Covaris Automation Platform

Solutions for Pre-analytical Sample Preparation

Covaris®

THE COVARIS MISSION

Accelerate discoveries in bio-analysis with cutting-edge pre-analytical sample prep solutions.

Even with advanced analytical technologies, low quality biomolecules will result in low quality data. We have therefore developed an optimized and non-degrading sample prep platform to help you improve sample quality.

Goals

- Standardize clinical sample prep
- Increase quality results from various sample types
- Revolutionize high-throughput bio-analytical applications
- Set new standards in cell lysis, biomolecule extraction, and sample processing

Our Technology

Covaris developed the Adaptive Focused Acoustics® (AFA®) technology used in all Focused-ultrasonicator systems to revolutionize sample preparations. AFA is highly tunable and controllable and thus standardizes pre-diagnostic sample preparation by improving processing robustness and by reducing sample-to-sample variation.
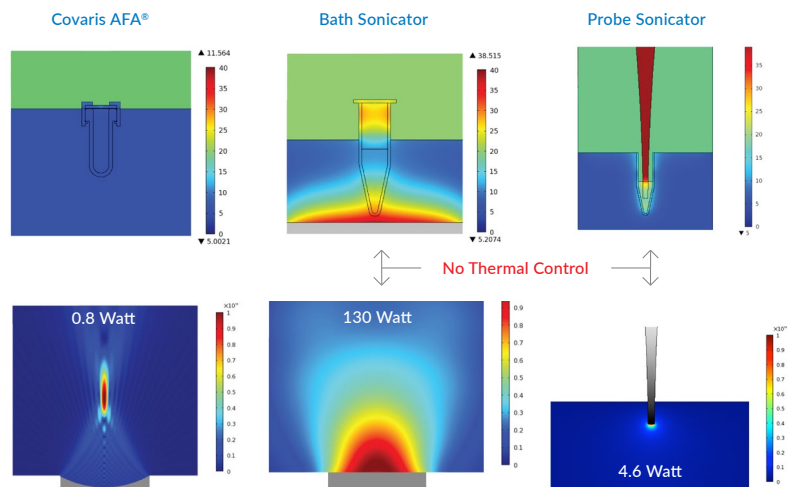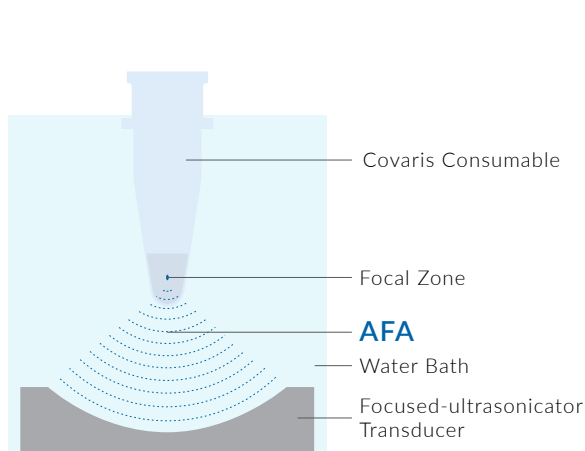
AFA-energetics® Benefits

- Sensitive: Low mass input needed
    - DNA concentration independent
- Ultra-high frequency energy: Fast processing time (in min)

More Control

- Reduced focal zone (3mm)
- Ideal for processing biological molecules
- Non-contact and isothermal: No biomolecule degradation

- Tunable and robust
    - Tight and tunable fragment sizes
    - Unbiased fragment generation
    - Uniform genome coverage and assembly
    - Class D electronics, NIST Traceable Calibrations
- Isothermal processing ensures optimal sample integrity
- From 1 sample to high-throughput (96+ wells plates)

Covaris Consumable

Focal Zone

AFA

Water Bath

Focused-ultrasonicator Transducer

Covaris AFA®   Bath Sonicator   Probe Sonicator

No Thermal Control

0.8 Watt   130 Watt   4.6 Watt

Pressure Profiles: Power required to initiate cavitation (1 Mpa)

Re-discover your Application with World-class Performance

AFA in Pre-analytical Sample Prep

| Cells/Tissue | FFPE | Bacteria |
| Yeast | Blood | Body Fluids |

Biological Diversity

The Covaris Process

| Proteomics | Metabolomics | Epigenomics |
| Genomics | Transcriptomics |

Analytical Complexity

Key Applications:

- Mechanical shearing for Next Generation Sequencing (NGS)
- DNA/RNA Extraction from Formalin-Fixed, Paraffin-Embedded (FFPE) tissue samples, and whole blood for NGS
- Chromatin mechanical shearing for ChIP-Seq

- Biomarker extraction for research and clinical microbiology
- Tissue disruption & homogenization
- Cell lysis
- Compound dissolution

Focused-ultrasonicator Family

Low-throughput → High-throughput

| M220 | S220 | ME220 | E220 | LE220R-plus | LE220Rsc | R230 AFA Revolution |

Consumables

Reagents
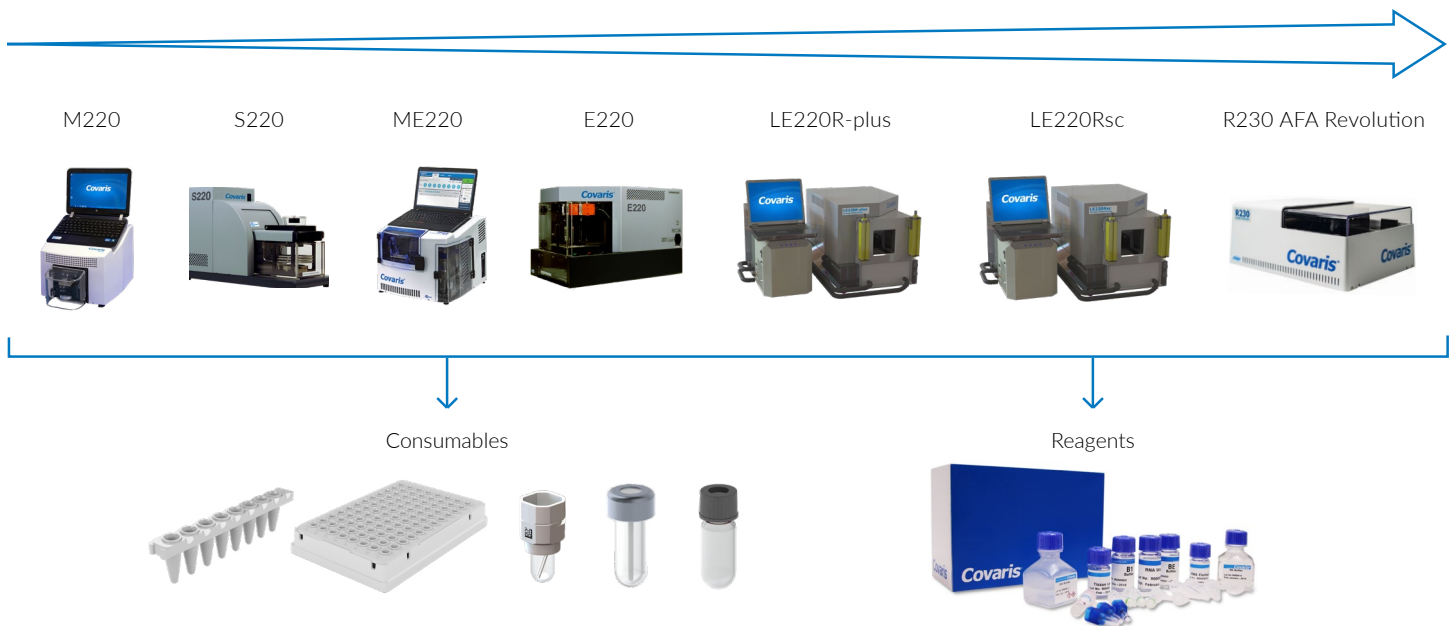
AFA-TUBE TPX

AFA Consumables Designed for High-throughput Automation

To facilitate the use of automated liquid handling and laboratory robotics with AFA-based sample preparation, Covaris has developed 8 strip and plate-based products, including the AFA-TUBE TPX with advanced sealing capabilities. This suite of automation-compatible acoustical cuvettes is optimized for both access by liquid handler tips and for integration with standard laboratory automation. Complies with the ANSI/SBS-4 standard for 96 well microplates.

- No fiber is required
- Conical bottom
- RFID-enabled sample chain of custody and multi-plate, batch processing
- Compatible with most liquid handlers
- Heat block and thermocycler compatible
- 8 and 96 wells (384 and 1536 plates in development)
- Ideal for 5 to 55 μl volumes

Consumables Integration

Covaris Certified Consumables Designed to Simplify your Automated Workflow

Universal Clamp & Automation Adaptors

To simplify automating AFA consumables, Covaris has developed a clamp system to hold microTUBE and AFA-TUBE TPX plates on deck during all pipetting steps. This is a two-part system which includes a universal clamp and automation adaptor (robot specific). The clamp system prevents plates from lifting off the deck of a liquid handler when the tips are withdrawn from the seals.
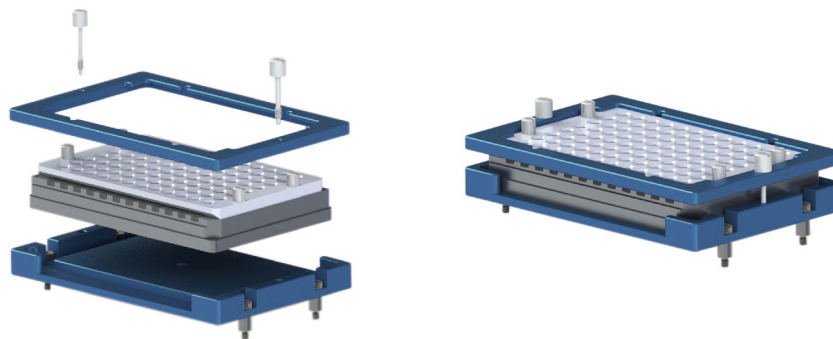
Technical Literature
Covaris Shearing Guide for 500 Base Pairs using the 96 AFA-TUBE TPX Plate
Pipetting Best Practices for Covaris 96 microTUBE Plate and 8 microTUBE Strip in Automated Liquid Handlers

LE220R-plus Focused-ultrasonicator

The LE220R-plus is the robotic version of the LE220-plus with an opening for a robotic arm to grip the sample plate with motion sensors for safety. Column of 8 to full plate processing in a single batch with scheduled system set-ups for degassing, chilling, and automated water level adjustments.

Key Features:

- Automation-ready with robotic arm capability
- Designed for integration with high-throughput laboratory automation
- No water adjustment is necessary
- User-defined scheduling for system set-up maximizes laboratory efficiency
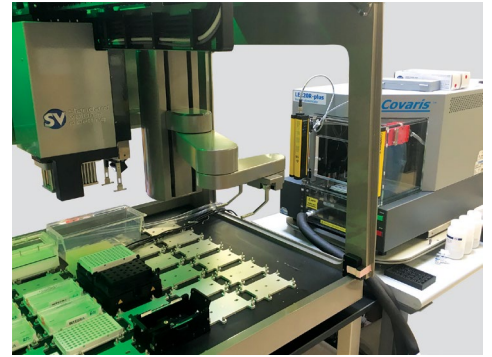
LE220R-plus solution, using a Robotic arm and Liquid handler

# Key Success: ARUP Laboratories

A Fully Automated Solution for DNA Fragmentation

Collaboration Objectives:

- Automate mechanical DNA fragmentation
- Deliver superior and consistent results
- Tunable for various sample types and specimen quality
- Certified light curtain to maintain safety standard

LE220R-plus integrated into central robotic frame of ARUP's NGS Workcell. Docking carts are powered and networked upon connection and locked into place. Docking carts have auto-fill enabled through a separate connection to deionized water. ThermoCube and WCS are nested in cart with UPS. LE220R-plus integrated into central robotic frame of ARUP's NGS Workcell.
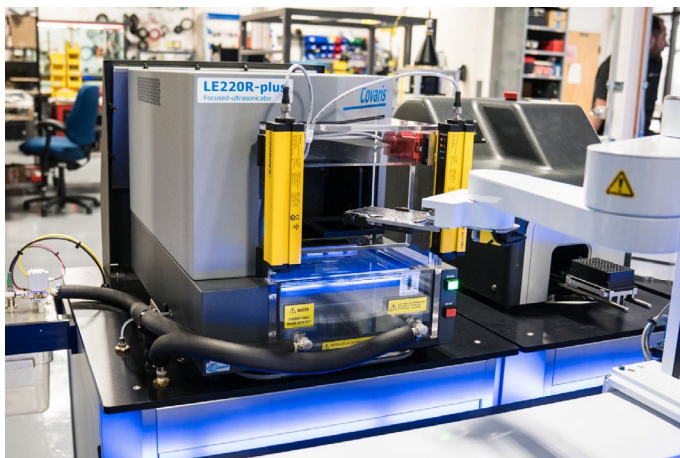
LE220R-plus features light curtains

Touchscreen mounted to back of LE220R-plus

Success: 24/7, 365 Facility Operation!
Liquid handling automation, coupled enhanced sample traceability, analytics integration (closes the loop), reduced human intervention, and increased throughput.

Photos courtesy of ARUP Laboratories.

The Future Starts Now: Introducing the AFA-Revolution

Unprecedented Results and Speed, Space Saving Design, and Automation-ready Solution

The new compact AFA-Revolution R230 instrument was designed to be implemented with your existing liquid handler to help you achieve optimal workflow efficiency, full automation, and standardized sample prep for NGS. The unique scanning processing motion and precise control of AFA-energetics™ revolutionizes standard sample prep, enabling high-throughput sample processing of up to 96 samples using the AFA-TUBE TPX Plate.

The AFA-Revolution R230 On-Deck with Hamilton NGS STAR

R230 On-Deck system
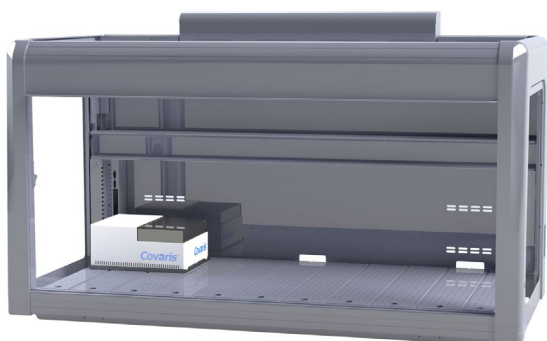
The AFA-Revolution R230 On-Deck in your Liquid Handler

96 AFA-TUBE Plate in the R230 On-Deck system

Integration capabilities and drivers are available for the following liquid handlers: Tecan, Hamilton, Dynamic Devices, and Beckman Coulter (non-exhaustive list).

Feature	Benefit
Powered by AFA-energetics	Controlled, non-contact processing
Direct on-deck integration	Compatible with most liquid handlers
Isothermal energy delivery	Maintains optimal sample integrity
Automation compatible with integrated RFID	Sample tracking and reduced human error
Automated water management	User-defined scheduling for system set-up maximizes laboratory efficiency
Eliminates columns and centrifugation	Higher recovery, lower cost, and faster turn-around-time (TAT)

Omniseq Collaboration

Optimize your Clinical FFPE Extraction Workflow using our Fully Automated AFA-Revolution Technology

Sequencing Performance Results; Manual vs. Automated Extraction using the Covaris AFA technology and truXTRAC® FFPE Kit

Sample	Manual vs. Automated	RNA QC Metrics			DNA QC Metrics				
		Mapped Reads	Valid Reads (%)	Positively Expressed HK Genes	Mapped Reads	On Target (%)	Mean Depth	Uniformity (%)	Exonic Bases ≥ 20x
A1	Manual	2,735,879	92	10	5,635,030	96	347	96	1,149,009
A1	Automated	2,787,396	89	10	3,993,898	96	242	95	1,142,259
B1	Manual	4,457,629	93	10	5,876,299	97	374	97	1,150,403
B1	Automated	5,263,349	91	10	5,298,795	96	334	97	1,150,570
C1	Manual	4,925,479	92	10	4,953,057	97	318	96	1,146,896
C1	Automated	5,874,845	92	10	4,234,211	96	272	97	1,150,150
D1	Manual	3,363,183	89	10	5,590,907	95	246	95	1,145,758
D1	Automated	4,354,899	89	10	5,371,301	96	334	96	1,147,159
Threshold Values (RNA and DNA-Seq)		≥ 200,000	≥ 67	≥ 6	N/A	> 94	N/A	> 92.6	≥ 850,000

Figure 1. Similar cfDNA and DNA library preparation yields between manual vs. automated methods with comparable downstream sequencing results

This assay provides clinicians with a comprehensive immune profile of their patient, greatly improving their ability to select a personalized immunotherapy treatment based on their patient's unique gene expression (OmniSeq website, www.omniseq.com/irc).

Automation Partners & Collaborations

Customers who use the Automation Integration Package have been able to successfully integrate our Covaris instrument with liquid handlers from a variety of vendors.

Automation Software

SonoLab Software and Automation Integration Packages

SonoLab Software is used in conjunction with the Covaris' Focused-ultrasonicator instruments for the processing of biological or chemical samples. Our proprietary software provides a user interface for manual control of the instrument, as well as an "integration interface" and an API for automation options.

Covaris offers an Automation Integration Package that includes an API developer's kit to enable users to easily integrate Covaris instruments with current liquid handling systems and other laboratory robotic automation.

Contact Covaris today to discuss your needs
and the potential of the AFA technology!