

DE BEERS GROUP

DiamondPlus™

Installation and User Manual



PLEASE READ THIS IMPORTANT INFORMATION PRIOR TO USE**DISCLAIMER**

The intended use of this DiamondPlus instrument (the "Instrument") is expressly limited to that set out in the "Limitations of Use" section of this manual and is subject to compliance with the procedures otherwise provided in this manual. The instructions and descriptions in this manual are accurate for this Instrument at the time that this manual is produced. Successive manuals are subject to change without notice and no liability is accepted for any losses which may result from such changes.

Customers and users of the Instrument must carefully read the manual and the Limitations of Use in full and, prior to conducting any analysis or testing activities, properly familiarize themselves with the operation of the Instrument. While care has been taken to ensure compatibility and compliance of the instrument with local laws and regulations as at the date of the manual, it shall be the ultimate responsibility of the customer/user to ensure that the Instrument is compatible and compliant with such laws and regulations in force as at the date of the Instrument's importation, sale and use.

To the extent permitted by law:

1. neither the authors of this manual, nor the designers or manufacturers of this Instrument, nor the instructors in the operation of the Instrument shall be liable for the misidentification of a treated diamond, synthetic diamond, diamond simulant or other material as a natural untreated diamond or vice versa if it arises (whether wholly or partly) as a result of:
 - a. any misuse of the Instrument (which shall include, without limitation, any failure on the part of the user to operate or maintain the Instrument at all times in strict accordance with this manual and the Limitations of Use); or
 - b. screening for those types of diamond, treatments or other substances for which the Instrument is not intended to detect as identified in the manual or in the Limitations of Use;
 - c. any development or alteration in the composition or in the design, production or treatment processes for those types of diamonds or other substances for which the instrument is intended to detect occurring after the date of the manual which renders the Instrument inaccurate or otherwise unable to detect the modified diamond or substance; or
 - d. any other customer/user error (whether in relation to the operation of the Instrument or the interpretation of resulting data or otherwise) or third party act or omission;
2. the parties referred to in Section 1 above may not be held liable for any damage to samples of any nature which are tested by the Instrument.

The use of the Instrument constitutes acceptance of the above conditions.

FCC COMPLIANCE STATEMENT

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the installation and user manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

IMPORTANT NOTICE

THERE ARE NO USER SERVICEABLE PARTS WITHIN THE INSTRUMENT COVER.

**EUROPEAN UNION ONLY**

Note: Marking in compliance with EU directive 2202/96/EC and EN50419

This equipment is marked with the recycling symbol as shown. It means that at the end of life of the equipment it must not be placed in the normal domestic unsorted waste stream. Please return it back to the manufacturer at the address below for appropriate recycling and disposal:

De Beers
Belmont road
Maidenhead
Berkshire
SL6 6JW
United Kingdom

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1 LIMITATIONS OF USE

The DiamondPlus is a compact screening device intended for use in all locations where polished diamonds are handled.

It is primarily designed to screen for type II high-pressure-high-temperature (HPHT) treated natural diamonds. For this application, the diamond will need to have been pre-identified as type II (for example by using the IIDGR DiamondSure instrument or by infrared spectroscopy) and standard gemmological tests should be applied to confirm that the diamond is natural rather than synthetic.

The instrument measures laser-excited photoluminescence and within 15 seconds returns an automated 'Pass' or 'Refer' result. In addition to referring all HPHT treated type II diamonds, the instrument will also refer a percentage of untreated natural type II diamonds. These untreated diamonds can be identified as such using more sensitive, laboratory-based, low temperature photoluminescence measurements. The instrument performs best on high colour type II diamonds and the referral rate may increase as the strength of the brown colour increases. Diamonds which are referred by the instrument should NOT be classified as HPHT treated without additional testing. Additional low-temperature laser-excited photo-luminescence measurements should be carried out by an accredited qualified gemmological laboratory in order to positively determine whether a diamond has been HPHT treated.

The instrument is not primarily designed to screen for synthetics but a 'Refer' or 'Refer (CVD Synthetic?)' result may be displayed if the diamond under test is synthetic. Diamonds which are referred by the instrument should NOT be classified as synthetic without additional testing. Standard gemmological tests should be applied to determine if a diamond is synthetic.

If the instrument gives a "Refer (Irradiated?)" result the tested stone is potentially an irradiated diamond but should not be classified as such without further tests.

The instrument is designed to make a measurement with the samples immersed in liquid nitrogen. For this reason the instrument is only suitable for testing loose stones; it is not suitable for testing mounted stones. Testing of non-diamond material is not recommended since the thermal shock may cause the sample to fracture. Testing of such material will result in the message, 'No Diamond Detected' being displayed.

The instrument is primarily intended for the testing of type II natural diamonds and should not be used in the classification of other precious gems or diamond simulants.

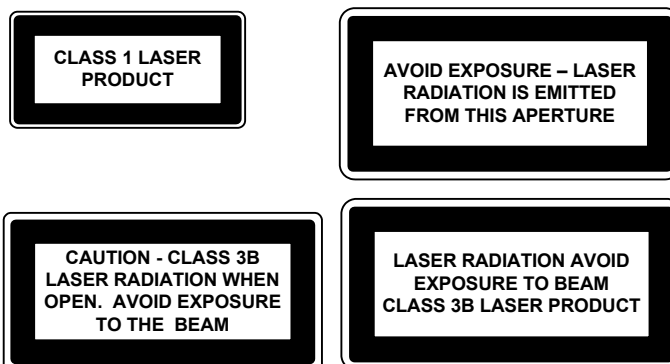
2 SAFETY INFORMATION

2.1 SAFETY LABELS USED ON THE INSTRUMENT

Direct current (dc) is used to power the instrument.

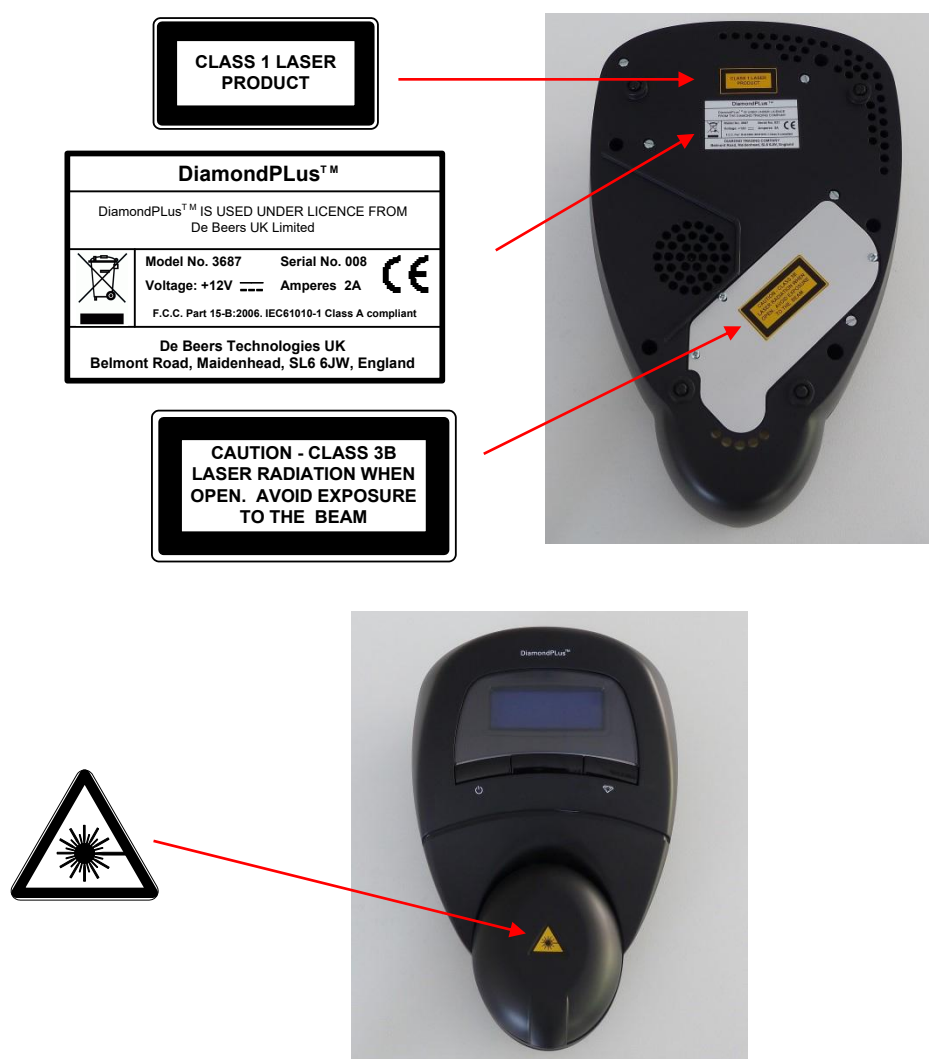


Laser Starburst. The instrument contains a Class 3B laser, but a safety interlock is fitted to the lid making the instrument a Class I laser product.

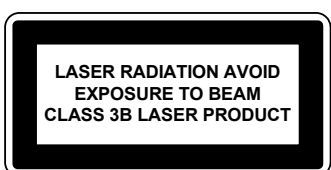
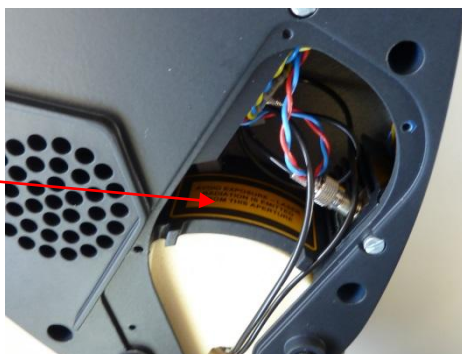
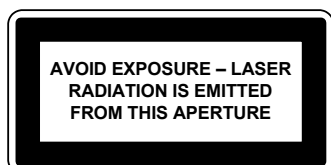


2.2 POSITION OF LABELS

2.2.1 Outside of the instrument



2.2.2 Inside the instrument



2.3 ENVIRONMENTAL

This instrument is designed for indoor use only.

It operates from a supply voltage of 12 Volts DC and maximum supply current of 2 Amperes using a mains universal power supply unit.

Warning



The instrument must only be used with the power supply provided.

It should be used in the temperature range 15 °C to 30 °C with a maximum operating humidity of 80% non-condensing.

The maximum operating altitude is 2000 metres.

2.4 GENERAL SAFETY

The instrument should only be used in accordance with the instructions given in this manual. **Failure to follow these instructions could impair the safety protection that is provided.**

The instrument is a Class 1 laser system. It is designed to be used with liquid nitrogen. The safety aspects of both of these potential hazards are discussed in Sections 2.5 & 2.6 respectively.

Caution



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

2.5 LASER SAFETY

The sample chamber lid forms part of an interlock system designed to ensure that the user is not exposed to laser radiation. Before each usage, the condition of the lid should be visually inspected. **In the event that the lid becomes damaged the user must immediately isolate the instrument from the mains and return it to the supplier for servicing.**

2.6 HANDLING OF LIQUID NITROGEN

The instrument uses liquid nitrogen in order to cool the diamond sample to 77 K (-196 °C) during a spectroscopic measurement.

Warning



Users of the instrument must be familiar with the safe handling of liquid nitrogen since it can present a potential hazard.

In transferring liquid nitrogen from a main supply Dewar flask to a small one litre Dewar (recommended for use with this instrument), follow the safety instructions supplied with the main Dewar.

It is recommended that supporting information for the safe handling of liquid nitrogen is acquired from your supplier.

The following is a list of hazards that may be encountered when using the instrument with liquid nitrogen. However, the risk of injury may be reduced if the following recommended procedures are adopted.

i) Extreme cold and the risk of cold burns or frostbite

Any part of the body which comes into contact with extreme cold can suffer injury. Small splashes of liquid nitrogen tend not to burn skin because, as the liquid boils, an insulating layer of vapour is formed, but even small splashes can burn the eyes badly.

A cold burn is very similar to a burn caused by heat. The amount of damage caused depends upon the temperature and the duration of exposure. Delicate tissues (like eyes) are affected much more easily and quickly than hard skin. The effect of a cold burn is not as obvious as a heat burn, and the onset of pain may be delayed.

ii) Asphyxiation (if the atmospheric oxygen is displaced)

This is in general only a hazard if large volumes of liquid nitrogen are boiling-off in a confined, unventilated area. For the volumes of liquid nitrogen used in the instrument (typically 1 litre per day) in a standard laboratory environment, this hazard presents no risk.

However, make sure that there is good ventilation in any room where cryogenics are stored or used.

iii) Explosion (due to pressure build up)

Do not pour liquid nitrogen into a closed container or place an airtight stopper or lid on a vessel containing liquid nitrogen. The pressure built up by the boiled-off gas could cause the vessel to explode. Only use a vessel designed for use with cryogenic liquids.

iv) General Laboratory Procedures

Display clear notices to warn people that they are entering a potentially hazardous area.

Label vessels clearly to indicate their contents. Remember that it is your responsibility to keep the working environment safe for other people, and they may hold you liable if you do not.

If you spill cryogenics on electrical cables, they may freeze and fracture the insulating layer causing electrical hazards. Keep all cables above the level where cryogenics may be spilt on them.

v) Protective Clothing

Cryogenics will boil violently and splash when they come into contact with warmer objects. Wear appropriate clothing as described below and handle cryogenics carefully.

Wear goggles, or safety glasses, to protect your eyes from liquid nitrogen splashes.

Wear loose fitting gloves when pouring liquid nitrogen so that they can be easily removed if liquid gets inside.

Wear sensible shoes (not sandals) and take care to ensure that cryogenics do not spill into your shoes.

2.7 SERVICE WARNING

Warning



There are no user serviceable parts within the main instrument enclosure. Only the fibre is replaceable.

Service personnel should be aware that the semiconductor laser is Class 3B but interlocked such that the complete instrument is laser Class 1. Over-riding the interlock can expose personnel to laser Class 3B radiation and is not recommended (typically 5 to 60 mW of visible radiation). Warning labels for Class 3B radiation are fitted inside the instrument.

The instrument must be returned to the supplier for a safety inspection once every 2 years. Failure to follow this instruction could impair the safety protection that is provided.

3 INTRODUCTION

This manual describes the operation of the DiamondPlus. This instrument is designed to refer all HPHT treated type II diamond and diamond simulants. The instrument is easy to use and provides results which require little interpretation.

The instrument has the following attributes:

- i) Rapid measurement time of around 15 seconds
- ii) Display of Raman normalised intensities of discriminatory photoluminescence features characteristic of irradiated natural diamond and synthetic CVD diamond.

The instrument may be used with unmounted stones in the size range of 0.05 to 10 carats.

4 USER INTERFACES

This section describes the various displays and controls available to the user of the DiamondPlus.

4.1 LIQUID CRYSTAL DISPLAY

The instrument is equipped with a 4 line 20 column Liquid Crystal Display mounted on the top panel. This allows various status messages to be displayed in addition to the test results. In normal operation the display is back-lit to enhance the contrast of the displayed text.

4.2 TOP PANEL KEYPAD

Two keys are mounted on the top panel of the instrument, marked with the symbols  (Standby key) and  (Test key). These two keys are all that are required for routine operation of the machine.

4.3 SAMPLE CHAMBER

The sample chamber is located at the front of the instrument and is accessed by opening the sample chamber lid, as shown in Figure 1. The chamber contains an elliptical recess (or bath) which is designed to hold a small quantity of liquid nitrogen. The parts of the instrument in contact with liquid nitrogen have been made from thermally insulating material. A fibre optic probe lies at the bottom of this chamber.



Figure 1: Placing a stone into the sample chamber

The fibre-optic probe is a precision optical component and should be treated with care. In particular samples should not be scraped across the tip and tweezers should not come into contact with the probe. Damage to the probe will result in impaired performance of the instrument.

4.3.1 Filling the bath with liquid nitrogen

Ensure that you are familiar with the safe handling of liquid nitrogen. It is recommended that supporting information for the safe handling of liquid nitrogen is acquired from your supplier. Section 2.6 of this manual provides guidance only.

The liquid nitrogen should be slowly poured from a small (1 litre) insulated Dewar flask, designed to hold liquid nitrogen, via a smaller liquid nitrogen safe vessel into the sample chamber.

Take Care

Take care not to overfill the sample chamber since any excess liquid nitrogen will pour over the sample chamber and onto the working surface.

The liquid nitrogen will initially boil violently before settling down to a steady boil-off rate after a minute or so. The liquid nitrogen hold time for the bath is around 50 minutes, before which time the bath will need to be re-filled. This process will need to be repeated periodically throughout a measurement session. It is important that the liquid nitrogen bath is kept topped up during a measurement session in order to avoid ice or condensation building up on the tip of the fibre which could significantly impair the instrument performance.

If ice is allowed to build up on the surfaces of the bath and fibre-optic probe, do not attempt to remove it with a hot air blower. This could result in permanent distortion of the bath walls. The user should wait until the ice has naturally melted and evaporated before re-filling the liquid nitrogen bath and commencing further measurements. This can typically take 20 minutes from complete evaporation of the liquid nitrogen from the bath.

Warning

Ice build-up and frosting on the outside of the bath may be a potential cold hazard. Avoid touching these parts of the instrument.

Under no circumstances should the instrument be tilted when the bath contains liquid nitrogen or for several hours after the instrument has been used. Moisture which has built up within a moisture trap inside the instrument has the potential to drip onto electronic components if such an action is taken. Whilst this presents no hazard to the user, it could damage the instrument.

Warning

Under no circumstances should the instrument be tilted when the bath contains liquid nitrogen

5 EXTERNAL CONNECTIONS

5.1 POWER SUPPLY

The instrument is powered from the mains supply. An external power supply is used to convert the mains supply voltage to the level required by the instrument.

The mains supply wall socket must be easily accessible.

The external power supply provided with the instrument is designed for use throughout the world and does not require adjustment for use in different countries. It is connected to the mains supply by a standard IEC flex terminated with a plug suitable for use in the country of operation. The power supply is connected to the instrument by means of a 1 pin socket located at the rear of the instrument.

If the mains adapter shows signs of damage or malfunction immediately stop using the adapter, disconnect from the mains and contact the supplier for replacement.

6 OPERATION OF THE INSTRUMENT

A list of items which comprise the DiamondPlus kit may be found on page 21.

The operational sequences of the instrument are detailed in the following sections.

A quick reference guide to the operation of the instrument is provided on page 22.

6.1 INSTALLATION

The DiamondPlus is designed for use indoors at an altitude less than 2000 metres in an environment with an ambient temperature between 15 and 30 degrees Celsius and maximum humidity of 80%, non-condensing.

The instrument and its external power supply should be placed on a level, non-slip surface close to an easily accessible earthed mains supply socket. The surface should be at a comfortable working height and the instrument should be positioned directly in front of the operator who should have unobstructed and comfortable access to its front panel. Ensure the instrument is placed away from the edge of the work surface.

6.2 SWITCHING ON

Before switching the instrument on, fill the sample chamber bath with liquid nitrogen, as detailed in Section 4.3.1. Ensure that the bath is not allowed to run dry during a measurement session.

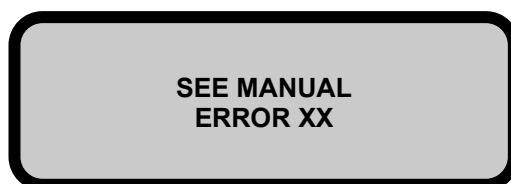
Connect the 1 pin power connector on the lead from the external power supply into the 1 pin socket on the rear panel of the instrument

Plug the external power supply to an earthed mains supply. Turn on the mains supply.

The instrument should only be used with the power supply provided.

When not in use, ensure that the external power supply is disconnected from the mains supply.

Immediately after powering up, the instrument performs various internal checks. If any of these checks indicates a fault, the instrument will display the following screen



XX may be any value, and provides service personnel with details of the detected fault condition. When this screen is displayed, the instrument must be returned to the supplier for servicing.

If the checks are successful, the instrument enters initialisation mode.

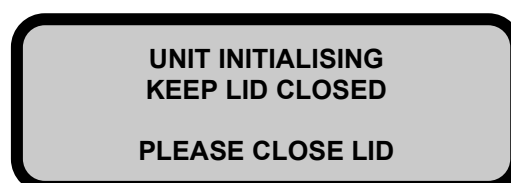
6.3 INITIALISATION MODE

Following a successful power-up self-test, or after exiting low power mode, the instrument enters initialisation mode for approximately 30 seconds. During this period, the instrument takes three 10s dark measurements from which it derives the reference dark spectrum applied to all subsequent stone measurements. It is therefore essential that the lid is kept closed during this period.

During initialisation, the display will show:



The progress of the current dark grab is shown by the progress bar along the bottom of the display. If the lid is opened during a grab, the display changes to:



The instrument will then pause until the lid is closed, at which point the current grab will be started over again. Following a successful initialisation, the instrument enters standby mode.

6.4 STANDBY MODE

Standby mode is the default state of the instrument. In standby mode the display will show:



Note: The code within brackets gives the current version of the software employed and may vary between instruments.

If the unit is held inactive in standby mode for a period of more than 30mins then it will automatically switch into low power mode.

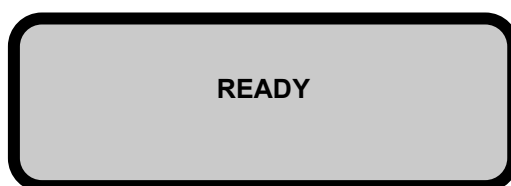
6.5 LOW POWER MODE

To enter low power mode from standby mode press and hold the standby key until the display turns off. Note that the instrument fan will remain switched on for a further 20 seconds after the display has turned off.

This mode places the lowest power drain on the instrument and is incorporated to conserve power when measurements are not being carried out, but where powering-down completely from the mains power switch is not desired.

6.6 READY MODE

From standby mode, ensure that the sample chamber lid is closed. Once closed pressing the standby key will place the instrument in ready mode. In this mode, DiamondPlus is fully powered up and ready to make a measurement. If the bath temperature is within limits, and the lid is closed, the display will show:



With this message displayed, the instrument is able to take a measurement.

Depending on the state of the instrument, other messages may be shown when entering Ready mode, or at any other time whilst in this mode:



If this message appears when the lid seems to be closed, check for ice build-up around the lid area which may be preventing the lid from fully closing.



If this message appears, check the liquid nitrogen level in the bath and refill if necessary. Once filled, the indicated temperature should steadily decrease until it reaches a value which will allow measurements to take place. This may take a minute or two.

6.7 MEASUREMENT MODE

Ensure that the sample chamber bath is full of liquid nitrogen and that it is not allowed to run dry throughout a measurement session (see Section 4.3.1).

This section describes the processes involved in testing un-mounted stones. Note that the instrument must be initialised before measurements may commence (see Section 6.6).

Before measuring ensure that the stones to be tested are clean and dry with no evidence of grease or fingerprints on the table region.

Ensure that the sample holder is dry and that there is sufficient Blue-Tac™ on the tip of the sample holder pin to hold a stone. After the holder and Blue-Tac™ have been removed from the liquid nitrogen, ice or condensation may be removed by rubbing them between the fingers.

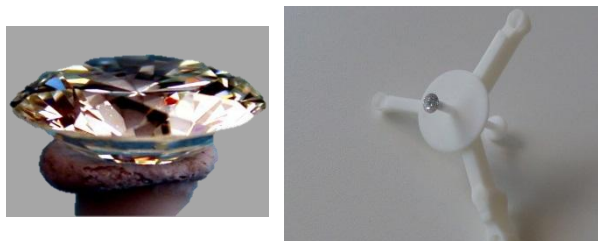


Figure 2: Mounting a stone on the sample holder

Press the culet of the stone into the Blue-Tac™ that is held on the tip of the sample holder pin (see Figure 2). Place the sample holder into the sample chamber so that the three locating pins around the sample chamber locate into the holes on the underside of the sample holder (see Figure 3). Gently press the pin down to ensure that the table of the diamond is in intimate contact with the fibre-optic probe at the bottom of the sample chamber and is centred on it.

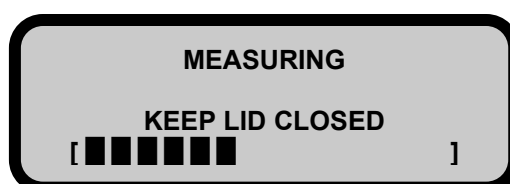


Figure 3: Locating the sample holder into the sample chamber

Note that stones larger than about 1 carat may be placed directly onto the fibre-probe using tweezers. For typical liquid nitrogen boil-off rates the weight of the stone will ensure that it is held in intimate contact with the fibre-probe and is not subject to movement on the probe.

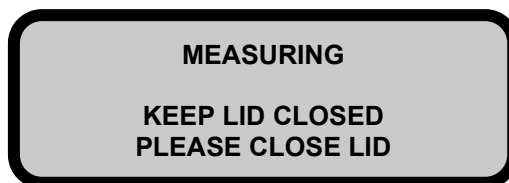
Close the sample chamber lid and allow a few seconds for the stone to reach its equilibrium temperature (the sound of the liquid nitrogen boil off reduces at this temperature).

The measurement may then be initiated by pressing the test key on the front panel. The following sequence of messages will then be displayed:



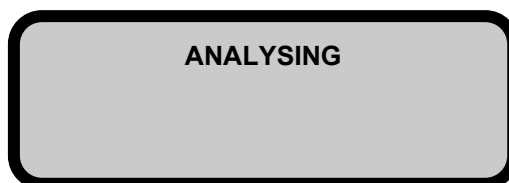
The measurement process will take between 200ms-15s depending on the stone being tested, and the progress of the measurement is shown by the progress bar at the bottom of the display.

If the lid is opened during the measurement, the display changes to:



The instrument then waits for the lid to be closed before restarting the measurement.

Following the measurement period, the display changes to:



A result will then be indicated as described in Section 6.7.1.

In rare cases, the following message may be displayed after the 'MEASURING' message:



If this message appears then reposition the sample on the probe and re-test the stone by pressing the test key on the front panel.

Take Care



Take care when removing the stone from the holder after measurement; the stone may be at a low temperature. Either wait for the stone to warm or use tweezers.

Tip / Information



Note: Very occasionally the instrument is unable to make a measurement on a stone because the saturation message cannot be eliminated. Such stones will need to be subjected to more detailed gemmological and spectroscopic tests.

6.7.1 Interpretation of results

When a measurement is successfully completed, the display indicates the result with one of the following messages:

PASS
XXXXXX

REFER
XXXXXX

For these two results, a diagnostic reference number is also displayed.

REFER
(IRRADIATED?)
741nm=XX.XX

REFER
(CVD SYNTHETIC?)
737nm=XX.XX

For these two results, the numerical value shown is the intensity of the relevant feature normalised to the Raman feature.

REFER

For other referral results a simple 'REFER' result will be displayed.

NO DIAMOND DETECTED

Tip / Information

If any of the 'Refer' results, or the 'No Diamond Detected' result, is obtained then re-position the stone on the probe and repeat the measurement. If the stone gives the same result again this process should be repeated one more time. A stone which gives three consecutive 'Refer' or 'No Diamond Detected' results should be subjected to standard gemmological techniques or more detailed low temperature photoluminescence measurements.

A stone can be accepted as natural and untreated if it receives a single 'PASS' result, irrespective of previous 'REFER' results. Different verdicts can result from different light paths through the stone.

If the stone is to be re-tested, pressing the test key will immediately start a new measurement. If no further measurements are immediately required the standby key should be pressed and the instrument will return to standby mode.

The main messages will now be considered in turn:

6.7.1.1 PASS

A stone that gives this result can be assumed not to be an HPHT treated natural diamond. Stones which have significant body colour should be examined more carefully to ensure that they have not been irradiated.

6.7.1.2 REFER

The stone under test is potentially an HPHT treated natural diamond. More detailed spectroscopic measurements should be carried out using laboratory based spectrometers in order to confirm whether the diamond has been HPHT treated or not. Synthetic diamond may also produce this response and so further tests should be directed towards revealing any characteristics of synthetic stones.

6.7.1.3 REFER (IRRADIATED?)

These samples would normally exhibit a green colour in absorption (unless they have been partially annealed to produce a yellowish brown colour). This result is displayed when luminescence from the neutral vacancy centre (V0) is detected. This centre is characteristic of diamonds that have been irradiated. The numerical data gives the Raman normalised intensity of the V0 feature at 741 nm.

6.7.1.4 REFER (CVD SYNTHETIC?)

This result will be displayed if the tested stone exhibits a feature at 737 nm, which is often exhibited by synthetic diamond grown by chemical vapour deposition (CVD) techniques. Other types of CVD diamond may give a 'Refer' result (see Section 6.7.1.2).

6.7.1.5 NO DIAMOND DETECTED

This result will be produced if no diamond Raman feature is detected. The stone under test will either not be a diamond, or it may be a diamond that gives rise to a very poor return signal. Some large polished diamonds (> 5 carats), blue diamonds and flat diamond plates may give rise to this result. The stone will need to be referred for a more detailed spectroscopic analysis.

6.8 AFTER USE

6.8.1 Returning to standby mode

When a sequence of tests has been completed the unit should be returned to its standby mode. This is achieved by pressing the standby key on the front panel. The display will change to that shown in Section 6.4.

From this state, further measurements may be made by following the procedure set out in Section 6.6.

6.8.2 Switching off

After the desired measurements have been completed, the DiamondPlus should be placed into low power mode by pressing and holding the standby key. To allow the laser to cool, the unit will continue to run the fan for twenty seconds. Once the fan has switched off, the power cable at the rear of the unit may be removed.

Ensure that the external power supply is disconnected from the mains when not in use.

7 MAINTENANCE

The instrument must be disconnected from the mains supply before cleaning.

7.1 CLEANING THE PROBE

The fibre--optic probe is a precision optical component and should be treated with care. The performance of the instrument could be severely diminished if grease or dirt becomes lodged on the probe.

Remove dirt or grease using a cotton bud (Q-tip), moistened in a solution of soapy water if necessary. The cotton bud should be moved across the probe in gentle sweeping actions.

Caution



Under no circumstances should solvents or household cleaners be used to clean the probe or sample-chamber.

Under no circumstances should solvents or household cleaners be used to clean the lid or unit cover.

Mild soapy water may be used.

7.2 Packing List

The following is the packing list for the DiamondPlus. The items are illustrated in Figure 4.

- a. 1 DiamondPlus instrument
- b. 1 External power supply
- c. 1 IEC mains supply lead
- d. 2 Sample holders
- e. 3 Sample holder pins
- f. 1 Pair of tweezers
- 1 Installation and User manual
- 1 Slab of Blu Tack™



Figure 4: Contents of the DiamondPlus kit

8 QUICK REFERENCE GUIDE

- Switch the instrument on by turning the main power supply on.
- Fill the sample chamber bath with liquid nitrogen and ensure that it is kept topped up during a measurement session.
- Ensure that the sample chamber lid is closed.
- Press .
- Wait until the 'READY' message is displayed.
- Open the sample chamber lid and place the stone to be tested into the liquid nitrogen using the sample holder provided.
- Close the sample chamber lid.
- Press the  key and wait for the result to appear.
- If 'PASS' is displayed then the stone is a natural untreated diamond (although perform further tests if the diamond has a yellowish-brown colour (see Section 6.7.1.1)).
- If any of the 'REFER' results occur then the stone should be repositioned on the fibre-probe and re-tested. A single 'PASS' result can be taken as the over-riding result.
- If 'REFER' is displayed for a type II diamond, then the diamond is potentially HPHT treated.
- If 'REFER (IRRADIATED?)' appears then the stone has possibly been irradiated
- If 'REFER (CVD SYNTHETIC?)' appears then a feature characteristic of CVD diamond has been detected.
- If 'NO DIAMOND DETECTED' appears then the material is either non-diamond or the return signal is too poor for diamond to have been identified.
- To re-test, or to measure other stones press the  key.
- If no further measurements are required then press the  key.
- The unit may be switched off after a few seconds using the switch for the main power supply.
- Disconnect from the mains when not in use.