



T256 (9mm)

Pilotix FPV thermal camera · 256×192 px · analogue
CVBS output
User manual



Read the safety instructions in Chapter 1 before installation. Power the camera only from a regulated 5 V supply - connecting it to a higher voltage will destroy the camera beyond repair.

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1. Safety instructions

1.1 Before you start

The **Pilotix T256 (9mm)** is a thermal imaging camera module intended for installation in drones and other devices with analogue video transmission. It is supplied as a bare electronic component without a housing, without a power supply and without any controls. Installation and wiring require basic knowledge of building FPV models.

- The product is intended for persons **aged 14 and over**. It is not a toy.
- Read the whole manual before installation and keep it for future reference. The manual is part of the product – if you sell the camera on, pass the manual on with it.
- Use the camera only for its intended purpose – displaying a thermal image from on board a model. Whoever assembles and operates the complete system (drone, battery, video transmitter) is responsible for its safe operation.
- Do not use the camera if it is visibly damaged, if it has been exposed to water or if it becomes excessively hot during operation.

1.2 Electrical safety

The camera is powered from a regulated 5 V supply. Never connect it directly to the drone battery or to any other voltage – voltage spikes on the main power supply will destroy the camera beyond repair.

- Connect the power supply only from the regulated **5 V (BEC)** output of the flight controller or from a separate voltage regulator.
- Check the **polarity** before connecting: pin 16 is the positive terminal (POWER, red wire), pin 15 is the negative terminal (GND, black wire). Reversed polarity will damage the camera.
- Carry out all wiring, soldering and mounting **with the battery disconnected**. Never plug in or unplug the camera connector while powered.
- The electronics board on the rear of the camera is exposed. Protect it from **electrostatic discharge** (ESD) when handling – hold the camera by its metal body, not by the components on the board.
- Route the cable wires so that they cannot be caught by the propellers or chafe on the edges of the frame. A short circuit between the wires can damage both the camera and the power supply.

1.3 Detector and optics

- The camera contains an uncooled infrared detector. **Never point the lens directly at the sun** or at other very strong sources of heat or infrared radiation (lasers, electric arcs) – this may permanently damage the detector.

- Do not touch the lens surface with your fingers and do not clean it with coarse materials. The optics of a thermal camera are more sensitive than those of a conventional camera – see Chapter 6.1.
- Do not disassemble the lens or the camera body. Tampering with the product voids the rights arising from defective performance.
- The camera **does not emit** any light or laser radiation – it only receives the thermal radiation of the scene. It is not hazardous to the eyes.

1.4 Operating environment

- The manufacturer specifies an operating temperature of **–40 °C to +80 °C** and a relative humidity of 5–95 %. The camera is not waterproof – protect it from rain, condensation and direct contact with water.
- The camera body warms up during operation; this is normal. Ensure at least minimal airflow around the camera and do not cover it with heat-insulating material.
- The camera is intended for an installation that protects it from impact. After a crash, check the lens, connector and cable before switching the camera on again.

2. Product description

2.1 Package contents

- 1× Pilotix T256 FPV thermal camera with 9 mm lens
- 1× interface cable with 16-pin connector and bare wire ends, including a label with the wire colour code

❖ **The camera is intended for direct installation and is supplied in simple technical packaging without a retail box.**



Package contents: camera and interface cable with wire colour label

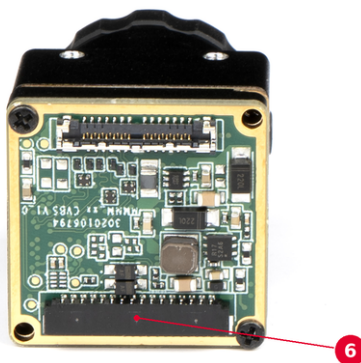
2.2 Parts overview



Front view

- ① **9 mm lens, F1.0** – the focal length and aperture are marked on the lens ring.
- ② **Mounting threads on the top** of the camera body.

- ③ **Mounting threads on the side** of the camera body.
- ④ **Identification label** with QR code – identifies the individual unit in case of a warranty claim.
- ⑤ **Electronics board** on the rear of the camera.



Rear view

- ⑥ **16-pin connector** for the interface cable – power, video output, serial line and USB (pin assignment see Chapter 2.4).

✱ **The second, smaller connector at the top edge of the board is an internal interface of the module. The manufacturer provides no documentation for it – do not connect anything to it.**

2.3 Technical data

All values in this table are stated by the manufacturer for the 9 mm lens version.

Parameter	Value
Detector type	uncooled vanadium oxide (VOx) microbolometer
Resolution	256 × 192 px
Lens	9 mm, F1.0
Field of view (FOV)	19.38° (H) × 14.58° (V), 24.16° (D)
Spectral range	8–14 µm
Thermal sensitivity (NETD)	≤ 50 mK (F1.0, 25 °C)
Frame rate	50 Hz
Scene temperature range	–20 °C to +550 °C
Temperature accuracy	±2 °C
Video output	CVBS (analogue, PAL)
Other interfaces	RS232 serial line, USB 2.0 (no manufacturer documentation)
Supply voltage	5 V DC
Power consumption	< 1.3 W
Operating temperature	–40 °C to +80 °C
Relative humidity	5–95 %
Vibration resistance	6.06 g
Shock resistance	80 g / 4 ms
Dimensions	21 × 21 × 30 mm
Weight	20 g

2.4 Connector and pin assignment

The camera has a 16-pin connector ⑥ on its rear. The supplied cable has the mating connector at one end and bare wires at the other. Not all pins are populated on the cable – nine wires are brought out, and their colours are listed on the cable label. Pins 8 to 14 (GND and KEY1-KEY5) are not brought out on the cable; the manufacturer does not document their function.

Pin	Name	Function	Wire colour
1	PAL	analogue CVBS video output	orange
2	AGND	video signal ground	grey
3	RS232_RX	serial line – input (RX)	brown
4	RS232_TX	serial line – output (TX)	yellow
5	GND	ground	blue
6	USB_2.0_DP	USB data +	green
7	USB_2.0_DM	USB data –	white
8	GND	ground	not populated
9–13	KEY1–KEY5	no manufacturer documentation	not populated
14	GND	ground	not populated
15	GND	power – (negative terminal)	black
16	POWER	power + (5 V)	red

❖ For normal operation on a drone only four wires need to be connected: 16 (POWER +5 V), 15 (GND), 1 (video) and 2 (video ground). Leave the other wires unconnected and insulated.

3. Legal conditions of use

3.1 The law of the country of operation applies

Regulations (EU) 2019/947 and 2019/945 on unmanned aircraft and the GDPR apply in all EU Member States, but national implementing rules differ – registration portals, minimum pilot age, geographical zones, compulsory insurance and rules for making recordings. This chapter describes the situation in the Czech Republic. If you operate the camera in another country, you must follow the regulations of the country in which you fly.

3.2 Drone operator registration

A thermal camera shows people and is therefore a **sensor capable of capturing personal data** under Article 14(5) of Implementing Regulation (EU) 2019/947. The operator of a drone fitted with this camera must register with the Czech Civil Aviation Authority (portal dron.caa.gov.cz) **regardless of the drone's weight** – including models under 250 g. The operator registration number must be displayed on the drone.

3.3 Personal data protection

- Making and publishing recordings in which persons can be recognised is processing of personal data under the GDPR; the exemption for purely personal activities does not cover recordings published online.
- Do not film private land and dwellings without the owner's consent. Respect privacy in the thermal image too – it shows people even in the dark and in vegetation.
- The Czech Office for Personal Data Protection has issued Recommendation No. 1/2024 on drone camera recordings – see uouu.gov.cz.

3.4 Conformity of the assembled drone

The camera itself does not transmit radio signals. The video transmitter you connect it to, however, is radio equipment – in the Czech Republic it is subject to the general authorisations of the Czech Telecommunication Office, which set the permitted frequency bands and maximum transmitted power. Whoever assembles and operates the drone is responsible for the conformity of the complete system, including the transmitter power setting.

3.5 Export outside the European Union

Thermal cameras with an uncooled detector and a frame rate above 9 Hz may be dual-use items under Annex I of Regulation (EU) 2021/821 (entry 6A003.b.4.b). Transport within the EU needs no licence; **export or re-export outside the European Union** may require an export licence – check in advance with the Licensing Administration of the Czech Ministry of Industry and Trade.

4. Installation and wiring

4.1 What else you need

- An **analogue video transmitter** (VTX) with a CVBS video input and a matching video receiver or FPV goggles. The camera has no digital video output and is not compatible with digital FPV systems.
- A **regulated 5 V supply** – typically the BEC output of the flight controller or the video transmitter. Make sure the supply can deliver the current the camera needs (power consumption < 1.3 W).
- A **mount or a place in the frame** matching the 21 × 21 mm camera body and the mounting threads on the top and side.
- Solder, heat-shrink tubing or connectors to join the bare cable wires to the video transmitter and the 5 V supply.

4.2 Mounting the camera

- Fix the camera using the mounting threads ② or ③ in the camera body. Tighten the screws gently – the camera body is made of light metal and the threads can be damaged by over-tightening. Do not use screws longer than the thread depth; a screw that is too long may reach the internal parts of the camera.
- Position the camera so that no propellers, frame arms or other parts of the drone are in the lens's field of view. The field of view is narrow (24° diagonal), so precise aiming is important.
- Position the rear of the camera with the exposed electronics board ⑤ so that it does not touch metal parts of the frame or other boards. Insulate it if necessary.
- Leave the lens uncovered – there must be no cover or glass in front of it. Ordinary glass and acrylic do not transmit thermal radiation and the camera would only show the cover.

4.3 Connecting power and video

Power the camera only from a 5 V output. Video transmitters often also offer a 9 V or 12 V output for cameras – do not use it for this camera.

- ① Disconnect the drone battery. Only ever wire with the power off.
- ② Connect the **red wire** (pin 16, POWER) to the **+5 V** BEC output and the **black wire** (pin 15, GND) to the ground (GND) of the same supply.
- ③ Connect the **orange wire** (pin 1, PAL) to the video input of the video transmitter and the **grey wire** (pin 2, AGND) to the ground of the video transmitter. The video ground and the power ground must be connected together – on common flight controllers and video transmitters they are joined on the board.
- ④ Leave the other wires (brown, yellow, blue, green, white) unconnected and insulate each one separately so that they cannot touch metal or each other.

- ⑤ Plug the 16-pin cable connector into connector ⑥ on the rear of the camera. The connector is keyed – do not use force when plugging it in.
- ⑥ Before connecting the battery, check the polarity once more and make sure that no wire is short-circuited.

4.4 Serial line and USB

The camera connector brings out an RS232 serial line (pins 3 and 4) and a USB 2.0 interface (pins 6 and 7). The manufacturer provides no documentation for these interfaces – the communication protocol, adjustable parameters and software are not available. These interfaces are not needed to display the thermal image. We recommend leaving them unconnected; connecting them to a flight controller or computer without knowledge of the protocol provides no function and, if wired incorrectly, may damage the camera.

4.5 First power-up

- ① Remove the propellers from the drone. Always carry out the first power-up without propellers.
- ② Connect the battery and switch on the video receiver or FPV goggles tuned to the video transmitter's channel.
- ③ A thermal image should appear on the screen within a few seconds of switching on. Point the camera at your hand or another warm object and check that it stands out clearly from the surroundings.
- ④ If no image appears, disconnect the battery immediately and check the wiring according to Chapter 7.
- ⑤ Let the camera run for a few minutes and check that the body warms up only moderately and the image remains stable.

5. Use

5.1 What the thermal camera shows

The camera does not capture visible light but thermal (infrared) radiation in the 8–14 μm band, which every object emits according to its temperature. The image therefore does not depend on lighting – the camera sees equally well by day, at night, in smoke and in fog. It shows temperature differences: people, animals, motors, power lines and other warm objects stand out from cooler surroundings. It cannot see through glass, acrylic or water, and only partly through dense vegetation.

A thermal image differs from that of a conventional camera: surfaces of similar temperature merge, shiny metals reflect surrounding heat and edges are less sharp. Familiarise yourself with the image under various conditions before using the camera for searching or inspection.

5.2 Field of view and use in flight

The 9 mm lens gives a field of view of 19.38° horizontally and 14.58° vertically – much narrower than ordinary FPV cameras. The camera shows distant objects in greater detail, but only a small section of the space ahead. It is therefore suited to **observation and searching** from a stable flight attitude, for example while hovering or during a slow pass.

We do not recommend using this camera as the only camera for controlling the flight – the narrow field of view and the different character of the thermal image give no sufficient overview of obstacles. Pilot with an ordinary FPV camera and show the thermal image as a second source.

5.3 Scene temperature range

The manufacturer states a scene temperature range of $-20\text{ }^{\circ}\text{C}$ to $+550\text{ }^{\circ}\text{C}$ with an accuracy of $\pm 2\text{ }^{\circ}\text{C}$. The camera shows no numerical temperature in the analogue image and the manufacturer documents no way of reading it – treat the figure as a property of the detector, not as a measuring function. The camera is not a measuring instrument and must not be used for official or safety-related measurements.

5.4 Recommendations for flying

- Before every flight, check the connector, the cable and that the lens is clean.
- Keep propellers and frame parts out of the field of view – rotating propellers appear as disturbing streaks.
- Over water, snow or in rain the thermal image loses contrast; temperature differences are strongest at night and in the early morning.
- Do not point the camera at the sun for extended periods – even a low sun can damage the detector.

6. Maintenance and storage

6.1 Cleaning the optics

- Remove dust from the lens first by blowing it off (with a blower bulb or compressed air from a safe distance).
- Wipe off fingerprints and smudges with a soft lens cloth or a cotton swab moistened with isopropyl alcohol. Do not press, and do not use paper towels, solvents or abrasive agents.
- Clean the camera body and the electronics board only with a dry, soft brush. Never clean them with water or liquids.

6.2 Post-flight check

- After every flight, and especially after a hard landing or crash, check that the camera is securely mounted, the cable is intact and the lens has not come loose.
- Check that no dirt, grass or moisture has settled on the electronics board ⑤. Switch the camera on only after it has dried completely.
- Do not repair a damaged cable provisionally – replace it or contact the seller.

6.3 Storage

- Store the camera in a dry place, out of direct sunlight, ideally in an antistatic bag or a box that protects both the lens and the exposed electronics board.
- Before longer storage, disconnect the camera from the drone and clean the lens.
- Do not store the camera together with batteries or in places with high humidity.

7. Troubleshooting

Disconnect the battery before any intervention. If the problem persists after checking all the points, contact the seller – do not open the camera yourself.

Problem	Possible cause and remedy
No image, camera does not warm up	The camera is not powered. Check for 5 V between the pin 16 (+) and pin 15 (–) wires, that the connector is seated and the connections to the BEC.
No image, camera warms up	No video signal is connected. Check the pin 1 (video) wire at the video transmitter input and the ground connection (pin 2 and the transmitter ground). Make sure the video receiver is tuned to the correct channel.
Image present but grey or without contrast	The scene has a uniform temperature (e.g. a wall, the sky) – point the camera at a warm object. Alternatively the lens is covered or dirty.
Image dark or blurred	The lens is fogged or dirty – clean it according to Chapter 6.1 and let the camera dry. Check that there is no cover in front of the lens.
Streaks or noise in the image	Interference via the power supply or a ground loop. Power the camera from the same supply as the video transmitter, shorten the video wires and route them away from power cables, check the ground connections.
Image drops out at full throttle	Voltage drop on the BEC under load or a poor contact. Use a BEC with sufficient current reserve and check the connections.
Permanently bright or dark spots in the image	The detector has been damaged by a strong heat source or by sunlight. Permanent detector damage is not a product defect.

8. Information for the EU and Czech Market

8.1 Importer and responsible person in the EU

The product is placed on the European Union market by the importer stated below, who is at the same time the responsible person within the meaning of Article 16 of Regulation (EU) 2023/988 of the European Parliament and of the Council on general product safety (GPSR).

Importer / responsible person in the EU	Rotorama, s.r.o.
Company ID (IČO)	051 57 692
VAT ID (DIČ)	CZ05157692
Registered office	Okrajová 1351, 674 01 Třebíč, Czech Republic
E-mail	info@rotorاما.cz
Phone	+420 252 252 098
Website	www.rotorاما.cz

8.2 Product conformity



- The product bears the **CE** marking and complies with the requirements of the applicable European Union harmonisation legislation.
- A copy of the **EU Declaration of Conformity** is available from the importer at the address stated above or at the e-mail address info@rotorاما.cz.
- **Product identification:** the type designation (T256) is given in this manual and on the packaging; each unit bears an identification label with a QR code on the side of the camera body ④.

8.3 Disposal of electrical equipment



- The crossed-out wheeled bin symbol on the product, its packaging or in the documentation means that at the end of its service life the product **must not be disposed of together with mixed municipal waste**.
- Hand it over at a take-back point for electrical equipment – at a collection yard, at a take-back point of a collective system, or at the retailer when purchasing a new equivalent product. Take-back is free of charge for the end user.
- The obligations under Act No. 542/2020 Coll., on end-of-life products, are fulfilled by the importer through a collective take-back system.
- Proper disposal helps prevent negative impacts on the environment and human health and contributes to the reuse of secondary raw materials.

Through its contractual partner **ASEKOL a.s.**, the company ensures the take-back of waste electrical equipment from households and the separate collection of waste electrical equipment, batteries and accumulators in accordance with the applicable legislation. The customer is entitled to hand over old electrical equipment or a battery or accumulator at any collection point of the above contractual partner. The addresses of these take-back points are listed at www.asekol.cz, www.ecobat.cz and also <https://visoh2.mzp.cz/RegistrMistZO/RegistrMistZOPublic/MapaMistZpetOdberu>.

9. Warranty and rights arising from defective performance

The rights and obligations of the contracting parties are governed by Czech law, in particular by Act No. 89/2012 Coll., the Civil Code, and Act No. 634/1992 Coll., on consumer protection.

- The seller is liable to the buyer for the product being free of defects on receipt. If the buyer is a consumer, a defect may be notified **within two years of receipt** of the product (Section 2165 of the Civil Code).
- If a defect appears within **one year** of receipt, the product is deemed to have been defective already at the time of receipt (Section 2161(5) of the Civil Code).
- When purchasing online, a consumer has the right to **withdraw from the contract within 14 days** of receiving the goods without giving a reason (Section 1829 of the Civil Code).
- Claims should be made with the retailer from whom you purchased the product. The importer's contact details are given in Chapter 8.1.
- The competent body for out-of-court settlement of consumer disputes is the **Czech Trade Inspection Authority**, Štěpánská 796/44, 110 00 Prague 1, www.coi.cz.