PERCIPIO.XYZ

# User Manual

# TM421-E1

2025.08.22 V1.0

# Contents

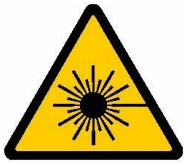
# Safety

## Safety Precautions

- To ensure safe use, please read this user manual carefully and understand how to use this product correctly before operation. Failure to use and maintain the product according to this manual may result in camera damage or other injuries. Any injuries or losses caused by improper operation are not the responsibility of Percipio, and Percipio assumes no liability.
- Following the warnings in this user manual can effectively reduce risks, but it cannot eliminate all risks.
- Each part of this user manual has been thoroughly checked during compilation. If you have any questions or find any errors, please feel free to contact Percipio at any time.
- This product should be installed, connected, used, and maintained by qualified adult technicians. Proper transportation, storage, installation, connection, use, and maintenance are essential to ensure the safe operation of the product.

## Laser Safety Notice

The Percipio Camera TM421-E1 (under default exposure settings) is classified as a Class 1 laser product. When the device is powered on, it emits laser radiation. Do not stare directly into the light beam, do not view it with optical instruments, and avoid direct exposure to the beam.



## User Instructions

- Do not place flammable, explosive, or other dangerous items near the camera. Keep the camera away from open flames and high temperatures. Do not incinerate or crush the product, as this may cause an explosion.
- Avoid collisions, throwing, or dropping the camera. Strong impacts or vibrations can cause damage or operational failure. Any form of modification to the camera is prohibited. Percipio is not responsible for damage or loss resulting from self-repair or disassembly.
- Prevent metal objects, dust, paper, sawdust, and other foreign materials from entering the camera. This can lead to fire, electrical shock, or functional failure.
- Do not use the camera in environments with extreme temperatures. For the operating temperature range for the camera, refer to Appendix: Specifications.
- Avoid using the camera in corrosive environments.
- Use the camera indoors unless specified otherwise. Some cameras are designed for outdoor use; please refer to the user manual for specific instructions.
- Do not point the lens directly at the sun or other strong light sources for extended periods, as this can damage the image sensor.
- Operate the camera at altitudes below 2,000 meters above sea level.

- It is strictly prohibited to use a power supply with a voltage higher than the standard power supply voltage of the camera to power the camera. Any casualties or any losses suffered by third parties due to your improper operation have nothing to do with Percipio, and Percipio shall not bear any liability.
- Install the camera in a well-ventilated and open area.
- The camera's casing is designed with built-in heat dissipation capabilities, so no additional cooling measures are necessary. It is recommended to ensure that the metal mounting surface of the camera is in contact with the equipment during installation to optimize heat dissipation. Do not cover the camera to avoid overheating, which may impair measurement performance.

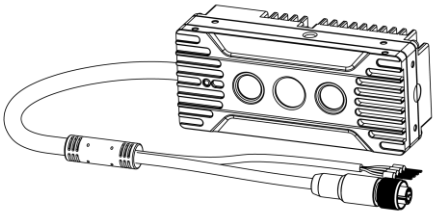
## Pre-use Inspection

- Before each use, carefully inspect the camera to ensure it is in normal working condition. Check for any signs of damage, water ingress, unusual odors, smoke emissions, or missing/damaged screws. If any of these issues are detected, immediately cut off the power and discontinue use.
- High temperatures can cause power cables to age. Please check the power cables regularly to ensure that they are in normal condition and free from aging.

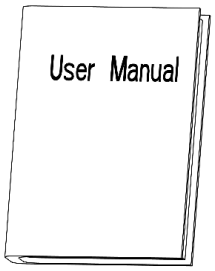
## Disposal Instructions

- When disposing of this camera, comply with local regulations to protect the environment. Do not discard used cameras improperly, as improper disposal can cause environmental pollution.

# Unboxing



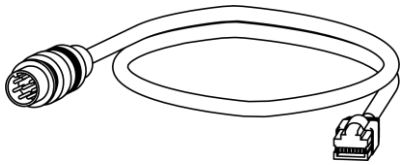
3D Camera (TM421-E1)




User Manual (E-manual)

> **Note**
> If any items are missing or damaged, please contact support@pcp3d.com promptly.

## Optional Accessories



Adapter Cable
(A-Code to RJ45)

> **Note**
> For accessory purchases, please contact support@pcp3d.com.

# Hardware Installation

## Connector

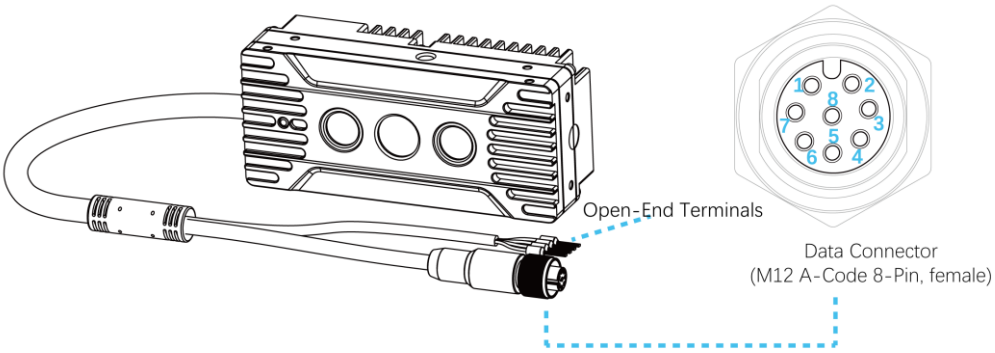



Figure 1 Connector

Table 1 Open-End Terminals Descriptions

| Name | Descriptions |
|---|---|
| DC_24V | DC power (camera or trigger circuit) |
| DC_GND | GND (camera or trigger circuit) |
| Trig_in | Trigger input signal (rising-edge) |
| Trig_out | Trigger output signal (rising-edge) |

Table 2 Data Connector Descriptions

| Pin No. | Descriptions |
|---|---|
| 1 | BI_D3- |
| 2 | BI_D4+ |
| 3 | BI_D4- |
| 4 | TX_D1- |
| 5 | RX_D2+ |
| 6 | TX_D1+ |
| 7 | BI_D3+ |
| 8 | RX_D2- |

# Indicator Light

After the camera is powered on, it immediately enters the initialization state. During this time, the status indicator remains solid blue. After the initialization is completed, the status of the indicator light is shown in the following table.

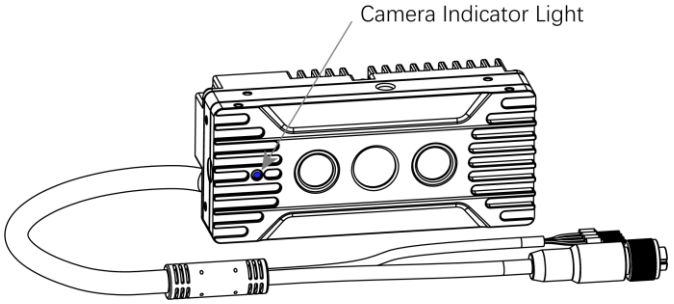



Figure 2 Indicator Light

Table 3 Indicator Light Descriptions

| Name | Color | Descriptions |
|---|---|---|
| Camera Status Indicator | Blue / Red | Blue flashing at 1Hz (slow flashing): The camera is in standby state.<br>Blue flashing at >1Hz (fast flashing): Data is being transmitted.<br>Red flashing at >1Hz (fast flashing): The camera is not working normally. |

# Camera Installation

The TM421-E1 camera offers two installation options: a 1/4-20 threaded hole or M3 threaded holes.

### Option 1: Using 1/4-20 Threaded Hole

For quick evaluation or experimentation where precise repositioning of the camera is not required, use the 1/4-20 threaded hole (thread depth: 8mm) to secure the camera to a tripod via a standard tripod head, quick-release clamp, or similar accessory.

### Option 2: Using M3 Threaded Holes

For long-term deployment, use the M3 threaded holes to ensure mounting reliability. The TM421-E1 camera features M3 threaded holes on the top and bottom surfaces (thread depth: 5mm) and side surfaces (thread depth: 4.5mm) for versatile mounting purposes.

Percipio does not provide camera mounting brackets. Please choose suitable mounting holes and design the mounting brackets based on your specific requirements to secure the camera in place. For more information on the mounting holes, refer to the camera's technical specifications, or contact support@pcp3d.com to request 2D/3D CAD models of the camera.

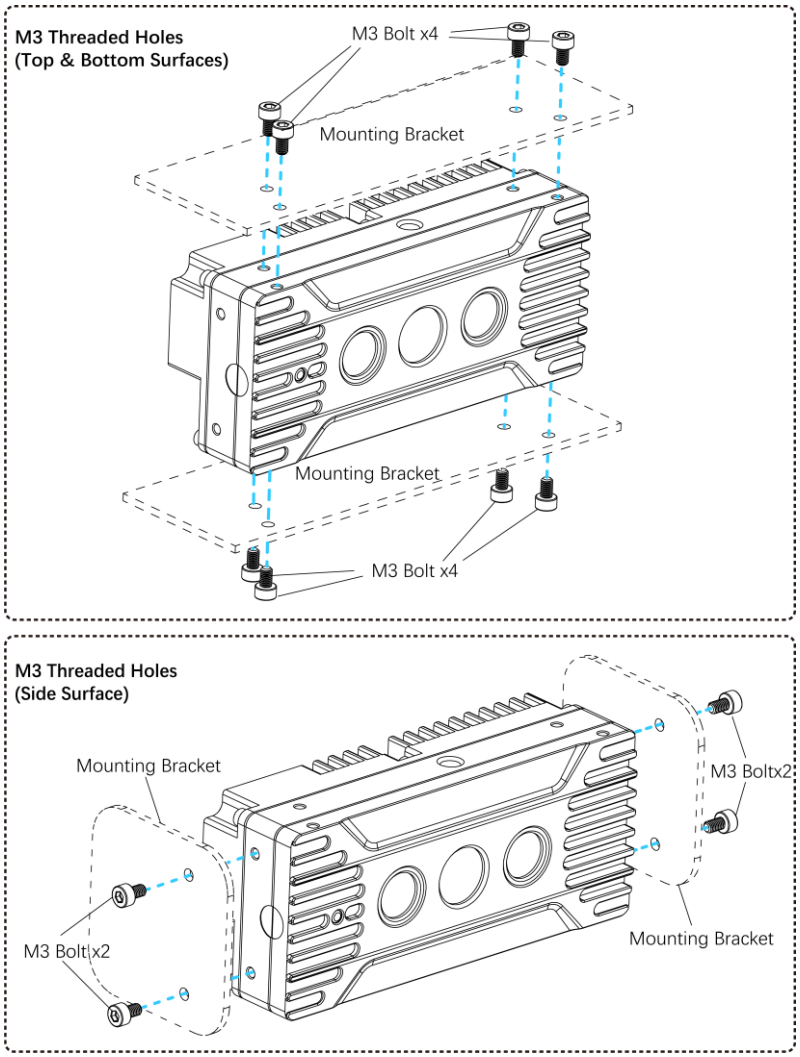



Figure 3 M3 Threaded Holes Mounting Diagram

# Power Supply & Network Connection

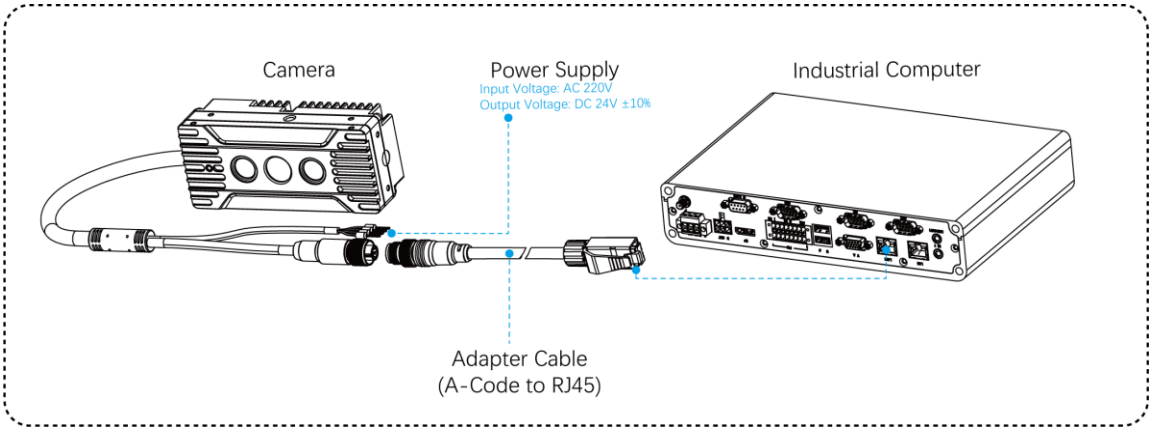



Figure 4 Connection Method

### Network Connection

1. Connect the M12 A-Code end of the adapter cable to the camera's data connector.
2. Insert the RJ45 end of the adapter cable into the RJ45 network port of the industrial computer (host computer).

**Network Configuration**

Percipio cameras are configured with dynamic IP addresses by default, enabling them to automatically obtain an IP. If a static IP address needs to be set for the camera, the SDK or Percipio Viewer software can be utilized. For detailed instructions, please refer to the Application example: Set Camera IP and the Percipio Viewer User Guide: Set Camera IP.

### Power Supply (External DC Power Supply)

External DC power supply output voltage must meet 24V ±10%.

Connect the camera’s DC_24V and DC_GND terminals to the external DC power supply.

# Hardware Trigger Connection

Hardware triggering refers to the camera operating in a hardware trigger mode, where it captures images upon receiving an external trigger signal. TM421-E1 supports one channel of rising edge hardware trigger input/output. This section provides a reference for hardware trigger wiring.

**Instructions**

If hardware triggering is not required, the camera can be operated after completing the Power Supply & Network Connection and Run the Camera.

## Hardware Trigger Requirements

1) Electrical Specifications for Hardware Triggering

Table 4 Electrical Specifications for Hardware Triggering

| Index | Minimum ( V ) | Typical ( V ) | Maximum ( V ) |
|---|---|---|---|
| DC_24V Voltage | 21.6 | 24 | 26.4 |
| Trig_out High Voltage | 21.6 | 24 | 26.4 |
| Trig_out Low Voltage | -0.3 | 0 | 0.4 |
| Trig_in High Voltage | 21.6 | 24 | 26.4 |
| Trig_in Low Voltage | -0.3 | 0 | 0.4 |

2) External Trigger Input Signal Requirements

To avoid abnormal hardware triggering, please use external trigger input signals that meet the following requirements:

- For rising-edge trigger, a high pulse square wave signal is required, with the rising-edge being effective. The pulse width should be within the range of 10 to 30 milliseconds. To prevent false triggering, the signal rise time should not exceed 5 microseconds.
- The trigger frequency must not exceed the device's processing capability (i.e., the frame rate in continuous mode). Otherwise, the camera will discard the trigger signals without processing them.

## Rising-Edge Trigger Input Wiring Reference

The following presents the wiring method for rising-edge trigger input, taking a PNP (sourcing) type connector as an example. Connect the client output connector to the Trig_in terminal. The Trig_out terminal can be utilized as required.

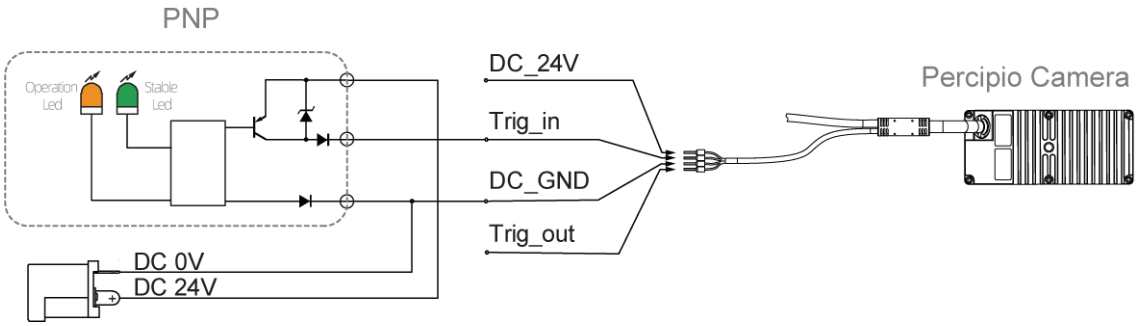



Figure 5 Rising-edge — PNP (sourcing) Type Connector Control Trigger

## Rising-Edge Trigger Output Wiring Reference

The camera's rising-edge trigger output signal can drive an optocoupler. A reference wiring diagram is shown below, where RL is selected based on the trigger power supply conditions.

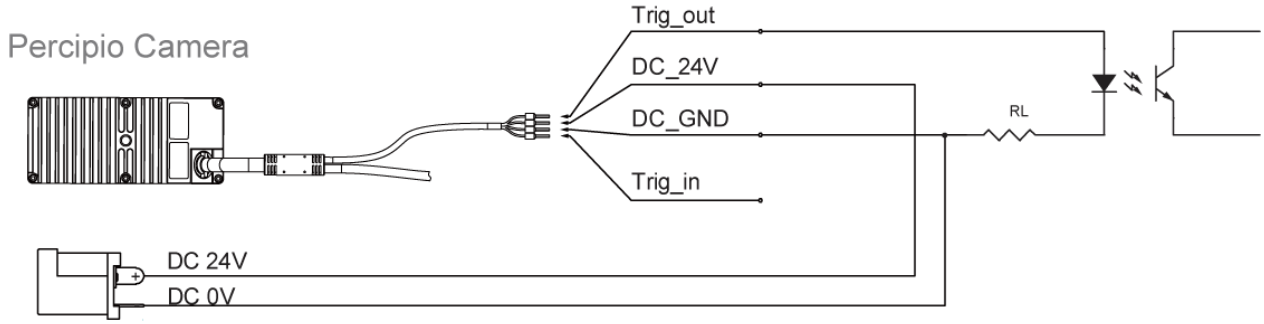



Figure 6 Rising-edge — Driving an Optocoupler

# Run the Camera

Users can use Percipio Viewer, a proprietary image viewing software developed by Percipio, to preview the camera's output in real-time, including depth maps, color images, grayscale images, and point clouds. Additionally, users can control the camera through Percipio's SDK and a series of APIs.

**Download Links:**

Percipio Viewer Download Links: https://en.percipio.xyz/downloadcenter/

SDK Download Links: https://en.percipio.xyz/downloadcenter/

**Tutorial Links:**

Percipio Viewer User Guide: https://doc.percipio.xyz/cam/latest/en/viewer-en.html

SDK and API Documentation: https://doc.percipio.xyz/cam/latest/en/index.html

Download Center

Technical Documentations

# Troubleshooting

If you encounter issues while operating the camera, you can refer to the Troubleshooting Guide to diagnose and resolve problems.

Troubleshooting Guide: https://doc.percipio.xyz/cam/latest/en/troubleshooting/index-en.html

Troubleshooting

# Service and Maintenance

## Service

TM421-E1 is a precision optical instrument with no user-serviceable parts inside. Do not disassemble the camera.

## Maintenance (Cleaning)

Clean the exterior of the camera as follows:

- Use lint-free cloth and alcohol or water to wipe the camera window (glass panel) to keep it clean.

  **Note**

  Avoid using gasoline or other corrosive and volatile solvents to clean the camera, as these substances may damage the camera's exterior and internal structure.

- It is recommended to regularly clean the dust on the camera surface to ensure efficient heat dissipation.

## Maintenance (Storage)

- Do not immerse the camera in water or place it in a high-humidity environment, as this may cause malfunction. Store the camera in a cool, dry, and well-ventilated indoor location.
- Do not leave the camera outdoors for an extended period to avoid damage from water ingress due to rain or snow.
- The storage temperature range for the camera is -10°C to 55°C. Exceeding this range may affect the camera, leading to performance degradation or damage.
- Disconnect the camera from the power supply before storage to prevent fire hazards.
- Do not point the camera lens directly at the sun or other strong light sources for an extended period to avoid damage to the image sensor from intense light.

# Appendix: Specifications

Table 5 TM421-E1 Specifications

| Index | Specifications |
|---|---|
| Technical Principle | Indirect Time of Flight (iToF) |
| Working Distance | 150 mm ~ 5000 mm |
| Field of View (Depth) | Near: 190 mm x 140 mm @ 150 mm (H/V ≈ 65°/50°)<br>Far: 6370 mm x 4665 mm @ 5000 mm (H/V ≈ 65°/50° ) |
| Z-axis Accuracy | ±5 mm + 0.5% of Depth |
| Frame Rate @ Resolution (Depth) | Supported resolution:<br>640 x 480, 320 x 240, 160 x 120<br>Supported depth quality and corresponding frame rate:<br>HIGH (5 fps), MEDIUM (10 fps) |
| Frame Rate @ Resolution @ Image Format (RGB) | 30 fps @ 1920 x 1080 @ JPEG<br>30 fps @ 1280 x 720 @ YUYV<br>30 fps @ 640 x 360 @ YUYV |
| Power Supply | External DC Power Supply：DC 24V ± 10% |
| Dimensions (Excl. Cable) | 114 mm x 50 mm x 34 mm |
| Weight (Excl. Cable) | 311 g |
| Power Consumption | ≤ 8 W |
| Ingress Protection | IP65 |
| Temperature | Operating: 0℃ ~ 45℃<br>Storage: -10 ℃ ~ 55 ℃ |
| Laser Safety | CLASS 1 |

**Percipio.XYZ** is an industry leading provider of 3D cameras. We provide a broad range of 3D camera products to meet requirements from various applications, such as industrial, automotive, inspection, logistics, medical, education, security and commercial etc. We will continue to develop and optimize our product roadmap to support more 3D vision applications.

Percipio is an independent vendor of 3D machine vision solutions. We provide products and services to system integration customers rather than end users. This marketing strategy allows us to serve multiple sectors and segments, and also means that our success will be based on our customer's success. Together with our customer's industry specific expertise, we can support end users with implementing machine intelligence, which will improve productivity and/or reduce cost.

## Affordable 3D Machine Vision

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Technical : support@pcp3d.com
Website : www.pcp3d.com
Documentation : doc.percipio.xyz/cam/latest/en/

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