



BLUE DRAGON TECHNOLOGY

ElementX H1

HANDHELD X-RAY FLUORESCENCE SPECTROMETER

Operation, Installation & Maintenance Manual



Blue Dragon Elemental Analysis & Materials Characterization

Document No. BD-EXH1-MAN-EN | Revision A | 28 July 2026

For trained and authorised operation and maintenance personnel



Document Control

This manual defines the approved Blue Dragon product configuration, operating instructions, technical specifications, safety requirements and quality guidance. The packing list, factory test report, certificate package, final software build, installed application modes, and serial-number-specific labels supplied with the instrument govern the delivered configuration.

Field	Details
Product	Blue Dragon ElementX H1 Handheld X-ray Fluorescence Spectrometer
Document	Operation, Installation & Maintenance Manual
Document number	BD-EXH1-MAN-EN
Revision	A - Initial customer release
Release date	28 July 2026
Language	English
Product family	Blue Dragon ElementX Series - Elemental Analysis & Materials Characterization
Standard configuration	Mg-U handheld EDXRF; Fast-SDD detector; Ag-target X-ray tube; 4.5-inch touchscreen; ore/mineral and rare-earth focused configuration
Standard warranty	12 months, subject to the sales contract
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Revision History

Revision	Date	Description	Prepared by
A	28 July 2026	Initial customer release of the Blue Dragon ElementX H1 Operation, Installation & Maintenance Manual.	Blue Dragon Technology

IMPORTANT

The ElementX H1 generates ionising radiation when the X-ray tube is energised. Operate only under applicable national and local radiation-control requirements. This instrument is an elemental screening and analysis tool; results depend on the installed calibration, sample matrix, surface, geometry, preparation and measurement time. Validate performance for the intended application before making compliance, custody-transfer or safety-critical decisions.



Contents

Section	Title	Page
1	About This Manual	3
2	Safety Information	4
3	Product Overview	5
4	Measurement Principle and Performance	7
5	Technical Specifications	8
6	Receiving, Inspection and Storage	9
7	Instrument Components and Controls	10
8	Battery Installation, Start-up and Calibration	11
9	Measurement Planning and Sample Preparation	13
10	Routine Measurement Workflow	14
11	Software Overview	18
12	Analysis Interface and Measurement Settings	20
13	Data, Reports and Records	26
14	System and Advanced Settings	28
15	Remote Connection	32
16	Battery Charging and Replacement	36
17	Test Window Film Replacement	37
18	Routine Maintenance and Service	38
19	Storage, Transportation and Disposal	39
20	Detailed Radiation Safety	40
21	Troubleshooting and Frequently Asked Questions	41
22	Warranty and Technical Support	42
Appendix A	Quick Start Checklist	43
Appendix B	Measurement Quality Checklist	44
Appendix C	Calibration and Verification Record	45
Appendix D	Configuration Record	46
Appendix E	Maintenance Log	47
Appendix F	Application Data Sheet	48
Appendix G	Standard Supply and Optional Accessories	49



1. About This Manual

1.1 Purpose

This manual provides the information required to receive, inspect, configure, operate, verify, maintain, store and troubleshoot the Blue Dragon ElementX H1 Handheld X-ray Fluorescence Spectrometer. It covers the standard instrument, batteries, charging system, calibration references, user interface, reports, communications and radiation-safety practices.

1.2 Intended Audience

- Authorised XRF operators who have completed instrument and radiation-safety training.
- Mining, geological, metallurgy, recycling, quality and laboratory personnel using field elemental results.
- Supervisors responsible for calibration verification, quality-control records and application approval.
- Maintenance personnel responsible for external cleaning, test-window film replacement, batteries and accessories.

1.3 Scope and Configuration Control

The ElementX H1 is supplied as a complete factory-assembled and factory-calibrated instrument. No internal installation is required by the customer. Commissioning consists of receiving inspection, battery charging, configuration review, calibration verification and an application check with suitable reference materials. Optional hardware and application modes are order-specific.

NOTE

The names and availability of analysis modes, calibration curves, administrator menus, GPS, scene camera, test stand and printer depend on the purchased configuration. The final packing list, software About screen and factory test report govern.

1.4 Terminology

Term	Meaning
XRF	X-ray fluorescence.
EDXRF	Energy-dispersive X-ray fluorescence.
FP	Fundamental Parameters calculation method.
Working curve	Empirical or factory calibration relating XRF response to concentration for a defined sample matrix.
Calibration verification	A check using a supplied or certified reference to confirm that instrument response remains acceptable.
RSD	Relative standard deviation, used to express repeatability.
Primary beam	The direct X-ray beam emitted from the test window.
Scattered radiation	Secondary radiation produced when the primary beam interacts with a sample.



2. Safety Information

WARNING

Never point the test head at yourself or another person. Never expose any part of the body to the primary beam. Do not hold small, thin, irregular or low-density samples by hand during measurement.

2.1 Authorised Use

- Operate only after completing the training and authorisation required by the responsible organisation and local regulator.
- Keep the instrument secured against unauthorised access, use or removal.
- Use the password and permission system. Change factory credentials during commissioning and restrict administrator access.
- Do not defeat, bypass or permanently disable the sample sensor, trigger controls, indicator lights or other safety functions.

2.2 Radiation Safety

- Confirm that the sample fully covers the test window before initiating a measurement.
- Keep hands and other body parts behind the instrument head and outside the beam path.
- Use a test stand and suitable shielding for samples smaller than the window, thin films, circuit boards, cables, plastics and irregular objects.
- Observe the X-ray active indicator. A yellow/orange breathing or flashing status indicates that the primary beam may be active.
- Apply the principles of time, distance and shielding. Minimise exposure time, maximise distance and use suitable dense shielding.
- Radiation surveys, acceptance tests and periodic verification shall be completed where required by applicable regulations or site procedures.

2.3 Battery and Electrical Safety

- Use only the approved batteries, charger and power adapter supplied or specified by Blue Dragon Technology.
- Do not charge in direct sunlight, near heat sources, in wet locations or where ventilation is obstructed.
- Remove the battery and stop use if the instrument is cracked, severely impacted, wet internally, unusually hot or otherwise unsafe.
- Do not short, puncture, crush, burn or disassemble lithium-ion batteries. Follow transport and disposal rules for lithium batteries.

2.4 Instrument and Sample Safety

- The detector window is fragile. Do not touch it, wipe it, blow compressed air at it or allow sharp objects or powder to enter the test head.
- Do not immerse the instrument or clean it with solvents. The IP54 rating does not permit submersion or pressure washing.
- Review samples for toxicity, contamination, radioactivity, sharp edges, heat, pressure and chemical hazards before testing.
- Clean or contain contaminated samples according to the site safety plan. Prevent dust and liquids from entering the window area.

2.5 Measurement Limitations

CAUTION

XRF results are affected by sample matrix, particle size, moisture, surface condition, coating, curvature, thickness, heterogeneity, measurement time and calibration selection. Use laboratory confirmation when required.



3. Product Overview

3.1 Description

The Blue Dragon ElementX H1 is a portable energy-dispersive X-ray fluorescence spectrometer for rapid, non-destructive qualitative and quantitative elemental analysis. The integrated X-ray source, Fast-SDD detector, digital pulse processor, touchscreen computer, batteries and analysis software form a self-contained field instrument.



Figure 1. Blue Dragon ElementX H1 handheld X-ray fluorescence spectrometer.

3.2 Intended Applications

- Ore and mineral exploration, mine-face screening, stockpile checks and grade-control support.
- Rare-earth exploration and screening of rare-earth-bearing ores and high-purity rare-earth materials.
- Screening of iron, copper, lead-zinc, molybdenum, tungsten, tantalum-niobium, nickel, lithium-bearing and gold-bearing ores, subject to installed calibration.
- Incoming-material inspection, metal/alloy identification, recycling and process-material checks where the required mode is installed.
- Soil, environmental and RoHS-oriented screening where the corresponding application package is installed and validated.

IMPORTANT

The presence of an element in the Mg-U analysis range does not establish a universal detection limit or guaranteed quantitative performance. Element- and matrix-specific capability depends on the installed curve and validation data.



3.3 Standard and Optional Configuration

Category	Standard ElementX H1 configuration	Optional / order-specific
Analysis	Ore/mineral and rare-earth focused XRF platform; installed modes confirmed on the delivered instrument.	Additional alloy, soil, RoHS, precious-metal or application-specific modes and curves.
Calibration	Factory calibration; built-in calibration standard; supplied external reference for verification.	Additional certified reference materials and customer-specific working curves.
Imaging	Sample macro camera.	Scene/environment camera.
Positioning	Not included as standard.	GPS/BDS/GLONASS positioning.
Accessories	Two batteries, charger, adapter, USB-OTG cable, USB drive, test films, wrist strap, transport case and calibration material, as listed on the packing list.	Test stand, shielding enclosure, Bluetooth printer and application accessories.



4. Measurement Principle and Performance

4.1 X-ray Fluorescence Principle

The X-ray tube directs primary radiation onto the sample. When the incident energy is sufficient, inner-shell electrons are displaced. Electrons from higher energy levels fill the vacancies and emit characteristic X-ray fluorescence. The detector measures the energy and intensity of these emissions. Peak energy identifies the element, while intensity is related to concentration through the selected analytical model and calibration.

4.2 Analytical Methods

Method	Use	Key qualification
Fundamental Parameters (FP)	Calculates composition using physical models, instrument response and matrix corrections.	Useful for broad applications but still depends on sample condition and model assumptions.
Working Curve / Empirical Calibration	Uses reference samples to relate measured response to concentration for a defined matrix.	Generally provides the strongest quantitative agreement when the sample matrix matches the calibration set.
Qualitative / Spectrum Review	Identifies likely elements from characteristic peaks and compares spectra.	Peak overlaps, low concentration and matrix effects require expert interpretation.

4.3 Performance Qualifications

Parameter	Published specification	Qualification
Element range	Mg to U	Capability varies by element, matrix, calibration and measurement condition.
Concentration range	0.0001% to 99.99%	A broad system range, not a universal detection limit for every element.
Repeatability	RSD <=2%	Specified under controlled test conditions.
Relative error	<=15%	Depends on reference value, matrix, calibration and sample preparation.
Detector resolution	≤125 eV Fast-SDD under specified reference conditions	The factory test report for the delivered serial number governs.

4.4 Sample and Matrix Effects

Condition	Possible effect	Recommended practice
Rough or curved surface	Variable distance and incomplete window coverage.	Use a flat representative area or prepare a flat sample.
Powder or heterogeneous ore	Particle-size and segregation effects; variable repeatability.	Grind, homogenise, fill a cup or prepare a pressed pellet where quantitative agreement is required.
Moisture	Dilution and absorption effects.	Measure under consistent moisture conditions or dry samples according to the method.
Thin or low-density sample	Primary beam may pass through; increased scattered radiation and substrate effects.	Use a test stand and shield; confirm minimum thickness.
Small sample	Incomplete beam coverage and radiation leakage risk.	Never hold by hand; use a shielded stand or sample enclosure.
Coating / layered material	Result may represent coating and substrate together.	Use an appropriate coating or layer-specific method.



5. Technical Specifications

Parameter	Specification
Product	Blue Dragon ElementX H1 Handheld X-ray Fluorescence Spectrometer
Measurement principle	Energy-dispersive X-ray fluorescence (EDXRF)
Analysis range	Mg to U, subject to installed calibration and application mode
Detector	Electrically cooled Fast-SDD; energy resolution ≤ 125 eV under specified reference conditions; 4096-channel digital pulse processor
X-ray source	Ag-target tube; 5-50 kV; 0-200 μ A; maximum matched power below 5 W
Computer	Industrial quad-core 1.8 GHz; 2 GB RAM; at least 24 GB internal storage; MicroSD expansion supported on applicable configuration
Display	4.5-inch capacitive colour touchscreen; 854 x 480 pixels; physical rocker and keys
Operating system	Industrial Linux
Software	Blue Dragon ElementX H1 Analysis Software; FP and working-curve methods; configurable reports, element display, units and measurement conditions
Data interfaces	Two USB ports; USB-OTG computer connection
Wireless	Built-in Wi-Fi and Bluetooth
Camera	Sample macro camera; scene camera optional
Atmospheric correction	Built-in barometer
Filter system	Eight automatic filter channels
Calibration	Factory calibrated; built-in standard plus supplied external verification material
Battery	6600 mAh lithium-ion; approximately 8 hours per battery depending on operating mode; hot-swap support
Dimensions	Approximately 27.6 x 24.5 x 8.2 cm
Weight	Approximately 1.5 kg with battery; 1.3 kg without battery
Operating conditions	-20 to 50 degC; 10-90% RH, non-condensing; altitude below 5000 m
Ingress protection	IP54
Languages	English, Indonesian, Simplified Chinese, Traditional Chinese, French, Spanish and Russian; availability depends on the software build

NOTE

Specifications are based on the available product documentation. The nameplate, factory test report, software About screen and order confirmation for the delivered serial number take precedence.



6. Receiving, Inspection and Storage

6.1 Receiving Inspection

1. Inspect the transport case and outer packaging for impact, crushing, water entry or tampering before opening.
2. Verify the instrument, two batteries, charger, adapter, USB-OTG cable, USB drive, wrist strap, test films, calibration material, manual and other items against the packing list.
3. Inspect the test window, protective film, sample sensor, screen, buttons, battery compartment, connectors and enclosure for damage.
4. Confirm that the model, serial number, certificates and factory test report match the order.
5. Charge both batteries and retain the packaging for storage, transport or warranty evaluation.

6.2 Storage Before Use

- Store the instrument in its protective case in a secure, clean and dry location.
- Protect from unauthorised access, direct sunlight, high temperature, condensation, corrosive vapours and strong vibration.
- Store batteries partially charged for extended periods and inspect them periodically according to site battery procedures.
- Keep replacement test films, calibration materials and the detector window clean and protected from dust.



7. Instrument Components and Controls

7.1 Touch Display and Control Panel

The capacitive touchscreen supports light taps and swipes. The physical controls include the power key, a four-way rocker with confirmation function, an indicator light and a return key. The instrument can be operated by touch or by the physical controls.

7.2 Data Interface and Test Head

The lower interface area provides USB connections for data transfer and USB-OTG computer connection. The test head contains the X-ray window, detector path, sample-presence sensor and sample camera. The scene camera is optional. The sample sensor prevents empty measurements and shall remain enabled during normal use.



Figure 2. Data interface and test-head components.

7.3 Battery and Battery Compartment

The removable battery contains a charge-level indicator. Install it only in the correct orientation and confirm that the battery cover and lock are fully secured.



Figure 3. Battery level indication, battery installation and battery lock detail.



8. Battery Installation, Start-up and Calibration

8.1 Battery Installation

6. Check that the battery is charged and undamaged.
7. Open the battery-cover lock at the bottom of the handle and remove the cover or existing battery.
8. Insert the battery in the only permitted orientation. Do not force it.
9. Close and lock the cover. Confirm that it cannot open during use.

8.2 Power-on and Login

10. Press and hold the power button until the indicator illuminates and the software starts.
11. At the login screen, enter the operator credential assigned during commissioning.
12. Change factory credentials and keep administrator credentials restricted.
13. Confirm battery level, date/time, selected mode and safety indicators before measurement.

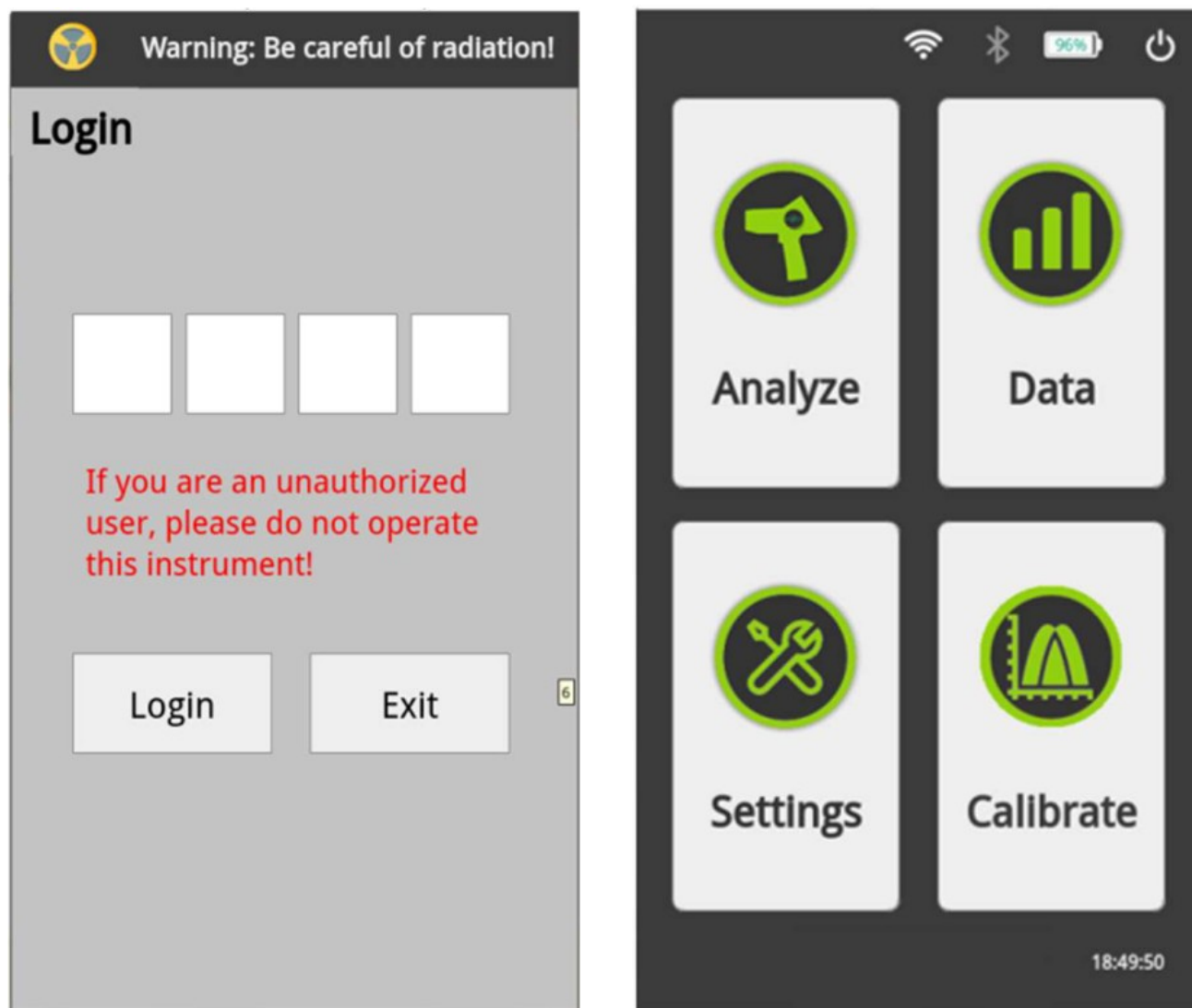


Figure 4. Login screen and main software interface.

8.3 Calibration and Verification

The ElementX H1 is calibrated and adjusted before shipment. It uses a built-in calibration standard and is supplied with an external reference material primarily for verification. One-touch calibration checks and corrects energy-channel alignment. Application-specific quantitative verification should be performed with a suitable reference material.

14. Inspect and clean the test window film. Confirm that the instrument has reached stable operating condition.
15. Tap Calibration. If prompted, position the supplied external reference so it fully covers the window.
16. Confirm the calibration command. The process normally completes automatically within approximately 5-50 seconds.
17. Record the result. If calibration fails, check the reference placement, window condition and battery level, then repeat once.
18. Do not change administrator calibration factors or curves unless authorised by Blue Dragon Technology or the responsible technical authority.

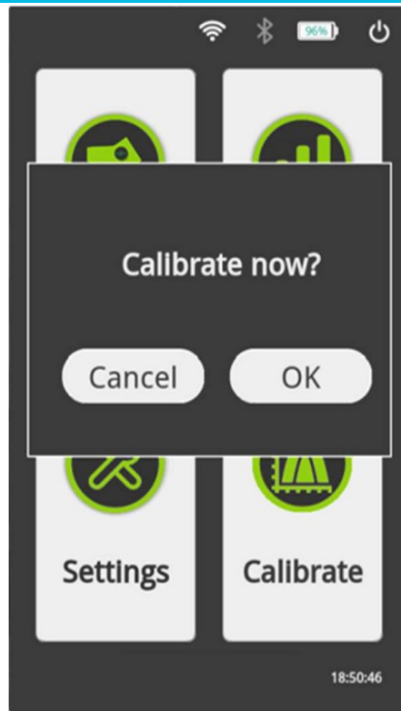


Figure 5. Calibration confirmation screen.

8.4 Normal Shutdown

19. Stop any active measurement and confirm that the X-ray indicator is off.
20. Return to the main screen and select Shutdown, or press and hold the power key until the indicator turns off.
21. Do not remove the battery while data are being saved or exported.



9. Measurement Planning and Sample Preparation

9.1 Select the Correct Mode and Curve

Select the analytical mode and test curve that correspond to the sample matrix. A curve intended for one ore, alloy or soil type may produce misleading results when applied to another matrix. Where automatic sample classification is enabled, review the selected curve before accepting the result.

9.2 Sample Coverage and Geometry

- The sample shall fully cover the test window and contact the head as closely and consistently as practical.
- Measure a flat, representative area. Avoid edges, holes, heavy corrosion, loose scale and strongly curved surfaces.
- For irregular objects, use a stable fixture or test stand and provide shielding behind the sample.
- Never hold small samples in the beam path.

9.3 Ore, Mineral and Powder Samples

- For rapid field screening, measure multiple representative points and report the spread of results.
- For improved quantitative repeatability, dry where appropriate, reduce particle size, homogenise and fill a suitable cup or prepare a pressed pellet.
- Do not permit loose powder to enter the test window. Use intact test film and appropriate sample containment.
- Use certified reference materials and duplicate measurements to confirm that the installed curve is suitable.

9.4 Quality-Control Practice

Check	Recommended frequency	Acceptance approach
Calibration / energy alignment	At start-up when required, after abnormal results, impact, major temperature change or service.	Calibration completes without error and verification result is acceptable.
Reference material	Start of shift or batch; after changing mode; after calibration.	Result within the site control limit established for the reference.
Duplicate measurement	Representative samples and whenever heterogeneity is suspected.	Difference within the site repeatability limit.
Blank / clean check	Where relevant to the application.	No unexpected contamination or carryover indication.



10. Routine Measurement Workflow

10.1 Select Analysis Mode

From the main interface, select Analysis. Tap the mode name to open the mode-selection screen and choose the appropriate application. The selected mode appears in the analysis status area.

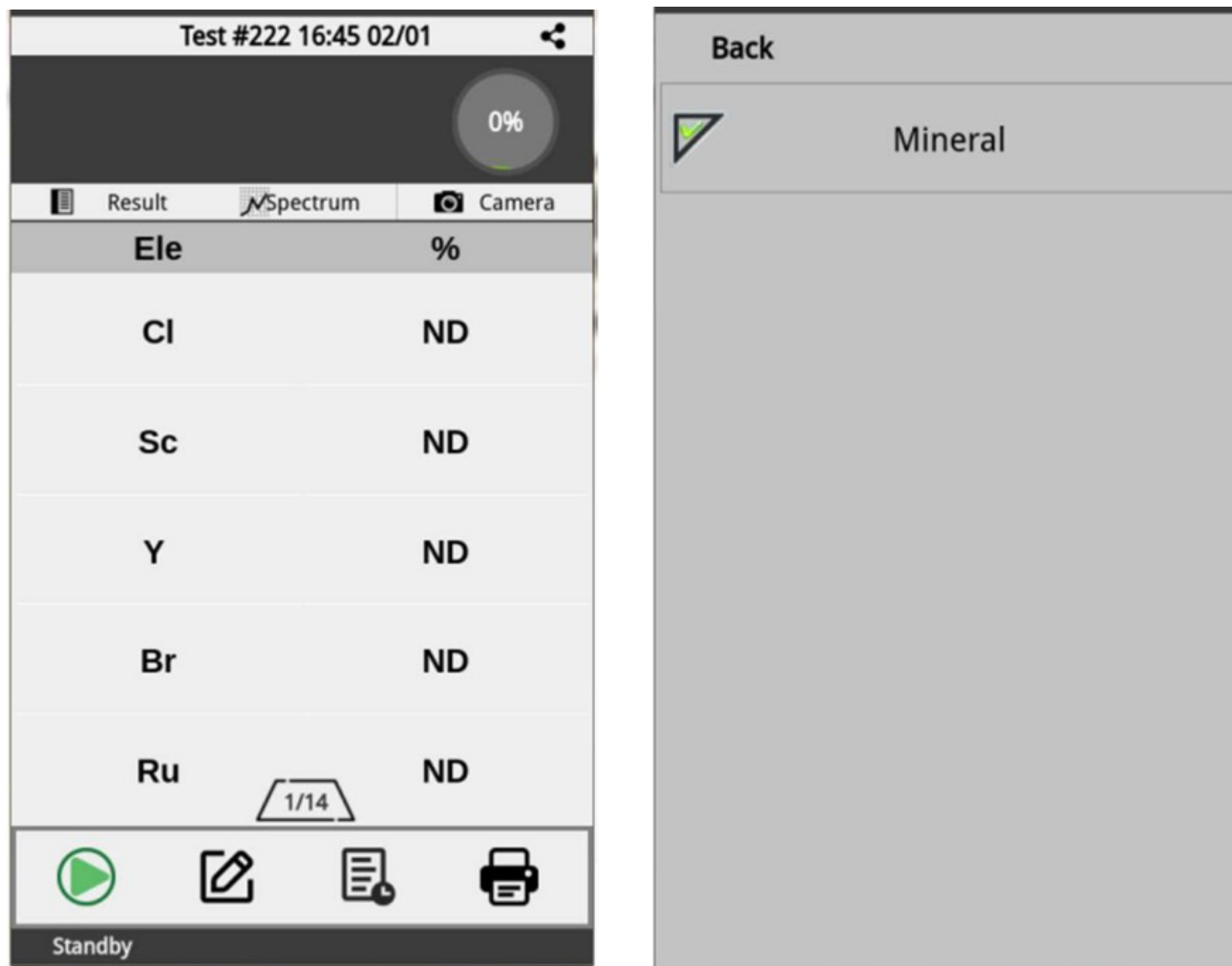


Figure 6. Analysis interface and mode-selection screen.

10.2 Enter Sample Information

Enter a unique sample name or use automatic naming. Record the sample description, operator, source or supplier, selected curve, measurement time, repeat count and interval. Use English letters and numbers for filenames where possible to improve compatibility when exporting data.

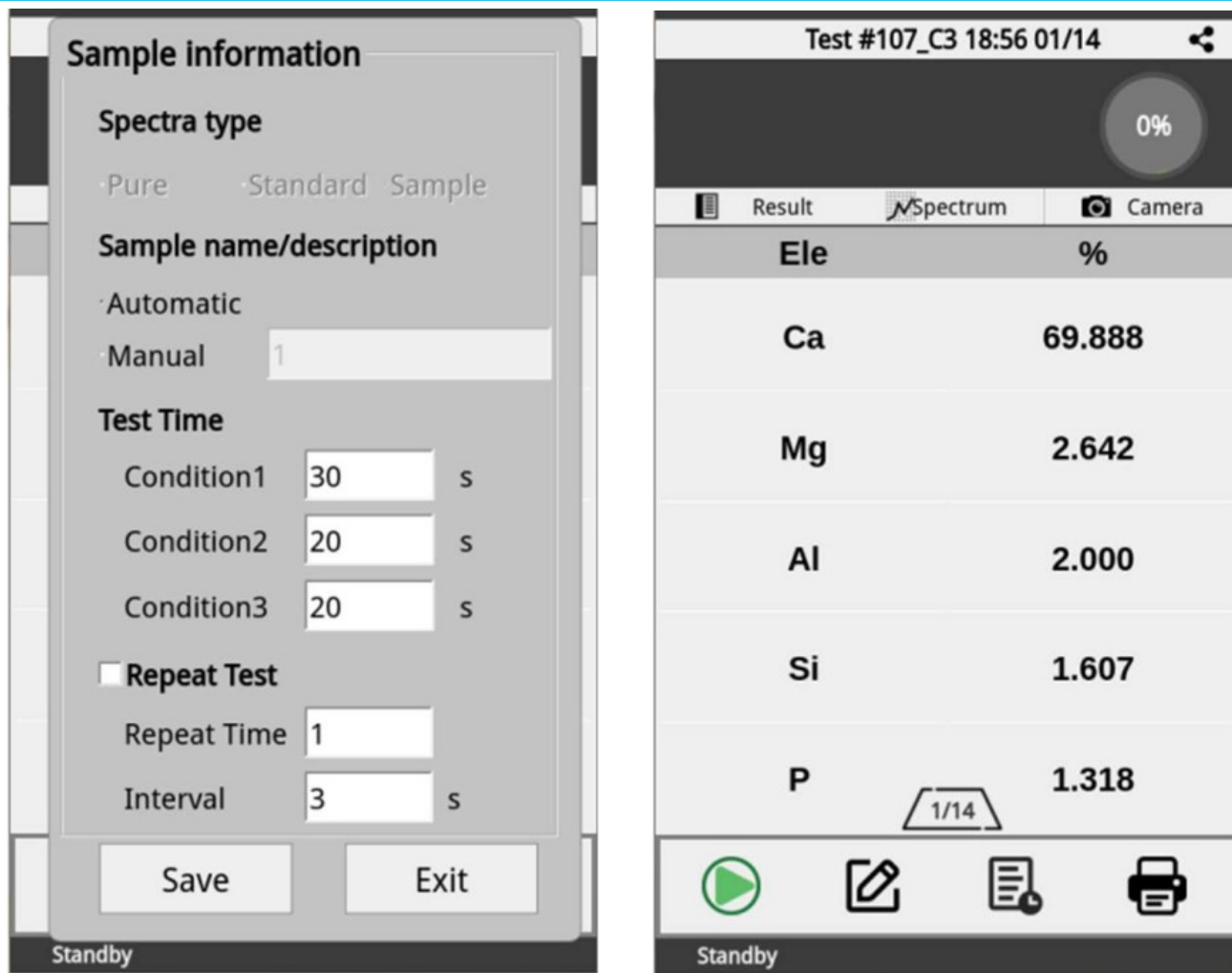


Figure 7. Sample information and test-result screens.

10.3 Start the Measurement

22. Confirm that the sample fully covers the test window and that the instrument is stable.
23. Tap Start or pull the trigger once. A prolonged trigger press is not required.
24. Observe the X-ray indicator and do not move the instrument or sample during the test.
25. At completion, review the result, spectrum, selected curve, measurement time and any warning or classification message.

10.4 Save, Print and Export

The spectrum and calculated result are stored in the instrument records. Formal reports can be generated from the historical-record interface and saved to the USB drive in the supported format. A compatible Bluetooth printer is required for direct paper printing and is optional.



History

Sample	Curve	Open
BD-006	Ore - General	Import
BD-005	Rare Earth	Details
BD-004	Gold Ore	Settings
BD-003	Precious Metal	Save
BD-002	Alloy	Print
BD-001	Soil	Export
		Statistics
		Delete
		Clear
		Exit

Curve Selection

Installed Curves	Open
Ore - General	Import
Rare Earth	Details
Precious Metal	Settings
Gold Ore	Save
Alloy	Print
Soil	Export
	Statistics
	Delete
	Clear
	Exit

Sample Detail

Sample ID: BD-006				Open
Curve: Ore - General				Import
Operator: Operator 1				Details
Date: 2026-07-28				Settings
Time: 10:35:14				Save
Element	Result	Unit	$\pm 2\sigma$	Print
Fe	54.21	%	0.42	Export
Cu	1.37	%	0.05	Statistics
Zn	2.68	%	0.07	Delete
Pb	0.42	%	0.03	Clear
Ni	0.31	%	0.02	Exit
Au	0.15	ppm	0.02	

Blue Dragon Report

BLUE DRAGON		ElementX H1 Report		Open
Sample Information				Import
Sample ID	BD-006	Curve	Ore - General	Details
Operator	Operator 1	Date	2026-07-28	Settings
Time	10:35:14	Instrument	ElementX H1	Save
Results				Print
Element	Result	Unit	$\pm 2\sigma$	Export
Fe	54.21	%	0.42	Statistics
Cu	1.37	%	0.05	Delete
Zn	2.68	%	0.07	Clear
Pb	0.42	%	0.03	Exit
Ni	0.31	%	0.02	
Au	0.15	ppm	0.02	

Figure 8. English-language history, curve-selection, sample-detail and Blue Dragon report screens.



10.5 Standard Test Flow

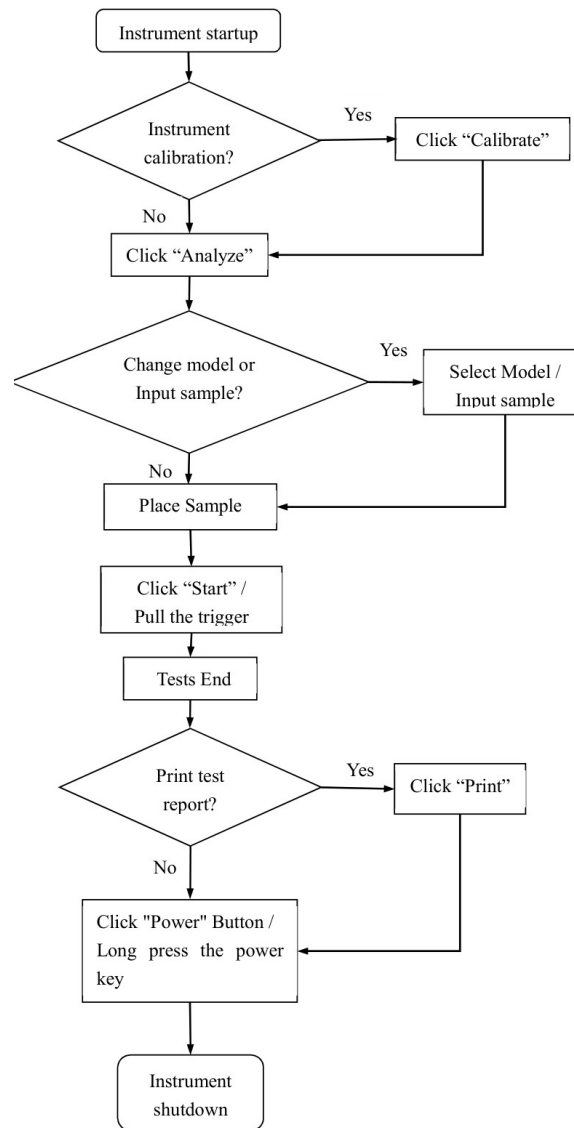


Figure 9. Standard measurement workflow.



11. Software Overview

11.1 Main Interface

After start-up, the main interface provides access to Analysis, Data, Settings and Calibration. The status bar shows battery and communications status, while the shutdown function safely closes the software and instrument.

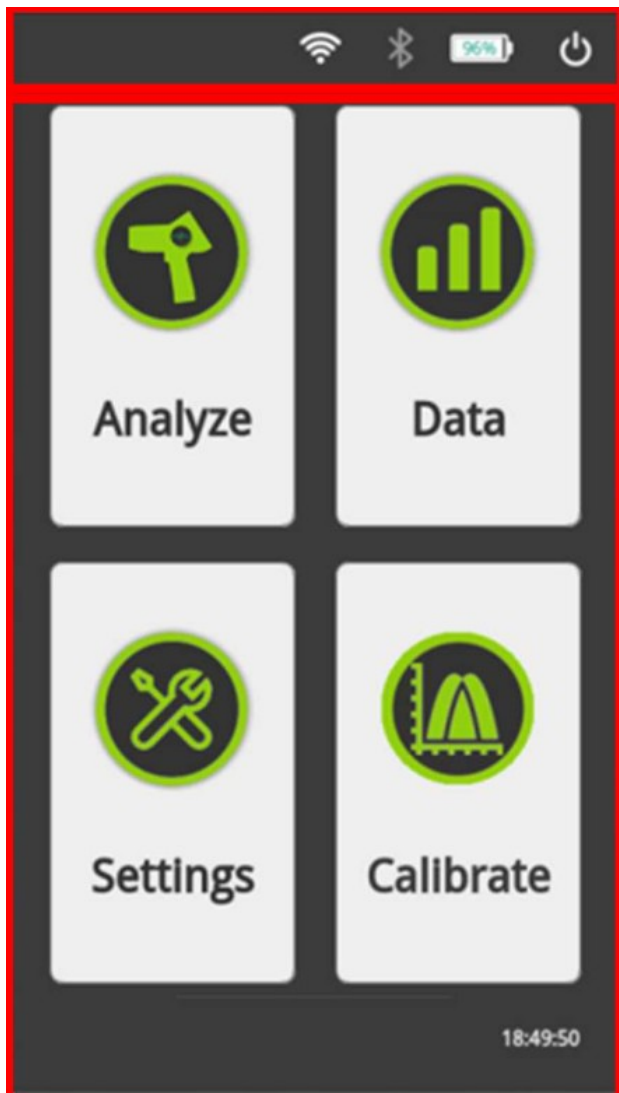


Figure 10. Main interface and status-bar indicators.

11.2 Analysis Interface Areas

The analysis interface is divided into the status area, mode and sample settings, result display, spectrum/camera display, shortcut controls and progress/status indication. Exact icons and labels may vary with the software build and installed application package.



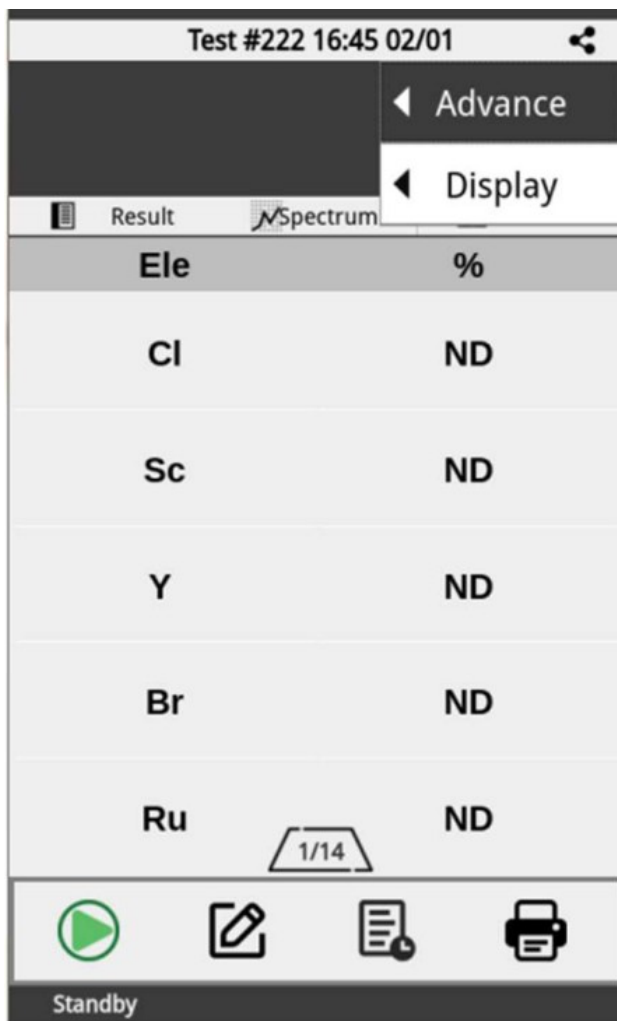
Figure 11. Analysis interface area reference.



12. Analysis Interface and Measurement Settings

12.1 Menu and Advanced Settings

Use the menu to open Advanced Settings and Display Settings. Normalisation controls residual processing for ore analysis. Automatic sample classification performs a preliminary identification step and selects a corresponding curve. Use these functions only when they are part of the validated method.



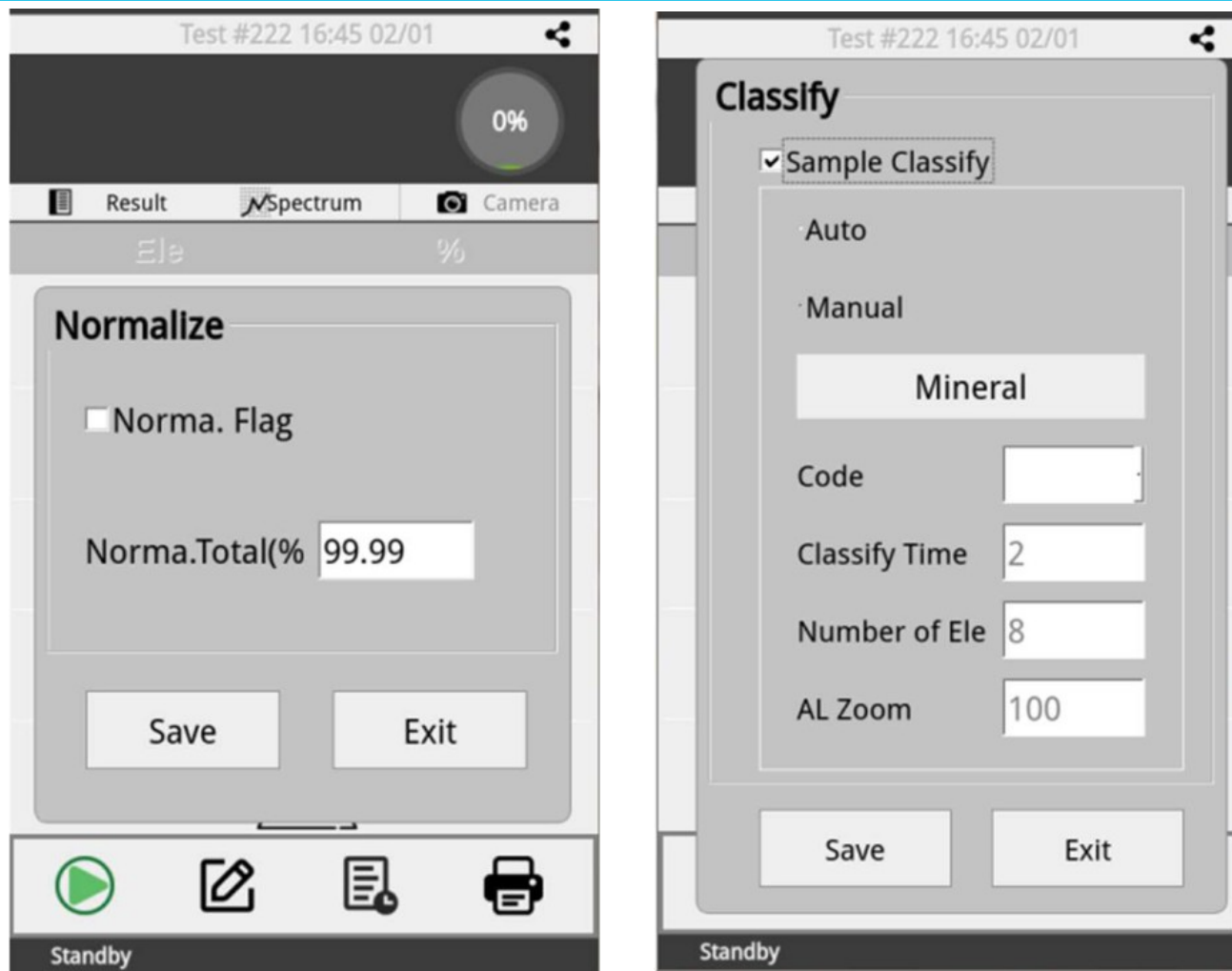


Figure 12. Menu, advanced settings, normalisation and sample-classification controls.

12.2 Measurement Termination and Calibration Factors

The test may end after a configured measurement time or, where enabled, after sample classification identifies the curve. Calibration-factor packages and quantitative corrections require administrator privileges and shall not be altered without technical approval.

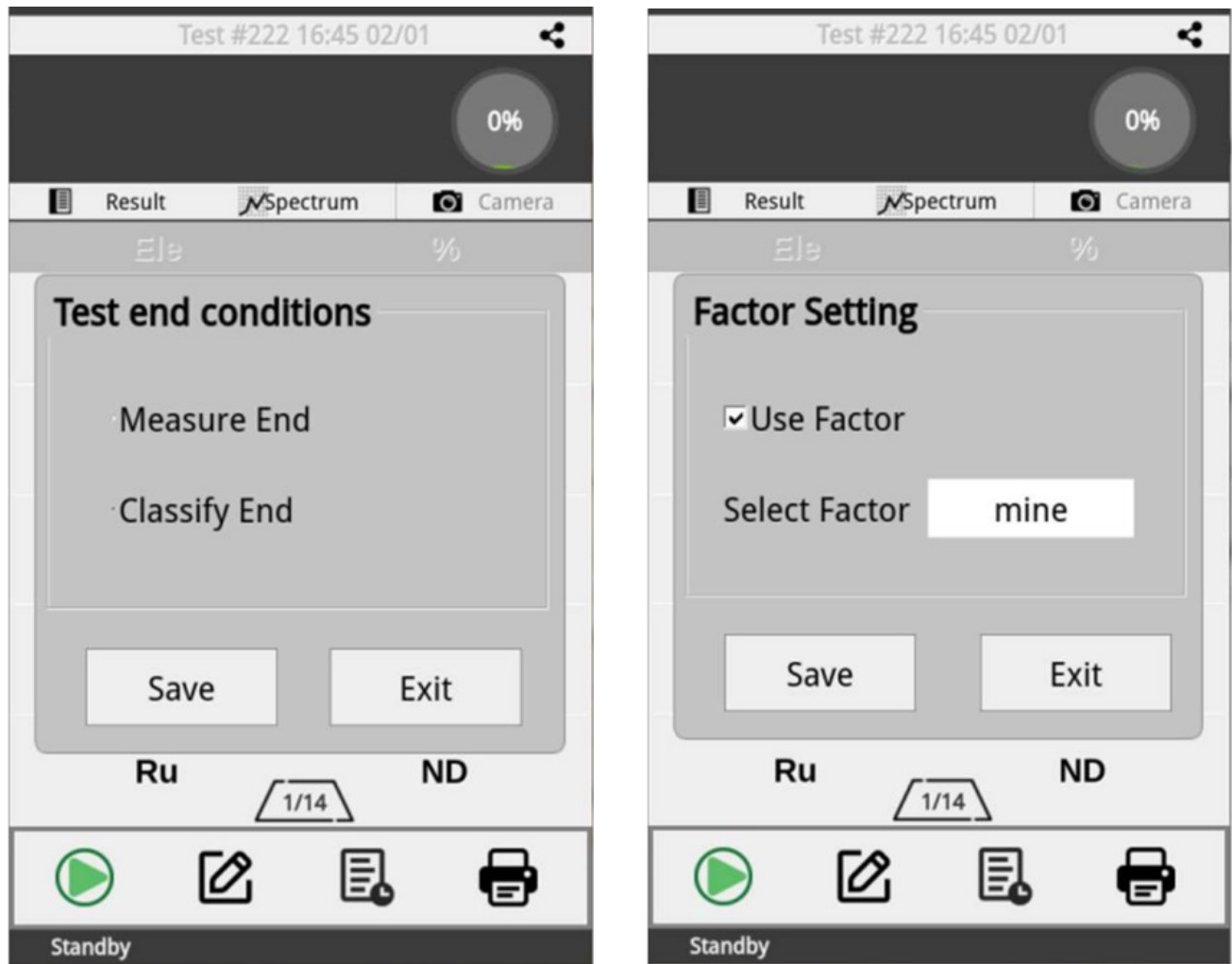


Figure 13. Measurement termination and factor settings.

12.3 Display Configuration

The operator can configure displayed elements, sorting, focus elements, limit values, units, oxide display, alloy grades where available, result precision and real-time result display. Display configuration changes how information is presented; it does not create an analytical capability that is absent from the selected curve.



Test #222 16:45 02/01

Ele.Show	◀ Advance
Ele.Sort	◀ Display
Focus Ele.	%
Ele.Limit	ND
Ele.Unit	ND
Elem Oxide	ND
Alloy Grade	ND
Result Decimal	ND
Real Time Result	ND
Ru	ND

1/14

Standby

Test #222 16:45 02/01

Ele.Show

◀ 1/9 ▶

Cl	Yes
Sc	Yes
Y	Yes
Br	Yes
Ru	Yes
Rh	Yes
I	Yes
Tc	Yes

Show All

Exit

☐ Show Valid Ele

Standby

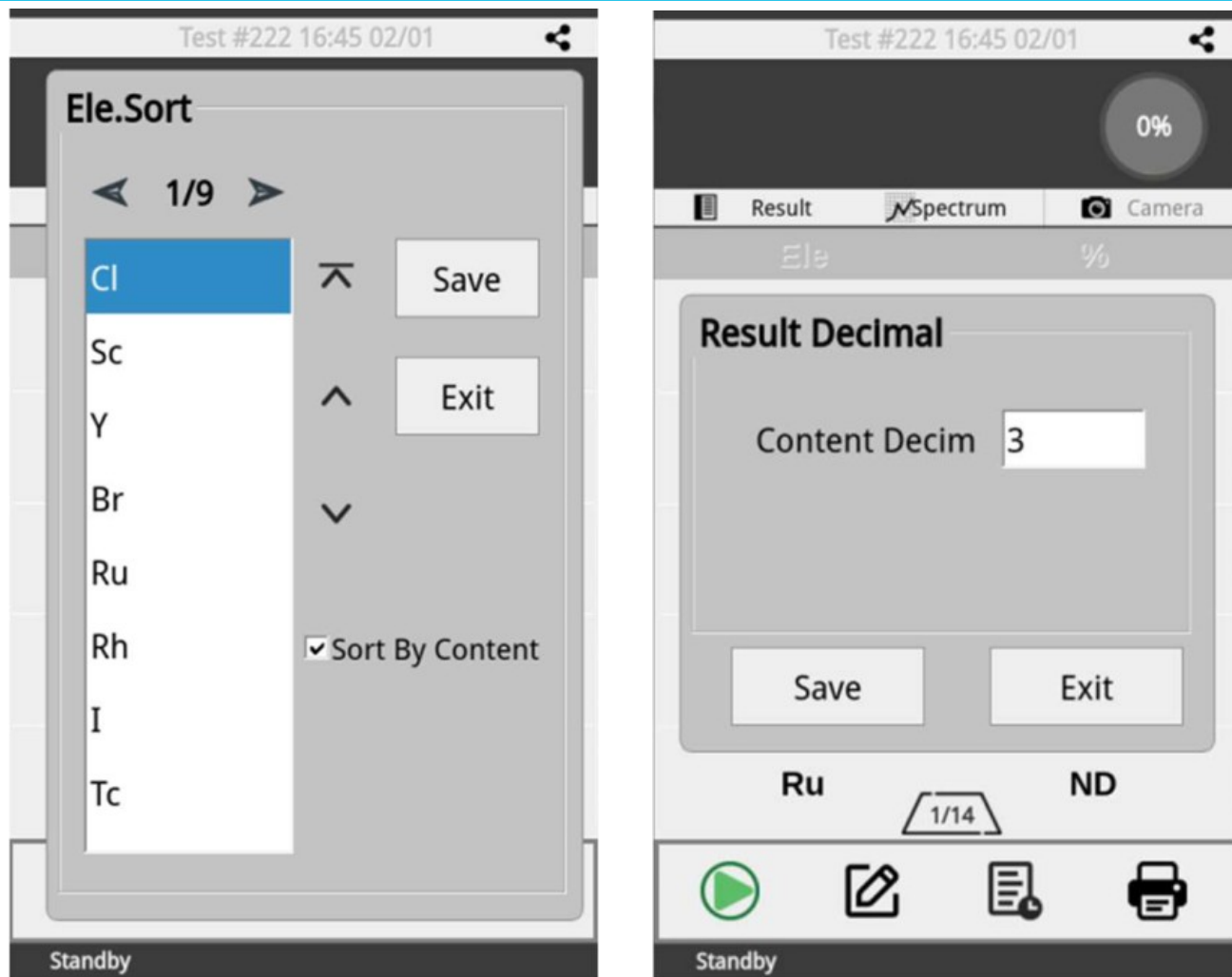


Figure 14. Element display, sorting and result-precision settings.

12.4 Results, Spectrum and Camera

The result page shows calculated element concentrations. The spectrum page displays the acquired spectrum and permits reference-spectrum comparison. The camera page shows the sample image and measurement location. Use the spectrum and sample image to support traceability and to investigate unexpected results.

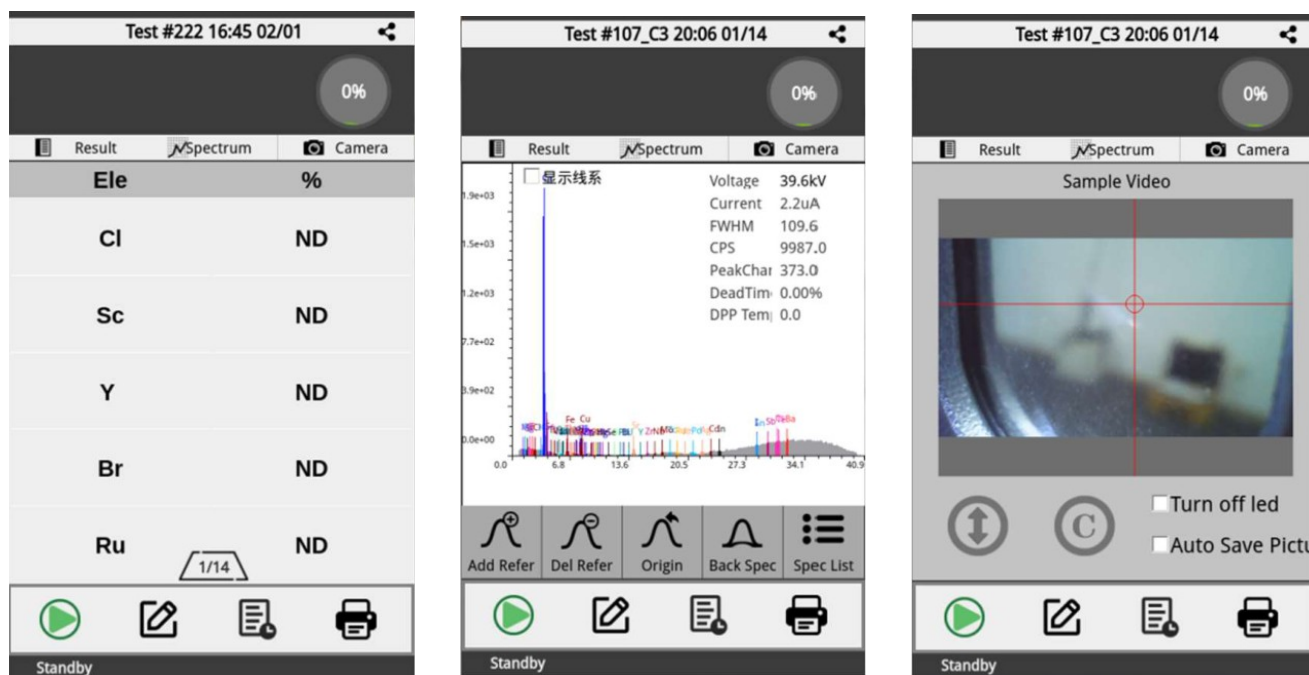


Figure 15. Results, spectrum and camera pages.

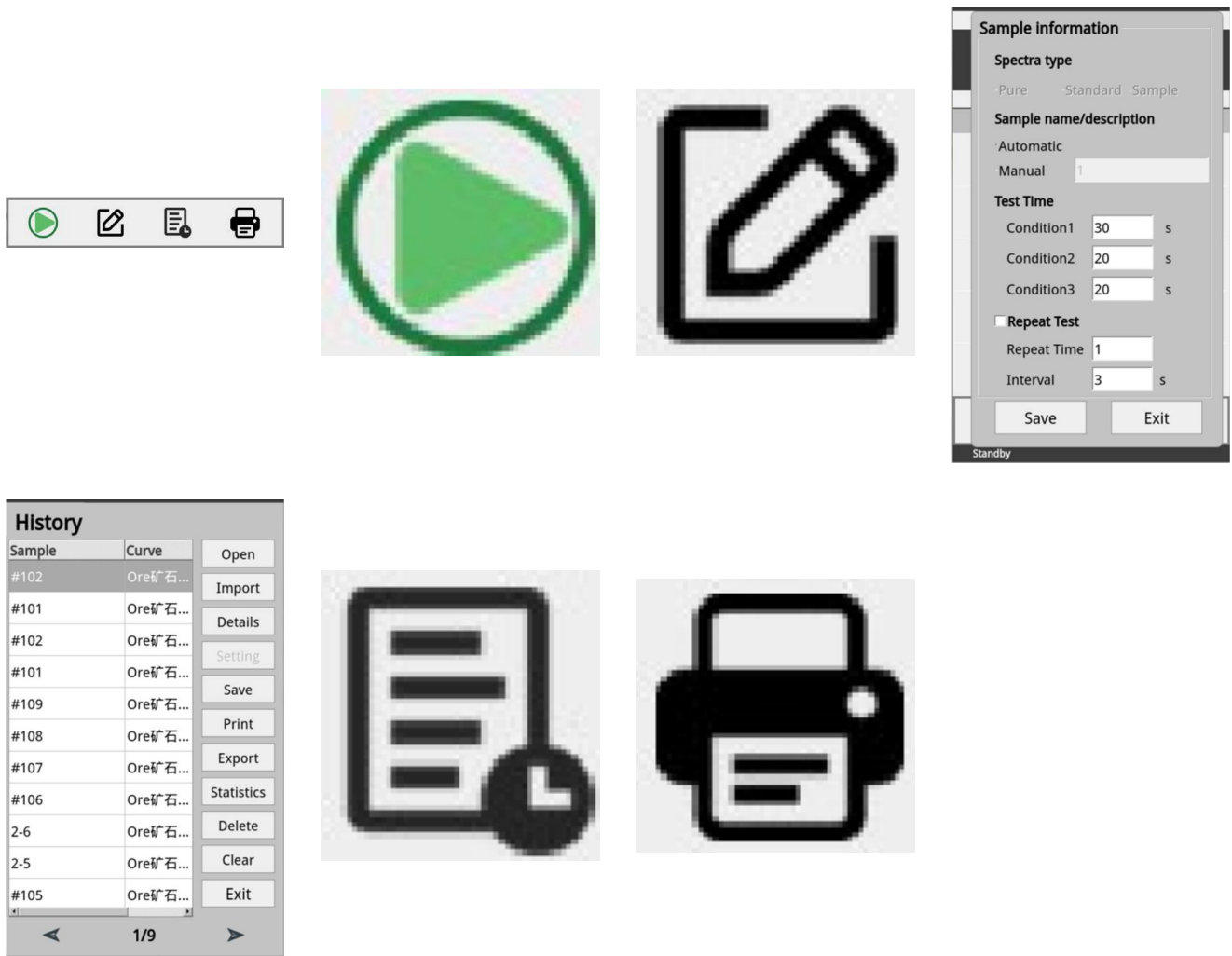


Figure 16. Shortcut controls for starting, sample information, records and printing.



13. Data, Reports and Records

13.1 Data Interface

The Data interface provides historical records, grade-management functions where installed, report export, standard/limit files, image management and data backup. Maintain a documented backup routine before software service, major configuration changes or storage-capacity limits are reached.

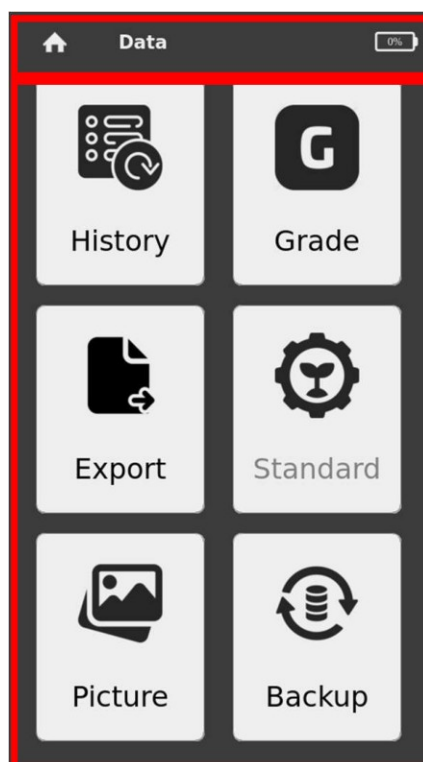


Figure 17. Data interface.

13.2 Historical Records and Sample Details

Historical records can be opened, reviewed, saved, printed, exported or deleted. Confirm the selected record before deleting or clearing data. Use unique sample identifiers and record the operator, mode and source to preserve traceability.

History	
Sample	Curve
BD-006	Ore - General
BD-005	Rare Earth
BD-004	Gold Ore
BD-003	Precious Metal
BD-002	Alloy
BD-001	Soil

Sample Detail			
Sample ID:		BD-006	
Curve:		Ore - General	
Operator:		Operator 1	
Date:		2026-07-28	
Time:		10:35:14	
Element	Result	Unit	$\pm 2\sigma$
Fe	54.21	%	0.42
Cu	1.37	%	0.05
Zn	2.68	%	0.07
Pb	0.42	%	0.03
Ni	0.31	%	0.02
Au	0.15	ppm	0.02

Figure 18. English-language history and sample-detail interfaces.

13.3 Report Export

Insert the USB drive, mount it through the software where required, select the report and destination, and copy the file. Always use the software unmount function before removing the drive to reduce the risk of data corruption.

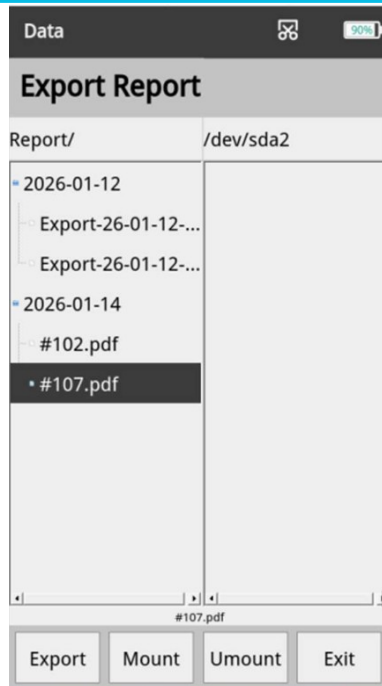


Figure 19. Report export interface.

13.4 Images and Backup

Image Management supports review and deletion of sample images. Data Backup supports backup and restoration of instrument data. Store backup copies on a controlled external system and protect customer or location data according to company policy.

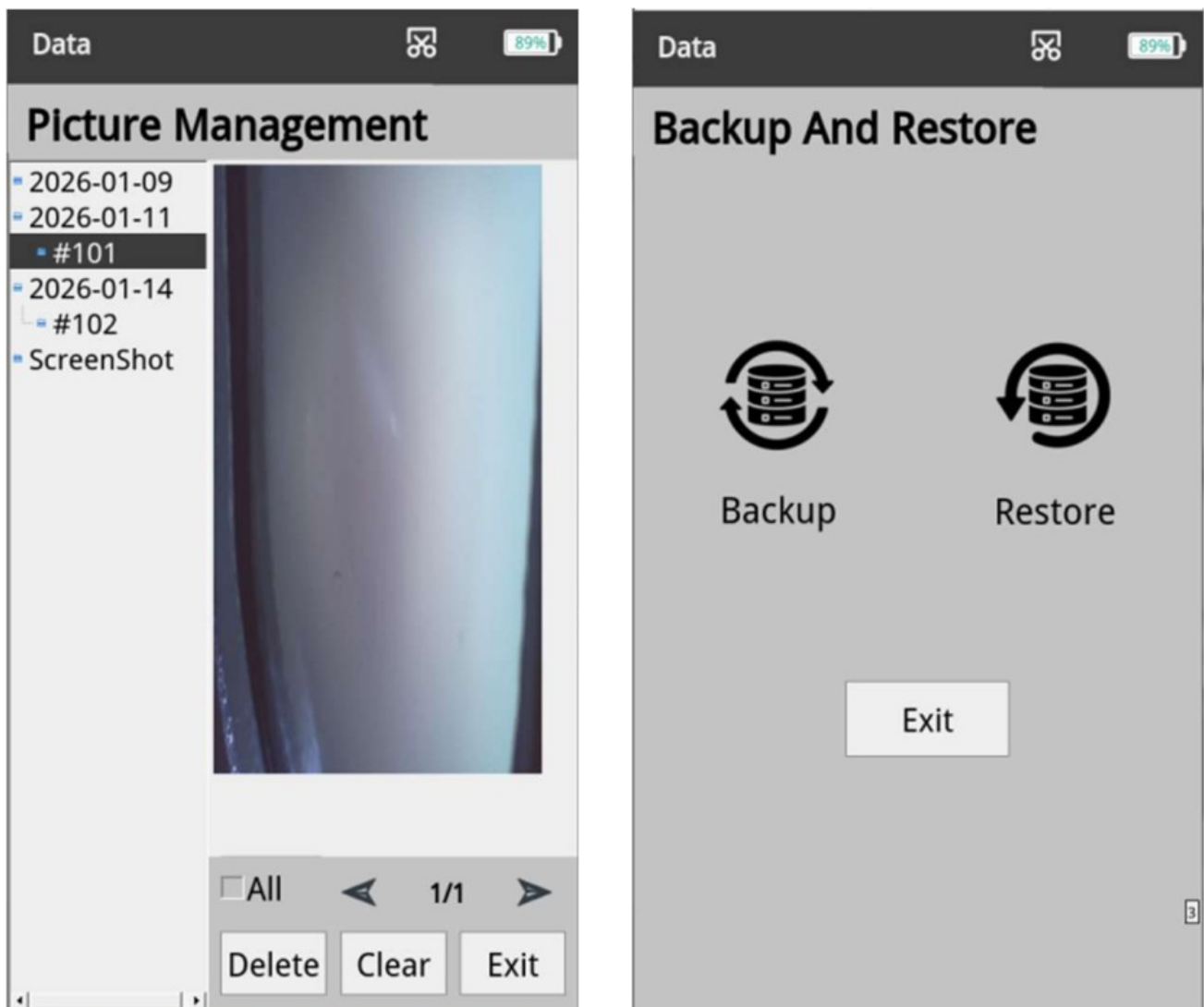


Figure 20. Image management and data backup.



14. System and Advanced Settings

14.1 Settings Interface

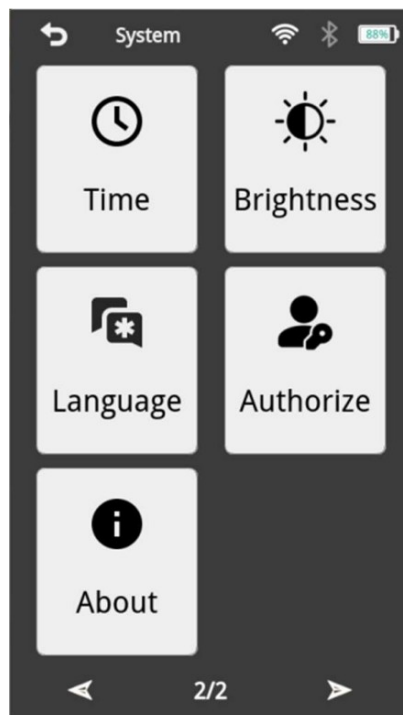
The Settings interface contains System Settings, Advanced Settings, Model Settings and Correction Factor. Operator access should be limited to functions needed for routine measurement. Administrator functions can change hardware parameters, calibration and analytical behaviour.



Figure 21. Settings interface.

14.2 Wi-Fi, GPS, Bluetooth and Remote Settings

Wi-Fi supports local remote connection. GPS is optional and records location with results when fitted. Bluetooth supports connection to the optional dedicated printer. Remote access should be disabled when not required and limited to trusted local networks.



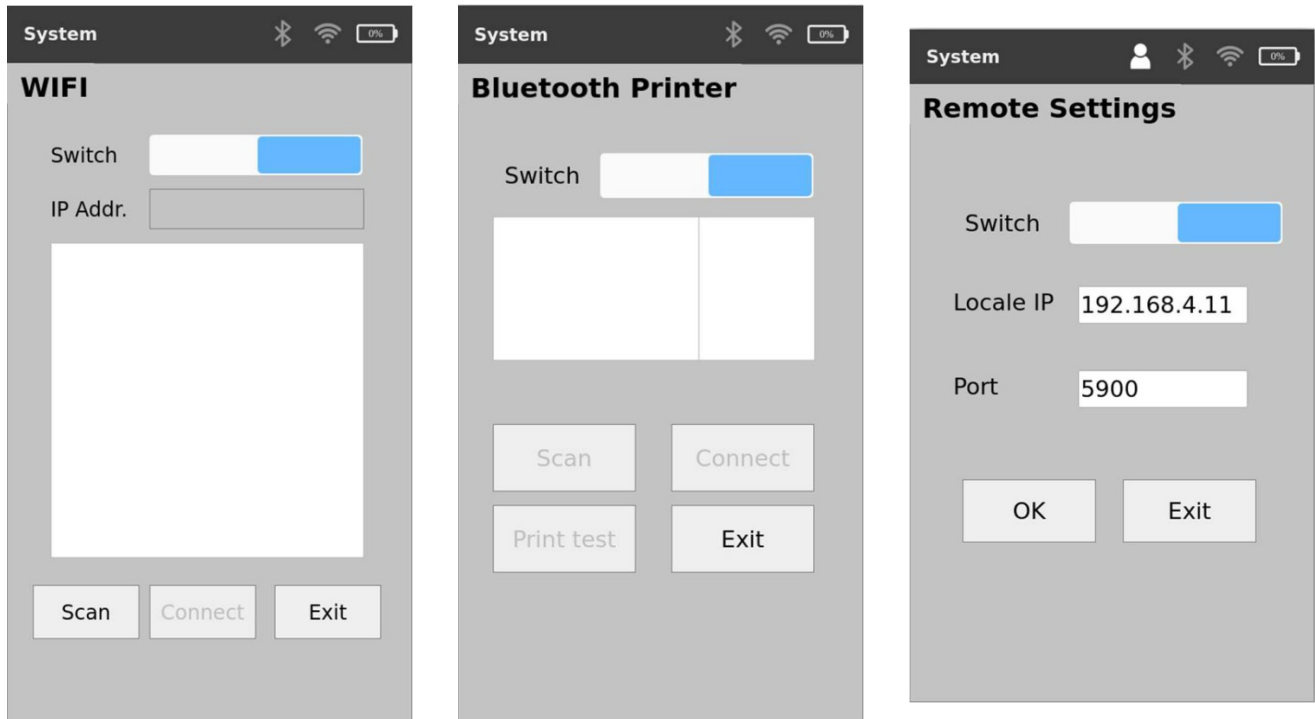
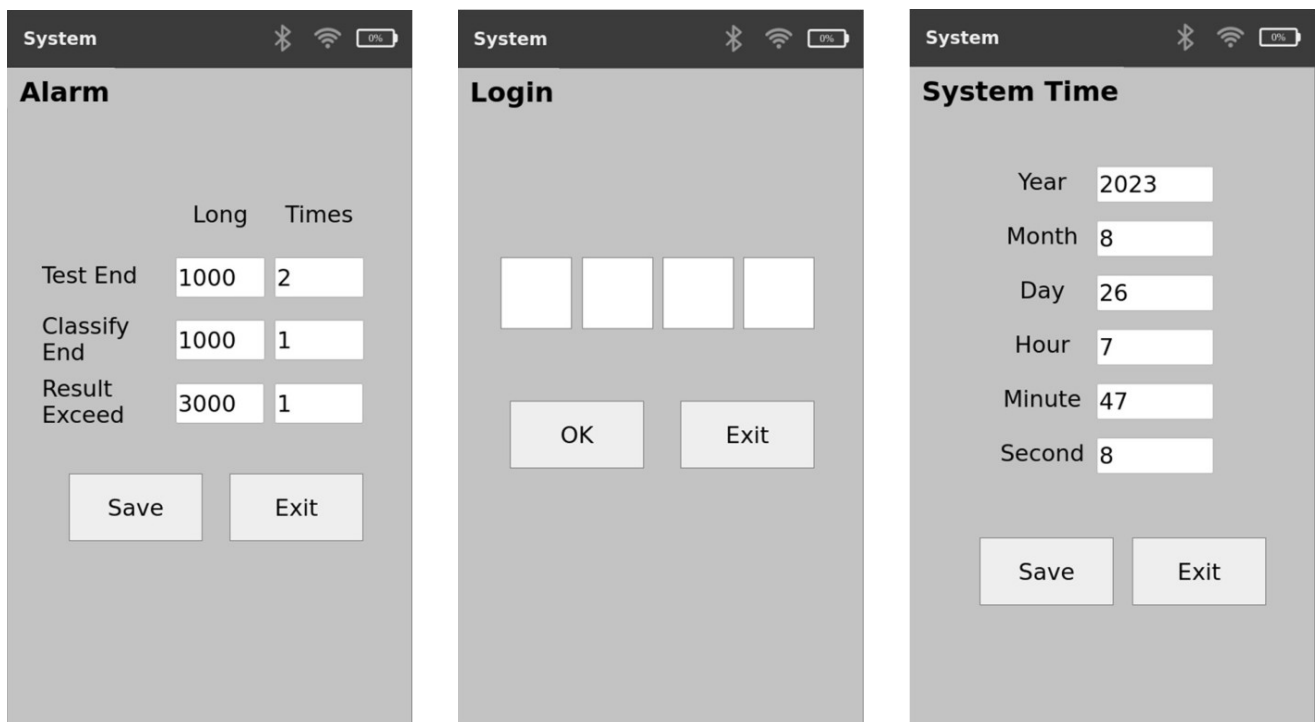


Figure 22. System, Wi-Fi, GPS, Bluetooth and remote settings.

14.3 Alarm, Administrator, Time, Brightness, Language and Authorisation

Configure audible alarms, local time, screen brightness and language during commissioning. Software authorisation records the activation status for the delivered instrument. Contact Blue Dragon Technology if the software reports an authorisation or activation error. Administrator credentials provide access to protected settings and shall be controlled.



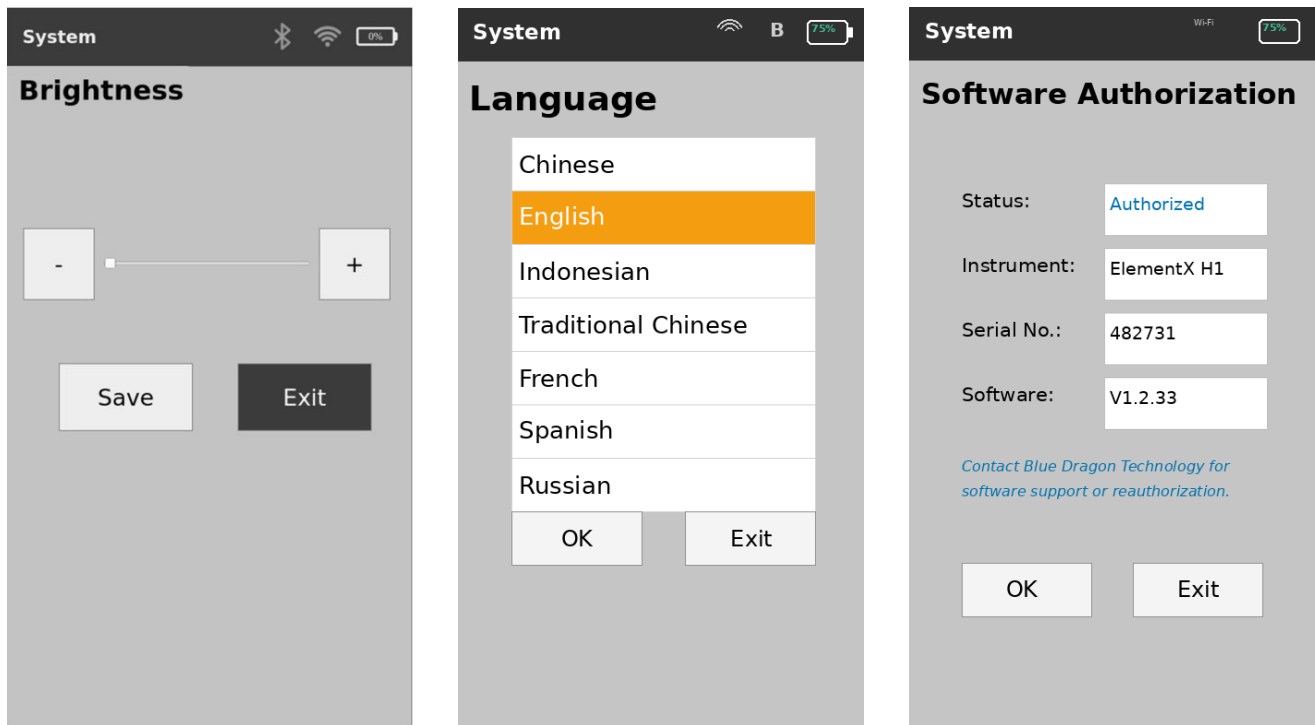
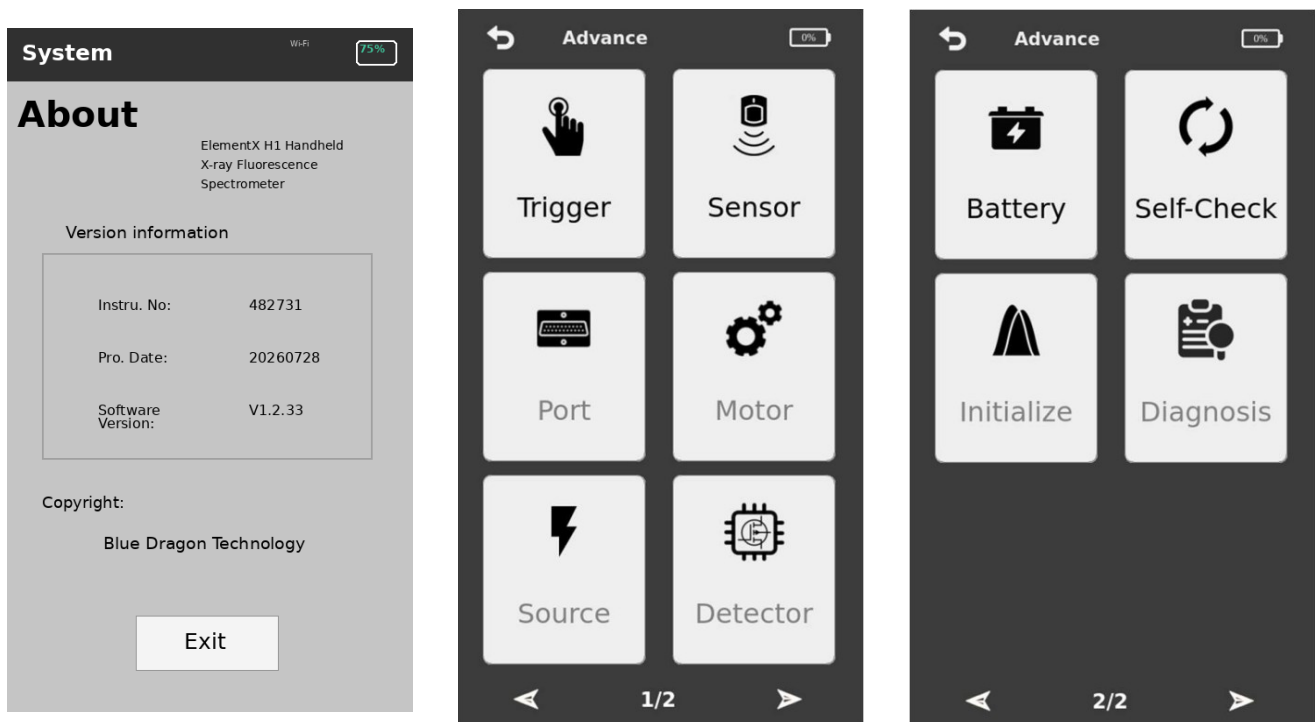


Figure 23. Alarm, administrator, time, brightness, language and software-authorization screens.

14.4 About and Advanced Hardware Settings

The About screen records the instrument number, production date and software version. Record this information before requesting technical support. Advanced hardware settings include trigger, sample sensor, ports, motor, X-ray source, detector, battery, self-test, calibration and diagnostics. Protected interfaces are for authorised personnel only.



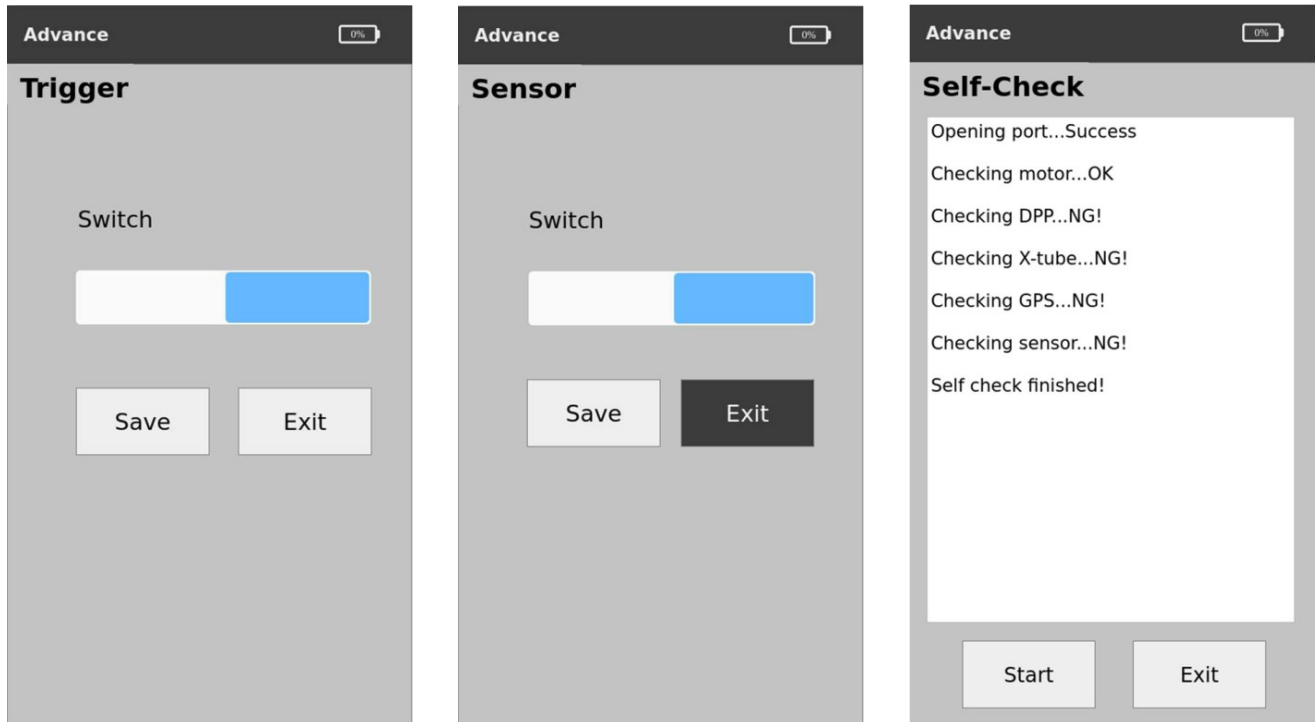
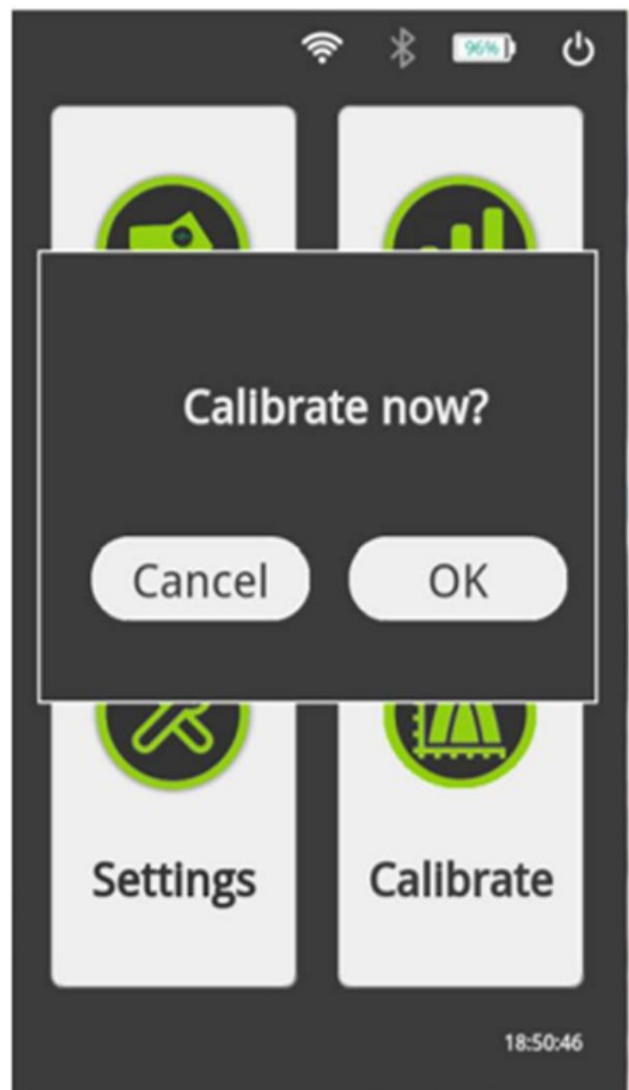
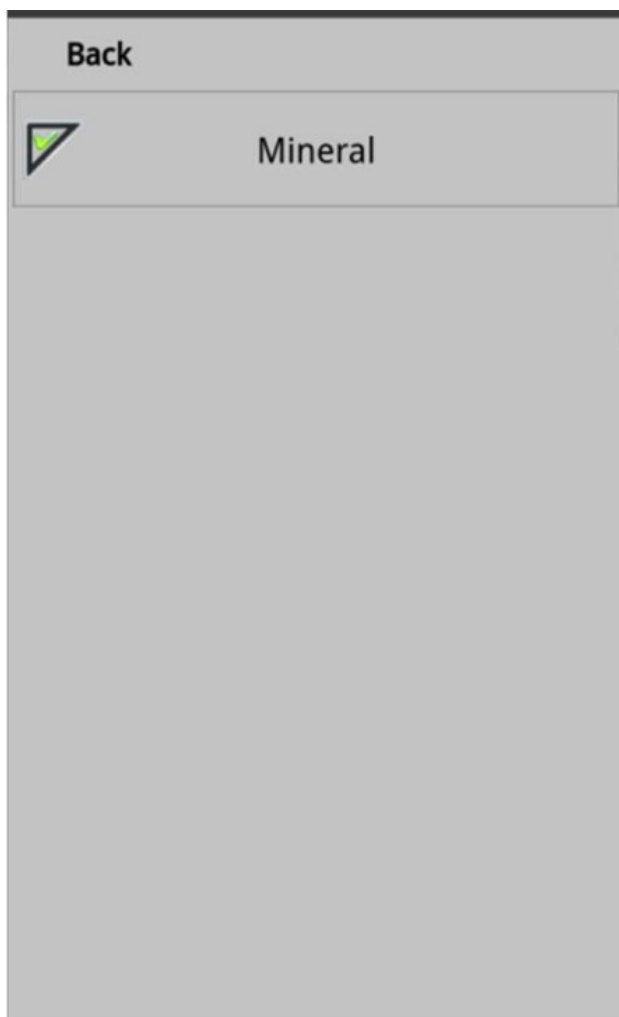


Figure 24. About screen, advanced-settings menus, trigger, sensor and self-test.

14.5 Model Settings and Correction Factors

Model Settings selects the qualitative/quantitative mode and test curve. Correction Factor functions alter calculated results and require administrator privileges. Do not change curves, factor packages or hardware parameters unless the change is documented and validated.





15. Remote Connection

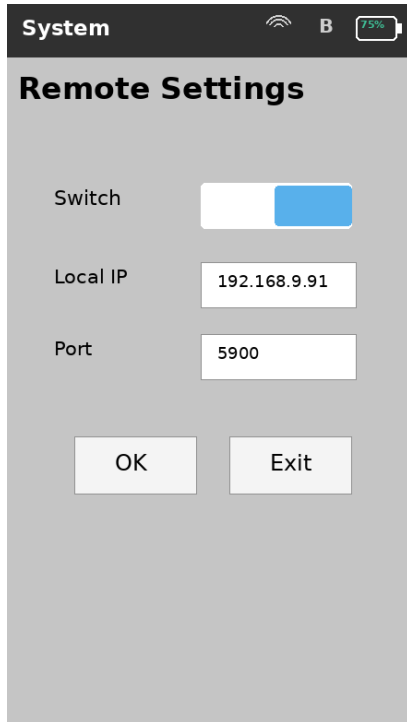
SECURITY

Remote access permits another device to operate the instrument interface. Enable it only for authorised support or controlled operation. Use a trusted private network, protect credentials, maintain visual control of the instrument, and confirm that the sample and shielding remain safe. Do not expose the remote-access service directly to the internet or configure router port forwarding. Disable remote access immediately after use.

15.1 Mobile-Device Connection

26. Connect the ElementX H1 and mobile device to the same trusted Wi-Fi network.
27. Record the IP address shown in the instrument Wi-Fi settings.
28. Enable Remote in the instrument settings and confirm the software restart into remote mode.
29. Open the Blue Dragon-approved remote-access client on the mobile device and create a connection using the displayed IP address and assigned port.
30. Open the connection and verify that the instrument screen appears. Disable remote mode after use.





Approved_Remote_Client.apk
ElementX_H1_Remote_Connection_Guide.pdf

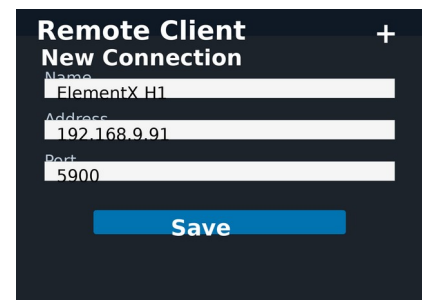
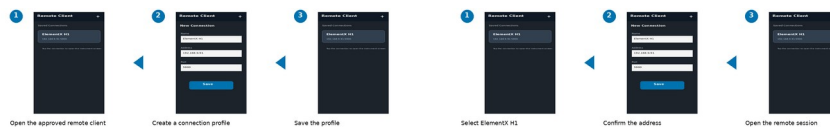
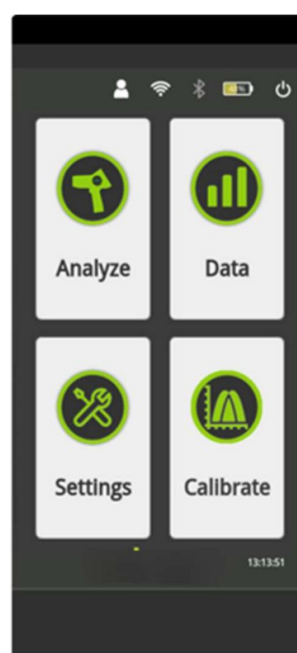
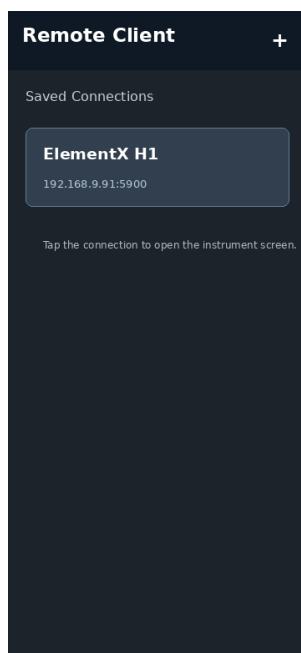


Figure 26. Mobile remote-access configuration sequence.

15.2 Computer Connection by USB-OTG

31. Connect the supplied USB-OTG cable between the instrument and computer.
32. Install the supplied virtual-network driver where required and verify that the USB network adapter appears.
33. Install the Blue Dragon-approved remote-access client supplied or specified for the order.
34. Enable remote mode on the instrument, create a connection using the displayed address and port, and open the connection.
35. Close the session and disable remote mode when support or operation is complete.



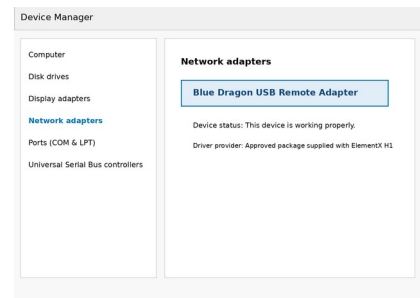


Ports (COM & LPT)

USB-SERIAL CH340 (COM3)



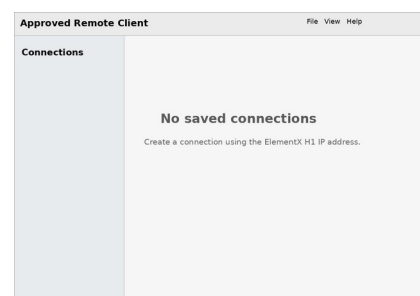
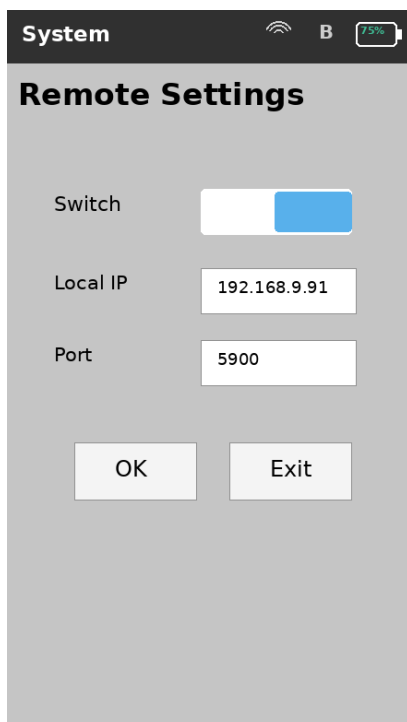
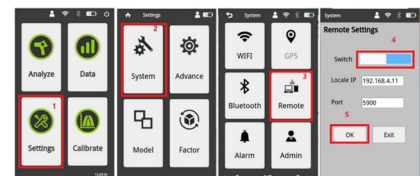
Blue_Dragon_USB Network_Driver v1.0.zip



Network adapters

Intel(R) Dual Band Wireless Adapter

Blue Dragon USB Remote Adapter



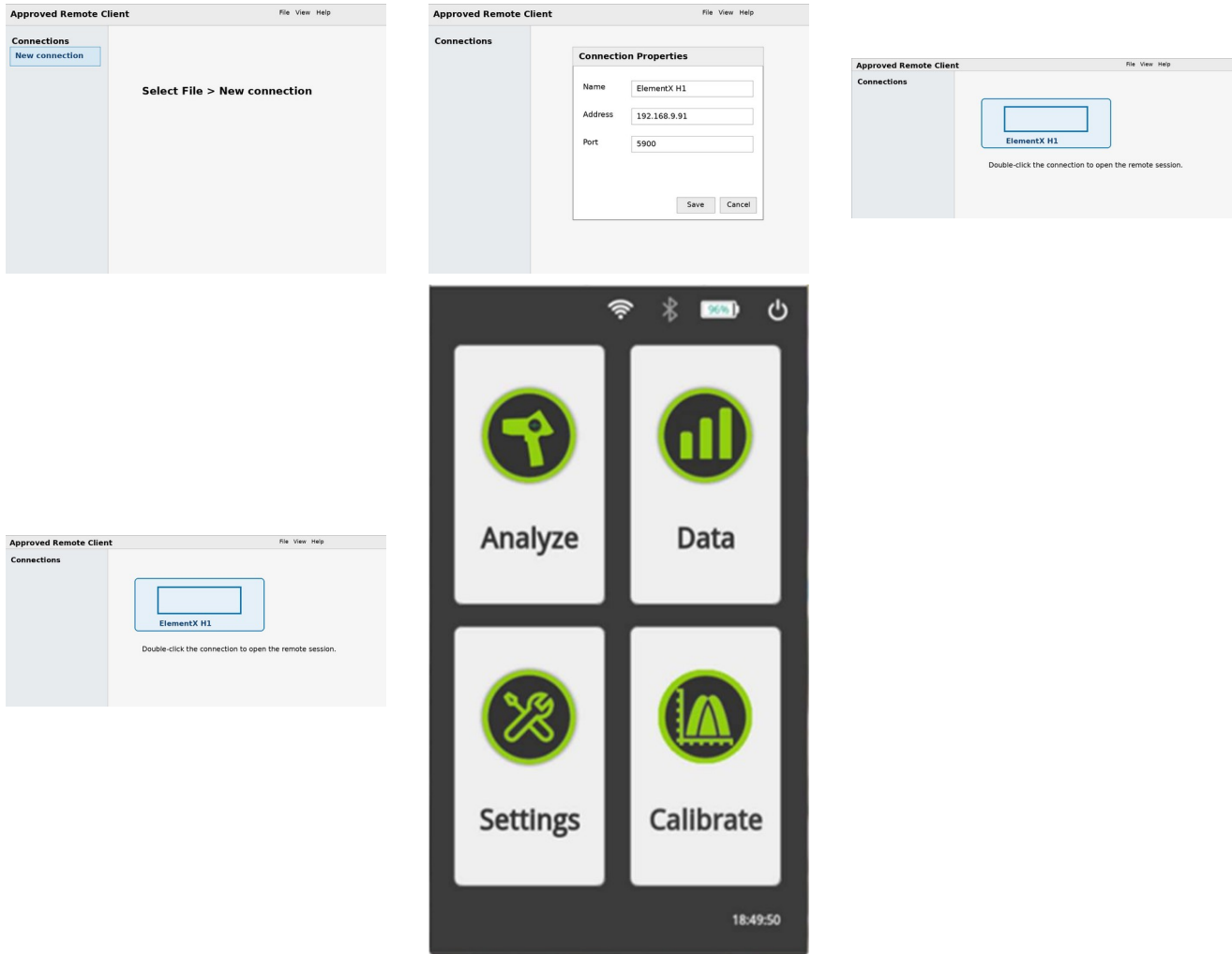


Figure 27. Computer USB-OTG driver and remote-access sequence.

NOTE

Remote-access software and driver versions may change. Use only the software package and instructions supplied or approved for the delivered instrument.



16. Battery Charging and Replacement

16.1 Replacement

36. Stop X-ray operation and place the instrument in a stable position.
37. Open the battery-cover lock and remove the battery.
38. Insert a charged battery in the correct orientation and close and lock the cover.
39. The hot-swap function may maintain standby operation briefly, but save data before replacement and do not rely on hot-swap during critical work.

16.2 Charging

40. Remove the battery from the instrument.
41. Insert it into the charger in the correct orientation.
42. Connect the approved adapter. The charger indicators show charging and completion status.
43. A full charge normally requires approximately three hours.
44. Disconnect and remove the battery after charging. Do not leave it charging for extended periods.



Figure 28. Battery installation and charging equipment.



17. Test Window Film Replacement

The protective test film prevents powder and foreign material from entering the instrument. Replace it when damaged, contaminated or difficult to clean.

45. Power off the instrument and remove the battery.
46. Press the release at the bottom of the instrument head and open the protective cover.
47. Remove the old film without touching the detector window.
48. Clean only the rear of the protective cover as required. Do not wipe, blow or touch the detector window.
49. Install the specified new film flat and free of wrinkles, then close the cover securely.
50. Perform a clean check or verification measurement before returning the instrument to service.



Figure 29. Test-head cover opening and protective-film area.

WARNING

The detector window is extremely fragile. Damage caused by contact, sharp objects, compressed air, powder entry or unauthorised handling may not be covered by warranty.



18. Routine Maintenance and Service

18.1 Operator Maintenance

Item	Action	Typical frequency
Instrument exterior	Wipe with a clean, soft, dry or slightly damp cloth. Do not use solvents or immerse.	After use and when contaminated.
Touchscreen	Clean with a soft lens-type cloth. Avoid excess liquid.	As required.
Test window film	Inspect for holes, wrinkles, powder and contamination. Replace when damaged or contaminated.	Before each work period and between incompatible samples.
Battery and contacts	Inspect for swelling, damage, contamination and secure locking.	Before use and monthly in storage.
Calibration verification	Measure the supplied reference or appropriate CRM and record the result.	Per site QC plan, after impact or abnormal result, and before critical work.
Transport case and accessories	Inspect for damage and completeness.	Before transport and after field work.

18.2 Restricted Service

All service other than external cleaning, battery replacement and test-window film replacement shall be performed by Blue Dragon Technology or a Blue Dragon-authorized service centre. Do not open the instrument housing. Unauthorized disassembly can expose high voltage, damage the detector or X-ray source, compromise radiation shielding and void warranty coverage.

18.3 Software and Data Maintenance

- Back up data before software updates, reauthorisation, service or factory reset.
- Record the instrument number, software version, installed modes and curve names.
- Do not install unauthorised software or connect the instrument to untrusted networks.
- After a software update, verify calibration, reference results, report output and remote-control security settings.



19. Storage, Transportation and Disposal

19.1 Storage

- Power off, remove contamination, clean and dry the instrument, and store it in the dedicated protective case.
- Secure the case against unauthorised access and protect it from heat, moisture, corrosive atmospheres and impact.
- Do not store the instrument with the X-ray tube active or with loose objects contacting the test head.
- For extended storage, manage battery state of charge and inspection according to lithium-battery procedures.

19.2 Transportation

- Transport only in the supplied shockproof case with the instrument powered off.
- Comply with local requirements for X-ray equipment and lithium-ion batteries, including air-shipment documentation where applicable.
- Do not ship a damaged battery. Protect spare batteries from short circuit.
- Retain the instrument serial number, certificate package and shipping documents with the responsible organisation.

19.3 Disposal

Do not dispose of the instrument, X-ray tube, electronics or lithium batteries as unsorted municipal waste. Return the equipment through Blue Dragon Technology, an authorised service organisation or an approved electronic/radiation-equipment waste route according to local law.



20. Detailed Radiation Safety

20.1 Time, Distance and Shielding

Radiation dose is reduced by limiting the time that the X-ray tube is energised, increasing distance from the source and placing suitable shielding between people and the beam. Distance is especially effective because radiation intensity decreases rapidly as distance increases.

20.2 Primary and Scattered Radiation

The primary beam exits the test window and has the highest intensity. It shall be fully intercepted by a suitable sample and shielding. Scattered radiation is produced when the beam interacts with the sample. Low-density, thin and small samples can provide less attenuation and may create higher scattered exposure than dense, thick samples.

20.3 Safe Sample Arrangements

Sample	Minimum safe practice
Large dense ore or metal	Place the test head firmly against a surface that fully covers the window. Keep all body parts behind the head.
Small sample	Use a shielded test stand or enclosure. Never hold the sample by hand.
Thin film, circuit board or cable	Use rear shielding and a stable fixture. Confirm that the beam cannot pass beyond the sample.
Plastic or other low-density material	Use a stand and scatter shield; minimise exposure time and increase distance.
Irregular sample	Stabilise the sample and provide shielding behind gaps or uncovered portions of the window.
Powder	Contain securely behind intact film; prevent powder entry and use a shielded sample cup or stand.

20.4 Abnormal or Damaged Instrument

51. Stop the measurement and move the instrument away from people without pointing the head at anyone.
52. Power off and remove the battery if safe to do so. Without the battery the X-ray tube cannot operate.
53. Secure and label the instrument to prevent use.
54. Contact Blue Dragon Technology or the authorised radiation-safety contact. Do not reopen or test a cracked, dropped or interlock-defective instrument.



21. Troubleshooting and Frequently Asked Questions

Condition	Possible cause	Action
Instrument does not start	Battery discharged, incorrectly installed, damaged or poor contact.	Charge and reinstall a known-good battery; inspect contacts; contact support if the fault remains.
Calibration fails	Reference misplaced, dirty film, unstable temperature, low battery or internal fault.	Reposition reference, inspect film, allow stabilisation, charge battery and retry once.
X-ray will not start	Sample sensor not covered, safety function active, mode not ready or fault state.	Confirm full sample coverage, sensor status, mode and self-test. Do not bypass safety controls.
Results are unstable	Heterogeneous sample, movement, rough surface, short test time, wrong curve or damaged/dirty film.	Prepare a representative sample, stabilise geometry, increase time, select correct curve and inspect film.
Unexpected element or concentration	Spectral overlap, contamination, wrong mode, coating/substrate effect or matrix mismatch.	Repeat on a clean representative area, review spectrum, verify mode and confirm by laboratory method.
USB export fails	Drive not mounted, unsupported media, storage error or unsafe removal.	Use the supplied/approved drive, mount through software, retry and unmount before removal.
Wi-Fi or remote connection fails	Different networks, wrong IP/port, remote mode disabled, driver or firewall issue.	Confirm network, address, port, driver and approved firewall settings; restart remote mode.
Instrument damaged or unsafe	Impact, crack, trigger/interlock fault, overheating or abnormal X-ray status.	Stop use, remove battery if safe, secure instrument and contact support.

21.1 Frequently Asked Questions

Question	Answer
What are the maximum tube settings?	The tube is adjustable up to 50 kV and 200 uA, with matched power below 5 W. Use only factory/authorised method settings.
Where is the serial number?	On the instrument label and in the software About screen. Record it in the configuration sheet.
Is calibration required before every test?	No. The instrument is factory calibrated. Perform one-touch calibration or verification according to the site quality plan, after abnormal results, impact, service or major environmental change.
Can the instrument measure gold or rare-earth elements?	The elemental range includes Au and rare-earth elements, but quantitative performance depends on the installed calibration, matrix and validation. Use laboratory confirmation where required.
Can a sample be held in the hand?	No. Do not hold samples in the beam path. Use the sample surface, a stand or a shielded fixture.
Is radiation leakage testing required?	Requirements differ by jurisdiction and site. Follow the applicable regulator, radiation-safety officer and acceptance/periodic survey programme.



22. Warranty and Technical Support

22.1 Warranty

The standard warranty is 12 months, subject to the sales contract, correct operation and the exclusions stated in the warranty terms. Damage caused by unauthorised disassembly, misuse, impact, liquid entry, incorrect charging, detector-window damage, unsuitable radiation exposure or operation outside specified conditions may be excluded.

22.2 Before Contacting Support

- Record the model, serial number, software version and installed analysis mode.
- Describe the sample, selected curve, measurement time and the exact sequence leading to the problem.
- Provide photographs, screenshots, self-test status, calibration result and example data where available.
- Do not send customer-confidential data unless authorised and appropriately protected.

22.3 Contact

Channel	bluedragontechnology.com
Email	info@bluedragontechnology.com
Technical support	bluedragontechnology.com/service-request/
Product reference	Blue Dragon ElementX H1 / Document BD-EXH1-MAN-EN
Product reference	Blue Dragon ElementX H1 / Document BD-EXH1-MAN-EN



Appendix A Quick Start Checklist

Check	Complete
Operator authorised and radiation-safety requirements confirmed	[]
Instrument, test window film, battery and sample sensor inspected	[]
Battery charged and securely installed	[]
Correct analysis mode and curve selected	[]
Calibration/verification completed where required	[]
Sample fully covers window; no body part in beam path	[]
Small/thin/low-density sample placed in shielded stand	[]
Sample information and measurement time entered	[]
Result, spectrum and QC check reviewed	[]
Report saved/exported and instrument shut down	[]



Appendix B Measurement Quality Checklist

Item	Record
Sample ID / description	
Date / time	
Operator	
Analysis mode / curve	
Measurement time and repetitions	
Sample preparation and moisture condition	
Reference material result	
Duplicate result / difference	
Reported result and units	
Laboratory confirmation required?	
Comments / limitations	



Appendix C Calibration and Verification Record

Date	Instrument / serial	Mode / curve	Reference ID	Certified / target value	Measured value	Acceptance limit	Result	Operator



Appendix D Configuration Record

Field	Recorded configuration
Model	ElementX H1
Serial number	
Software name / version	
Installed analysis modes	
Installed curve names / versions	
Administrator credential custodian	
Sample camera	Standard / fitted
Scene camera	Not fitted / optional / fitted
GPS	Not fitted / optional / fitted
Test stand	Not included / optional / fitted
Bluetooth printer	Not included / optional / fitted
Calibration references supplied	
Certificate and factory test report references	



Appendix E Maintenance Log

Date	Operating hours / use	Maintenance or inspection	Parts used	Verification result	Performed by



Appendix F Application Data Sheet

Application information	Details
Industry / site	
Sample type / mineral / alloy	
Target elements and expected ranges	
Required reporting units	
Sample form: solid / powder / pellet / film / other	
Typical moisture and particle size	
Surface condition / sample geometry	
Required detection or decision limits	
Reference laboratory method	
Available certified reference materials	
Expected daily sample count	
Radiation-control and operator requirements	
Recommended mode / curve	To be confirmed by Blue Dragon Technology
Validation plan and acceptance criteria	



Appendix G Standard Supply and Optional Accessories

Category	Item	Status
Standard	ElementX H1 instrument	Included
Standard	Two 6600 mAh lithium-ion batteries	Included
Standard	Approved power adapter and dual-port charger	Included
Standard	USB-OTG cable	Included
Standard	32 GB USB flash drive or supplied equivalent	Included
Standard	Protective test-window films	Included quantity per packing list
Standard	Wrist strap	Included
Standard	Protective transport case	Included
Standard	Built-in calibration standard and external verification reference	Included
Optional	GPS/BDS/GLONASS positioning	Order-specific
Optional	Scene/environment camera	Order-specific
Optional	Shielded test stand / sample enclosure	Order-specific
Optional	Bluetooth printer	Order-specific
Optional	Additional certified reference materials	Application-specific
Optional	Additional analysis modes and calibration curves	Application-specific