

Instructions for Spark Diamond Detection System

Introduction

The diamond cutting system is a comprehensive system dedicated to the evaluation and analysis of diamond cutting quality. It integrates advanced image analysis, measurement technology, data processing, and a user - friendly operation interface, providing accurate and efficient cutting detection solutions for professionals and enthusiasts in the diamond industry.

System Overview

- **Hardware Composition:** It includes a diamond cutting instrument, a stage, a computer host, a monitor, a printer, etc.
- **Software Functions:** It has functions such as image acquisition, algorithm processing, display of detection result data, 3D model display, export and storage of data files, report printing, multi - language settings, grading standard settings, and model settings. It can measure multiple cutting parameters such as total depth ratio, table width ratio, crown angle, crown height ratio, pavilion angle, pavilion depth ratio, and girdle thickness ratio, and evaluate the cutting grade according to international standards, IGI standards, and custom - developed standards.

Installation and Initialization

- **Installation Steps:**
 - i. Connect the diamond cutting instrument to the designated interface of the computer host and ensure a stable connection.
 - ii. Connect the printer and install the printer driver.
 - iii. Turn on the computer, insert the installation USB drive of the diamond cutting system or run the installation program, and complete the software installation according to the prompts.
- **Initialization Settings:**
 - i. When the system is run for the first time, system initialization is required, including setting the IP address, algorithm parameters, cutting instrument parameters, system language, user permissions, etc. (For details, refer to the installation manual).
 - ii. Enter the system administrator account and password, and after logging in to the system, enter the settings interface to perform relevant system configuration settings.

Operation Process

- **Sample Preparation:**

- i. Before testing the stone, ensure that the stone and the stage are clean. Use tweezers to carefully pick up the stone to be tested, avoiding direct contact with the diamond surface by hand.
- ii. Gently place the diamond on the stage with the table of the diamond facing down and centered on the stage. Ensure that the stage is clean and free of foreign objects. Finally, close the lid of the instrument for the next scanning operation.

- **Measurement Operation:**

- i. Open the Spark Diamond Cutting Detection System and select the "Start Detection" option on the main interface.
- ii. On the diamond selection page, select the shape and format of the stone to be tested (the current version only supports round and P8 - P8 formats).
- iii. Click the "Start Detection" button, and the system will pop up a diamond code input box:
 1. Click the "Skip" button, and the detection result data will be automatically saved to the "temp" file without a stone number.
 2. Click the "OK" button (manually or use a barcode scanner to enter the stone number), and the detection result data will automatically generate a file with the diamond number.
- iv. The system will automatically control the optical measuring instrument to collect optical data of the diamond from multiple angles and in all directions, generate detection result data, and evaluate the cutting grade of the detected diamond.
- v. During the stone detection process, click the "Start/Pause/Previous Frame/Next Frame" buttons to view the detection images multifunctionally.
- vi. During the stone detection process, click the "Terminate Detection" button to end the current detection process.

- **Result Viewing and Analysis:**

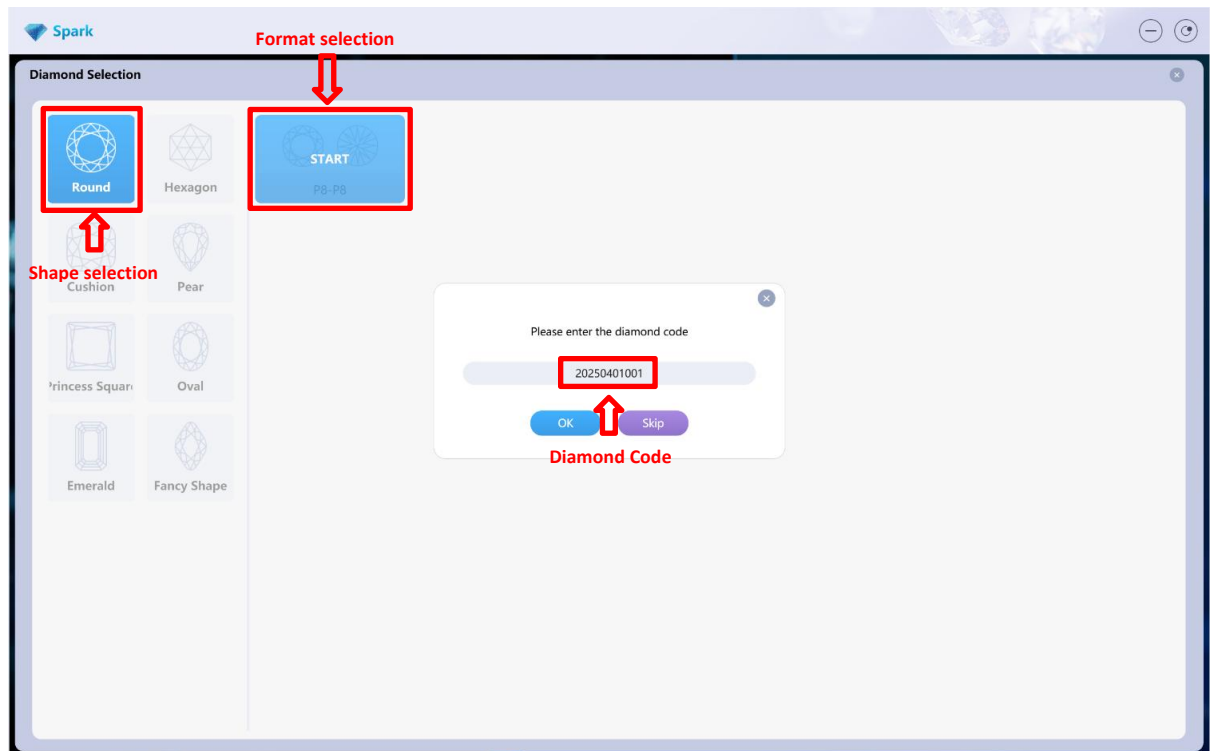
- i. After the measurement is completed, the system displays the basic information, result data, and 3D model of the diamond on the detection result page.
- ii. The evaluation standards for the cutting grade and symmetry grade of the parameters are used to grade the diamond according to the cutting standard and symmetry standard selected in the system configuration (such as "Excellent - Ide (Perfect)", "Excellent", "Very Good", "Good", "Fair", "Poor").
- iii. In the 3D model, further analyze and view the measurement data (such as viewing the optical reflection and refraction images of each facet).
- iv. 3D Model Multifunctional Settings:
 1. Left - click the face of the model: Clicking on the same - type face will change the color and display the object information.
 2. Middle - click and drag: Hold the middle mouse button and drag to change the position of the model.
 3. Mouse wheel: Scroll up to enlarge the diamond model and scroll down to reduce it.
 4. Right - click the model area: A 3D model property option will pop up. Refer to the text content of the property options to "Enable/Disable" functions for analyzing the model data and symmetry.
 5. Right - click and drag: Hold the right mouse button and slide the mouse to rotate the 3D model.
 6. Rotation button: Click to automatically play the model imaging display.
 7. Hearts and arrows diagram button: Click to display the hearts and arrows diagram imaging of the diamond.
- v. Evaluate the symmetry by observing through the 3D model grid - line caliper property, and manually modify the evaluation grade through the symmetry list of the detection result data.

Methods of Recording and Saving Measurement Results

- **Automatic Saving:**
 - i. When entering the diamond number at the start of detection: After the detection is completed, a data file named after the diamond number will be automatically generated. The system will automatically save the measurement results to the database after the measurement is completed, and you can view the measurement result records in the TXT file in the file save path.
 - ii. When not entering the diamond number at the start of detection: After the detection is completed, a piece of temporary data will be automatically appended to the "temp" file. The "temp" file is in the file save path configured by the system.
- **Manual Saving:**
 - i. Click the "Save" button on the detection result page (when the diamond number has been entered), and save the measurement result data file (such as TXT, Excel, STL, DAT formats). The file output format depends on the selected upload file options in the system configuration.
 - ii. Click the "Save" button on the detection result page (when the diamond number has not been entered), a diamond code input dialog box will pop up. Confirm by scanning with a barcode scanner or manually entering the number, and save the measurement result data file (such as TXT, Excel, STL, DAT formats). The file output format depends on the selected upload file options in the system configuration.
- **File Export:**
 - i. Click the "Export" button on the detection result page (when the diamond number has been entered), manually select the export file path, and export the measurement result data TXT file.
 - ii. Click the "Export" button on the detection result page (when the diamond number has not been entered), a diamond code input dialog box will pop up. Confirm by scanning with a barcode scanner or manually entering the number, manually select the export file path, and export the measurement result data TXT file.
- **Print Output:**
 - i. Click the "Print" button on the detection result page, and the system will pop up a print preview page.
 - ii. After confirming the print, print the detection report label.

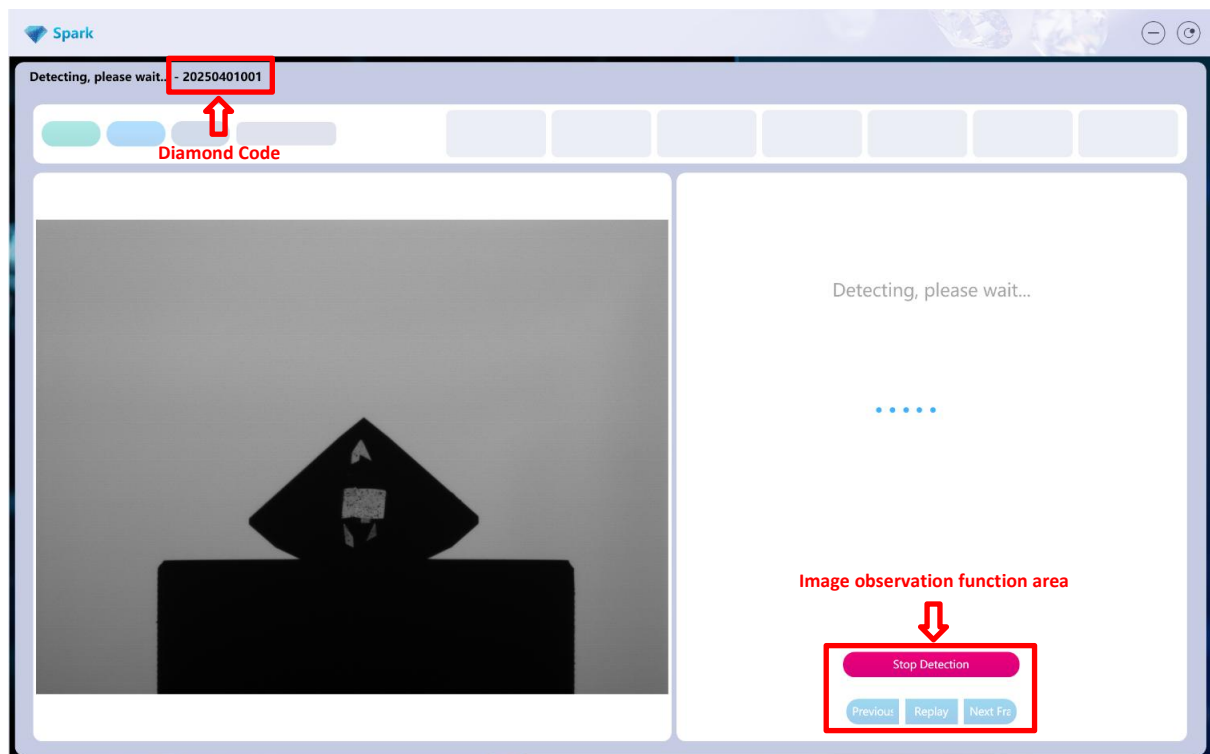
Function Introduction

- Diamond Selection:



Diamond Selection Page

- Start Detection:



Start Detecting Page

- **Detection Result:**



Detection Result Page

- i. The diamond basic information area shows the standard (the current detection and evaluation standard version), the shape of the detected diamond, the crown and pavilion formats of the detected diamond, and the estimated weight of the detected diamond.
- ii. The diamond data area displays the detection result parameter information. The cutting evaluation grade includes total depth ratio, table width ratio, crown angle, crown height ratio, pavilion angle, pavilion depth ratio, and girdle thickness ratio. The symmetry evaluation grade includes total depth ratio, crown angle, crown height ratio, wave peak (kite face), girdle thickness ratio, pavilion angle, pavilion depth ratio, table off - center ratio, culet off - center ratio, twist, and culet - to - table off - center ratio.
- iii. The four buttons in the model view box are used to observe the picture properties of the 3D graph, which are top view, bottom view, front view with the culet facing down, and front view with the culet facing up.
- iv. The 3D model is a real - diamond 3D model obtained after scanning.

- **Diamond Detailed Data Page:**

Spark

Detection Result - 20250401001(1.074ct)

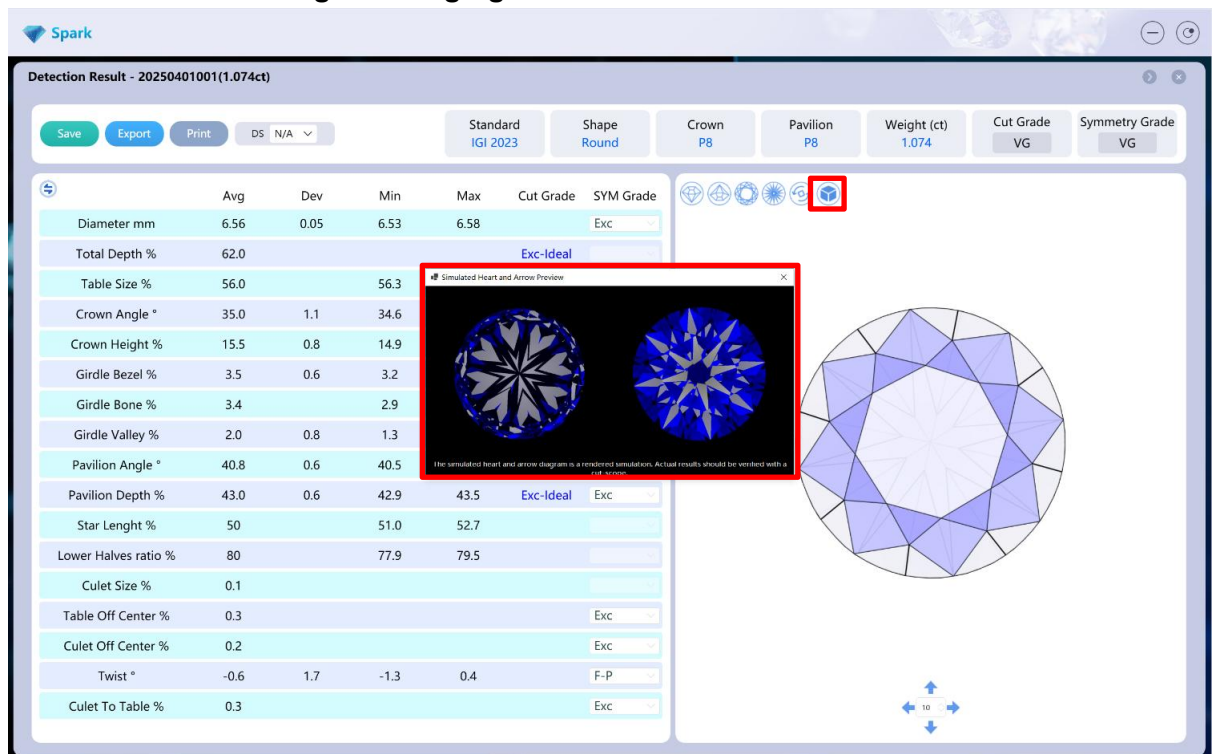
Save Export Print DS N/A

Standard IGI 2023 Shape Round Crown P8 Pavilion P8 Weight (ct) 1.074 Cut Grade VG Symmetry Grade VG

	Avg	Dev	Min	Max	1	2	3	4	5	6	7	8	Cut Grade	SYM Grade
Diameter mm	6.56	0.05	6.53	6.58	6.56	6.53	6.54	6.56	6.57	6.57	6.55	6.55	Exc	
Total Depth %	62.0												Exc-Ideal	
Table Size %	56.0		56.3	56.8	56.3	56.8	56.3	56.8					Exc-Ideal	
Crown Angle °	35.0	1.1	34.6	35.7	35.1	35.6	34.6	34.9	35.0	34.8	34.7	35.7	Exc-Ideal	VG
Crown Height %	15.5	0.8	14.9	15.7	15.6	15.7	15.0	15.0	15.1	14.9	15.1	15.6	Exc-Ideal	Exc
Girdle Bezel %	3.5	0.6	3.2	3.8	3.4	3.2	3.5	3.3	3.6	3.6	3.8	3.4	Exc	
Girdle Bone %	3.4		2.9	3.8	2.9	3.6	3.5	3.8	3.5	3.2	3.0	3.5		
Girdle Valley %	2.0	0.8	1.3	2.1	1.38	1.49	1.52	1.66	2.02	2.03	2.08	2.13	VG	Exc
Pavilion Angle °	40.8	0.6	40.5	41.1	40.6	40.5	40.9	41.0	40.9	41.1	40.8	40.7	Exc-Ideal	Exc
Pavilion Depth %	43.0	0.6	42.9	43.5	42.9	42.9	43.3	43.5	43.2	43.4	43.0	42.9	Exc-Ideal	Exc
Star Length %	50		51.0	52.7	52.7	52.2	52.7	51.0	52.0	51.1	52.7	51.8		
Lower Halves ratio %	80		77.9	79.5	78.8	78.5	77.9	78.6	79.5	79.0	78.1	78.3		
Culet Size %	0.1													
Table Off Center %	0.3												Exc	
Culet Off Center %	0.2												Exc	
Twist °	-0.6	1.7	-1.3	0.4	-1.3	-0.1	-1.3	-0.2	-1.0	-0.2	-0.8	0.4	F-P	
Culet To Table %	0.3												Exc	

Diamond Detailed Data Page

- **Hearts and Arrows Diagram Imaging:**



Diamond Heart Arrow Diagram - Optical Imaging

- Manual export function:

	1	2	3	4	5	6	7	8	Cut Grade	SYM Grade				
6.56	6.53	6.54	6.56	6.57	6.57	6.55	6.55		Exc					
56.3	56.8	56.3	56.8						Exc-Ideal					
35.1	35.6	34.6	34.9	35.0	34.8	34.7	35.7		Exc-Ideal	VG				
Crown Height %	15.5	0.8	14.9	15.7	15.6	15.7	15.0	15.1	14.9	15.1	15.6	Exc-Ideal	Exc	
Girdle Bezel %	3.5	0.6	3.2	3.8	3.4	3.2	3.5	3.3	3.6	3.6	3.8	3.4		Exc
Girdle Bone %	3.4		2.9	3.8	2.9	3.6	3.5	3.8	3.5	3.2	3.0	3.5		
Girdle Valley %	2.0	0.8	1.3	2.1	1.38	1.49	1.52	1.66	2.02	2.03	2.08	2.13	VG	Exc
Pavilion Angle °	40.8	0.6	40.5	41.1	40.6	40.5	40.9	41.0	40.9	41.1	40.8	40.7	Exc-Ideal	Exc
Pavilion Depth %	43.0	0.6	42.9	43.5	42.9	42.9	43.3	43.5	43.2	43.4	43.0	42.9	Exc-Ideal	Exc
Star Length %	50		51.0	52.7	52.7	52.2	52.7	51.0	52.0	51.1	52.7	51.8		
Lower Halves ratio %	80		77.9	79.5	78.8	78.5	77.9	78.6	79.5	79.0	78.1	78.3		
Culet Size %	0.1													
Table Off Center %	0.3													Exc
Culet Off Center %	0.2													Exc
Twist °	-0.6	1.7	-1.3	0.4	-1.3	-0.1	-1.3	-0.2	-1.0	-0.2	-0.8	0.4		F-P
Culet To Table %	0.3													Exc

Manually export data and save it as a TXT text file

- Manual saving function:

	Avg	Dev	Min	Max	1	2	3	4	5	6	7	8	Cut Grade	SYM Grade
Diameter mm	6.56	0.05	6.53	6.58	6.56	6.53	6.54	6.56	6.57	6.57	6.55	6.55		Exc
Total Depth %	62.0													Exc-Ideal
Table Size %	56.0		56.3	56.8	56.3	56.8	56.3	56.8						Exc-Ideal
Crown Angle °	35.0	1.1	34.6	35.7	35.1	35.6	34.6	34.9	35.0	34.8	34.7	35.7	Exc-Ideal	VG
Crown Height %	15.5	0.8	14.9	15.7	15.6	15.7	15.0	15.0	15.1	14.9	15.1	15.6	Exc-Ideal	Exc
Girdle Bezel %	3.5	0.6	3.2	3.8	3.4	3.2	3.5	3.3	3.6	3.6	3.8	3.4		Exc
Girdle Bone %	3.4		2.9	3.8	2.9	3.6	3.5	3.8	3.5	3.2	3.0	3.5		
Girdle Valley %	2.0	0.8	1.3	2.1	1.38	1.49	1.52	1.66	2.02	2.03	2.08	2.13	VG	Exc
Pavilion Angle °	40.8	0.6	40.5	41.1	40.6	40.5	40.9	41.0	40.9	41.1	40.8	40.7	Exc-Ideal	Exc
Pavilion Depth %	43.0	0.6	42.9	43.5	42.9	42.9	43.3	43.5	43.2	43.4	43.0	42.9	Exc-Ideal	Exc
Star Length %	50		51.0	52.7	52.7	52.2	52.7	51.0	52.0	51.1	52.7	51.8		
Lower Halves ratio %	80		77.9	79.5	78.8	78.5	77.9	78.6	79.5	79.0	78.1	78.3		
Culet Size %	0.1													
Table Off Center %	0.3													Exc
Culet Off Center %	0.2													Exc
Twist °	-0.6	1.7	-1.3	0.4	-1.3	-0.1	-1.3	-0.2	-1.0	-0.2	-0.8	0.4		F-P
Culet To Table %	0.3													Exc

Manually save data files (the file format is determined by the upload file format in the system configuration)

Shortcut Key Definition

- **Combination shortcut keys:**

List of Shortcut Keys for Spark Client			
ID	Applicable pages	Shortcut keys	Role
1	detection result page	Ctrl + Alt + Q	Quickly start the inspection, jump to the diamond selection page to automatically select the shape and specifications for this inspection, and pop up the diamond code input.
2	detection result page	Ctrl + Alt + E	Close the detection results page.
3	detection result page	Ctrl + 1	Switch between "Detailed Data Page" and "Data Model Page".
4	detection result page	Ctrl + 2	Render and open the heart arrow diagram.

System maintenance and calibration

- **Routine maintenance:**
 - i. Regularly use a clean soft cloth to wipe the lens and stage of the optical measuring instrument, remove dust and stains, and keep the optical system clean.
 - ii. Check the disk space and memory usage of the computer system, promptly clean up useless files and programs, and ensure smooth system operation.
- **Periodic calibration:**
 - i. To ensure the accuracy and reliability of the measurement, it is recommended to calibrate the system every three months.
 - ii. Calibration operations require the use of standard diamond samples and calibration tools, following the steps of the system maintenance personnel. System settings must not be changed arbitrarily during the calibration process.

Troubleshooting

- **Abnormal measurement results:**
 - i. Check the surface of the diamond sample for stains, scratches, or other defects. If necessary, use a specialized diamond cleaner to clean or replace the sample.
 - ii. Check the calibration status of the system, and if it has exceeded the calibration cycle, perform calibration operations in a timely manner.
 - iii. Confirm whether there is vibration, strong light, or electromagnetic interference in the surrounding environment of the system during measurement, and adjust the measurement environment if necessary.
- **System failure:**
 - i. If the system crashes, freezes, or experiences other abnormal situations, try restarting the system and related devices.
 - ii. Check if there are updated versions of the system software, and if necessary, promptly update the software.
 - iii. If the problem still cannot be solved, contact the system manufacturer or professional technicians for repair and handling.

Precautions

- When operating the Starlight Diamond Cutting Inspection System, please strictly follow the operating steps in this manual and do not arbitrarily change the system settings or engage in illegal operations.
- Please do not delete or modify system files at will to avoid affecting the accuracy of detection data and causing program crashes due to missing important files. If it is necessary to modify the file, please contact the system maintenance personnel.
- Before scanning the stone, it is necessary to ensure that the stone is clean (which affects the detection result data) and the stage is clean and free of foreign objects.
- Do not loosen the machine connection lines or turn off the power while the software is running.
- Non professional maintenance personnel are not allowed to disassemble the hardware equipment of the system without authorization, in order to avoid equipment damage or safety accidents.
- If any abnormal sound, odor or other abnormal situation is found in the system during use, it should be immediately stopped and the power should be cut off. After identifying the cause and troubleshooting, it can be resumed.
- Properly store the relevant accessories, standard samples, and manuals of the system so that they can be accessed and used in a timely manner when needed.