

PROJECT ASSURE
DIAMOND VERIFICATION INSTRUMENT STANDARD
TEST RESULTS

Assessment Report for: Jubilee Diamond Instruments / BELIZE combination tester



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Report Date: July 31, 2024
Approved by:

Quinten Van Avondt
Lab Manager

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DIAMOND VERIFICATION INSTRUMENT

Manufacturer's Name: Jubilee Diamond Instruments
Instrument Model: BELIZE Combination Tester (GEM-0022-01)
Serial Number: S/N: 222404180N
Software Version: not applicable
Lab Manager: Quinten Van Avondt
Analyst /Operator: Cindy De Plukker

Manufacturer stated diamond verification instrument description and features:

- Manual stone feed
- Automatic stone classification (Earth mined diamond, Type IIa/HPHT/CVD diamond, Simulant and Moissanite)
- Manual stone sorting

Manufacturer stated diamond verification instrument limitations:

- Loose stones
- All types of mounted jewelry, closed and open-back
- Stone size 0.02 ct to 10 ct
- Stone colour D-J
- Stone clarity VVS1 to SI2

INSTRUMENT PERFORMANCE ASSESSMENT

ASSESSMENT CRITERIA

The ASSURE testing methodology and performance metrics are dependent on the operational capabilities of the diamond verification instrument being tested. These are defined by the following three categories:

Category 1- Screen diamonds from synthetic diamonds. This category of device is intended for discrimination of diamonds from synthetic diamonds. It cannot distinguish diamonds from diamond simulants and therefore requires stones to be pre-screened to ensure no simulants are introduced into the device.

Category 2 – Screen diamonds from synthetic diamonds and diamond simulants. This category of device is intended for discrimination of diamonds from synthetic diamonds and diamond simulants. This device cannot distinguish synthetic diamonds from diamond simulants.

Category 3 – Screen diamond from synthetic diamonds from diamond simulants. This category of device is intended for discrimination of diamonds, synthetic diamonds and diamond simulants from each other. This device can distinguish synthetic diamonds from diamond simulants.

Instrument performance for classifying the different kinds of stones was assessed against:

Diamond Verification Instrument Standard Part 1 – Diamond Verification Instrument for Screening Diamonds from Synthetic Diamonds (2024 03 08)





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- Diamond Verification Instrument Standard Part 2 – Diamond Verification Instrument for Screening Diamonds from Synthetic Diamonds and Diamond Simulants (2024 03 08)
- Diamond Verification Instrument Standard Part 3 – Diamond Verification Instrument for Screening Diamonds, Synthetic Diamonds, and Diamond Simulants (2024 03 08)

as referenced in sections 7.3 and 7.4 of the Diamond Verification Instrument Standard – General Requirements for Evaluation Diamond Verification Instruments (2024 03 08). Any deviations from the Standard are noted below:

DEFINITIONS:

Diamond Accuracy

Diamond test stones correctly classified as Diamond.



Synthetic Diamond Accuracy	Synthetic Diamond test stones correctly classified as Synthetic Diamond.
Diamond Simulant Accuracy	Diamond Simulant test stones correctly classified as Diamond Simulant.
Diamond Referral Rate	Diamond test stones classified as Referral.
Synthetic Diamond Referral Rate	Synthetic diamond test stones classified as Referral
Simulant Referral Rate	Diamond simulant test stones classified as Referral
Diamond False Positive Rate	Synthetic Diamond / Diamond Simulant test stones incorrectly classified as Diamonds.
Synthetic Diamond False Positive Rate	Diamond / Diamond Simulant test stones incorrectly classified as Synthetic Diamonds
Diamond Simulant False Positive Rate	Diamond / Synthetic Diamond test stones incorrectly classified as Diamond Simulants
Diamond False Negative Rate	Diamonds incorrectly classified as Synthetic Diamonds or Diamond Simulants
Synthetic Diamond False Negative Rate	Fraction of <i>Synthetic Diamonds</i> incorrectly classified as <i>Diamond</i> .
Diamond Simulant False Negative Rate	Fraction of <i>Diamond Simulants</i> incorrectly classified as <i>Diamond</i> .
Testing Speed	The average speed at which the diamond verification instrument evaluates the stones in the PRIMARY loose sample set, including set-up time (if any)
Operating Speed	For auto-loading diamond verification instruments only, the average speed at which stones are evaluated once the instrument achieves a steady-state. Does not include set-up time.

TEST STONE SETS USED FOR EVALUATION

Loose, Polished Stone Test Sets	Diamond	Synthetic Diamond	Diamond Simulant
Primary Sample Set (>2.0 mm, D-J color)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Supplementary Smalls Sample Set (1.0-2.0 mm, D-J color)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mounted, Polished Stone Test Sets	Diamond	Synthetic Diamond	Diamond Simulant
Primary Sample Set (>2.0 mm, D-J color)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Supplementary Smalls Sample Set (1.0-2.0 mm, D-J color)	<input type="checkbox"/>	<input type="checkbox"/>	

Notes: smalls sample not tested

CLEANING PROCEDURE OF STONES PRIOR TO TESTING

Test stones sets are cleaned in an ultrasonic bath of isopropanol for 2 minutes and dried prior to testing to reduce grease and electrostatic charge, as per Section 8 of ASSURE Standard.



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LABORATORY CONDITIONS AT TIME OF ASSESSMENT

Condition	Requirement	Actual
Temperature (°C)	18 to 25°C	22 °C
Humidity (%)	50 to 65%	55 %

RESULTS OF INSTRUMENT PERFORMANCE ASSESSMENT – LOOSE STONES

Performance Metric	Primary	Uncertainty ^[1]
Diamond accuracy (%)	92.8	0.6
Synthetic diamond accuracy (%)	n/a ^[2]	n/a ^[2]
Diamond simulant accuracy (%)	100.0	0.0
Diamond referral rate (%)	7.2	0.6
Synthetic diamond referral rate (%)	100.0 ^[2]	0.0 ^[2]
Diamond simulant referral rate (%)	0.0	0.0
Diamond false positive rate (%)	0.0	0.0
Synthetic diamond false positive rate (%)	0.0	0.0
Diamond simulant false positive rate (%)	0.0	0.0
Diamond false negative rate (%)	0.0	0.0
Synthetic diamond false negative rate (%)	0.0	0.0
Diamond simulant false negative rate (%)	0.0	0.0

Notes: ^[1] Uncertainty is expressed as absolute +/- range and reflects the consistency of the instrument’s classification of stones for each of the three trials performed with the ASSURE sample.

^[2] This instrument cannot distinguish between CVD/HPHT and Type IIa diamonds. Stones identified as CVD /HPHT/Type IIa diamonds are classified as REFER.

RESULTS OF INSTRUMENT PERFORMANCE ASSESSMENT – MOUNTED STONES

Performance metric	Primary
Diamond accuracy (%)	85.6
Synthetic diamond accuracy (%)	n/a ^[1]
Diamond simulant accuracy (%)	100.0
Diamond referral rate (%)	14.4
Synthetic diamond referral rate (%)	100.0 ^[1]
Diamond simulant referral rate (%)	0.0



Diamond false positive rate (%)	0.0
Synthetic diamond false positive rate (%)	0.0
Diamond simulant false positive rate (%)	0.0
Diamond false negative rate (%)	0.0
Synthetic diamond false negative rate (%)	0.0
Diamond simulant false negative rate (%)	0.0

Notes: ^[1] This instrument cannot distinguish between CVD/HPHT and Type IIa diamonds. Stones identified as CVD / HPHT Type IIa diamonds are classified as REFER.

Two jewelry samples were removed from the sample set as they contained foiled back glass stones which cannot be tested by BELIZE.

INSTRUMENT TESTING SPEED ASSESSMENT

Testing Speed approximates the usage turnaround time that could be expected by a novice user of the diamond verification instrument and is determined by the time required to evaluate the performance of the diamond verification instrument on the Primary Loose stone test set:

- Testing Speed accounts for the time directly associated with stone assessment including loading stones, programming any applicable instrument measurement parameters, analyzing the stones, and segregating the analyzed stones into respective instrument classified groups.
- Testing Speed does not include the time to initially warm-up the diamond verification instrument (if applicable) nor the time to separate diamonds from synthetic diamonds for each of the instrument classified groups of analyzed stones.
- Testing Speed does not include time associated with interruptions to the testing process.

Diamond verification instruments that continuously load and analyze stones (i.e., autoloading diamond verification instruments) shall also be assessed for a steady-state Instrument Operating Speed.

Testing speed, and instrument operating speed if applicable, are measured in triplicate. The mean value is reported in the Speed Test Results table below. The Uncertainty reflects the absolute +/- range of the results measured over the three trials.

SPEED TEST RESULTS (PRIMARY LOOSE SAMPLE)



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Category	Stones per hour	Uncertainty
Testing Speed (all devices)	256	12
Operating Speed (auto-loading devices)	n/a ^[1]	n/a ^[1]

Notes: ^[1] not applicable for this device, the device has manual feed

ADDITIONAL FINDINGS

None

***** End of Report *****