



# Unsurpassed extraction technology Accelerated solvent extraction

Thermo Scientific Dionex ASE 350 System



# Sample extraction with walk-away capability to produce uncompromised results

The Thermo Scientific™ Dionex™ ASE™ 350 Accelerated Solvent Extractor System is the solution for laboratories seeking to spend minimal time and effort to extract samples for chromatographic analysis.

## Increase laboratory productivity and sample throughput

The Dionex ASE 350 system improves productivity by using a combination of elevated temperature and pressure to increase the efficiency of the extraction process. The result is faster extraction times with a significant reduction in solvent use when compared to traditional extraction techniques such as Soxhlet or sonication. Other extraction techniques can take up to 48 hours per sample while the Dionex ASE 350 system extractions are typically performed in 12–20 minutes. Solvent consumption is reduced by 50–90% when compared with traditional extraction techniques.

Why compromise analytical results with cumbersome and ineffective sample extraction techniques?

Extraction time	
Technique	Average extraction times*
Soxhlet	4–48 h
Automated Soxhlet	1–4 h
Sonication	0.5–1 h
SFE	0.5–2 h
Microwave	0.5–1 h
Dionex ASE 350 system	0.2–0.3 h

The Dionex ASE 350 system has proven to yield fast, unattended operation that significantly improves laboratory productivity.

Solvent usage	
Technique	Solvent usage*
Soxhlet	150–500 mL
Automated Soxhlet	50–100 mL
Sonication	150–200 mL
SFE	5–50 mL
Microwave	25–50 mL
Dionex ASE 350 system	5–200 mL

\*Calculated on a per sample basis

# Innovative sample preparation solutions to optimize the laboratory workflow

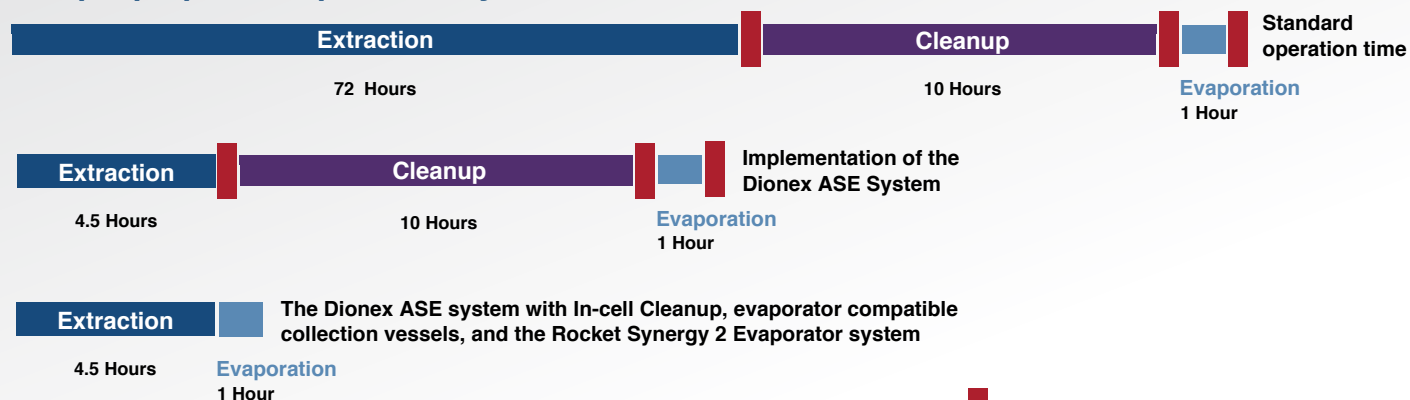
Sample preparation is the most vital part of the laboratory workflow. Since greater than 60% of all errors occur during this phase, it is often considered the most frustrating and cumbersome component of the workflow. While analytical technology has evolved remarkably over the last 20 years, most sample preparation still relies on antiquated manual techniques that can produce low analyte recovery with highly variable reproducibility.

A traditional sample preparation workflow consists of extraction, cleanup, and evaporation, all of which use manual sample transfer steps through the transition. Techniques such as Soxhlet, gel permeation chromatography, and nitrogen blowdown evaporation often produce total sample prep workflow times in excess of 60 hours per batch.

In 1995, the Thermo Scientific™ Dionex™ ASE 200 System was introduced and substantially reduced extraction time. More recently, we introduced the Dionex ASE system with In-cell Cleanup and the Thermo Scientific™ Rocket Synergy™ 2 Evaporator System to address the entire sample preparation workflow and reduce the total time to six hours per sample batch.

The combination of the Dionex ASE system with In-cell Cleanup and the Rocket Synergy 2 Evaporator system provides a total sample preparation solution for the analytical laboratory. The combination of these two techniques eliminates both the manual cleanup step and manual sample transfer resulting in highly accurate and reproducible sample preparation.

## Sample preparation productivity\*



Red boxes indicate sample transfer steps

\*Average processing times for 18 samples



Thermo Scientific™ Dionex™ ASE 350 System



Thermo Scientific™ Rocket Synergy™ 2 Evaporator System



Thermo Scientific™ TRACE™ 1600 Series Gas Chromatograph



Thermo Scientific™ ISQ™ 7610 Single Quadrupole GC-MS System

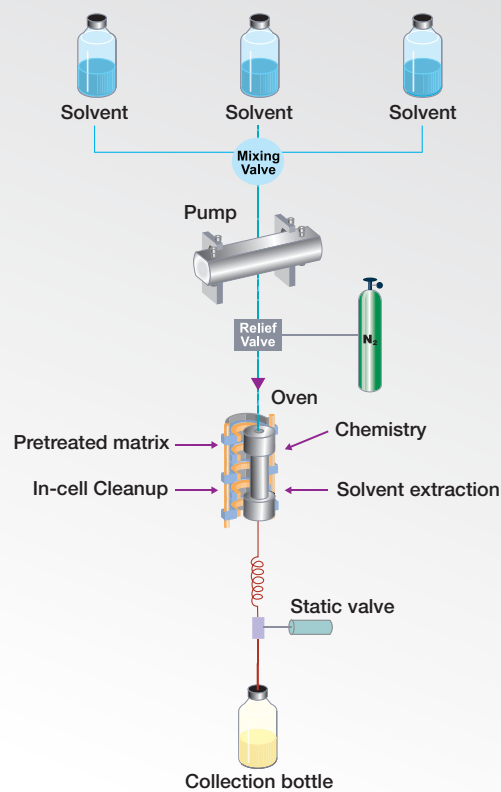
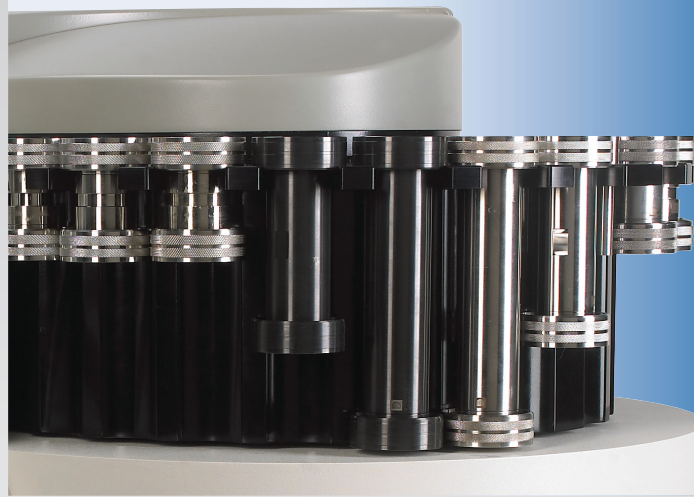


Thermo Scientific™ TSQ™ 9610 Triple Quadrupole GC-MS System

# Inside the system

## The Dionex ASE 350 system uses patented technology that automatically performs solvent extractions

Extraction cells filled with sample are loaded into an oven where they are filled with solvent, heated, and pressurized. The cell is held at a preset temperature for a fixed period of time for a static extraction. A static valve is then opened to release the extract into the collection vessel and then is closed in preparation for a second static extraction. The number of static extraction cycles is programmable and once complete, the extraction cell is flushed and purged with nitrogen.



Through use of the static extraction cycles, the accelerated solvent extraction technique assures an exhaustive extraction in a manner that uses much less solvent and time. Since analytes diffuse out of the matrix and into the extraction solvent, static extraction cycles maximize the concentration gradient that permits this movement and results in highly efficient extractions. This results in high percent recoveries for analytes of interest in a diverse array of solid matrices with extraction times as low as 12 minutes per sample with a little as 5 mL of solvent used for each extraction.

The Dionex ASE 350 system works with both stainless steel and Dionium extraction cells. Dionium cells permit the use of samples that require pretreatment with acids and bases and bring the benefits of the system to several new applications for food and renewable fuel source analysis.



# Performance and productivity beyond traditional sample preparation techniques or procedures



Dionex ASE 350 system delivers greater capabilities



**The Dionex ASE 350 is designed for high-throughput labs with large sample testing requirements. It is ideal for the busy environmental, food analysis, chemical, pharmaceutical, or research labs.**

## Key features include:

- Unattended extraction of up to 24 samples
- Automated in-line solvent mixing for complex extractions
- Thermo Scientific™ Chromeleon™ 7 Chromatography Data System (CDS) Software control for compliance and to simplify automation
- Collection vessels (60 mL) and bottles (250 mL) can be directly transferred to the Rocket Synergy 2 Evaporator
- Stores 24 extraction methods and 24 extraction sequences for unmatched flexibility
- pH hardened pathways for acid and base pretreated samples

Dionex ASE 350 system

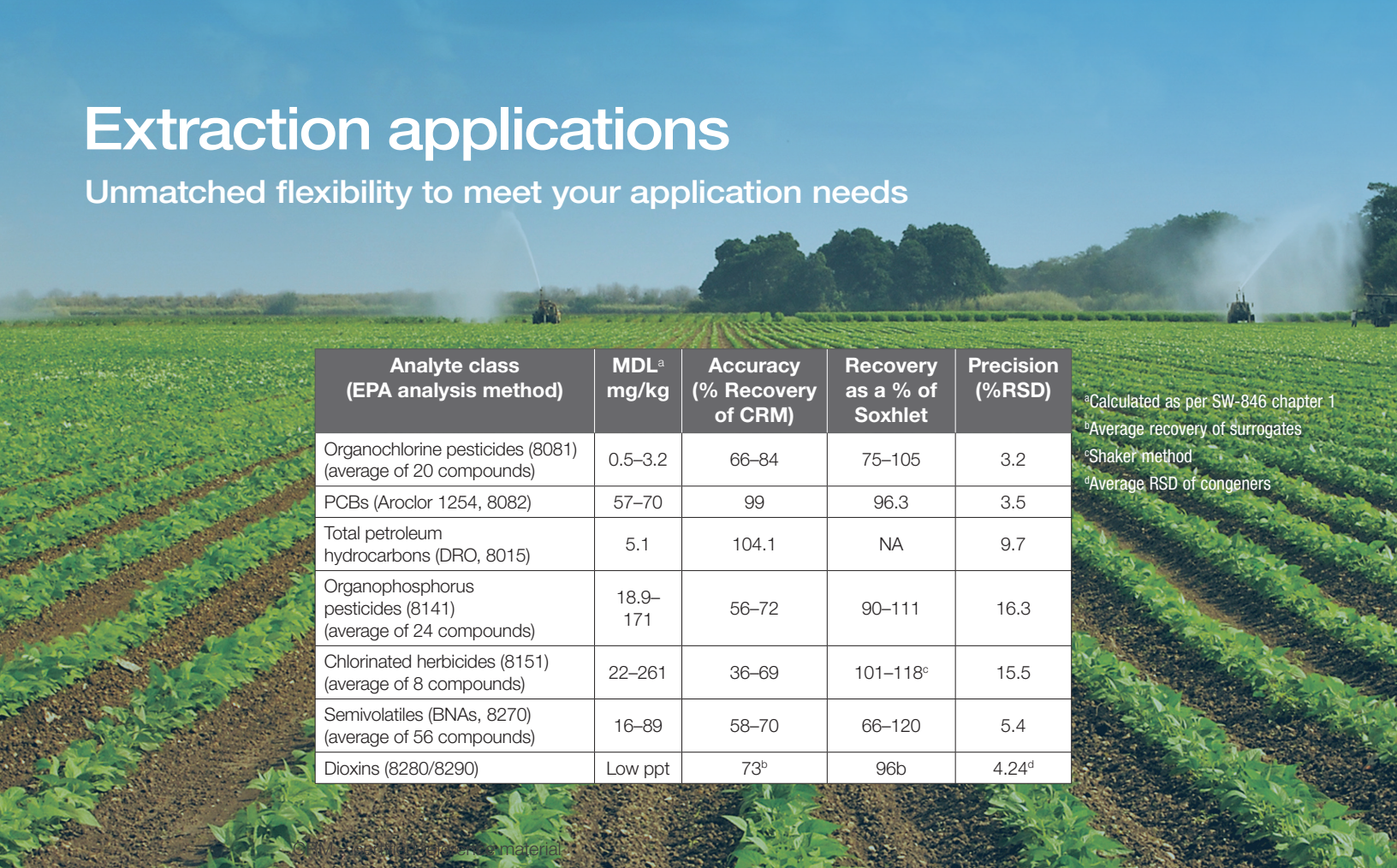
## In-cell Cleanup

Interferences may be extracted along with desired analytes during an extraction process. The use of sorbents like alumina, silica gel and Florisil® in the extraction cell may help to remove unwanted co-extractables, thus combining extraction and purification into a single step.

For more information, please reference [Thermo Scientific Technical Note 210](#).

# Extraction applications

Unmatched flexibility to meet your application needs



Analyte class (EPA analysis method)	MDL <sup>a</sup> mg/kg	Accuracy (% Recovery of CRM)	Recovery as a % of Soxhlet	Precision (%RSD)
Organochlorine pesticides (8081) (average of 20 compounds)	0.5–3.2	66–84	75–105	3.2
PCBs (Aroclor 1254, 8082)	57–70	99	96.3	3.5
Total petroleum hydrocarbons (DRO, 8015)	5.1	104.1	NA	9.7
Organophosphorus pesticides (8141) (average of 24 compounds)	18.9– 171	56–72	90–111	16.3
Chlorinated herbicides (8151) (average of 8 compounds)	22–261	36–69	101–118 <sup>c</sup>	15.5
Semivolatiles (BNAs, 8270) (average of 56 compounds)	16–89	58–70	66–120	5.4
Dioxins (8280/8290)	Low ppt	73 <sup>b</sup>	96 <sup>b</sup>	4.24 <sup>d</sup>

<sup>a</sup>Calculated as per SW-846 chapter 1

<sup>b</sup>Average recovery of surrogates

<sup>c</sup>Shaker method

<sup>d</sup>Average RSD of congeners

## Environmental

For environmental applications, the Dionex ASE 350 system is proven to produce data equivalent to or better than traditional extraction techniques such as Soxhlet or sonication. Accelerated solvent extraction technique is accepted under U.S. EPA Method 3454A for the extraction of the following compounds from soil, sludge, tissue, and sediments:

- Pesticides and herbicides
- Polyaromatic hydrocarbons
- Polychlorinated biphenyls
- Dioxins and furans
- Total petroleum hydrocarbons
- Explosive compounds

The Dionex ASE 350 system is also accepted for use in U.S. EPA Method 6860 for the determination of perchlorate and Contract Laboratory Program (CLP) Organic Low Medium OLM04.2A. for semi volatiles and pesticides. The accelerated solvent extraction technique has also proven effective in extracting organic compounds from air using polyurethane foam filters (PUF) and XAD resins.

## Food and beverage

The accelerated solvent extraction technique is used for multiple applications in the food and beverage industry. The Dionex ASE 350 system is capable of extracting large-gram weight samples with high moisture content to support the low detection limits required for food analysis and delivers optimal extractions for the following applications:

- Pesticide residues in a variety of sample types marketed for human or animal consumption
- Fats and lipids using acid hydrolysis
- Fats and total lipids using alkaline saponification
- Acrylamide
- Antibiotic residues
- Antioxidants



## Pharmaceutical and natural product industries

- Monitoring the level of pharmaceutical agents and their metabolites in tissue to assess stability
- Verify that level of active compounds in products such as transdermal patches are within specification
- Verify that natural products such as St. Johns Wort, echinacea, and ginkgo biloba meet industry guidelines for standardized market compounds

Automation and improved reproducibility result in better control of manufacturing processes and faster identification of potential therapeutic agents.

## Chemical, petrochemical, and renewable fuel sources

The Dionex ASE 350 system has a diversity of uses in the plastics, rubber, and biofuels industries including:

- Extraction of plastizers from PVC
- Extraction of polypropylene and polyethylene for additives (UV stabilizers and antioxidants)
- Extraction of oils and organic acids from styrene butadiene rubber (ASTM D 1416)
- Determination of extractive in biomass (NREL Method 510-42619)

Dionex ASE 350 system replaces 12-24 hour solvent extractions, significantly reducing extraction time and solvent use.

Extraction for marker compounds from natural products										
Method	Dianthrones (St. John's Wort)		Deacysaponins (Horse chestnut)		Silybin (Milk thistle)		Curcumin (Turmeric rhizome)		Thymol (Thyme)	
	Soxhlet	*ASE technique	Soxhlet & reflux	*ASE technique	Soxhlet	*ASE technique	Reflux	*ASE technique	Steam distillation	*ASE technique
Percent wt. (RSD%)	0.028 (7.1) <sup>a</sup>	0.035 (2.9)	2.6 (12)	3.7 (5.4)	1.13 (3.5)	1.16 (3.4)	0.89 (2.2)	1.06 (0.94)	1.15 (7.0)	1.17 (3.4)
Solvents	DCM Acetone	DCM MeOH	DCM MeOH	DCM MeOH	Petrol MeOH	Hexane MeOH	MeOH	MeOH	Water	Hexane DCM
Volume	250 mL	<50 mL	170 mL	<50 mL	200 mL	<70 mL	50 mL	<20 mL	250 mL	<80 mL
Total time	38 h	<25 min	7 h	<40 min	9 h	<25 min	1 h	<30 min	2 h	<25 min

Total extractables from styrene-butadiene rubber (SBR)				
Sample	Target value	*ASE value (%)	*ASE RSD (n = 3)	*ASE recovery (% vs. Target value)
1	32.59	32.66	0.52%	100.2
2	32.60	32.77	0.12%	100.5
3	33.86	33.89	0.56%	100.1
4	34.83	34.44	0.91%	98.9

Weight percent of each plasticizer in polyvinyl chloride (PVC)			
Plasticizer	*ASE recovery (n=3)	Soxhlet recovery (ASTM D2124) (n=2)	*ASE recovery (% vs. Target value)
DOA	9.81	9.56	102.6
TOP	9.50	9.28	102.4
DOP	9.42	9.35	100.7
TOTM	9.17	9.05	101.3

Extraction of additives from low-density polyethylene (LDPE)					
Procedure	Additive concentration (ppm)				
	I-3114	I-1010	I-1330	I-168	I-1076
Chloroform dissolution	nd	95	599	659	205
*ASE technique	nd	95	598	694	154

Extraction of additives from high-density polyethylene (HDPE)					
Procedure	Additive concentration (ppm)				
	I-3114	I-1010	I-1330	I-168	I-1076
ASTM D-6953-11	353	132	nd	nd	240
*ASE technique	335	138	nd	nd	281

<sup>a</sup>Accelerated solvent extraction technique

# Total workflow solutions from Thermo Fisher Scientific

## Thermo Scientific™ Dionex™ ASE 350 System

Automated accelerated solvent extractor systems. Enables extraction of solid and semisolid samples using common solvents at elevated temperatures and pressures.



## Thermo Scientific™ Rocket Synergy™ 2 Evaporator System

A revolutionary solvent evaporator system that concentrates or dries up to 18 ASE vials or 6 large-volume flasks unattended.



## Thermo Scientific™ Dionex™ AutoTrace™ 280 PFAS Instrument

Get automated solid phase extraction (SPE) for PFAS sample preparation with the Dionex AutoTrace 280 PFAS instrument and reduce your risk of background contamination using an instrument with non-fluoropolymer-based tubing, valves, and filters. The Dionex AutoTrace 280 PFAS removes potential interferences from the analysis, while improving extraction recovery and reproducibility with precise flow-rate control. Throughput is increased by processing six samples at a time with minimal user interaction. The Dionex AutoTrace 280 PFAS ensures compliance with regulated methods such as U.S. EPA 537, 537.1 and 533.



## Thermo Scientific™ TRACE™ 1600 Series Gas Chromatograph

Maximize the operational efficiency and profitability of your lab with the TRACE 1600 Series GC and its unique modular concept for optimized instrumental usage. The TRACE 1600 Series GC is designed for minimum interaction with the instrument, limiting the local operations to the essentials and enabling full instrument control through the chromatography data system.



## Thermo Scientific™ TSQ™ 9610 Triple Quadrupole GC-MS/MS System

To confidently stay ahead, your GC-MS/MS system must deliver ultimate performance while consistently producing trusted quantitative results. For this, turn to the TSQ 9610 triple quadrupole GC-MS/MS system. User-centric Thermo Scientific™ NeverVent™ technology, extended-life detector, and intelligent software eliminate unnecessary downtime to maximize your sample throughput and return on investment.



## Thermo Scientific™ Vanquish™ HPLC and UHPLC Systems

Designed with innovative technology and attention to fine detail, Vanquish HPLC and UHPLC systems are the most advanced LC instruments available. The Vanquish systems improve performance and repeatability with no trade-offs in quality, robustness, or ease-of-use. Regardless of which Vanquish HPLC or UHPLC system is used, chromatographers have all they need to solve their toughest analytical challenges with confidence.



## Thermo Scientific™ Chromeleon™ Chromatography Data System (CDS) Software

One scalable software platform for LC, GC, IC, and MS that provides Operational Simplicity™ by streamlining your entire analysis process – ultimately boosting your lab's overall productivity, simplifying compliance and increasing the quality of your analytical results.



Learn more at [thermofisher.com/chromatography](https://thermofisher.com/chromatography)