

User Manual

AMT-FAM-10

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English

Thank you for choosing our product. Please read the instructions carefully before operation. Follow these instructions to ensure that the product is functioning properly. The images shown in this manual are for illustrative purposes only.



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ARMATURA is a leading global developer and supplier of biometric solutions which incorporate the latest technologies on biometric hardware design, algorithm research and software development. ARMATURA holds numerous patents in the field of biometric recognition technologies. Its products are primarily used in business applications which require high-secured, high-accurate and fast matching and identification processes.

ARMATURA biometric hardware and software are built into the product of world top workforce management (WFM) solution providers, Point-of-Sale (PoS) terminals vendors, intercoms, electronic safes, metal key lockers, dangerous machinery, and many other product vendors which heavily rely on accurate, secured and fast user identification features.

About the Manual

This manual introduces the operations of AMT-FAM-10, a dual-lens near-infrared light and visible light face module.

All figures displayed in this manual are for illustration purposes only which may not be exactly consistent with the actual product.

Document Conventions

Conventions used in this manual are listed below:

GUI Conventions

For Software	
Convention	Description
Bold font	Used to identify software interface names e.g. OK, Confirm, Cancel.
>	Multi-level menus are separated by these brackets. For example, File > Create > Folder.
For Device	
Convention	Description
< >	Button or key names for devices. For example, press <OK>.
[]	Window names, menu items, data table, and field names are inside square brackets. For example, pop up the [New User] window.
/	Multi-level menus are separated by forwarding slashes. For example, [File/Create/Folder].

Symbols






Convention	Description
	This represents a note that needs to pay more attention to.
	The general information which helps in performing the operations faster.
	The information which is significant.
	Care taken to avoid danger or mistakes.
	The statement or event that warns of something or that serves as a cautionary example.

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1 Product Introduction

1.1 Overview

AMT-FAM-10 is a high-performance dual-lens face image capturing module that supports both visible light and near-infrared light images. This module is equipped with an optical camera with a wide dynamic imaging sensor, a megapixel lens, and near-infrared-light LEDs.

The model is also equipped with a high-performance processor with a frequency of 400MHz, capable of capturing high-quality visible and near-infrared face images. It supports USB interface communication and external power supply in one single cable.

AMT-FAM-10 utilizes the Infrared light imaging sensor to capture grayscale face images for face recognition process by integrating with AMT FaceLite SDK, and the visible light camera captures the true color face image for display and other relevant process. Combined with AMT FaceLite SDK, the captured face grayscale image and true color image are utilized for liveness detection and anti-spoofing protection process. AMT FaceLite SDK well fits to integrate facial recognition features into business applications.

For price-sensitive customers, the module and AMT FaceLite SDK together provide a cost-effective biometric authentication solution. The solution can be applied to a wide range of applications such as time attendance, access control, entrance management, payment kiosks, intercoms, turnstiles which are running on windows PCs, Android tablets, Linux based devices and other hardware platforms.

1.2 Features

- Supports Visible Light and Near-Infrared face image acquisition.
- Built-in wide dynamic imaging sensor suitable for the various lighting conditions.
- Works with AMT FaceLite SDK to perform liveness detection and anti-spoofing process with grayscale face images and true color face images.
- Supports integration with third-party applications on Windows, Android or Linux operating systems via AMT FaceLite SDK.

- Compatible with USB 2.0 specifications.
- Low power consumption with operating power less than 2W.
- Supports wide field of view which is adaptable to varieties of individual's height.
- Compact, light-weight size with USB 2.0 interface which simplifies integration with various hardware devices.
- Provides hygienic and non-invasive touchless identification solution which makes it stress free for public use.

2 Product Specifications

2.1 Technical Specifications

Features	Technical Specifications
Processor	Low-power-consumption processor, 400MHz
Image Sensor	Dual 1/2.7", HDR CMOS (support visible and Near-infrared light)
Connector	7-pin 1.25mm USB 2.0
Communication Interface	USB 2.0 (High speed)
Power Supply	USB 5V
Power Consumption	1.0W (Standby) / 1.75W (Operating)
Dimensions	60 * 22 * 19.30 mm (± 1 mm)
Certifications	CE, FCC, RoHS

2.2 Electrical Features

Specifications	Test Conditions	Min	Standard	Max
Operating Voltage	-	4.75V	5.0V	5.25V

Specifications	Test Conditions	Min	Standard	Max
Operating Current	T = 25°C/77°F, VCC = 5.0 V	-	350mA	400mA
Operating Power Consumption	T = 25°C/77°F, VCC = 5.0 V	-	1.75W	2.0W
Standby Current	T = 25°C/77°F, VCC = 5.0 V	-	200mA	220mA
Standby Power Consumption	T = 25°C/77°F, VCC = 5.0 V	-	1.0W	1.1W
Operating Temperature	-	-10°C/14°F	-	55°C/131°F
Storage Temperature	-	-20°C/-4°F	-	80°C/176°F

2.3 Optical and Image Specifications

Features	Technical Specifications	
Sensor Model	HDR CMOS Sensor	
Sensor Size	1/2.7 inch	
Sensor Type	Optical	
Image Size	720W x 1280H (Pixel)	
Dynamic Range	83 dB	
Max. Frame Rate	12 fps	
Lens Type	RGB	IR
Optical Wavelength	440 to 650 nm	840 to 860 nm
Field of View (FOV)	Diagonal = 74°, Horizontal = 40°, Vertical = 65°	
Optical Distortion Rate	≤1%	
Lens Composition	Composed of 4-Plastic Lens and an IR-Filter (4P+1IR)	
Default Output Format	MJPEG	

Recognition Distance	40 cm to 80 cm
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2.4 Model Specifications

Features	Technical Specifications
SDK	AMT FaceLite SDK 12
Recognition Angle	Yaw \leq 25°, Pitch \leq 25°, Roll \leq 25°
Recognition Method	1:1 and 1:N
Capacity	6,000 templates
Accuracy	TAR=98.6% when FAR=0.001%
Recognition Time*	<300ms
Windows	Windows XP / Windows 7 / Windows10 (32/64bits)
Android	Android 4.1 or higher version

Notes:

* The performance is based on Quad-core Cortex-A9 up to 1.6GHz platform.

3 Algorithm Specifications

AMT FaceLite 12.0 is an excellent near-infrared face recognition algorithm based on the indoor face recognition algorithm which is adaptable to various lighting conditions and meets the requirement on large volume recognition case. To ensure a very low False Rejection Rate (FRR), the algorithm focuses on improving the adaptability to the deployed environment and user experience, thereby achieves the robustness and high-pass rate of face recognition.

The SDK libraries assist to enhance the security requirements through facial recognition which protects spoofing attack and is widely used in various business applications, including attendance,

security, video surveillance and more. Face recognition specifications are presented in the following table.

Algorithm Version	AMT FaceLite 12.0
Face Detection Speed	< 50 ms
Biometric Template Extraction Speed	< 200 ms
Biometric Comparison Speed	< 100 ms
Face Capacity	6,000
Posture Adaptability	Yaw $\leq 25^\circ$, Pitch $\leq 25^\circ$, Roll $\leq 25^\circ$
Precision	TAR=98.6% when FAR=0.001%

Note:

The algorithm performance is tested based on a proprietary image data set with image size of 480W x 640H pixel and on quad-core Cortex-A9 @1.5 GHz processor platform.

4 Application Scenarios

The AMT-FAM-10 module is optimized on its physical structure for the purpose of the built-in design and integration, facilitating easy and fast integration into third-party hardware device. Kept the integration thought into design, the module can be built into a host device using a single USB cable which provides both the power supply and data communication, this approach simplifies the integration development work considerably.

With AMT FaceLite SDK, you only need to write a few lines of code to call the SDK interfaces to achieve face recognition in your application. It speeds the development work and improves the productivity. The integration solution can be applied to various business applications such as time attendance, access control, entrance management, payment kiosks, intercom units, turnstiles, PCs, tablets, and more.

5 Structural Dimensions

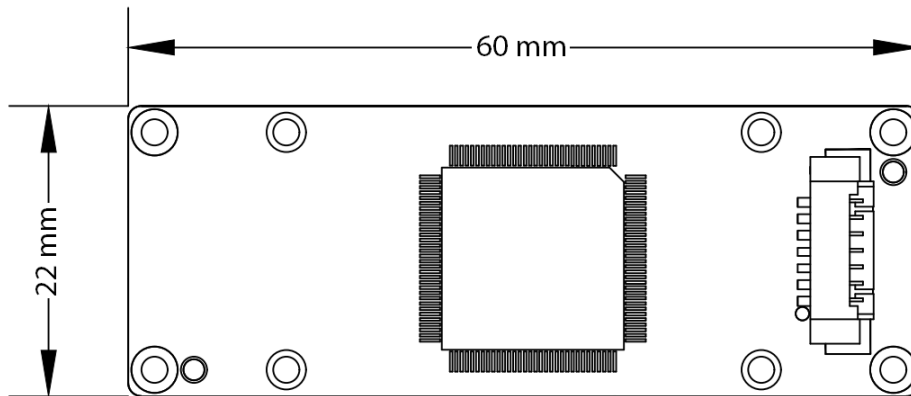


Figure 5.1 Bottom view

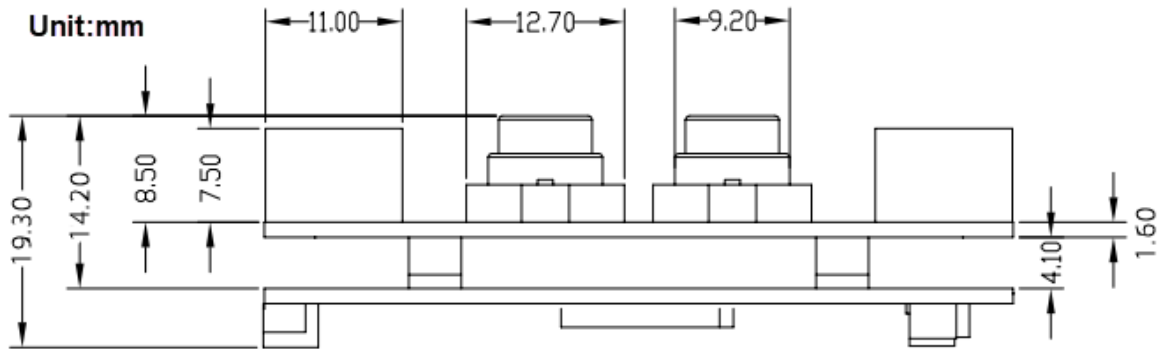


Figure 5.2 Side view

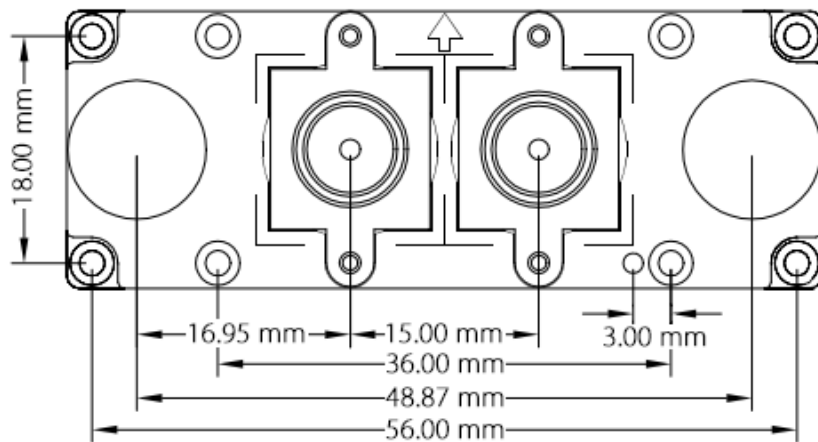


Figure 5.3 Top view

6 PIN Socket Definition

6.1 PIN Socket Position and Definition

The pin socket includes the USB communication and power supply pins, and the position and pin definition of the interface is shown in Figure 6.1 below.

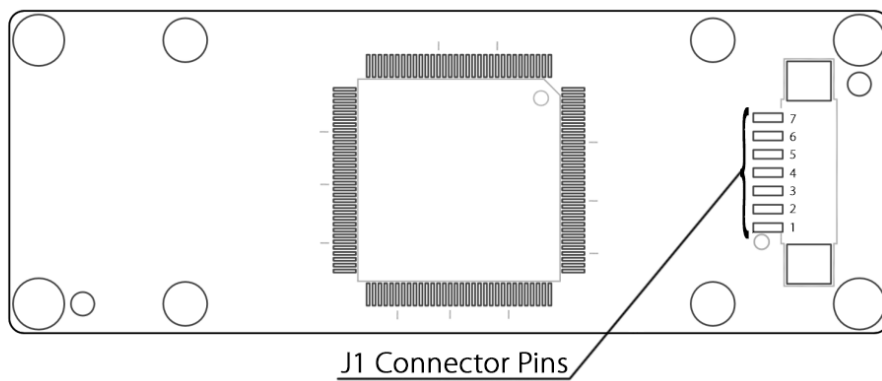


Figure 6.1 J1 Connector (7 Pin)

Pin Description

J1 (7 Pin / 1.25 mm)							
PIN	1	2	3	4	5	6	7
Detail	+5V	GND	Shield GND	USB-	USB+	Reserved	Reserved

6.2 PIN Socket Dimensions

The structural dimensions of the 7 Pin connector of the module are shown in Figure 6.2.

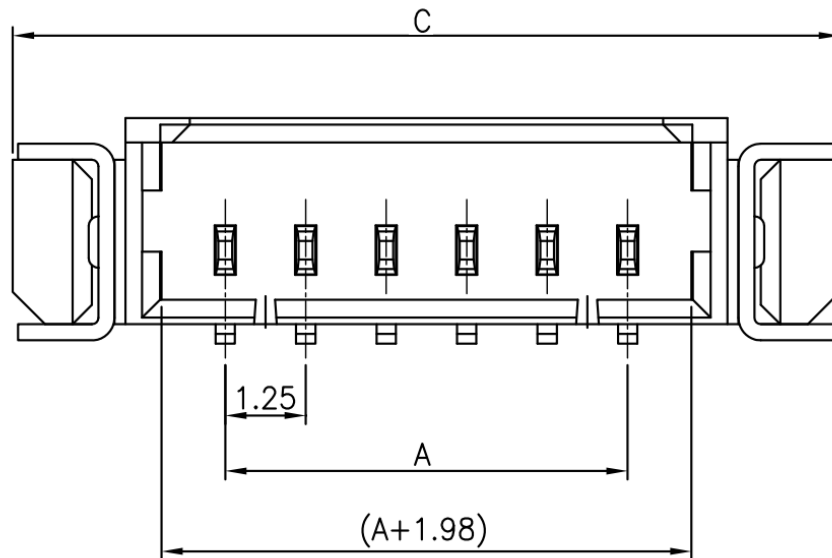


Figure 6.2 Dimensions of a 7-pin port socket

Part No.	Dimensions (mm)	
	A	C
7 Pin	7.50	14.10

7 USB Cable Requirements

7.1 USB Type-A cable

The total length of the USB cable is recommended to be 1.2 meters/4 feet or less. The wire needs to be shielded and the braiding number is 64 or more. The D+/D- data cable needs to be twisted and uses a 26AWG wire. The wire is on the side of the module with a magnetic ring. The reference design diagram is in the figure 7.1 below.

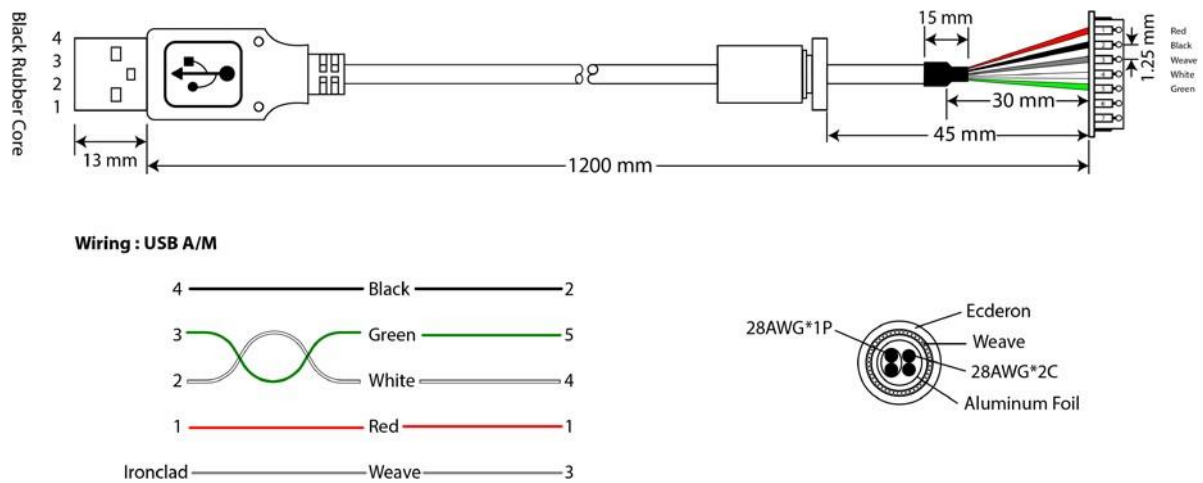


Figure 7.1 Cable Interface

7.2 Plug Wire

It is recommended that the USB signal cable D+/D- twisted-pair uses a 26AWG wire. The total length of the double-plug wire must not be more than 15cm. With a shielding layer, the number of weaves is 64 or more to enhance the anti-interference of the USB cable. The reference design diagram is shown in Figure 7.2.

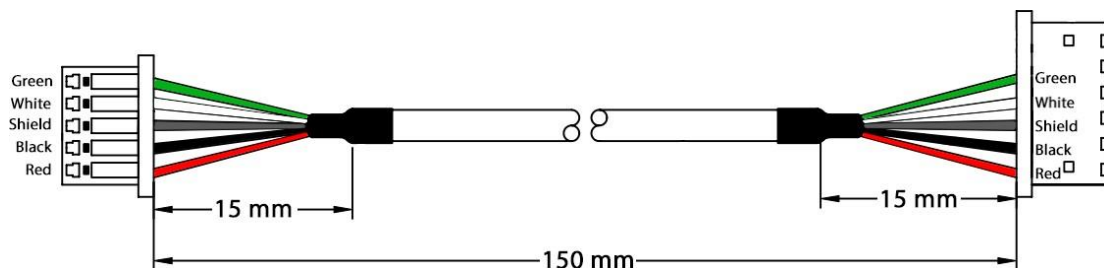


Figure 7.2 Plug Interface

8 Design Guide

8.1 Front Lens Design

- The front of the module is recommended to take glass or acrylic transparent material, which requires a transmission rate of more than 85 % within 400nm to 900nm wavelength range.
- The aperture size of the transparent material in front of the lens is recommended to be 4mm-7mm, as shown in the figure below, and the middle two lens holes are recommended to use a circular hole design with a diameter of 6.6mm.
- The aperture size of the transparent material in front of the Near-Infrared fill light is recommended to be 12mm-15mm, as shown in the figure below, and it is recommended to use a circular hole design with a diameter of 12mm.

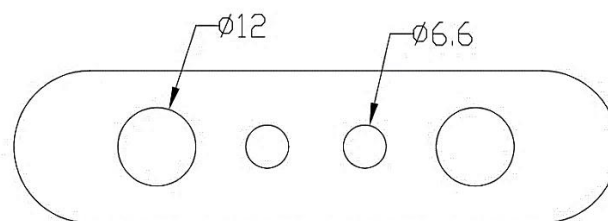


Figure 2.1 Schematic diagram of Acrylic Transparent Holes

- It is recommended to shade the front of the module, except for the position of the lens and the near-infrared LED corresponding to the transparent circular hole, to reduce the effect of stray light on image acquisition.
- As shown in the diagram below, there is a 0.5mm spacing between the lens and the transparent material in front to allow module size variance and avoid lens focusing errors in module assembly.

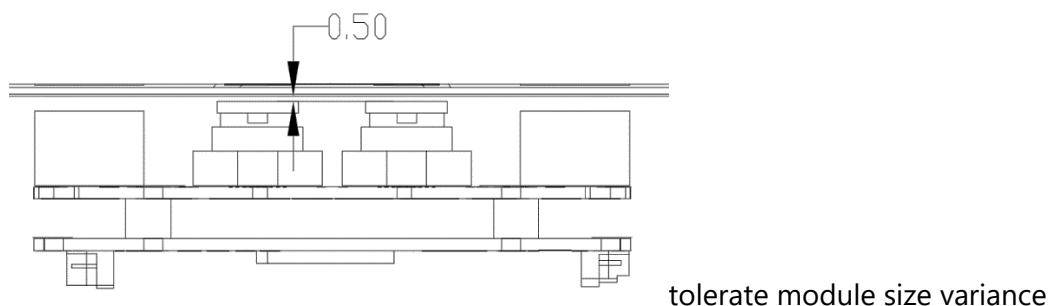


Figure 8.2 Schematic diagram of the distance between the lens and the front transparent material

- It is recommended to add the shading treatment around the lens and use the foam to isolate stray light.
- The foam is in close contact with the front glass or acrylic to reduce the effect of stray light on image acquisition, as shown below.

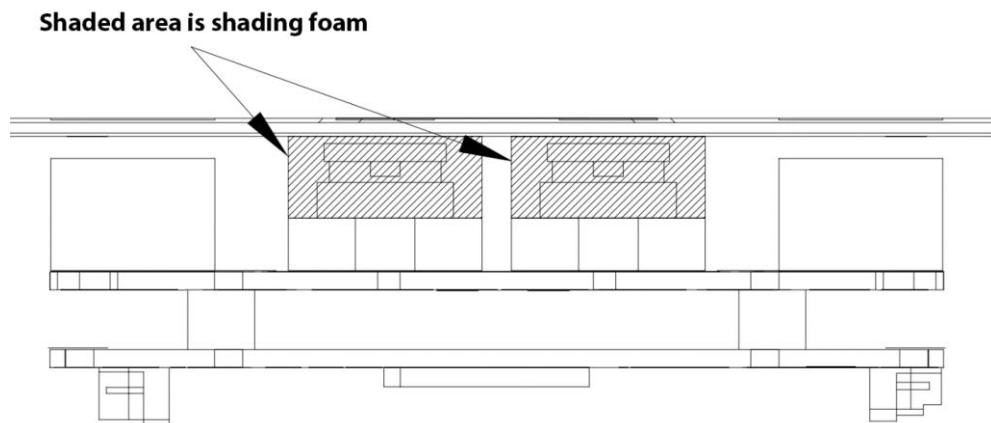


Figure 8.3 Schematic diagram of Foam Shading design

8.2 Heat Dissipation Design

- It is recommended to take the heat dissipation method. The surface of the CPU chip and the heat sink (or the metal shell of the device) are kept in close contact by thermal conductive silicone pad.
- The thickness of the thermal conductive silicone pad is recommended to be less than 3mm. The schematic diagram of the conductive heat treatment is shown below.

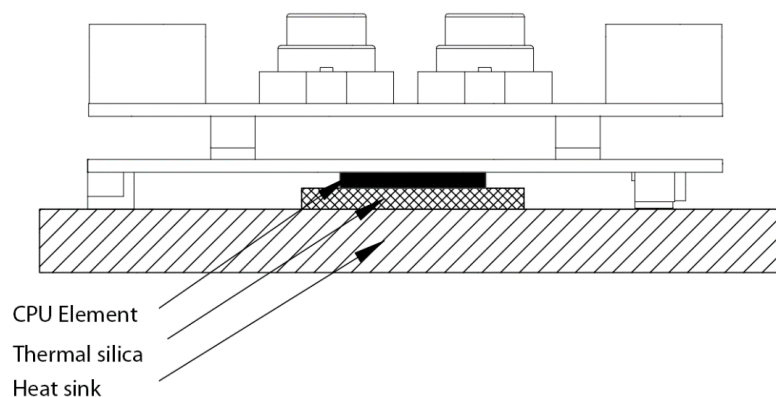


Figure 8.4 Schematic diagram of conductive heat treatment

9 Installation Guide

9.1 Installation Method

The screw holes at the four corners of the module as shown below are used to fix the module with the hole diameter of 2.0 mm, as shown in Figure 9.1.

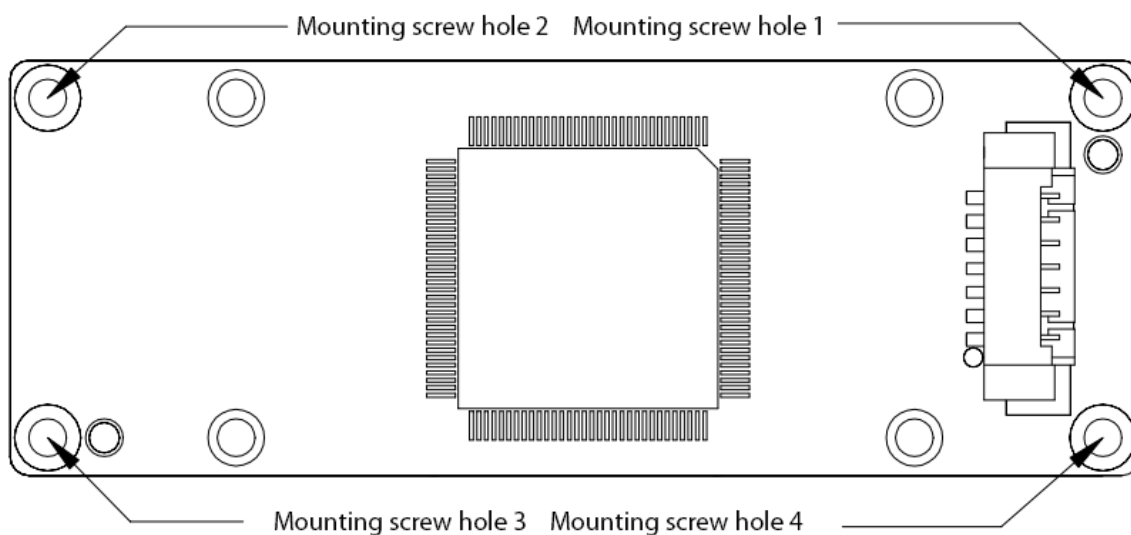


Figure 9.1 Location of the mounting holes in the module

- The module has a positioning hole with an aperture of 1.6 mm, as shown below:

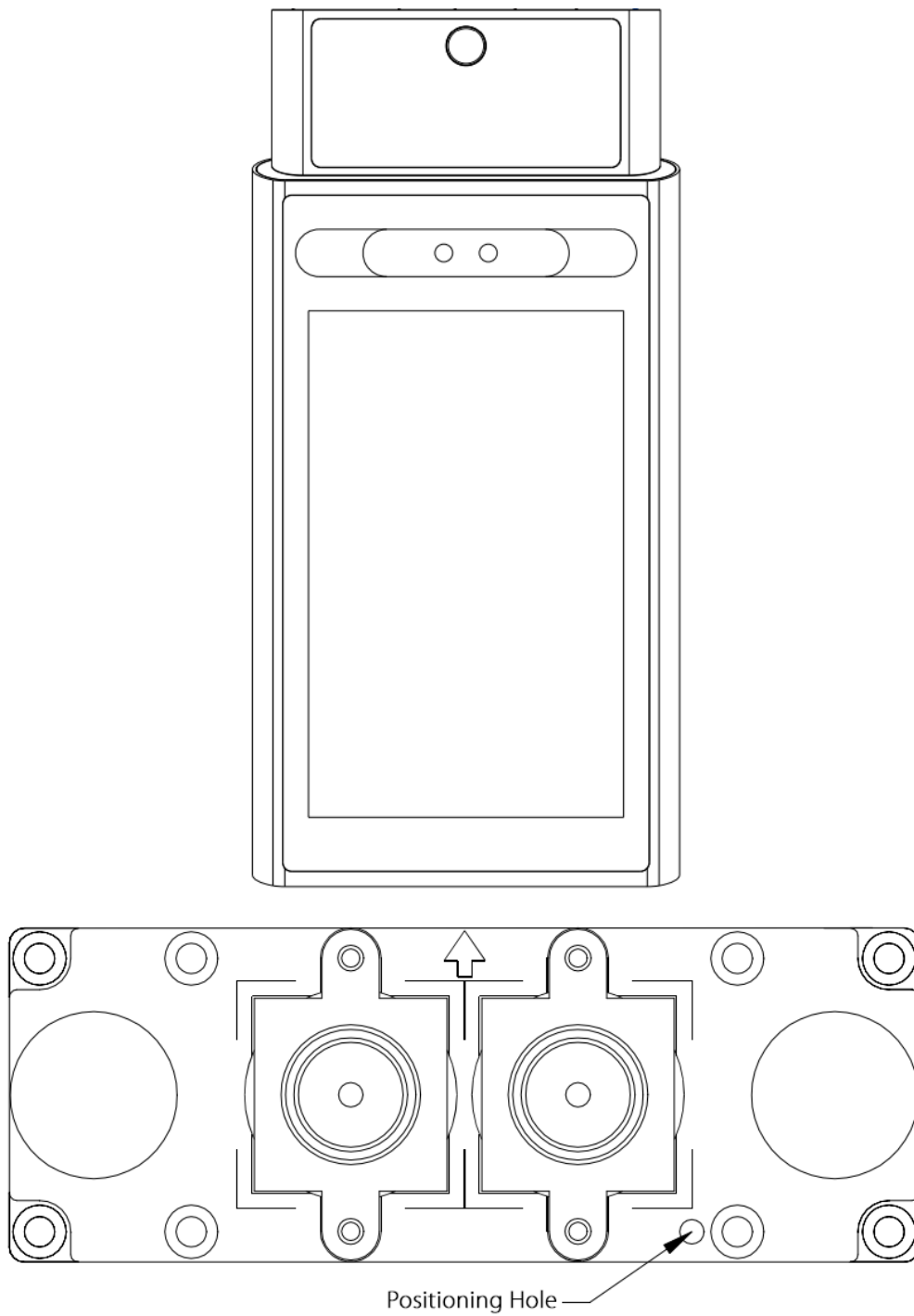


Figure 9.2 Location of Positioning hole in the module

- Once the module is installed inside the metal case, the screw hole of the module needs to be aligned with the metal case with fixed screws.
- To avoid any damage to the module, the metal casing should not contact other part of the module.

9.2 Vertical Mount Approach

The plane where the lens is located (or the lens plane) should be perpendicular to the horizontal direction:

- The recommended installation height is 1.55 meters, and the recognition distance is between 0.4 - 0.8 meters.
- This can be adapted to the height range of 1.47m to 1.82m, as shown below.

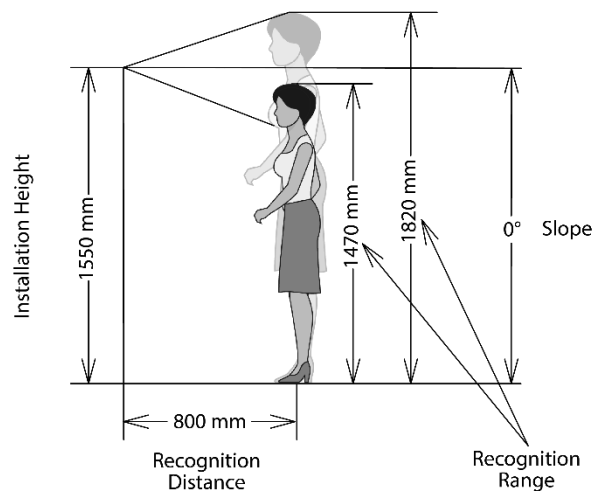


Figure 9.3 Schematic diagram of the installation height of 1.55 m

9.3 Tilting Mount Approach

- The recommended installation height is 1.2 meters or 48 inches, and the tilt angle is 37 degrees (that is, the angle between the plane above the lens and the vertical direction is 37 degrees), and the recognition distance between 0.4 to 0.8 meters.
- This can adapt to the height range of 1.5m to 2.2m, as shown in the below image.

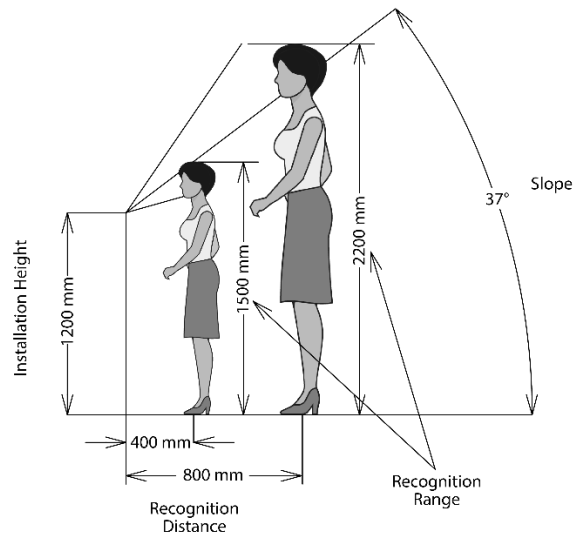


Figure 9.4 Schematic diagram of the installation height of 1.2 meters

9.4 Recommended Installation Height and Mounting Angle

- As shown in the table below, the listed mounting angle is the angle between the centre axis of the lens and the horizontal ground (that is, the angle between the plane above the module lens and the vertical direction).
- And the installation height is the distance from the module to the ground.

Height	0.8m	0.9m	1.0m	1.1m	1.2m	1.3m	1.4m	1.5m	1.55m
Angle	54°	50°	46°	43°	37°	24°	18°	8°	0°

10 Facial Expressions and Standing Posture

During enrollment and matching process, please keep natural facial expressions and proper standing postures. Incorrect facial expressions and standing postures may cause recognition failure. The guide of natural facial expressions and proper standing postures are illustrated in Figure 10.1 and 10.2, respectively.



Figure 10.1 The facial expressions illustration



Figure 10.2 The standing postures illustration

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