



A Practical Guide to Safety and Security Threat Detection Technology

Advanced technology and instruments for first responders, law enforcement, military, and government agencies to aid in the detection of radioactive materials and the identification of chemicals, narcotics, and explosive threats.

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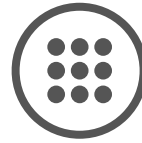
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overview

When You Need to Know if the Threat is Real

From routine security monitoring and surveillance to emergency response situations, integrated analytical instruments help safety and security professionals detect and mitigate hazardous materials, explosives, and radiological threats to keep the public and themselves safe.



Law Enforcement

Officers often don't know what they're walking into or if their lives are at risk. Is that puddle of water a toxic spill from illegal dumping, or just water? Is that box emitting harmful radiation? When dealing with unknown substances, real-time tools that can help clarify the situation and determine an appropriate course of action are critical to law enforcement officer's safety.



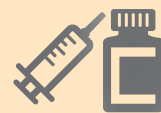
Law enforcement must quickly identify hundreds of narcotics and cutting agents using portable analyzers that bring lab-proven technology to the scene. Analytical instruments must also provide non-contact analysis of industrial chemicals that may be precursors for explosives, narcotics, or chemical warfare agents.

Law Enforcement: Narcotics, Chemical and Radiation Threats



Chemical Identification

When faced with chemical agents, dirty bombs, and unknown chemicals in the field, first responders need to act fast. Field-based chemical identification tools are needed to protect law officials, mitigate the scene, and safely execute the mission.



Narcotics Identification

With illegal drug targets rapidly evolving, traditional wet chemistry kits cannot keep pace with the constant influx of unknown substances. Police must be able to identify unknown substances on the spot to keep the public and themselves safe.



Radiation Detection & Identification

Law enforcement and police teams tasked with public safety at large events have an array of potential security threats to consider, including radioactive materials that could be used for malicious intent.



Firefighters

As the first responders to an emergency, firefighters may be walking into an unknown chemical or radiological hazard. These threats to firefighter safety can range from flammable and explosive materials to industrial chemicals that may be precursors for explosives or chemical warfare agents. Unsecured radioactive sources can lead to catastrophic scenarios for emergency response teams and can have devastating, long-term implications for the surrounding community.



Firefighters need actionable information in seconds. In an emergency, any number of flammable, explosive, or radioactive materials can put firefighters at risk. A broad range of portable instruments can help first responders detect, identify, and mitigate any potential threat.

Firefighters: Chemical and Radiation Threats



Radiation Detection & Identification and Post Incident Support

Hospital and industrial settings utilize radioactive materials. Firefighters need to prevent the spread of radioactive contamination to keep facilities safe and outside areas secure.



Radiation Protection for Firefighters

Firefighters operate in radiation emergencies where they must not only secure the area but protect themselves.



Chemical Identification and Post-Incident Support

Firefighters may be called on to analyze and identify potentially explosive chemicals, unlabeled spilled material, or the contents of illegally dumped drums containing toxic chemicals.



Military

The military and CBRNE defense teams are subjected to the harshest and most frightening threats known to man, whether they be toxic materials, bombs, chemical threats, or radiological events. Rapid identification of explosives, chemical weapons and agents, and radiation can be a matter of life and death for occupants of the target area.



Military personnel need to minimize time on target with lightweight, portable instruments that enable quick decision making in the hazard zone. Radiation detectors are needed to protect military personnel searching for WMDs, and analyzers that rapidly identify explosives and chemical weapons.

Military: Chemical and Radiation Threats



Explosive Ordnance Disposal

Homemade, improvised explosives, chemical threats, and locally manufactured ordnance items by terrorist organizations are growing concerns. EOD teams need to quickly identify potential explosive threats and detect chemical weapons to make informed decisions downrange on the target.



Finding Radiation Threats

Military must localize, identify, and measure radioactivity in any scenario with radiation monitoring and surveillance instruments that enable military personnel to respond quickly and appropriately.



Protection against Radiation

Personnel need to be protected from threats such as exposure to depleted uranium in artillery, and nuclear power on ships and submarines with portable and wearable radiation detectors and monitoring instruments.



Chemical Identification

Military personnel must be able to perform rapid testing and identification of chemical warfare agents (CWAs), toxic industrial chemicals (TICs), toxic industrial materials (TIMs), and numerous other hazardous substances in the field.



Government Agencies

Government agencies are responsible for public safety and well being on many levels. Homeland security forces are always on the alert for radiological threats and chemical attacks. Border patrol and customs agents face the daunting challenge of identifying dangerous substances such as illegal narcotics, new synthetic drugs, potential chemical weapons, and explosives, from entering the country while facilitating commerce and safe travel.



Government agencies must locate orphaned sources, radiation contamination, and potential malicious intent sources with interactive threat detection tools. Security threat detection instruments also help secure borders and ports of entry against illegal narcotics, synthetic drugs, counterfeit pharmaceuticals, and unknown chemicals.

Government Agencies: Narcotics, Chemical and Radiation Threats



Narcotics Identification

Customs and Border Protection (CBP) organizations need advanced tools to help guard against illegal and potentially harmful items, such as illegal narcotics and new synthetic drugs, from reaching beyond borders.



Radiation Protection

Government, military and civil defense outfits that work with sources of radiation or need to address the problems of orphaned, unknown, and hidden radioactive threats need to safeguard themselves and the environment.



Chemical Identification

Government personnel at ports and borders must quickly identify potential CBRNE hazards, chemical weapons or an unknown chemical substances.





planning tools

5 Steps to Radiation Preparedness



- 1 Recognize the importance of preparation.
- 2 Develop a coordinated, smart program.
- 3 Determine funding sources.
- 4 Identify instrumentation and a vendor with solutions to match your needs.
- 5 Train agents and implement your plan.



Case Studies

Will the Public be Safe at Your City's Next Big Event?

Securing large sporting events, races and parades offer a number of challenges to keeping the public safe. Large sporting events are high-risk areas for malicious radiation threats. Parade and race routes typically go through heavily populated areas that are difficult to monitor.

Read our case studies to learn how you can be better armed to monitor and detect radiation threats prior to and during these events.



Read our case studies on **sporting event security** and **parades**.



Strengthen Chain of Custody

Breaks in the chain of custody (CoC) for narcotic cases can prevent evidence from being introduced during court proceedings and, ultimately, cause the dismissal of charges against a defendant. In some cases, the consequences of breaks in CoC can be disastrous, especially if tampering has occurred. Jurisdictions that do not have a protocol or standard operating procedure for CoC and evidence preservation should consider one, and question if handheld analyzers can help by providing proper documentation in the CoC.



Grants

Available Grants for Radiation Detection Products and Chemical, Explosives, and Narcotics Identification Products

Get FREE assistance

- Grant research customized to your department's needs
- Unlimited free consulting from Senior Grant Consultants
- Free grant application help and review services
- Free online grant writing training

Funds are available and we have a wide range of products to meet your needs.



Radiation Measurement Products



Hazmat and Chemical Identification Products



Narcotics Identification Products



Radiation Measurement Products



Explosives Identification Products





technology



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Raman and FTIR Spectroscopy

Complementary Technologies for Chemical and Explosives Identification



FTIR

SUITABLE FOR:

- Colored samples
- Fluorescent samples

Thermo Scientific™
TruDefender™ FTX
Handheld FTIR for
Chemical Identification

Both identify
light-colored samples.
FTIR & Raman serve
as complementary and
confirmatory analysis for
many samples.



Thermo Scientific™
Gemini™ Analyzer

Raman

SUITABLE FOR:

- Aqueous solutions
- Point-and-shoot through semi-translucent containers



Thermo Scientific™
FirstDefender™ RMX/RM
Chemical Identification
System

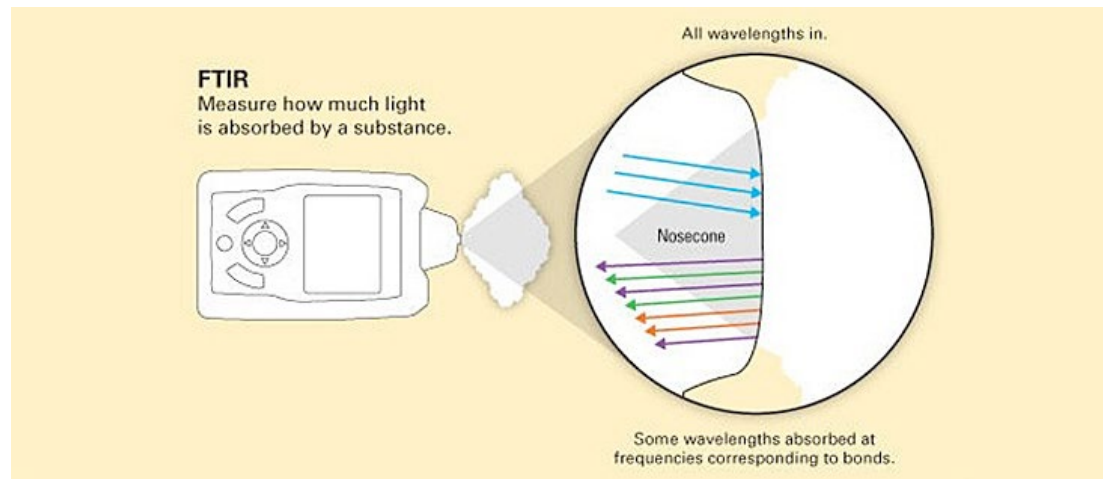


FTIR Spectroscopy



Learn more about FTIR technology in our [FTIR Spectroscopy Academy](#).

FTIR stands for Fourier Transform InfraRed, the preferred method of infrared (IR) spectroscopy. When IR laser is passed through a sample, some light is absorbed by the sample and some passes through (is transmitted). The resulting signal at the detector is a spectrum representing a molecular ‘fingerprint’ of the sample. The usefulness of infrared spectroscopy arises because different chemical structures (molecules) produce different spectral fingerprints. The Fourier Transform converts the detector output to an interpretable spectrum. The FTIR generates spectra with patterns that provide structural insights.



Raman Spectroscopy

Raman spectroscopy is a technology that enables users to safely analyze explosive materials through sealed translucent containers without disturbing the sample. Chemical Identification analyzers using Raman can recognize thousands of potential explosives including: TATP (triacetone triperoxide), ammonium nitrate, TNT (trinitrotoluene), RDX (cyclonite) and HMTD (hexamethylene triperoxidediamine). Additionally, these instruments are capable of identifying explosive precursors in liquid mixtures including: hydrogen peroxide, fuel oil, acetone, sulfuric acid and more.



Learn more about Raman spectroscopy in our [Raman Spectroscopy Academy](#).

To aid in identification, the device collects the molecular fingerprint of an unknown sample, and then compares the substance against the onboard chemical library, typically providing results in a matter of seconds. Raman instruments excel at identifying liquids, gels, pastes and light colored solid materials. (Raman technology utilizes a focused laser, which can heat some energetic materials, so proper safety protocols should be followed to ensure operator safety.)

This technology can provide specific actionable data to first responders, EOD and CBRNE teams, because explosives, precursors and improvised explosive devices can be identified quickly, right in the hazard zone. (Read more: [Explosives Identification Using Raman Technology](#).)



Raman Spectroscopy

Legal Precedence and Potential Impact on Prosecution for Narcotics Identification

Raman spectroscopy is a well-established forensic laboratory technique. Further, it is also accepted by the Scientific Working Group for the Analysis of Seized Drugs (SWGDRUG) for the analysis of controlled substances. Forensic labs tasked with providing confirmatory narcotic testing results will also frequently use gas chromatography/mass spectrometry (GC/MS), which some consider the gold standard in analytical instrumentation.



Although GC/MS provides definitive results, it is a costly, laboratory-based technique, which is time-consuming and contributes to the backlog of samples, subsequently delaying the reporting of results back to law enforcement agencies waiting to prosecute cases.

Raman spectroscopy already has a proven track record in U.S. Federal District Courts. Raman spectroscopy for the chemical identification of narcotic (or controlled) substances meets the Daubert admissibility standards. Raman spectroscopy can also differentiate isomers*.

*GC/MS will not identify isomerers.



Chemical Identification Software

HazMasterG3[®]: Chemical ID Coupled with Decision Support

HazMasterG3[®], from Alluviam LLC, is an advanced decision support tool that has been integrated into the handheld Gemini instrument. It is the only CBRNE / HME / IED support software to have earned a US Department of Homeland Security certification for approved anti-terrorism technology. This decision support tool serves as a force multiplier for operators on the front lines of threat response, and provides key chemical insights to help interpret the analyzer's results.

The image displays three screenshots of the HazMasterG3 software interface. The top-left screenshot shows the 'Tools' menu with options: 'Date & Time' (17), 'Tag On/Off', 'Delete Tags', and a 'HazMaster' button with a diamond-shaped logo containing 'H', 'M', 'G', and '3'. The top-right screenshot shows a 'Scan Result' for 'Hydrogen peroxide' with CAS: 7722-84-1, a hazard diamond (0, 1, 3, 0), and the text 'UN, ITF-40, Industrial Chemicals, Laboratory Reagent...'. The bottom-left screenshot shows a search list with 'HYDROGEN PEROXIDE, STABILIZED' highlighted, and a 'Display: Likely outcomes' section showing '100%: HMTD'.



Natural Background Rejection Technology

Natural Background Rejection (NBR) is a technology used to eliminate fluctuating natural background levels while measuring radiation. This proprietary and patented technology is used to quickly differentiate between natural and artificial radiation by stripping away any natural background radiation that is registering, delivering you a more accurate result of artificial radiation levels. Operators using instruments without NBR often set their alarm thresholds higher to eliminate the nuisances of false alarms or ignore alarms due to their frequency potentially missing out on hidden or shielded sources. Using an instrument with NBR allows you to keep your alarm threshold extremely low without the need to worry about false alarms from non-threatening sources so when the alarm goes off, you know it is time to take action.

Application Technology Snapshot

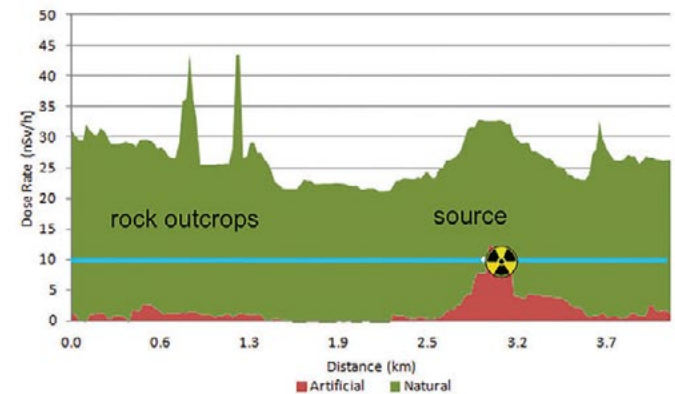
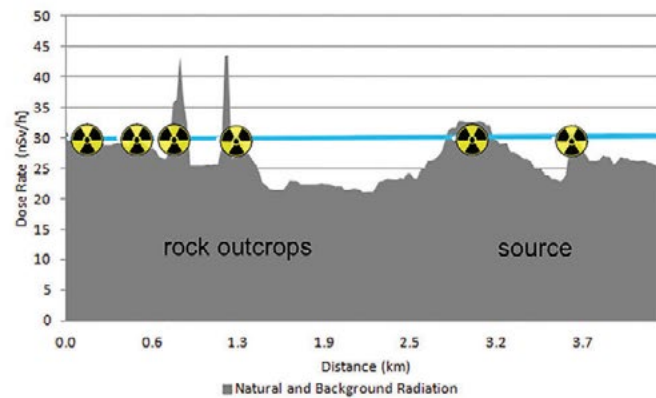
QA What can Natural Background Rejection (NBR) technology do for me?

- Reduce the number of false alarms
- Better detect low levels of artificial radiation such as hidden or shielded sources

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Thermo SCIENTIFIC



What's the Difference Between Geiger Counter and Personal Radiation Detector Technology

Personal radiation detectors offer the functionality of traditional Geiger counters, while delivering features not available in traditional Geiger counters. These lightweight instruments offer an improved range of detection of multiple types of ionizing radiation, even in the same unit – alpha, beta, x-rays, and gamma.





equipment

Advanced Threat Detection Technology

When it comes to the detection and identification of radioactive materials, chemicals, or explosives threats, ensuring that on-site teams are properly equipped requires a strategic approach. We are constantly working to protect against these threats with advanced technology and innovative instruments that offer real-time security threat detection and immediate results.



Advanced Threat Detection Technology

#	Location	Description of threat	Narcotics		Chemical Identification		Radiation Detection and Identification			Other Inspection Instruments	
			TruNarc	Gemini	FirstDefender	TruDefender	RadEye Detectors	PackEye	RadHalo	Niton XRF	Micro Phazir AS
1	Traffic stop	Suspected narcotics found in the car	●								
2	Hospital	Nuclear sources used in medicine program could be stolen or improperly stored and disposed of						●			
3	Museum	Ensure proper preservation materials were received		●							
4	School	Suspected narcotics found in students locker	●								
5	City streets	Various chemical and radiation threats		●				●			
6	Sporting stadium	Fans bringing in explosive or radioactive materials		●				●	●		
7	Stone buildings	Contain natural radiation that can trigger false alarms						●			
8	Commercial building	Incoming packages may contain illicit chemicals, dirty bombs or lead paint screening		●	●		●	●		●	
9	Government building	Visitors to building need to be screened		●							
10	Bus terminal	Unknown substances found on bus or passenger		●						●	
11	Train station	Unknown substances found in terminal									
12	Train tracks	Unknown chemical is spilled due to derailment		●	●		●				
13	Factory	Orphaned radiation sources and non-labelled chemicals found		●				●			
14	Marina	Suspected narcotics found on boat	●								
15	Airport	Passengers could carry numerous possible harmful substances	●	●				●			
16	Cargo ships	Ships may contain radiation sources or harmful chemicals		●						●	
17	Demolished building*	Orphaned radiation sources from testing equipment and old chemicals left behind		●				●			●
18	Shipping port*	Suspicious packages and chemicals found in container		●				●			
19	Logistics facility	Suspicious packages with unknown chemicals or radiation are found		●				●		●	
20	Nuclear power plant**	A possible radiation leak is suspected at the plant									
21	Highway	Unknown chemicals are spilled during an accident		●							
22	Scrap yard*	Orphaned radiation sources arrive with shipment of scrap metal						●			●
23	Street fair	Possible radiation or chemical threats		●				●	●	●	

*** Other Considerations**

- 17. Instruments for determining the presence of asbestos or the composition of metal are available
- 18. A wide range of portal monitors for monitoring large containers are available
- 20. A wide range of radiation monitoring equipment is available for pre-emptive or post-incident monitoring
- 22. Portal monitors are available for monitoring scrap and the Niton XRF provides material identification



Illegal Drugs



Thermo Scientific™ TruNarc™ Handheld Narcotics Analyzer

- Identifies suspected narcotics in the field.
- Enables officers, customs, border control, and other personnel to scan more than 450 suspected illicit substances in a single, definitive test.



Hazardous Materials, Chemical Weapons & Explosives Identification



Thermo Scientific™ Gemini™ Analyzer

- Identifies a broad range of unknown chemicals and explosives in the field.
- Contains FTIR and Raman spectroscopy in one instrument.
- Features the HazMasterG3™ decision support system from Alluvium LLC.
- Helps military personnel, bomb technicians, hazmat teams and first responders minimize time on target.



Thermo Scientific™ FirstDefender™ RM Chemical Identification System

- Enables hazmat, law enforcement, military and other first responders to identify chemicals, explosives and hazardous materials in seconds, through sealed translucent containers.
- Features a large, vivid display for ease of use in bulky protective gear.
- Can be easily transported into a hazard zone.



Thermo Scientific™ TruDefender™ FTX Handheld FTIR for Chemical Identification

- Identifies explosives or hazardous materials.
- Great at identifying dark materials and materials that fluoresce.
- Features a self-contained anvil sampling head for easy sampling of solid and liquid chemicals in the field.



Radiation Detection & Identification



Thermo Scientific™ RadEye™ SPRD Personal Radiation Detector

- Detects radiation in the most challenging cases while eliminating nuisance alarms.
- Identifies the category or specific type of radiation.
- Can be configured for operation or user skills.



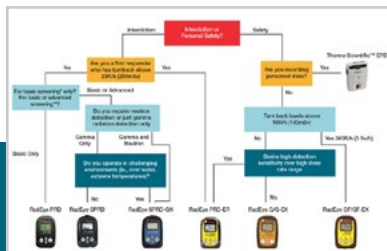
Thermo Scientific™ RadEye™ G Series Personal Dose Rate Meters

- Continuously monitors radiation exposure in any nuclear or radiological emergency.
- Detects and measures very low gamma energies; even the smallest change in radiation rates are displayed immediately, while coincidentally occurring fluctuations are suppressed.
- Meets the latest A TEX standards.



Thermo Scientific™ RadHalo™ RDP and FM Spectroscopic Area Monitors

- Detects and identifies radiation on location or from miles away.
- Available as rapid deployment probes (RDP) and fixed monitors (FM).
- Delivers high precision gamma and neutron radiation measurements and real-time data collection across a wide range of environments and radiation dose rate levels.



Radiation Detection & Identification



Contamination Monitors

Quickly and reliably screen for possible radiation contamination. Our contamination monitors help safeguard firefighters and ensure a secure environment in areas where the problems of orphaned, unknown, and hidden radioactive threats need to be addressed.



Survey Meters

Quickly distinguish between naturally occurring radioactive material (NORM) and radiation from man-made sources such as nuclear weapons, improvised nuclear devices (INDs), or radiological dispersal devices (RDDs). We offer a variety of portable radiation detection devices and instruments for continuous monitoring and immediate alert to a variety of radiation types.



Integrated Radiation Monitoring Systems

Integrating personnel, area, and environmental radiation monitoring systems into one solution. We offer a variety of environmental and industrial process radiation monitoring instruments that work together to provide real-time monitoring for applications such as radiological hotspot identification, environmental contamination detection, or routine security surveillance.



Radiation Isotope Identifiers

Whether you are evaluating water or soil samples or searching for materials that could make a dirty bomb, it's critical to know the exact isotope of the radioactive material in order to assess the potential threat and quickly initiate a plan of action. These instruments are well suited to support users from homeland security operations to contamination monitoring and remediation, with the industry's fastest, most accurate and easy to use RIID.



PackEye Radiation Detection Backpack

Provide your survey teams with a tool for effectively addressing the problems of orphaned sources, radiological contamination, and maliciously introduced sources with Thermo Scientific™ PackEye Radiation Detection Backpack. It locates and detects gamma-emitting radioactive sources in large areas very rapidly, but unobtrusively.

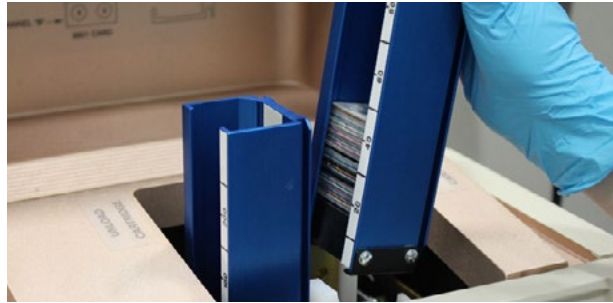


Dosimetry



Thermo Scientific™ EPD TruDose

Protect your employees with electronic personal dosimeters that deliver real time radiation monitoring in most critical areas of your facility. The Thermo Scientific™ EPD TruDose Electronic Personal Dosimeter monitors Gamma and Beta radiation in any environment where workers need to monitor their exposure to radiation, with improved accuracy and simplified operation over previous generations of EPDs. EPD TruDose personal radiation monitors are available with or without telemetry and integrate with many different systems, including ViewPoint and webREMS.



Thermo Scientific™ TLD Readers, Cards and Material

Ensure accurate radiation exposure monitoring. Thermo Scientific™ TLD readers provide cost-effective measurements of the radiation dose absorbed by individual TLD elements for medical, nuclear, research, and health physics applications. Manual and automated systems for whole body, extremity, neutron, and environmental monitoring are easy to operate, service, and maintain.



Dosimetry Services

Radiation exposure in the workplace must be accurately measured and monitored for protection of employees and employers alike. When worker safety can't be compromised, you can rely on our radiation dose monitoring services.





About Thermo Fisher Scientific

Thermo Fisher Scientific is the world leader in serving science, with revenues of more than \$24 billion and approximately 70,000 employees globally. Our mission is to enable our customers to make the world healthier, cleaner and safer. We help our customers accelerate life sciences research, solve complex analytical challenges, improve patient diagnostics, deliver medicines to market and increase laboratory productivity. Through our premier brands – Thermo Scientific, Applied Biosystems, Invitrogen, Fisher Scientific and Unity Lab Services – we offer an unmatched combination of innovative technologies, purchasing convenience and comprehensive services.

For additional information or to request a quote, please click below.

