

DE BEERS GROUP

DiamondSure™

Installation and User Manual



DiamondSure Installation & User Manual

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

The intended use of this DiamondSure 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 MAIN
DIAMONDSURE 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 DiamondSure is a screening device intended for use in all locations where polished diamonds are handled. It is designed to discriminate natural diamond from synthetic diamond and diamond simulants. Diamonds which are referred by the DiamondSure, however, should NOT be classified as synthetic without additional testing since certain rare types of natural diamond cannot be recognised by this instrument (these represent about 1-2% of the general diamond production). Refer to Section 6.6.3 for more details.

The instrument is only intended for use with colourless or near-colourless diamonds. In general the referral rate for natural brown and natural fancy colour diamonds will be extremely high. The exception to this is natural Cape yellow diamond. DiamondSure can discriminate between yellow synthetic diamond and natural Cape yellow diamond.

The instrument is not intended for use in the classification of other precious gems or diamond simulants, or to detect the treatment of natural diamonds eg. fracture filling, irradiation or heat-treatments (however see note in Section 6.6.3).

2 INTRODUCTION

This manual describes the operation of the DiamondSure. This instrument is designed to discriminate between natural and synthetic diamond. The instrument is easy to use and provides results which require little interpretation.

DiamondSure has the following attributes:

- i) low referral rates for natural diamond (typically around 1-2%).
- ii) identification of type II and type IaB diamond (these type of diamond has been shown to be suitable for colour enhancement treatments and may require more detailed examination).
- iii) effective detection of those heat-treated synthetics which exhibit the N3 absorption system.
- iv) explicit detection of the diamond simulant, synthetic moissanite.

The DiamondSure may be used with a wide variety of stones, both mounted and unmounted in the size range of 0.1 to 10 carats. Although designed for round brilliant cut stones, the unit will work well with most fancy cut stones.

3 INSTRUMENT IDENTIFICATION

The instrument identification label is located underneath the instrument at the rear of the baseplate. The model number and serial number should be quoted in all correspondence relating to servicing.

4 USER INTERFACES

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

4.1 LIQUID CRYSTAL DISPLAY

The DiamondSure 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 results of the tests which are carried out. 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 DiamondSure instrument; these keys are all that are required to control the machine.

The two keys are marked  (standby) and  (test/function). These keys will be identified by these symbols wherever they are referred to in this manual (see Figure 2).

4.3 SAMPLE AREA

The stones to be tested are individually placed on the end of a fibre-optic probe which is located in the centre of the sample dish as shown in Figure 1



Figure 1: Sample Dish

Measurements may be made under normal external ambient light conditions; however, under intense external illumination the referral rate may be excessively high. It is therefore recommended that the instrument be positioned away from excessive light. A warning message will be displayed if the external illumination is too bright.

The sample dish is removable to allow for testing parcels of diamonds. A parcel can be 'tipped' onto the dish, each stone tested separately, and then poured back into the parcel paper.

The sample dish is removed by sliding the dish towards you, and replaced by sliding back into position and "clicked" back.

Stones mounted in simple settings (such as rings, earrings or pendant necklaces) may be manually held in contact with the probe whilst a measurement is being made

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.

The white fibre ferrule surrounding the optical fibre tip is also an important part of the DiamondSure instrument and contamination with grease or dirt should be avoided. See Section 7.3 for further information on cleaning the fibre ferrule.

4.4 HAND HELD PROBE

If it is not possible to take measurements from mounted stones using the sample dish area, the probe can be removed from the unit and positioned directly against the mounted stone as shown in Figure 2 and used as a hand held probe.

Refer to Section 6.6.2 for more detail.



Figure 2: Hand held probe

5 EXTERNAL CONNECTIONS

5.1 POWER SUPPLY

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

The mains supply wall socket must be easily accessible.

The external power supply provided with the DiamondSure 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 DiamondSure by means of a 1 pin power socket located at the rear of the instrument see Figure 3.

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



Figure 3: Power socket location

6 OPERATION OF THE DIAMONDSURE

A list of items which comprise the DiamondSure kit may be found on page 26.

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

A quick reference guide to the operation of the instrument is provided on page 27.

6.1 INSTALLATION

The DiamondSure is designed for use indoors in an environment with a maximum ambient temperature of 30 degrees Celsius and maximum humidity of 70%, 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 DiamondSure should be positioned directly in front of the operator who should have unobstructed and comfortable access to its front panel.

- i) Plug the 1 pin power socket on the lead from the external power supply into the 1 pin socket on the rear panel of the DiamondSure. See Figure 3.
- ii) Once connected to the external power supply the unit is in 'Standby' mode.
- iii) **When not in use ensure that the external power supply is disconnected from the mains supply.**

THE INSTRUMENT SHOULD ONLY BE USED WITH THE POWER SUPPLY PROVIDED.

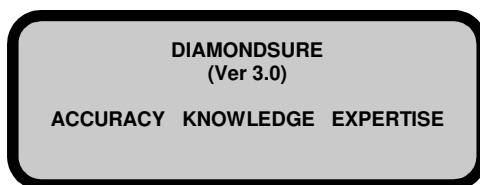
6.2 SWITCHING ON

Connect the external power supply to an earthed mains supply and to the DiamondSure as described in Section 6.1. Turn on the mains supply, the unit is now in "Standby" mode.

6.3 STANDBY MODE

Standby mode is entered when the power is first connected.

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 the standby mode for a period of more than 30mins then it will automatically switch into "low power" mode.

6.4 LOW POWER MODE

To enter 'low power' mode from the 'Standby' mode press and hold the  (standby) key until the display turns off.

With the exception of the power off state, this mode places the lowest power drain on the instrument and is incorporated to conserve energy when measurements are not being carried out. In order to conserve energy the display backlight is not operative in this mode.

6.5 INITIALISATION MODE

From standby mode ensure that the calibration arm is in position over the probe; depress the calibration arm to release and lift the arm from its position and manually swing the arm out into position as shown in Figure 4.

Once in position pressing the  key on the front panel will start the initialisation procedure. This will take the system to a state where it is fully powered up, calibrated and ready to make a measurement.

Before the standby key is pressed the unit must be closed and the calibration arm in position over the probe as shown in Figure 4.

The display backlight is turned on when this mode is entered. The following messages will be displayed during initialisation:

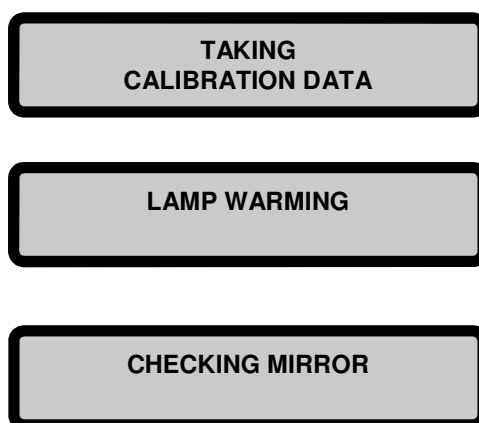
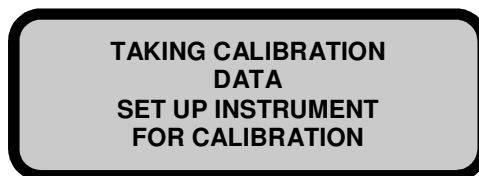


Figure 4: Calibration arm in position over probe

If the calibration arm is not in position the following message will be displayed:



If so, please position the arm as shown in Figure 4 press the  key on the front panel. The above message may also be displayed even if the calibration arm is in place. If this is the case then it is likely the overhead lighting is too bright. Reduce the overhead lighting and press .

If the calibration is successful the display will then show the following message:



Once complete the calibration arm should be lifted and swung back into its “home” position, pushed and clicked back.

The instrument is now ready for use.

In the event of an error occurring during the calibration, the sequence of messages shown in Section 6.9.1 will be displayed. Fault diagnosis is also presented in Section 6.9.

6.6 MEASUREMENT MODE

This section describes the processes involved in testing either mounted or unmounted stones. Note that the DiamondSure must be initialised before measurements may commence (see Section 6.5).

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

Before placing stones on the sample dish for measuring, ensure that the probe tip is flush or slightly protruding above the white disc. If under flush adjust the height of the tip, see Section 6.6.2.4

The measurement time may vary between 2 to 4 seconds depending upon the characteristics of the stone under test.

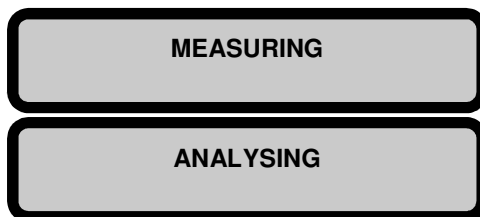
If an error message is displayed during any of the steps described in this section, consult Section 6.9 for advice on the action which should be taken.

If there is no activity for 5 minutes whilst in measurement mode the unit will switch automatically to standby mode.

Note: if a stone exhibits a bright green fluorescence when placed on the illuminated probe it should be treated with some suspicion, regardless of the test result. The stone should be submitted for a detailed gemmological examination in order to determine whether it has been treated to affect its colour.

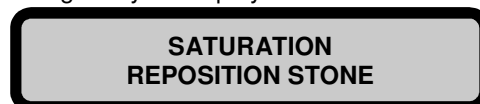
6.6.1 Unmounted stones

Centre the table of the stone directly onto the tip of the fibre-optic probe, as shown in Figure 5 then press the  key to initiate the measurement. The following sequence of messages will then be displayed:



A result will then be indicated as described in Section 6.6.3

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 press the  key on the top panel to repeat the process. Occasionally the instrument is unable to make a measurement on a stone because the saturation message cannot be eliminated. This is only likely to occur for stones smaller than 0.1 carats.

The DiamondSure is intended for use with colourless and near-colourless stones. If a dark (brown) stone is tested then the following message will be shown:



Figure 5: Placing a stone on the fibre probe

A warning message ('Room lights. Please move instrument') will be displayed if the external illumination is too bright.

6.6.2 Mounted stones

Some mounted stones may be placed on the probe in the dish area for measurement. However if this is not possible because the item is too big, unstable or not in close enough contact with the probe, the probe can be removed and used in the "hand held" position as detailed below and shown in Figure 6 and Figure 7.

The unit must be initialised first according to Section 6.5 and the "READY" message appears before removing the probe and taking measurements.

6.6.2.1 Removing the probe

The probe is attached to the underside of the sample dish. To remove the probe, first slide out the sample dish from the unit. The probe is then removed from the dish with a 90° twist action whilst holding the sample dish.



Figure 6: Removing the probe

The probe can then be carefully pulled forwards until it is fully extended.



Figure 7: Hand held probe

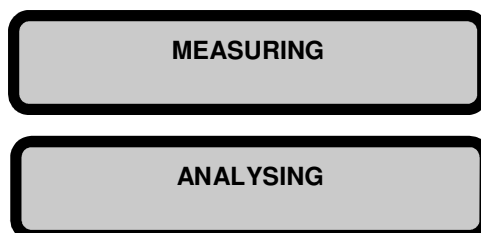
N.B The sample dish can be replaced on the unit during this function if required.

6.6.2.2 Using the probe

The probe is now ready to be used in the 'hand held' position; to enable measurements to be taken hold the probe against the stone and press the  button to initiate the measurement.

To aid in the hand held operation you can enter the 'auto detect' function by pressing and holding down the  button, for further details of the function refer to Section 6.7.

When the measurement is initiated, the following sequence of messages will then be displayed:



Once the "ANALYSING" message appears the stone may be removed from the probe, a high-pitched "beep" also indicates the stone can be removed. The above sequence of events will typically take around 2 seconds.

For reliable results, the sample must be held still throughout the above measurement procedure.

For best results fit the probe with appropriate size white disc (depending on stone size), these are located at the front of the instrument beneath the sample dish see Figure 8.



Figure 8: White disc location

If the sample is moved, the following error message may be displayed:



If this occurs, reposition the sample according to the auto detect instructions and press the  key to initiate a measurement. Hold the sample still until the message 'ANALYSING' appears on the display. In the case of jewellery set with multiple stones, only the stone under test must be touching the tip of the fibre probe for the measurement to be valid.

6.6.2.3 Replacing the dish and probe

To replace the hand held probe; click the probe back into the sample dish with a 90° twist action, guide the probe back into the unit, ensuring that the fibre slides under the main housing inside the unit see Figure 9. Replace the sample dish with the probe attached onto the unit.

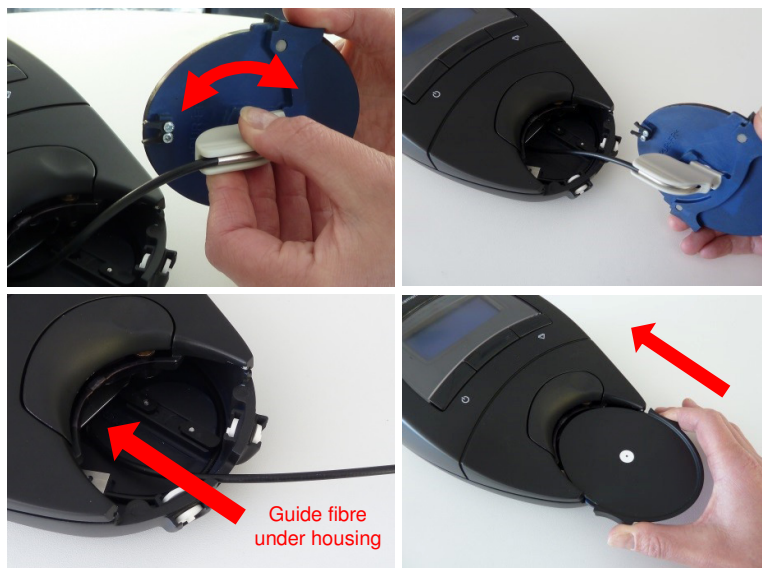


Figure 9: Replacing the hand held probe & dish

6.6.2.4 Adjusting the probe tip height

Adjust the probe height to ensure the fibre tip is slightly proud of the white disc when the sample dish is assembled. To do this use the Hex key provided to adjust the screw at the front of the unit, up or down as shown in Figure 10.

Whilst turning the key you can observe the fibre tip moving up and down, the final position should be flush with the surface of the white disc in the sample dish. This ensures that the diamond sits flat during the measurement.

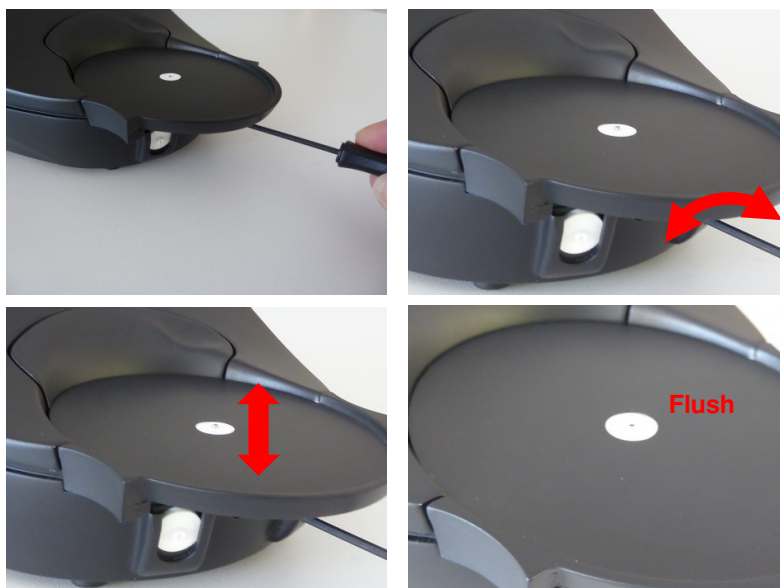
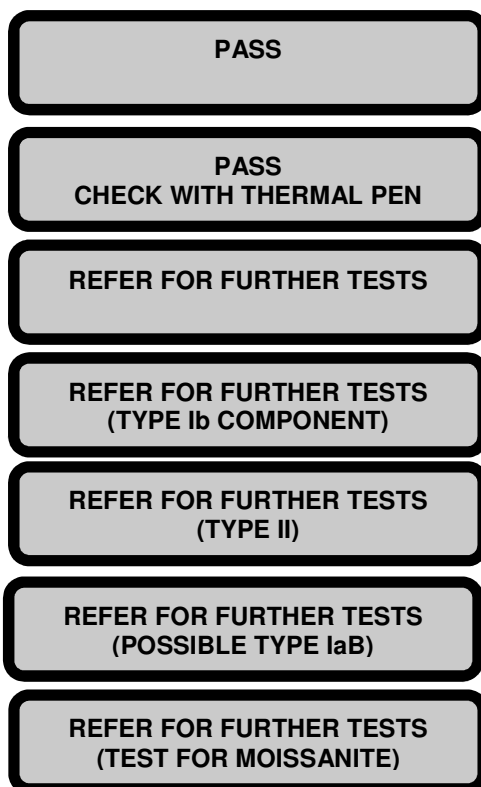


Figure 10: Adjusting the probe tip height

6.6.3 Interpretation of results

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



Tip / Information



If a 'REFER' result is obtained, re-position the stone on the probe and repeat the measurement. If the stone is again referred this process should be repeated one more time. A stone which gives three consecutive refer results should be tested on an IIDGR DiamondView™ instrument or it should be subjected to standard gemmological tests at a gemmological laboratory or other suitably qualified body.

Note: a 'referral' does not indicate that the stone is synthetic since the stone may be a member of a rare group of natural diamonds which will also be referred by this instrument.

A single 'PASS' result indicates the detection of natural diamond irrespective of previous 'REFER' results. Different results can arise as a result of the different paths which the light takes through the stone but the instrument will always give a 'failsafe' result.

If the stone is to be re-tested, pressing the  key will immediately start a new measurement. If no further measurements are immediately required the  key should be pressed and the instrument will return to the condition described in Section 6.3.

Each message will now be considered in turn:

6.6.3.1 PASS

Natural diamond has been detected.

6.6.3.2 PASS (CHECK WITH THERMAL PEN)

Natural diamond is present if the stone under test gives a 'Diamond' response when tested with a thermal pen. Some simulants may also give this response (in particular colourless CZ and beryl), but they will always be discriminated from diamond by the thermal pen test.

6.6.3.3 REFER FOR FURTHER TESTS

Synthetic diamonds will either fall into this category or one of the next two categories (see Sections 6.6.3.4 and 6.6.3.5). Many diamond simulants may also fall into this category. The remainder (apart from moissanite) will fall into the category described in Section 6.6.3.5. The occasional natural diamond may also fall into this category, particularly if it has a distinct colour. These are easily identified by standard gemmological tests.

6.6.3.4 REFER FOR FURTHER TESTS (TYPE Ib COMPONENT)

The 'Ib' absorption component is characteristic of yellow synthetic diamond. In very rare cases it may also be exhibited by natural diamond (these rare natural examples are referred to as 'Canary' yellow diamonds). Most pale yellow synthetic diamonds will produce this result, with the remainder, and all deep yellow or brownish yellow synthetics producing the refer result described in Section 6.6.3.3.

6.6.3.5 REFER FOR FURTHER TESTS (TYPE II)

All *colourless/near colourless* natural type II and synthetic type II diamond will fall into this category, as will some diamond simulants. Occasionally certain type I diamonds may also appear within this category. If a type classification is required the DiamondSure result should always be confirmed by an appropriate infra-red absorption measurement. The separation of natural type II diamond from synthetic type II diamond is easily made using standard gemmological techniques or the IIDGR DiamondView™ instrument.

Note: this result also appears when measurements are made with no stone on the probe or when a gap is present between the fibre and the table of the stone.

6.6.3.6 REFER FOR FURTHER TESTS (POSSIBLE TYPE IaB)

Small percentages of diamonds are type IaB, and will be identified by DiamondSure either as type IaB or type II. Referral as type IaB should be followed by infra-red absorption measurement for confirmation of type. Type IaB diamonds have been shown to be suitable for colour enhancement treatments and require examination that is more detailed.

6.6.3.7 REFER FOR FURTHER TESTS (TEST FOR MOISSANITE)

Moissanite will always be referred by DiamondSure and in the vast majority of cases it will be referred within this category. However, occasionally moissanite may be referred within the category described in Section 6.6.3.3. Simple gemmological tests will identify moissanite from diamond.

6.7 AUTO DETECT FUNCTION

The measurement function of DiamondSure incorporates an auto detect / measure function that senses when a stone has been placed on the probe either in the sample dish area or in the hand held position. Once a stone has been detected a "beep" sounds that indicates a stone has been detected and that the measurement is being taken.

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This function is useful for repetition i.e. when a large consignment of samples requires testing, and when operating the unit in the “hand held” position.

To place the unit into “Auto detect” mode the unit must be “Ready” for taking measurements, then press and hold the  key to enter the mode. (To exit the “Auto detect” mode press and hold the  key again.)

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  key on the top panel. The lamp which illuminates the probe will extinguish and the display will change to that shown in Section 6.3.

From this state, further measurements may be made by following the procedure set out in Section 6.5.

6.8.2 Switching the DiamondSure off

After the desired measurements have been completed, the DiamondSure should be placed into “low power” mode by pressing and holding the  key. The unit should then be left in this mode for about twenty seconds to allow the lamp to cool, after which time the power socket at the rear of the unit may be removed.

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

6.9 DIAMONDSURE ERRORS

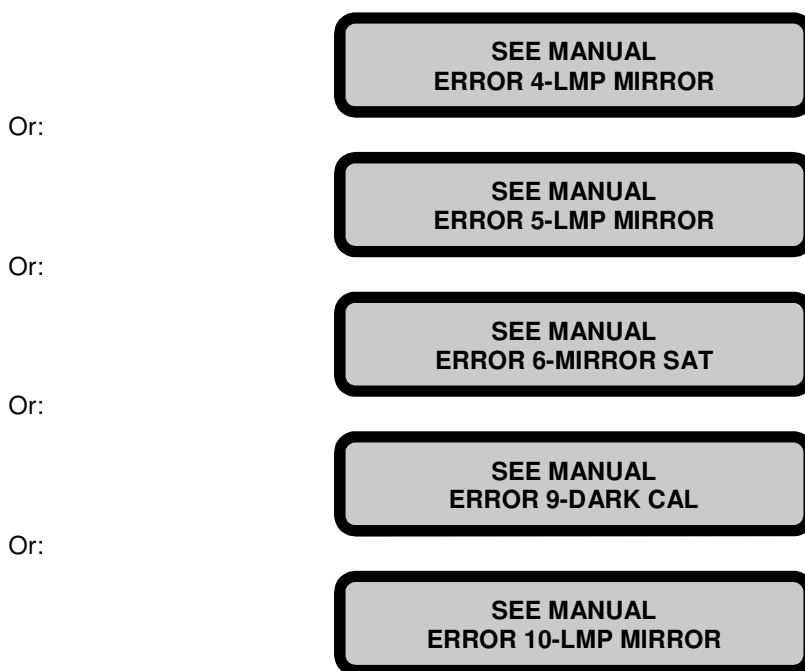
Tip / Information



A more detailed diagnostic/action chart can be found in the Error Diagnostic Guide which accompanies the unit.

6.9.1 Errors in Initialisation mode

If during the initialisation process, the following messages are displayed:



- the unit should be turned off by unplugging the external power supply and then waiting for the lamp to cool. The instrument should then be reconnected to the main power supply and re-initialised (Section 6.5) after checking each of the following in the order given:

- i) Ensure that the end of the fibre probe is clean and not obstructed (perhaps by a sample)
- ii) Ensure that the hand held probe has been replaced back into the main unit and the sample dish is clicked into its 'home' position within the unit.
- iii) Ensure that the lamp is still operating. This may be checked by repeating the initialisation procedure detailed in Section 6.5. But this time once the dark calibration reading has been taken and the message, 'LAMP WARMING' appears, swing the calibration arm away from the probe and carefully observe that the end of the fibre tip is illuminated. If the lamp does not come on, replace the lamp as detailed in Section 7.1.
- iv) If 'Error 9-DARK CAL' is displayed, unplug the unit, and then restart the initialisation process ensuring the calibration arm is in place. If error is still shown check the mirror for dust or obstructions, see Section 7.6. If the problem persists please refer the unit to the supplier.
- v) If 'Error 6-MIRROR SAT' is displayed, ensure the filter is correctly assembled. If so the lamp could be over performing and may require re-aligning. Refer to Section 7.1.1.
- vi) If 'Error 10-LMP MIRROR' is displayed, unplug the unit, and then restart the initialisation process ensuring the calibration arm is in place. If the error persists, the lamp, whilst not having failed completely, may not be performing to specification and may require replacement. Refer to Section 7.1.

- vii) If 'Error 4-LMP MIRROR' is displayed and the lamp is clearly illuminating the fibre probe, the lamp may simply need re-aligning. Consult Section 7.1.1 in order to carry out this operation. Ensure the fibre connectors into the spectrometer and lamp housing are not loose – finger tight is sufficient whilst ensuring no damage is sustained to the fibres see Section 7.4.2
- viii) Check fibre tip for wear and replace accordingly.
- ix) If 'Error 5-LMP MIRROR' is displayed the lamp, whilst not having failed completely, may not be performing to specification and may require replacement. Refer to Section 7.1. Also check fibre tip for wear and replace accordingly.

If none of the above measures are effective the unit will need to be returned to the supplier for servicing.

6.9.2 Remaining errors and actions to be taken

ERROR 1-COEFFS	Return to the supplier
ERROR 2-REF MIRROR	Return to the supplier for service
ERROR 3-FILE ERROR	Return to the supplier for service

7 MAINTENANCE

7.1 CHANGING THE LAMP

Ensure that the unit is turned off and disconnected from the mains.

If the instrument has been in recent use allow around 5 minutes for the lamp to cool. The lamp will be extremely hot immediately after use.

Once disconnected from the mains turn the instrument over and place in the storage case so that the underneath of the unit faces you.

Undo the lamp housing cover by removing the screws as shown in Figure 11 using the screwdriver provided; take care in this area as the lamp may still be hot.



Figure 11: Access to the lamp

Wearing the white gloves provided, remove the lamp by pulling it vertically upwards and out of the lamp holder (See Figure 12)



Figure 12: Removing the lamp

Take one of the spare lamps provided in the DiamondSure kit and, holding it using the white gloves, insert it into the lamp holder by firmly pushing it vertically downwards until it hits a stop. Note that if an attempt is made to push the lamp in whilst it is tilted, it could break. When looking from above, ensure that the lamp is vertical and not tilted in any direction.

Warning



NEVER touch the glass of the lamp with bare hands; ALWAYS use the white gloves provided

When changing the lamp be careful not to touch the filters that are in the lamp housing, shown as “A” in Figure 12.

Replace the lamp housing cover and replace the screws to hold it in place.

Now check the lamp alignment by following the procedure outlined in Section 7.1.1.

Note: spare lamps may be purchased from the supplier of this instrument.

Failure to use lamps purchased from the supplier may significantly impair the performance of the DiamondSure or result in an initialisation error.

7.1.1 Aligning the lamp

Ensure that the unit is switched off and that the calibration arm is “out” in position over the probe in the sample dish area.

While holding the  key down on the front panel turn the instrument on by connecting the external power supply.

When the ‘LAMP WARMING’ message appears on the display, release the  key.

The following message will then be displayed:



If the ‘|’ on the second line of the display lies approximately central (i.e. below the ‘T’ or ‘I’ of ‘CALIBRATION’ on the first line) then the lamp throughput is comparable to the factory-tested value and no alignment is required. If it lies to the right of centre then throughput is enhanced relative to the factory setting and no alignment is required.

If the ‘|’ lies significantly to the left of centre then lamp throughput is diminished and re-alignment may be required.

To re-align, adjust the lamp position by using the two adjusting screws located at the back and side of the unit (see Figure 13). Firstly turn the rear adjusting screw using the Hex key provided. Turn clockwise and anti-clockwise noting the effect on the signal level on the display. The signal is maximised when the ‘|’ is as far right of the display as possible. A further fine adjustment can be made with the adjusting screw on the side of the unit. Use the same Hex key to make fine adjustments to ensure the maximum signal has been achieved.

It should be noted that if, when maximised, the ‘|’ still lies to the left of the ‘B’ of ‘CALIBRATION’ the instrument performance will not necessarily be impaired. The unit should only be returned for servicing if the referral rate for natural diamond is noticeably high or if the unit fails to initialise.

To exit calibration mode press the  key until the message ‘TURNING LAMP OFF’ appears. The key should then be released and the instrument returns to standby mode, as detailed in Section 6.3.



Figure 13: Rear and side view showing adjusting screws

7.2 CLEANING THE PROBE

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

Remove fibre-optic probe from the sample dish prior to cleaning (see Section 6.6.2.1). Remove dirt or grease using a cotton bud (Q-tip) dowsed in alcohol (methanol or ethanol are ideal). Do **not** use acetone. The cotton bud should be moved across the probe in gentle sweeping actions.

7.3 CLEANING THE FIBRE FERRULE

The white fibre ferrule, see **Figure 14**, is an important part of the DiamondSure instrument and contamination with grease or dirt should be avoided as this will severely diminish the performance of the instrument.



Figure 14 White fibre ferrule situated in the centre of the sample dish.

The fibre ferrule should be cleaned or replaced when it becomes discoloured. Cleaning every 3 months is recommended if the instrument is heavily used, sooner if there is clear evidence of dirt and grease.

The fibre ferrule must be removed from the sample dish prior to cleaning. Care should be taken not to touch the front surface of the fibre ferrule during this process. A clean tissue or cloth should be placed over the fibre ferrule before gently pushing it out of the sample dish. Alternatively, cotton gloves can be worn to handle the fibre ferrule.

Hold the fibre ferrule by its edge during the cleaning process. Begin by sanding the front surface of the fibre ferrule under running water with 500 grit size wet or dry sandpaper (3M Wetordry Tri-M-ite P500 sandpaper is recommended). After a few seconds transfer the sandpaper and fibre ferrule to a flat surface and continue sanding for approximately 10 seconds. Rinse the fibre ferrule under running water and finish by blow drying with clean air or nitrogen, or allow the material to air dry. Once the fibre ferrule is dry fit it back into the sample dish by pushing it gently back into place taking care not to touch the front surface of the fibre ferrule.

The sample dish should be fitted back into the DiamondSure instrument. It may be necessary to adjust the height of the fibre-optic probe tip following the fitting of the sample dish. The fibre tip should be very slightly proud of the fibre ferrule when the sample dish is in place. Use a hex key to adjust the screw at the front of the unit to move the fibre tip up or down. See Section 6.6.2.4 for further details.

The thickness of the fibre ferrule is reduced after each cleaning cycle and eventually it will need to be replaced. Replace the fibre ferrule when it sits significantly below the sample dish or it becomes difficult to set the fibre-optic tip to be slightly proud of the fibre ferrule.

Contamination of the fibre ferrule with grease or dirt should be avoided following the cleaning process. Always use tweezers to place stones on the DiamondSure and avoid touching the ferrule with fingers.

Contamination of the fibre ferrule with acetone should also be avoided. If acetone is used as part of the stone cleaning process try to ensure the stone is completely dry when it is placed on the DiamondSure and be careful not to drip acetone onto the sample dish area.

Note: Replacement fibre ferrules may be purchased from the supplier of this instrument.

7.4 REPLACING THE FIBRE

Over a long period of time the fibre may become scratched and worn, this will in turn impair the performance of the unit. The removal and replacement of the fibre can be carried out by the user.

The user may purchase a new fibre from the supplier and replace it according the instructions in Section 7.4.1 and 7.4.2.

7.4.1 To remove the fibre

1. Remove the sample dish from the unit and detach the probe from the dish, see Section 6.6.2.1
2. Remove the probe body from the fibre. To do this remove the M3 retaining spring plunger screw from the top of the probe using the tool provided. Then remove the adjusting cam using the tool provided from the front of the probe as shown. See Figure 15.
The fibre will then slide away from the probe body.

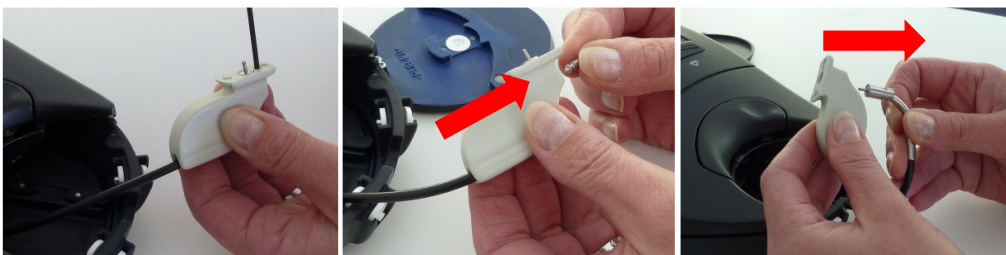


Figure 15: Removing the probe body

3. Loosen the two tab screws on the underside of the unit and push the fibre cable retaining tabs inwards to release the fibre see Figure 16.



Figure 16 Retaining tabs

4. Pull the fibre cable forwards out of the unit. See Figure 17.



Figure 17: Remove the fibre forwards

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5. Turn over the unit and remove the two torx screws and remove the fibre access cover. See Figure 18

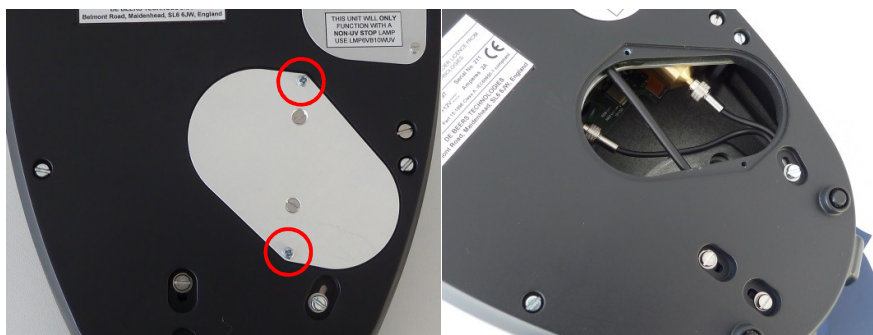


Figure 18: Remove access cover

6. Unscrew the clamp screw to release the fibre fixing block from the case. See Figure 19

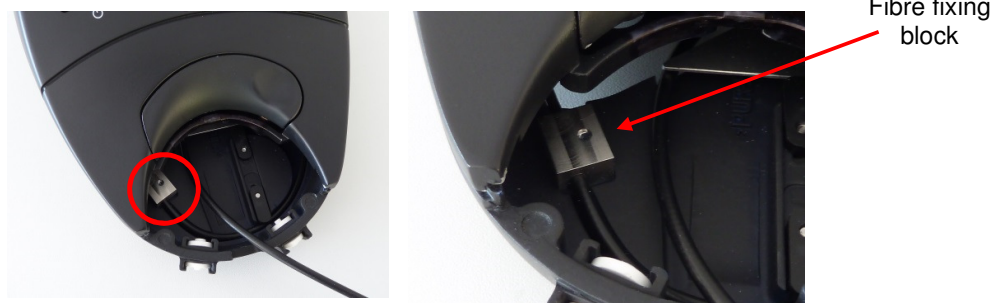


Figure 19: Remove fixing block

7. Now the fibre tails can be removed by unscrewing the knurled part of the tail. Remove fibre from the unit. See Figure 20.



Figure 20: Unscrew tails

7.4.2 To assemble the new fibre

To assemble the new fibre, first remove all outer packaging ensuring not to damage the ends.

Secondly remove the two clean caps from the tails of the fibre **Do not touch the ends of the fibre.**

1. Guide the fibre tails into the unit through the front of the unit (sample dish removed) with the remaining length of the fibre outside of the unit.
2. Turn the unit over and locate the fibre tails through the access opening.
3. Screw in the tails of the fibre one by one. The short tail is to be assembled into the right hand socket (when looking from the underside) and the long tail on the left of the access area. See Figure 21.

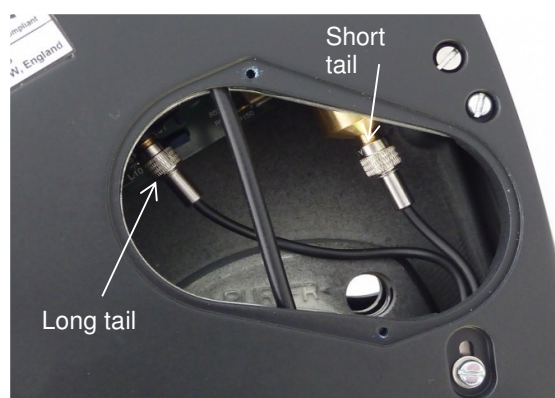


Figure 21: Assembling the fibre tails

4. Once the fibres are in position locate the clamp block back into the unit. Screw the clamp block into position ensuring that the fibre tails are not stretched, with a **slight curve in the short tail**. See Figures 19 and 20
5. The fibre can now be (1) fed back in and around the unit as shown, then (2) push the two fibre retaining tabs outwards and tighten the tab screws on the underside of the unit. See Figure 22.



Figure 22: Re-assembling the fibre cable

6. Replace the access cover on the back of the unit.

7. Re-assemble the probe body to the fibre see Figure 15.

To do this first remove the protective cap from the tip of the fibre, then guide the fibre into the probe body.

Replace the adjusting cam into the front of the probe using the tool provided ensuring the cam locates within the slot of the fibre sleeve.

Once in position replace the retaining spring plunger screw using the tool provided into the top of the probe to secure the components together.

8. The probe can now be replaced back into the sample dish, and the dish back onto the unit.
With the dish now assembled into the unit the fibre tip will need to be adjusted to ensure that it sits flush or slightly proud of the white disc, see Section 6.6.2.4 see Figure 10

Note: Worn fibres can be re-polished and re-used. Please contact the supplier via the website for more information on this service <https://verification.debeersgroup.com>

7.5 REPLACING THE FILTER

Over a long period of time the lamp filter may deteriorate or become scratched, this may impair instrument performance and will therefore require a replacement.

7.5.1 To remove the filter

To remove the filter, ensure that the unit is powered off and disconnected from the mains. Once disconnected from the mains turn the instrument over and place into the storage case so that the underneath of the unit is facing you.

Undo the lamp housing cover by removing the screws with a flat head screwdriver, as shown in Figure 23, tool provided; take care in this area as the lamp may still be hot. Once the cover is removed, the filter retainer should be slid back, by loosening the screw to allow for the filter to be removed easily, see Figure 23.



Figure 23: Filter access

The filter is opposite the lamp; it is blue in colour. Using the white gloves provided carefully lift and pull the filter out vertically from the instrument as shown in Figure 24.

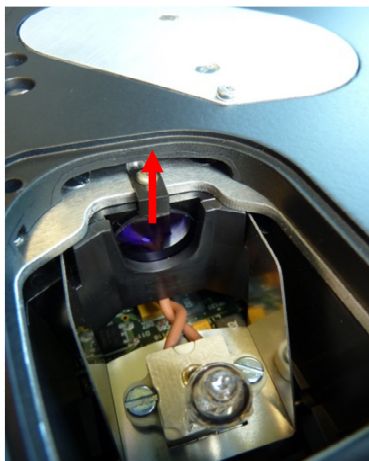


Figure 24: removing the filter

Once the filter has been removed, replace with a new one using the white gloves provided taking extra care not to scratch or mark the surface of the filter. When assembling the filter back into the instrument ensure that the filter retainer is put back into position, holding the filter in place.

Note: Spare filters may be purchased from the supplier of this instrument.

7.6 CHECKING THE MIRROR

The calibration arm houses a mirror which could become dirty or scratched, and in turn impair the calibration process.

The mirror can be checked for any problems by removing the fibre access cover and viewing the mirror from inside the unit see Figure 25.

If the mirror has dust or dirt on the surface use an air can or similar to blow off the dust. **Do not use any chemicals on the surface of the mirror.**

If the mirror has become scratched, the mirror will need replacing – please return the unit to the supplier.

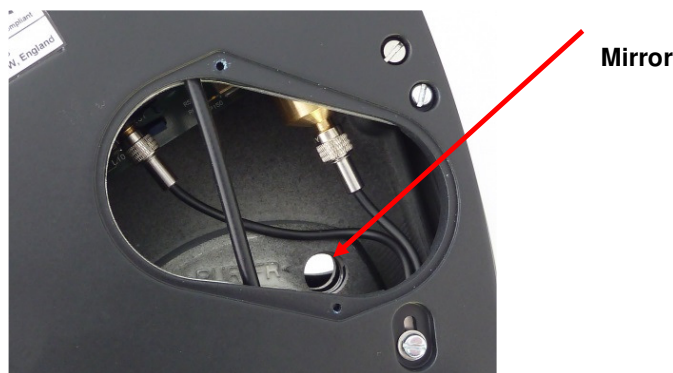


Figure 25: Mirror location

8 **PACKING LIST**

The following is the packing list for the DiamondSure.
The items are illustrated in Figure 26.

- A. 1 DiamondSure instrument
- B. 1 External power supply
- C. 2 Spare lamps (Philips or GE 10 W 6V QTH)
- D. 1 Pair of white gloves (for use during lamp replacement)
- E. 1 Flat head screw driver
- F. 1 Torx screwdriver
- G. 2 Hex keys (2 different sizes)
- H. Power lead
- I. Installation & User Manual
- J. Quick Start Sheet
- K. Error Diagnostic Guide
- L. Spare Fibre



Figure 26: Contents of the DiamondSure kit

QUICK REFERENCE GUIDE

- Turn the instrument on by turning the main power supply on.
- Ensure that the calibration arm is in the “out” position over the probe.
- Press **Standby** 
- Wait until the ‘READY’ message is displayed.
- Replace the calibration arm and place the stone to be tested table down onto the centre of the probe.
- Press the  key and wait a few seconds for the result to appear
- If ‘PASS’ is displayed then natural diamond has been detected.
- If ‘PASS (CHECK WITH THERMAL PEN)’ is displayed , and the stone registers as ‘Diamond’ during a thermal pen test then natural diamond is present.
- If ‘REFER FOR FURTHER TESTS’ appears then the stone should be re-positioned on the fibre-probe and re-tested. If these additional tests also give ‘REFER’ results then the stone should be passed to a Gemmological Laboratory for further analysis or tested with a DiamondView instrument.
- If ‘REFER FOR FURTHER TESTS (TYPE Ib COMPONENT)’ appears then the stone should be re-positioned on the fibre-probe and re-tested. If these additional tests also give ‘REFER’ results then the stone should be passed to a Gemmological Laboratory for further analysis or tested with a DiamondView instrument.
- If ‘REFER FOR FURTHER TESTS (TYPE II)’ appears then reposition the stone and re-test, if same result appears then the stone is either a colourless type IIa natural or IIa synthetic or a diamond simulant. The stone should be passed on to a Gemmological Laboratory for further analysis or tested with a DiamondView instrument.
- If “REFER FOR FURTHER TESTS (POSSIBLE TYPE IaB)’ appears, then the stone could be type IaB and should be passed on to a Gemmological Laboratory for further analysis.
- If ‘REFER (TEST FOR MOISSANITE)’ appears then reposition and re-test, if the same result appears then apply simple gemmological tests to confirm that the stone is synthetic moissanite
- To re-test, or to measure other stones remove and replace a stone on the probe and press the  key.

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- 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 supply when not in use.