DM100MINI

Drone–mounted 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 is intended to provide information about products. 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.

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1 Safety Notice

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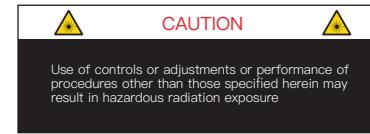
■ Warning

Be sure to observe the following points:
Avoid direct eye exposure. The lasers may harm your eyes.
Do not point the lasers at people when the product is powered on.
Do not allow children to handle the product.
Green indicator lasers have outlet labels next to them,
and Class 3R warning labels are attached to the side of the device.

⚠ CAUTION ⚠

Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure

Aperture Label

■ Laser Safety

Infrared Measerment Laser:
Class 3R, Wavelength: 1651 nm/1653 nm, <15 mW
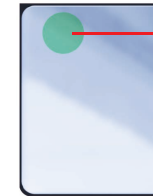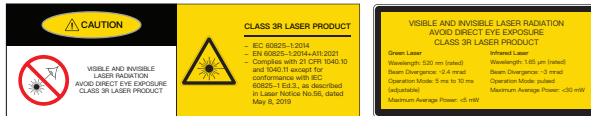Green Alignment Laser: Class 3R, Wavelength: 520 nm, <5 mW

The device satisfies the requirements of:
- IEC 60825–1: 2014
- EN 60825–1: 2014+A11: 2021
- Complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825–1 Ed.3., as described in Laser Notice No.56, dated May 8, 2019.

Infrared & Green Laser Output

Figure 1. Laser Safety Notice

DM100MINI

2 Introduction

Hesai Drone–mounted Remote Methane Leak Detector is an ultralight and highly sensitive module that utilizes an infrared laser to remotely detect methane leaks. It can be mounted on the drones, vehicles, and ships for applications such as pipeline survey, residential area detection, etc.

The detector measures the methane concentration by emitting an infrared laser and receiving the laser reflection.
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.

Infrared & Green Laser Output

Receiving Area
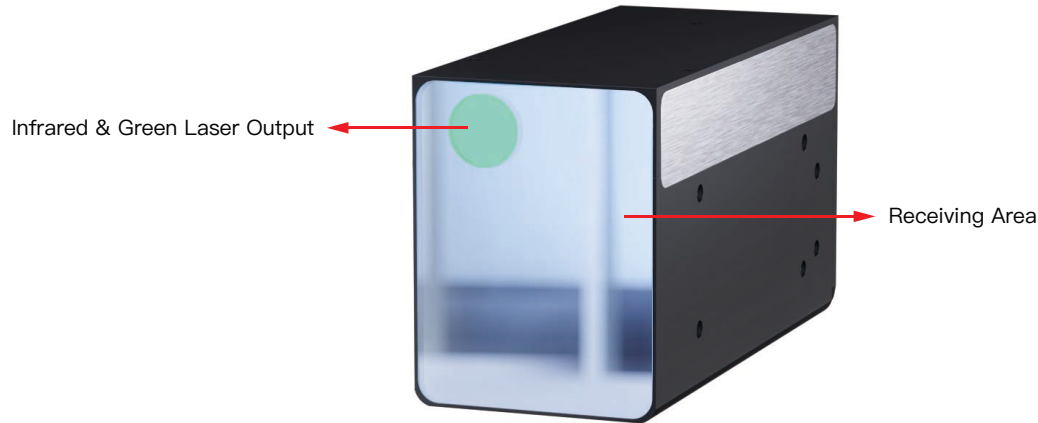
Figure 2. Light Instructions

3 Specifications

Target Gas	Methane（CH4）and methane–containing gases	Operating Voltage	DC 7~12 V
Working Principle	Tunable Diode Laser Absorption Spectroscopy (TDLAS)	Rated Current	<1 A 0.25 A (typical value) under 8 V power supply
Sensitivity	5 ppm*m@100 ms (Actual)	Data Output	Methane concentration, light intensity, temperature, etc.
Detection Range (CH4)	0~99999 ppm*m	Laser Classes	Infrared Measerment Laser : Class 3R, Wavelength: 1651 nm/1653 nm, <15 mW Green Alignment Laser: Class 3R, Wavelength: 520 nm, <5 mW
Measurement Accuracy	±10% (100~50000 ppm*m)		
Response Time	5 ms, 10 ms, 100 ms (configurable)		
Detection Distance	200 m (@82% reflectivity, 15000 ppm*m) (Actual distance may vary due to background)	Operating Temperature	−20℃~+45℃
Weight	< 148 g	Enclosure Level	IP54
Size	45.5 mm*35 mm*82 mm	Beam Size	Infrared light divergence angle: 3 mrad (6 cm at 20 m)

Table 1. Main Specifications

* Specifications are subject to change without notice

4 Installation Guide

4.1 Installation Notice

Prior to installing the detector, please read the notes carefully to ensure safe and appropriate usage:

1) Supply the detector as required (DC 7~12 V).
2) Provide good heat dissipation to the laser.
3) Pay attention to static electricity. Please release the body static electricity or wear antistatic bracelet before the installation.
4) Do not weld/replace any component unless it is recognized by Hesai.
5) Do not unplug the laser fiber. Do not bend the fiber even at a small angle.
6) Do not attempt to remove any circuit boards unless it is recognized by Hesai.
7) Do not use the PCB of detector A on detector B.
8) Do not disassemble or repair the device on your own accord. For repairs and maintenance inquiries, please contact an authorized Hesai Technologies service personnel.
9) It is recommended that the length of the external cable should not exceed 3m.

4.2   Mechanical Installation

There are four mechanical mounting holes on the side of the detector. The mechanical drawing of the detector is shown below.
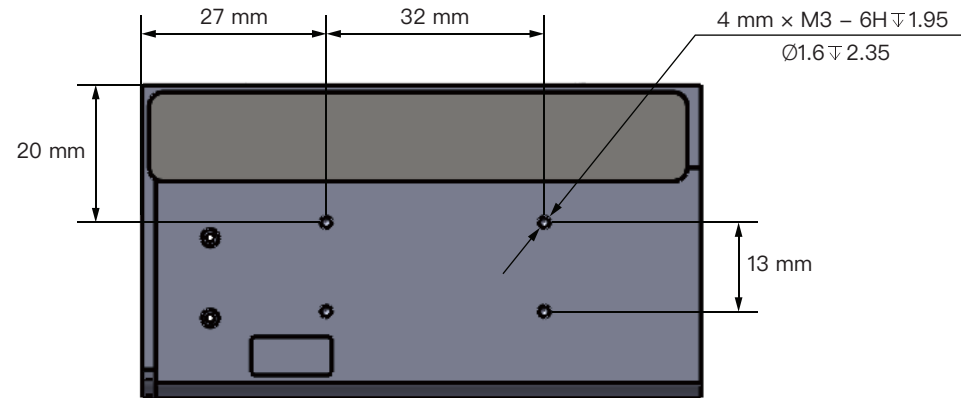
Figure 3. Detector Mechanical Drawing

4.3 Interface Introduction

The interfaces are at the back of the detector. Descriptions of the interfaces are shown below.

Type A 4–conductor plug

1 2 3 4

Type A 4–conductor socket
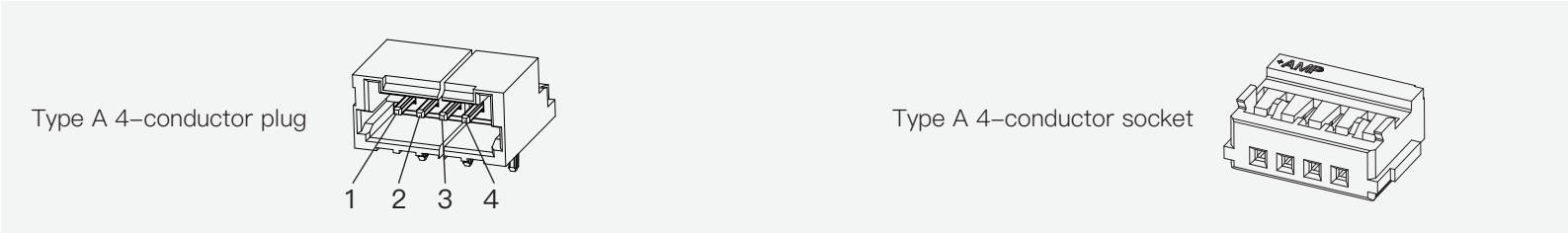
Figure 4. Detector Interfaces

Interface	Description
1	Positive power supply, DC 7–12V, Rated Current <1A
2	Negative power supply, GND
3	Data output, TX
4	Data input, RX

Table 2. Detector Interfaces

5 UART Serial Port Data and Parameter Configuration

5.1 UART Serial Port Data Output

■ Serial Port Configuration

Baud Rate: 57600; Data: 8 bytes; Stop: 1 byte; Parity: None.

■ Data Format

After power–on, the detector will use around 3 seconds to complete the self–test. If there is an issue, the detector will repeat self–testing until the problem is solved. After booting up, the serial port will send out data in the following format:

Header	Methane Concentration	Light Intensity		Relevancy* 1000	Environment Temperature				SNR	Reserved Bytes	Version Number	Error Code	Checksum
	5 bytes	5 bytes	5 bytes	5 bytes	5 bytes	5 bytes	5 bytes	5 bytes	3 bytes	3 bytes	3 bytes	3 bytes	
$	00318,	02147,	00735,	00999,	00036,	00024,	−0078,	00000,	003,	000,	010,	000	*3C

Table 3. Outputs Data Format

Data	Description
Methane Concentration	the unit is ppm*m
Light Intensity	the light intensity of infrared detection laser
Relevancy	reference value of whether the signal is distorted, <00900, no outputs
Environment Temperature	measured from PCB board thermistor
SNR	signal to noise ratio reference value
Version Number	used to record the software version number, e.g. 011

Data	Description
Error Code	000 normal operation; 004 circuit board temperature exceeds −20~80℃; 001 temperature control failure; 008 laser case temperature exceeds −20~80 ℃; 002 laser diode error; 016 reference channel error.

Checksum	Starting character is '*', and the Checksum value is obtained by the data difference or operation between '$' and' * '.
	
	Checksum calculation example:
	
	`unsigned char CalcChecksum(unsigned char* str, int len)`
	`{`
	   `unsigned char cs;`
	   `int i;`
	   `cs = 0;`
	       `for (i=0; i<len; i++)`
	       `{`
	          `cs ^= str[i];`
	       `}`
	       `return cs;`
	`}`

Table 4. Data Description

◼ Error Code Proper Handling Method

When the error message appears, try restarting the device. If error code 001, 004, or 008 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   Parameter Configuration

Users can use the serial port debugging tool to configure parameters for the detector. The specific configuration parameters are as follows:

Functions	Command	DM100 Return	Description
Enter configuration mode	"+++\r\n"	"WELCOME\r\n"	Serial port configuration is only valid in configuration mode
Set measurement time	"SSPD,%f\r\n"	"AOK\r\n"	Default setting: 0.1 s. Options: 0.1 s~10 s
Set save power	"SD,Savepower\r\n"	"AOK\r\n"	–
Set wakeup	"SD,Wakeup\r\n"	"AOK\r\n"	–
Set SNR	"SSNR,%f\r\n"	"AOK\r\n"	Default setting: 2. Options: 0.1~10
Set light intensity threshold	"SITH,%d\r\n"	"AOK\r\n"	Default setting: 100, Options: 50~1000 (integer)
Get device information	"DSP\r\n"	"DeviceSN:%s\r\n LaserSN:%s\r\n SetTId:%x\r\n IS1651:%d\r\n SNRThreshX10:%d\r\n IntensityThresh:%d\r\n"	Example： "DeviceSN:HESAI194 LaserSN:ABCD1234 SetTId:825 IS1651:1 SNRThreshX10:10 IntensityThresh:100"
Set green alignment laser	"SGL,ON\r\n" "SGL,OFF\r\n"	"AOK\r\n"	Default setting: ON
Reset	"SF,1\r\n"	"AOK\r\n"	Restore system default setting
Exit	"---\r\n"	"END\r\n"	Enter test mode after exiting configuration mode

Table 5. Parameter Configuration

* After sending the configuration command, the system returns the value "AOK\r\n"; if the command is incorrect, it returns "ERR\r\n".
  End a command with "\r\n".

Appendix I Warranty and Maintenance

■ **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 rule–breaking 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 instructed;
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.

■ **Maintenance**

For maintenance requirement, please follow the following steps:

1) Report the problem to Hesai for the preliminary problem diagnosis.
2) Return the product to Hesai.
3) Hesai conducts the maintenance test report, calculates maintenance fee (if any), and provides the maintenance agreement.
4) Sign the maintenance agreement and pay the maintenance fee if needed.
5) Receive the repaired instrument and finish the delivery inspection.

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

Appendix II EC–Declaration of Conformity

EC-Declaration of Conformity

CE

Konformitätserklärung / Déclaration de conformité / Conformiteitsverklaring / Dichiarazione di conformità / Declaración de conformidad Megfelelőségi nyilatkozat / Yhdenmukaisuusvakuutus / Överensstämmelseförklaring / Prohlášení o shodě / Declaraţie de conformitate / Δήλωση ξαμθυνίας / Overensstemmelse erklæring / Overensstemmelse forklaring

Manufacturer Name: Hesai Photonics Technology Co., Ltd.
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Tel: 00+86-21-31588240; Fax: 00+86-21-31588240; E-mail: lijinyu@hesaitech.com

We hereby declare that our products below described electrical equipment manufactured by us fulfills the requirements :

1. **Electromagnetic Compatibility Directive (EMC) 2014/30/EU**
2. **Restriction of Hazardous Substance Directive (RoHS) 2011/65/EU last amended by (EU)2015/863**
3. **Waste Electric and Electronic Equipment (WEEE) Directive 2012/19/EU**
4. **Screening of SVHCs subject to authorization, according to (EU) No 143/2011, (EU) No 125/2012, (EU) No 348/2013 and (EU) No 895/2014 and (EU) No 2017/999 (Annex XIV of EC No 1907/2006) and SVHCs in candidate list by European Chemical Agency (ECHA), and the EU Court of Justice rules on SVHCs in articles**

Declare that product: / erklären, dass das Produkt: / Déclarons que le produit: / verklaren dat het product: / Dichiara che il prodotto: / Declara que el producto: / Kijelentjük, hogy a termék, amelynek: / Vakuutamme, että: / Intygar att produkten: / prohlašuje, že výrobek: / Declarăm că acest produs: / Δηλώνουμε όη ηο τιροϊόν: / Forsikrer at produktet, / Forsikrer at produktet

Product Name: Drone-mounted Remote Methane Leak Detector
Product Model: DM100

is in conformity with the following standards: / den folgenden Standards entspricht: / est conforme aux normes suivantes: / in overeenstemming met de volgende normen is: / è conforme ai seguenti standard: / es conforme a las siguientes normas: / Megfelel az alábbi szabványoknak: / Täyttää seuraavat standardit: / Överensstämmer med följande standarder: / splňuje následující normy: / Este în conformitate cu următoarele standarde: / Σσμμορθώνεηαι με ηις ακόλοοθες προδιαγραθές; / Overensstemmelse med følgende standarder: / Overensstemmer med følgende standarder:

EN 61326-1:2013; IEC 61326-1:2012; EN 60825-1:2014; IEC 60825-1:2014; GB 7247.1-2012
21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No.50, Dated June 24,2017
Article 11 Recovery and Recycling, Calculation of Theoretical Recovery and Recycling Rate

Signed,

Mr. Li Jinyu / Certification Manager
Shanghai, P. R. China
25 June, 2019

Hesai Photonics Technology Co., Ltd
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021-31588240
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Appendix III FCC Statement

FCC ID：2ASO2DM100

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.

Please note that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note: 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.

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