AZ Robotics
SURFACE METROLOGY · NUMISMATICS

REPORT AZR-50C-1859-O
ISSUED 26 September 2026, 7:47 PM EDT
REV G

COIN EXAMINATION REPORT

1859-O ½ Dollar "Seated Liberty Half Dollar" (without date arrows)

KM#A68 · Numista #14904 · 1856–1866



Obverse — Seated Liberty with shield and pole and cap, thirteen stars around, the date below. Photograph, even light.



Reverse — Eagle with arrows and olive branch, UNITED STATES OF AMERICA around, HALF DOL. and the mint mark O below. Photograph, even light.

CONDITION	OUTLINE	WEIGHT	FIELD DEPRESSIONS	RELIEF
≈ G	30.8–31.4 mm	11.99 g	1 · 3	154 µm
an AI reading of the photographs, not a certified grade	the outline's ellipse axes · oval by 1.9 % · nominal 30.6 mm	customer's balance · nominal 12.44 g (−3.6 %)	obverse · reverse, in the open field (§04)	Liberty above the obverse field

IDENTITY The catalogue type ½ Dollar "Seated Liberty Half Dollar" (without date arrows) (KM#A68), 1856–1866; the date 1859 and the mint mark O read on the coin.

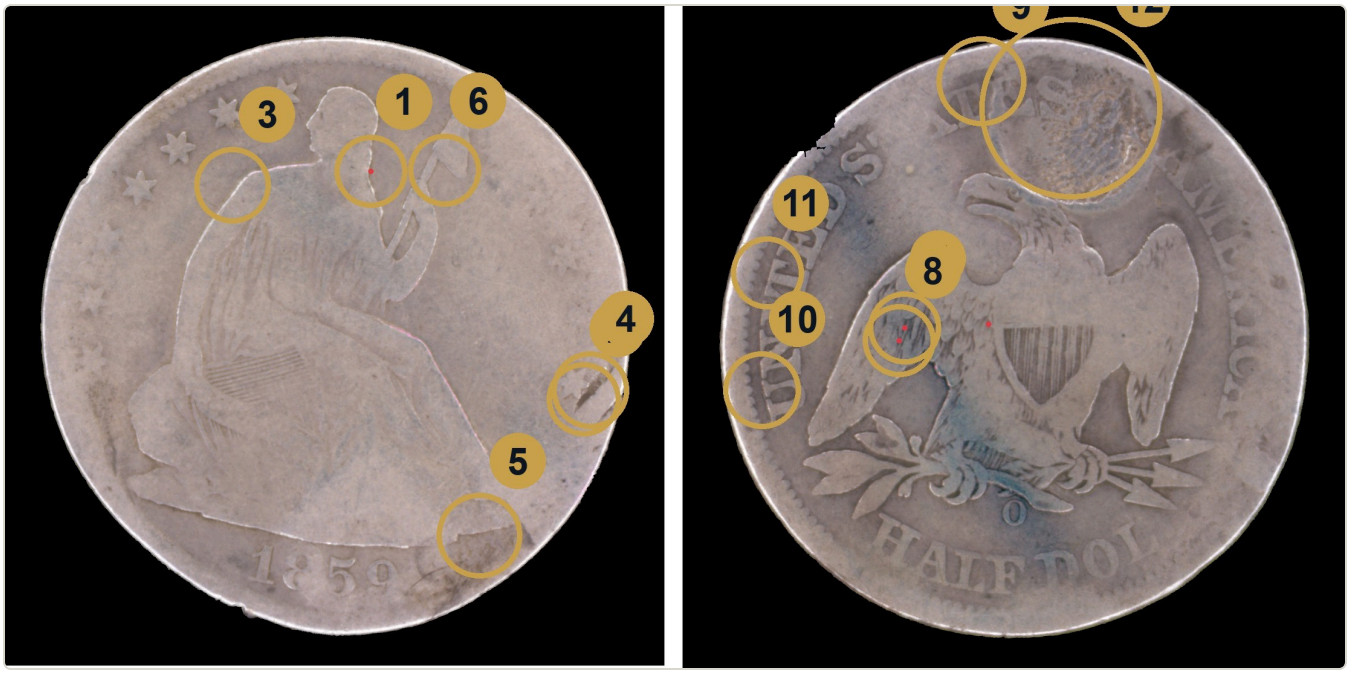
SHAPE The outline is an oval: 30.8 by 31.4 mm on its axes, 1.9 % out of round; the customer's caliper reads 30.8–31.4 mm.

DIE AXIS The reverse die stands 178° from the obverse's (0° medal, 180° coin alignment), −2° from the type's coin alignment.

MARKS A cut 2.3 mm long and 61 µm deep beside the star at the right of the obverse, with 3 linear marks on that face and 1 on the reverse (§01).

01 Condition map

Both faces photographed in even light. **Red circles**: each pit the detector found in the open field (away from the design; method in §04). **Numbered circles**: the densest pitting, the deepest pits and the longest cuts, scratches and hairlines on each face and the ridged patch above the eagle's head: fine wavy ridges with a loop at the left, in the pattern of a fingerprint, flush with the field. Close-ups follow.



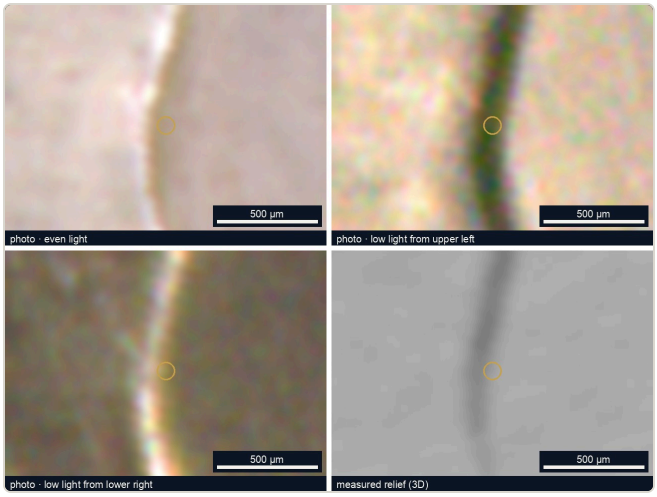
Obverse (left) and reverse (right), upright, at matching scale.

NO.	FACE	LOCATION	FINDING	MEASURED
1	Obverse	1 o'clock	Pit in the open field	0.09 mm across and 7 µm deep
2	Obverse	3 o'clock	Hairline scratch in the field	2.16 mm long, 23 µm deep
3	Obverse	12 o'clock	Hairline scratch in the field	2.27 mm long, 6 µm deep
4	Obverse	3 o'clock	Linear mark in the field (a cut or scratch)	2.34 mm long, 0.41 mm wide, 61 µm below the field
5	Obverse	4 o'clock	Linear mark in the field (a cut or scratch)	2.68 mm long, 0.36 mm wide, 23 µm below the field
6	Obverse	1 o'clock	Linear mark in the field (a cut or scratch)	1.42 mm long, 0.36 mm wide, 19 µm below the field
7	Reverse	9 o'clock	Pit in the open field	0.20 mm across and 12 µm deep
8	Reverse	9 o'clock	Pit in the open field	0.17 mm across and 9 µm deep
9	Reverse	11 o'clock	Hairline scratch in the field	2.87 mm long, 7 µm deep

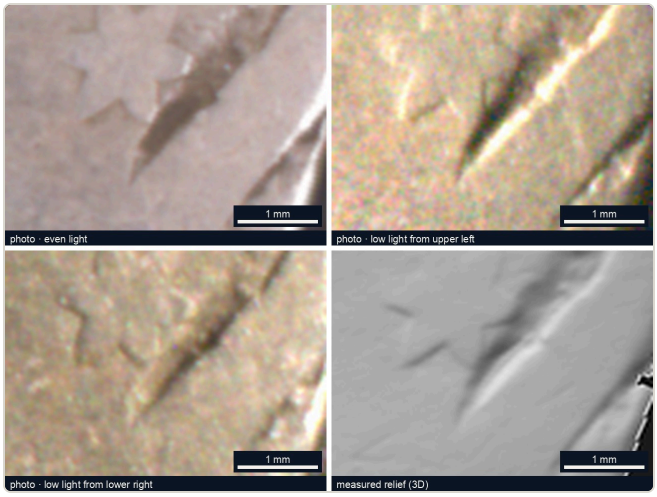
NO.	FACE	LOCATION	FINDING	MEASURED
10	Reverse	9 o’clock	Hairline scratch in the field	2.32 mm long, 8 µm deep
11	Reverse	9 o’clock	Linear mark in the field (a cut or scratch)	1.12 mm long, 0.13 mm wide, 20 µm below the field
12	Reverse	above the eagle’s head, over the word OF	The ridged patch above the eagle’s head: fine wavy ridges with a loop at the left, in the pattern of a fingerprint, flush with the field	ridges 0.43 mm apart (dominant period of the surface slope within the patch) · four views

CLOSE-UPS IN CAPTURED LIGHT

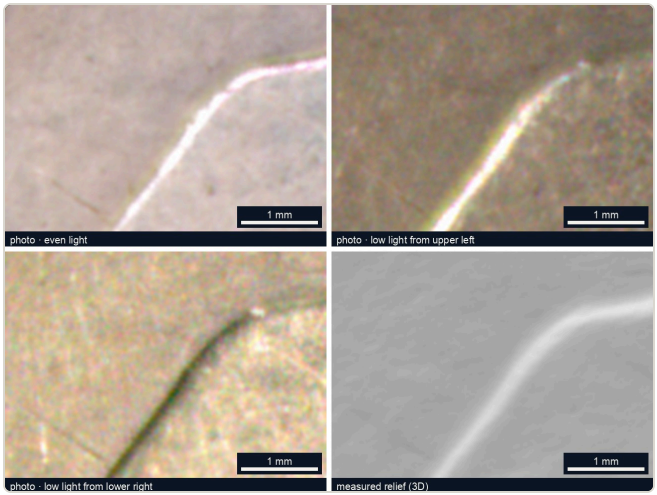
Each item four ways: a photograph in even light, photographs lit low from opposite sides (relief casts shadows, a pit shows a dark and a bright wall), and the measured relief. The photographs are captured frames from this examination, not retouched; each tile carries a scale bar.



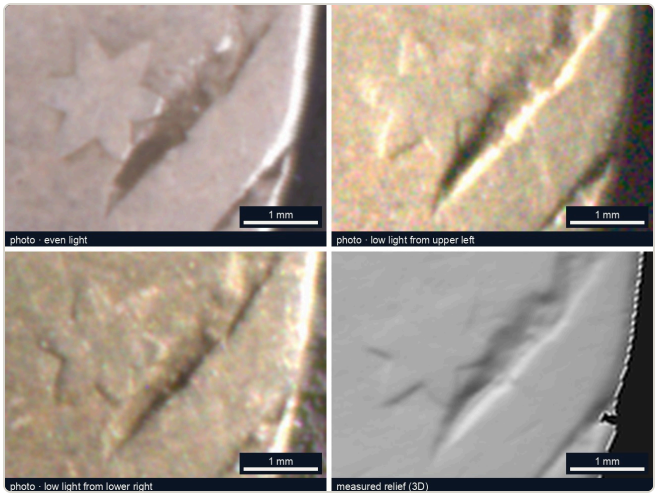
ITEM 1 Pit, obverse field at 1 o’clock (circled).



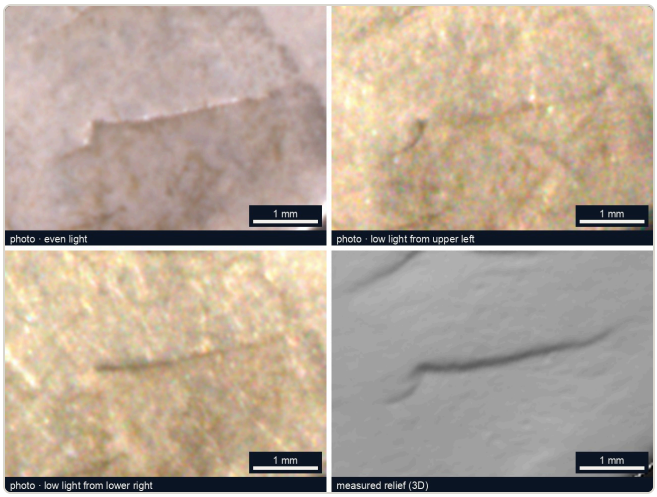
ITEM 2 Hairline scratch, obverse field at 3 o’clock (boxed).



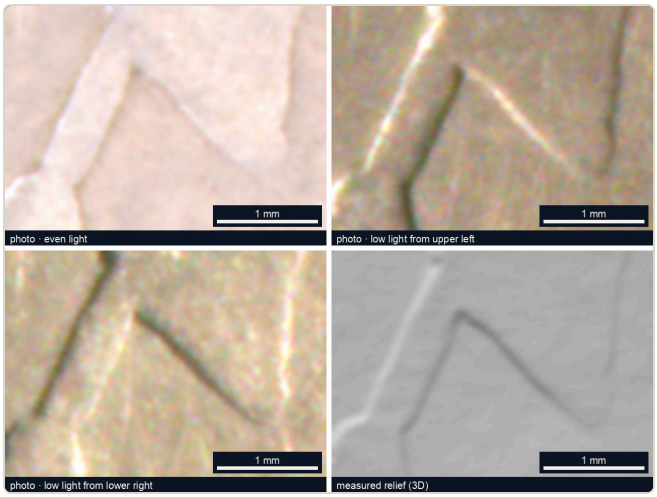
ITEM 3 Hairline scratch, obverse field at 12 o’clock (boxed).



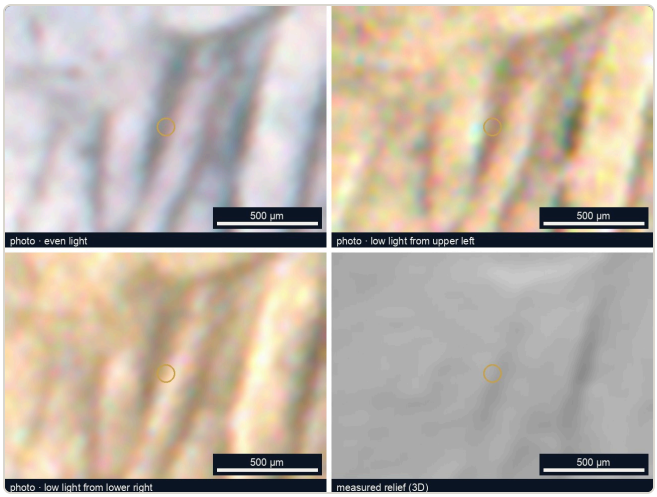
ITEM 4 Linear mark, obverse field at 3 o’clock (boxed).



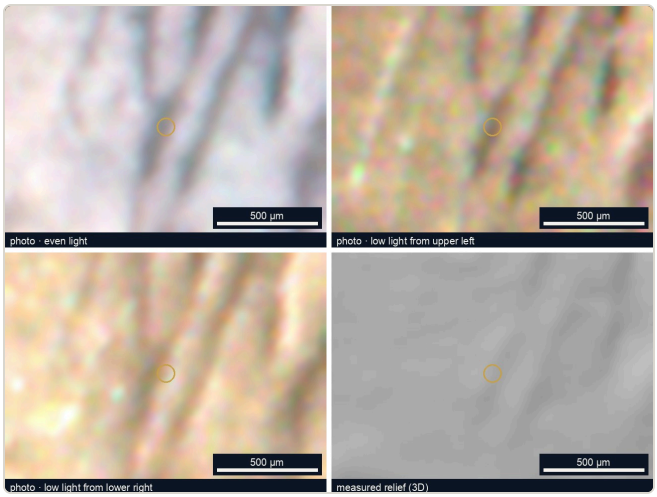
ITEM 5 Linear mark, obverse field at 4 o’clock (boxed).



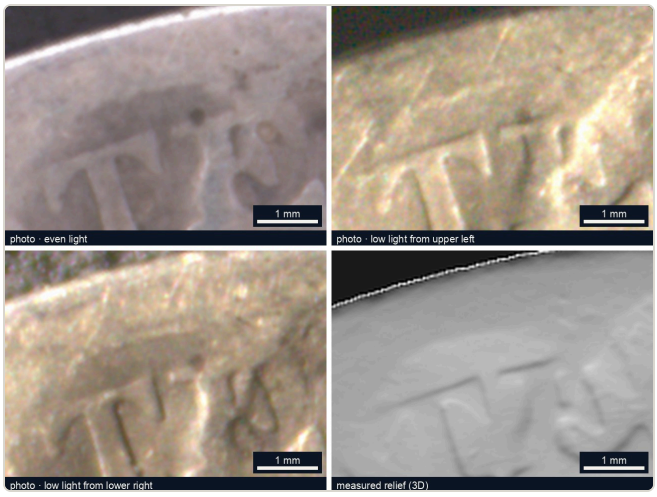
ITEM 6 Linear mark, obverse field at 1 o’clock (boxed).



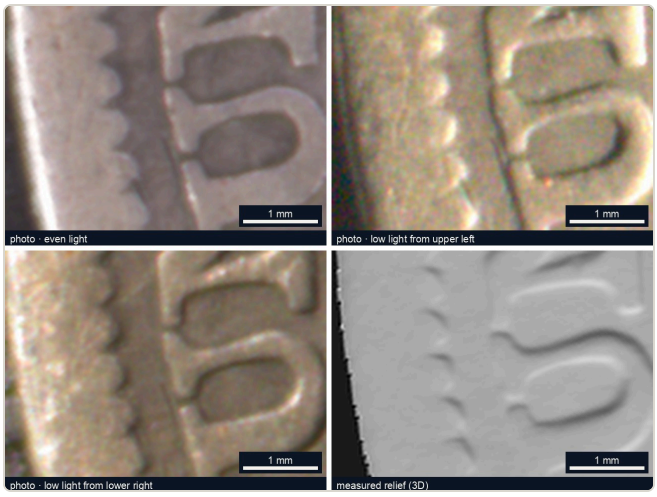
ITEM 7 Pit, reverse field at 9 o’clock (circled).



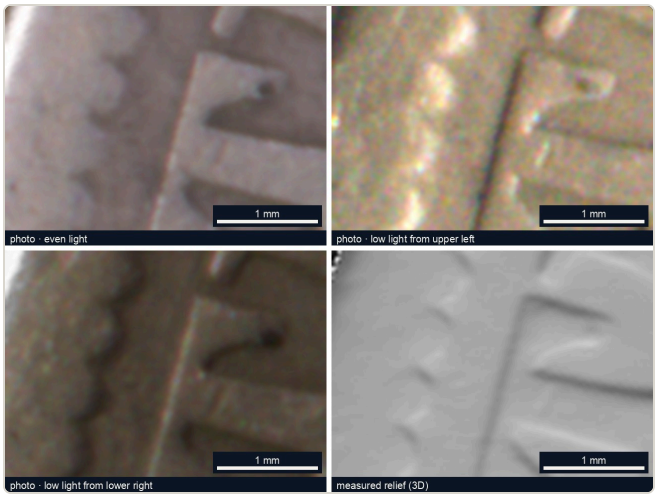
ITEM 8 Pit, reverse field at 9 o’clock (circled).



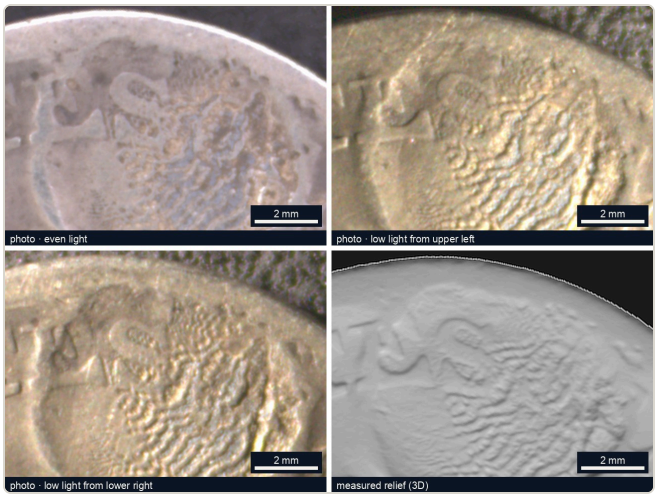
ITEM 9 Hairline scratch, reverse field at 11 o’clock (boxed).



ITEM 10 Hairline scratch, reverse field at 9 o’clock (boxed).



ITEM 11 Linear mark, reverse field at 9 o'clock (boxed).



ITEM 12 The ridged patch four ways: even light, low light from opposite sides, and the measured relief. The ridges run in waves with a loop at the left; the letters O and F of the legend lie under it.

02 Identification

Legends, marks and dimensions read from the measured surface, compared against the catalogue type.

ELEMENT	READ ON THE COIN	CATALOGUE (NUMISTA #14904)
Date	1859	✓ issued 1856–1866 (the type's range; the catalogue's example dates are not this coin's)
Legend	UNITED STATES (OF) AMERICA	✓ UNITED STATES OF AMERICA
Value	HALF DOL.	✓ HALF DOL.
Mint mark	O	✓ issue 1859-O in the catalogue's issue list

The legends and types read on the coin agree with the catalogue type **KM#A68** (Numista #14904, 1856–1866).

PHYSICAL

MEASURE	THIS COIN	TYPE STANDARD	Δ
Diameter	30.8 × 31.4 mm (outline's ellipse axes, obverse) · 30.7 × 31.5 mm (reverse) · caliper 30.8–31.4 mm	30.6 mm, nominal	+1.5 % (equivalent circle)
Weight	11.99 g (customer's balance)	12.44 g	−3.6 %
Die axis	178° (0° medal, 180° coin alignment; the two faces' outlines registered by the rim's irregularities)	180° (coin alignment, the type's)	−2°
Denticles	about 150 per revolution on the reverse (the beading measurable over 135° of rim) · 151 on the obverse (90°)	—	—
Stars	7 of the type's 13 found on the ring band; 6 worn below the detection response; ring radius 12.4 mm	13 stars, the catalogue	—
Composition	—	Silver (.900) (.100 copper)	—

03 Condition

ELEMENT	DETAIL VISIBLE	SOFTER AREAS
Seated Liberty (obverse)	The figure outlined in full: head, arm, shield, pole and cap; the stripes of the shield.	The drapery folds flattened; no letters of LIBERTY seen on the shield's band.

ELEMENT	DETAIL VISIBLE	SOFTER AREAS
Date	The four digits, 1859, clear; no arrows beside the date.	—
Stars	The stars on the left clear; those on the right faint.	The stars on the right.
Eagle (reverse)	The eagle, the shield on its breast, the arrows and the olive branch; feathers in the lower wings.	The head and the upper feathers.
Legend and value	The legend and the value below the eagle clear, apart from the letters under the ridged patch.	The letters under the ridged patch.
Ridged patch (reverse)	A roughly round patch above the eagle's head, crossed by fine wavy ridges with a loop at its left; flush with the field around it.	The design under it.
Obverse field	A cut beside the star at the right, long scratches in the right field and nicks at the right rim.	—

ASSESSMENT

Detail comparable to Good (G), provisional

Detail comparable to Good (G), provisional: Liberty is outlined in full and the date, legend and value are clear, but no letters of LIBERTY are seen on the shield's band and the drapery is flat. The reverse holds more detail than the obverse. A patch of fine ridges the size of a fingertip covers the word OF above the eagle; whether it is a print etched into the surface, corrosion or a residue is not decided. Relief of Liberty and of the eagle above the field around them: 154 µm on the obverse and 167 µm on the reverse. Recorded for comparison with later scans; not calibrated against graded coins.

Ridged patch. Item 12 on the condition map: a patch of fine wavy ridges above the eagle's head, in the pattern of a fingerprint, flush with the field around it and covering the word OF. Its cause is not decided (see Method, Not decided).

Surfaces. Depressions in the open fields: 1 on the obverse and 3 on the reverse (§04). Their cause is not decided by the detector.

Scope. The table is an AI reading of the photographs and close-ups (§01, §06) for the elements listed; elements not listed were not individually inspected.

04 Surfaces: depressions

The depressions the instrument detected in the open fields: where they are, how large, how deep, and — where the measurements are comparable — how they compare with other coins.

PITS IN THE OPEN FIELD

	OBVERSE	REVERSE
Pits found	1	3
Open field examined	264 mm²	201 mm²

	OBVERSE	REVERSE
Density	0.4 per cm²	1.5 per cm²
Size across (median · p90 · max)	0.09 · 0.09 · 0.09 mm	0.20 · 0.22 · 0.22 mm
Depth (median · p90 · max)	7 · 7 · 7 µm	9 · 11 · 12 µm
Nearest-pit distance (median)	— mm	— mm
Nearest-neighbour ratio (descriptive)	—	—
Pits on the raised design (less reliable)	0	24

Face: the coin inside its own outline (the framecheck's min-over-lights outline). Open field: field pixels at least 0.2 mm from raised design, outside the holes the design encloses (letter counters, windows) and away from the rim band. A counted depression is at least 6 µm on the obverse and 6 µm on the reverse below its filled surroundings (each face's own threshold: the larger of a fixed floor and four robust sigmas of its field) and at least 0.006 mm² in area. These are detected depressions; their cause (corrosion, porosity, a strike or planchet flaw) is not decided by the detector.

OTHER COINS MEASURED WITH THE SAME CODE (PITS PER CM² OF OPEN FIELD, WHERE COMPARABLE)

COIN	OBVERSE	REVERSE	MEDIAN DEPTH
This coin	0.4	1.5	7–9 µm
8 reales, chopmarked, circulated	not comparable: 69 px/mm sampling	not comparable: 69 px/mm sampling	—
Reference specimen: Silver Eagle 2001, uncirculated (one coin)	—	not comparable: 67 px/mm sampling	—

The comparison coins are examples, not a population baseline.

Cuts and scratches. Linear marks at least 13 µm below the field and about a millimetre long: 3 on the obverse (the longest 2.3 mm, the deepest 61 µm) and 1 on the reverse (the longest 1.1 mm, the deepest 20 µm). The longest are numbered on the condition map (§01); a gap between raised design elements sits at the field and is not counted.

Hairlines. Thin straight scratches found in the curvature of the measured surface: 13 in the open field of the obverse (17.9 mm together) and 6 of the reverse (9.5 mm); the longest are numbered on the condition map (§01). Lines on the design are counted separately: an engraved line and a scratch across it are not told apart by shape alone.

Resolution. This run used the standard solve at 31 pixels per mm; depressions narrower than about a tenth of a millimetre are not resolved, so the counts are lower bounds.

Appearance. Dull grey silver with darker grey toning at the lower left of the obverse, around the date; no lustre seen. (photographs with grey-card colour balance; cover). Hairlines and reflectivity are not systematically assessed.

05 Consistency checks

Each measured fact set beside the catalogue's nominal or a working tolerance chosen for this examination. These checks can raise questions; they cannot establish authenticity, and no score is formed.

INDICATORS

No check fell outside its working tolerance. These checks can raise questions; they cannot establish authenticity.

CHECK	MEASURED	REFERENCE	READING
Weight against the type's nominal	11.99 g (−3.6 %)	12.44	within the working tolerance
Diameter	31.29 mm	29.7-31.5 mm	within the working tolerance
Outline axes against the customer's caliper	30.8–31.4 mm (+0.2 %)	30.8-31.4 mm	within the working tolerance
Die axis against the type's alignment	178 deg	180 deg (coin alignment)	within the working tolerance
Specific gravity	—	about 10.3 for silver of this fineness	not tested

No reference coin. No coin of this type has been measured on this instrument; the figures are reported for the record and for the next coin of the series.

Next measurement. A specific-gravity measurement is the recommended next test; it constrains the alloy but cannot by itself establish identity or authenticity.

06 Detail evidence

Photographs from this examination: the coin lit low from the upper left (three captured frames averaged), shown upright, colour balanced against a grey card, each with a scale bar. Crops are at instrument resolution (31.4 pixels per mm).

OBVERSE



FIG 1 The shield at Liberty's side and the drapery over her knee; the lower part of the pole.



FIG 2 The date below Liberty, with no arrows beside it.

REVERSE



FIG 3 The shield on the eagle's breast, the arrows and the olive branch in its talons.

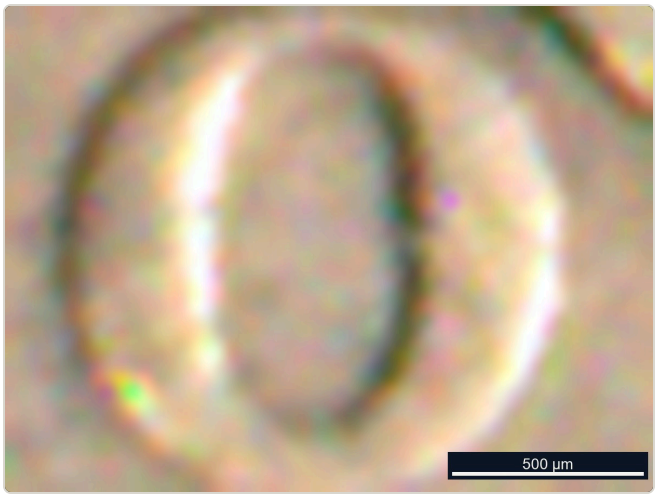


FIG 4 The mint mark O below the eagle.

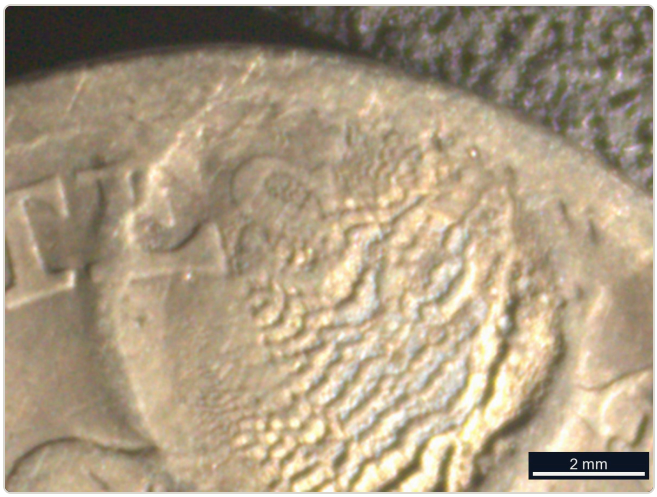


FIG 5 The patch above the eagle's head, over the word OF, with its fine wavy ridges.

LEGENDS, AS READ

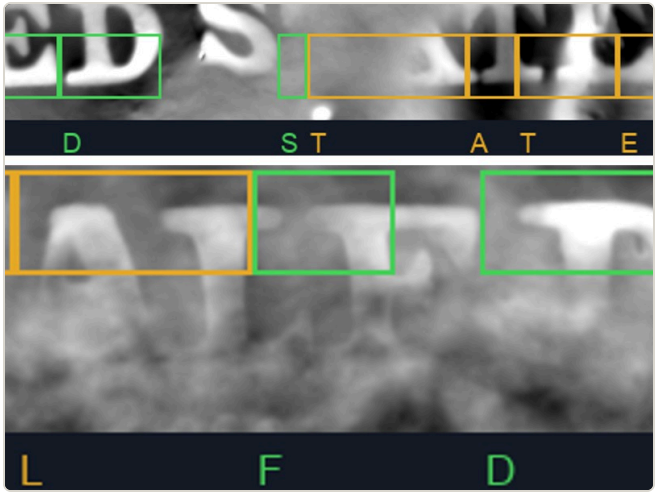
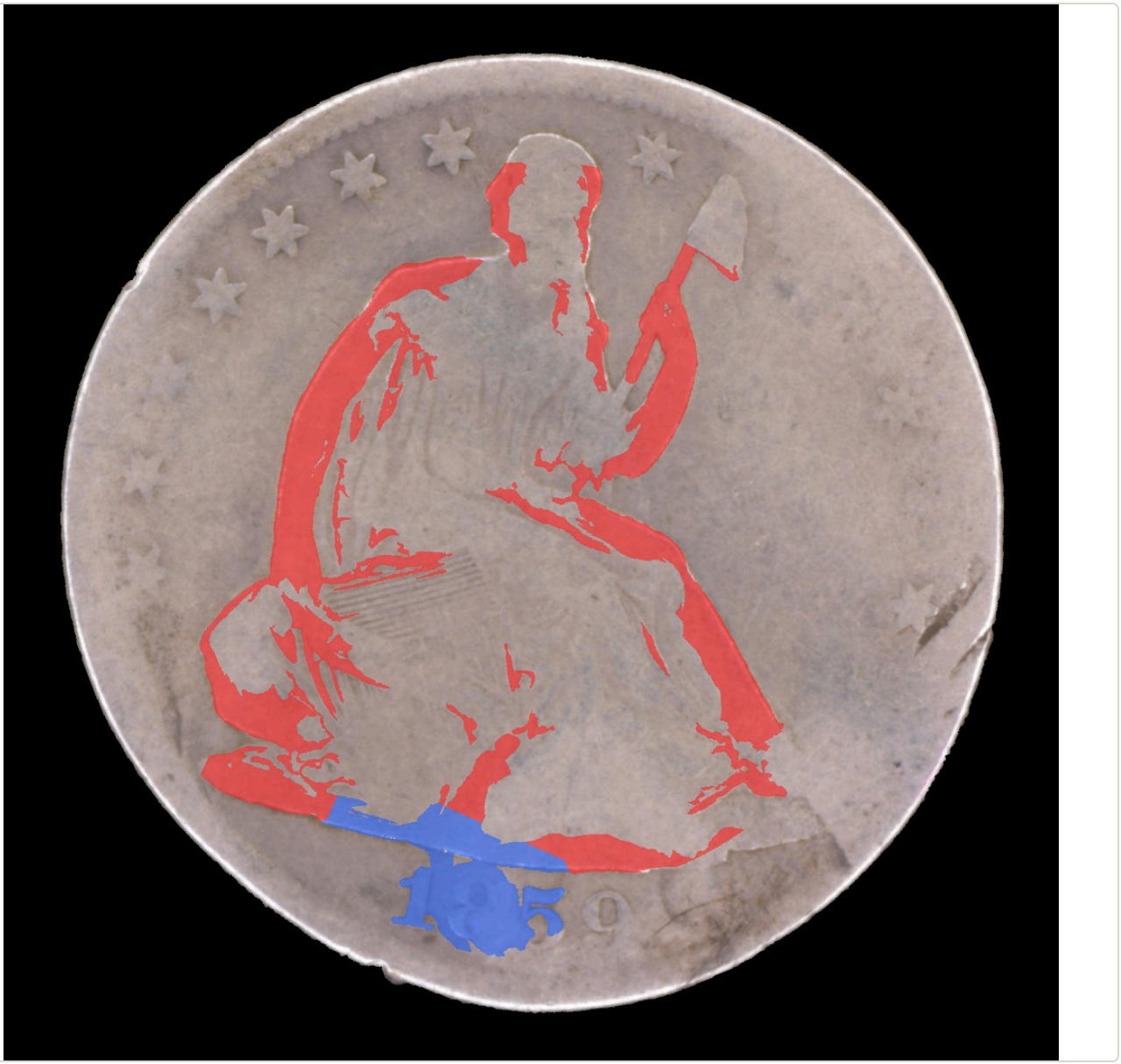


FIG 6 The reverse legend unrolled from the measured relief, each of the catalogue's letters boxed where it stands: green, read by OCR at that place (11 of 28); amber, placed between the letters read.

07 Design element maps

The design elements identified on the measured surface, shown in colour on the photograph. The outer rim lies outside the measured surface and is shown uncoloured.

Obverse (Liberty) — identified design elements



DESIGN ELEMENTS

- Seated Liberty
- Date

Reverse (eagle) — identified design elements



DESIGN ELEMENTS

- Eagle
- Mint mark O
- Ridged patch

08 Method and limitations

METHOD	Each face was photographed 120 times, each frame lit by one light from a known direction; the photographs here are those frames, colour balanced against a grey card. The same frames were reconstructed by photometric stereo into a measured surface at 31.4 pixels per mm (about 32 µm per pixel), on which depressions, relief and design elements are measured. Design elements were segmented automatically from the measured surface; readings and the condition assessment are AI-assisted and checked against the catalogue; the figures are generated from the examination record.
ORIENTATION	Each face was turned upright by registering it against the catalogue's photograph of the type: the design's edges compared over the whole face through a full turn, refined to a quarter of a degree, the photograph and the measured relief agreeing. The die axis rests on these uprights.
SCALE	Set by the instrument: the rig's optics are calibrated to 31.38 pixels per mm on the sensor, checked against a calipered coin; this coin's outline measures 31.29 mm (obverse) and 31.28 mm (reverse) at that scale. Lateral lengths carry about ±1 % (see Uncertainty). Provisional: the comparison coins' scales rest on diameters whose source is not recorded, which moves their pit densities by a few per cent.
NOT DECIDED	The cause of the ridged patch on the reverse: not decided — its ridges are spaced about half a millimetre apart, the spacing of human fingerprint ridges, but the instrument cannot tell a print etched into the surface from corrosion or a residue of the same form. It would be settled by the ridge endings and forks under magnification, or a conservator's look at the patch. Capture repeatability of the figures: not characterised — one capture per face in this run. It would be settled by a re-seated repeat capture of each face.
NOT SYSTEMATICALLY ASSESSED	Hairlines (noted only where a close-up shows them), reflectivity and lustre; the edge.
NOT A CERTIFICATION	This is an instrument-based examination, not a third-party grading service opinion (NGC, PCGS).
UNCERTAINTY	Lateral lengths (diameters, offsets, areas) rest on the rig's scale, calibrated against a calipered coin: about ±1 %. Heights — relief, depression depths, steps — are relative measurements within one capture, referred to the surface around each feature; their repeatability between captures has been measured on one coin only, and absolute height accuracy is not certified. The long-range shape of a face (bowing, warp) is known less well than local relief; this solve corrects the LEDs' emission lobe with the fit measured for silver, which a flat target showed removes most of the instrument's bowl. A saddle fixed in the camera frame, measured on a flat target, is not corrected and is part of that long-range uncertainty. The solve grid is a sampling grid, not a demonstrated optical resolution.

DIGITAL SUPPLEMENT

In the delivery bundle AZR-50C-1859-O-revG-bundle.zip, beside this PDF: the clean face photographs and animations of the captured frames (one light at a time, going round the coin).

AZR-50C-1859-O-REVG-OBVERSE.JPG	The obverse, photographed in even light, without annotations.
AZR-50C-1859-O-REVG-REVERSE.JPG	The reverse, photographed in even light, without annotations.
AZR-50C-1859-O-REVG-OBVERSE_LIGHT_SWEEP.GIF	The whole obverse under each of the 60 low lights in turn.
AZR-50C-1859-O-REVG-REVERSE_LIGHT_SWEEP.GIF	The whole reverse under each of the 60 low lights in turn.

REFERENCES

Numista #14904 (KM#A68).

PREPARED BY

Anton Zalutsky
Principal Examiner · AZ Robotics LLC

Automated examination; no reviewer sign-off is recorded for this revision.

REPORT

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This report is complete only with all pages present.

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