HESAI

www.hesaitech.com

4000-en-1901A1

HS4000

Handheld Remote Methane Leak Detector User's Manual

HESAI Wechat

Notice

Please read this manual carefully before using the equipment.

■ Caution

To avoid violating the warranty and to minimize the chances of getting electrically shocked, please do not disassemble the device on your own accord. The device must not be tampered with and must not be changed in any way. There are no user-serviceable parts inside the device. For repairs and maintenance inquiries, please contact an authorized Hesai Technologies service personnel.

■ Disclaimer

The information contained within this user's manual and the functions offered are intended to provide information about the product. All reasonable efforts have been made to ensure the accuracy of the information. However, Hesai cannot be held responsible for any errors. Hesai does not warrant the accuracy and reserves the right to make changes to the catalog and its functions at any time without notice.

Contents

1 Safety Notice

Prior to using this product, please read the safety notices carefully to ensure the safety and to avoid any improper usage.

1.1 Body Safety

1) Do not use the instrument if the outer body is broken or wet.
2) Please stop using the instrument instantly and pull out the battery in case of smoke, strange smell, short, or fire.
3) The enclosure level of the instrument is IP54. Please stop using the instrument and pull out the battery if any liquids have gotten inside.
4) Do not look at laser apertures while using the instrument.
5) Do not fix the instrument without the permission from Hesai.
6) Do not touch the LCD when it is broken.

NOTE

1) Any damage of anodizing layer of the heat sink of middle shell or sight base occurs, the product should be no longer used in hazardous area.
2) The instrument satisfies the requirements of:
   - IEC 60079-0:2017
   - IEC 60079-11:2011
   - IEC 60079-28:2015

FCC ID: 2ASO2HS4000

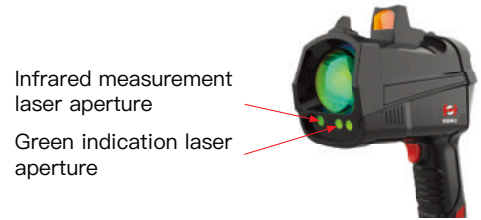
This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The device contains FCC ID：A8TBM71S2.

1.2 Laser Safety

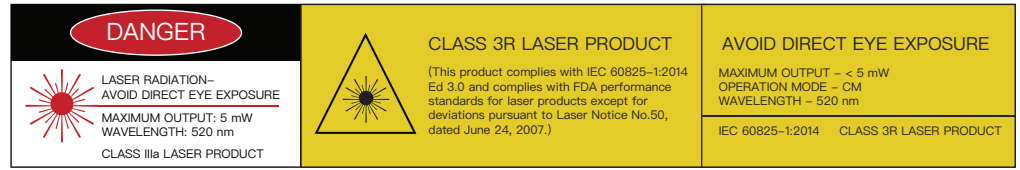
Infrared Measurement Laser: Class 1 Eye Safe, wavelength: 1651 nm, <10 mW.
Green Indication Laser: Class 3R, wavelength: 520 nm, <5 mW.

NOTE Please avoid direct eye exposure.



The device satisfies the requirements of:

- IEC 60825–1:2014;
- IEC 60825–1:2007;
- 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No.50, dated June 24, 2007;
- GB7247.1–2012.



1.3 Battery and Charger Safety

1) Do not use the non–original batteries and chargers.
2) Do not charge the battery if the charger or the battery is broken.
3) Please keep surrounding environments safe when charging.
4) Please keep the charger and battery clean to avoid short.
5) Please stop charging instantly and unplug the plug when there is short, fire, strange smell, or smoke.
6) Do not dismantle, modify or repair the battery.
7) Please store the battery in a cool and dry environment. Do not place the battery in a place with too high or too low temperature.
8) Do not store or transport the battery together with metal objects.
9) Do not touch the battery with wet hands.
10) Do not hit or throw the battery.
11) If the battery leaks contact with the skin or clothes, be sure to rinse with clean water. Please seek medical attention if necessary.
12) Do not store the device with the battery installed when not using the device for a long time.

13) Do not change the battery in explosive atmospheres.
14) Use charger type HS4000-C only.
15) Do not charge the battery pack in explosive atmospheres.
16) Do not dispose of the battery pack in the fire.
17) Never attempt to disassemble the battery pack.
18) Do not short-circuit the terminals of the battery pack.
19) Do not take off the battery package in explosive atmosphere.

1.4 Usage Safety

Operating Temperature: -20 to +45℃; Operating Humidity: <80%RH, Non-condensing.

1) Please avoid electromagnetic interference when using the product.
2) Do not forcefully push the buttons or subject the device to strong shocks.
3) Please use the strap when using the device to avoid breakage and foot injury caused by dropping of the device.

1.5 Storage and Transportation Safety

1) Please store the product in a cool and dry environment.
2) Please transport the product with a dedicated case to avoid strong shocks or vibration.

1.6 Intrinsic Safety

Type of Protection: Ex ib op is IIA T3 Gb
Ⓔx II 2 G Ex ib op is IIA T3 Gb
IECEx Certificate Number: IECEx NEP 19.0004X.
ATEX Certificate Number: Baseefa19ATEX0021X.

2 Introduction

HS4000 is an ultralight and highly sensitive instrument that utilizes infrared laser to remotely detect methane leaks. HS4000 comes with Bluetooth capability that can transfer measurement data in real-time to the dedicated APP. Users can use the APP to check, record and export the data. Through the APP, users can generate detection reports using the saved data as well.

2.1 Working Principle

HS4000 emits an infrared laser at 1.65 um. The laser beam travels to the target, is partially absorbed by the gas, then reflected all the way back into the receiver.
The reflected laser is collected and converted to an electrical signal that carries information needed to deduce the relative methane concentration. The reading is expressed by a methane column density (ppm*m). It is the integral of the methane concentration (ppm) and the distance (m) on the optical path.

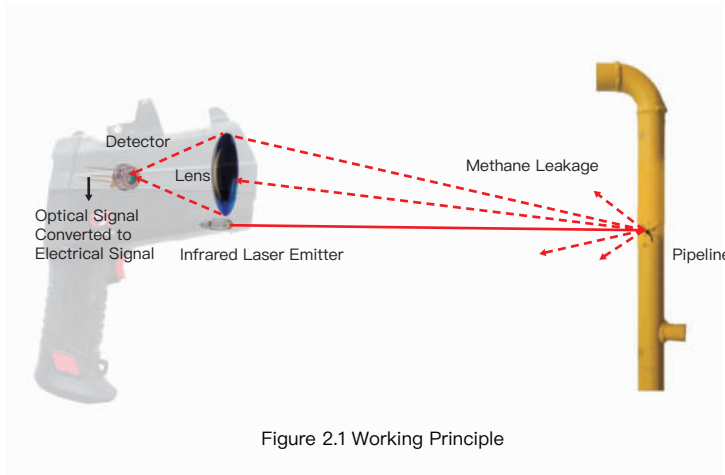


Figure 2.1 Working Principle

2.2 Specifications

Target Gas	Methane (CH4) and methane-containing gases
Working Principle	Tunable Diode Laser Absorption Spectroscopy (TDLAS)
Measurement Method	Laser Reflection
Sensitivity	5 (Actual) ppm*m
Detection Range (CH4)	0 to 99999 ppm*m
Measurement Accuracy	±10% (100 to 50000 ppm*m)
Detection Distance	160 m (75% reflectivity, slow detection mode)
Unit	ppm*m/%vol*m/%LEL*m
Response Time	0.1 s/0.4 s/1.6 s
Weight (with battery and sight)	0.76 kg
Size (without sight)	160 mm*210 mm*80 mm
Data Transmission	Bluetooth, Dedicated APP
Display	2.8 Inch LCD
Enclosure Level	IP54
Explosion Proof Classification	Ex ib op is IIA T3 Gb Ⓔx II 2 G Ex ib op is IIA T3 Gb
Laser Classes	Infrared Laser: Class I Eye Safe Green Indication Laser: Class 3R, Avoid direct eye exposure
Operating Temperature	-20 to +45℃
Operating Humidity	<80%RH, Non-condensing
Storage Temperature	-20 to +60℃
Sight Effective Distance	>15 m
Beam Dimension	Divergence angle: 2 mrad（4 cm at 20 m）
Power Supply	Rechargeable Lithium battery pack, Nominal Voltage: 7.2 V, HS4000-B
Operating Time	Continuous operating time: 15 hours (Typical value, ambient temperature 25℃, 2 batteries)
Self-Test	Built-in self-test while turning on the instrument, 10 s （typical value）
Threshold Alarm	Threshold: Can be set by users Alarm: Buzz with LCD turning red
System False Alarm	Corresponding error message while there is any hardware issue

Table 2.1 Main Specifications

2.3 Package Components


01
Handheld Remote Methane Leak Detector


02
Lens Cap


03
Battery Pack


04
Power Adapter


05
Charging Base


06
Carrying Case

Figure 2.2 Package Components

No.	Components	Quantity	Remark
01	Handheld Remote Methane Leak Detector	1	–
02	Lens Cap	1	–
03	Battery Pack (HS4000-B)	2	Can be equipped with additional batteries
04	Power Adapter	1	–
05	Charging Base (HS4000-C)	1	–
06	Carrying Case	1	–

Table 2.2 Package Components Description

3 Interface Operation

3.1 Buttons

Figure 3.1 Device Buttons

No.	Button	Descriptions
01	Power/Return Button	Hold the power button about 3 seconds to open the device
02	Enter Button	Enter the menu/Confirm
03	Up Button	Move up the cursor
04	Down Button	Move down the cursor
05	Test Button	Click once to start testing and click again to stop testing
06	Battery Compartment Button	Used to remove the battery

Table 3.1 Device Buttons Description

3.2 Light Instructions and Display

3.2.1 Light Instructions

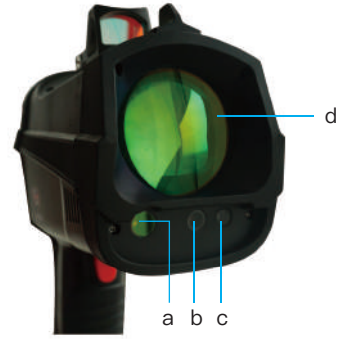


Figure 3.2 Light Instructions

No.	Name	Notes
a	Infrared Laser Emitter	–
b	Indication Laser (Green)	Class 3R, Avoid Direct Eye Exposure The indication light will start to blink when the device starts detecting
c	Working Light (Blue)	The blue working light will turn on in the process of device self-test It will not light after the device is started
d	Receiving Lens	–

Table 3.2 Light Instructions

3.2.2 Interface Display

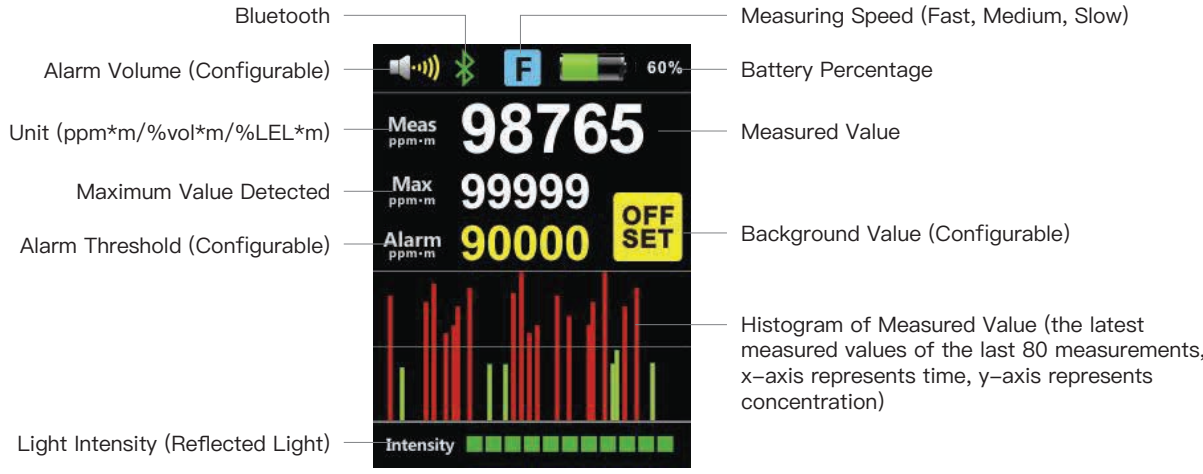


Figure 3.3 User Interface

NOTE Please measure when the light intensity signal is between 4 to 10 grids to avoid the measurement error caused by too weak or too strong light intensity.

3.3 Setting Menus

3.3.1 Menus and Default Settings

Please click the enter button to enter the menus. Through the setting menus, users can set the alarm threshold value, alarm volume, screen display brightness, screen standby time, and system language. Also, Users can check the device hardware and software version through About menu.

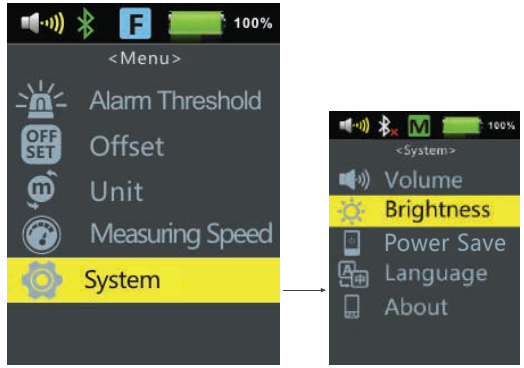


Figure 3.4 Menus

Name	Default Setting
Alarm Threshold	200 ppm*m
Offset	0 ppm*m
Unit	ppm*m (Options: ppm*m/%vol*m/%LEL*m)
Measuring Speed	Fast (Options: Fast 0.1 s; Medium 0.4 s; Slow 1.6 s)
Alarm Volume	ON, volume 100% (Options: ON/OFF)
Brightness	100%
Power Save	3 Min (Options: 3 Min/10 Min/30 Min/60 Min/120 Min/Never)
Language	English (Options: Chinese/English/French/Spanish)
About	Hardware Version; Firmware Version; Device Serial NO; Bluetooth Address

Table 3.3 Menu Default Settings

3.3.2 Changing Settings

Use Up/Down button to select the item or adjust the value.

Use Enter button to enter the submenu or confirm the setting.

Use Power button to return.

4 Instrument Operation

Before the operation, please read all instructions carefully in this manual.

4.1 Charging Battery

4.1.1 Charging Method

1) Connect the power adapter cord to the charging base.
2) Insert the battery into the charging base.
3) Plug the power adapter into a power outlet.
4) Unplug the adapter and remove the battery when charging is complete.

Figure 4.1 Charging Diagram

4.1.2 Charging Notes

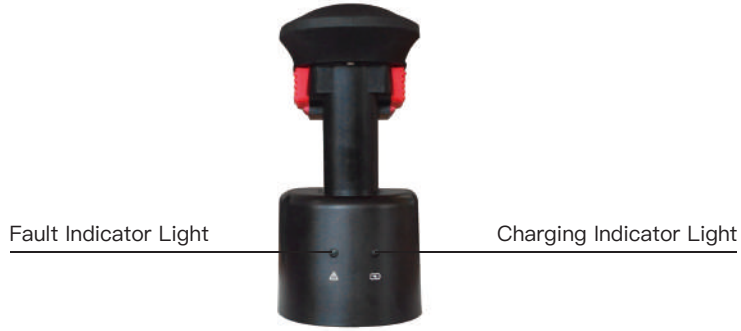


Figure 4.2 Charging Indicator Light

1) There are two lights on the battery charging base. One is the fault indicator light, the other is the charging indicator light.
2) If the fault indicator light is on, stop charging immediately, unplug the charger, and contact us for maintenance.
3) The charging indicator lights up during charging and turns off when the battery is fully charged.
4) When the adapter is plugged in but the battery is missing from the charging base, the charge indicator light will blink.

4.2 Battery Installation

4.2.1 Insert Battery

Step1
Align the battery with the battery compartment

Step2
Push the battery in gently

Step3
The installation is completed when you hear a click sound

Figure 4.3 Insert Battery Steps

NOTE Please ensure surrounding environments are safe.

4.2.2 Remove Battery

Step1
Press the battery compartment button

Step2
Pull the battery out gently

Step3
Till the battery is fully unplugged

Figure 4.4 Remove Battery Steps

NOTE Please ensure surrounding environments are safe.

4.3 Instructions on the red dot sight

Users can look through the red dot sight to achieve better aiming. The red dot sight is powered by the device . It automatically lights up after powering on the device.

NOTE The sight is effective when aiming over 15 m away. If the distance from the measured object is too short, the red dot will not overlap with the green indication laser.

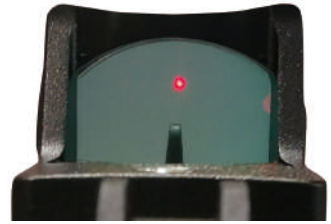
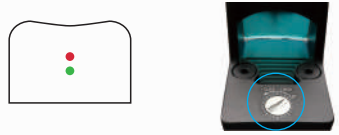


Figure 4.5 Red dot sight diagram

If the red dot and the green indicator laser do not overlap when aiming for a long distance (>15 m), the red dot calibration can be performed by adjusting the knob on the sight.



If the red dot is higher than the green indication laser, turn the knob counterclockwise to make it lower; if the red dot is lower than the green indication laser, turn the knob clockwise to move it up.

If the red dot is to the right of the green indication laser, turn the knob counterclockwise to shift it to the left; if the red dot is to the left of the green indication laser, turn the knob clockwise to shift it to the right.

4.4 Bluetooth Connection

4.4.1 Functions

HS4000 uses Bluetooth for communication tool. By connecting the detector with the App, users can:

1) Check real-time data.
2) Take pictures of a leakage point and show the corresponding N/E position.
3) Show GPS location on the map.
4) Record and export measurement data.
5) Generate measurement reports (can be shared via WeChat, QQ or E-mail).

NOTE Please contact Hesai to obtain the App.

4.4.2 How to connect using Bluetooth:

1) Turn on Bluetooth on the mobile phone and search for the nearby Remote Methane Leak Detector.
2) The Bluetooth icon on the top of the device screen will turn green to indicate successful connection.
3) Use your app to read, record, and export data.

Figure 4.5 Bluetooth connected icon

4.5 Operational Steps

4.5.1 Start to Use

	Step 2 Remove the lens cap		Step 4 Click the test button to start measuring	
Step 1 Take out the device and insert the battery		Step 3 Hold the power button till the device turns on		Step 5 Connect the device to the App (if needed). Aim the green indication light towards the object that needs to be measured.

NOTE The red dot aiming sight, which is turned on once the device is powered on, can be used for better aiming.

4.5.2 After Use

	Step 2 Hold the power button till the device turns off		Step 4 Cover the lens cap	
Step 1 Click the test button again to stop measuring		Step 3 Remove battery		Step 5 Put the device, battery, and lens cap back to the dedicated casing.

NOTE

1) Please store the instrument in a cool and dry environment. Do not place the instrument in a place with too high or too low temperature.
2) If there is dust on the lens or body of the instrument, please wipe with a dry clean cloth or with a little water. Do not use rough paper (such as a napkin) to clean the lens to avoid damages to the lens coating.
3) Please ensure surrounding environments are safe when removing the battery (step 3).

4.6 Detection Do's and Don'ts

4.6.1 Case 1

When detecting through the glass, if the infrared laser is incident on the glass vertically, part of the light reflected by the glass will be received by the device, which will cause light intensity saturation or inaccurate measurement result.
In such case, please point as shown in Figure 4.6.B to avoid receiving the glass reflected light.

Figure 4.6 Do's and Don'ts when detecting through the glass

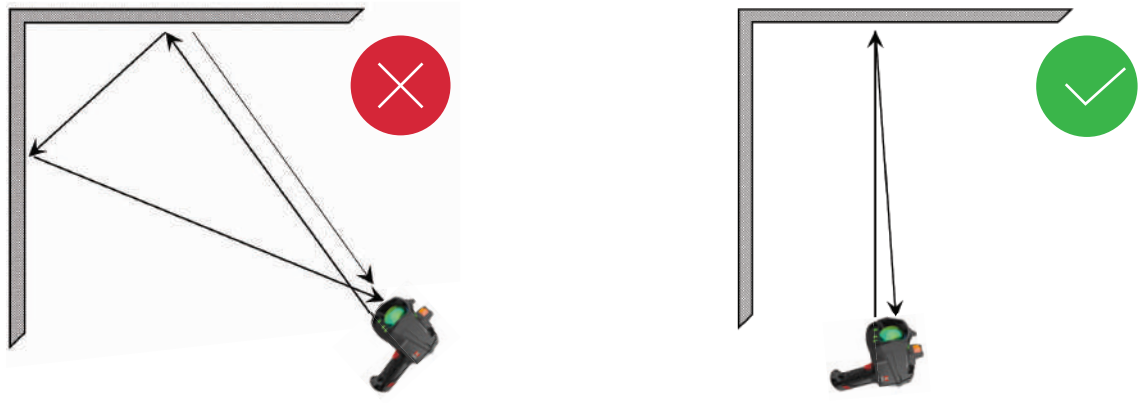
4.6.2 Case 2

Please avoid detecting through materials that have strong absorption or reflection effect on the infrared laser, such as PMMA, laminated glass, anti-infrared glass. In such case, the methane concentration behind can't be detected or the measurement result may be inaccurate.

Figure 4.7 Avoid detecting through anti-infrared or absorbing infrared material

4.6.3 Case 3

When detecting towards the corner (or similar situation), as shown in Figure 4.8.A, the infrared laser may reflect between walls, resulting in high measurement concentration. In such case, please point as shown in Figure 4.8.B to have the accurate measurement result.



A B

Figure 4.8 Do's and Don'ts when detecting the corner

5 Technical Support and Maintenance

5.1 Error Messages

5.1.1 Error Code

Error Code	Description
0x01	Laser temperature control system is abnormal
0x02/0x03	Laser intensity in the reference channel is too weak
0x04/0x05	Circuit board temperature exceeds the range of –20 to +80℃
0x08/0x09	Laser shell temperature exceeds the range of –20 to +60℃
0x10/0x11	Unable to detect the absorption signal in the reference channel

Table 5.1 Error Code Explanations

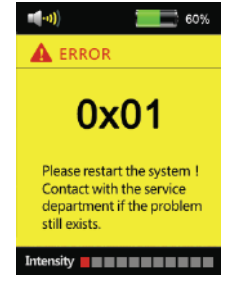


Figure 5.1 Error Messages

5.1.2 Proper Handling Method

When the error message appears, try restarting the device. If error code 0x01\0x04\0x05\0x08\0x09 appears, please try to restart the device after it is completely cooling down.
If the error still exists, please contact Hesai for the technical support.

NOTE Do not try to repair the device on your own accord.

5.2 Trouble Shooting

1) The instrument cannot be turned on.
   Please reinstall the battery, wait 5 seconds, then press the power button to turn on the instrument. If the instrument still cannot turn on within 30 seconds, please check whether it is out of battery.

2) The instrument's alarm is always on or never on.
   Please check whether the alarm threshold value is set too high or too low.

3) The instrument's alarm is on, but there is no sound.
   Please check the volume of the instrument. Make sure that the alarm is on and the volume is set properly.

4) The battery cannot be charged.
   Please check whether all the components are connected well.
   Please check whether the charging base has power.
   Please check whether the battery is plugged into the charging base.

5) The instrument is in good condition but there is no reading.
   Please check whether the light intensity is too strong or too low.
   When light intensity is too strong, please avoid complete perpendicular between the detecting laser beam and the object reflective surface.

5.3 Warranty and Maintenance

5.3.1 Warranty

During the warranty period, Hesai will provide free maintenance service when the device can't operate due to the problem of software or hardware. But Hesai will not provide the service if the problem is caused by improper or unauthorized operations. Situations that break the warranty include but are not limited to the following:

1) Missing warranty document or effective purchase vouchers.
2) Did not use the instrument as per these instructions.
3) Unauthorized modification, disassembly, or repair.
4) Intentional damages.
5) Stolen, lost or discarded device.
6) Damaged device due to use with unauthorized accessories and services.
7) Those damages caused by natural disasters, such as fire, lightning, flood, earthquake, etc.

5.3.2 Maintenance

For maintenance requirement, please follow the following steps:

1) Report the problem to Hesai for the preliminary problem diagnose and receive Return Material Authorization (RMA).
2) Delivery product to Hesai.
3) Hesai provides the maintenance test report, maintenance fee (if any), and repair agreement.
4) Pay the maintenance fee if needed.
5) Receive the repaired instrument and finish delivery inspection.

Normal Maintenance Time (after receiving the product): 7 days.
The specific maintenance time shall be determined according to actual repairs or service needed.

Appendix I FCC Statement

FCC ID: 2ASO2HS4000

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation.
If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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

Hesai Photonics Technology Co., Ltd

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