SERSTECH

SIMPLICITY - SPEED - PRECISION

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Application Note: Serstech Arx mkII Raman Spectrometer

Rapid Chemical Identification for HAZMAT Response Teams

Overview

HAZMAT response teams operate in unpredictable, high-risk environments where rapid and accurate chemical identification is critical for personnel safety, public protection, and effective incident management. Whether responding to transportation accidents, industrial spills, clandestine laboratories, or suspicious packages, responders need immediate answers about unknown substances. The Serstech Arx mkII handheld Raman spectrometer provides HAZMAT teams with laboratory-quality chemical identification capabilities in a rugged, pocket-portable device designed specifically for field operations.

Arx mkII - 4th Gen CWA

The HAZMAT Chemical Identification Challenge

Response Scenarios Requiring Chemical Identification

HAZMAT teams encounter diverse situations requiring immediate substance identification:

- Transportation Incidents - Overturned tanker trucks, derailed rail cars, damaged shipping containers with unknown contents or compromised placards

- Industrial Accidents - Chemical spills, leaks, or releases at manufacturing facilities where labeling may be damaged or missing
- Illegal Dumping - Abandoned drums, containers, or tanks with unknown chemicals
- Clandestine Laboratories - Drug manufacturing operations containing precursors, reagents, and finished products
- Suspicious Packages and Powders - White powder incidents, unknown substances sent through mail or found in public spaces
- Warehouse Fires - Mixed chemical inventories where labels are destroyed and products may have reacted or degraded
- Unknown Liquids and Spills - Puddles, leaks, or spilled materials on surfaces requiring identification

Traditional Identification Challenges

Conventional approaches to chemical identification create operational difficulties:

1. Visual Assessment Limitations - Many hazardous chemicals look identical (clear liquids, white powders, colorless gases)
2. Damaged or Missing Labels - Accidents often destroy placards and container markings
3. Laboratory Delays - Field sampling followed by laboratory analysis takes hours to days for results
4. Presumptive Tests - Chemical field tests provide limited information, require consumables, can be hazardous to perform, and often give false positives/negatives
5. Multiple Test Kits Required - Different kits needed for acids, bases, explosives, drugs, toxic industrial chemicals
6. Sample Collection Risks - Opening containers or collecting samples exposes responders to unknown hazards
7. Cross-Contamination - Multiple samples at complex scenes risk equipment contamination and evidence degradation

The Case for Handheld Raman vs. Standoff Systems

The chemical identification market offers two primary Raman approaches: standoff systems (measuring from several feet away) and handheld point-and-shoot systems like the Arx mkII. While standoff capability sounds appealing, practical HAZMAT operations reveal significant limitations:

Standoff System Limitations:

Size and Weight Constraints

- Standoff Raman systems typically weigh 3-8 lbs (1.4-3.6 kg) compared to the Arx mkII's 590g (1.3 lbs)
- Bulky form factors require two-handed operation and cannot be pocket-carried
- Difficult to maneuver in confined spaces, inside vehicles, or in awkward positions
- Tiring to hold steadily during extended operations
- Cannot be worn on a lanyard for hands-free carrying between measurements

Cost and Complexity

- Standoff systems cost significantly more (often 50-100% premium over handheld units)
- More complex optical systems with additional failure points
- Higher maintenance requirements and repair costs
- Larger initial investment that may limit fleet size

Operational Realities

- **Sampling Often Required Anyway** - Even with standoff capability, responders typically need to collect samples for:
  - Confirmation by laboratory analysis
  - Multi-technique verification (Raman + FTIR + pH + specific gravity)
  - Evidence preservation and chain of custody
  - Regulatory documentation and reporting
  - Secondary contamination testing
- **Awkward Positioning Hazards** - Attempting to position a heavy standoff system to get a clear line-of-sight to a substance in a drum, under equipment, or in a damaged container often requires:
  - Reaching over or leaning into hazard zones
  - Unstable body positions that increase fall or exposure risk
  - Maintaining steady aim for measurement duration (often 30+ seconds)
  - Getting closer than intended when obstacles block the measurement path
- **Safer Sampling Protocols Exist** - HAZMAT teams already use established, safe sampling techniques:

- Drum samplers (coliwasa, thieves, bailers) for liquids in drums and tanks
- Long-handled scoops and spatulas for powders and solids
- Extension poles and remote tools for difficult-to-reach materials
- These tools provide controlled sampling from safe distances while allowing responders to maintain stable positions and proper protective equipment

The Handheld Arx mkII Advantage:

Protective Equipment Compatibility

- HAZMAT responders are already wearing appropriate personal protective equipment (Level A, B, or C suits)
- With proper PPE, direct sampling is safe and controlled
- The Arx mkII's compact size works easily with thick gloves
- Single-button operation functions even with bulky HAZMAT suit gloves
- Rugged IP67/MIL-STD-810G construction survives HAZMAT environments
- Arx mkII can be worn on a lanyard - freeing a hand

Practical Workflow Integration

- Lightweight device can be worn on lanyard, kept in pocket, or attached to suit
- Quick access for multiple measurements across complex scenes
- Easy to pass between team members
- Simple to decontaminate with standard HAZMAT decon procedures
- No awkward positioning or aiming required—just point and shoot, or, position and use delay scan

True Portability

- 12-hour battery supports entire operational periods
- No need to return to command post or vehicle between measurements
- Can be carried throughout hot zone, warm zone, and cold zone, on a lanyard, in a pocket or in a plastic bag
- Enables rapid scene assessment and dynamic decision-making

Economic Deployment

- Lower cost enables multiple units per team
- Redundancy protects against equipment failure during operations

- Multiple technicians can work simultaneously across large scenes
- Budget allows for backup units and spare parts inventory
- 5-year warranty and free library and firmware updates for the life of the instrument

Solution: Serstech Arx mkII Raman Spectrometer

Technology Overview

Raman spectroscopy identifies chemicals by analyzing the unique molecular vibrations of substances when illuminated by a laser. Each chemical produces a distinctive spectral "fingerprint" that can be matched against comprehensive reference libraries. The Arx mkII's 785 nm laser provides optimal performance across a wide range of chemical classes while minimizing fluorescence interference.

Key Features for HAZMAT Applications

Patented Autofocus Technology (SharpEye)

- Automatically identifies optimal measurement point in milliseconds
- Distinguishes between container materials and actual substances
- Enables through-container analysis (plastic bottles, glass jars, translucent containers)
- Reduces interference from packaging and surface contamination
- Minimizes exposure risk by allowing non-contact measurement

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Rugged Field-Ready Design

- Compact and Lightweight - 590g (1.3 lbs), pocket-portable
- 12-Hour Battery Life - Supports full operational periods and extended incidents
- IP67 Certified - Fully dust-tight and waterproof to 1 meter for 30 minutes
- MIL-STD-810G Certified - Withstands drops, vibration, temperature extremes, and harsh conditions
- Operating Temperature Range - Functions from -20°C to +50°C (-4°F to 122°F)
- Single-Button Operation - Intuitive interface works with thick gloves
- High-Contrast Screen - Readable in bright sunlight and low light conditions; also night vision compatible

Comprehensive Chemical Libraries

The Arx mkII includes extensive libraries covering HAZMAT response needs:

- Hazardous Chemicals Library - Toxic industrial chemicals (TICs), corrosives, oxidizers, reactives, compressed gases
- Narcotics Library - Illegal drugs, precursors, and cutting agents found in clandestine labs
- Explosives and Precursors - Energetic materials, homemade explosive compounds, and precursor chemicals
- Pharmaceuticals - Legitimate medications that may be encountered or misused
- Common Industrial Chemicals - Solvents, acids, bases, cleaning agents, fuels
- Quarterly Library Updates - New chemicals and emerging threats added at no additional cost

Versatile Sampling Capabilities

Direct Point-and-Shoot Measurement

- Scan powders and solids directly on surfaces
- Analyze liquids in translucent containers without opening
- Measure through clear plastic bags, bottles, and vials
- Non-contact measurement preserves evidence integrity

Capillary Probe for Liquid Spills

- Critical for Surface Spills - Standard handheld Raman units struggle with liquid spills on surfaces because the substrate (concrete, metal, asphalt) interferes with measurement
- The Capillary Probe Solution - Touches the probe tip to the liquid; capillary action draws sample into the probe (minimum 10 µL - a single droplet)
- Eliminates Surface Interference - Measures only the liquid, not the underlying surface
- Safe and Efficient - No need for awkward positioning or trying to measure pooled liquids at difficult angles
- Trace Analysis - Identifies minute quantities that might otherwise be impossible to sample

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Small Volume Adapter

- Analyzes small liquid samples in vials or containers
- Minimum volume: 400 µL (less than 1/2 teaspoon)
- Ideal for samples collected with drum samplers, coliwasa tubes, or bailers

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SERS Kit for Enhanced Sensitivity

- Surface Enhanced Raman Spectroscopy (SERS) reduces detection limits to 200 ppm
- Critical for identifying trace contaminants, explosives residues, and potent substances
- Simple snap-on attachment with disposable substrates
- Enables detection of substances at concentrations too low for standard Raman

Application Scenarios in HAZMAT Response

Scenario 1: Overturned Tanker Truck – Unknown Liquid Identification

HAZMAT Team Alpha responds to a highway accident involving an overturned tanker truck. The placard is damaged and unreadable. A clear, oily liquid is leaking from the tank and forming a large puddle on the road surface. The shipping papers are missing, and the driver is unconscious. The team needs immediate identification to determine proper containment and protection levels.

Solution:

Rather than attempting to position a heavy standoff system to measure the pooled liquid (which would be difficult due to surface interference and awkward positioning around the damaged vehicle), the technician uses the Arx mkII with the capillary probe attachment.

Procedure:

1. Technician in Level B protection approaches the spill edge
2. Uses capillary probe to collect a single droplet (10 µL) from the liquid puddle
3. Arx mkII analyzes the sample in 10 seconds
4. Device identifies: Toluene (methylbenzene) - aromatic hydrocarbon solvent

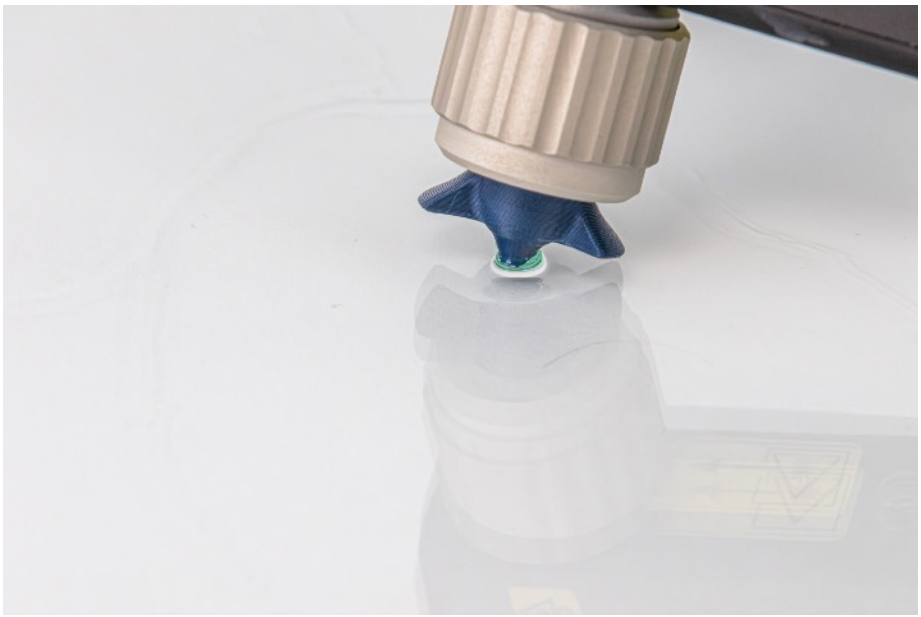
Result: Immediate identification enables the incident commander to:

- Confirm appropriate respiratory protection (organic vapor cartridges adequate)
- Select proper containment foam and absorbents
- Establish correct evacuation distances per ERG guidelines
- Request appropriate environmental cleanup contractors
- Notify water treatment facilities of potential contamination risk

The capillary probe eliminated the need to awkwardly position equipment over the spill or collect a sample in a separate container first. Total time from arrival to identification: 3 minutes.

Scenario 2: Abandoned Drums – Multiple Unknown Chemicals

Environmental enforcement discovers 15 unmarked 55-gallon drums abandoned at a rural site. Labels are removed, and contents are unknown. Some drums contain liquids, others contain powders or semi-solids. The team must identify all contents for proper disposal and potential criminal investigation.



Capillary Probe

Solution:

Using drum sampling equipment (coliwasa sampler for liquids, thieves for semi-solids, long-handled scoops for powders) and the Arx mkII, the team systematically identifies all contents without entering the hot zone unnecessarily.

Procedure for Liquid Drums:

1. Insert coliwasa sampler into drum to collect composite sample
2. Transfer small amount (500 µL) to sample vial
3. Analyze using Arx mkII with small volume adapter
4. Results in 15 seconds per drum

Procedure for Powder/Solid Drums:

1. Use long-handled scoop to extract small sample
2. Place sample on clean surface or in clear vial
3. Scan directly with Arx mkII point-and-shoot mode
4. Results in 10 seconds per drum

Identified Contents:

- Drums 1-4: Methylene chloride (industrial solvent)
- Drums 5-7: Sulfuric acid (98% concentration)
- Drum 8: Sodium hydroxide pellets
- Drums 9-11: Xylene (mixed isomers)

- Drum 12: Acetone
- Drums 13-14: Waste oil (mixed hydrocarbons)
- Drum 15: PCB-contaminated oil (detected with SERS kit)

Result: Complete scene characterization in 45 minutes. All chemicals identified for proper disposal manifesting. The PCB contamination discovery (requiring SERS sensitivity) triggers additional environmental investigation. Safe sampling protocols combined with the portable Arx mkII provided comprehensive results without laboratory delays.

Scenario 3: Clandestine Drug Laboratory - Multi-Chemical Identification

DEA and HAZMAT respond to a suspected methamphetamine production facility in a residential structure. The scene contains dozens of containers with liquids, powders, and crystals. Many are mislabeled or in unmarked containers. The team must identify precursors, reagents, products, and waste materials for evidence and safe disposal.

Solution:

The Arx mkII's comprehensive narcotics and hazardous chemicals libraries enable rapid identification of the complex mixture of substances.

Findings:

- Clear liquid in milk jug → Anhydrous ammonia (extremely corrosive)
- White powder in plastic bag → Pseudoephedrine (precursor)
- Red liquid in soda bottle → Red phosphorus suspended in solvent
- Clear crystals in jar → Methamphetamine (finished product)
- Yellow liquid in beaker → Iodine in ether solution
- Residue on glassware → Lithium metal remnants (water-reactive)
- Brownish liquid in drum → Waste containing methylamine

Result: Comprehensive scene assessment completed in 2 hours identifying 34 different substances. The immediate identification of water-reactive lithium and anhydrous ammonia allows proper handling to avoid violent reactions. Evidence documentation includes GPS-tagged spectral data for each substance. Laboratory confirmation follows, but field identification enables safe scene processing immediately.

Scenario 4: White Powder Incident - Suspicious Substance in Public Building

HAZMAT responds to a white powder discovered in an envelope delivered to a government office building. The building is evacuated, and the powder requires immediate identification to determine threat level and decontamination requirements.

Solution:

The team establishes a field identification station. The suspicious envelope is carefully opened in a contained environment, and a small amount of powder is transferred to a clean surface.

Procedure:

1. Technician in Level A protection collects micro-sample of powder
2. Arx mkII scans powder directly (point-and-shoot mode)
3. Analysis complete in 8 seconds
4. Result: Lactose (common harmless cutting agent or milk powder)

Follow-up with SERS: Given the high-profile nature of the incident, the team conducts secondary analysis using the SERS kit to check for trace contaminants that might not appear in standard analysis.

SERS Result: No dangerous substances detected at trace levels

Result: Building declared safe and occupants allowed to return within 30 minutes of HAZMAT arrival. The rapid definitive identification prevented hours of building closure, extensive decontamination, and costly laboratory analysis. GPS-tagged spectral data provides defensible scientific documentation that no biological or chemical threats were present.

Scenario 5: Industrial Fire - Chemical Inventory Verification

HAZMAT teams respond to support firefighting operations at a chemical warehouse. Fire has destroyed labeling, and mixed chemicals may have created hazardous reaction products. Firefighting runoff is flowing toward storm drains. The team must identify remaining chemicals and test runoff water for contamination.

Solution:

Using the Arx mkII's through-container capability and capillary probe, the team rapidly assesses remaining containers and runoff contamination.

Container Identification (through damaged but still translucent plastic):

- Container 1: Sodium hypochlorite (bleach) - scanning through partially melted container
- Container 2: Hydrochloric acid - avoiding need to open damaged container
- Container 3: Hydrogen peroxide (30%) - confirming through smoke-damaged label
- Container 4: Calcium hypochlorite (pool shock) - identifying unlabeled material

Runoff Analysis (using capillary probe):

- Sample Point 1 (near warehouse): High concentration of sodium hypochlorite

- Sample Point 2 (midstream): Diluted bleach with pH indicators
- Sample Point 3 (storm drain approach): Below detection limits

Result: The identification of bleach and acid prevented potential chlorine gas generation if containers had mixed. Runoff contamination tracking enabled targeted containment of the most contaminated water and documented the successful dilution downstream. Real-time analysis guided dynamic firefighting decisions without waiting for laboratory results.

Scenario 6: Transportation Incident – Liquid Spill on Multiple Surfaces

A forklift punctures several containers in a warehouse, creating liquid spills across concrete floors, metal shelving, and wooden pallets. Different liquids have mixed in some areas, and labeling is compromised. The team must identify each liquid and determine if hazardous reactions have occurred.

Solution:

The capillary probe enables accurate identification despite the complex surface interference problem.

Procedure:

1. Use capillary probe to sample each distinct liquid pool
2. Sample both pure liquids and mixed areas
3. Analyze each with Arx mkII
4. Total analysis time: 20 seconds per sample

Identified Liquids:

- Spill A (on concrete): Isopropanol (70%)
- Spill B (on metal shelving): Ethylene glycol
- Spill C (on wooden pallet): Mineral oil
- Mixed Area D: Isopropanol + ethylene glycol (no hazardous reaction)
- Residue on equipment: Acetone (from cleaning operations)

Result: Confirmed no dangerous chemical reactions occurred. Identified proper absorbents and cleanup methods for each chemical. The capillary probe eliminated surface interference that would have complicated or prevented accurate identification of spills on concrete and metal surfaces. Completed identification in 15 minutes across entire scene.

Scenario 7: Unknown Powder in Ventilation System

Building maintenance discovers a fine white powder accumulating in an HVAC system. Concerned about potential chemical contamination or biological agent, they request HAZMAT response.

Solution:

The team collects a sample of the powder and uses both standard Raman and SERS to ensure comprehensive analysis.

Standard Raman Scan:

- Result: Primarily calcium carbonate (limestone dust)
- Analysis time: 10 seconds

SERS Scan (to check for trace contaminants):

- Result: Trace amounts of gypsum (calcium sulfate) detected
- Analysis time: 15 seconds

Conclusion: Material identified as normal construction dust (drywall and concrete particles).

Through thick, dark glass

No chemical or biological threat present. The rapid identification prevents unnecessary building evacuation and extensive environmental testing.

Operational Advantages for HAZMAT Teams

Enhanced Responder Safety

Non-Contact and Through-Container Analysis

- Scan substances without opening containers or direct contact
- Analyze liquids through translucent plastic and glass
- Identify powders in sealed bags and vials
- Reduces exposure risk during initial assessment

Appropriate PPE Combined with Smart Tools

- Responders already wear protective equipment suitable for hazard levels
- Lightweight Arx mkII works seamlessly with thick gloves and suits
- Safer to use controlled sampling tools (coliwasa, drum thief) + portable analyzer than awkward standoff positioning
- Decontamination protocols easily applied to compact device

Immediate Hazard Assessment

- Identify corrosives, reactives, and toxic materials in seconds
- Determine proper respiratory protection requirements
- Assess potential for violent reactions if materials mix
- Detect explosive materials and sensitized compounds

Operational Efficiency

Rapid Scene Assessment

- Analyze multiple substances in minutes rather than hours
- Dynamic decision-making during active incidents
- Real-time adjustment of tactics based on chemical identification
- Comprehensive scene documentation with GPS-tagged spectral data

Elimination of Laboratory Delays

- Instant results enable immediate protective action decisions
- No waiting hours or days for laboratory confirmation
- Field identification guides sampling for confirmatory lab analysis
- Reduced need for expensive rush laboratory services

Simplified Equipment Logistics

- Single device replaces multiple presumptive test kits
- No consumables to inventory and restock

- 12-hour battery eliminates frequent recharging during operations
- Compact size doesn't consume vehicle storage space

Legal and Documentation Benefits

Scientifically Defensible Identification

- Raman spectroscopy is accepted analytical technique
- Spectral data provides definitive chemical identification
- Results admissible in legal proceedings
- Supports criminal prosecution and regulatory enforcement

Comprehensive Digital Documentation

- GPS tagging records exact location of each measurement
- Spectral graphs can be exported and archived
- ChemDash software manages all results in centralized database
- Incident reports include scientific data supporting field decisions

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Chain of Custody Support

- Non-destructive testing preserves evidence integrity
- Multiple samples can be analyzed without consuming material
- Results linked to specific sample locations and times
- Supports evidence presentation in court

Integration into HAZMAT Operations

Response Phases

Initial Size-Up and Reconnaissance

1. Incident commander dispatches reconnaissance team with Arx mkII
2. Initial substance identification guides protective equipment selection
3. Hazard assessment determines hot zone boundaries
4. Preliminary chemical identification supports incident action plan

Entry Operations

1. Entry team carries Arx mkII into hot zone
2. Systematic identification of unknown substances
3. Real-time communication of findings to command post
4. Documentation of all measurements with GPS coordinates

Sample Collection and Analysis

1. Use appropriate sampling tools (coliwasa, thieves, scoops, bailers)
2. Transfer small samples to analysis vials or analyze directly
3. Point-and-shoot measurement of solids and powders
4. Capillary probe for liquid spills and traces
5. SERS kit for trace-level analysis when needed

Decontamination and Documentation

1. Decontaminate Arx mkII per standard HAZMAT protocols (compatible with standard decon solutions)
2. Download all spectral data via WiFi or USB
3. Generate comprehensive incident reports in ChemDash
4. Archive data for long-term records and legal proceedings

Standard Operating Procedures

Pre-Incident Preparation

- Ensure device fully charged before each shift
- Verify all libraries activated and current
- Inspect device for damage and lens cleanliness
- Confirm capillary probe and adapters are present
- Test device function with known substance

During Incident Operations

- Maintain device on lanyard or in protective pocket
- Keep lens clean (wipe with provided lens pen if contaminated)

- Document each measurement location on scene sketch
- Communicate findings immediately to incident command
- Cross-reference results with ERG and safety data sheets

Post-Incident Procedures

- Decontaminate device per agency SOPs
- Charge device and prepare for next response
- Export all data to ChemDash software
- Complete incident documentation with spectral evidence
- Brief team on findings and lessons learned

Technical Specifications Summary

Specification	Details
Weight	590g (1.3 lbs) - pocket-portable
Dimensions	Compact handheld form factor
Battery Life	12 hours continuous operation
Laser	785 nm, Class 3B, 300 mW max output
Operating Temperature	-20°C to +50°C (-4°F to 122°F)
Durability	IP67 (dust/water resistant), MIL-STD-810G certified
Analysis Time	5-15 seconds typical (varies by sample)
Display	High-contrast touchscreen, glove-operable
Connectivity	WiFi, USB, optional ATAK integration
Operation	Single-button, intuitive interface
Detection Limit	Standard: substance-dependent; SERS: 200 ppm

Libraries	Hazmat, narcotics, explosives, pharmaceuticals, industrial chemicals

Comparison: Arx mkII vs. Standoff Raman Systems

Feature	Arx mkII Handheld	Typical Standoff System
Weight	590g (1.3 lbs)	1.4-3.6 kg (3-8 lbs)
Portability	Pocket-sized, lanyard-compatible	Two-handed operation required
Cost	Base price + libraries	50-100% premium cost
PPE Compatibility	Excellent with thick gloves	More difficult with bulky suits
Confined Space Use	Easy maneuvering	Difficult in tight spaces
Surface Spill Analysis	Capillary probe eliminates interference	Standoff distance doesn't help with substrate interference
Sampling Integration	Works with standard sampling tools	Still requires sampling for confirmation
Decontamination	Simple, compact surface area	Larger device, more complex decon
Team Deployment	Affordable for multiple units	Cost limits fleet size
Operational Reality	Matches HAZMAT workflow	Creates awkward positioning requirements

Recommended Package Configuration for HAZMAT Teams

Arx mkII HAZMAT Response Package (Suggested Configuration):

Core Components:

- Arx mkII base unit
- Comprehensive hazardous chemicals library
- Narcotics library
- Explosives and precursors library
- SERS kit for enhanced sensitivity
- Capillary probe for liquid spills
- Small volume adapter
- ChemDash Pro software

- Ruggedized carrying case
- Spare battery
- Lens cleaning kit
- Five-year comprehensive warranty

Optional Enhancements:

- Additional pharmaceuticals library
- Multiple SERS substrate packs
- GPS tagging module
- ATAK integration for military/federal teams
- Extended battery pack
- Vehicle charging adapter
- Multiple user licenses for ChemDash enterprise
- Backup Arx mkII unit for redundancy

Training and Certification

Recommended Training Program

Module 1: Raman Spectroscopy Fundamentals (4 hours)

- Basic principles of Raman spectroscopy
- Understanding molecular vibrations and chemical fingerprints
- Laser safety and Class 3B requirements
- Limitations and interference factors

Module 2: Arx mkII Operation (4 hours)

- Device operation and interface navigation
- Point-and-shoot measurement techniques
- Using capillary probe for liquid spills
- Small volume adapter procedures
- SERS kit attachment and operation
- Battery management and charging

Module 3: Library Interpretation (4 hours)

- Understanding spectral match scores
- Interpreting mixture results
- Recognizing library limitations
- When to use SERS for trace detection
- Dealing with "no match" results

Module 4: HAZMAT Integration (4 hours)

- Incorporating Raman into response SOPs

- Sampling techniques (coliwasa, thieves, scoops)
- Decontamination procedures for the Arx mkII
- Documentation and ChemDash software
- Legal considerations and evidence handling

Module 5: Practical Field Exercises (8 hours)

- Simulated spill scenarios
- Unknown drum identification exercises
- White powder incident response
- Multi-chemical scene assessment
- Equipment troubleshooting
- Final competency evaluation

Recertification: Annual refresher training recommended (4 hours)

Maintenance and Support

Routine Maintenance

Daily (Pre-Response):

- Check battery charge level
- Inspect lens for cleanliness and damage
- Verify device powers on and self-test passes
- Confirm all accessories present in response kit

Weekly:

- Clean lens with isopropanol swabs or lens pen
- Inspect device exterior for cracks or damage
- Verify WiFi and USB connectivity
- Test measurement with known substance

Monthly:

- Deep clean device per manufacturer guidelines
- Inspect carrying case and protective accessories
- Update software if new version available
- Review library updates

Annual:

- Comprehensive device inspection
- Calibration verification (as per agency protocol)
- Battery capacity testing
- Firmware updates
- Comprehensive performance testing

Warranty and Support

- Five-year comprehensive warranty included
- Quarterly library updates at no charge
- Technical support via phone, email, and web
- Replacement parts and accessories available
- Expedited repair service for critical HAZMAT units

Cost-Benefit Analysis

Traditional Approach Costs:

- Multiple presumptive test kits: $2,000-5,000/year in consumables
- Laboratory analysis: $150-500 per sample, 24-72 hour turnaround
- Extended incident duration due to identification delays
- Potential exposure incidents from opening containers
- Environmental sampling and analysis
- Equipment inventory and logistics management

Arx mkII Approach:

- One-time device investment
- Zero consumables for standard operation (SERS substrates only for trace analysis)
- Immediate identification results
- Reduced exposure risk
- Lower laboratory costs (confirmation only)
- Simplified equipment logistics
- Multiple substances identified per incident

Return on Investment:

Typical HAZMAT teams report ROI within 12-18 months based on:

- Reduced laboratory analysis costs
- Faster incident resolution (reduced personnel hours)
- Prevention of unnecessary evacuations
- Improved evidence documentation
- Enhanced responder safety

Conclusion

The Serstech Arx mkII represents a paradigm shift in HAZMAT chemical identification. By providing laboratory-quality Raman spectroscopy in a truly portable, rugged, field-ready package, it

addresses the real-world needs of HAZMAT response teams more effectively than bulky standoff systems.
The critical advantage of the Arx mkII lies in its integration with established HAZMAT practices. Rather than creating awkward new workflows or requiring responders to position heavy equipment at difficult angles, it works seamlessly with existing sampling tools (coliwasa, drum thieves, bailers) and protective equipment. The capillary probe innovation specifically addresses the surface interference challenge that has plagued liquid spill identification, enabling accurate results where other methods struggle.
HAZMAT responders are already protected by appropriate PPE—what they need is a tool that's fast, accurate, lightweight, and easy to decontaminate. The Arx mkII delivers on all these requirements at a cost that allows teams to deploy multiple units for operational redundancy and broader capability.
From overturned tankers to abandoned drums, clandestine laboratories to suspicious powders, the Arx mkII provides the immediate chemical identification that enables rapid, safe, and effective hazmat response. Its combination of comprehensive chemical libraries, through-container capability, capillary probe technology, and SERS enhancement makes it the optimal choice for today's HAZMAT challenges.
In an environment where every second counts and every decision impacts responder safety and public protection, the Serstech Arx mkII gives HAZMAT teams the information they need, when they need it, in a form factor that works with real-world operations.

For More Information
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Address: Åldermansgatan 13, SE-227 64 Lund, Sweden
Product Documentation and Resources

- Technical specifications and datasheets
- ChemDash software documentation and training videos

- Application videos demonstrating HAZMAT scenarios
- Case studies from fire departments and HAZMAT teams
- Comparison guides: Raman vs. FTIR vs. other identification technologies

Authorized Distributors and Government Procurement
Contact Serstech for information about:

- Authorized distributors in your region
- Government and municipal procurement channels
- Volume pricing for multiple-unit deployments
- Customized training programs for your team
- Demo units and trial programs

Industry Standards and Certifications

- NFPA 1072: Standard for Hazardous Materials/Weapons of Mass Destruction Emergency Response Personnel Professional Qualifications
- OSHA 29 CFR 1910.120: Hazardous Waste Operations and Emergency Response
- Meets requirements for various Authorized Equipment Lists (AEL)

This application note is provided for informational purposes. HAZMAT teams should evaluate the Arx mkII within their specific operational context and standard operating procedures. All chemical identification results should be used as part of a comprehensive hazard assessment strategy that includes multiple sources of information (placards, shipping papers, other detection instruments, and laboratory confirmation when appropriate).