ORBBEC

Femto Mega

Datasheet v1.1

Product Brief	02
Product Specifications	03
Product Information	04
SDK	05
Camera Setup and Operation	05
Installation Guide	06
Safety and Handling	07
Product Drawings	07
Field of View Illustration	08
Multi-Camera Synchronization	08
Glossary of Terms	09



Developed with

Microsoft NVIDIA

Copyright Orbbec Inc. All rights reserved. The product described may contain defects or errors or deviation from published specifications. Contact your sales representative to obtain the latest Orbbec 3D product specifications. Orbbec is not responsible for any users infringing on third party copyright or other rights in use of Orbbec products. In addition, Orbbec does not assume any liability for damages or any losses resulting from the use of this product. All information provided here is subject to change without notice.

1. Product Brief

Product Overview

Femto Mega is a programmable multi-mode Depth and RGB camera with real-time streaming of processed images over Ethernet or USB connections. The camera uses Microsoft's industry proven TOF technology and the NVIDIA® Jetson™ platform to deliver a software-defined Depth and RGB vision platform for computer vision and AI developers.

Product Features

- 1 Mega Pixel ToF sensor
- 4K RGB
- IMU: 6DoF
- Processor: NVIDIA Jetson Nano™
- Data interfaces: Ethernet, USB 3.2 Gen 1 Type-C
- Power: PoE/USB Type-C/DC
- Trigger/Sync Control
- OS: Windows or Linux
- Operating temperature: 10°C ~ 25°C

Product Characteristics

Performance

- High resolution sensor provides detailed scene understanding.
- Wide Field of View covers large area.
- Various operating modes for different applications.

Programmability

- In-camera processing of advanced depth vision algorithms.
- Integrated NVIDIA Jetson Nano™ system-on-module for AI processing can remove need for dedicated compute.
- Orbbec SDK enables easy setup and provides a rich set of APIs for integration with various applications.

Packaging

- Depth and RGB cameras in single device.
- Combined data and power with Power over Ethernet (PoE) or USB 3.2 Gen 1 Type-C connections eliminate need for multiple cables.
- Can be directly connected to servers or cloud as an IoT device.
- Precise synchronization trigger control uses standard Ethernet cables.

ORBBEC. All Rights Reserved. https://orbbec3d.com/
Note: Orbbec reserves the right to change any information in the document without prior notice.
Contact us: info@orbbec3d.com | 2800 Livernois Rd, Troy, MI 48083 USA

2. Product Specifications

Parameter	Specifications
Model	F20364-552
VID/PID	0x2BC5/0x0669
Technology	iToF
Shutter Type	IR: Global Shutter; Color: Rolling Shutter
Wavelength	850nm

Mode	Resolution	FoV	FPS	Range	Format
WFOV Unbinned	1024 x 1024	H 120° x V 120°	5, 15	0.25m – 2.21m	Y16
WFOV Binned	512 x 512		5, 15, 25, 30	0.25m –2.88m	
NFOV Unbinned	640 x 576	H 75° x V 65°	5, 15, 25, 30	0.5m – 3.86m	
NFOV Binned	320 x 288		5, 15, 25, 30	0.5m – 5.46m	
RGB	3840 x 2160	16:9 H 80°x V 51°	5, 15, 25	N/A	YUY2, MJPG, H.264, H.265
	2560 x 1440		5, 15, 25, 30	N/A	
	1920 x 1080		5, 15, 25, 30	N/A	
	1280 x 720		5, 15, 25, 30	N/A	
	1280x960	4:3 H 65° x V 51°	5, 15, 25, 30	N/A	

Depth typical systematic error (accuracy)* < 11 mm + 0.1% distance
Depth random error std. dev.(precision)* ≤ 17 mm,
Passive-IR mode supported
*15% to 95% reflectivity at 850nm, 2.2 μW/cm2/nm without multi-path interference.
Depending on object reflectivity, depth may be provided outside of the operating range indicated above.

Parameter	Specifications
IMU	6 DoF; Frequency range: 50-2,000Hz; Data format: float
Mirror Mode	Supported, non-mirror by default
Processing	NVIDIA Jetson Nano™ for in-camera processing
Data Connection	USB 3.2 Gen 1 Type-C Gigabit Ethernet 8 Pin-Connector*1 Micro USB*2 *1 for multi-device sync. *2 for firmware upgrade and device reset.
Network Protocol	RTSP, RTP
Power Mode	DC/POE/USB Type-C
Power Input	DC 12V 2A POE+/802.3at (24W) Type-C 5V 3A
Operating Modes	DC Power + USB Type-C Data Type-C Power + USB Type-C Data*1 POE Power + Gigabit Ethernet Data*2 *1 Depth & IR mode support 640 x 576 and below, Y16 format. Color mode supports 1,920 x 1,080 and below, YUY2 and MJPG format. *2 Color mode supports H.264 and H.265 format.
Power Consumption	DC Power + USB data: 11W (Peak 16W) USB power + data: 10W (Peak 14W) POE power + Gigabit Ethernet data: 13W (Peak 17W)
Operating Environment	10°C - 25°C, 8%RH - 90%RH, Indoor/Semi-Outdoor
Anti-flicker	50Hz & 60Hz
Supported Functions	D2C, Multi-Camera Sync
Dimensions WxHxD	115 mm × 40 mm × 145 mm
Weight	560g
Certifications	ROHS, Reach, WEEE, CP65, EMC, FCC, IC, UKCA, Class 1 Laser Product, FDA
Installation	Bottom: 1 x ¼-20unc Sides: 4 x M2.5

ORBBEC. All Rights Reserved. https://orbbec3d.com/
Note: Orbbec reserves the right to change any information in the document without prior notice.
Contact us: info@orbbec3d.com | 2800 Livernois Rd, Troy, MI 48083 USA

3. Product Information

a. Product Images

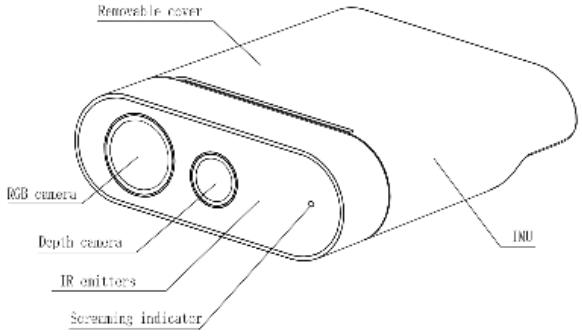


Front View



Rear View

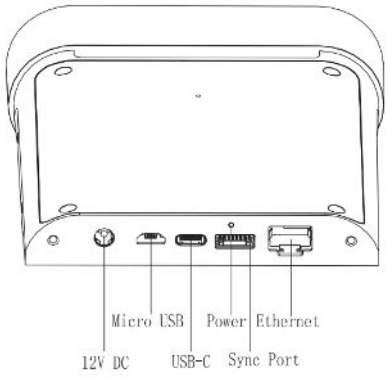
b. Product Components



Femto Mega Components

c. Product Interfaces

The hardware interfaces of Femto Mega camera are shown in the figure below.



**Micro USB port and Registration Pin are intended for firmware upgrade only.*

d. Connection Type

	Supported Connection Type		Data Transmission
1	DC		USB or Ethernet
2	USB Type-C		USB Type-C
3	Ethernet port with POE		Ethernet
4	DC	USB Type-C	USB Type-C
5	DC	Ethernet port with POE	Ethernet
6	DC	Ethernet port without POE	Ethernet

ORBBEC. All Rights Reserved. https://orbbec3d.com/
Note: Orbbec reserves the right to change any information in the document without prior notice.
Contact us: info@orbbec3d.com | 2800 Livernois Rd, Troy, MI 48083 USA

4. Software Development Kit (SDK)

Orbbec SDK is a flexible and modular platform for easy camera setup and runs on Linux/Windows with a rich set of APIs. It supports camera access, device setup and configuration, data stream reading, processing, and viewing, RGB-D registration and frame synchronization.

The functions include:

- Access and control of camera devices.
- Control of frame synchronization and alignment.
- Acquisition of point cloud data.
- Orbbec Viewer for camera testing.

Please check https://orbbec3d.com/developers/orbbec-sdk/ for latest SDK.

Temperature sensor and recording

The temperature of camera core components can be obtained, including CPU temperature, laser temperature, IR sensor temperature and IMU sensor temperature through API commands.

Case Temperature Limits

- Lower than 40°C

5. Camera Setup and Operation

Packing List

- Orbbec Femto Mega device
- USB Type-C to USB Type-C power + data cable
- AC to DC Power Supply/Adapter

Initialization and operation

- Connect Femto Mega via the cable to the host PC.
- Check both indicators on the camera and validate that all cameras enumerate correctly on the host computer
- Download Orbbec SDK from https://orbbec3d.com/developers/orbbec-sdk/
- Use Orbbec Viewer to validate that images can be streamed from all sensors with the following settings:
  - Depth camera: NFOV Unbinned
  - RGB Camera: 2160p
  - IMU enabled
- If for any reason that the camera is not responding or not being detected, please remove all cables from the camera and unplug to the host PC for resetting the camera state.

a. Indicators

Front: The indicator is ON by default while the device is operating and can be manually switched on/off through the SDK.

State of Indicators	Meaning	Next Steps
Solid White	Powered ON and working correctly	Use the device.
Flashing Amber	The device is in faulty state	Unplug power to reboot the device.

Rear: The power indicator indicates the connection status of power supply and data. This indicator is enabled by default and cannot be turned off.

State of Indicators	Meaning	Next Steps
Solid White	Powered on and data ready	Device is ready for use.

ORBBEC. All Rights Reserved. https://orbbec3d.com/
Note: Orbbec reserves the right to change any information in the document without prior notice.
Contact us: info@orbbec3d.com | 2800 Livernois Rd, Troy, MI 48083 USA

Rear: Continued from previous page

State of Indicators	Meaning	Next Steps
Flashing White	Power ready, waiting for data connection	Ensure that the power adapter is connected properly. Make sure that the USB Type-C cable is connected to the device and to a USB port on your PC or connect the device to a different USB port on the PC. On your PC, open Device Manager (**Start** > **Control Panel** > **Device Manager**), and verify that your PC has a supported USB 3.0 Gen 1 or later host controller.
Flashing Amber	Insufficient power supply	Ensure that the power adapter is properly connected. Make sure that the USB Type-C cable is connected to the device and to your PC.

6. Installation 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. The device design features a cooling channel in between the front section and rear sleeve. When installing the device, make sure this cooling channel is not obstructed.

a. Installation Recommendations

1. Camera is active cooled, please do not cover the venting holes of the fan.
2. 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.
3. Avoid external forces applied to the camera chassis during installation process.
4. Disassembling chassis and mounting brackets voids the warranty.

b. Heat Dissipation

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

Note: For further support of housing design information, please contact Orbbec 3D at info@orbbec3d.com.

c. Transmittance Requirements

Transmittance requirements for front cover protection lens of Femto Mega 3D camera are listed as follows:

1. RGB transmittance:
   835~865nm T_{min} > 85%,
   800~960nm T_{ave} > 88% and
   400~700nm T_{ave} > 85%
2. RX transmittance:
   420~680nm T_{min} > 97%
3. Flatness of front cover lens material: < 0.005mm.
4. Glass is recommended.

Before changing the structural design of camera, the protective lens in front of the camera lens must meet the requirements above.

d. Cable Design Guide

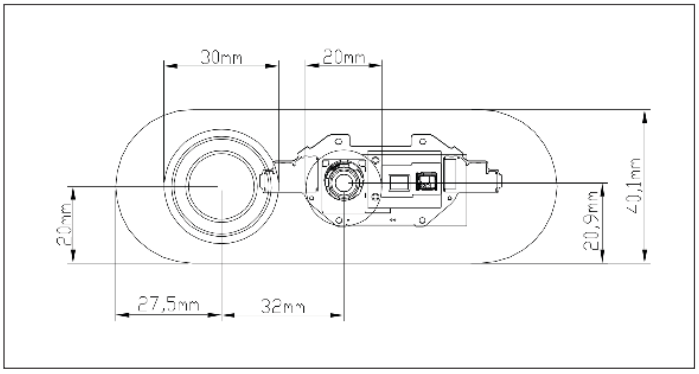
It is recommended to use included USB Type-C cable. If there is a need for longer cable, please select a USB certified cable that supports both power and data (1-1.5m length is recommended).

ORBBEC. All Rights Reserved. https://orbbec3d.com/
Note: Orbbec reserves the right to change any information in the document without prior notice.
Contact us: info@orbbec3d.com | 2800 Livernois Rd, Troy, MI 48083 USA

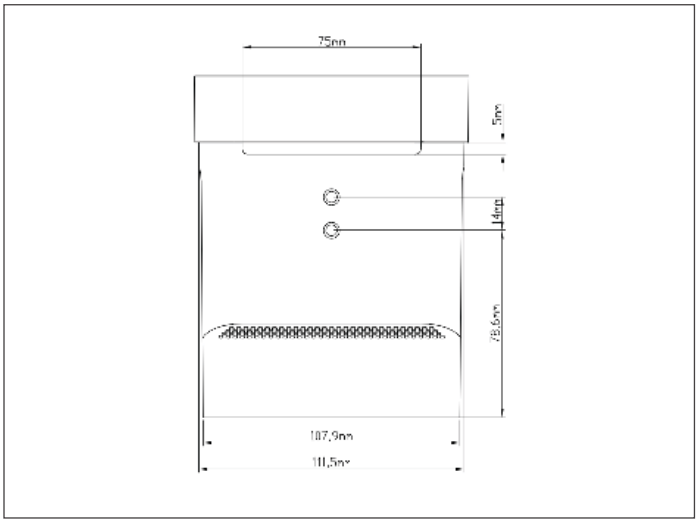
7. Safety and Handling

1. Follow the instructions to operate the camera. Improper operation may cause damage to internal components.
2. Do not drop or hit the camera with external force.
3. Do not attempt to modify the camera in any way. Any modification may cause permanent damage or inaccuracy.
4. It is expected that the temperature of the camera may increase during prolonged usage.
5. Do not touch the lens. Finger prints on the lens may affect image quality.
6. Keep the product beyond the reach of children or animals to avoid accidents.
7. If the camera is not recognized by the computer, check if the cable meets the power/data transfer requirements and reinsert the USB cable for inspection.
8. Class 1 laser is used in this product. Looking at the laser for more than 20 s is not recommended.

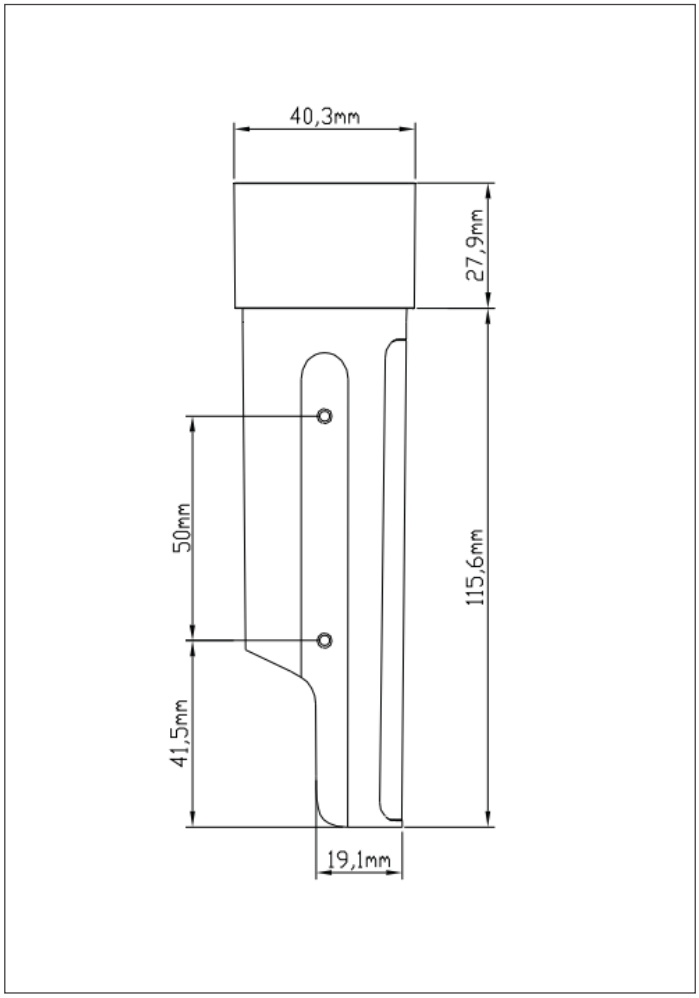
8. Product Drawings



Front View



Bottom View

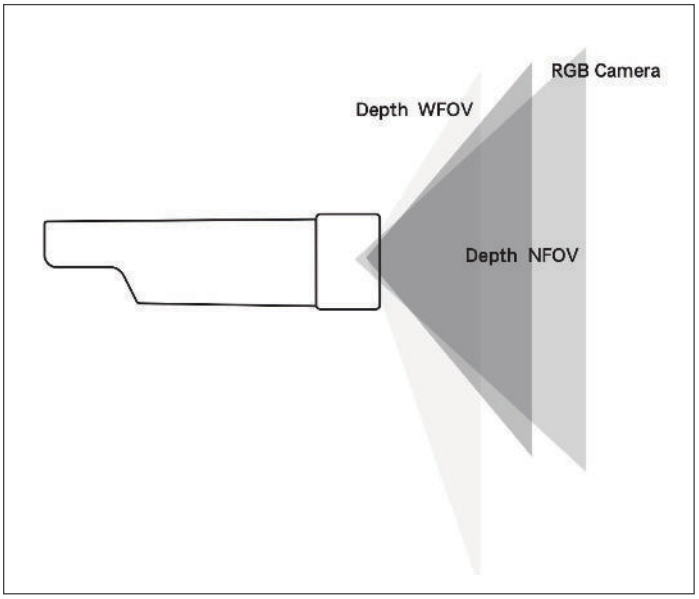


Side View

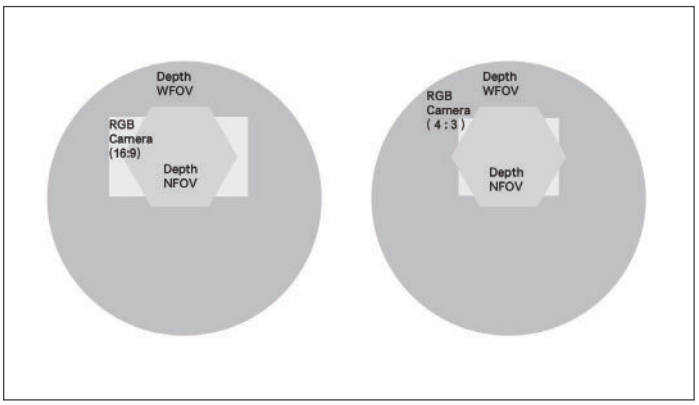
ORBBEC. All Rights Reserved. https://orbbec3d.com/
Note: Orbbec reserves the right to change any information in the document without prior notice.
Contact us: info@orbbec3d.com | 2800 Livernois Rd, Troy, MI 48083 USA

9. Field of View Illustration

The image below shows the depth and RGB camera field-of-view, or the angles that the sensors "see". This diagram shows the RGB camera in a 4:3 mode.



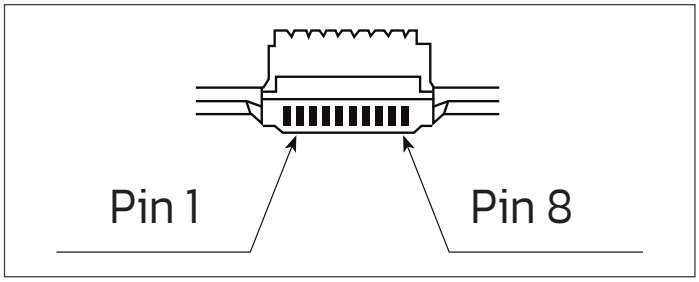
This image demonstrates the camera's field-of-view as seen from the front at a distance of 2000 mm. When depth is in NFOV mode, the RGB camera has better pixel overlap in 4:3 than 16:9 resolutions.



10. Multi-Camera Synchronization

Advantages of multi-camera setup

- Increase camera coverage in given space and fill in the occlusions where 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 frames per second (FPS).



**The Pin sequence is shown with camera placed in rear view.*

Using a 8-pin connector and matching cable, a multi-camera and multi-sensor network can be designed. Recommended minimum delay setting is 160us (please follow the instruction in the SDK)

An advanced trigger control hub and 8-pin to RJ45 adapter are being developed and will be available for purchase. With these optional accessories, CAT 5 (or better) rated ethernet cables can be utilized as trigger cable to help with long distance triggering setup and provide the function of switching trigger level, 1.8V, 3.3V or 5V.

Pin	Definitions	Description
Pin_1	GND	Ground
Pin_2	TIME_SYNC_IN	Hardware timestamp Reset Signal Input
Pin_3	VSYNC_IN	Active high, used for the triggering/sync signal from primary device
Pin_4	RESET_IN	Pulse signal, power down and POR
Pin_5	TIME_SYNC_OUT	Pulse signal source, reset hardware timestamp of secondary devices
Pin_6	VSYNC_OUT	Active high. The high level provides the triggering signal for the secondary devices.
Pin_7	GPIO_OUT	Active high. The high-level interval coincides with the IR exposure time.
Pin_8	SYNC_VCC	Default Voltage is 1.8V. This voltage is sensed (3.3V or 5V) and used to set/sense the level of all signals.

ORBBEC. All Rights Reserved. https://orbbec3d.com/
Note: Orbbec reserves the right to change any information in the document without prior notice.
Contact us: info@orbbec3d.com | 2800 Livernois Rd, Troy, MI 48083 USA

11. Glossary of Terms

Terms	Descriptions
D2C	Depth to Color function maps each pixel on depth map to the corresponding color image according to the intrinsic and extrinsic parameters of depth camera and color camera
Depth	Depth video streams are like color video streams except each pixel has a value representing the distance away from the sensor instead of color information
Depth Camera	Includes depth imaging module and external interface only, of which the former is generally composed of infrared projector, infrared camera and depth computing processor
FOV	Field of View (FoV) describes the angular extent of a given scene that is captured by a camera, which can be measured in horizontal, vertical, or diagonal
I2C	I2C bus refers to a kind of simple bidirectional two-wire synchronous serial bus developed by Philips. It can be used for transferring information among devices connected to the bus with two wires.
IR Camera	Infrared camera
IR Flood	IR floodlights are used tofor illuminate the environment
ISP	Image signal processor, which is used for image post-processing
MIPI	MIPI alliance, i.e., Mobile Industry Processor Interface (MIPI) Alliance. MIPI is an open standard and specification formulated by MIPI Alliance for mobile application processors.
PCBA	Circuit board consists of depth computing processor, memory, and other electronic devices
Point Cloud	A Point Cloud is a discrete set of data points in space
SoC	System on Chip, integrated circuit (IC) that integrates all components of a computing system
TBD	To Be Determined. In the context of this document, information will be available in a later revision.

ORBBEC. All Rights Reserved. https://orbbec3d.com/
Note: Orbbec reserves the right to change any information in the document without prior notice.
Contact us: info@orbbec3d.com | 2800 Livernois Rd, Troy, MI 48083 USA



Copyright Orbbec Inc. All rights reserved. The product described may contain defects or errors or deviation from published specifications. Contact your sales representative to obtain the latest Orbbec 3D product specifications. Orbbec is not responsible for any users infringing on third party copyright or other rights in use of Orbbec products. In addition, Orbbec does not assume any liability for damages or any losses resulting from the use of this product. All information provided here is subject to change without notice.