

LCT-18

INSTRUCTION MANUAL



NOTICE

The functionality of the instrument may be impaired if the system is used in a manner not specified in this manual.

NOTICE

The present manual is an accessory part of the LCT-18. Please retain these instructions for future reference.

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GENERAL NOTICES

QBIT s.r.l. is responsible of safety, reliability and performance only if:

- . the system is used according to the instructions reported in this manual – regarding both safety precautions and use;
- . any change, adjustment and maintenance operation is performed by qualified personnel duly authorized by QBIT s.r.l. ;
- . the instrument is connected to an electrical system which is consistent with both IEC and local directions;

**The system LCT-18 is a refrigerant gas and SF6 leak detector
for industrial use**

FOREWARD

The following instructions must be carefully read and observed in order to properly install the system and avoid any damage risk.

1. UNPACKING AND INITIAL CHECKS

When you receive the instrument, please unpack it promptly and make a visual inspection to make sure that no damage has occurred during shipment and that all the ordered items have been received. If damage was found, immediately file a claim with the carrier.

N.B.: by law, any good is shipped at buyer's risk and, if not clearly stated, without insurance.

QBIT is not responsible of any damage following dispatch, freight, unloading and unpacking.

2. OPERATION ENVIRONMENT

The operation environment must be consistent with local directives regarding the electrical system and human working area.

3. LIABILITY

QBIT warrants, as final seller, that the system is consistent with CE Council Directives N° 2004/108/EC (Electromagnetic Compatibility) and N° 2006/95/EC (Electrical safety of low voltage equipment).

The responsibility of use, safety in the working area and any other action rests entirely with the employer, following local laws and European Directive N° 89/391/CEE.

The only manufacturer responsibility is that stated by local laws and European Directives.

The manufacturer is not responsible for any impairment due to installation, use and maintenance not consistent with the instructions reported in the present manual.

The manufacturer is not responsible for the lack of any care and safety precaution necessary to avoid every damage or prejudice.

4. WARRANTY

QBIT s.r.l. warrants that, at the time of delivery, this product is free from defects or malfunctions, and it conforms substantially to the specifications reported in the present manual. QBIT's liability is limited to

the repair or replacement, at QBIT's option, of this product or parts thereof returned to seller and shown to QBIT's reasonable satisfaction to have been defective; provided that written notice of the defect shall have been given by Buyer to QBIT within one (1) year after the date of delivery of this product by QBIT.

The warranty does not apply to parts the instruction manual designates as having a limited shelf-life or as being expended in normal use (e.g. filters).

Excepting those parts subject to maintenance, disassembly, change or modification to the instrument will void the warranty. Any control, adjustment or procedure different from those reported in the present manual will also void the warranty.

CHAPTER I

SAFETY

Safety is essential in the use and maintenance of the equipment. Therefore the present chapter provides important safety information concerning the operation and maintenance of the LCT-18 system.

I.1. GENERAL SAFETY

The system LCT-18 is consistent with the following directives:

- **CE Council Directive 2006/95/EC** (Electrical safety of low voltage equipment);
- **CE Council Directive 2004/108/EC** (Electromagnetic Compatibility).

I.2. SAFETY PRECAUTIONS

Even if the system has been produced in agreement with safety directives, a proper and careful use is very important for safe operation.

IN ORDER TO CORRECTLY OPERATE THE SYSTEM, IT IS STRICTLY REQUESTED TO FOLLOW THE SPECIFICATIONS REPORTED IN THE NEXT PARAGRAPHS.

I.2. 1. Instrument safe location:

Locate the equipment on a flat surface, far from heat sources or strong air flows. For the best operation, the instrument should preferably work in standard clean air, with no refrigerant gas pollution.

I.2.2. AC power and grounding:

The instrument is equipped with a power supply accepting 220 VAC, 50/60 Hz standard line input. **UNDER NO CIRCUMSTANCES SHOULD THIS INSTRUMENT BE OPERATED WITHOUT CONNECTION TO A PROTECTIVE GROUND. DOING SO CREATES A POTENTIAL SHOCK HAZARD AND IS ALSO A VIOLATION OF ELECTRICAL SAFETY STANDARDS APPLICABLE TO THIS TYPE OF EQUIPMENT.**

I.2. 3. Proper use:

Do not operate this instrument in the presence of flammable liquids, vapors or aerosols. Both when the equipment is working and when it is not in use, avoid to lean the handpiece and the cord on the floor, or anywhere they risk to be bent, crushed and thus damaged.

During system operation avoid to obstruct the sniffer tip and the sample gas exhaust on the rear panel.

CAREFULLY PREVENT ANY LIQUID TO BE SUCKED UP IN THE SNIFFER;THE INSTRUMENT MAY BE SERIOUSLY DAMAGED.

I.2.4. In case of malfunction:

Do not continue to use this equipment if there are any symptoms of malfunction or failure. In the case of such occurrence, unplug the AC power cord, refer to Chapter VI of the present manual and contact technical service.

I.2. 5. Cleaning:

Use a dry cloth to clean the outside of the case. Do not use soap and water. Do not use blast of compressed air.

When the system is not in use, it is suggested to protect the sniffer tip with its plastic cap and set the equipment in a dry, dust free place.

CHAPTER II

SPECIFICATIONS

II.1. MEASUREMENT SPECIFICATIONS:

The measurement specifications are reported in Table II.1.

Table II.1

Detectable gases	Measuring head LS-3.	CO ₂
	Measuring head LS-4.	R134a, R404A, R407C, R410A
	Measuring head LS-5.	R134a, R404A, R407C, R410A, R22
	Measuring head LS-6.	600a, R290
	Measuring head LS-7.	SF ₆
Detection method.	Infrared cell	
Units.	g/yr, Atm cc/sec, PPM	
Range.	0.0 a 99.9 g/yr	
Operating modes.	Continuous: leak measurement	
Response time.	< 1 second	
Sensitivity.	0.3 g/yr for R134a	
Resolution.	0.1 g/yr	

II.2. GENERAL SPECIFICATIONS:

The general specifications are reported in Table II.2.

Table II.2

Calibration.	Internal: with factory settings
	External: with external customer supplied calibrated leak
Audio alarm.	At threshold, with frequency proportional to the leak
Flow rate.	110÷130 sccm
Power supply.	LiFePo internal battery, 24 V – 8 Ah (5Ah optional)
Power consumption.	5 Watts
Warm-up time.	10 minutes for initial operation
	30 minutes to meet specifications
Working temperature.	12°C to 40° C
Storage temperature.	-20°C to 80° C
Ambient humidity.	10% to 80% RH, non-condensing
Case dimensions.	310 x 260 x 150 mm (except adjustable handle bar)
Cord length.	1400 mm
Weight.	5 kg

II.3. TECHNICAL TERMS

MAIN UNIT: main case equipped with 24V DC input connector, main switch, cord with handpiece, adjustable handle bar.

POWER SUPPLY/BATTERY CHARGER: external 220 Vac power supply, with two color led and connection for main unit and battery.

CORD: flexible cable connecting the main unit with handpiece.

HANDPIECE: terminal probe, equipped with stainless steel sniffer, connected with the main unit by the cord.

SNIFFER: terminal fitting of the handpiece, consisting of a stainless steel capillary (3 mm external diameter).

TABLET/MOBILE PHONE: external control unit connected to the main unit by USB-micro cable.

CALIBRATED LEAK: certified device reproducing a leak of known gas type and rate (optional).

II.4. DISPOSAL

At the end of lifetime, the system is to be disposed as electronic material, following European Directives 2002/95/EC e 2003/108/EC. The Buyer will contact QBIT s.r.l. to get any instruction about disposal or return of the equipment.

CHAPTER III

FUNCTIONAL OVERVIEW

The system LCT-18 is a refrigerant gas leak detector for industrial applications. It was studied to allow detection and measurement of very small leaks that may occur in any field or device where specified gases (see Table II.1) are employed. The state-of-the-art detection method, based on infra-red light absorption, leads to high sensitivity, short response time, reduced ownership costs and long lifetime.

The instrument consists of an easily portable suit-case (main unit) equipped with tablet (or mobile phone) connected by Blue-Tooth wireless interface to the main unit, a flexible cord (stainless steel with non-conductive sheathing) and a plastic handpiece.

It is possible to store measurement sequences and to download the corresponding files on a PC. An acoustic alarm is also present, that helps in leak detection and location. Moreover, since it is possible to choose different infra-red cells, a large variety of gases can be detected with this unit.

The LCT-18 is powered by an internal LiFePo (rechargeable) battery and thus can be easily operated in those environments where line power is not available.

The LCT-18 leak detector is excellent for any application in mass production of refrigerators and air conditioners, and for installation and maintenance of large industrial plants. In these fields, the LCT-18 leak detector allows production of goods with reduced gas emission, thus contributing to the control of environmental pollution.

The present manual refers to the standard configuration, including a mini-Tablet or mobile phone (powered by the main unit); it specially suits measurements where portability and full autonomy are requested.

III.1. MAIN PANEL

By releasing the lateral blocking locks of the case it is possible to lift the cover and access the main panel (Figure III.1).



Figure III.1. Main panel.

III.1.1. Main switch

The electric power can be switched ON and OFF by means of the black switch located on the main panel (right side).

III.1.2. Identification plate

On top of main panel, the instrument identification plate reports the model and the serial number.

III.1.3. USB plug

The USB plug is used for power supplying the external control unit (tablet or mobile phone) by means of the internal battery. The control unit is interfaced via Blue-Tooth connection and a proprietary software described in the appendix of this manual. All measurement files are saved in the memory of the control unit.

III.2. REAR PANEL

In Figure III.2 the rear panel is shown. In what follows the components are described from left to right hand.



Figure III.2. Rear panel.

III.2.1. Fan

The rear panel fan allows continuous flow of external air in order to assure the correct operation of the leak detector.

III.2.2. Power supply / battery connector

The screw socket is used for connecting the external power supply to the battery.

III.3. TABLET/MOBILE PHONE

The standard instrument configuration adopts, as on-board control unit, a tablet or a mobile phone. This device is supplied with its original package. Store this package on which serial number and product number are reported; it is requested for applying warranty.

III.4. CORD

The cord, 1.4 m long, connects the main case with the handpiece. It shields electrical cables and pneumatic circuitry.

III.5. HANDPIECE

The handpiece (Figure III.3) ends in a stainless steel, 15 cm long, capillary probe (sniffer) with a protective plastic cap. The sniffer is fixed by means of a connector (that can be easily unscrewed) containing a paper filter.

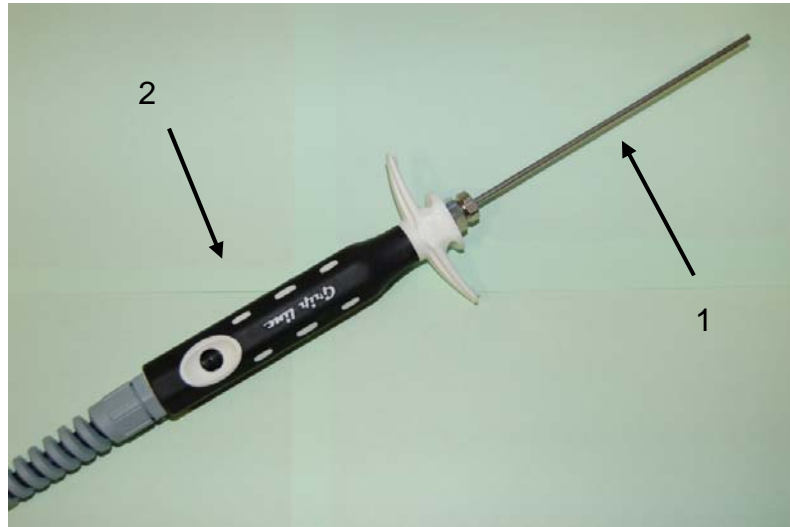


Figure III.3. 1) Capillary sniffer , 2) handpiece.

III.6. ACCESSORIES

III.6.1. Battery charger

Figure III.4 shows the external power supply/battery charger. The power supply is equipped with a warning light which is red when electrical current is supplied and becomes green if no current is delivered.



Figure III.4. Battery charger.

III.6.2. Sniffer filters and velcro strips

Figure III.5 shows the sniffer filters (see Chapter VII – periodic maintenance) and the two self-adhesive velcro strips for fixing the tablet or phone.



Figure III.5: Tip filters for sniffer and self-adhesive Velcro strips.

III.6.3. Manual

The present operating manual is an accessory of LCT-18. Retain these instructions for future reference. Electronic version of any technical document is also available at the URL www.qbit-optronics.com/.

CHAPTER IV

PREPARING FOR OPERATION

NOTICE:

ANY CONTROL, ADJUSTMENT OR PROCEDURE DIFFERENT FROM THOSE REPORTED IN THE PRESENT MANUAL MAY CAUSE ERRORS AND/OR INSTRUMENT IMPAIRMENT.

IV.1. LOCATION

Locate the equipment on a flat surface, far from heat sources or strong air flows. For the best operation, the instrument should preferably work in standard clean air, with no refrigerant gas pollution.

IV.1. 1. Temperature fluctuations

Infra-red absorption measurements are, by their own nature, strongly influenced by environmental temperature. Temperature changes usually induce fluctuations in the measure of background concentration. Although the LCT-18 has been studied and manufactured so that it has the best temperature stability, it is suggested to install the detector in a place with minimum temperature variations.

IV.2. INITIAL OPERATION

Unpack the leak detector and accessories. Connect the AC power cord to the instrument's rear panel and then plug the power cord into a nearby AC line connector. Wait until the light on the battery charger switches from red to green.

UNDER NO CIRCUMSTANCES CAN THIS INSTRUMENT BE OPERATED WITHOUT CONNECTION TO A PROTECTIVE GROUND.

NOTICE

Avoid to lean the handpiece and the cord on the floor, or anywhere they risk to be bent, crushed and thus damaged.

During system operation avoid to obstruct the sniffer tip and the sample gas exhaust on the rear panel.

CAREFULLY PREVENT ANY LIQUID TO BE SUCKED UP IN THE SNIFFER; THE INSTRUMENT MAY BE SERIOUSLY DAMAGED.

CHAPTER V

SYSTEM FUNCTIONALITY

V.1. POWER SUPPLY CONNECTIONS

V.1.1. Connection to external AC line

The link to an external AC line is obtained through the external power supply/battery charger shown in Figure V.1. Connect the male and female black/blue connectors and tighten the safety nut.



Figure V.1. Connection to AC line.

V.2. MOBILE PHONE / TABLET

The standard configuration of the instrument adopts a mobile phone or a tablet as external control unit. This device is delivered with its original package. It is suggested to retain the package where serial and product numbers are reported. Warranty does not apply if these identification numbers are lost.

The external control unit (phone or tablet) is connected for data transfer to the main unit by wireless Blue-Tooth protocol. The phone battery can be supplied through the powerful LCT-18 internal battery; it is sufficient to connect the phone to the USB-A plug on the main panel and turn on the main switch. In order to avoid any measurement stop, no energy saving procedure is to be selected. Two self-adhesive Velcro strips are supplied as accessories, which allow to fix the phone on the main unit, preferably over the main panel (Figure V.2) or in the suit-case cover.



Figure V.2. Phone fixed over the main panel.

Placing the phone over the main panel optimizes the USB cable path and the case can be easily closed also during measurements. When the instrument is not in use, the phone stand-by condition is not suggested, since it may cause an unwanted battery run-down.

V.3. BEFORE TURN-ON

Always remove the plastic cap of the sniffer probe.

V.4. MAIN UNIT TURN-ON

The main unit is turned on with the black switch (O/I) placed over the main panel. The phone/tablet is charged (if connected to USB plug) by the main unit only if the main unit is on. When the main unit is switched on the rear panel fan and the internal pump are also activated.

V.5. INSTALLATION AND SW START-UP

The QBIT application (Figure V.3) is factory pre-installed in the phone/tablet, and the start icon is in the application bar of the desktop (Android or Windows). It is possible to down-load the software from

QBIT web-site (www.qbit-optronics.com/software_qbit/) if software recover is necessary or any new revisions are available. The down-load procedure is password protected. The user password can be obtained sending an e-mail to: tech@qbit-optronics.com. The software is also available as an auto-installing executable file.



Figure V.3. Initial SW screenshot.

V.6. QBIT APPLICATION FOR LCT-18

The QBIT application is available among the other applications of the operative system (Android or Windows), or in the desktop start-menu bar. In order to enter the instrument control window it is sufficient to launch the application.

The Qbit software presents a simple and friendly graphic interface. The full SW description is also available at the following URL

www.qbit-optronics.com/it/wp-content/uploads/2015/07/Guida_Software_Qbit-Optonics_ver11.pdf

V.7. INITIAL PAIRING

In case the control unit has not yet configured (e.g. a phone not supplied by QBIT), it is necessary to establish the initial pairing among the control unit and the main unit (suit-case). Turn on both the devices and verify they are in a range of distance suitable for Blue-Tooth connection.

In the “*Blue-Tooth*” menù of the Android “Settings”, the main unit is detected as “*WT12-A*” and the access code is “*0000*” (4 zeroes).

V.8. CORRECT OPERATION

This section contains the main operative suggestions to be followed in order to obtain the leak-detector correct operation. The user is recommended to carefully read these instructions so that errors and malfunctions can be avoided.

V.8.1 Auto-zero

By pressing the “*auto-zero*” key on the front panel of the application (see appendix, page 5), the instrument measures and stores the background concentration level which is to be subtracted by leak measurements, until next zero procedure. This function sets the instrument for a precise measurement of the leak level even in presence of polluted air.

Since infra-red absorption measurements are, by their nature, influenced by temperature, the leak detector may present small fluctuations in the measure of background concentration during the first 30 minutes after turn on. In order to increase measurement precision, it is suggested to perform the zeroing procedure frequently.

ATTENTION. DURING THE AUTO-ZERO PROCEDURE DO NOT PLACE THE SNIFFER CLOSE TO ANY POTENTIAL GAS LEAK OR SOURCE; THIS MAY RESULT IN A WRONG BACKGROUND CONCENTRATION MEASUREMENT.

V.8.2 Misure/leak detection

Immediately after an auto-zero procedure, the leak detector is ready for continuous operation. In order to activate measurements, tap on the *Start/Stop* key on the front panel of the application (see appendix, page 5). If the background concentration changes during operation, stop measurements and repeat the auto-zero.

V.8.3 Calibration

The LCT-18 is factory tested with calibrated leaks for the available gas(es), in standard temperature and humidity conditions. Thus it does not need any further calibration.

Anyway, the leak detector allows the user to record a custom calibration if a calibrated leak is available (see also V.8.4). The custom calibration can be exploited for the successive measurements, unless the factory default parameters or any other calibration is restored.


The current setting is saved on the leak detector memory and, if it is not modified by the user, remains active for any successive turn-on operation.

V.8. 4. External-leak calibration

Once the active gas is selected, the user is allowed to externally calibrate the instrument, provided a calibrated leak is available.

IMPORTANT NOTE: IT IS SUGGESTED TO EXTERNALLY CALIBRATE THE INSTRUMENT BY USING CALIBRATED LEAKS OF AT LEAST 3.0 g/yr or $5.0 \cdot 10^{-6}$ cc/sec; the use of too small calibrated leaks may cause errors due to amplification of fluctuation close to background concentration.

In order to correctly perform a custom external-leak calibration:

- 1) select the gas under use;
- 2) in the application, select the “*settings*” menù  , and the sub-menù “*scale factor calibration*” (see pag.4 of appendix); follow the instructions of the application;
- 3) during the leak sniffing, wait few seconds before confirm calibration, so that the leak reading is stable; the custom calibration can be impaired by clouding effects that are tipycal of calibrated leak output nozzles.

If the external-leak calibration is correctly performed, the LCT-18 will detect the leak with a value corresponding to the nominal one.

The factory calibration can be easily restored by accessing the application sub-menù “*gas parameters*” and setting the amplification parameter $a=1.0$.

V.9. INSTRUMENT TURN-OFF

Turn off the main unit by the switch on the main panel and turn off the control unit (mobile phone or tablet). The internal battery can be charged even if the instrument is off; connect the battery charger to the line plug and to the main unit rear panel connector.

The battery charger is equipped with a warning light which is red when electrical current is supplied and becomes green when the charge is complete.

Before stock the leak detector, fit in the plastic cap of the sniffer probe.

CHAPTER VI

ERRORS AND TROUBLESHOOTING

VI.1. SYSTEM ERRORS AND MALFUNCTIONS

The system is equipped with auxiliary sensing devices to reveal errors and malfunction conditions. As soon as any malfunction occurs, the corresponding alarm message is displayed on the control unit screen.

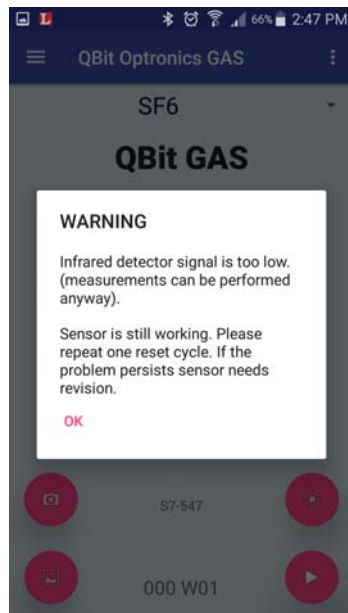
VI.2. ERROR AND MALFUNCTION DESCRIPTION

VI.2.1. Infrared sensor not responding

If the message “*Very low infrared signal*” is displayed, a communication error with the infrared cell has occurred. Reset the instrument by turning off the system. If the problem persists contact the technical service.

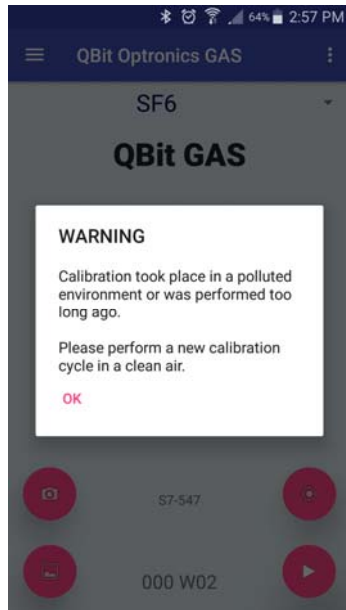
VI.2. 2. Infrared sensor needs revision

If the message “*WARNING Infrared detector signal is too low...*”, is displayed on the screen, a partial occlusion of the infrared cell optical channel has occurred. The leak detector is still working, but not all specifications are met; maintenance is required by the technical service.



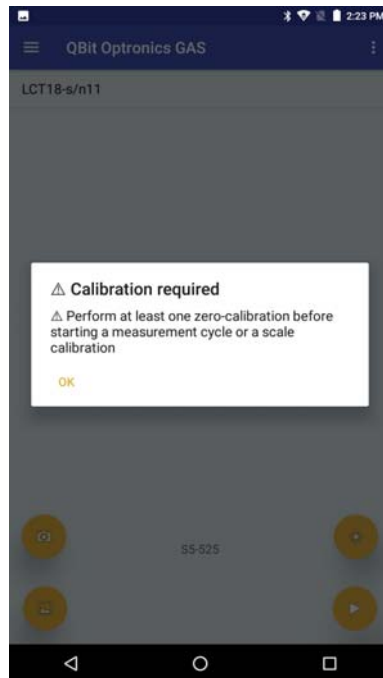
VI.2. 3. Abnormal reference level

If the message “*WARNING Calibration took place in a pollute environment.....*” is displayed on the main screen, the last auto-zero procedure occurred in a polluted environment. Repeat the zero procedure, paying attention that the sniffer is placed in a clean, not polluted area.



VI.2. 4. Calibration required

If the message “calibration required” is displayed on the main screen, the measurement cycle has been initiated without background subtraction. Stop measurements and perform proper auto-zero.



VI.3. TROUBLESHOOTING

In Table VI.1, the most frequently occurring errors and malfunctions are reported, together with any user countermeasure:

Table VI.1

Malfunction	What to do
Turn-on fails	Check that the power cord is connected and AC required specifications are met. Verify the fan on the rear panel and the led on the battery charger. If the fan and the led are off the power supply is not properly working.
The control unit (phone/tablet) is off	Verify the battery of the control unit is charged. Unplug it from the suit-case and charge it by its own charger for at least 1 hour, then try again to turn-on.
Commands from control unit are ignored	Verify that the leak detector is correctly set in the application SW (see appendix, page 4).If the problem persists, turn-on again the system and repeat the pairing (V.7)
Temperature too high	Turn off the system and wait to allow cooling. Reduce the working place temperature or move the detector to a cooler location. Verify that the rear panel fan is not obstructed.
Infrared sensor not responding	Reset the system by turning off the leak detector. If the problem persists contact technical service
Calibration required	Repeat auto-zero, paying attention that the sniffer is placed in a clean, not polluted area.

CHAPTER VII

MAINTENANCE

For a long and reliable operation of the LCT08 infrared detection system, a few maintenance operations are suggested to be performed by the user and by qualified personnel.

VII.1. USER MAINTENANCE

VII.1.1. Cleaning suggestions

Daily cleaning

- remove dust and solid particles from the instrument;
- do not use abrasive products;
- wipe with soft and clean cloths.

Precautions

- avoid dust or grease get into the sniffer;
- avoid moisture or liquids get into the sniffer;
- when the system is not in use, protect the sniffer tip with its plastic cap;
- avoid dust get into the main case apertures;
- do not use chemical solvents and/or abrasive detergents;
- do not use alcohol to clean the device.

ALWAYS DISCONNECT THE AC POWER BEFORE ANY MAINTENANCE OPERATION.

When the system is not in use, it is suggested to set the equipment in a dry, dust free place.

VII.1.2. Paper filter replacement

This maintenance operation can be performed by the user, at time intervals which depend on working conditions and external environment. In any case, the paper filter should be replaced every 30 hours of system operation.

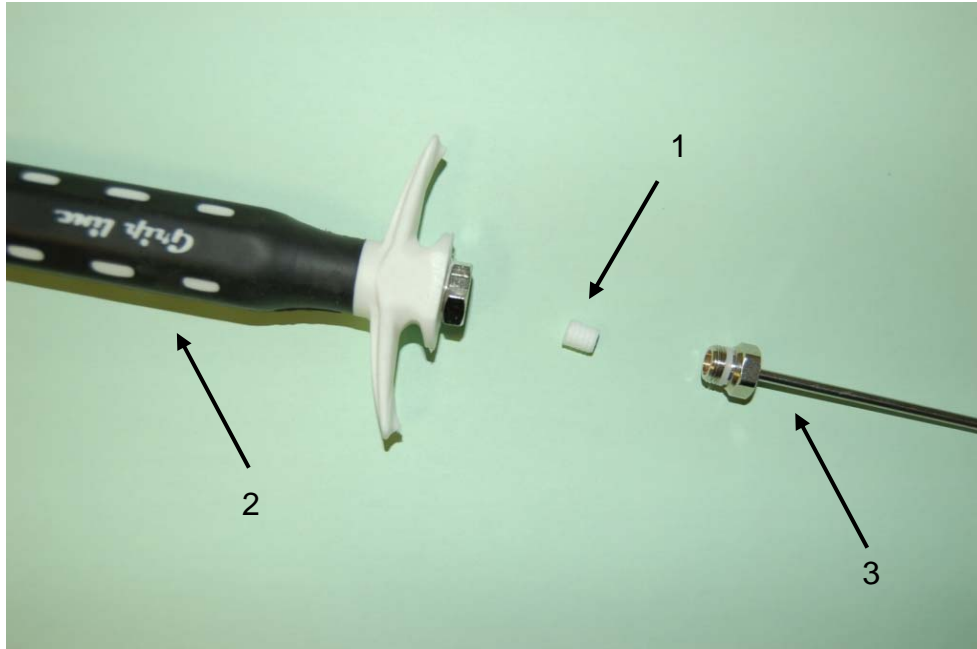


Figure VII.1: 1) Filter , 2) handpiece, 3) sniffer.

Unscrew the sniffer by using 12 mm and 14 mm wrenches. Remove the filter placed in the sniffer connector (Figure VII.1). Verify that the stainless steel capillary is not obstructed and insert the new filter. Screw again the sniffer until gasket tightening.

VII.2. QUALIFIED PERSONNEL MAINTENANCE

IN ORDER TO ENSURE SYSTEM ACCURACY AND RELIABILITY, THE FOLLOWING MAINTENANCE OPERATIONS ARE TO BE PERFORMED BY QUALIFIED PERSONNEL AT REGULAR INTERVALS (PREFERABLY ONCE A YEAR):

- infrared sensor calibration;
- flow calibration;
- electric insulation check.

CHAPTER VIII

ACCESSORY PARTS

VIII.1. SYSTEM ACCESSORY PARTS

The leak detector is supplied with the following accessory parts:

- n. 20 paper filters
- battery charger with AC power cord
- self adhesive Velcro strips
- operation manual