

APEX 200

User Manual V1.0.6



ICI Infrared Cameras Inc.

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1.Safety Information



WARNING

- 1.Before using the cleanser, make sure you read all applicable material safety data sheets (MSDS) and warning labels on cleanser containers.
- 2.Do not use too long screws when installing the front/rear mounting bracket, which may damage the thermal camera.
- 3.It is prohibited to place the product in a high temperature above 70°C or in a low temperature below-45 °C.
- 4.It is forbidden to disassemble or refit the infrared thermal camera at will.



CAUTION

- 1.No matter there is a lens cover or not, do not point the infrared thermal camera towards strong light or equipment with laser radiation. This will affect the accuracy of the thermal camera and even damage the detector in the thermal camera.
- 2.Do not use the product under conditions that doesn't match the environmental requirements. For specific use environment requirements, see the product parameter table.
- 3.Do not apply solvents or equivalent liquids to the camera, the cables, or other items.
- 4.Be careful when you clean the infrared lenses. The lens has an anti-reflective coating which is easily damaged. Damage to the infrared lens can occur with too much force or cleaning with rough objects such as tissues.

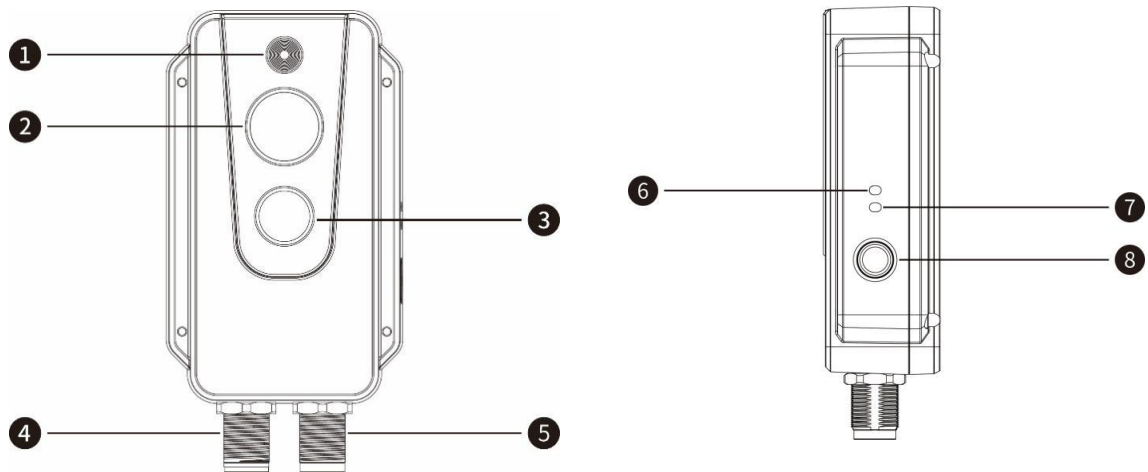
2.Product Introduction



Main Features	Accurate temperature measurement
	Support multi-protocol access to industrial or IoT systems
	Compact size
	Support PoE
	Bi-spectrum display
	Powerful web client
	Wi-Fi hotspot

Typical Applications	Monitoring power distribution cabinet
	Monitoring warehouse
	Monitoring production line

3.Product Figure and Explanation



No.	Explanation
1	Fill light
2	Digital camera
3	Infrared lens
4	Ethernet and PoE cable interface
5	DC power supply and alarm input/output
6	Power LED light
7	Network LED light
8	Reset button

Table 3.1 Explanation of Product Appearance

4.Quick Start Guide

Please follow the steps:

1. After installing the thermal camera in the desired position, use the cable to connect the thermal camera and the computer normally. There are two power supply methods for APEX 200. Connect the device to the PoE port of the power supply through the M12 8-pin adapter cable or connect to the DC power supply through the M12 12-pin adapter cable. Connect APEX 200 to the network, and wait for 2 minutes after powering on. The power indicator light is steady blue and the network indicator light flashes green, indicating that the network connection is normal.
2. Modify the computer network segment to be the same with that of thermal camera. The specific path is "Control Panel"->"Network and Internet"->"Network and Sharing Center"->"Change Adapter Options"->"Ethernet"->" Properties"->"Internet Protocol Version 4 (TCP/IPv4)" - "Use the following IP address"-set the IP address to 192.168.1.xxx.
3. After the power is on for 30 minutes, the temperature measurement, monitoring and analysis can be carried out through the web terminal of the computer. For web instructions, please refer to APEX 200 Online Dual-spectrum Thermal Camera Web Client Operation Manual.

5.Product and Accessories List

Product and Accessories
APEX 200
44cm long M12 8-pin adapter cable
Fixing accessories (screws, mounting stickers)

Optional Accessories
M12 12-pin adapter cable & alarm input/output cable
front/rear mounting bracket

Table 5.1 Product and Accessories List

6.Mechanical Installation

The front and back of the thermal camera are equipped with mounting interfaces, which can be installed with screws after the holes are punched with the auxiliary stickers in the package. In addition, we also provide two optional forms of front and back installation.



Do not use too long screws in case of damaging the thermal camera.

The maximum hole depth of the front shell is 10mm, and the maximum hole depth of the rear shell is 4mm.

It's normal that the thermal camera will generate heat during operation. In order to sufficiently dissipate the heat, it is suggested that the back shell of the thermal camera should be fixed on a metal object to minimize the temperature drift of the infrared detector in thermal camera.

6.1 Installing Housings with Screws

6.1.1 Installing Front Housing

As shown in Figure 6.1, please paste the alignment guide to the position to be installed, and then drill 4 $\Phi 2.5$ mounting holes according to the markers on the alignment guide, and use 4 ST2.2 screws to install the front housing.

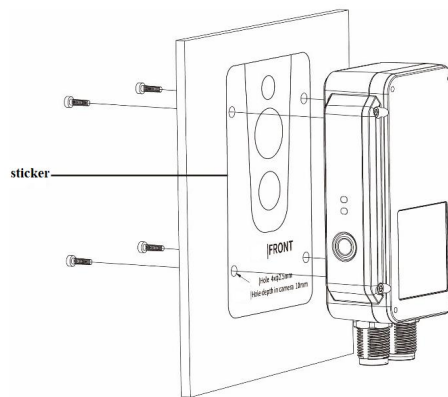


Figure 6.1 Front Housing Installation

6.1.2 Installing Rear Housing

As shown in Figure 6.2, please paste the alignment guide to the position to be installed, and then drill 4 $\Phi 2.5$ mounting holes according to the markers on the alignment guide, and use 4 M2 screws to install the rear housing.

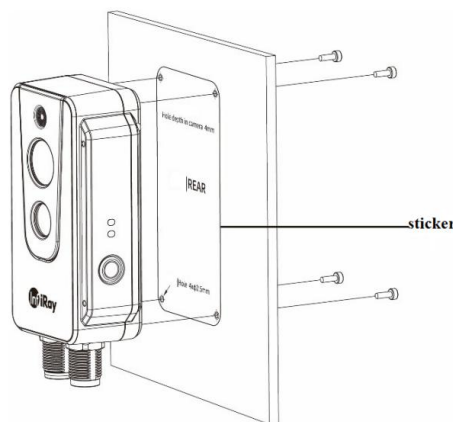


Figure 6.2 Rear Housing Installation

6.2 Front Mounting

There are four M4 threaded holes on the front mounting bracket for fixing.

Step 1 Install the front mounting bracket

As shown in Figure 6.3, connect the front mounting bracket and the thermal camera with ST2.2*8 self-tapping screws. The installation effect is shown in Figure 6.4.

Step 2 Drill holes

As shown in Figure 6.5, please paste the alignment guide to the position to be installed, and then drill four $\Phi 4.5$ mounting holes according to the markers on the alignment guide.

Step 3 Install the thermal camera

As shown in Figure 6.5, use M4 screws to install the thermal camera to the designated location.

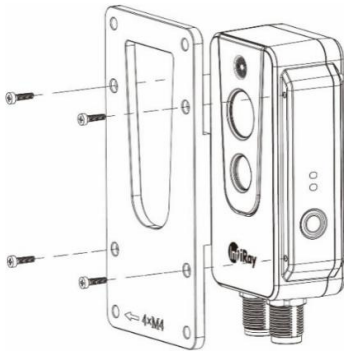


Figure 6.3



Figure 6.4

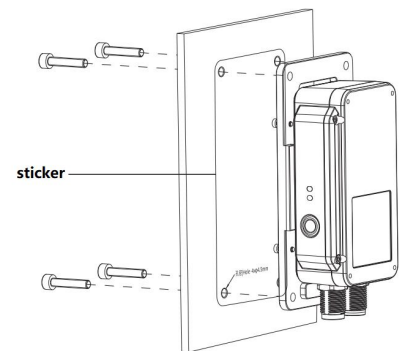


Figure 6.5

6.3 Rear Mounting

There are four M4 threaded holes on the rear mounting bracket for fixing.

Step 1 Install the rear mounting bracket

As shown in Figure 6.6, connect the rear mounting bracket and the thermal camera with ST2.2*8 self-tapping screws. The effect installation is shown in Figure 6.7.

Step 2 Drill holes

As shown in Figure 6.8, please paste the alignment guide to the position to be installed, and then drill four $\Phi 4.5$ mounting holes according to the markers on the alignment guide.

Step 3 Install the thermal camera

As shown in Figure 6.8, use M4 screws to install the thermal camera to the designated location.

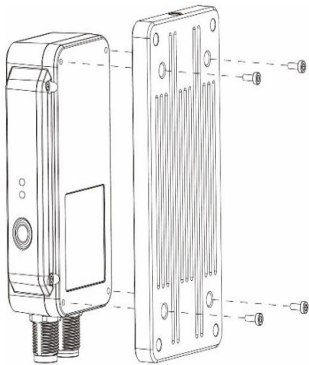


Figure 6.6

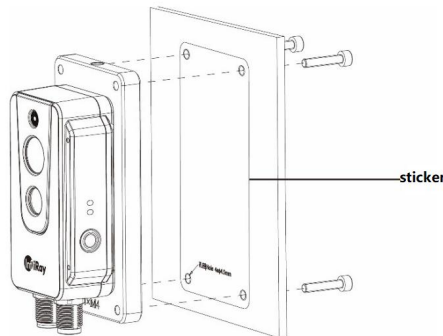


Figure 6.7

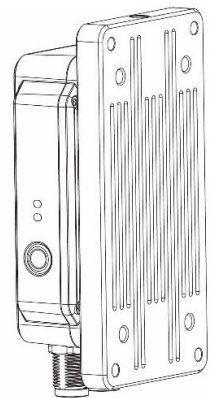


Figure 6.8

7.Alarm Input and Output

7.1 Alarm Input

Support 1 active alarm input (photoelectric isolation), and the input voltage range is 3~5.5V.

7.2 Alarm Output

Support 2 alarm outputs (switch value and photoelectric isolation), 3~25VDC, maximum 85mA.

8. Protocol Introduction

8.1 Modbus TCP

This camera supports Modbus TCP protocol for transmitting temperature measurement information.

M12 8-pin to RJ45 cable is required when using this protocol.

IP	Camera IP(default: 192.168.1.20)		
Port	1502		
Register Address	R/W	Length(word)	Data
0x0001	R	2	Version No., e.g.0x0102 0x0304 = V1.2.3.4
0x0003	R	1	
0x0004	R	1	
0x0005	R	1	
0x0006	R	1	
0x0007	R	2	the highest temperature of the entire frame, the actual temperature = (register value-2732) / 10.0
0x0009	R	2	the average temperature of the entire frame
0x000B	R	2	the lowest temperature of the entire frame
0x000D+N*4	R	1	Region attributes, Bit0: region validness Bit1~2: region type, box=0,line=1,point=2 Bit3: whether temperature alarm is on Bit4:whether to trigger an alarm
0x000E+N*4	R	1	the highest temperature in the region
0x000F+N*4	R	1	the average temperature in the region
0x0010+N*4	R	1	the lowest temperature in the region
*N: 0~15			

8.2 MQTT

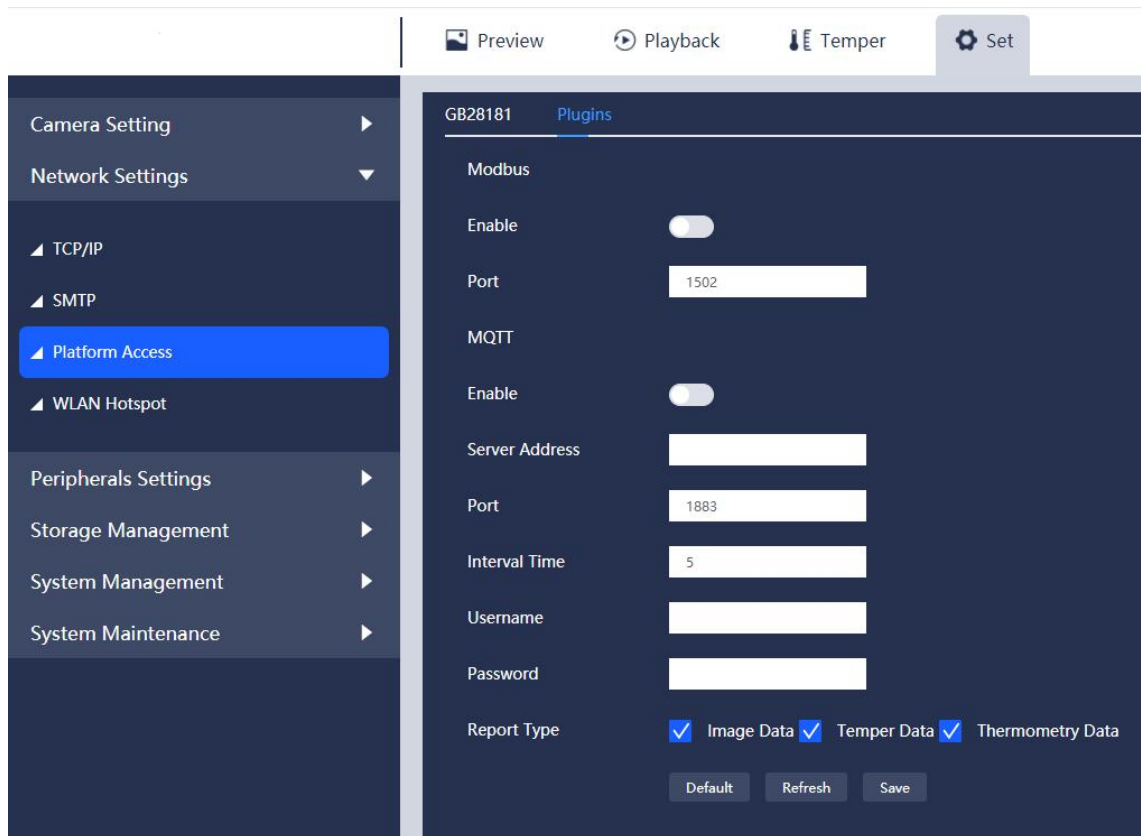
APEX 200 supports the MQTT protocol, as defined below:

1. The server sends the subject.

APEX 200_ICI

2. Set the configuration MQTT parameters through the Web interface, and enable the MQTT function. The configuration will be valid after saving and restarting. The camera will automatically connect to the MQTT

server after restarting.



3. Data format is as follows:

Image data:

```
{
  "timestamp": "2021.4.9.15:52", #time stamp
  "ip": "192.168.1.21",          #camera IP
  "type": 0,                     #data type: 0-image 1-temperature 2-temperature measurement
  "resolution": "1280*720",      #visible light resolution
  "resolution": "1024*768",      #thermal resolution
  "formate": ".jpg",             #image format
  "image": "....."             # visible light image data base64 encode
  "ir_image": "....."          # thermal image data base64 encode
}
```

Temperature data:

```
{
  "timestamp": "2021.4.9.15:52", # time stamp
  "ip": "192.168.1.21",          #camera IP
```

```

"type": 1,          # data type: 0-image 1-temperature 2-temperature measurement
"unit": "C",        #Unit: °C
"data": "....."    # temperature data base64 encode
}

```

Temperature measurement data: temperature measurement function needs to be enabled in Web interface.

```

{
  "timestamp": "2021.4.9.15:52", # time stamp
  "ip": "192.168.1.21",          # camera IP
  "type": 2,                     # data type: 0-image 1-temperature 2-temperature measurement
  "subnetmask": "255.255.255.0", #subnet mask
  "gateway": "192.168.1.1",      #gateway
  "mac": "86:5D:55:0B:A9:74",    #MAC address
  "uptime": 33,                  #boot time
  "version": "V0.2.7",           #software version
  "airTemp": 25,                 #air temperature(°C)
  "airtransmissivit": 1,         #air transmittance
  "distance": 3,                 #distance(m)
  "emissivity": 0.95,            # emissivity
  "reflectemp": 25,              # reflection temperature(°C)
  "maxtemp": 45.6,               #maximum temperature of frame(°C)
  "mintemp": 44.9,               # minimum temperature of frame(°C)
  "avgtemp": 45.3,               #average temperature of frame(°C)
  "list": [{                     # 16 data in the temperature measurement area, enable=1 is valid
    "index": 0,                  # temperature index
    "enable": 1,                 #enable temperature measuring or not
    "type": 0,                   #type: 0- rectangle 1-line 2-point
    "x0": 67,                    #start: x value
    "y0": 61,                    #start: y value
    "x1": 125,                   #end: x value
    "y1": 98,                    #end: y value
    "maxTemp": 45.5,              # maximum temperature of the region(°C)
    "minTemp": 45,                # minimum temperature of the region(°C)
    "avgTemp": 45.3               # average temperature of the region(°C)
  }], {
    "index": 1,

```

```

    "enable":0,
    "type": 0,
    "x0": 0,
    "y0": 0,
    "x1": 0,
    "y1": 0,
    "maxTemp": 0,
    "minTemp": 0,
    "avgTemp": 0
  }, {
    "index": 2,
    "enable":0,
    "type": 0,
    "x0": 0,
    "y0": 0,
    "x1": 0,
    "y1": 0,
    "maxTemp": 0,
    "minTemp": 0,
    "avgTemp": 0
  }, {
    "index": 3,
    "enable":0,
    "type": 0,
    "x0": 0,
    "y0": 0,
    "x1": 0,
    "y1": 0,
    "maxTemp": 0,
    "minTemp": 0,
    "avgTemp": 0
  }, {
    "index": 4,
    "enable":0,
    "type": 0,
    "x0": 0,
    "y0": 0,
    "x1": 0,

```

```

        "y1":    0,
        "maxTemp": 0,
        "minTemp": 0,
        "avgTemp": 0
    }, {
        "index": 5,
        "enable":0,
        "type": 0,
        "x0":    0,
        "y0":    0,
        "x1":    0,
        "y1":    0,
        "maxTemp": 0,
        "minTemp": 0,
        "avgTemp": 0
    }, {
        "index": 6,
        "enable":0,
        "type": 0,
        "x0":    0,
        "y0":    0,
        "x1":    0,
        "y1":    0,
        "maxTemp": 0,
        "minTemp": 0,
        "avgTemp": 0
    }, {
        "index": 7,
        "enable":0,
        "type": 0,
        "x0":    0,
        "y0":    0,
        "x1":    0,
        "y1":    0,
        "maxTemp": 0,
        "minTemp": 0,
        "avgTemp": 0
    }, {

```

```

    "index": 8,
    "enable":0,
    "type": 0,
    "x0":    0,
    "y0":    0,
    "x1":    0,
    "y1":    0,
    "maxTemp": 0,
    "minTemp": 0,
    "avgTemp": 0
  }, {
    "index": 9,
    "enable":0,
    "type": 0,
    "x0":    0,
    "y0":    0,
    "x1":    0,
    "y1":    0,
    "maxTemp": 0,
    "minTemp": 0,
    "avgTemp": 0
  }, {
    "index": 10,
    "enable":0,
    "type": 0,
    "x0":    0,
    "y0":    0,
    "x1":    0,
    "y1":    0,
    "maxTemp": 0,
    "minTemp": 0,
    "avgTemp": 0
  }, {
    "index": 11,
    "enable":0,
    "type": 0,
    "x0":    0,
    "y0":    0,

```

```

        "x1": 0,
        "y1": 0,
        "maxTemp": 0,
        "minTemp": 0,
        "avgTemp": 0
    }, {
        "index": 12,
        "enable": 0,
        "type": 0,
        "x0": 0,
        "y0": 0,
        "x1": 0,
        "y1": 0,
        "maxTemp": 0,
        "minTemp": 0,
        "avgTemp": 0
    }, {
        "index": 13,
        "enable": 0,
        "type": 0,
        "x0": 0,
        "y0": 0,
        "x1": 0,
        "y1": 0,
        "maxTemp": 0,
        "minTemp": 0,
        "avgTemp": 0
    }, {
        "index": 14,
        "enable": 0,
        "type": 0,
        "x0": 0,
        "y0": 0,
        "x1": 0,
        "y1": 0,
        "maxTemp": 0,
        "minTemp": 0,
        "avgTemp": 0
    }

```

```

    }, {
      "index": 15,
      "enable": 0,
      "type": 0,
      "x0": 0,
      "y0": 0,
      "x1": 0,
      "y1": 0,
      "maxTemp": 0,
      "minTemp": 0,
      "avgTemp": 0
    }
  ]
}

```

9. Protocol Introduction

9.1 Modbus TCP

This camera supports Modbus TCP protocol for transmitting temperature measurement information.

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0x0003	R	1	
0x0004	R	1	
0x0005	R	1	
0x0006	R	1	
0x0007	R	2	the highest temperature of the entire frame, the actual temperature = (register value-2732) / 10.0
0x0009	R	2	the average temperature of the entire frame
0x000B	R	2	the lowest temperature of the entire frame
0x000D+N*4	R	1	Region attributes, Bit0: region validness Bit1~2: region type, box=0,line=1,point=2 Bit3: whether temperature alarm is on Bit4:whether to trigger an alarm
0x000E+N*4	R	1	the highest temperature in the region
0x000F+N*4	R	1	the average temperature in the region
0x0010+N*4	R	1	the lowest temperature in the region
*N: 0~15			

10. Technical Data

Detector Data	
Detector Type	VOx, Uncooled FPA detector
Spectral Range	8~14μm
Pixel Pitch	12μm

Imaging and Optical Data		
Infrared	Resolution	256×192
	NETD	40mK
	Frequency	30Hz
	Lens	3.2mm
	FOV	56°×42°
	Focus	focus-free
Visible Light	Visible Light Pixels	2 MP (SC2310)
	FOV	72°×61°
	Fill Light	LED

Temperature Measurement	
Object Temperature Range	-20~550℃
Accuracy	±2℃ or ±2%
Point/Line/Area	maximum 16 points/lines/areas
Palette	18 palettes are available

Environment Variable Correction	distance, atmospheric temperature, emissivity, reflection temperature, atmospheric transmittance
---------------------------------	--

Alarm	
Alarm Function	The highest temperature, lowest temperature and average temperature in all temperature measurement points, temperature measurement areas and lines can be configured with separate alarm outputs.
Alarm Input/Output	1 alarm input (photoelectric isolation, 3~5.5V); 2 alarm output (photoelectric isolation, 3~25VDC, maximum 85mA) Other alarms: save image/video, sending file (FTP), email (SMTP), and flash alarm;

Image transmission		
Image Stream	Image Stream Format	H.264/H.265
	Resolution	visible light1080P; infrared support super resolution up to 4X, Max 1024×768
	Image Mode	thermal image, visible image, fusion, DDE, and parallel display of visible light images are supported.
	Frequency Adjustment	supported
Data Stream	Data Stream Transmission	Visible and thermal images, temperature stream, adjustable frequency
Image Storage	Storage Medium	built-in 32GB storage
	Storage Mode	store thermal images and visible images simultaneously.
	File Format	JPG, MP4
	Storage Form	local storage; connected to monitoring systems, such as NVR.

Ethernet	
Ethernet Functions	control, imaging and power supply
Ethernet Connector Type	RJ45/ hotspot of thermal camera
Ethernet Power Supply	PoE is supported
Network Protocol	TCP,UDP,RTSP,HTTP,SMTP
Interface Protocol	ONVIF,GB28181,Modbus TCP,MQTT

Typical Power Supply	
External Power	12~30V DC
PoE	IEEE 802.3af
Power Consumption	≤2W

Physical Data	
Dimension	109×55.9×29.5mm
Weight	170g
Housing Material	Front shell is plastic and rear shell is aluminium alloy. .

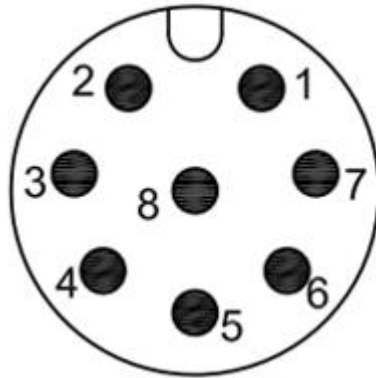
Environmental Data	
Encapsulation	IP67
Operating Temperature Range	-10~50℃
Storage Temperature Range	-40~70℃
Humidity	≤95% (no condensation)
EMC	IEC 61000-4-2(anti-interference) IEC 61000-4-3(anti-radiation)
Shock	25G, IEC68-2-29
Vibration	2G, IEC68-2-6

Others	
Certification	CE/FCC/RoHS
SDK	Cross-platform SDK that supports secondary development of customers.
External Interface	M12 A type 8-pin, including 10M / 100M adaptive Ethernet port and PoE power supply; M12 A type 12-pin, including DC power supply, alarm input and output;

Table 10.1 APEX 200 Performance Parameters

11.Pin Configuration for Interfaces

11.1 Ethernet Pin Configuration (8pin)



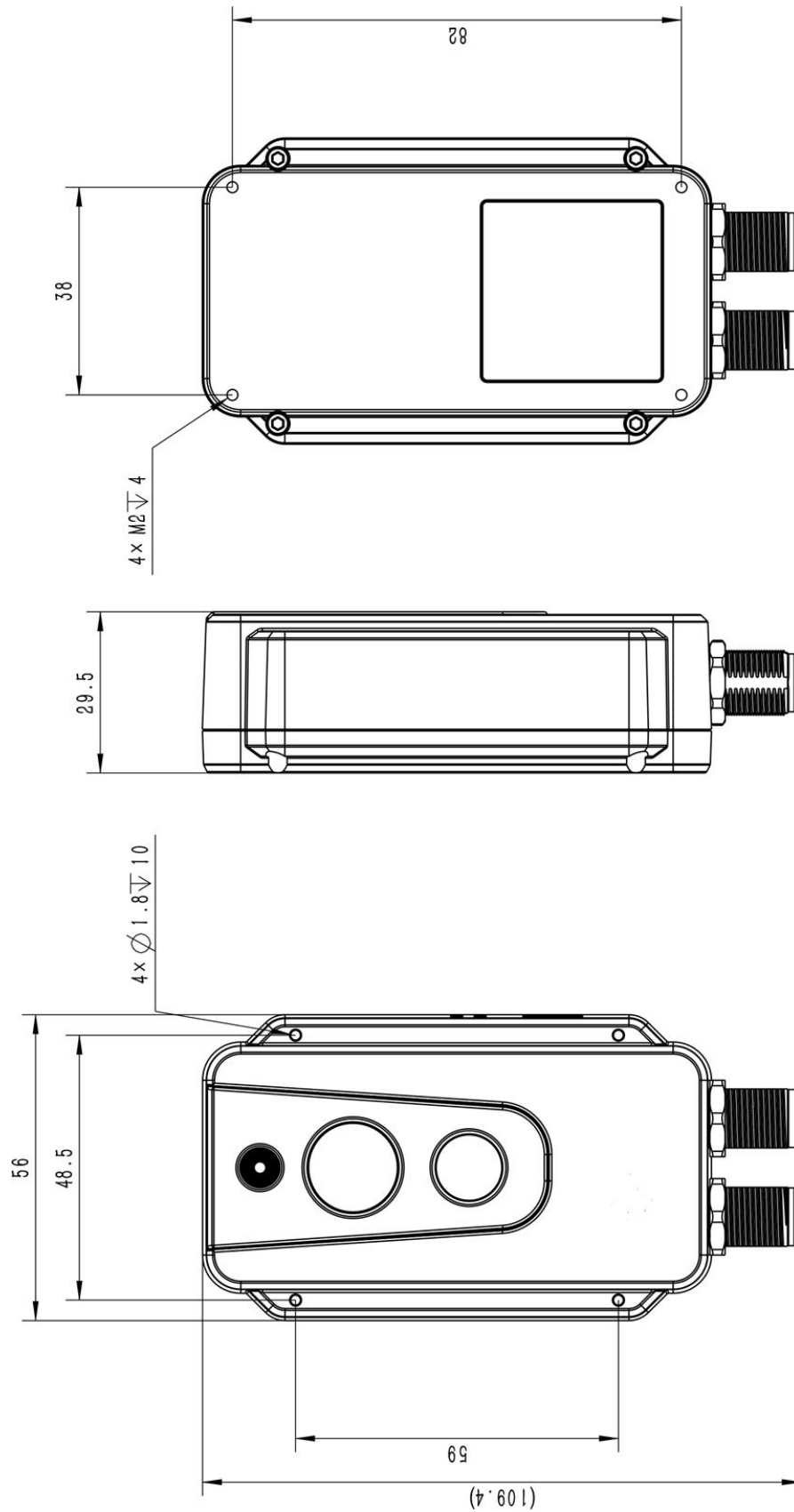
Pin	Configuration	Pin	Configuration
1	TX+	5	PD+
2	TX-	6	PD+
3	RX+	7	PD-
4	RX-	8	PD-

11.2 Power Pin Configuration (12pin)



Pin	Configuration	Pin	Configuration
1	Power +	7	ALARM_POWER2
2	Power +	8	ALARM_OUT2
3	Power Ground	9	ALARM_IN+
4	Power Ground	10	ALARM_IN-
5	ALARM_POWER1	11	NC
6	ALARM_OUT1	12	NC

12.Mechanical Drawings



13.Common Troubleshooting

Troubles	Possible Cause	Solutions
Camera cannot be started.	The supply voltage exceeds the normal working supply voltage range.	Check whether the power supply voltage is between 12 and 24V
	The power connector is loose.	Check whether the power cable is connected
Web cannot be logged in.	IP setting is wrong.	Manually configure the computer address to the 192.168.1.XX
Image is stuck.	Network cable connection is loose.	After checking the network cable connection, restart the web.

14.Cleaning Thermal Camera

14.1 Cleaning Camera Housing, Cables and Other Items

Camera Housing, Cables and Other Items	
Liquids	One of the following liquids can be used. 1.Warm water 2.A Weak detergent solution
Cleaning Tools	A soft cloth
Cleaning Procedure	Please follow this procedure: 1.Soak a soft cloth in the liquid. 2.Twist the cloth to remove excess liquid. 3.Clean the camera parts with the cloth.

14.2 Cleaning Infrared Lens

Cleaning Infrared Lens	
Liquids	One of the following liquids can be used. 1. Commercial lens cleaning liquid with more than 30% isopropyl alcohol. 2. 96% ethyl alcohol (C_2H_5OH).
Cleaning Tools	Dustless cloth, cotton wool
Cleaning Procedure	Please follow this procedure (Take dustless cloth as an example). 1. Soak the dustless cloth in the liquid. 2. Gently wipe the lens with the dustless cloth



CAUTION

The dustless cloth or cotton wool should be used one time only.

Appendix A Emissivity of Common Materials

Material	Temperature (°C)	Emissivity
Water	0~100	0.95~0.98
Soil(dry)	20	0.92
Soil(wet)	20	0.95
Woods	17	0.962
Sand	20	0.9
Sandstone	19	0.909~0.935
PVC plastic	70	0.93
Asphalt	20	0.967
Paint	70	0.92~0.94
Wallpaper	20	0.85~0.90
Cloth	20	0.98
Concrete	20	0.92
Pavement surface	5	0.974
Smooth porcelain	20	0.92
Ceramic tile	17	0.94
Gypsum	17	0.86
Bricks	35	0.94
Hard rubber	0~100	0.89
Charcoal	20~400	0.95~0.97
Granite(rough)	20	0.879
Cold rolled steel	70	0.09
Oxidized steel	50	0.88
Copper	20	0.07
Oxidized copper	50	0.6~0.7

FCC Statement:

MODIFICATION: Any changes or modifications not expressly approved by the grantee of this device could void the user's authority to operate the device.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

For a Class A digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note:

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

The device should be installed and operated with minimum distance 7.9 inches (20 cm) between the radiator & your body.