RESPO
Responsive Detection

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HRLD 300 600 LASER METHANE GAS DETECTOR

OPERATING MANUAL

BASIC VERSION 2.0

1. Using the Manual

Thank you for choosing the products from Respo. To use this instrument safely and effectively, please read the following instructions before using the device and operate according to the provided relevant operating steps so that you can fully enjoy the services provided by Respo while avoiding the misuse of your machine and damage to the machine or other accidents. Respo will not be responsible for the consequence if the user does not install, operate, repair or replace components in accordance with this manual.

Please keep this manual to check timely and get help in the future.

To use this instrument safely and effectively, please read the following instructions before using the device.

2. Symbol Definition

Before starting to use it, please be familiar with the symbols that may appear in this manual:

Warning: A cautionary statement indicates any danger or insecure hidden trouble that may result in a major accident or personal injury.

Notice: The notice states that any danger of personal injury or products, property loss and insecure hidden trouble should be noted.

Remark: Notes, user hints or additional information

3. User Service Guide

1. Before using this product, please check the accessories according to the product list. If any is missing, please contact the distributor or manufacturer immediately.
2. Within twelve months from the date of sale, if the user abides by the storage, transportation, and use requirements, while the product quality is lower than the technical indicators, the user can enjoy free maintenance within the warranty.
3. The damage caused by the violation of operating regulations and the fault caused by poor maintenance or not operated by our designated special technical service department or caused by quality problems due to force majeure, fall or physical damage, our company will charge for maintenance.

4. Safety

1. Users of this device need to read this manual before installation, operation and maintenance and pay more attention to the warning and notices.
2. When you open the box, please check if the equipment shell has cracks or missing parts. If the equipment is damaged or missing parts, please do not use it and contact Respo immediately.
3. Before any operation, the user must abide by local regulations and on-field operation procedures.
4. Please check the battery before using the instrument and ensure the correct connection.
5. This instrument uses a visible Spotter beam as a class 3R laser product, which is prohibited from directly staring at the laser beam or watching it with an optical instrument.
6. Do not charge, tear down or replace batteries in hazardousareas.
7. Do not aim the instrument at the sun directly to avoid damage.
8. Do not expose the detector to the environment of electric shock, strong electromagnetic field or continuous severe vibrations.
9. Please charge the battery with the customised charger from Respo.
10. Do not charge in dangerous environments; please charge indoors in a safe and dry environment.
11. If the detector is left unused for the long term, please take out the battery, and recharge the battery to full capacity for long-term storage; please pay attention to not let the battery short-circuit.
12. Lithium-ion battery contained. Do not put the battery together with other household garbage. Qualified recyclers or processors of dangerous goods should handle discarded batteries.
13. Protect the detector from falling from a height or suffering severe vibration.
14. Installation of the detector must abide by local electrical installation requirements; otherwise, it may lead to severepersonal injury.
15. Please use a dust blower to blow away the dust on the optical lens, then

use medical gauze or equivalent non-abrasive lens tissue with a small amount of alcohol. You can use lens wipes used for optical cleaning. Do not use isopropyl alcohol or any other cleaning agent like Colin to clean the optical surface.

16. Forbidden to repair, adjust, repair or change components without permission.
17. Only a qualified HRLD 330/600 repair technician should attempt to repair or adjust the detector. Please carefully read and fully understand the operational manual before the operation or maintenance of the detector.
18. No attempt should be made to repair the detector. Should the detector not work properly, or indicate a fault or warning, refer to the troubleshooting section of this manual.

5. Overview

HRLD600 Handheld laser remote Methane detector is an advanced gas inspection device developed by Respo. It adopts the world's most advanced laser gas detection technology to realise non-contact and remote detection for the places the inspector can not reach.

The leakage point and source can be located and found accurately and quickly.

This device will improve work efficiency and reduce labour intensity.

6. Technical Features

i. Remotely measure gas leakage without contact.
ii. The detection distance can be a maximum of 50 meters for HRLD 300 and 120 meters for HRLD 600.
iii. Small size and lightweight design, easy to carry.
iv. Good selectivity, the response only to methane
v. One-button simple operation
vi. Sensitivity of 5 ppm * m
vii. Fast Response, no alarm delay
viii. Colour LCD with adjustable brightness
ix. Selective display units among ppm * M, LEL * M and VOL * M
x. The air background can be eliminated, and the data is more accurate once during self-calibration or manual calibration. This is done automatically when the unit is turned on or can be initiated manually.
xi. Ergonomically designed for easy carrying and handling.
xii. It can continuously monitor objects that light can penetrate for a long time, such as ordinary glass.
xiii. Aiming beam with a green laser to improve long-distance visibility.
xiv. Audio and Visual Alarms simultaneously.

xv. The alarm set point can be set in the range of 0~9999 ppm * M
xvi. Self-Test and calibration function during startup countdown.
xvii. Low battery voltage warning
xviii. Low consumption and can be used for continuous testing for 8 hours.
xix. Intrinsically Safe design.

HRLD 300/600 adopts Tunable Diode Laser Absorption Spectroscopic (TDLAS) technology, which has high sensitivity, quick response and good selectivity. It only responds to Methane only while not to other hydrocarbon gas that may result in false alarms.
A lithium battery with low consumption and long life of 8 working hours on a single charge powers it. The charging time of a fully depleted battery is 3.5 hours.
The software operation menu is intuitive and friendly, with visual and audible alarms. It can be applied to the municipal gas pipeline, oil refineries, chemical plants in the petroleum and petrochemical industry, metallurgical industry, power industry or any place that is possible to have gas leakage.

A lithium battery powers HRLD 300/600, and it can work for 8 hours normally.

Warning:

- Aiming light is a 3R laser product. Do not stare into the beam orview directly with optical instruments.
- Do not aim the spotter beam to the sun to avoid damage.
- Please charge the battery with the customised charger from Respo.

7. Specifications

Gas	CH_4
Principle	TDLAS
Sensitivity	5 ppm * M
Detection Range	0 ~ 10,00,00 ppm
Distance	50 meters for HRLD 300 120 meters for HRLD 600

Response Time	T90 < 0.05 seconds
Working Temperature	-30°C ~ 50°C
Storage Temperature	-30°C ~ 60°C
Humidity	0 ~ 99% RH (non condensing)
Explosion Proof Grade	Intrinsically Safe (I MI G Ex ia I Ma T4)
Ingress Protection	IP 66
Weight	~ 600 grams
Voltage	3.7 V DC
Working Time	8 hours continuously
Display	Colour LCD
Lifespan	10 years or more
Alarming Method	Audio and Visual Alarms
Penetration	Glass objects
Data Transmission	Bluetooth
Accessory	Battery Charger, Carrying Case, Storage Case

Remark: The sensitivity to gas concentration relies on the distance from the instrument to the target and the reflection factor of the target reflector.

8. Product Introduction

HRLD 300/600 adopts the optical path design of transmitter-receiver integration, which is easy to use. The detector emits two lasers of detecting light and aiming light. Detecting light is invisible while aiming light is visible. After double-clicking the detection button, the detector starts to detect, and the aiming lights start to light up. After double-clicking the detecting button again, the detector stops detection, and the aiming light is turned off. When in standby mode, the detector will automatically enter the

sleep state if it is not operated for a long time. When the operator clicks any button, the detector will start by itself. Double-clicking the detection button to continue the detection.

When using the device, do not look directly into the green spotter beam or shoot into the eyes of others; else will cause a distraction to others.

During the detection status, it will display the concentration of Methane on the LCD screen. It there is a Methane leak, it will give an alarm if the concentration exceeds the alarming threshold.

If the operation is improper, e.g., the scanning distance is too long or the reflection ratio of the background reflector is too low, the instrument will give an alarm alerting the reflection fault. Please move to the proper distance or angle to operate detection.

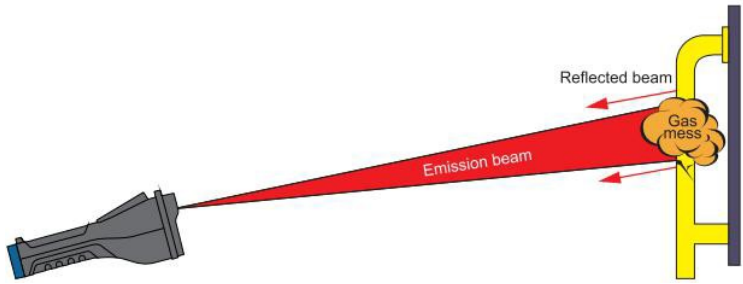
HRLD 300/600 has superior environment durability, and the reasonable dust on leans will not influence the sensitivity and detection range.

9. Principle Introduction

- Detection Principle

HRLD 300/600 adopts advanced tunable diode laser absorption spectroscopy (TDLAS) technology combined with DSP digital signal processing technique. TDLAS is a technique for trace gas detection using wavelength scanning and current tuning characteristics of semiconductor laser diodes and selecting the specific methane absorption line to realise zero cross interference. Adopted DSP digital signal processing technique allows digital circuit for signal generation, analysis and processing. It will improve the anti-interference ability, stability and repeatability of the system.

When the laser from HRLD 300/600 hits the target gas pipeline,part of the laser beam will be absorbed if there has a gas leak. After passing through the gas mass, the laser beam will return after being scattered by the reflecting surface or the wall behind the gas.
The returned scattered light will be collected by an optical lens and received by high sensitive TDLAS detector. After signal processing, we will get the gas concentration between the detector and the background reflector.



- ## Glossary & Definition

Detecting Beam: The laser beam is sent by a handheld remote laser methane detector for detecting the gas leak.
Spotter Beam: The visible laser beam sent by a handheld remote laser methane detector to help the operator to aim at the target.
Scanning Distance: The longest working distance of a handheld remote laser methane detector.
Reflection Light Fault: The fault is caused by the situation that theremote detector can not get enough returned light because of the reflective rate of the background reflector, scanning distance and ambient environment etc.
TDLAS technology: An advanced technique for gas detection adopts laser wavelength scanning and current tuning characteristics.
Integral Concentration: The traditional measurement of a gas detector is the average indoor/outdoor gas concentration; the unit is ppm or %LEL. HRLD 300/600 measures the integral gas concentration along the "effective path of light transmission" between the detector and the target reflector. Normally, the effect of a higher concentration of gas plume in a small range and a lower concentration of gas cloud in a larger range is the same. The unit of handheld remote laser methane detector is different from traditional methane gas detector. The unit is the gas average concentration of PPM * m or ppm.m.

The following is described in the 5 m 100ppm gas plume, a gas plume of 2 m 250PPM appears in the path between the HRLD 300/600, and the working beam of the background reflector is equal to that of
100 ppm * 5m = 500 ppm
250 ppm * 2m = 500 ppm
500 ppm + 500 ppm = 1000 ppm

10. Operational Instruction

10.1.1.System Makeup

HRLD600 handheld laser remote Methane detector consists of the detector, battery, charger, wrist band and carrying case.

10.1.2.Battery Pack

The battery pack is a rechargeable Lithium-ion battery that works continuously for 8 hours. Battery status is shown on the screen. The detector will remind to charge the battery when the battery is low.

Remark:

- Better to fully charge the battery pack for the next day's operation after one day.
- Please use the supplied charger to charge the battery pack.

Warning:

- Forbidden to charge, disassemble or replace the battery in a potentially explosive atmosphere!
- Forbidden to squeeze, pierce, or burn the battery and forbidden external contact to short-cut the battery.
- Replacement of battery pack should be carried out by professional personnel.

10.1.2.Charger

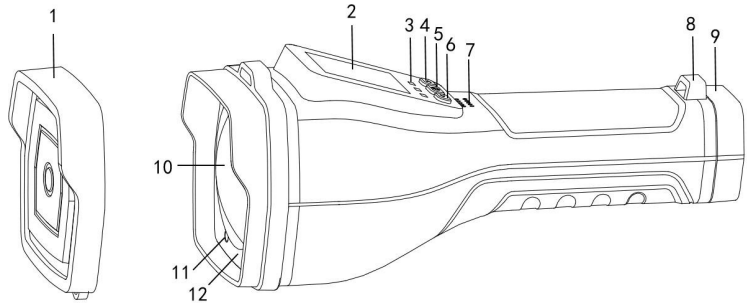
Charge the battery pack for the first time use of the detector. When charging starts, the screen battery symbol and the red indicator light will flash to indicate the charging progress. If the charging fails or is not charged, the screen and indicator light will not come on. During the charging process, there will be no operation for 20 seconds, and the

system will enter the sleep state. The screen will be off. Holding the button "<" or ">" for 3 seconds, the system will be awakened, and the current charging power can be checked on the screen. When the screen power symbol is full, and the green indicator lights up, the battery is full. You can unplug the charger. The charger is only applicable to this instrument.

Remark:

- If the magnetic absorption charger cannot charge the detector normally, please unplug the charger and re-start it.If it still cannot be solved, please contact the manufacturerto deal with it.

10.2.Operation Instruction



No.	Function	No.	Function
1	Protective Cover	7	Buzzer
2	LCD screen	8	Wrist band
3	Indication LED	9	Battery pack
4	“>” button	10	Optical lens
5	Power and detection buttons	11	Detecting beam
6	“<” button	12	Spotter beam

10.2.1.Power On/Off

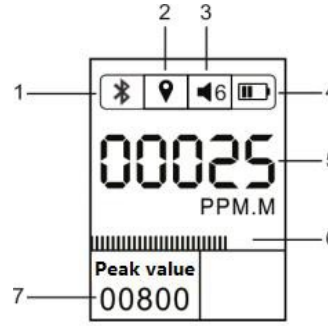
Keep holding the power button until you feel the vibration, then release the power button. The detector powers on and enters the standby state. Double-clicking the power button and the detector enters the detection state for measurement. When power-off is required, first double-click the power button to enter the standby state, and then keep holding the power button for 3 seconds. After the shutdown progress bar is finished, release the power button and the detector is poer off.

10.2.2.Normal display interface

Below drawing is the normal status display:

Blue-tooth icon

1. Reserved function
2. The volume level
3. Battery Indication
4. Gas Concentration
5. Laser Reflection Rate
6. Peak value of historical records

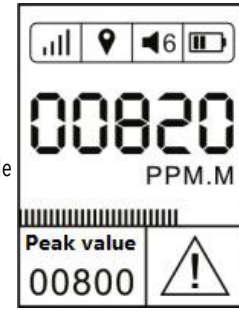


10.2.3.Gas alarm interface

When the gas concentration exceeds the alarm threshold, the detector will give audible and visual alarm. The display will show real-time gas concentration as illustration of following diagram. In this interface, if power button is pressed, the historical alarm records will be deleted.

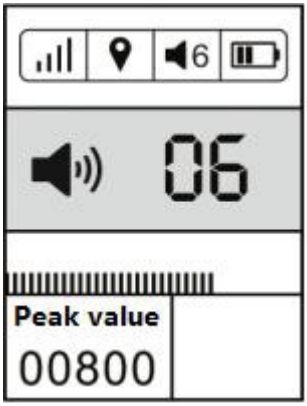
10.2.4.Fault alert interface

The detector will fault alert if the laser refection ratio is lowerthan the pre-set value. The display will show the menu as illustration of following diagram, reminding you to change angle or measuring distance to detect again.



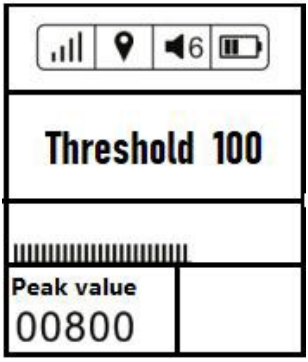
10.2.5.The volume setting interface

In the standby status, click ">" button to pop up the volume settingsub-menu. Then click "<" button or ">" button to reduce or increase the volume. The setting interface is shown in below diagram:



10.2.6.Alarm threshold setting menu

In the detecting state, press ">" button to pop up the alarm threshold setting sub-menu. Then click "<" button or ">" buttonto reduce or increase the threshold value. The initial value is "100".The setting interface is shown in the below diagram:



10.2.7.Concentration unit switch

In the standby state, keep holding the "<" button and the concentration unit can be changed to ppm.m, %LEL.m, %VOL.m.The initial unit is ppm.m.

10.2.8.Curve display interface

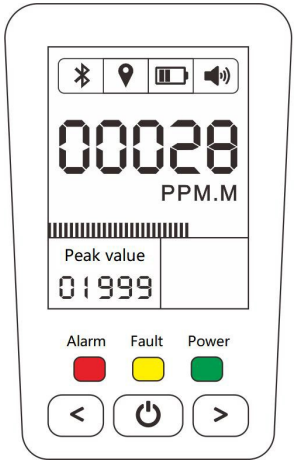
In the detection state, press the detection button, the detector will enter into the curve display interface. Then keep holding the power button, the detector will return to the figure display interface. Under the curve interface (unit is ppm.), click "<" or ">" to change the concentration unit. The concentration unit after entering the curve display interface corresponds to the concentration unit of the digital display interface before switching. The default display interface is digital display interface.

10.2.9.Spotter beam setting

In the detecting state, the working mode of the spotter beam can be set as lighting mode or flashing mode by pressing the ">" button. The spotter beam is working only in the detecting state.

10.2.10.Alarm LED indication

The green power LED will flash after the detector is turned on, it means the detector is powered on. When the detector detects gas concentration and gives alarms, the red alarm LED will be on. When there is a laser reflection ratio fault, the yellow fault alarm LED will be on.



10.3.Charging

Charging should be in the safe and dry environment. Charging procedure is as below:

- Turn off telemetry.
- Aim the charger's magnetic suction plug at the tail of the machine and two electric shocks will automatically tighten the charging. The detector screen lights up and the battery icon flashes, while the red indicator flashes.
- Until the display screen indicates that the battery is full and the green indicator light is always on, it means that thebattery pack is full. Unplug the charger outlet.

Remark:

- When charging, if no operation within 20 seconds, the detector will enter the sleep state and the screen will be off. Keep holding the "<" button or ">" button for 3 seconds, the detector will be awakened. The charging process can be checked on the screen.
- When the charging starts, if the screen doesn't turn on or the red indicator does not flash, it means poor battery contact or charger failure.
- When the charger restarts and the above charging problem still cannot be solved, please contact the manufacturer or the seller for solution.

Warning:

- Charging in dry and safe environment.
- Ambient temperature not exceeding 50°C.
- Plug out the charger plug from power socket when chargingis not operated.
- Make sure to use special charger made by Respo to avoidpotential danger.

10.4.Wavelength calibration

In order to keep the detector working with higher sensitivity, one gas chamber is set in

the detector to calibrate the laser wavelength. Below is the calibration process:

- Take detector out from carrying case.
- In standby mode, press both the "<" and ">" buttons at the same time and release them at the same time to enter the calibration state.
- You will see the number increases from 0 to 500 and decreases from 500 to 0 within 2 minutes.
- Enter the standby interface, please press the power button to power off the detector.
- After rebooting, normal detection can begin.

If the sensitivity is reduced, the wavelength of the laser can be calibrated through this calibration process. To ensure maximum measurement sensitivity, we recommend that the operator perform calibration every three months.

Remark:

- Laser wavelength drift is a normal characteristic of the detector. Normally, the drift rate ill not affect the sensitivity if the periodical calibration is done.
- Please restart the detector after the wavelength calibration is completed.
- Before calibration, please ensure the battery voltage is enough.

10.6. HRLD300/600 can detect leaks from up to 150 meters. Actual distance may vary due to target surface and environmental conditions. As the scanning distance is increased, the laser light level returned will decrease. As the maximum distance is approached, low laser reflection ratio sound is heard, you will need to move in closer or change the scanning angle to detect again.

Remark:

- Use HRLD300/600 according to experience, make a better control of aiming at

target position to ensure the laser beam pass through the target area.

- Windy or high temperature weather will lead to rapid diffusion of gas plume and decrease of gas concentration. Please make scanning against the wind.
- CH4's density is lighter than air, the leaked CH4 will diffuseupward, make scanning on the position over the place where the gas leak easily happens.
- Detecting beam is cone-shape beam, the spot/beam width size will become bigger with the increase of scan distance. The spot/beam width size is around 50 cm at 30 meters distance.
- Obstruction or variations in the landscape can cause dark zones where the laser doesn't scan, you will need to find andchange to a better angle to scan again.
- Strong reflection off certain types of surfaces (e.g., stainless steel bar, glass, polished surfaces, reflectors, etc.) may givea false detection. Re-scan the area from a slightly different angle.

11. Maintenance

In order to maintain the HRLD600 in good working condition, the following maintenance should be performed as indicated:

11.1.Put detector back into carrying case, and recharge the battery to full capacity after each use to ensure battery life.

11.2. If needed, clean outer surfaces with clean rag.

11.3.No need to clean the optical lens frequently. If needed, pleaseuse dust blower blow away the dust on optical lens, then use medical gauze or equivalent none abrasive lens tissue with small amount of alcohol. When clean the optical lens, please clean inthe gentle way to avoid scratches on the optical lens.

11.4.As needed to change accessories (e.g., battery pack) due to damage, it is better to contact local distributor for assistance or directly contact Respo for assistance.

12. Troubleshooting

Problem	Likely Cause	Solutions
Not power on	Incorrect battery installation	Check battery installation and re-install
	Low voltage of battery	Check and recharge

Reflection ratio fault	Scanning at a distancebeyond the range	Move closer to the target
	Background surface is absorbing or reflection the light	Change angle to thetarget to get a better reflecting background
	Dust on optical lens	Clean the optical lens
System fault	Laser wave lengthdrift	Reboot detector
		Perform wavelength
		Contact Respo
	Low voltage of battery	Check and recharge, or change battery
Keeping gas leak alarming warning	Low alarm level	Check alarm level and
	Scanning too fast	Slow down the scanning
	Background refection too high	Change angle to the target to get a better
No alarmwhen gas leaks	Laser wave lengthdrifts	Reboot detector
		Perform wavelength calibration
		Contact Respo
	Laser beam doesn’t pass through gas	Change to better positionor angle,
Charging Indicator Light	Bad contact of battery	Plug out and plug in
		Reboot charger
	Charger fault	Contact Respo

13. Using notes

- The visible green Spotter beam is a Class 3R laser product. Do not stare into beam or view directly with optical instruments.
- Battery is forbidden to be recharged, uninstalled and replaced in flammable or explosive atmosphere.
- Do not aim the detector to sun to avoid damage to detector!
- Do not expose detector to environment of electric shock, strong electromagnetic field or continuous severe vibrations.
- Must use customized charger provided by Respo to charge the battery.
- Do not charge in dangerous environment, please charge indoors in the safe and dry environment.
- If detector is left unused for long term, please take out battery, and recharge the battery to full capacity for long term storage, please pay attention to not let the battery short-circuit.
- Lithium-ion battery contained. Do not put the battery together with other household garbage. Discarded battery should be handled by qualified recyclers or processor of dangerous goods.
- Protect the detector from falling from a height or suffering severe vibration.
- Installation of the detector must abide by local requirements of electrical installation, otherwise may lead to severe personal injury.
- Please use dust blower blow away the dust on optical lens, then use medical gauze or equivalent none abrasive lens tissue with small amount of alcohol.
- Forbidden to repair, adjust, repair or change components without permission.
- Only a qualified HRLD600 repair technician should attempt to repair or adjust the detector. Please carefully read andfully understand the operational manual before using or repair the detector.
- No attempt should be made to repair the detector. Should the detector not work properly, or indicate a fault or warning, refer to the trouble shooting section of this manual.

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