.2 Platform and System Requirements;	2025-05
V1.4	● Refine and improve the content of the Product Specifications; ● Update section 4.4 Data Format of Depth and Color Streams.	2025-08

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0. Glossary

Terms	Descriptions
ASIC	Application-specific Integrated Circuit
Baseline	The distance between the optical centers of the two cameras used for depth calculation
D2C	Depth to Color alignment, a spatial alignment maps each pixel on a depth map to the corresponding position on a color image using the intrinsic and extrinsic parameters of the depth camera and color camera
Depth	Depth video streams are basically the same as the color video streams except each pixel has a value representing the spatial depth of the observed object from the camera instead of color information
Depth Camera	It comprises a depth imaging module and external interface, of which the former is generally composed of an infrared projector, an infrared camera or multiple infrared cameras, and a depth computing processor
FOV	Field of View describes the angular extent of a given scene that is captured by a camera, which can be measured in the horizontal, vertical, and diagonal
I2C	Refers to a simple bi-directional two-wire synchronous serial bus developed by Philips
IMU	Inertial measurement unit.
IR	Light in the infrared spectrum, which ranges from 700 nm and above
IR Camera	A camera capable of seeing light in the IR spectrum
ISP	Image signal processor
LDM	Laser Diode Module
MIPI	Mobile Industry Processor Interface (MIPI) Alliance. MIPI is an open standard and specification formulated by the MIPI Alliance for mobile application processors
Point Cloud	A discrete set of data points in space
RGB Module	Color Camera
ROI	Region of Interest(ROI) in image processing refers to a specific area selected from the entire image

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UVC	USB Video Class (UVC) is a protocol standard defined for USB video capture devices and has become one of the USB.org standards
VCSEL	Vertical-Cavity Surface-Emitting Laser (VCSEL) is a type of semiconductor laser where the laser light is emitted perpendicular to the surface of the device
TBD	To Be Determined. Information will be provided in a later revision.

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1. Product Brief

As members of Orbbec's stereo vision Gemini series, the Gemini 215 and Gemini 210 are new additions to Orbbec's stereo vision Gemini series, they are specifically designed for high-precision close-range detailed 3D scanning applications such as body part and object scanning.

Powered by Orbbec's custom ASIC MX6600 and a high-performance optical system, Gemini 215 and Gemini 210 excel in close-range indoor scanning, delivering accurate and real-time depth images with fine details.

Supported by the open-source Orbbec SDK, it is easy to develop custom applications on platforms such as Windows and Linux, enabling fast, flexible and scalable project implementation.

These two cameras adopt the same optical system and hardware interface. The difference is that the Gemini 215 camera comes with housing, while the Gemini 210 doesn't have any housing, which leads to differences in their fixing methods.

- Active stereo, reliable indoor scanning even on textureless surfaces
- On-chip depth and RGB processing
- Excellent depth accuracy < 0.5mm at 300mm
- Short-range depth sensing for 0.15 - 0.7m
- Real-time depth processing up to 1280 x 800 @ 30fps
- Minimum point distance / resolution: 0.16mm @ 0.15m
- Multi-device sync support for expanding field of view

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2. Product Specifications

Parameter	Gemini 215	Gemini 210
Use Environment	Indoor	
Technology	Stereo Vision	
Baseline	75mm	
LDM Wavelength	850nm	
Operating Range[1]	Close_Up Precision Mode：0.15 – 0.3m Extended Distance Mode：0.2 – 0.7m	
Ideal Range	0.2 – 0.5m	
Spatial Precision[2]	< 0.5mm（1280 X 800 @ 0.3m） < 1.5mm（1280 X 800 @ 0.6m）	
Depth Resolution @ Frame Rate	Up to 1280 x 800 @ 30fps	
Depth FOV	H63.0°x V44.8° @ 0.7m	
Sensor Type	IR: Global Shutter Color: Rolling Shutter	
RGB Resolution @ Frame Rate	Up to 1920 x 1080 @ 30fps	
RGB FOV	H74.7° x V46.2°	
3D Resolution	0.16mm @ 0.15m (Minimum Point Distance/Resolution)	
IMU	6 DoF; three-axis linear acceleration, and three-axis angular acceleration	
Depth Processing	In-camera processing using Orbbec MX6600 ASIC	
Data Connection	USB 3.0 & USB 2.0 Type-C for data and power	
ESD	Contact discharge: ±4KV / Air discharge: ±8KV Class A	
Power Consumption	Average < 2.5W Peak < 7W	
Operating Environment	0℃ - 40℃ 5% RH – 95% RH	
Storage Environment	Short Term: -20℃ - 70℃,5%-90%RH(non-condensing) Long Term: 0℃ - 60℃,5%-90%RH(non-condensing)	
Protection	N/A	

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Supported Functions	Hardware Spatial Alignment of Depth to Color (D2C) Hardware Timestamps Multi-camera Sync UVC Camera	
Dimensions(W*H*D)	120mm x 26mm x 30 mm	116.6mm x 22.6mm x 24.6mm
Weight	105g	63g
Installation	Bottom: 1x 1/4-20 UNC, Max Torque: 4.0 N.m Back: 2x M3,Max Torque: 0.4 N.m	Follow integration instructions
Lifespan[3]	3 Years: Default Operating Mode & Operating Environment	

Notes:

[1] When the reflectivity of the measured object is higher than 80%, depth data can be acquired for a maximum distance of 0.7m. However, the actual precision varies with the distance and the measured object.

[2] The test object is a flat plane with a reflectivity higher than 80%. The reference range is the depth map area of 81% FOV (81% FOV refers to the remaining central 81% area after cropping 5% from each of the top, bottom, left, and right of the depth map). Calculate the root mean square of the distancefor all valid points within the calculation area to the best-fitting position of the fitted plane.

[3] The camera is operating with the typical configuration and for 8 hours per day, and under the working environment of 0 - 40℃.

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3. Product Information

3.1 Product Pictures

Table 3-1-1 Product pictures for Gemini 215 & Gemini 210

Name	Gemini 215	Gemini 210
Front View		
Rear View		

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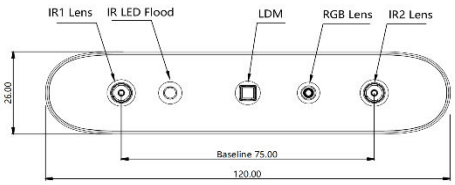
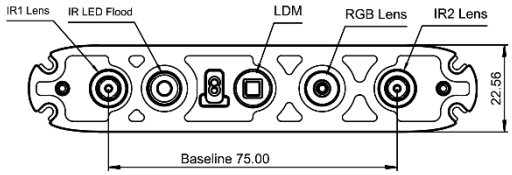
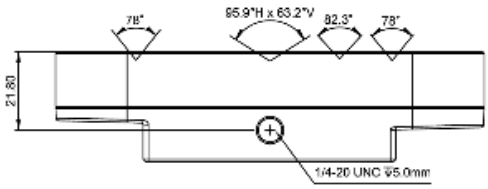
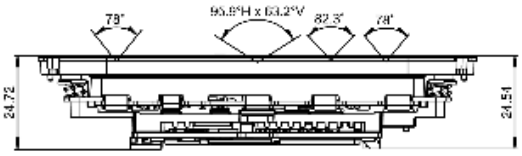
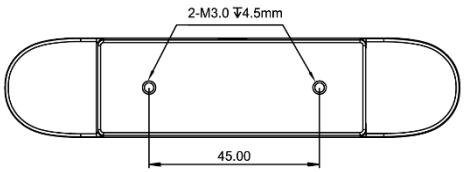
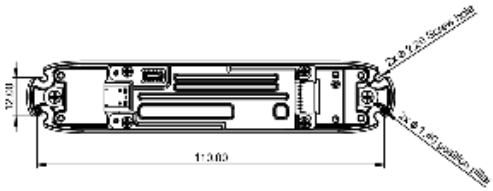
3.2 Product Drawings

Table 3-2-1 Product drawings for Gemini 215 & Gemini 210

	Gemini 215	Gemini 210
Front View		
Bottom View		
Rear View		

3.3 Product Interfaces

Table 3-3-1 Product interfaces for Gemini 215 & Gemini 210

Gemini 215	Gemini 210

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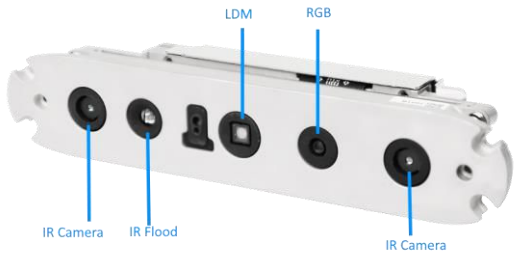
3.4 Product Components

3.4.1 Overview of Product Components for Gemini 215/Gemini 210

Table 3-4-1 Overview of product components for Gemini 215/210

Gemini 215	Gemini 210
	

3.4.2 Laser Diode Module

The laser module (LDM), also known as the laser emitting module, consists of a vertical-cavity surface-emitting laser array and other optic components. It projects a static infrared pattern onto the scene to enhance the texture of low-texture scenes and improves the ability of the 3D camera system to detect depth information. Under normal circumstances, the Gemini 215/210 laser module comply with Class 1 laser safety.

Table 3-4-2 LDM parameters

LDM	Gemini 215 / Gemini 210
Type	Infrared
Component	Vertical Cavity Surface Emitting Laser (VCSEL) + Optical Devices
Laser Controller	Pulse
Wavelength	850nm
Horizontal FOV	95.8°
Vertical FOV	63.9°
FOV tolerance	±3.0°

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3.4.3 Infrared Module

Table 3-4-3 Infrared module parameters

IR Module	Gemini 215 / Gemini 210
Effective Pixels	1280 x 800
Sensor Aspect Ratio	16:10
Focus Type	Fixed Focus
Shutter Type	Global Shutter
Signal Interface	MIPI
Horizontal FOV	67.9°
Vertical FOV	45.3°
FOV tolerance	±3.0°

3.4.5 RGB Module

Table 3-4-4 RGB module parameters

RGB Module	Gemini 215/Gemini 210
Effective Pixels	1920 x 1080
Sensor Aspect Ratio	16:9
Data Format	MJPEG & YUYV
Focus Type	Fixed Focus
Shutter Type	Rolling Shutter
Signal Interface	MIPI
Horizontal FOV	74°
Vertical FOV	46°
Diagonal FOV	82.3°
FOV tolerance	±3.0°

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3.4.5 IMU

Table 3-4-5 Gemini 210 series IMU Specification

	Parameters		Gemini 215 / Gemini 210
IMU	Timestamp		The IR, depth and RGB data all use the same time reference value and clock frequency to achieve timestamp synchronization (in microseconds)
	X/Y/Z Axis		The X-axis is consistent with the depth and points to the right side of the camera. The Y-axis is consistent with the depth and points to the bottom of the camera. The Z-axis is consistent with the depth and points to the front of the camera.
	Gyroscope	Format	3 x 16-bit
		Range	±17.45 rad/s (1000dps)
		Frequency (Hz)	100/200/500/1000
	Accelerometer	Format	3 x 16-bit
		Range	± 39.2m/s² (4g)
		Frequency (Hz)	100/200/500/1000
	Temperature	Format	1 x 16-bit
		Range	-40 to 85℃
		Frequency (Hz)	Follow the frequency of the gyroscope and accelerometer.

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4. Functional Specifications

4.1 Vendor Identifier (VID) and Product Identifier (PID)

Table 4-1-1 VID & PID table

Name	Gemini 215	Gemini 210
Model	G20000-150	G25000-150
PID	0x0808	0x0809
VID	0x2BC5	

4.2 Platform and System Requirements

This product connects to the host computer using USB, which is compatible with various platforms and system requirements.

Table 4-2-1 Gemini 210 series Recommended Platforms and Systems

Chip	x86/x64		ARM	
OS	Windows 10/11	Ubuntu 18.04 and above	Android OS 10 and above	Ubuntu 18.04 and above
USB	USB 3.0	USB 3.0	USB 3.0	USB 3.0
CPU	Quad-core, 2.9GHz	Quad-core, 2.9GHz	Quad-core Cortex-A73, dual-core Cortex-A53	Quad-core A57
Reference model	Intel i3 10100 / Intel i5 8400	Intel i3 10100 / Intel i5 8400	Qualcomm Snapdragon RB5	NVIDIA Jetson AGX Orin / Orin NX / Orin Nano / AGX Xavier / Xavier NX
RAM	8GB RAM and above	4GB RAM and above	4GB RAM and above	4GB RAM and above

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4.3 Gemini 215/Gemini 210 FOV

4.3.1 Definition of Depth Field of View

The image below shows the depth field of view (FOV). For a better understanding, we illustrate the angles that the depth and IR cameras "see".

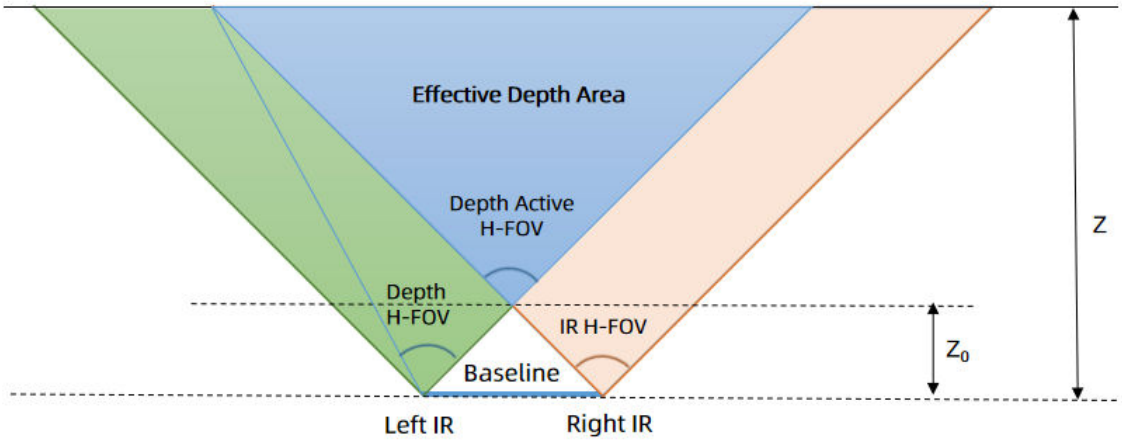

Figure 4-3-1 Illustration of Depth FOV

Depth FOV at any depth (Z) can be calculated using the following equation:

Table 4-3-1 Formulas for Depth FOV Calculation

Calculation Formulas	Definitions
$\text{Depth H} - \text{FOV} = \arctan\left(\frac{cx}{fx} - \frac{B}{Z}\right) + \arctan\frac{width - 1 - cx}{fx}$	1. cx = X-direction image coordinate of the principle point of the depth image 2. fx = Depth camera focal length in pixels of x-axis 3. cy = Y-direction image coordinate of the principle point of the depth image 4. fy = Depth camera focal length 5. width = Depth image width 6. height = Depth image height 7. Depth active H-FOV = Left IR H-FOV
$\text{Depth Active H} - \text{FoV} = \arctan\frac{cx}{fx} + \arctan\frac{width - 1 - cx}{fx}$	
$Z_0 = \frac{B}{2 * \tan\left(\frac{Depth\ Active\ H - FOV}{2}\right)}$	
$\text{Depth V - FOV} = \arctan\left(\frac{cy}{fy}\right) + \arctan\frac{height\text{-}1\text{-}cy}{fy}$	

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Note:

1. Depth intrinsics, including *cx, cy, fx, fy, width* and height, are obtained through SDK APIs, and these parameters may vary across different units.
2. At different depth values, the depth FOV is non-constant. The farther the depth, the greater the depth FOV.

4.3.2 Illustration of Depth Field of View

The table below presents the reference values of the depth FOV for Gemini 215 / Gemini 210, including the horizontal FOV, vertical FOV and the tolerance range.

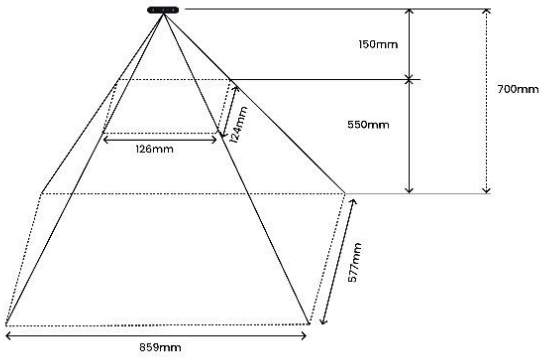
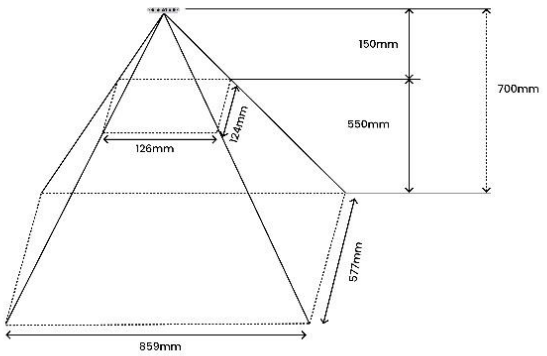
Gemini 215	
Gemini 210	

Figure 4-3-2 Schematic Diagram of the FOV of Gemini 215/Gemini 210

Table 4-3-2 Gemini 215 /Gemini 210 Depth FOV Reference Values

	Value
Gemini 215 /Gemini 210 Depth FOV@700mm	Horizontal FOV 63.0°
	Vertical FOV 44.8°
	FOV Tolerance ±3.0°

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4.4 Data Format of Depth and Color Streams

Gemini 215 / Gemini 210 provide high-quality, multi-resolution depth image data, and also offer high-definition color image data. The Y14/RLE format of the depth image data is the output format of the camera, while the output format of the SDK is Y16. The format of the color image data output by the camera is MJPEG/YUYV, and the SDK supports the output format of MJPEG/YUYV/RGB888.

Table 4-4-1 Image Data Format from Gemini 215 / Gemini 210 Cameras

Data Format	Resolution	Frame Rate	Notes
Y14 (uncompressed format)	1280 x 800	5, 10, 15, 20, 30	Depth Image
	640 x 400	5, 10, 15, 20, 30	
RLE (compressed format)	1280 x 800	5, 10, 15, 20, 30	
	640 x 400	5, 10, 15, 20, 30	
Y8	1280 x 800	5, 10, 15, 20, 30	Infrared Image
	640 x 400	5, 10, 15, 20, 30	
MJPEG	1280 x 800	5, 10, 15, 20, 30	
	640 x 400	5, 10, 15, 20, 30	
YUYV	1920 x 1080	5, 10, 15, 20, 30	Color Image
	1280 x 800	5, 10, 15, 20, 30	
	640 x 360	5, 10, 15, 20, 30	
MJPEG	1920 x 1080	5, 10, 15, 20, 30	
	1280 x 800	5, 10, 15, 20, 30	
	640 x 360	5, 10, 15, 20, 30	

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4.5 Reference for the Depth Starting Point of Gemini 215

The depth starting point or ground zero reference can be described as the starting point or plane where the depth equals 0. For Gemini 215, the distance from the depth zero point to the front surface of the module is 2.2 mm.

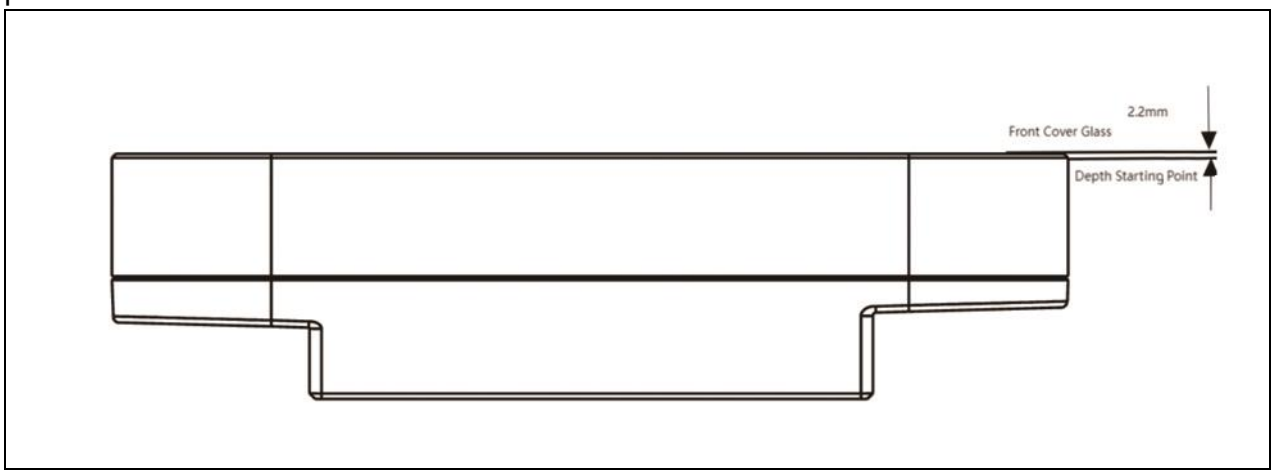

Figure 4-5-1 Schematic Diagram of the Depth Starting Point of Gemini 215

4.6 Reference for the Depth Starting Point of Gemini 210

The depth starting point or ground zero reference can be described as the starting point or plane where the depth equals 0. For Gemini 210, the distance from the depth zero point to the front surface of the module is 1.3 mm.

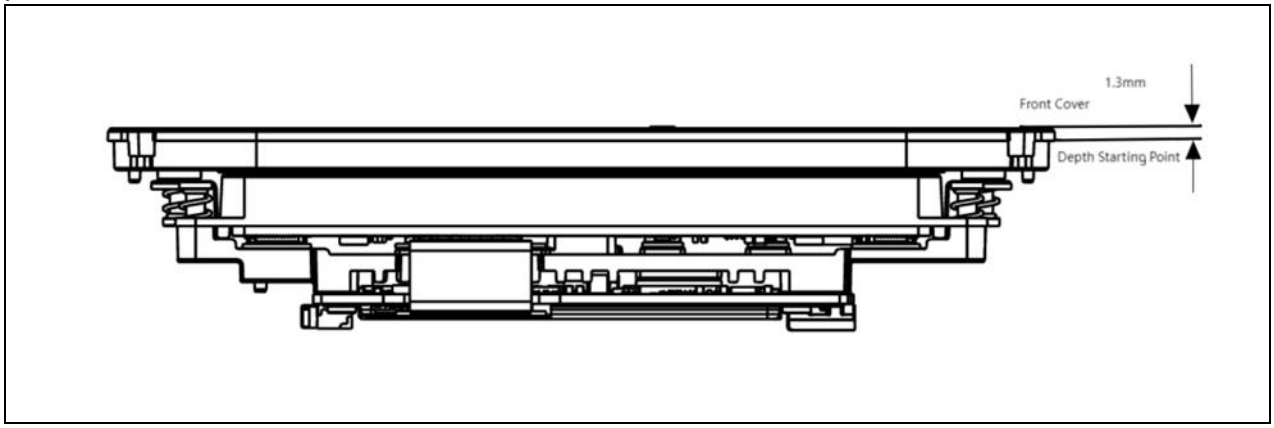

Figure 4-6-1 Schematic Diagram of the Depth Starting Point of Gemini 210

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4.7 Depth-to-Color (D2C) Alignment

Gemini 215 / Gemini 210 support spatially and temporally aligned output of D2C (Depth To Color) depth and color images. D2C (Depth To Color) refers to mapping each pixel point on the depth map to the corresponding position on the color map according to the internal and external parameters of the depth camera and the color camera, so as to obtain the RGBD map.

The maximum resolution supported for depth image alignment is 1280×800@30fps, and the maximum resolution supported for color image alignment can reach 1920 x 1080@30fps.

Table 4-7-1 Supported D2C Alignment for Gemini 215/Gemini 210

Depth Image Before D2C	Color Image	Depth Image After D2C
1280 x 800@5/10/15/20/30fps	1920 x 1080@5/10/15/20/30fps	1920 x 1080@5/10/15/20/30fps
1280 x 800@5/10/15/20/30fps	1280 x 720@5/10/15/20/30fps	1280 x 720@5/10/15/20/30fps
640 x 400@5/10/15/20/30fps	1920 x 1080@5/10/15/20/30fps	1920 x 1080@5/10/15/20/30fps
640 x 400@5/10/15/20/30fps	1280 x 720@5/10/15/20/30fps	1280 x 720@5/10/15/20/30fps
640 x 400@5/10/15/20/30fps	640 x 360@5/10/15/20/30fps	640 x 360@5/10/15/20/30fps

4.8 Depth Work Mode

Table 4-8-1 Depth Work Mode for Gemini 215 / Gemini 210

Deoth Work Mode	Resolution	Depth Range Configuration
Close_Up Precision Mode	1280 x 800	0.15 - 0.3m
	640 x 400	
Extended Distance Mode	1280 x 800	0.2 - 0.7m
	640 x 400	

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4.9 IMU Specifications

4.9.1 IMU Coordinate System

The origin of the IMU coordinate system of Gemini 215 / Gemini 210 is consistent with the position of the center point of the physical sensor. The direction of the coordinate axis is consistent with the depth direction.

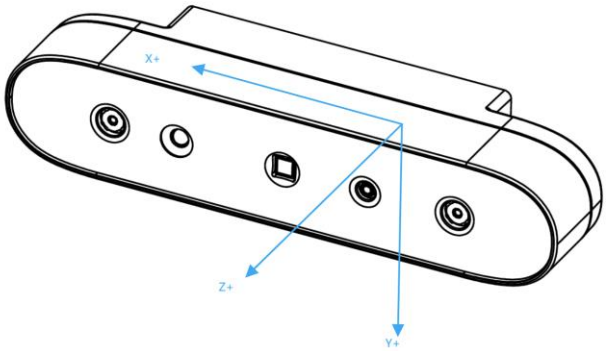

Figure 4-9-1 Schematic Diagram of the IMU Coordinate System of Gemini 215 / Gemini 210

4.10 Multi-camera Data Synchronization Function

4.10.1 Multi-camera Synchronization

For a multi-camera use case, one camera can be initialized as primary, and the rest configured as secondary. Alternatively, an external signal generator can also be used as the primary trigger with all cameras set to secondary mode. When applying an external sync pulse, the HW SYNC input requires a 100-microsecond positive pulse at the nominal camera frame rate, e.g. 33.33ms for a 30Hz frame rate. Inputs are high impedance, 1.8V CMOS voltage levels. However, it is important to make sure to use a high-resolution signal generator. The frequency of the signal generator needs to exactly match the sensor frame rate. For example, if the sensor is set up as 30FPS, the real frame rate may be 30.015FPS. You may need to use an oscilloscope to measure the real frame rate and configure the signal generator to the same frequency. For this reason, it may be better to just use one additional camera as the primary sync signal generator.

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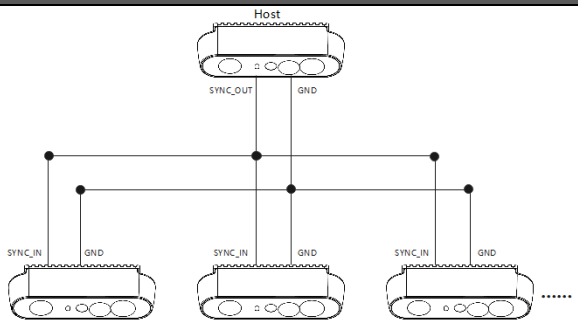
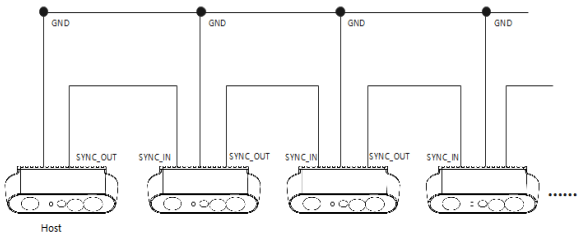
Advantages of multi-camera setup:

- Increase camera coverage in a given space and fill in the occlusions where a single camera may have blind spots
- Capture multiple images of the same scene and scan objects from different angles
- Increase the effective frame rate to greater than 30 FPS

Using an 8-pin connector and matching cable, a multi-camera and multi-sensor network can be designed. (Please follow the instructions in the SDK).

Multi-camera synchronization in two topologies is supported, including depth image synchronization and RGB image synchronization (time difference ≤ 5ms, when auto exposure off), using the multi-camera synchronization function.

Table 4-10-1 Topologies schematic diagram

Star Topology	Daisy-chain Topology
	

4.10.2 Description of multi-machine synchronization interface

Table 4-10-2 Synchronization Interfaces of Gemini 210 Series

Pin	Definitions	Description
Pin_1	VCC	The default electrical level setting is 1.8V; when 3.3V or 5V drive voltage is provided on the VCC interface, the I/O level setting can be adjusted to 3.3V or 5V as required.
Pin_2	GPIO_OUT	Synchronization drive signal: Active high. The high-level interval coincides with the IR exposure time. Typical application is to drive external fill light.

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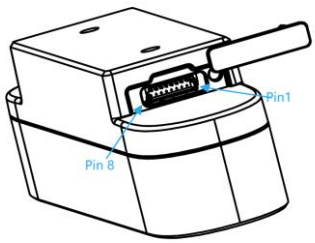
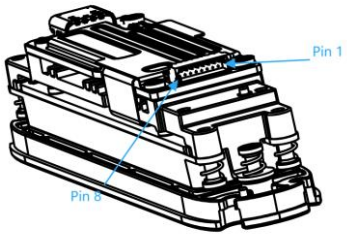
Pin_3	VSYNC_OUT	Synchronous trigger signal: Active high. The high level provides the triggering signal for the secondary devices.
Pin_4	TIMER_SYNC_OUT	Pulse signal source, reset hardware timestamp of secondary devices.
Pin_5	RESET_IN	Hardware reset signal: Triggers the camera to power down and automatically power up and reset. Detect the input signal: 20 Hz / 50% duty cycle / more than 5 consecutive cycles, that is, judged as normal input signal, other signals filtered out; allowed fluctuations for frequency ± 1 Hz, duty cycle ± 2%.
Pin_6	VSYNC_IN	Synchronous trigger signal: Active high, used for the triggering/sync signal from primary device, with a duration of 1 ms.
Pin_7	TIMER_SYNC_IN	Hardware timestamp reset signal input, hardware timestamp clearing.
Pin_8	GND	Ground

Table4-10-3 Gemini 210 series Multi-camera Synchronization Pin Placement

Gemini 215	Gemini 210
	

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5. Performance

5.1 Electrical Performance

5.1.1 Power Supply

Gemini 215 / Gemini 210 use the standard USB Type-C 5V DC for power supply.

5.1.2 Power Consumption

Table 5-1-1 Camera Configurations for Typical Use Cases of Gemini 215 / Gemini 210

Operating Mode	Camera Configuration									
	Depth / IR Configuration							RGB Configuration		
	Resolution @ Frame Rate	Image Format	Hardware D2C Status	AE Status	Exposure (in microseconds)	Gain	Laser Energy Level	Resolution @ Frame Rate	Image Format	AE Status
Close_Up Precision Mode	1280x800@30fps	RLE	on	off	5000	1000	5	1920x1080@30fps	MJPEG	on
Extended Distance Mode	1280x800@30fps	RLE	on	off	5000	1000	5	1920x1080@30fps	MJPEG	on
Notes	1. In order to test the maximum power consumption of RGB, it is necessary to maintain a low-light environment so that the exposure time of RGB can be extended. 2. The IMU Output Data Rate (ODR) is set to 1000 Hz.									

Table5-1-2 Reference Power Consumption Values for Gemini 215 / Gemini 210

Scenario	Test Case	Peak Current (mA)	Average Current (mA)	Average Voltage (V)	Peak Power (mW)	Average Power (mW)
Streaming Data	Close-up Precision Mode	1226	467	5	6085	2313
	Extended Distance Mode	/	/	/	/	/
Power-on	Instantaneous current at power-on	7720	/	5.0	/	/
	Power on and boot up to enter the standby state	82	63	5.01	419	324
Standby	Turn on the IR stream first and then turn it off	104	84	5.01	532	429

Notes：

For diverse scenarios, the power consumption of the whole device may vary as the overall load varies.

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The table corresponds to the power consumption performance of the Gemini 215/Gemini 210 products in typical scenarios.

5.1.3 ESD Performance

Table 5-1-3 Gemini 215/Gemini210 ESD Performance

Conditions	Powered-On	Powered-Off	Certification Standards
Contact Discharge	±4KV Class A	±4KV Class A	EN 61000-6-2 EN 61000-6-4
Air Discharge	±8KV Class A	±8KV Class A	

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6. Firmware

6.1 Firmware Update & Cautions

Gemini 215/Gemini 210 support update the firmware via online or location, you can upgrade or downgrade as needed. To get the firmware and changelog: Firmware Release

Please note the following considerations:

1. You can update the firmware in any working mode or preset;
2. All data streams must be closed when update the firmware;
3. During the firmware update, please ensure that the power supply and data transmission cable connections are stable;
4. The camera will automatically restart after the firmware update is completed. You can also re-plug the cable after completion and restart it manually;

6.2 How to Update Firmware

The simplest way to update the firmware is through the Orbbec Viewer tool, which supports both manual updates and online updates. For detailed instructions, please refer to the documentation: Update firmware

6.3 Recovery

Ensure the stability of cable during the update process to avoid upgrade failure. If the update process fails, disconnect the cable, re-insert it, and burn the product again. If re-burning is unsuccessful, the product may be damaged. Orbbec assumes no liability for any damages or losses resulting from the use of this product.

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7. Orbbec SDK

7.1 Description of Orbbec SDK

Orbbec SDK is a cross-platform (Windows, Android, Linux) software development kit for Orbbec's structured light, binocular, iToF and other 3D cameras. It provides device parameter configuration, data stream reading and stream processing. The functions provided include:

1. Access and control of hardware devices;
2. Access, control and data acquisition of sensors included in the device;
3. Control of frame synchronization and alignment;
4. Acquisition of point cloud data (this function can be obtained by updating the SDK version in subsequent versions);
5. Provision of algorithm capabilities such as filtering;
6. Support for different systems and Wrappers;
7. Effect display tool Orbbec Viewer;
8. Please select the corresponding SDK and display tool according to the different system versions of Gemini 215 / Gemini 210;
9. For Orbbec SDK download and update, please go to: Orbbec SDK v2 Open-Source Repo.

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8. Use Guidance

8.1 Packing List

Table 8-1-1 Gemini 215/Gemini 210 Package List

Package Type	Package List	Gemini 215	Gemini 210	Notes
Bulk	Camera			Minimum batch packaging quantity: 100pcs
Box	Camera		N/A	Minimum batch packaging quantity: 20pcs
	1x Tripod			
	1x USB Cable (2m)			

8.2 Initialization and Operation

- Connect Gemini 215/Gemini 210 via the USB cable to the host PC
- Download Orbbec SDK from： Orbbec SDK v2 Repo
- Use Orbbec Viewer to validate that images can be streamed from all sensors with the following settings:
  - Depth stream: 640 x 400
  - Color stream: 1280 x 720
  - IMU enabled
- If for any reason that the camera is not responding or not detected, please unplug all cables from the camera and replug the cable into the host PC for resetting the camera status.

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9. Regulatory Compliance

These products are certified as follows:

9.1 Laser Safety certification

Class 1 Laser Product under the EN/IEC 60825-1:2014
CLASS 1 LASER PRODUCT

9.2 EMC Regulatory Compliance

CE-Declaration	FCC part 15 Declaration of Conformity	KC

9.3 Environment Regulatory Compliance

RoHS 2.0, REACH, WEEE,

RoHS	REACH	WEEE

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10. System Integration Guide

Use outside of the specified conditions could cause the device to fail and/or function incorrectly. These conditions are applicable for the environment immediately around the device under all operational conditions. When used with an external enclosure, active temperature control and/or other cooling solutions are recommended to ensure the device is maintained within these ranges.

10.1 Installation Recommendations

1. When using external housing around the camera for dust proofing, use foam inserts or rubber gaskets between the front of the camera and the external housing.
2. Avoid external forces applied to the camera chassis during installation process.
3. Disassembling chassis will void the warranty.
4. For the detailed installation reference solution, please refer to Document Reference solution & best practice - mounting

10.2 Heat Dissipation

1. Avoid direct heat source around the camera.
2. Maximizing the space inside the external housing may help lower operating temperature.

10.3 Cable Design Guide

1. It is recommended to use the included USB Type-C cable. If there is a need for longer cable, please select a USB-IF certified cable that supports both power and data (≤3.0 m length is recommended).
2. For the detailed cable design guide reference solution, please refer to Document Reference design & best practice - cable

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11. Cautions

1. Follow the instructions carefully when operating the camera. Improper handling may lead to damage to the internal components.
2. Do not drop the camera or expose the camera to mechanical stress.
3. Do not attempt to modify the camera as such modifications may cause permanent damage or performance degradation.
4. The temperature of the camera may rise during long periods of use.
5. Do not touch the lens. Fingerprints on the lens may affect image quality.
6. Keep the product beyond the reach of children or animals to avoid accidents.
7. If the computer does not recognize the camera, verify that the cable meets the power and data transfer requirements, then replug it into the USB port to reconnect.
8. This product is classified as a Class 1 Laser Product under the international standard EN/IEC 60825-1, Edition 3 (2014). Using controls, adjustments, or procedures other than those specified herein may result in hazardous radiation exposure.

Safety and Handling Instructions:

- Avoid powering on the product if any external damage was observed.
- Do not attempt to open any portion of this product. There are no user serviceable parts.
- Be cautious of invisible laser radiation. Avoid direct exposure to the beam.
- To maintain compliance and safety standards, do not modify or service the product. Unauthorized modifications or servicing could result in emissions surpassing the Class 1 safety level.
- Only update the camera firmware with official releases that match the specific module SKU and revision to ensure proper functionality and safety.

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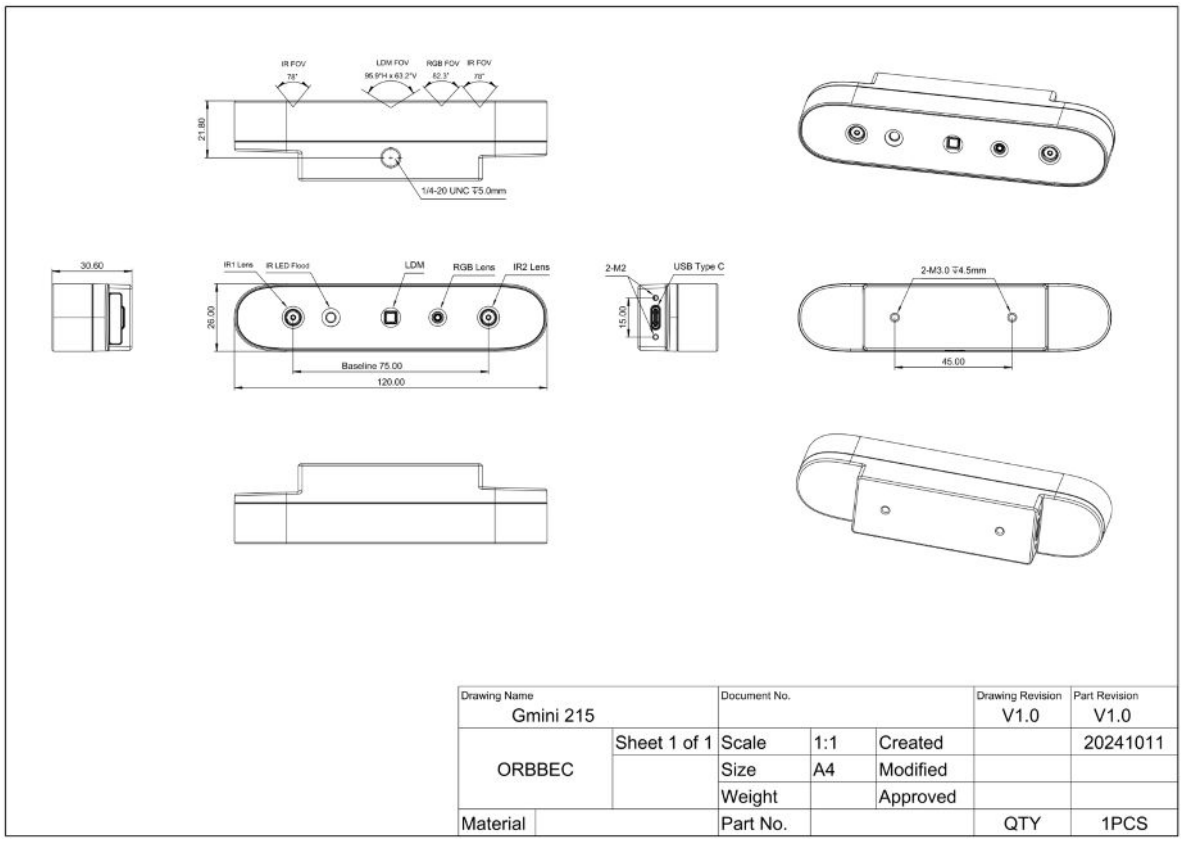
Appendix A Structural Drawings of Gemini 215



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ORBBEC	Sheet 1 of 1	Scale	1:1	Created		20241011
		Size	A4	Modified		
		Weight		Approved		
Material		Part No.			QTY	1PCS

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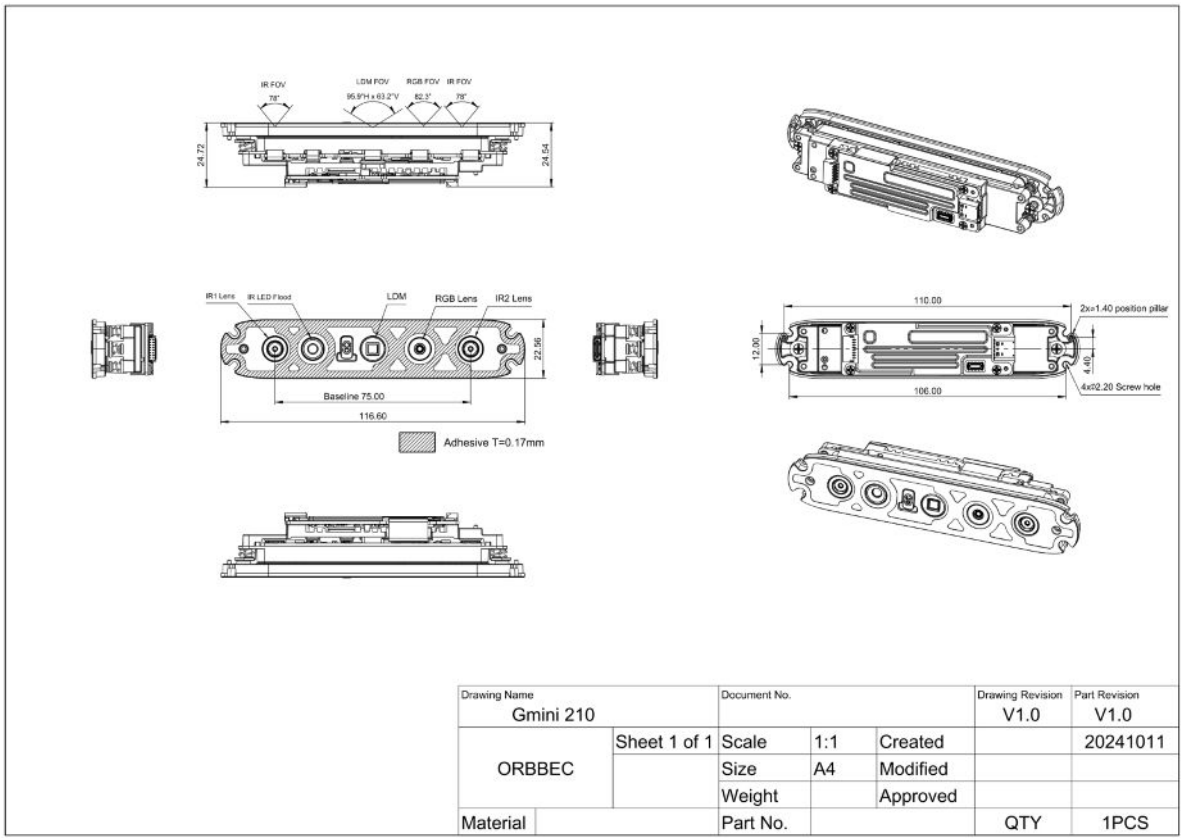
Appendix B Structural Drawings of Gemini 210



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Material		Part No.			QTY	1PCS

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