

X-D400 Technical Specification

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Change Record

Version	Revision Date	Revised Chapter	Revision History
V1.1.1	2023/07/02	All chapters	First Edition
V1.1.2	2024/04/10	Chapter 2	Updated the specification
V1.1.3	2024/06/11	Chapter 1, 2	Structure changed in products iteration.
V1.1.4	2024/07/1	Chapter 3	Updated the installation instructions etc.

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X-D400 Technical Specification

1.Product Overview

The X-D400 is an industrial camera based on the 3DiToF (indirect Time-of-Flight) technology solution.

The sensor emits the modulated near-infrared light which is reflected after encountering the object, calculates the phase difference between emission and reflection before transmit it into a time difference to convert the distance of the shot scene, so as to forms depth information and finally present the object's three dimensional profile in topographic maps with different colors representing different distances. This product can be widely used in industrial measurement, application scenarios with requirements of 3D images in consumer electronics and other fields.

The technical solution provides high precision (millimeter lever) depth maps and 3D point cloud maps, X-D400 camera integrated with RGB to output pixel-aligned RGBD images.It can also provides full platform SDK, which support Windows /Linux(PC or ARM)/ROS system fit applications from different industries.

Product X-D400 Features:

- Small in size, easy to install.
- Self-developed high-precision calibration and correction algorithm enable precision of 1%@whole range
- Ambient light/ multi-path/ multi-machine interference resistance algorithm.
- Post-processing algorithms: image denoising, flying spot elimination
- Deep customization available according to the user scenarios

2.Specification Parameter

2.1.Product pictures

The product pictures are shown as below:



Figure 1. Upper oblique view effect picture of X-D400

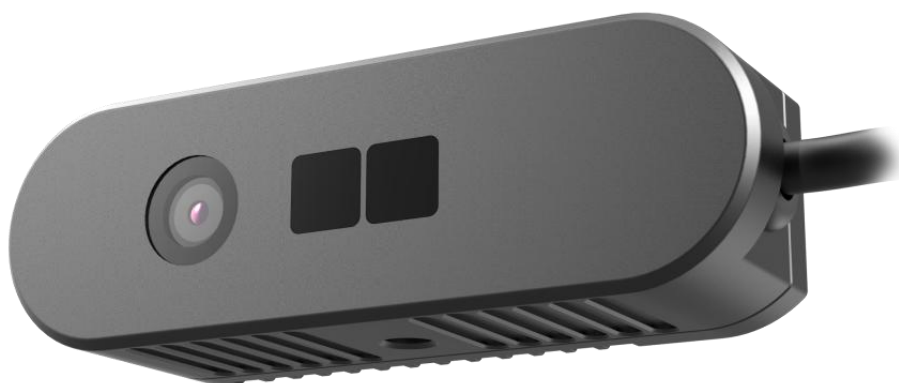


Figure 2. Lower oblique view effect picture of X-D400

2.2.Product specification

Product specifications are as follows:

Table 1 Product specification sheet

Classification Name	Performance Indicators	Index Parameter	Note
System parameter	Site environment	Indoors, outdoors	
	Anti-glare interference degree	90k lux	
	Operating temperature	-20°C~60°C	
	Safety class	CLASS 1	
	Protection grade	IP56	
	Size	85mm x 26.5mm x 25.05mm	
Electric parameter	Communication interface	Million Ethernet interface	
		CAN interface	Optional
		Hardware trigger interface	Optional
	Power interface	DC5521	
	Supply voltage	12~24V	
	Rated power consumption	DC24V < 3W	
TOF	Resolution	640 x 480 / 320 x 240	
	Frame rate	5fps@640 x 480 / 20fps@320 x 240	
	Ranging	0.3~3m@10% reflectivity 0.2~4m@90% reflectivity	
	Ranging accuracy	1%@whole range	

	FOV	64° x 50°	
	Wave length	940nm	
RGB	Maximum resolution	1920 x 1080	Whether it is configured or not can be determined as needed.
	Frame rate	20fps	
	FOV	64° x 40°	
	Shutter mode	Rolling shutter	
SDK	Operating system	Windows / Linux / ROS	
	Algorithm SDK	Preprocessing: Correction algorithm, depth calculation algorithm, etc; Postprocessing: Filtering algorithm, point cloud conversion, etc	
	Settable parameters	Resolution, exposure time, algorithm level	

3. Structure description and interface

3.1. Structural drawings

The structure drawings of product X-D400 are as follows:

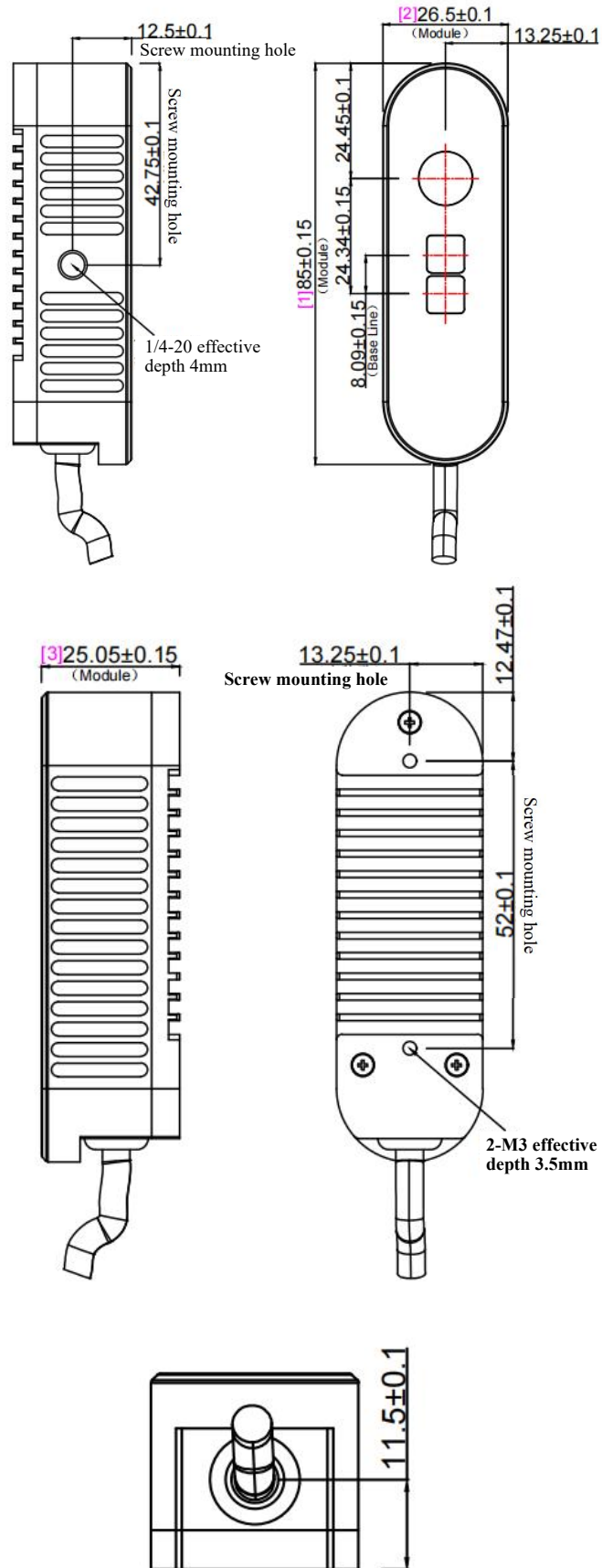


Figure 3. X-D400 structure diagram

3.2.Hardware interface definition

The hardware interface structure are shown as below:



Figure 4. product interface diagram

The corresponding interface specifications in the product interface diagram are shown in the following table:

Table 2. Interface specifications sheet

Interface	No.	Output
Hardware interface	①	Million Ethernet interfaces
	②	External trigger interface (“+”:positive pole, “-”: negative pole)
	③	DC5521 power supply interface

(PS: By default, the external trigger negative electrode is connected to the power supply negative electrode of the camera. Other interfaces such as external synchronization interface and I/O interface are optional.)

3.3.Accessories

The camera accessories parameters are as follows:

Suggested adapter: 12V/2A, 24V/1A

Suggested adapter interface: DC5521 male terminal

3.4.Connection Schematic Diagram

The product connection schematic diagram is as follows:

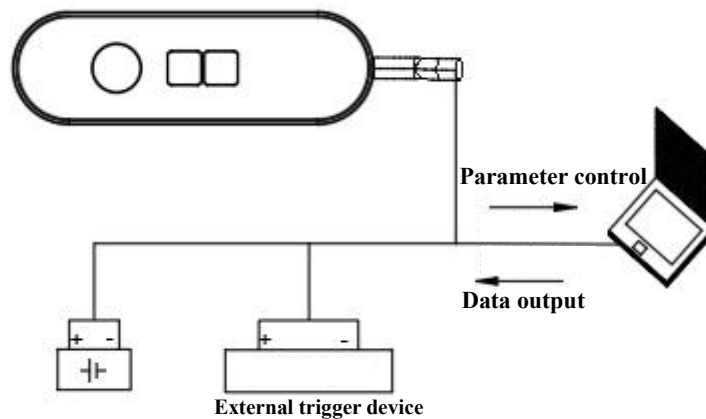
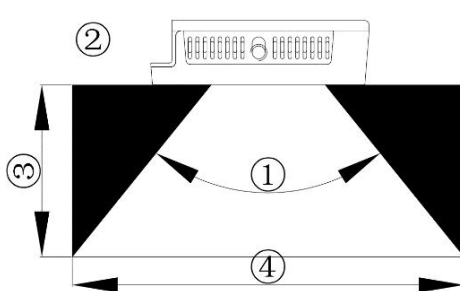


Figure 5. Product connection diagram

3.5.Installation Instructions



- ① FOV (angle of field of view)
- ② Camera
- ③ Distance between camera and object
- ④ Field of view

The installation instructions are as follows:

- (1) The target object must be completely within the field of view ④.
- (2) When installing or positioning, please consider the tolerances.
- (3) The distance between the camera and the target, named as ranging, has a maximum value need to be noticed during the actual use.
- (4) The smaller the value of ③, the higher the accuracy.

- (5) When selecting the installation position, the cleanliness of the external lens of the camera should be considered.
- (6) There should be no other transparent object between the camera and the measured object, because reflected lights or light go through the transparent object will cause measurement distortion.
- (7) Extra glass on the camera lens is not suggested because of light energy decrement caused by transmittance reduction.
- (8) The coverage area ④ of the product is directly related to the distance ③. Please refer to the FOV extension position of 3D or consult from technician personnel to get more parameters information.

3.6.Heat Dissipation Suggestion

The housing design can meet the heat dissipation needs of this product but if further reduction of the temperature rise to improve the product effect is required, the following solutions to improve the heat dissipation efficiency can be considered:

1. Install the product in cross ventilation area.
2. Placed some metal materials on the fixed position where directly contact with the product in order to assist heat dissipation.
3. Add a fan or radiating fin to assist heat dissipation.

4.Electrical Characteristics

4.1.Power Supply and power consumption

X-D400 related parameters are shown as follows:

Table 3. Power supply parameters and specifications

Average power consumption	3.072W (12V) ; 3.264W (24V)
Average current	0.256A (12V) ; 0.136A (24V)
Peak current	1.28A (12V) ; 0.68A (24V)
Rated voltage	24V
Nominal input voltage range	12V~24V

Minimum input voltage	9V
Maximum input voltage	26.4V
Electrical connection between the main-board and product housing	Not directly connected

4.2. Reliability Standards

The reliability standard parameters of X-D400 are shown as below:

Table 4. Reliability standards

Operating temperature	-20°C~60°C
Storage temperature	-40°C~80°C
Protect grade	IP56

5. Version Updating and Relevant SDK

5.1. Version Updating

- (1) Version upgrade/downgrade can be carried out through the upper computer independently developed by X-Dynamics. For detailed operations, please refer to the corresponding upper computer user manual;
- (2) When upgrade processed, the camera needs to be restarted to take effect the new version. The communication modes such as network ports need to be kept in a stable state during the upgrading, otherwise, it may cause upgrade failure. If the upgrade fails, please just restart the camera and repeat the upgrade steps after camera is recognized.

5.2. SDK Instructions

SDK for Windows, Linux and ROS platforms are available. Please contact the relevant sales person for the latest SDK.

Table 6. SDK brief description table

SDK	Providing a general SDK development kit, including basic API, Demo programs, help documents, and some tool software;
Supported platform	Support cross-platform development. Windows/Linux(PC or ARM)/ROS;

6. Appendix

6.1. System Integration Guidance

Before using X-D400 iToF camera for development, please contact X-Dynamics staff to get technical specifications, user manuals, upper computer info. etc. Preliminary assessment, commissioning, verification and other steps can be processed to determine whether it meets the requirements of mass production.

Recommended process:

- Read the X-D400 specifications.
- Purchase and obtain X-D400 samples through official channels.
- Before development, please contact X-Dynamics staff to obtain the user manuals and other materials.
- Choose the appropriate development platform according to the need.
- During the product development based on functions, if with any questions, please timely contact with X-Dynamics staff.
- Determine the mass production proposal of the final product.

6.2. Use Suggestions

- (1) Remove the protective film in front of the lens before using the 3D camera;
- (2) Camera(especially for the position of the lens) should be as far away from heat sources as possible during the installation or using;
- (3) When using the 3D camera, please avoid the lens of the product being scratched by sharp objects;
- (4) Avoid frequent use of alcohol (organic solvent) to wipe the lens surface which take risk of damage to the coating. It is recommended to wipe with a pure lint-free cloth;
- (5) In scenes such as strong high-frequency vibration or external impact, please add appropriate protection conditions for the camera;
- (6) In severe environments such as over humid or strong dust condition, please add appropriate protection conditions for the camera;
- (7) Please refer to the 3D camera installation guide during the installation, and do not install the camera in any way may cause serious deformation to the camera.

6.3. Attentions

- (1) Self-purchased cables or cutting& re-connecting cables from the original ones need strict accordance with the cable definition in the specification, otherwise wrong cable may burn the camera, or cause abnormal signal.
- (2) During the using or testing, please never start power-on work when the 3D camera is installed backwards to table etc. or there is any non-transparent materials covering on the laser emitting surface. It can help avoid components damaged from overheated laser.
- (3) Although the 3D camera has passed the certification according to EN60825-1 CLASS 1, it is still recommended to avoid any human eyes looking directly at the lens of working device in close distance.
- (4) If the image frame rate is insufficient or the flow cannot be turned on during the using, it is recommended to reconnect the camera correctly after good contacts confirmed.
- (5) Disassembling the camera is prohibited.