

**Portable/Handheld Spectrophotometer for Inspection of Offset and Screen Printing
Color Bars of Banknote Sheets**

1. Technical Specifications

Sr. No.	Parameter	Mandatory Minimum Requirement
1	Instrument Type	Handheld/portable spectrophotometer suitable for quantitative color measurement and quality control of printed security documents including banknote sheets.
2	Application	The instrument shall be suitable for inspection and measurement of color bars, solid color patches and printed areas produced by offset and screen printing processes .
3	Measurement Geometry	0°:45° or 45°:0° geometry, in accordance with a recognized international standard for color measurement.
4	Spectral Range	Minimum 380–700 nm for visible spectral color measurement.
5	Spectral Bandwidth	≤10 nm.
6	Wavelength Resolution	≤5 nm.
7	Measurement Aperture	3 mm nominal measuring aperture suitable for measurement of small color patches/color bars.
8	Color Measurement	Shall measure and display CIE L*a*b* and CIE XYZ values.
9	Color Difference	Shall calculate and display ΔE*ab and ΔE00 .
10	Illuminants	Shall support at least D50 and D65 standard illuminants.
11	Standard Observer	Shall support 2° and 10° standard observers.

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12	Density Measurement	Shall provide integrated optical density measurement suitable for printed colors.
13	Density Filters	Shall provide appropriate density filters/modes for printing applications, including DIN and/or ISO equivalent density measurement.
14	Reference/Standard Measurement	Shall allow measurement and storage of an approved reference/master color standard.
15	Delta/Comparison Mode	Shall provide direct comparison of a measured sample against a stored/reference standard.
16	Pass/Fail	Shall provide user-definable color tolerance and automatic Pass/Fail indication based on the specified tolerance.
17	Measurement Averaging	Shall provide facility for averaging multiple measurements.
18	Spectral Curve	Shall display and/or record the spectral reflectance curve .
19	Colorimetric Repeatability	Colorimetric repeatability shall be $\leq 0.30 \Delta E^{*ab}$ under the manufacturer's specified test conditions.
20	Inter-Instrument Agreement	Inter-instrument agreement shall be $\leq 0.50 \Delta E^{*ab}$ under the manufacturer's specified test conditions.
21	Density Repeatability	Density repeatability shall be $\leq 0.01 D$ or better.
22	Display	Shall have an integrated display capable of displaying measurement values, color difference and Pass/Fail results.
23	Data Storage	Shall have internal memory for storage of reference standards and measurement results/batches.

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24	Data Communication	Shall provide USB, Ethernet or equivalent wired digital communication for transfer of measurement data to a computer.
25	Software	Manufacturer-supplied software shall be included for instrument operation, color measurement, reference-standard management, tolerance setting, data storage and reporting.
26	Data Export	Measurement data shall be transferable/exportable to a commonly usable electronic format such as CSV, Excel or equivalent.
27	Calibration	Instrument shall provide user calibration using a supplied certified white/reference standard.
28	Calibration Standard	A certified/traceable white calibration/reference standard appropriate for the instrument shall be supplied.
29	Battery	Shall have an integrated rechargeable battery suitable for portable production-floor operation.
30	Battery Capacity	Battery shall support a minimum of 500 measurements per charge .
31	Operating Temperature	Minimum operating temperature range shall include 10°C to 40°C .
32	Relative Humidity	Shall operate at minimum 20–80% RH, non-condensing , or wider range.
34	Construction	Rugged handheld construction suitable for routine industrial/production-floor use.

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35	Sample Positioning	Measuring head shall provide accurate and repeatable positioning of the instrument on small color patches/color bars.
36	Calibration Certificate	Manufacturer/OEM calibration certificate shall be supplied with the instrument.
37	Documentation	Original manufacturer's user manual and technical documentation shall be supplied.
38	Accessories	All standard accessories necessary for normal operation, including charger/power supply, calibration standard, communication cable and carrying/protective case, shall be supplied.
43	Equipment Condition	Equipment shall be brand-new, unused and supported by the original manufacturer at the time of supply.
44	Manufacturer Specification	All claimed technical performance parameters shall be supported by the original manufacturer's published technical documentation/datasheet.
45	Demonstration/Acceptance	The offered instrument shall successfully demonstrate color measurement, ΔE calculation, Pass/Fail operation, density measurement, calibration and data transfer during commissioning/acceptance.

2. Sample Picture / Visual Reference for Conformance

A sample picture/image of the required handheld spectrophotometer is pasted below for visual reference and conformance purposes:



The bidder shall ensure that the offered instrument is functionally and technically compliant with all the mandatory technical specifications stated in this document and provided sample, and is suitable for the intended measurement of color bars/printed areas of banknote sheets.

The pictures of sample are provided for reference and identification of the required type/form of equipment only and shall not be construed as restricting the procurement to any particular manufacturer, brand or model. The bidder shall submit the make and exact model of the offered instrument along with the manufacturer's original product literature/datasheet for verification of conformance.