TELEDYNE
GAS MEASUREMENT INSTRUMENTS
Everywhereyoulook™

User Manual

GAS LASER

Natural Gas Leak Detector

106220 Revision 1

WARNING: ALL INDIVIDUALS WHO, HAVE OR WILL HAVE, RESPONSIBILITY FOR USING, MAINTAINING, OR SERVICING THIS PRODUCT, MUST READ THIS ENTIRE MANUAL CAREFULLY. FAILURE TO USE THIS EQUIPMENT PROPERLY COULD RESULT IN SERIOUS INJURY OR DEATH.

LEGAL STATEMENT

DESCRIPTION

This User Manual provides information for use only with the Gas Laser (or "the instrument").

LIABILITY

Every care has been taken in the preparation of this User Manual, but the Company does not accept any responsibility for errors or omissions and their consequences. Information in this User Manual is subject to change without notice. This User Manual does not constitute a specification or basis for a contract.

MODIFICATION NOTICES

The Company aims to notify customers of relevant changes in the product operation and maintain this User Manual up to date. Due to continuous product improvement, there may be operational differences between the latest product and this User Manual.

This User Manual is an important part of the instrument, and it should be referred to for the life of the product.

SOFTWARE

Any software supplied must only be used in this product and may not be copied without the written permission of the Company. Reproduction or disassembly of such embodied programs or algorithms is prohibited. Ownership of such software is not transferable, and the Company does not warrant that the operation of the software will be error free or that the software will meet the customer's requirements.

DISPOSAL ADVICE

Dispose of the instrument carefully and with respect for the environment. If returned, the Company will dispose of the instrument without charge.

AREAS OF USE

Environmental factors may affect readings.

SPECIAL CONDITIONS OF USE

The instrument not designed for use in harsh environments. The instrument is sealed to IP54 and, if not subjected to misuse or malicious damage, will provide many years of reliable service.

Table of Contents

1. General Information

WARNING: READ, UNDERSTAND AND FOLLOW THE ENTIRE CONTENT OF THIS GUIDE PRIOR TO USE. FAILURE TO DO SO MAY RESULT IN SERIOUS INJURY OR DEATH.

This User Manual instructs gas detection personnel on the features and usage of the Gas Laser (or "the instrument"), including information on operation, configuration, maintenance, specifications and troubleshooting.

This User Manual assumes the reader has a basic knowledge of gas detection procedures.

1.1. Manual Conventions

The following visual elements are used throughout this manual, where applicable:

Icon	Description
	WARNING: THIS ICON AND TEXT INDICATE A POTENTIALLY HAZARDOUS SITUATION, WHICH, IF NOT AVOIDED, COULD RESULT IN DEATH OR INJURY.
	Caution: This icon and text indicate an action or situation, which, if not avoided, could result in damage to the equipment.
	Note: This icon and text designates information of special note to the operator.

1.2. Safety requirements for the use of GAS LASER

WARNING: IT IS STRICTLY FORBIDDEN TO OPEN THE INSTRUMENT OR THE BATTERY, PARTICULARLY, IN A HAZARDOUS OR POTENTIALLY HAZARDOUS ATMOSPHERE.

WARNING: IT IS STRICTLY FORBIDDEN TO CHANGE, TO MODIFY OR TO ADAPT EXTERNAL OR INTERNAL PARTS OR COMPONENTS OF THE INSTRUMENT.

1.2.1. Body Safety

- Do not use the instrument if the outer case is broken or wet.
- Stop using the instrument immediately and remove the battery in the event of smoke, unusual smells or fire.
- The instrument enclosure rating is IP54. Do not immerse in liquid. Stop using the instrument and remove the battery if any liquids enter instrument.
- Do not look directly at the laser while using the instrument.
- Do not point the laser at others.
- Do not attempt to open the instrument.
- Do not touch the LCD screen if it is broken.

NOTE: Should any damage occur to the anodizing layer of the heat sink (middle shell or sight base), then the instrument must not be used in hazardous atmospheres.

FCC ID: 2ASO2HS4000
This instrument complies with part 15 of the Federal Communications Commission (FCC) rules. Operation is subject to the following two conditions:

- This instrument may not cause harmful interference, and
- This instrument must accept any interference received, including interference that may cause undesired operation.

1.2.2. Battery and Charger Safety

- Use only the original manufacturer supplied batteries and chargers.
- Do not remove the battery in explosive atmospheres.
- Do not charge the battery in flammable or explosive atmospheres.
- Use Teledyne GMI provided charger only.
- Do not charge the battery if the charger or the battery is broken or damaged.
- Keep the charger and battery clean to avoid a short-circuit.
- Stop charging instantly and unplug the charger immediately if any noticeable issues arise while charging (smoke, strange smells, a short-circuit, or fire).
- Do not short-circuit the terminals of the battery pack.
- Do not, or attempt to, dismantle, modify, or repair the battery.
- Do not touch the battery with wet hands.
- Do not hit or throw the battery.
- Do not dispose of the battery in a fire. Observe disposal regulations to preserve the environment.
- Should the battery leak and come in contact with the skin or clothes, rinse with clean water and seek medical attention if necessary.

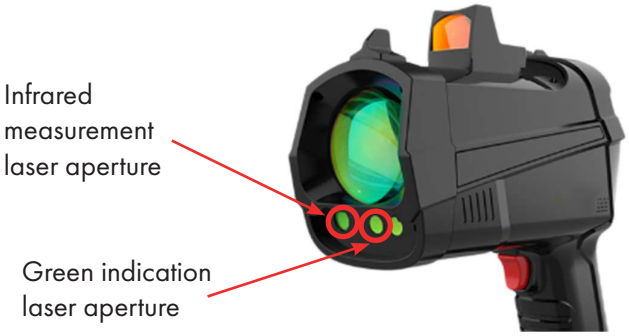
- Store batteries in a well-ventilated, cool and dry environment. Do not store the battery in extreme temperatures.
- Do not store the instrument with the battery installed when not in use for prolonged time.
- Do not store or transport the battery together with metal objects. Observe relevant regulations when lithium batteries are in transit.

1.2.3. Laser Safety

Infrared measurement laser: Class 1 eye safety, wavelength: 1651 nm, <10mW

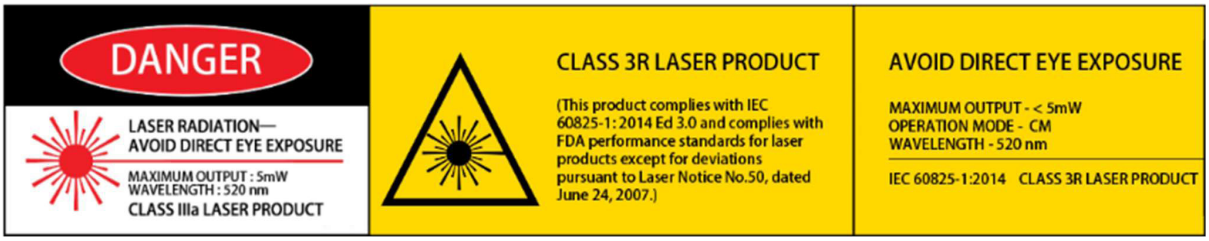
Green indication laser: Class 3R, wavelength: 520 nm, <5mW

Do not stare into the beam. Do not point the laser at humans or animals.



The instrument satisfies the requirements of:

- International Electrotechnical Commission Standards:
  - o IEC 60825-1:2014
  - o IEC 60825-1:2007
- US CRH standard: 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No.50, dated June 24, 2007;
- People's Republic of China's standard: GB7247.1-2012.



1.2.4. Usage Safety

Operating temperature: -4°F to 113°F (-20°C to +45°C)

Operating humidity: <80% RH, Non-condensing.

- Avoid electromagnetic interference when using this product.
- Do not forcefully push the buttons or subject the instrument to strong shocks.
- Use the strap when using the instrument to avoid damage or foot injury caused by dropping.

1.2.5. Storage and Transportation Safety

- Store this product in a cool and dry environment. Do not store the instrument in an area with extreme temperatures.
- Do not store instrument with battery installed.
- Transport this product within its dedicated casing to avoid damage from shocks or vibrations.

1.2.6. Tips and Recommendations

- Lithium batteries operate at a high level, but performance can drop suddenly. An optional second battery is recommended.
- If there is dust on the lens or body of the instrument, wipe with a lint free dry clean cloth or premoistened optical wipe. Do not use napkins or other rough materials which could damage the lens surface.

1.2.7. Warnings

Only use replacement parts approved by the Company.

Re-charge the instrument only in a safe area (refer to Section 6. Battery Operation).

If the instrument detects gas, follow your organization's procedures and operational guidelines.

Any right of claim relating to product liability or consequential damage to any third party against the Company is removed if these warnings are not observed.

2. Introduction

GAS LASER is an ultra-light and highly sensitive handheld remote methane leak detector (RMLD) which uses infrared lasers to remotely detect methane leaks. A smart sensor using infrared (TDLAS) technology guarantees measurement efficiency.

GAS LASER comes with Bluetooth capability that can transfer measurement data in real-time to a dedicated APP supplied as an option. Users can use the APP to check, record and export the data.

2.1. Key features

- Methane selectivity
- Excellent detection at 328 feet (100 meters)
- Detects through glass
- 5 ppm sensitivity per meter
- Fast response time, 0.1s
- Lightweight, 1.68lbs (0.76kg) with battery
- Visual and audio alarms with configurable alarm threshold
- Large color 2.8in LCD screen
- Bluetooth® data transmission
- Green guide laser light
- Red dot sight for precise targeting in bright sunlight or ambient light

2.2. Purpose

Ultralight, compact and easy to use, the GAS LASER instrument is designed for rapidly inspecting difficult-to-access installations and equipment in industrial sites. The GAS LASER is suited to situations where field technicians cannot operate close to the inspection zone, for example:

- Not readily accessible (i.e. overhead installations).
- Safety reasons.

With IECEx and ATEX certification, it can be used in explosive atmospheres.

2.3. Areas of Application

The GAS LASER meets the safety and performance requirements of a large range of applications including:

- Natural gas transmission and distribution pipeline leak inspection (inspection on street, between buildings, inspection of overhead pipelines, valves, service galleries of bridges...)
- Inspection of buildings (entrances, staircases, through windows) and fenced residential properties
- Safety of first responders
- Industrial site monitoring (refineries, natural gas production, processing and storage plants, compression stations, injection/extraction wells...).

3. Marking

Instrument markings include:

Teledyne Gas Measurement Instruments
14880 Skinner Road
Cypress, TX 77249, USA.

Ex ib op is IIA T3 Gb
Ⓔx II 2G Ex ib op is IIA T3 Gb

IECEx Certificate Number: IECEx NEP 19.0022X
ATEX Certificate Number: Baseefa19ATEX0076X

4. Instrument Shipping List

The instrument is shipped in a heavy-duty carry case containing:

1x Gas Laser	1x Lens Cap	2x Battery	1x Power Adapter	1x Charging Base
				

5. User Interface

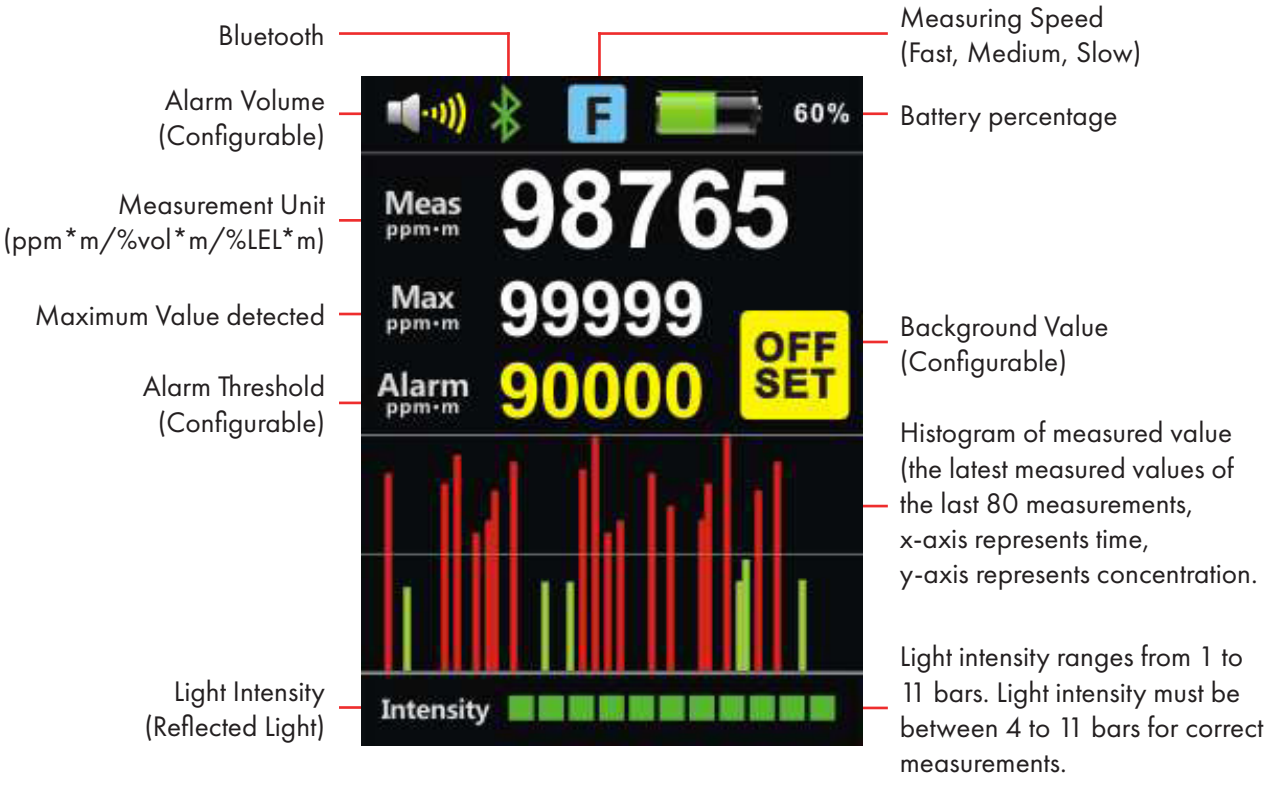
5.1. Instrument Buttons

No.	Picture	Button	Description
01		Power/Return Button	Hold the power button about 3 seconds to start up the instrument
02		Enter Button	Enter the menu/confirm selection
03		Up Button	Move up the cursor
04		Down Button	Move down the cursor
05		Test Button	Click once to start testing. The green indication laser is visible. Click again to stop testing
06		Battery Compartment Button	Used to remove the battery

5.2. Light instructions

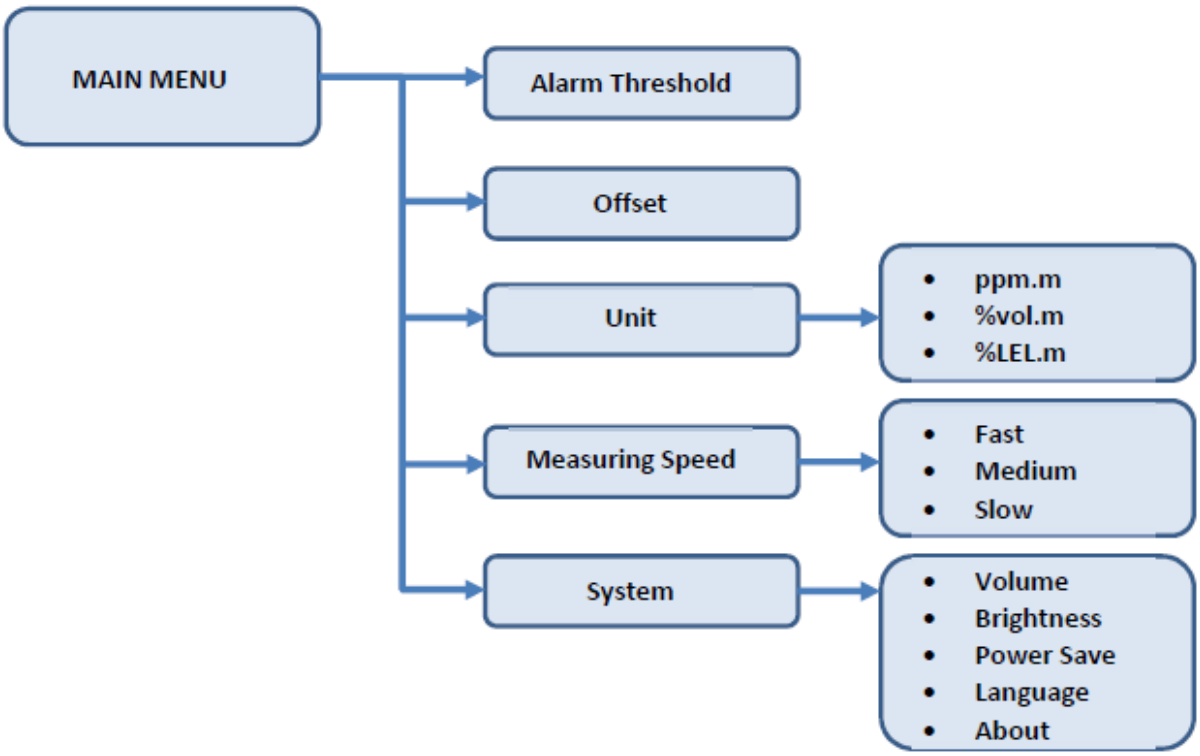
No.	Designation	Comments
a	Infrared Laser Emitter	-
b	Indication Laser (Green)	Class 3R, Avoid Direct Eye Exposure The indication light will start to blink when the instrument starts measuring and detecting.
c	Working Light (Blue)	The blue working light will turn on on the process of instrument self-test.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

5.3. Interface Display



NOTE: Measurements must be taken when the light intensity is between 4 to 11 bars to avoid the measurement error caused by too weak or too strong light intensity.

5.4. Setting Menus



Main Menu gives access to submenus to adjust the instrument's settings.

5.5. Menus and Default Settings

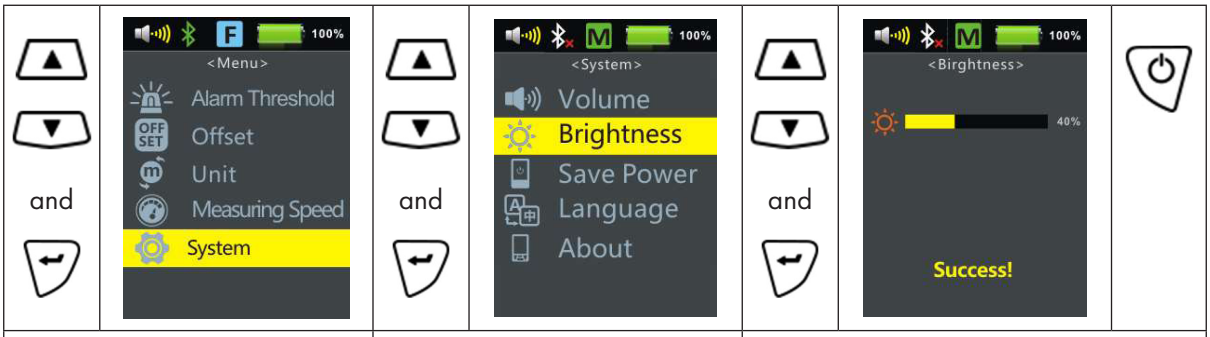
5.5.1. Default Settings

Through the setting menus, users can set the alarm threshold value, alarm volume, screen display brightness, screen standby time and system language. Users can also check the instrument hardware and software version through About menu. Menus are subject to change depending on software updates.

Designation	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; Medium; Slow)
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; instrument Serial No; Bluetooth Address

Example of menu and submenu access procedure:

To have access to menus, the test button must not be activated (green indication light not visible).



1. Use Up/Down button to move inside Menu 2. Press Enter button to select item from menu	3. Use Up/Down button to move inside Menu 4. Press Enter button to select item	5. Use Up/Down button to adjust the value 6. Press Enter button to confirm 7. Press Power/Return button to return

5.5.2. Changing Settings

Step 1	Step 2	Step 3
[Enter/Validation Button] Press Enter button to enter the Menu [Up Button] [Down Button] Use Up/Down button to select the item in the Menu	[Up Button] [Down Button] Use Up/Down button to adjust the value of the selected item [Enter/Validation Button] Use Enter button to confirm the setting	[Power/Return Button] Press shortly Power button to exit and return

6. Battery Operation

6.1. Charging the Battery

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.

Before	After
	

6.2. Battery Charging Information

1. There are two lights on the battery charging base:
   a. The fault indicator light
   b. The charging indicator light
2. If the fault indicator light is on, stop charging immediately, unplug the charger, and contact Teledyne GMI 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 charging indicator light will blink.

6.3. Inserting the Battery

Step 1	Step 2	Step 3
Align the battery with the battery compartment.	Push the battery in gently.	The installation is completed when you hear a click sound. Note: wait 10s before turning on the instrument.

NOTE: Keep surrounding environments safe.

6.4. Removing the Battery

Step 1	Step 2	Step 3
Press the battery compartment button.	Gently pull out the battery...	...until the battery is fully unplugged.

NOTE: Keep surrounding environments safe.
Always store the instrument with the battery removed.

7. Self-test, Red Dot Sight and Bluetooth

7.1. Initialization / Self-test

The GAS LASER automatically performs a Self-test when powered on. The initialization Self-test is performing a series of internal diagnostics to verify the integrity and performance of the sensor and components. The instrument will continue to the subsequent user screens upon a successful result of the diagnostics analysis. If any errors are found during the Self-Check, an error screen will occur. In this case, contact your local GAS LASER service center for assistance.

7.2. 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 instrument. It automatically lights up after powering on the instrument.

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

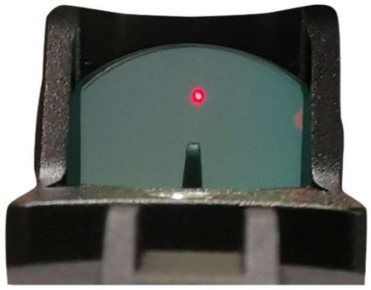
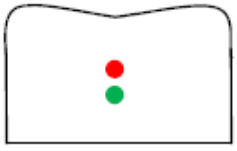
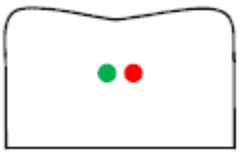


Figure 7-1: Red dot sight diagram

If the red dot and the green indicator laser do not overlap when aiming for a long distance (>15m), 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 dote is to the left of the green indication laser, turn the knob clockwise to shift it to the right.	

7.3. Bluetooth Connection

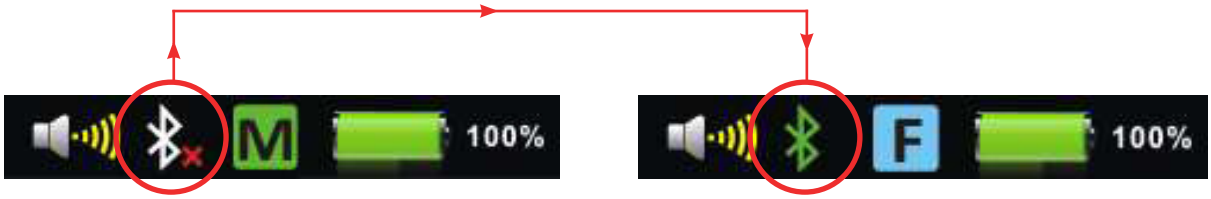
7.3.1. Functions

The GAS LASER instrument uses Bluetooth for communication tool. The Bluetooth communication enables real-time transfer data to a dedicated App (optional) running on iOS, Android or Microsoft Windows mobile devices.

NOTE: Contact Teledyne GMI to obtain the App.

7.3.2. How to connect using Bluetooth

1. Turn on Bluetooth on the mobile device and follow instructions given by the App.
2. The Bluetooth icon on the top of the instrument screen will turn green to indicate successful connection.
3. Use the dedicated App to read, record and export data.



NOTE: To enable Bluetooth connection, always press the Test button (in that case the green indication laser is visible).

8. Operating the Instrument

8.1. Start to use

	**Step 1 – Insert the battery** Take the instrument out of the carrying case. Insert the battery in its compartment.
	**Step 2 – Remove the lens cap** Remove the cap that protects the lens.
	**Step 3 – Turn ON the instrument** Once the installation of the battery is completed, wait AT LEAST 10s to turn ON the instrument. Hold the Power button until the instrument turns ON.
	**Step 4 – Prepare for measuring** Press shortly the Test Button to start measuring. Do not hold the button. Point the aim indicator towards the object that needs to be measured. To modify the reading frequency, go to "Measuring speed" submenu.
	**Step 5 – Connect to App (optional)** Start the App and follow provided instructions to connect to App.

8.2. After use

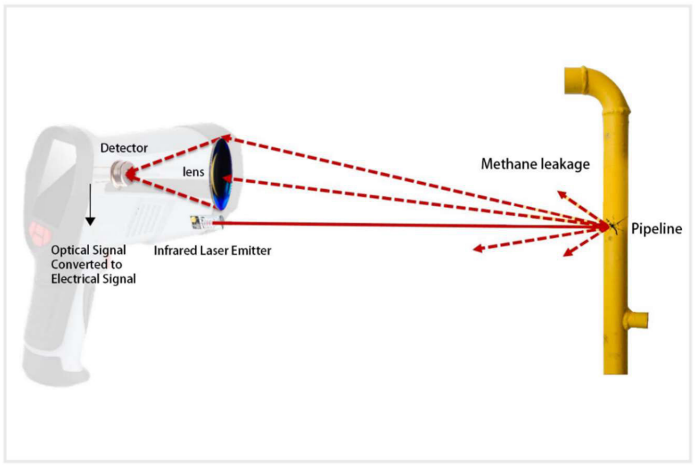
	**Step 1 – Stop measuring** Press the test button to stop measuring.
	**Step 2 – Turn OFF the instrument** Hold the Power Button until the instrument turns OFF.
	**Step 3 – Remove the battery** Press the Battery Compartment Button. Remove the battery.
	**Step 4 – Lens cover** Cover the lens with the protective cap.
	Step 5 – Store the instrument Put battery and instrument with lens cap back into the case. Always store the instrument with battery removed.

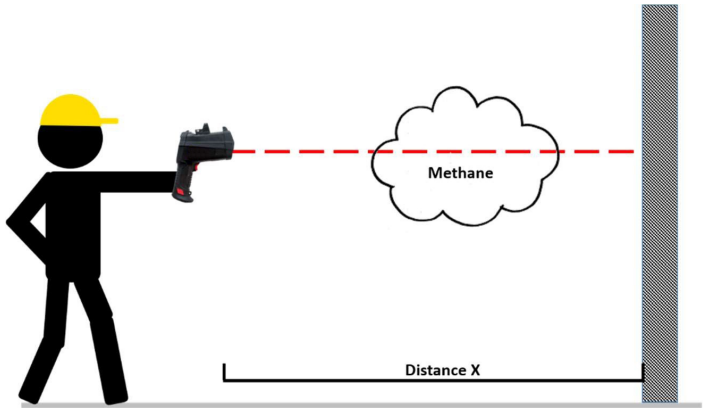
9. Technical Principles - Do's and Don'ts

9.1. Working principle

For the GAS LASER to detect a leak, the laser beam has to pass through a gas plume and reflect off a surface.

The reflected light is collected by the GAS LASER and converted into a methane concentration.





- The GAS LASER 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.

9.2. PPM*M measurement unit

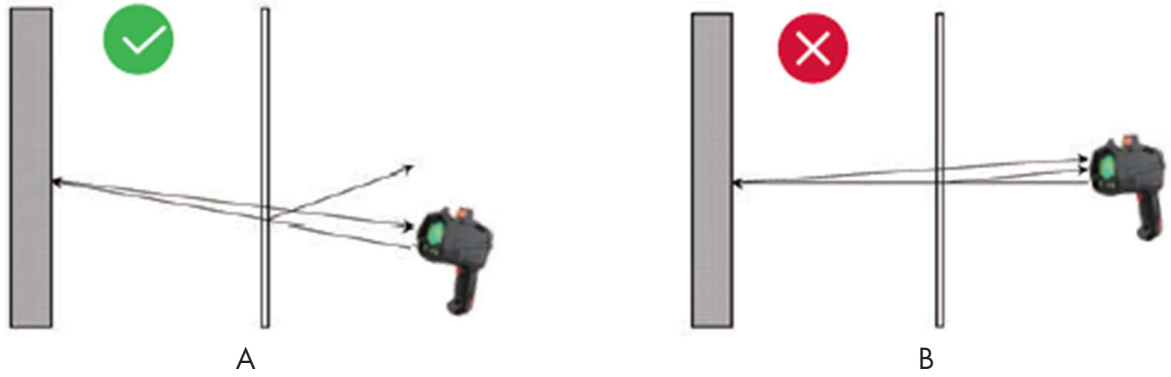
ppm*m is the Parts Per Million concentration that a gas plume 1 meter in depth would have.

- Therefore a 1-meter plume of methane at a concentration of 5000 ppm would be read as 5000 ppm*m.
- While a gas plume that was 0.5 meter in depth with the same concentration of 5000 ppm would be read as 2500 ppm*m.
- In the case of a 2-meter plume of methane at the same concentration of 5000 ppm, the reading will be 10000 ppm*m.

9.3. Detection Do's and Don'ts

9.3.1. Case 1 – Detection through glass

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 instrument, which will cause the light intensity saturation or inaccurate measurement result. In such case, the GAS LASER needs to be pointed as shown in figure below to avoid receiving the light reflected by the glass.



Case1: Detecting through glass

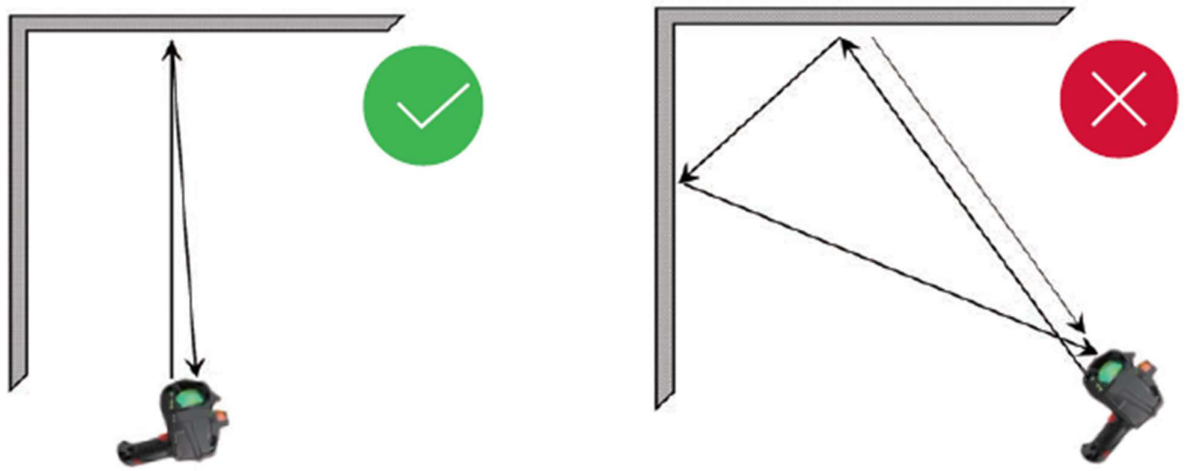
9.3.2. Case 2 – Detection through materials with strong absorption or reflection effect on the infrared laser

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

Case 2: Avoid detecting through anti-infrared or absorbing infrared material

9.3.3. Case 3 – Detection towards a corner or similar situation

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



A B

Case 3: Do's and Don' ts when detecting towards a corner

10. Maintenance

10.1. Error messages

10.1.1. Error codes

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°C to +80°C (-4°F to +176°F).
0x08/0x09	Laser shell temperature exceeds the range of -20°C to +60°C (-4°F to +140°F).
0x10/0x11	Unable to detect the absorption signal in the reference channel.

10.1.2. Proper handling method

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

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

10.2. Troubleshooting

Problems	Solutions
1. The instrument cannot be turned on.	Remove and reinsert the battery, wait at least 10 seconds, then press the Power button. If the instrument still cannot turn on within 30s, check with a second battery.
2. The instrument's alarm is always on or never on.	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.	Check the volume of the instrument. Make sure that the alarm is on and the volume is set properly
4. The screen is too dark.	Check whether the screen brightness value is set too low.
5. The battery cannot be recharged.	Check whether all the components are connected properly. Check whether the charging base has power. Check whether the battery is plugged into the charging base.
6. The fault indicator light of the battery charger is on.	Remove the battery and replace with a new one.
7. The instrument is in good condition but there is no reading.	Check whether the light intensity is too strong or too low. A minimum of 4 bars (on the 1 to 11 bar scale) is required. When light intensity is too strong, avoid complete perpendicular between the detecting laser beam and the object reflective surface.

Please contact Teledyne GMI Service Center or your local representative if the above solutions do not solve your problem.

11. Warranty

During the warranty period, Teledyne GMI will provide free maintenance when the instrument does not operate as expected. Teledyne GMI will not provide this service if the problem is due to the fact that the equipment has not been used, handled or stored in accordance with the recommendations in this manual. Situations that invalidate the warranty include:

- Missing purchase documents
- Did not use the instrument as per instructed
- Unauthorized modification, disassembly, or repair
- Intentional damages to the instrument
- Stolen, lost or discarded instrument
- Damaged instrument due to use with unauthorized accessories and services
- Those damages caused by natural disasters, such as fire, lightning, flood, earthquake, etc.

12. Technical Support

This product is designed to provide you with reliable, trouble-free service. Contact your regional technical support if you have technical questions, need support, or if you need to return a product. Details can be found at:

www.teledynegasandflamedetection.com

Note: When returning a product, contact Technical Support to obtain a Return Material Authorization (RMA) number prior to shipping.

13. Technical Specifications

Target gas:	Methane (CH_4) and methane containing gases
Working principle:	Tunable Diode Laser Absorption Spectroscopy (TDLAS)
Measurement method:	Laser reflection
Sensitivity:	5 (Actual) ppm*m
Detection range CH_4:	0-99,999ppm*m
Measurement accuracy:	±10% (100-50,000ppm*m)
3 measuring speeds:	Fast (F) = 0.1s; Medium (M) = 0.4s; Slow (S) = 1.6s
Measuring unit:	ppm*m %vol*m %LEL*m
Detection distance:	Over 100m (328ft) if the light intensity indicator is equal or superior to 7 bars
Data transmission:	Bluetooth® communication, dedicated App for mobile devices
Display:	2.8-inch color LCD
Weight:	0.76kg (1.68 lbs.) with battery
Dimensions:	160mm x 240mm x 80mm (6.3''x9.4''x3.1'') (with battery)
Operating temperature:	-20°C to +45°C (-4°F to +113°F)
Operating humidity:	<80% HR, non-condensing
Storage temperature:	-20°C to +60°C (-4°F to +140°F)
Ingress Protection:	IP54
Explosion-proof classification and certification:	Ex ib op is IIA T3 Gb Ⓔx II 2 G Ex ib op is IIA T3 Gb IECEx and ATEX
Laser classes:	Infrared Laser emitter: 1651nm, <10mW, Class 1 eye safety Green indication laser: 520nm, <5mW, Class 3R
Battery:	Rechargeable Lithium battery, 7.2V
Battery operating life:	8 hours at 25°C (77°F) - Continuous
Charging time:	≈ 5 hours
Threshold alarm:	Can be set by user, buzz with LCD turning red
Self-test:	Built-in self-test while turning on the instrument, <10s (typical value)

Appendix A - 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 instrument could void the user's authority to operate the equipment.

TELEDYNE
GAS MEASUREMENT INSTRUMENTS
Everywhereyoulook™

AMERICAS
14880 Skinner Road
Cypress,
TX 77249, USA
Tel: +1-713-559-9200

EMEA
Inchinnan Business Park
Renfrew, PA4, 9RG
Scotland, UK
Tel.: +44 (0) 141 812 3211

ASIA PACIFIC
290 Guigiao Road
Pudang, Shanghai 201206
People's Republic of China
Tel.: +86-21-3127-6373

www.teledynegasandflamedetection.com

106220 Revision 1