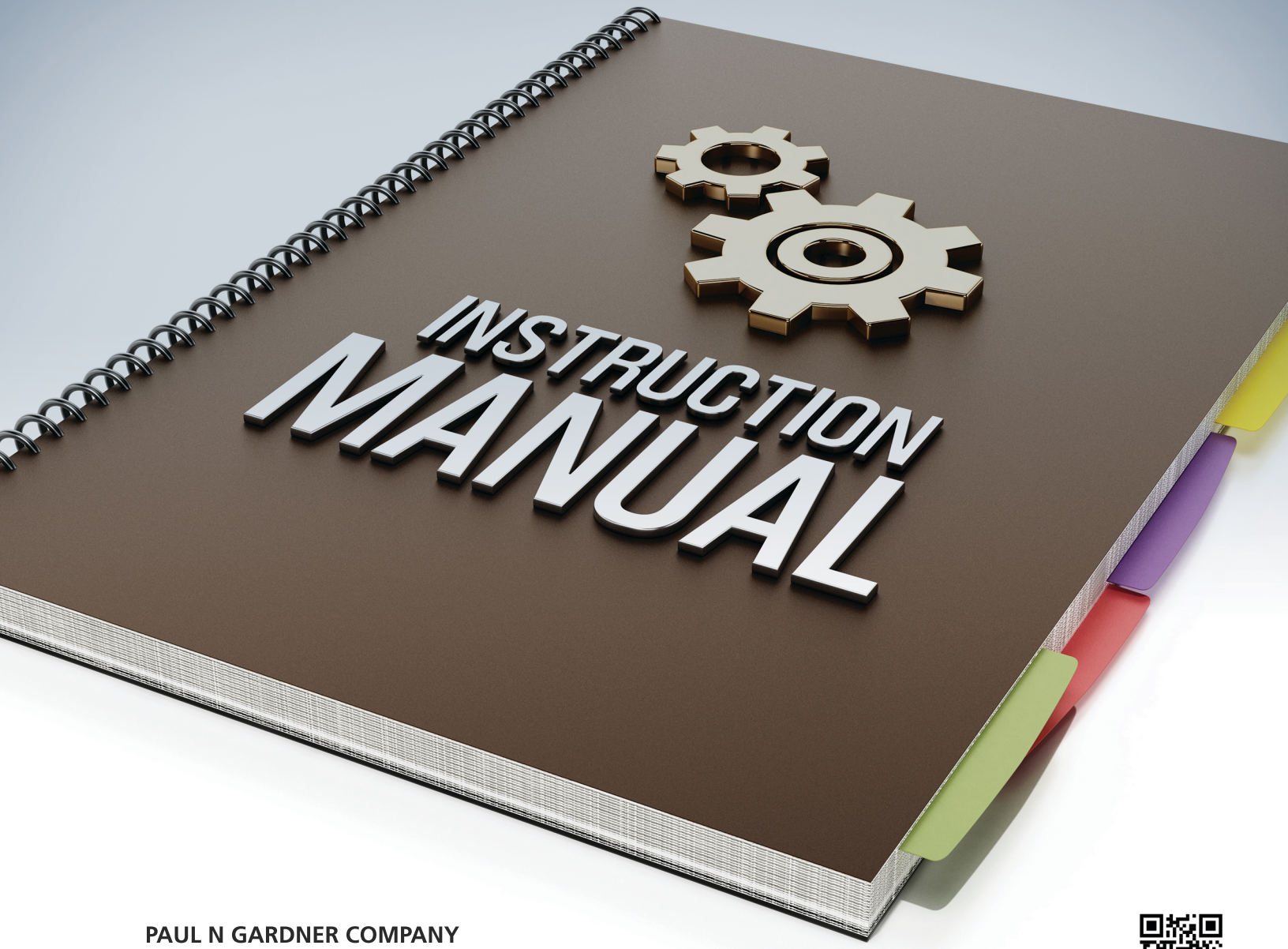

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INSTRUCTIONS

GARDCO DISTRIBUTED PRODUCTS

GARDCO®

TQC LOW VOLTAGE PINHOLE DETECTOR®

LD8100 - LD8105

User Guide

V1.1 0115

This product is RoHs compliant (Directive 2002/95/EC)

DANGER
People with for instance a pacemaker or heart problems should completely avoid the use of this device.

WARNING: Risk of electric shock
The TQC Low Voltage Pinhole Detector (possibly) uses of tensions that may cause a mild electric shock. The earth clamp detection will switch off the voltage of the device once it is removed from the substrate, yet the risk of electric shock remains, particularly if the device isn't used properly. It is strongly recommended at all times to hold the device UNDER the button and avoid. each contact with the top plate (the live part) The use of gloves is also recommended.

WARRANTY

TQC will grant a warranty for a period of 12 months for TQC Pinhole Detector and 12 months for all related equipment from the date of delivery in respect of any evidence of faulty workmanship and materials. TQC will extend the warranty for TQC Pinhole Detector to a period of 24 months from the date of delivery if TQC Pinhole Detector is licensed via the TQC Ideal Finish Analysis software. Should a delivered consignment prove to be contrary to contract upon inspection, the customer shall grant TQC the opportunity hereunder of removing the fault, or else the customer may demand replacement? Should the supply or delivery of any improvement or replacement not prove possible, the customer may choose between having the purchase price reduced or in demanding the contract of sale to be rescinded (conversion). Damage resulting from natural wear and tear, mechanical or chemical damage, an act of God or non-compliance with the operating instructions shall be excluded from the warranty as well as mechanical interference by the customer or by third parties with TQC Pinhole Detector and related equipment without TQC's written permission. No liability will be accepted for defects, damage or injury caused due to use not carried out in accordance with the manufacturer's user instructions.
To claim warranty, the rejected product has to be sent to TQC together with the original invoice, any exchange before the product has been returned to TQC is not possible. TQC reserve the right to repair, exchange or supply an equivalent substitute. TQC is not liable for handling or transport costs. Warranty on the purchase price is limited, all liability for consequential damages or changes in technology is expelled
lijkheid voor gevolgschade of technologische veranderingen zijn uitgesloten.

SCOPE OF SUPPLY

The TQC Low Voltage Pinhole Detector-Basic (LD8100) comes in a hardboard box with the following items:

- TQC Low Voltage Pinhole Detector
- Sponge wand
- Grounding cable with clamp
- Calibration certificate
- User manual

The TQC Low Voltage Pinhole Detector-Advanced (LD8105) comes in a hard plastic box with the following items:

- TQC Low Voltage Pinhole Detector
- Sponge wand
- Grounding cable with clamp
- Calibration certificate
- User manual

EN

TABLE OF CONTENTS

1. GENERAL

1.1 Importance of operating manual

This manual is written in order to become familiar with all the functions and possible applications of the instrument. It contains important instructions about how to use the instrument safely and economically; according to the purpose designated. Following these instructions is not only essential to avoid risks. It also reduces repair costs and down-time and increases the products reliability and service-life.
Anyone who works with the instrument should follow the instructions in this manual, particularly the safety related instructions. Additionally local rules and regulations relating to environmental safety and accident prevention should be observed.

1.2 User-responsibility

The user should

a) only allow persons to work with the instrument who are familiar with the general instructions on how to work safely and to prevent accidents. The use of the instrument should have been instructed duly The safety chapter and the warnings in this manual should have been read and understood; acknowledged as evidenced by their signature.
b) regularly check the safety-awareness of personnel at work.

1.3 Responsibility of personnel

Before commencing work anyone appointed to work with the instrument should pay attention to the general regulations relating to working safety and accident prevention. The safety chapter and the warnings in this manual should have been read and understood; acknowledged as evidenced by their signature.

1.4 Dangers

This instrument has been designed and constructed in accordance with state-of-the-art technology and the acknowledged safety regulations. Nevertheless, working with the instrument may cause danger to the life and health of the operator or to others, or damage to the instrument or other property. Therefore the instrument should only be used for its designated purpose, and in a perfect technical condition. Any defect that could have a negative effect on safety should be repaired immediately.

1.5 Designated purpose

The TQC Low Voltage Pinhole Detector is exclusively designed to The TQC Low Voltage Pinhole detector enables you to inspect various coatings on conductive substrates for small defects such as holidays and pinholes using the 'wet sponge technique'. Other applications constitute improper use.

TQC will not be held liable for damage resulting from improper use. Designated purpose also includes properly observing all instructions in the operation manual, and adherence to inspection and maintenance schedules.

1.6 Copyright

1.7 Manufacturer's/Supplier's address

TQC - Molenbaan 19, 2908 LL Capelle aan den IJssel - The Netherlands,
T +31(0)10 7900100, F +31 (0)10 7900129

2. SAFETY INSTRUCTIONS

2.1 Meaning of Symbols

The following symbols for dangers are used in this instruction manual.

DANGER

Possible immediate danger to the life or health of personnel If this guideline is not noted it can lead to severe danger to health, up to fatal injury

WARNING

A dangerous situation could be caused. Non observance of this guideline can lead to injury or to damage to equipment.

TIPS! / NOTE!
Special tips and particular information. Guidelines to make optimal use of the instrument.

2.2 Availability of Safety Information

The instruction manual should be kept at the place where the instrument operates.
In addition to the information contained in the instruction manual, general and local regulations for accident prevention and environmental protection shall be kept available and observed.
Always ensure all guidelines in respect of safety and dangers on the instrument are in readable condition.

2.3 Training of Personnel

- Anyone who operates the instrument should be trained properly.
- It has to be clear who has which responsibility regarding commissioning, set-up of maintenance and repairs, installation, and operation.
- Anyone who hasn't finished training should be supervised by an experienced person while working with the instrument.

2.4 Dangers from Electrical Energy

DANGER People with for instance a pacemaker or heart problems should completely avoid the use of this device.

WARNING: Risk of electric shock

The TQC Low Voltage Pinhole Detector (possibly) uses of tensions that may cause a mild electric shock. The earth clamp detection will switch off the voltage of the device once it is removed from the substrate, yet the risk of electric shock remains, particularly if the device isn't used properly. It is strongly recommended at all times to hold the device UNDER the button and avoid each contact with the top plate (the live part) The use of gloves is also recommended.

- The electrical equipment of the instrument must be checked regularly. Loose connections and cable damaged by heat must be corrected immediately. This may only be done by a qualified electrician.
- Always make sure the instrument's power is turned off while adjusting any electrical component.

3. TRANSPORT AND STORAGE

3.1 Packing

Please take note of pictorial symbols on the packing.

3.2 User: Check on Receipt

- Check packing for damage
- After unpacking check complete supply.

3.3 Reporting Transport Damage and Documentation

Any damage should be documented as accurately as possible (possibly photographed) and reported to the relevant insurers or, in the case of sales "delivered to customers works", to the supplier.

3.4 Storage and Protective Measures when not in use

- The instrument must be stored in a dry place at a temperature between 10 - 40°C.
- The storage period should not be longer than 3 months.
- Store instrument in the original packing if possible.
- To prevent battery leakage remove batteries when the device is unused for a longer period of time.

4. DEVICE

The TQC Low Voltage Pinhole detector enables you to inspect various coatings on conductive substrates for small defects such as holidays and pinholes using the 'wet sponge technique'

The grounding clamp shall be connected to an untreated piece of the substrate(which is electrically connected with the measurement area), where the wet sponge will be used to probe the entirety of the coating with the selected voltage applied. When current flows from the sponge wand to the grounding clamp, this indicates a defect in the coating, and the user will be notified using the selected feedback method(s). (Buzzer, vibration, headphones and/or display)

Reliable and valid detection is only possible on clean coatings. Measurements on dirty, excessively wet or otherwise contaminated surfaces are unreliable.

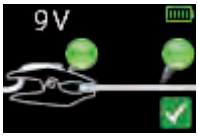
The TQC Pinhole Detector is available in two models:

Article No	Model	Voltages
LD8100	TQC Pinhole Detector Basic	9 V & 90 V
LD8105	TQC Pinhole Detector Advanced	9 V, 24 V, 67.5 V, 90 V

The number of detected pinholes is stored in memory, and remains available after power down, even when replacing batteries. This memory can be cleared by the user.

4.1 Ground connection detection

The TQC Low Voltage Pinhole Detector uses a high frequency earth clamp detection. This provides the user feedback if the earth clamp is connected properly. It also prolongs the battery life because the power is turned off when there is no mass detected, thus reducing the risk of electric shock.



As a side note to this technique it should be mentioned that the reliability of this detection depends on the circumstances in which the TQC Low Voltage Pinhole Detector is used.

A few examples will be given to illustrate whether or not detection is reliable.

Example 1: A small treated object placed on an insulating table, and connected to the ground terminal by a short cable. Once the sponge makes contact with the object, the mass will be detected. Once the sponge disconnects, nothing will be detected. In this case, the mass detection will work exactly as intended.

Example 2: The earth clamp is connected to a (large) chassis of a vehicle which is isolated from the floor . The ground cable is (partially) on sheet metal of the chassis. Once the sponge makes contact with the object mass will be detected. If the clamp comes loose, a signal might still be detected through the cable, and the detection is not 100% reliable.

Example 3: The earth clamp is connected to an object that is embedded in a concrete floor and the long cable is on this floor. In this case, it may be that the mass detection already detects mass after switching on the device. In this case, the mass detection is NOT reliable, and extra attention should be paid whether or not the earth clamp is still connected properly.

WARNING: Risk of electric shock

The TQC Low Voltage Pinhole Detector (possibly) uses of tensions that may cause a mild electric shock. The earth clamp detection will switch off the voltage of the device once it is removed from the substrate, yet the risk of electric shock remains, particularly if the device isn't used properly. It is strongly recommended at all times to hold the device UNDER the button and avoid each contact with the top plate (the live part) The use of gloves is also recommended.

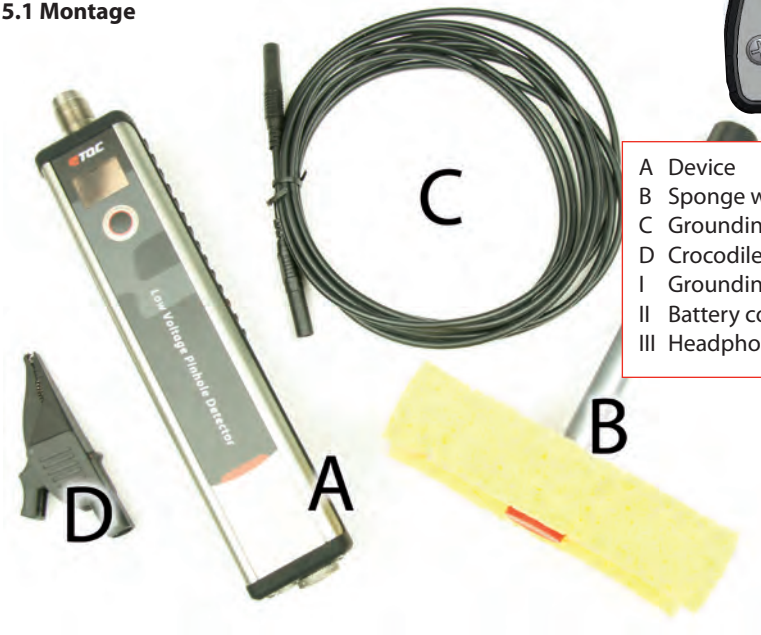
DANGER

People with for instance a pacemaker or heart problems should completely avoid the use of this device.

5. GETTING STARTED WITH THE LOW VOLTAGE PINHOLE DETECTOR

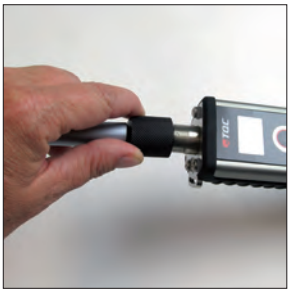
The Low Voltage Pinhole Detector is ready for use as soon as you unpack it. All you have to do is insert batteries (see 6.4), mount the sponge wand and connect the ground cable and crocodile clamp to the device and the substrate to be tested.

5.1 Montage



A Device
B Sponge wand
C Grounding cable
D Crocodile clamp
I Grounding cable connection
II Battery compartment
III Headphone connection

Upon delivery the device (A) and sponge wand (B) will be delivered separately. Before use, they should be connected by means of the screw connection. The 'Advanced' model also has the opportunity to use an extension cable, which offers the possibility to connect the unit to your belt strap. The advanced model comes with different additional accessories that can be used instead of the sponge wand.



The grounding cable (C) must be inserted into the black bus (I) be on the bottom of the device. (near the battery compartment)

The other side of the earth cable is plugged into the supplied crocodile clip (D). This crocodile clip must be connected. When used on an untreated piece of the substrate

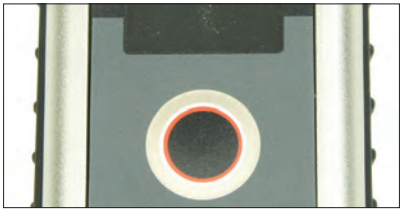
The bottom of the unit also houses the battery compartment (II) and the headphone jack (III)

5.2 Other preparations

To get proper conductivity, it is important that you work with a wet sponge. You can use tap water containing a small amount (drop per liter) detergent. This detergent reduces the surface tension of the water. It is important that the surface remains wet during the measurement.

5.3 The operating button

The device is operated by a single button:
The button is located directly under the display, slightly elevated and 'clicks' when pressed.

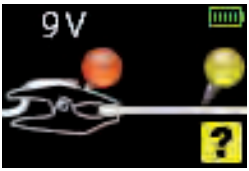


Because of the safety it's very important to hold the device UNDER the operating button and avoid each contact with the top plate.

5.3.1 Powering up the Pinhole Detector

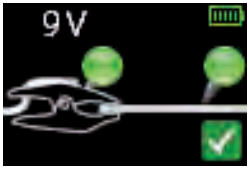
Hold the button until the TQC logo shows on the display. As soon as the logo disappears the device is ready for use. Below the start-up screen and the main screen:

->

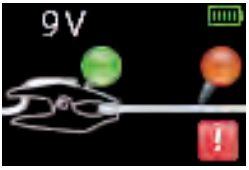


TIP!
To test if the device detects **an electronic contact briefly hold the crocodile clamp against the wet sponge. When functioning properly feedback is immediately given (audio / tactile), depending on the settings.**

Connect the grounding clamp to an untreated piece of the substrate (which is electrically connected with the measurement area)
Place the wet sponge, on the substrate. The left side of the screen indicates that the ground cable is connected properly. If the coating in the selected position is in good condition, the right half of the screen will indicate this.
When current flows from the sponge wand to the grounding clamp, this indicates a defect in the coating, and the user will be notified using the selected feedback method(s). (audio, tactile)



Grounding clamp detected,
Coating without defect



Grounding clamp detected,
Coating with defect

NOTE The device will power itself down after 5 minutes of inactivity to preserve battery power. The delay before power down is user configurable. (see 5.4.2)

5.3.2 Operating button functions

The button can be pressed several different ways to effectively be able to use it as three separate buttons. A slight buzz will indicate roll-over to the next button function.

'Click' A short press of the button up to half a second
'Press' A press of the button from half a second to one second
'Hold' Holding the button for at least 1 ½ seconds

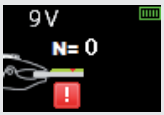
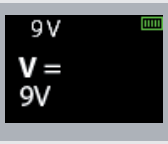
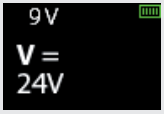
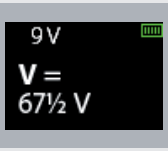
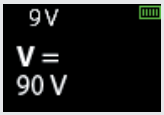
5.4 How to operate the Pinhole Detector?

This section will describe how to operate the Pinhole Detector, as well as describing the hierarchy of the available menus and settings.

Configuring the device
After powering on (main screen) the menu can be opened using a 'click'. Navigating the available settings is done with subsequent 'clicks', after the last item the menu loops back to the first item. A 'press' confirms or opens the selected item. 'Holding' the button will exit the current menu. *

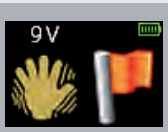
* A 'hold' return is not applicable in the voltage selection menu items. As soon as the button is held for more than half a second ('press' event), the selected voltage is immediately applied while returning to the main screen. To leave the menu nonetheless, navigate past the voltage items and then 'hold' the button.

5.4.1 Main menu

#		Description	'Press' event
1		***Pinhole counter:*** shows the current number of pinholes detected	Resets the counter to zero
2		Voltage: 9 V	The selected voltage will be applied
3		* Voltage: 24 V	
4		* Voltage: 67.5 V	
5		Voltage: 90 V	
6		Settings	The settings sub-menu will be opened

* * Voltages 24V en 67.5V are only available on the Advanced model (LD8105)

5.4.2 Settings

#	Description	'Press' event
1	Buzzer (Enable / Disable)	 *Buzzer enabled*  *Buzzer disabled*
2	Vibration (Enable / Disable)	 *Vibration enabled*  *Vibration disabled*
3	Screen dimming (Enable / Disable)	 *Screen dimming enabled*  *Screen dimming disabled*
4	 Automatic power down	Toggle option This function selects whether the device automatically turns of after 5, 15, 30 or 60 minutes of inactivity. It is not possible to disable the automatic power down function.
5	 Device information	Shows device information In this menu, the device model- and serial number will be displayed. After 'pressing' the button device details such as calibration date and distributor location will be displayed.

Settings: automatic power down

This function selects whether the device automatically turns of after 5, 15, 30 or 60 minutes of inactivity. It is not possible to disable the automatic power down function.

Setting: Product information
On this menu, the device model- and serial number will be displayed. After 'pressing' the button device

5.4.3 Power on / off

Using this menu option the device can be powered down.

1. Navigate to the main menu
2. 'hold' the button until this screen appears:

3. When you release the button the device turns off and the screen will turn black.

6. GENERAL MAINTENANCE

6.1.1 Care, Maintenance, Repairs

- Do not open the device. In case of malfunction always consult the manufacturer.
- Maintenance and inspection should be carried out at the correct intervals
- Always make sure the device s power is turned off while adjusting any electrical component whenever maintenance, inspection or repair work is done.
- Always store the TQC Low Voltage Pinhole Detector in its original packing when not in use. Never use compressed air to clean the device

6.1.2. Cleaning the device

We advise to clean te instrument with a soft dry cloth. Don's use any solvents. In case of hard to remove stains a small amount of Isopropyl Alcohol may be used.

6.1.3 Cables and connectors

It is possible to connect the device to a computer for firmware updates. Under normal conditions this will not be required, end users will be informed if updates are available. Please make sure connectors and cables are undamaged before making a connection.

6.1.4 Heat, moisture and dust

Protect the device from extreme heat. Do not leave the device on the dashboard of a car, near heaters or furnaces, or use direct heat to dry a wet device. When drying is required use a moisture absorbing cloth. Exposing the device to extreme temperatures may damage the screen, the plastic parts as well as the internal components. Do not leave the device in extremely dusty or wet places. Excessive dust and moisture exposure might damage the device and cause malfunctions or defects.

6.2 Modifications to the Equipment

- Any modifications or additions or alterations to the device may solely be made with permission from the manufacturer.
- All measures involving modifications require written confirmation of approval from TQC
- Devices which are not in fault-free condition must immediately be switched off
- Only use replacement parts from the original supplier. Parts used from other sources aren't guaranteed to take the loading and meet the safety requirements.

6.3 Calibration

The device will be supplied ready to use (calibrated). In the event re-calibration is required the device will indicate this to the user.

Please send the device to:
TQC BV
Molenbaan 19
2908LL Capelle aan den IJssel
The Netherlands

Please complete and add the RMA form from our website:
http://www.tqc.eu/en/service/repairs-calibrations

6.4 Batteries

The battery status is displayed in the upper right corner of the display. The batteries will be emptier as the color of the indicator shifts to red and the bars decline. The use of rechargeable batteries such as NiMH or NiCd might show a value that differs from the actual value. This however does not negatively impact device functionality.

Battery type: AA 1.5 V alkaline or AA 1.2 NiMH/NiCd. The use of high quality batteries is advised to prevent battery leakage which may damage your device. The batteries should be inserted with the positive pole facing inwards.

To prevent battery leakage remove batteries when the device is unused for a longer period of time. Store device in the original packing if possible.

7. SPECIFICATIONS TQC PINHOLE DETECTOR

Model:	**LD8100**	**LD8105**
TQC Pinhole Detector:	Basic	Advanced
Voltages (DC):	9 V en 90 V	9 V, 24 V, 67.5 V en 90 V
Measuring range:	up to max. 500 µm coating thickness	
Voltage accuracy:	±2 % at 9 V, 24 V and 67,5 V and ±5 % at 90 V	
Sensisitivity:	100 k Ω at all voltages	
Headset connector type:	3.5 mm jack plug	
Headphone output power:	max 150 mm W	
Headphone output impedance:	~ 75 Ω	
Dimensions:	190x40x45 mm / 7,5 x 1,6 x 1,8 inch	
Weight (device):	460 g	
Weight (device + sponge wand):	600 g	
Display	Full Color OLED display, 1 inch, 96 x 64 px	
Operation:	single button, menu-driven by a microprocessor	
Measurement speed:	Continuous	
Units:	Binary indication (defect/intact)	
Operational relative humidity:	0-85 %rH	
Operational temperature:	-10°C to 50°C / 14°F to 122°F	
Factory calibration:	Certified components and measuring equipment	
Recertification	possible	
Battery preservation:	User configurable	
Battery life	Appr. 130 hours (depending on battery type)	
Software:	Firmware Update Tool inclusive	

Standards:
This device is usable for inspections such as those stated in the following standards:
ISO 8289-A, ISO 14654:1999, BS 7793-2:1996, ASTM D 5162-A, JIS K 6766:2008, TM0384-2002