

X-D500 Specification

by

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Revision History

Version	Date	Description of Changes
1.0	2023-11-03	Initial draft

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Chapter 1 Overall Introduction



Figure 1.1: X-D500

1.1 General Introduction

The X-D500 3D camera is equipped with a 3D iToF(indirect Time-of-Flight) sensor, emitting modulated near-infrared light. When encountering an object, the sensor precisely calculates the phase difference between emitted and reflected light. These calculations are then transformed into time differentials, accurately measuring the distance of the captured scene, thereby generating comprehensive depth information. The resulting three-dimensional object outlines are depicted on a topographic map using a spectrum of colors to denote varying distances. The product is suitable for various applications in industrial measurement and consumer electronics requiring three-dimensional imaging. The technical solution offers high-precision (millimeter-level) depth maps and three-dimensional point cloud images. The X-D500 camera, with an optional integrated RGB feature, can output pixel-aligned RGBD images. Additionally, we provide customers with a cross-platform SDK supporting Windows, Linux (PC or ARM), and ROS systems, catering to various industry applications. The X-D500 3D camera Features:

- Proprietary high-precision calibration and alignment algorithms.
- Anti-environmental light, multi-path, and multi-device interference algorithms. Post processing algorithms: noise reduction, outlier removal, motion artifact removal.

1.2 Application Introduction

- Obstacle avoidance: AGV (Automated Guided Vehicle) robots.
- Pallet recognition: Identification of various stack holes.
- Object scanning: Vehicle load measurement, volume assessment, parcel sorting.
- 3D Mapping: Indoor mapping, environmental scanning.
- Robotics: Navigation, object detection, and localization.
- Healthcare: Patient monitoring, equipment positioning, robotic assistance.
- Agriculture: Crop monitoring, harvesting automation, precision agriculture.
- Security and Surveillance: Intrusion detection, people counting, access control.

Chapter 2 Product Specification

2.1 General Specification

Parameter	Description
ToF Sensor Type	Area Scan CMOS (Time-of-Flight)
Measuring Method	Time-of-Flight
ToF Resolution (H x V Pixels)	Max. 640 x 480, VGA
ToF Field of View (H x V)	64° x 50°
ToF Range	0.2–5m
Accuracy (typical)	0.5%
Frame Rate	5fps(Default,640 x 480 pixels) 20fps(320 x 240 pixels)
Synchronization	software trigger
Illumination	VCSEL, 940 nm
RGB Resolution (H x V Pixels)	Max. 1920 x 1080

RGB Field of View (H x V)	84° x 60°
USB Video Class (UVC)	Support
RGB Shutter Type	Rolling Shutter
Image Signal Process (ISP)	HDR, EV
Ambient Light Robustness	100K Lux
Multi-Camera Operation	Yes; via setting different frequency of the lasers before ex-factory
Communication Interface	100 Mbit/s Ethernet
Pixel Formats	NV12
Exposure Time Control	Programmable via the camera API
Camera Power Requirements	24 VDC / 2 A (18-25.2 VDC acceptable)
Cooling	Passive, no fan
Enclosure Rating	IP67
Size (W x H x L)	83 x 67.5 x 42 mm
Weight	271g
Laser Safety	Laser Class 1 (EN60825-1:2014)
Operating System	Windows 10/11, Linux, ROS
Programming Languages	C++, C, Python

Table 2.1: Product Specifications

2.2 Dimension and Mechanical Structure

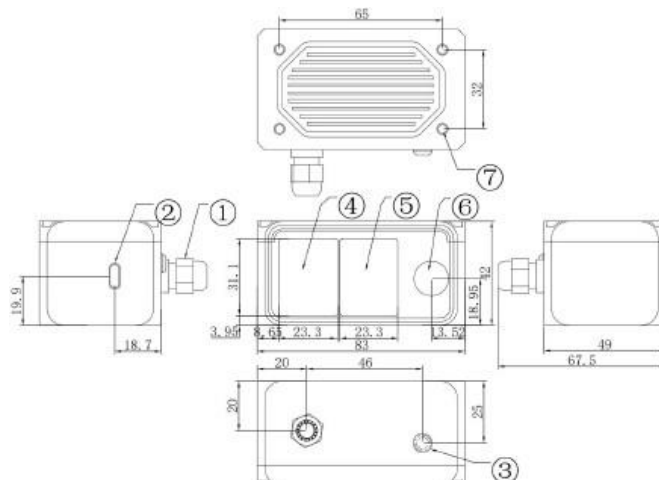


Figure 2.1: 2D Drawing (unit: mm)

- 1) Power and network communication outlet;
- 2) Type-C interface;
- 3) Status indicator light;
- 4) Protective glass above Vcsl
- 5) Protective glass above the sensor
- 6) Protective glass above the RGB module
- 7) Mounting holes (four in total) with threaded M4 specifications, each with a depth of 4mm.

Chapter 3 Requirements

3.1 Hardware Requirements

- X-D500 camera
- Camera bracket
- Power supply
- Accessory cable with Ethernet port
- Computer with a network adapter

3.2 Software Requirements

- Operating System
 - Windows 10
 - Windows 11
 - Linux x86
 - AArch64 Linux
- SDK
 - Viewer

- C/C++ SDK for X-D500
- C++, C, and Python programming samples
- Robot Operating System (ROS) driver for X-D500

X-D500 software development kit (SDK) incorporates pre-processing algorithms such as calibration algorithms and depth calculation algorithms. Additionally, it integrates post-processing algorithms including filtering, point cloud conversion, and automatic exposure functionalities. Users can select the X-D500 resolution, frame rate, integration time, confidence level, and other parameters based on different environments and objects being measured to achieve optimal results.

SDK Download Link:

- Firmware upgrade

The latest firmware is suggested to make sure the best performance of the X-D500 camera. It can be upgraded via the corresponding upper computer software. After the successful upgrade/downgrade, the camera must be restarted for the new version to take effect.

Firmware upgrade download Link:

3.3 Environmental Requirements

- Temperature and Heat Dissipation

Environment temperature	-20 to 60°C
Storage temperature	-40 to 80°C

Table 3.1: Environmental Specifications

It is recommended to install the unit in a location with adequate airflow and contact between the metal mounting surface and the camera.

3.4 Cable Requirements

The X-D500 is shipped together with a 1 meter length cable which provides female connectors for power supply and data transfer.

Maximum recommended cable length: 10 m

3.5 Installation Requirements

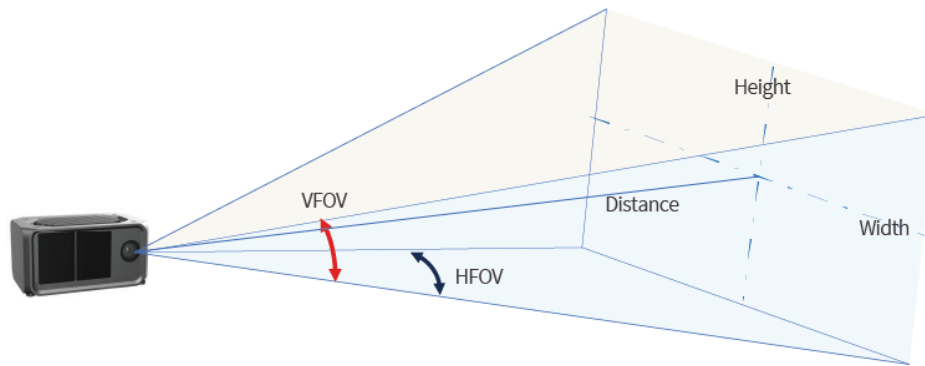


Figure 3.1: Field of View(FoV)

Installation Instructions:

- The target object must be entirely within the field of view.
- When positioning the installation, consider tolerances.
- When selecting the installation position, consider maintaining the cleanliness of the external lens of the camera.
- There should be no transparent objects between the camera and the object being measured, as reflected light can cause measurement distortion.

Note: The product's outer casing itself meets the heat dissipation requirements without requiring additional cooling methods. It is recommended to install the unit in a location with adequate airflow and contact between the metal mounting surface and the camera.

Chapter 4 Accessory and Connection

4.1 Accessory List

One cable with three interfaces, which are the Gigabit Ethernet port connector, CAN inter-face connector, and power interface connector. Length: 1 meter

4.2 Connection Illustration

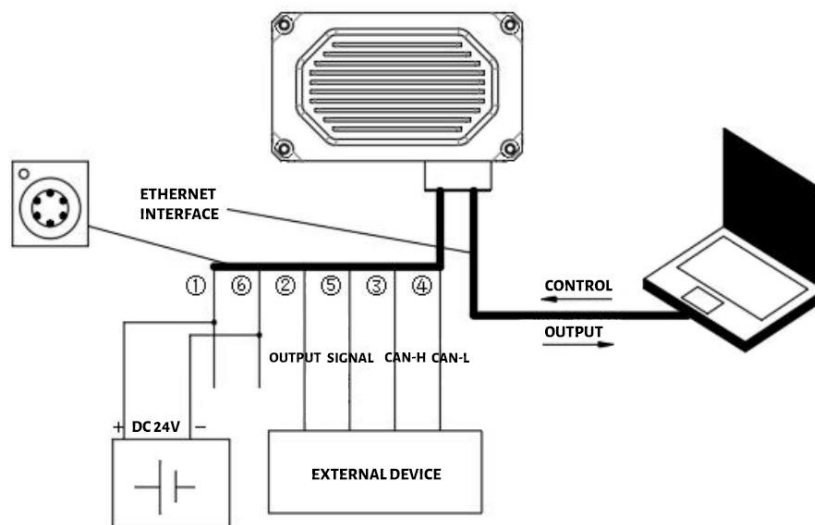


Figure 4.1: Hardware Connections Illustration

Chapter 5 Operational Guidelines and Usage Recommendations

- When using the 3D camera, remove the protective film from the lens.
- Install and operate the camera away from heat sources, especially near the lens.

- Avoid exposing the camera lens to sharp objects to prevent scratching during use.
- Refrain from frequent use of alcohol or organic solvents for cleaning the lens, as it may damage the coating. Use a clean, lint-free cloth for cleaning.
- Protect the camera adequately in scenarios involving strong vibrations, external impacts, or extreme environmental conditions.
- Provide suitable protection for the camera in excessively humid or dusty environments.
- Follow the installation instructions to prevent any installation methods that might cause severe deformation of the camera.
- Strictly adhere to the cable definitions in the specifications when using self-purchased cables or modifying bundled cables. Incorrect wiring can lead to camera burnout or signal anomalies.
- Avoid powering the camera on surfaces or objects during camera use or testing to prevent laser overheating and component damage.
- Although the 3D camera is CLASS I certified, it is advised to avoid close, direct eye contact with the lens during operation.
- If experiencing insufficient image frame rates or streaming issues, reconnect the camera correctly and ensure all interfaces have good connections.
- Disassembling the camera is prohibited.