



# Pyrometer

## Quick Start Guide

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# 1. About This Manual

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The Manual includes instructions for using and managing the Product. Pictures, charts, images and all other information hereinafter are for description and explanation only. The information contained in the Manual is subject to change, without notice, due to firmware updates or other reasons. Please find the latest version of this Manual at the HIKMICRO website (<http://www.hikmicrotech.com>).

Please use this Manual with the guidance and assistance of professionals trained in supporting the Product.

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## 1.3 Symbols

The symbols that may be found in this document are defined as follows.

Symbol	Description
 <b>Danger</b>	Indicates a hazardous situation which, if not avoided, will or could result in serious injury.
 <b>Caution</b>	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance degradation, or unexpected results.
 <b>Note</b>	Provides additional information to emphasize or supplement important points of the main text.

## 2. Safety Instruction

These instructions are intended to ensure that user can use the product correctly to avoid danger or property loss. The device can only be operated by trained personnel in accordance with these instructions and local safety regulations.

### Laws and Regulations

- The device should be used in compliance with local laws, electrical safety regulations, and fire prevention regulations.

### Transportation

- Keep the device in original or similar packaging while transporting it.
- Do not drop the product or subject it to physical shock. Keep the device away from magnetic interface.

### Electrical Safety

- The device external wiring connected to the hazardous live terminals requires installation by an instructed person.
- Make sure that the power has been disconnected before you wire, install, or disassemble the device.
- The device must be connected to an earthed mains socket-outlet.
- Make sure the plug is properly connected to the power socket.
- If the device is powered by terminals connected to the power cord, ensure correct voltage and wiring of the terminals for connection to mains supply.
- DO NOT expose the device to high electromagnetic radiation.

### Laser

- Intra-beam viewing of this product is hazardous as laser beam may cause dizziness, flash blindness and visual afterimage. Avoid visual interruption during safety-oriented operations.

- The wave length is 650+10 nm; the maximum output is 7 mW; laser beam divergence angle is  $36 \times 7^\circ$  (maximum:  $40 \times 10^\circ$ ).
- Prevent eyes from direct laser and wear a pair of goggles for your safety. The operating wavelength of the eyewear should be longer than laser peak wavelength and its optical density should be higher than OD5+.
- The following warning labels are attached to the laser aperture of the equipment. An aperture label is affixed close to aperture through which laser radiation is emitted.



- Caution! Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.
- The laser radiation emitted from the device can cause eye injuries, burning of skin or inflammable substances. Prevent eyes from direct laser.
- DO NOT maintain the camera when it is powered on, or it may cause electric shock!
- If the product does not work properly, please contact your dealer or the nearest service center. We shall not assume any responsibility for problems caused by unauthorized repair or maintenance.

## Maintenance

- If the product does not work properly, please contact your dealer or the nearest service center. We shall not assume any responsibility for problems caused by unauthorized repair or maintenance.
- Wipe the device gently with a clean cloth and a small quantity of ethanol, if necessary.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the device may be impaired.



## 3. Overview

### 3.1 Description

The 2-color pyrometer (hereinafter referred to as pyrometer or device) is an intelligent 2-color temperature measuring instrument, which can measure the target of medium and high temperature with high accuracy. The device is often used in various kinds of industrial sites with high demand for temperature control.

Pyrometer determines the temperature by measuring the energy ratio of two close and partially overlapped infrared bands. It can meet the requirements for precise temperature measurement of unstable target conditions (changing emissivity and size) in complex environments, such as high humidity and dusty environment.

Pyrometer can be applied in medium and high temperature measurement scenarios, such as wire rod, hot rolled sheet, cement kilns, heat treatment, inductive heating, monocrystalline and polycrystalline silicon, etc. It can also be used in super high temperature measurement of vacuum furnace, graphite furnace, high temperature furnace and so on.

### 3.2 Dimensions

The following figure describes the dimensions of the device.



#### **Note**

For detailed technical data, please refer to the technical specifications of the product.

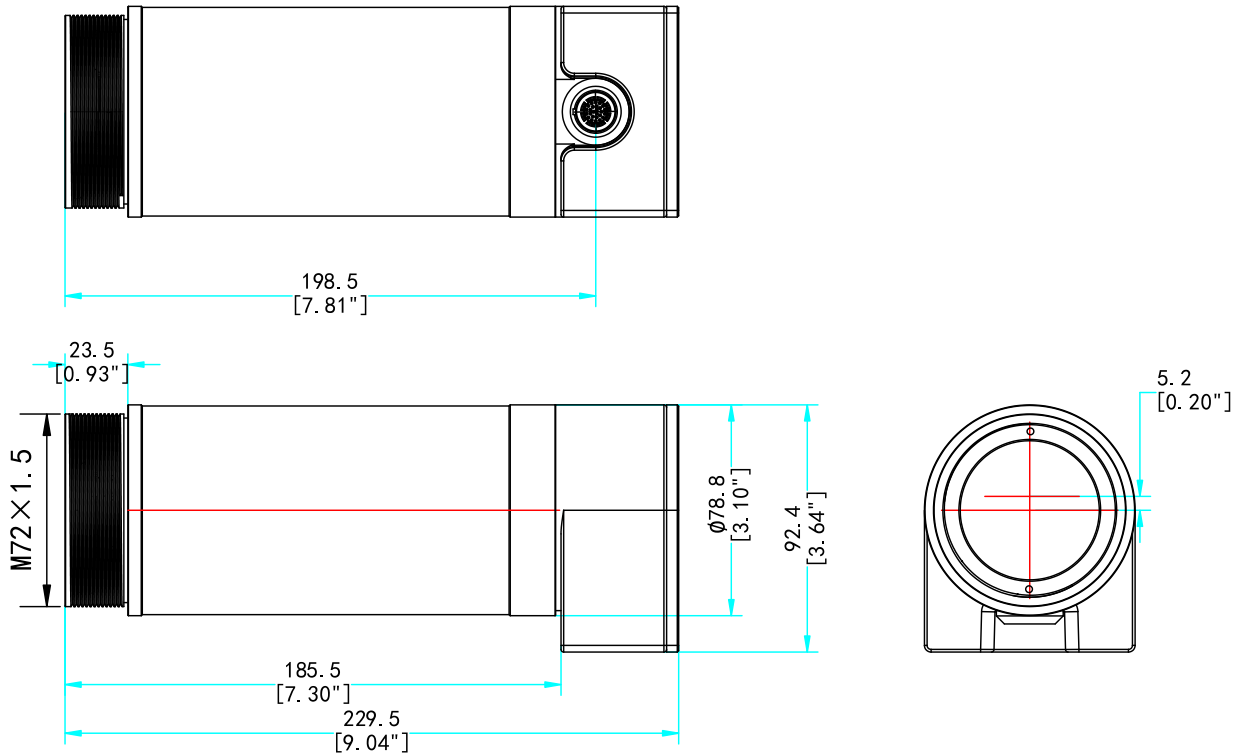


Figure 3-1 Dimensions (Unit: mm [inch])

## 3.3 Basics

### 3.3.1 Infrared Radiation and Emissivity

The surface of an object emits infrared radiation, the intensity of which varies with the temperature of the object.

At the same time, according to the material and surface properties, the emitted radiation is roughly in the wavelength range of 1 to 20  $\mu\text{m}$ . This fixed constant, which depends on the substance, is called emissivity. The emissivity of an object depends on the state of the object's surface, for example, the roughness, color, material type, etc. The amount of radiated energy emitted by an object is affected by the emissivity. The higher the emissivity, the greater the infrared radiated energy emitted by the object.

### 3.3.2 1-Color and 2-Color Mode

The pyrometer supports 1-color and 2-color temperature modes.

The 1-color mode determines the temperature by the radiation energy of a narrow wavelength range emitted from an object. The pyrometer measures the average temperature for a small detection area. Thus, the accuracy of measurement is affected by several factors, such as whether the target emissivity is stable, the measurement setting-up and the target is correctly arranged, and other environmental factors like background radiation. With proper installation and accessories to prevent the interference from the lens, the influence of external factors to the accuracy could be reduced.

The 2-color mode determines the temperature by the energy ratio of two wavelength bands. This mode is less affected by the changing conditions of the target and the environment. Because the detected energy on both wavelength bands decrease simultaneously, which does not affect to the energy ratio.

### 3.3.3 Targets Smaller Than Field of View

When the target size is smaller than the field of view of the pyrometer, or the target moves within the field of view, such as narrow cable rods or melted glass, the infrared radiation energy will be reduced. At this point, the 1-color mode cannot obtain the true target temperature. However, since the energy ratio is unaffected, the temperature readings in the 2-color mode remain accurate.



#### **Note**

The relationship between the target size and the field of view of the device can affect the actual measurement distance in 1-color mode.

# 4. Appearance

## 4.1 Component

The pyrometer appearance is shown in the figure below.

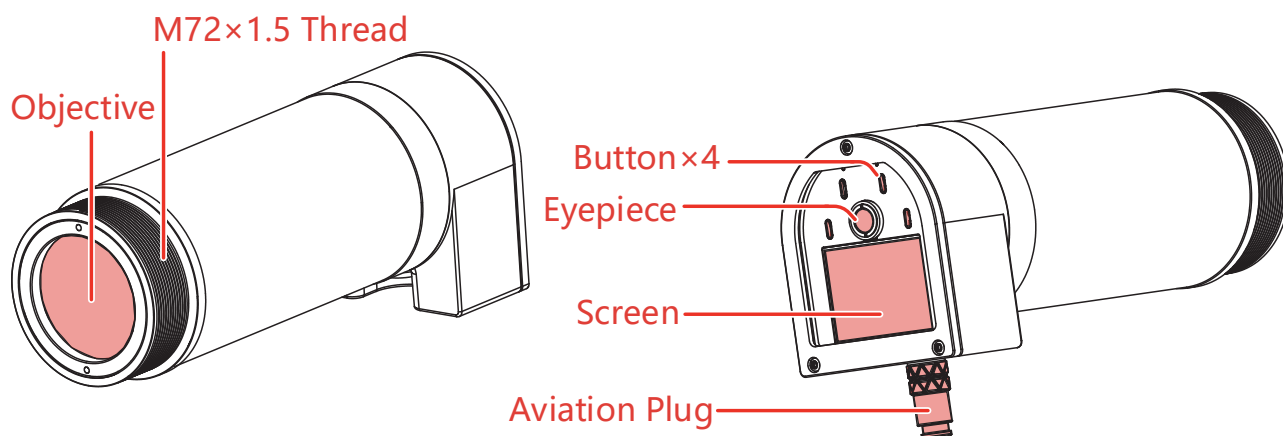


Figure 4-1 Pyrometer Exterior Components

## 4.2 Cable

The pyrometer comes with 1 standard cable from the factory, one end of which connects to the device's aviation plug, while the other end can be customized for power connection, temperature and alarm signal transmission, etc.

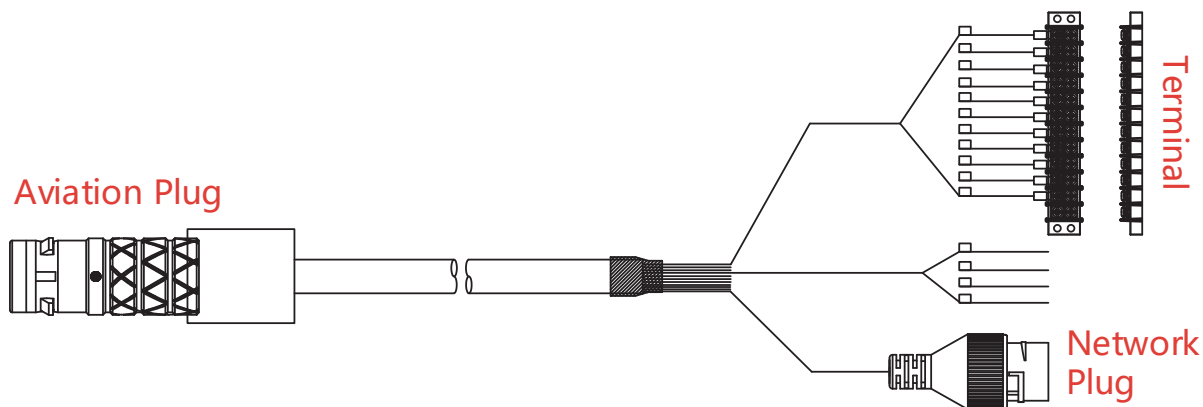


Figure 4-2 Standard Cable

## Aviation Plug

Connects to the aviation plug of the pyrometer.

## Network Plug

Connects to a switch or router for power and network supply. PoE powered, DC24 V.

## Terminal

Table 4-1 Description of the Terminal Wiring Sequence

Wire Number	1	2	3	4	5	6	7	8	9	10	11
Specification	DC 24 V.	Power ground	Analog	Analog output ground	4~20 mA	RS-485+	RS-485-	COM	No.	PNP	GND
Function	Power input		Analog output			RS-485 communication		Alarm output		PNP	

- 1&2: connects to power supply for the device, DC24 V.
- 3&4&5: two analog outputs.
  - 4&3 are selectable analog outputs: 4 mA~20 mA, 0 mA~20 mA, 0 V~5 V, 0 V~10 V; resolution: 16 bit, accurate to 0.1°C; maximum load for current loop output: 600 Ω.
  - 4&5 are fixed analog outputs: 4 mA~20 mA; resolution: 16 bit, accurate to 0.1°C; maximum load for current loop output: 600 Ω.
- 6&7: RS-485 output, half-duplex, capable of long-range signal transmission.
- 8&9: alarm output, optocoupler relay, response time<2 ms.
- 10&11: PNP level output, DC24 V.

# 5. Installation

## 5.1 Positioning

### 5.1.1 Environment

Before determining the installation location of the device, it is necessary to clarify the ambient temperature, air quality, and electromagnetic interference at the site.



#### Note

For detailed technical data, please refer to the technical specifications of the product.

#### Ambient Temperature

Under no circumstances should the ambient temperature exceed the maximum allowable operating temperature of the device. Optional water/air cooled housing can reduce internal temperature and increase device adaptability.

#### Air Quality

If the lens is contaminated or obscured, the measurement accuracy of the pyrometer will also be affected, so the pyrometer should be kept as far as possible above the heat source. Direct installation should be avoided in scenarios such as water vapor and mist. If necessary, install an air purge or a water/air cooled housing to remove possible contamination.

#### Electromagnetic Interference

The pyrometer should be installed as far away as possible from potential sources of electromagnetic interference, such as various motor equipment. The following measures are recommended to reduce electromagnetic interference:

- All I/O connections use shielded wiring. For all external wiring, use cable sleeves for protection. Solid tubes are superior to hoses in noisy environment.

- To avoid ground loops, make sure that the device or the external power supply terminal connected to the device is grounded at a single point.

 **Note**

If you are unsure about the temperature measurement mode to use, it is recommended to select installation points that meet the requirements for both 1-color and 2-color modes.

## 5.1.2 Distance to Object

The distance to the object is equal to the linear distance from the device lens to the surface of the target being measured.

The actual distance may vary depending on device models. At the same time, due to the different principles of the 1-color and 2-color mode, the requirements for the state of the target, as well as the distance to the object, are all different between two modes.

### 1-Color mode

In 1-color mode, the focal length of the device lens and the required target size determine the optimal distance to the object. In order to obtain accurate readings, the actual measurement distance needs to meet the following requirements: device minimum focus distance  $\leq$  actual measurement distance  $\leq$  maximum measurement distance  $\leq$  maximum focus distance.

1. Refer to the specifications of the device for the minimum focus distance.
2. Calculate the maximum measurement distance based on the device optical resolution and the diameter of the target.

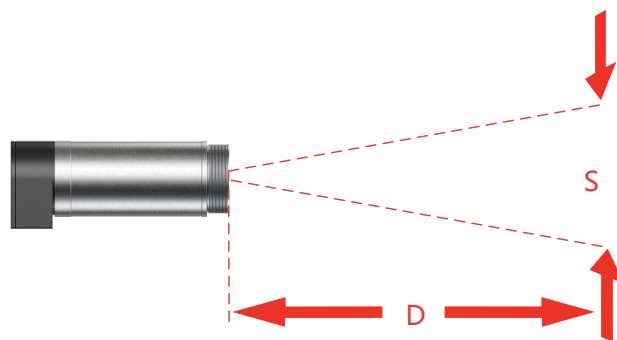


Figure 5-1 Optical Resolution (D:S) as Ratio Between Distance (D) and Spot Size (S)

 **Note**

D represents the distance to object. S represents the diameter of the target spot size. D:S represents the fixed optical resolution, refer to the technical specifications.

For example: spot size S = 10 mm, device D:S = 100:1, then the maximum measurement distance should be no more than 1000 mm.

3. Adjust the actual distance according to the field of view of the device. The target spot size must completely fill the entire field of view of the device.

- To avoid incorrect readings during actual installation, it is recommended that the installation distance be slightly less than the maximum measurement distance to ensure that the target can fully cover the field of view, generally 20% greater than the field of view.
- Turn on the laser aiming light and observe the size of the spot and the target. The spot coverage can be considered an area of precise temperature measurement at the current distance.

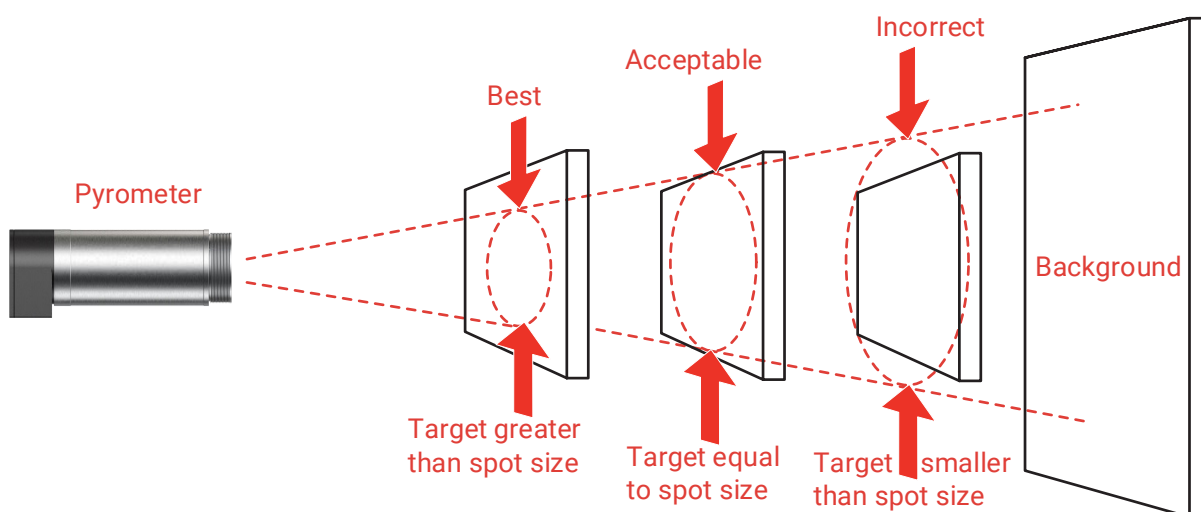


Figure 5-2 Device Placement in 1-Color Mode

## 2-Color mode

In 2-color mode, the device can be installed at a farther distance, without limitations of the target size and the device's field of view. Please select the actual measurement distance based on the device's focal distance, refer to the technical specifications of the device.



### 5.1.3 Viewing Angles

In 1-color mode, it is best for the measurement direction to be perpendicular to the target, with an allowable angle between the measurement direction and the target ranging from 30 degrees to 90 degrees.

In 2-color mode, it is best for the measurement direction to be perpendicular to the target, with an allowable angle between the measurement direction and the target ranging from 45 degrees to 90 degrees.

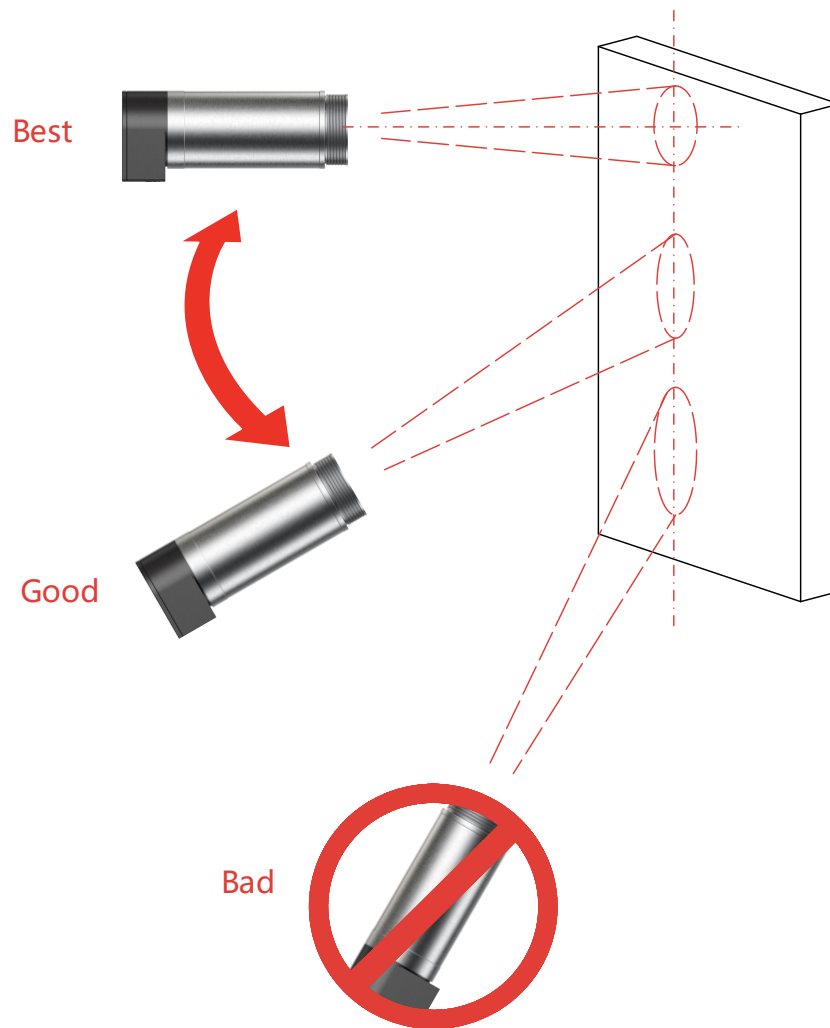


Figure 5-3 Acceptable Viewing Angles

## 5.2 Mechanical Accessories

The device has an M72 × 1.5 standard, 23.5 mm long thread on its front end, which can be installed with optional accessories such as the fixed bracket, adjustable bracket, air-purge, and water/air cooled housing.

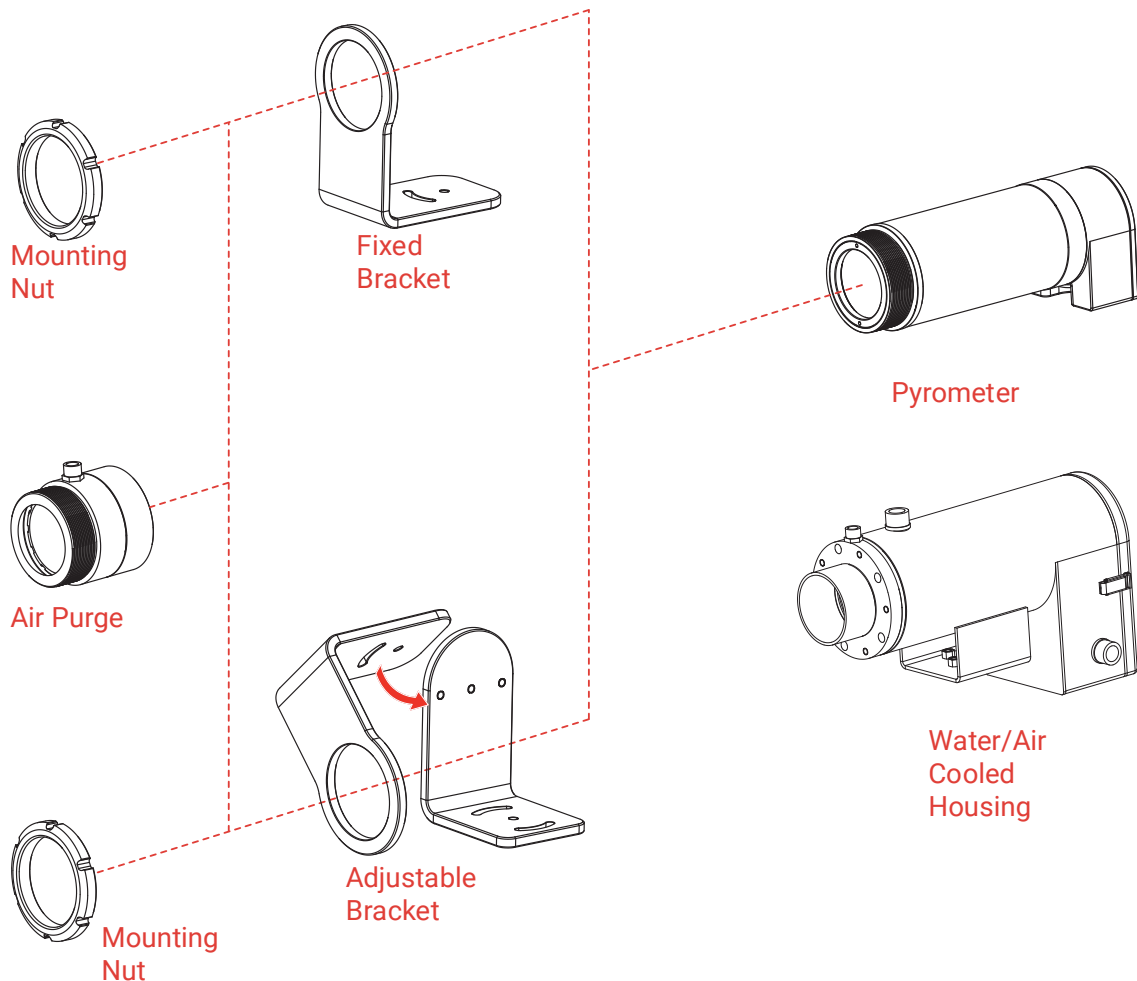


Figure 5-4 Mechanical Accessories

### 5.2.1 Fixed Bracket

The fixed bracket enables the device to be mounted in a fixed location. For a correct horizontal device orientation, a swivel range within 60° is available.

1. Lock the fixed bracket to the M72 × 1.5 threaded connection on the front of the pyrometer using the mounting nut.

2. The fixed bracket has one 6.5 mm diameter hole and one 6.5 mm wide waist hole at the bottom, which can be mounted with the optional bracket.

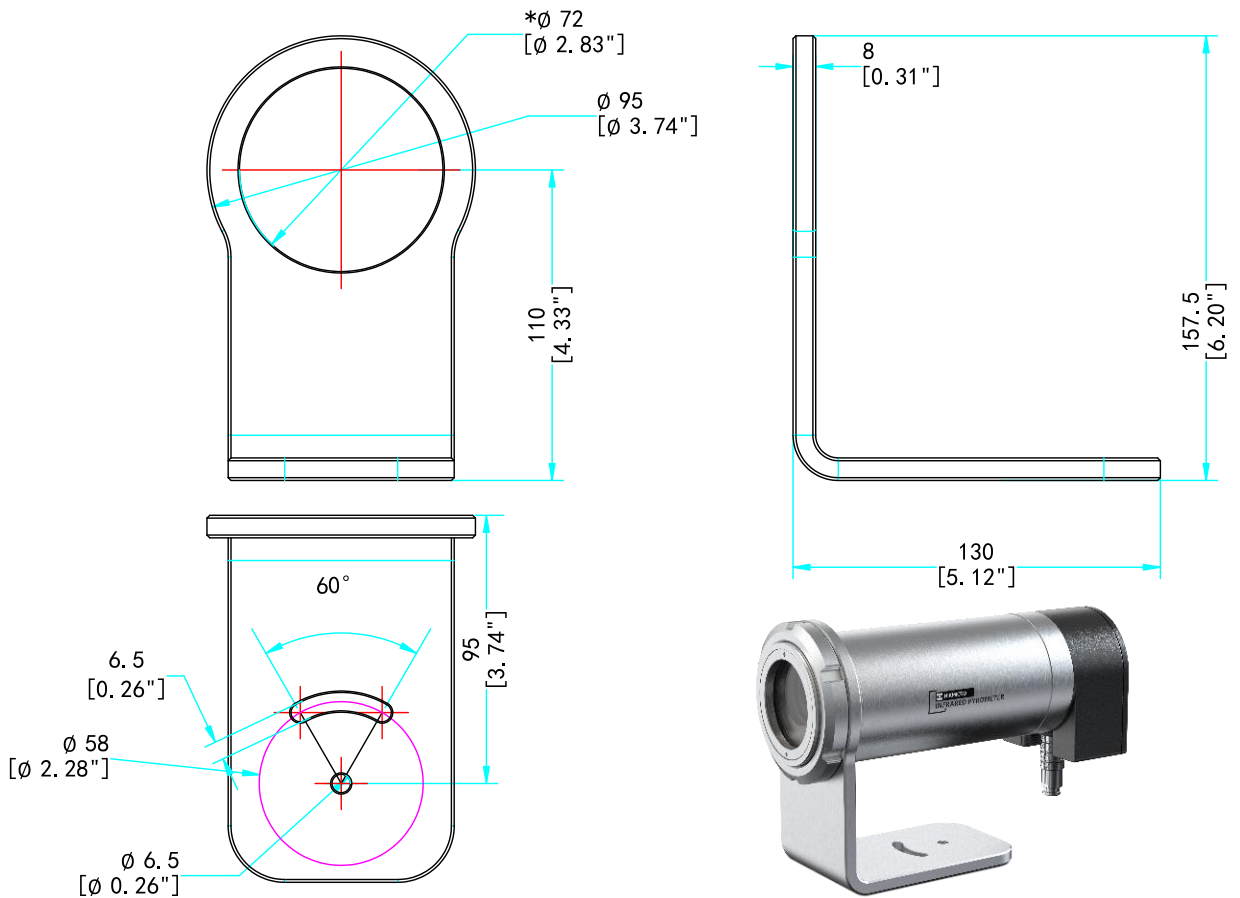


Figure 5-5 Dimension of Fixed Bracket (Unit: mm [inch])

## 5.2.2 Adjustable Bracket

The adjustable bracket enables the device to be mounted in a movable location. For a correct device orientation, you can pitch and swivel the sighting axis in a range of about 60° per axis.

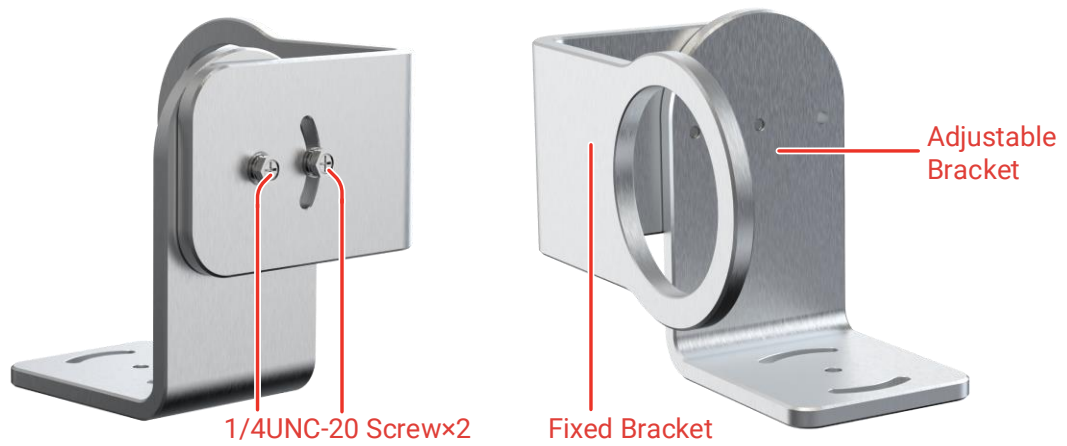


Figure 5-6 Adjustable Bracket

1. Lock the adjustable bracket and fixed bracket using two 1/4UNC-20 screws.
2. Lock the fixed bracket to the M72 × 1.5 threaded connection on the front of the pyrometer using the mounting nut.
3. The adjustable bracket has one 6.5 mm diameter hole and two 6.5 mm wide waist holes at the bottom, which can be mounted with the optional bracket.

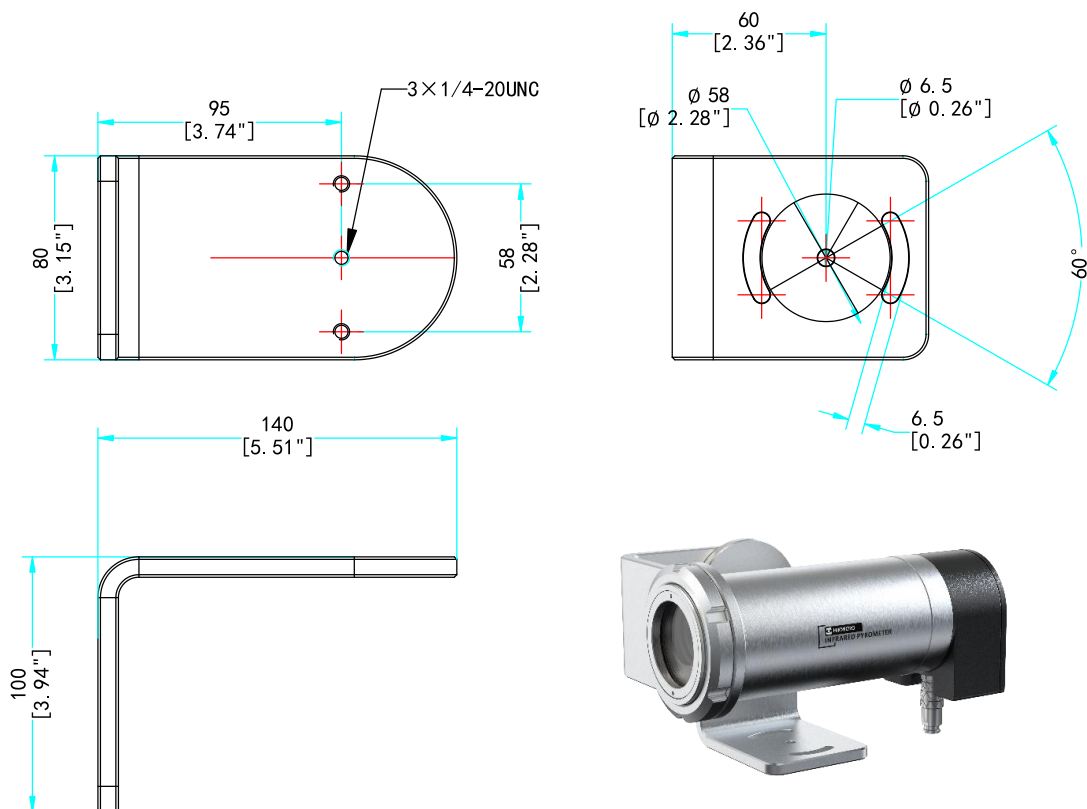


Figure 5-7 Dimension of Adjustable Bracket (Unit: mm [inch])

## 5.2.3 Air Purge

The air purge is used to remove dust, moisture, water vapor and suspended particles from the pyrometer lens and can be installed with the fixed-bracket.

1. Lock the purge onto the M72 × 1.5 threaded connection on the front of the pyrometer.

### Note

The air purge can be used to replace the mounting nut to secure the fixed bracket.

2. Optional bracket can be mounted via the M72 × 1.5 standard, 23.5 mm long threaded connection at the front of the purge.
3. Connect the external purge device via the purge connection (G1/4 pipe thread).

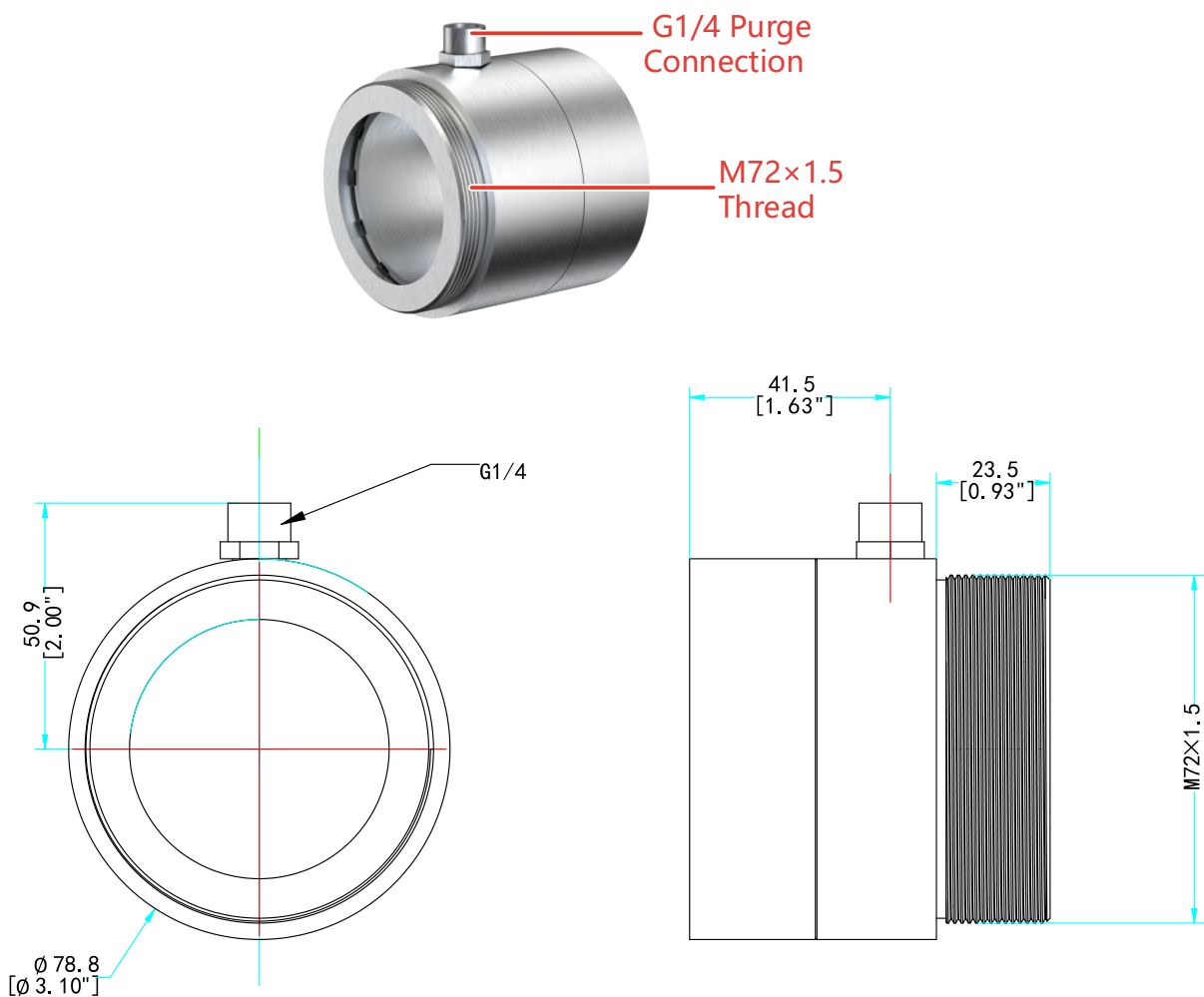


Figure 5-8 Dimension of Air Purge (Unit: mm [inch])



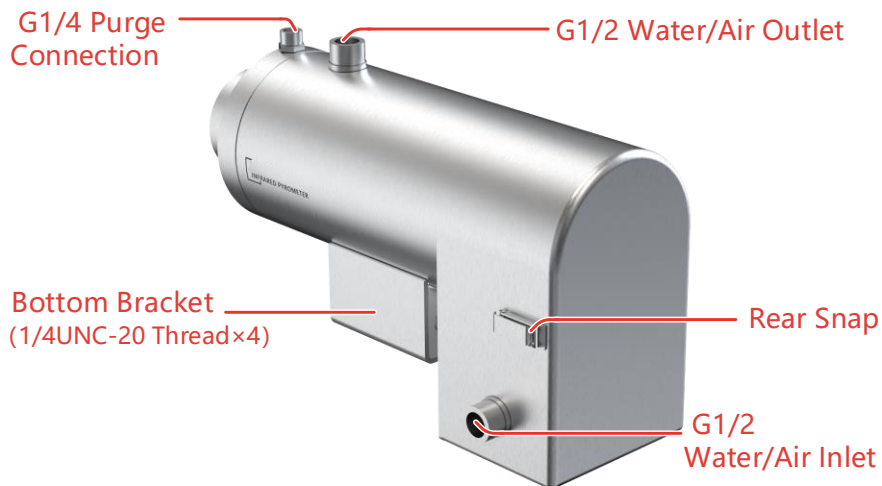
### Caution

- When measuring temperature in 1-color mode, the purge must always be supplied with clean and dry compressed air or nitrogen to avoid contaminating the lens area.
  - Do not purge with cold air at temperatures below 10 °C, the purge input should follow the correct pressure flow.
- 

## 5.2.4 Water/Air Cooled Housing

The water/air cooled housing is used to keep the lens area clean and the interior of the device at a low operating temperature.

1. Remove the rear cover by loosening the two snaps on the two sides of the rear end of the housing.
2. Install the device in position along the inner tube of the housing and secure it with the L-shaped bracket in the inner tube.
3. The housing has four 1/4UNC-20 threaded connections on the bottom bracket, which can be used with DS-1707ZJ-E model bracket for fixed point mounting.



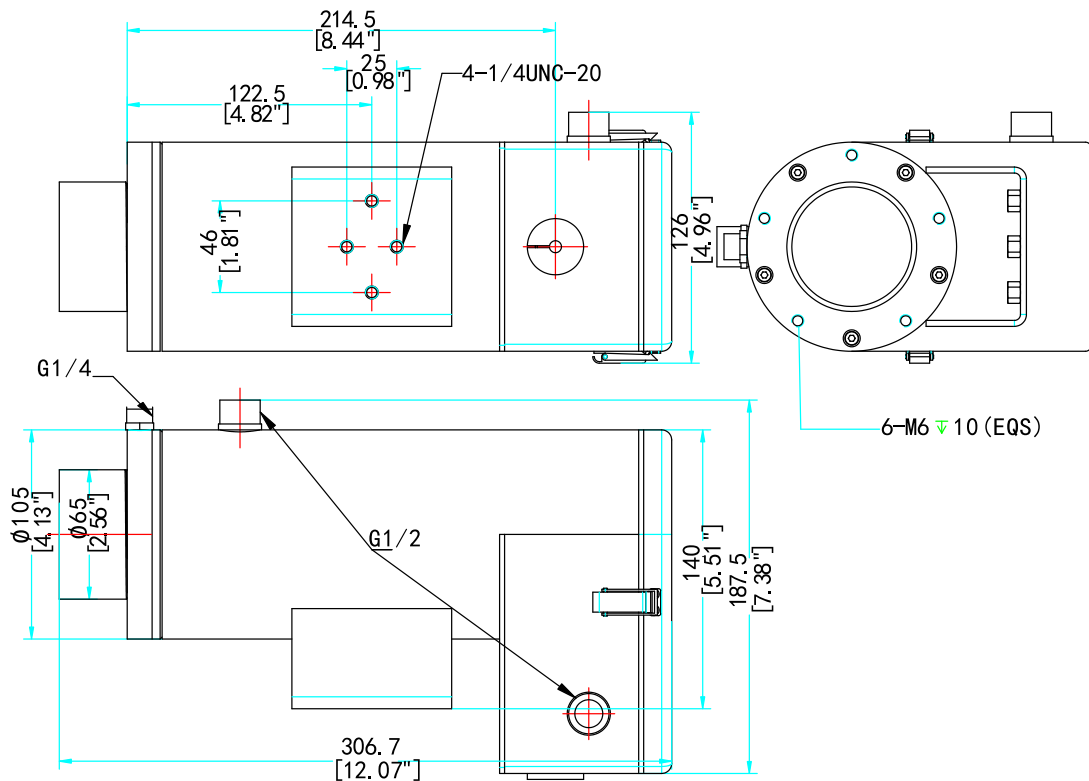


Figure 5-9 Dimension of Water/Air Cooled Housing (Unit: mm [inch])

4. Connect the purge and water/air cooled device via the purge connection, water/air inlet, and water/air outlet. Self-selected connecting hoses, air compressors, and water pumps are available. For situations with higher safety requirements or where water cooling is not suitable, compressed air cooling or vortex coolers can be used for cooling.

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**⚠ Caution**

- When measuring temperature in 1-color mode, the purge must always be supplied with clean and dry compressed air or nitrogen to avoid contaminating the lens area.
  - Do not purge with cold air at temperatures below 10 °C, the purge input should follow the correct pressure flow.
-

## 6. More Operations

For a detailed explanation of the device installation, commissioning and configuration, scan the QR code below:



### Note

The document is aimed at those who work with the device over the entire life cycle and perform specific configurations.

## 7. Regulatory Information



### Note

These clauses apply only to the products bearing the corresponding mark or information.

### EU Conformity Statement



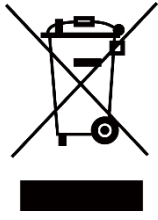
This product and - if applicable - the supplied accessories too are marked with "CE" and comply therefore with the applicable harmonized European standards listed under the Directive 2014/30/EU (EMCD) and Directive 2011/65/EU (RoHS).

Note: The products with the input voltage of within 50 to 1000 VAC or 75 to 1500 VDC comply with Directive 2014/35/EU (LVD), and the rest products comply with Directive 2001/95/EC (GPSD). Please check the specific power supply information for reference.

Warning: This is a class A product. In a domestic environment this product may cause radio interference in which case the user may



be required to take adequate measures.



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Regulation (EU) 2023/1542(Battery Regulation): This product contains a battery and it is in conformity with the Regulation (EU) 2023/1542. The battery cannot be disposed of as unsorted municipal waste in the European Union. See the product documentation for specific battery information. The battery is marked with this symbol, which may include lettering to indicate cadmium (Cd), or lead (Pb). For proper recycling, return the battery to your supplier or to a designated collection point. For more information see: [www.recyclethis.info](http://www.recyclethis.info).

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