

**Thermo Scientific Dionex  
ASE 150 and 350 Systems**

# **Unsurpassed Extraction Technology Accelerated Solvent Extraction**

**Thermo**  
SCIENTIFIC



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

The Thermo Scientific™ Dionex™ ASE™ 150/350 Accelerated Solvent Extractor systems are for laboratories seeking to spend minimal time and effort to extract samples for chromatographic analysis.

## Increase Laboratory Productivity and Sample Throughput

The Dionex ASE 150/350 systems improve 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 150/350 system extractions are typically performed in 12–20 minutes. Solvent consumption is reduced by 50–90% when compared with traditional extraction techniques.

Time Savings	
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 150/350	0.2–0.3 h

The Dionex ASE 150/350 systems has proven to yield fast, unattended operation that significantly improves laboratory productivity.

Solvent Savings	
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 150/350	5–200 mL

\*Calculated on a per sample basis

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

# Innovative Sample Preparation Solutions to Optimize the Laboratory Workflow

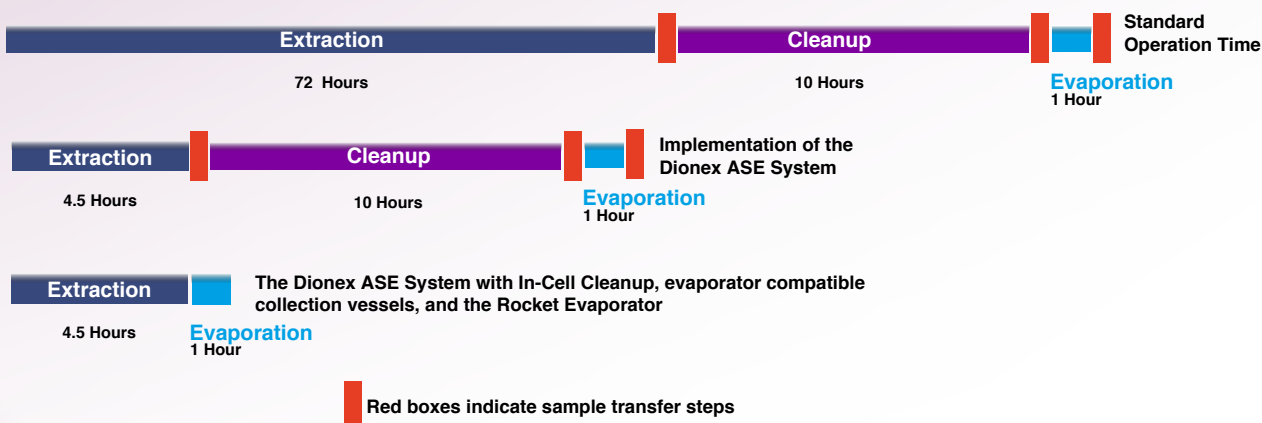
Sample preparation is the most vital part of the laboratory workflow. Since greater than 60% of all errors occur during this phase, it is often considered the most frustrating and cumbersome component of the workflow. While analytical technology has evolved remarkably over the last 20 years, most sample 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 Dionex ASE 200 was introduced and substantially reduced extraction time. More recently, we introduced the Dionex ASE system with In-Cell Cleanup and Thermo Scientific™ Rocket™ Evaporator 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 Evaporator 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\*



\*average processing times for 18 samples



Dionex ASE 350 System



Rocket Evaporator



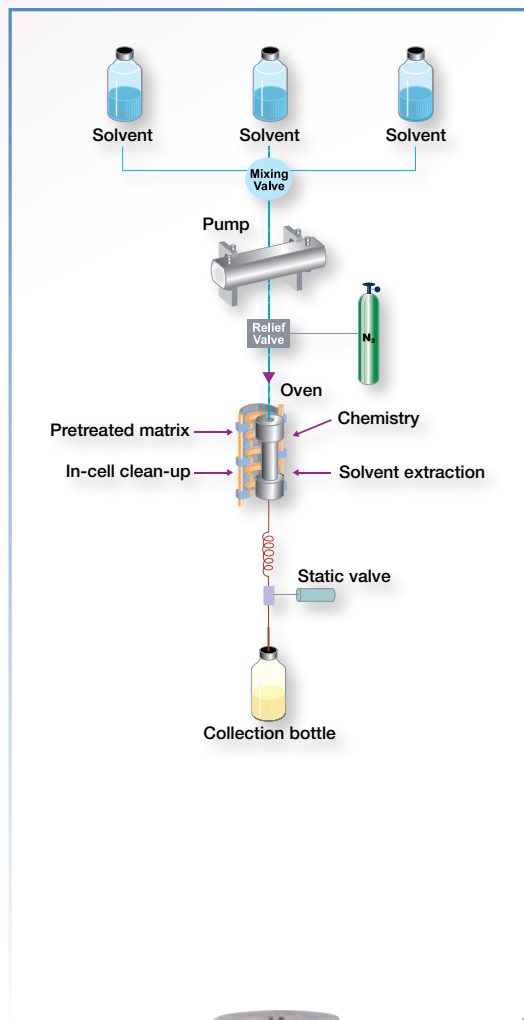
Thermo Scientific™ TRACE™  
1300 Series GC



## Inside the System

### The Dionex ASE 150/350 systems use 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.



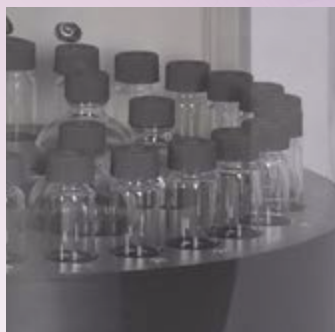
Through use of the static extraction cycles, the accelerated solvent extraction technique assures an exhaustive extraction in a manner that uses much less solvent and time. Since analytes diffuse out of the matrix and into the extraction solvent, static extraction cycles maximize the concentration gradient 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 150/350 systems work 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 150/350 Systems Deliver Greater Capabilities

**The Dionex ASE 150 is the entry-level ASE system designed for use in lower throughput labs. This system offers fast and efficient extraction for a large range of sample sizes.**

#### Key features include:

- Automated extraction for a single sample
- Small Footprint that requires less than 36 cm (14 in) of bench space
- Preprogrammed extraction methods to facilitate ease of use
- pH Hardened Pathways for acid and base pretreated samples

**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™Dionex™ Chromeleon 7.2 Chromatography Data System (CDS) software control for CDS standardization
- Collection vessels (60 mL) can be directly transferred to the Rocket Evaporator
- Stores 24 extraction methods and 24 extraction sequences for unmatched flexibility
- pH Hardened Pathways for acid and base pretreated samples



Dionex ASE 150 system



Dionex ASE 350 system

#### In-Cell Clean Up

The extraction cells used by both the Dionex ASE 150 system and Dionex ASE 350 system make use of several adsorbents that perform In-Cell clean up. Interfering compounds can be selectively removed through the addition of resins such as activated alumina and florisil. Use of these adsorbents may remove the need to offline gel permeation chromatography procedures. More detailed information can be found in Thermo Scientific Technical Note 210.

# Extraction Applications

Unmatched Flexibility to Meet Your Application Needs

Analyte Class (EPA Analysis Method)	MDLa 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>

CRM = certified reference material

<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, Dionex ASE 150/350 systems are 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 150/350 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 (OLM) 04 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 150/350 systems are 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 150/350 systems have 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 150/350 systems replace 12-24 hour solvent extractions, significantly reducing extraction time and solvent use.

Extraction for Marker Compounds from Natural Products										
	Dianthrones (St. John's Wort)		Deacylsaponins (Horse Chestnut)		Silybin (Milk Thistle)		Curcumin (Turmeric Rhizome)		Thymol (Thyme)	
Method	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 Poly Vinyl 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 Scientific

## Dionex ASE 150/350 Systems

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



## Rocket Evaporator

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



## Thermo Scientific™ Dionex™ AutoTrace™ 280 Solid-Phase Extraction (SPE) Instrument

Automated SPE instrument that extracts large-volume samples (20 mL-20 L) for the isolation of trace organics in aqueous matrices. Produces analyte recoveries that are superior to manual liquid-liquid extraction techniques using less time and solvent.



## TRACE 1300 Series GC Systems

The first and only gas chromatograph featuring user-exchangeable miniaturized, instant connect injectors and detectors that eliminate maintenance downtime and enable the user to quickly tailor instrument capability to specific applications and daily workload.



## Thermo Scientific™ TSQ™ 8000 Triple Quadrupole GC-MS/MS System

A reliable, easy-to-use system that enables faster, more precise, error-free analyses, saving time and reducing laboratory costs. It enables more precise routine analyses and offers unstoppable productivity with uncompromised MS/MS simplicity.



## Thermo Scientific™ Dionex™ UltiMate™ 3000 LC Systems

The UltiMate 3000 platform is the most complete LC solution provided by a single chromatography powerhouse. Our UltiMate 3000 systems are all UHPLC compatible by design and integrate unique hardware features, ultrafast separations and excellent resolution for an unprecedented level of flexibility, ease-of-use and high sample throughput.



## Chromeleon 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 and increasing the quality of your analytical results.



Find out more at [thermofisher.com/chromatography](http://thermofisher.com/chromatography)

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