Thermo Accela UHPLC

TWO SYSTEMS IN ONE– CONVENTIONAL ANALYTICAL HPLC AND U-HPLC AT 15,000 psi

Sample analysis is now faster, easier, and more reliable. The innovative Thermo Scientific Accela LC system performs separations over an expansive range of flow rates and pressures–all with a single instrument.

Accela is designed to optimize performance of sub-two micron particle columns. It provides seamless operation spanning conventional LC pressures from short LC columns, up to 15,000 psi for long-column separations of complex mixtures. Accela features a unique quaternary pump with only 65 microliters of delay volume, assuring rapid transfer of even the most complex gradients from the pump to the column.

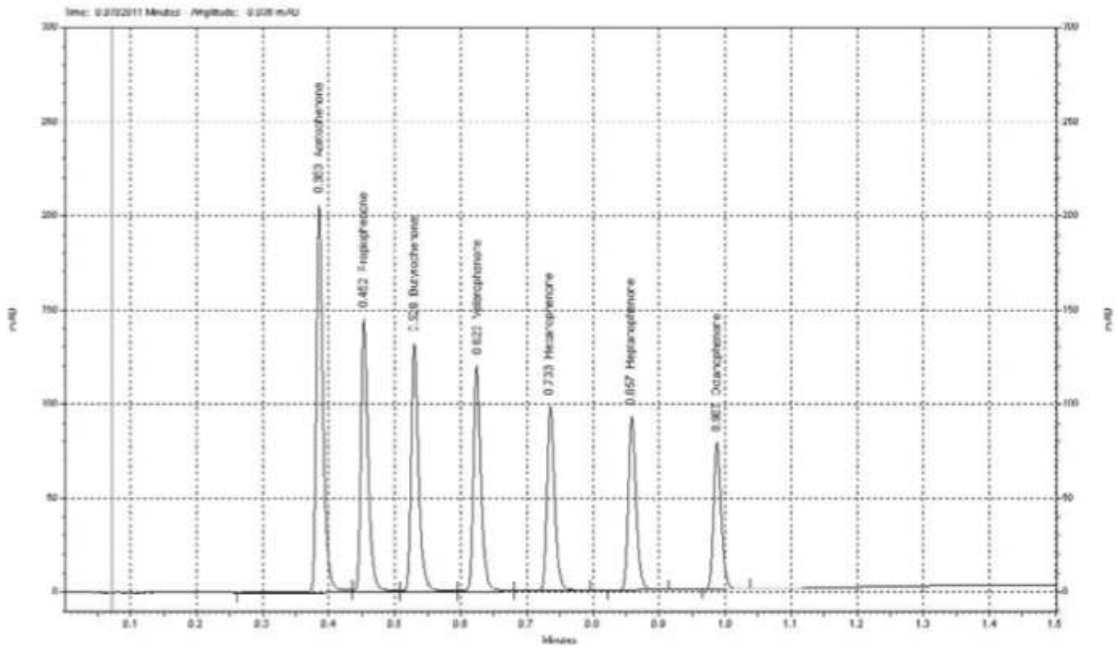
The autosampler integrates isothermal injection and separation to provide superior reproducibility by eliminating virtually all external environmental influences to the chromatography.

The "Total Temperature Management" system ensures the mobile phase, sample loop, injection valve, column and samples remain at the same consistent temperature providing maximum retention reproducibility. The photo diode array provides the highest sensitivity available with our patented LightPipe™ technology. Accela, coupled with sub-two micron particle columns, provides fast, controlled separations with high efficiency and resolution, accelerating LC and LC/MS applications.

Maximize sensitivity and resolution for high speed, high throughput applications.

Accela LC uses Hypersil GOLD™ small particle technology to achieve sharper, narrower chromatographic peaks with increased efficiency and throughput. Our patented LightPipe™technology further increases data quality by providing five times the sensitivity of conventional photodiode array detectors. The fiber optic beam shaper tech-nology in the Accela PDA collects and focuses the transmitted light from the lightpipe, maximizing resolution without light-reducing slits.

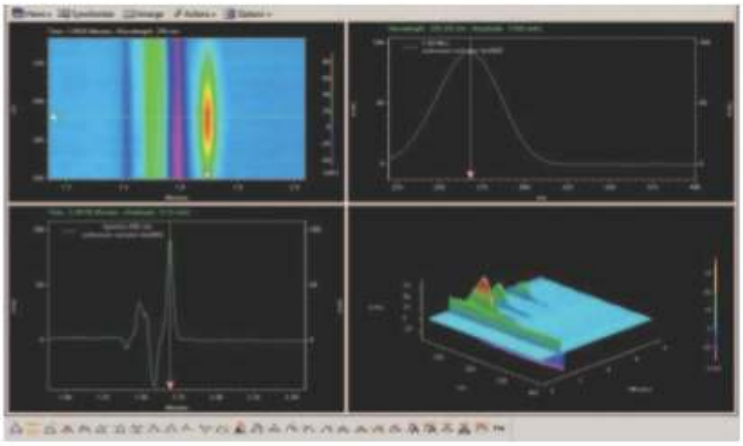
The Accela High Speed LC system produces fast separations with excellent sensitivity and resolution. Illustrated below, seven phenones elute in less than 1 minute with a Hypersil GOLD 1.9 µm column using PDA detection.



Column:	Hypersil GOLD 1.9 µm, 100 x 2.1 mm	
Flow rate:	1000 µL/min	
Mobile phase:	A–H_2O; B–CH_3OH	
Gradient:	Time (min)	%B
	0	65
	1.0	95
	1.5	95
Temperature:	40 °C	
Detection:	Photo Diode Array	
Pressure:	9,000 psi (620 bar)	

Solute	N (plates/m)	Peak width (s)
Acetophenone	72677	1.08
Propiophenone	83369	1.16
Butyrophenone	110000	1.21
Valerophenone	145216	1.24
Hexanophenone	191286	1.26
Heptanophenone	252406	1.30
Octanophenone	334688	1.30

Use the Thermo Scientific ChromQuest™ Chromatography Data System (CDS) or Xcalibur™ Mass Spectrometry Data System to fully control Accela for LC or LC/MS applications. These advanced data systems ensure complete control of Accela instrument operation, data acquisition, comprehensive data analysis and reporting. Whether Accela is used as a stand-alone LC or as part of a tightly integrated LC/MS system, our comprehensive software solutions provide complete automation and data handling.



Accela's Photo Diode Array (PDA) detector provides the ideal LC detection for high speed chromatography performance. ChromQuest software can effectively collect all Accela PDA data and provide a variety of valuable data representation to assist in interpreting and analyzing the data.

Accela LC accelerates the capabilities of the world's fastest ion traps with reduced run times and increased sensitivity.

•Accela maximizes metabolic application flexibility by accommodating the back pressures of many different column lengths

Industryleading MS/MScycle speed providesmore data in lesstime

Intelligent precursor ion selection with automated Data Dependent™ MS^n

Provides data on targeted and unpredicted analytes

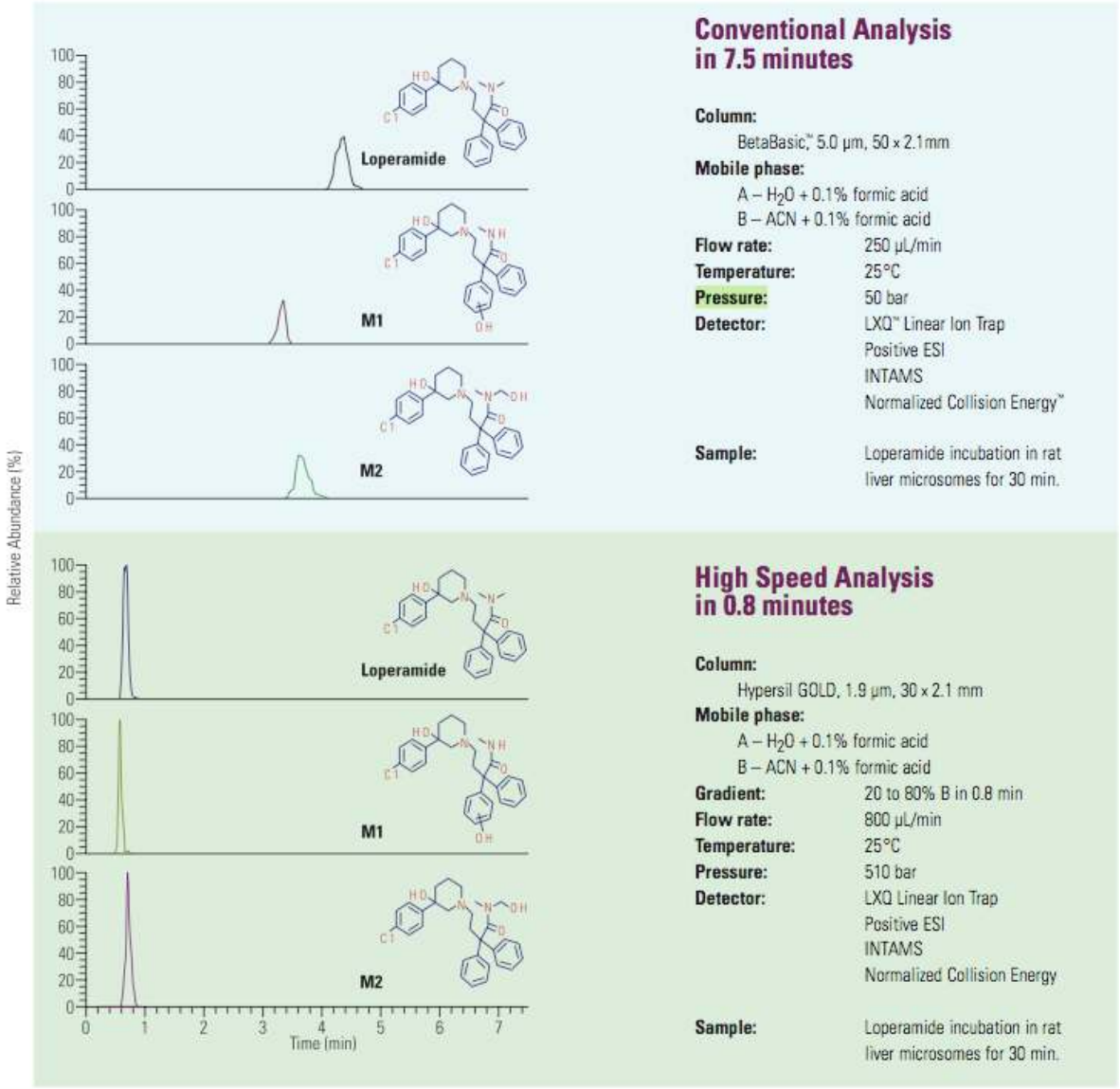
Accela routinely provides peak widths of one second and shorter (FWHH), which challenges the scan speeds and duty cycles of many mass spectrometers. Thermo Scientific's industry-leading linear ion trap mass spectrometry technology provides maximum data for even the sharpest chromatographic peaks without compromising data quality.

LTQ XL™High Performance Linear Ion Trap MS
Powerful new tools generate extensive structural information
for the most demanding proteomics and metabolism applications.

Optimize the efficiency of MS^nidentification.

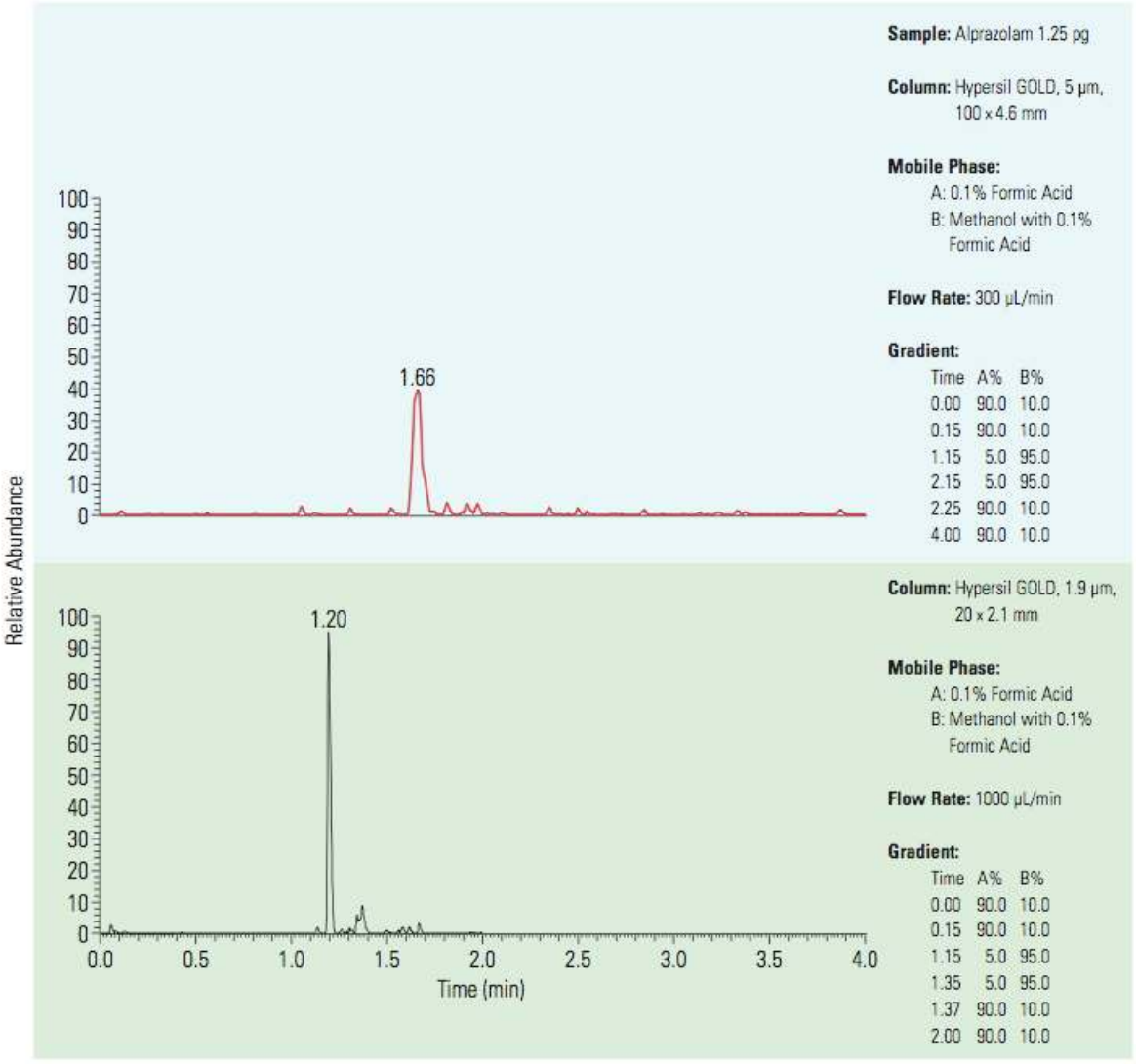
Accela is designed to optimize the efficiency of separation in the column regardless of column length. Whether short columns for targeted analysis, or long columns for complex mixtures, Accela easily handles the resulting backpressure, allowing you to work at optimal column flow rates using a variety of column lengths. Coupling Accela to a linear ion trap mass spectrometer provides fast, accurate MS^ndata of the most complex metabolic compounds and products.

Qualitative metabolite identification provides unique challenges in sample complexity. Samples can range from several targeted analytes to thousands of unknowns. The conventional separation was accelerated from 7.5 minutes to 48 seconds with an increase in sensitivity
of 8×and increase in speed of nearly 9×.



Accela, coupled to Thermo Scientific's quadrupole mass spectrometers provides sensitivity, specificity, and speed in quantitation.

The exceptional separation efficiency of Accela with Hypersil GOLD columns greatly enhances both speed and sensitivity of quantitation for high throughput analysis. The high chromatographic efficiencies of 1.9 µm Hypersil GOLD columns focus peaks into narrow bands providing enhanced signal to noise. Additionally, by separating the analyte from the matrix, charge competition in the API source is reduced, increasing ionization efficiency resulting in increased sensitivity.



•Accurate mass capability for molecular weight related and MS/MS fragment signals

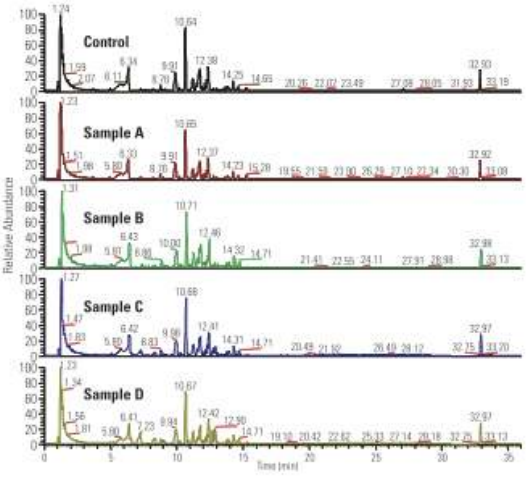
•Parallel scanning capability(Data DependentMS/MS on the LTQ while acquiring accurate mass MS in the Orbitrap)

•Very high mass resolution capability(>100,000 FWHM atm/z400) for separation of nominal mass signals

High speed chromatography provides an additional degree of separation to the LTQ Orbitrap™ with the benefit of sharp chromatography enhancing the dynamic range of even the most complex separations.

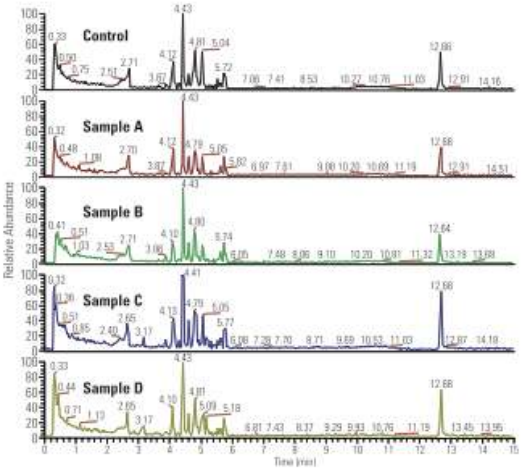
The inherent complexity of metabolic mixtures employs chromatographic and accurate mass separation techniques to provide structural information of individual components. The broad range of chemistries often requires multiple injections with different chromatographic or ionization conditions using long columns to achieve adequate separation, taking hours to complete. By coupling the Accela hyperbaric LC with the LTQ Orbitrap™, fast separations are easily achieved on long columns providing sharper peaks while greatly reducing run times.

In the analysis below, four urine samples were spiked with a drug mixture of primidones, opiates, and amphetamines. When the LTQ Orbitrap is coupled with the Accela LC and a 1.9 µm Hypersil GOLD column, the run time is reduced by 20 minutes (from 33 to 13 minutes), providing a time savings with increased sensitivity and resolution.



Conventional LC/MS in 33 minutes

Column: Hypersil GOLD, 5 µm, 100 × 2.1 mm
Flow Rate: 600 µL/min



High Speed LC/MS in 13 minutes

Column: Hypersil GOLD, 1.9 µm, 50 × 2.1 mm
Flow Rate: 250 µL/min

Maximize separation efficiency with the ability to select the ideal column for your application.

Accela hyperbaric LC is designed to work from conventional to ultra-high pressures, maximizing the advantage of the superior efficiency and peak shape of the Hypersil GOLD column regardless of length. High speed separations of relatively simple mixtures using ballistic gradients are easily achieved using shorter columns. These columns generate very low backpressures easily handled by Accela. More complex separations like those often found in metabolite and biomarker analysis require longer columns for efficient separation of thousands of compounds. These columns generate high backpressures that are just as easily handled by Accela. Accela is designed to provide optimum performance from the column, period. Forget about the pressure. Select the ideal column for your analytical challenge and maximize the efficiency with Accela.

Hypersil GOLD 1.9 µm columns allow high flow rates without loss of efficiency.
The figure below shows how column length and particle size can be optimized to reduce run time while maintaining maximum efficiency.

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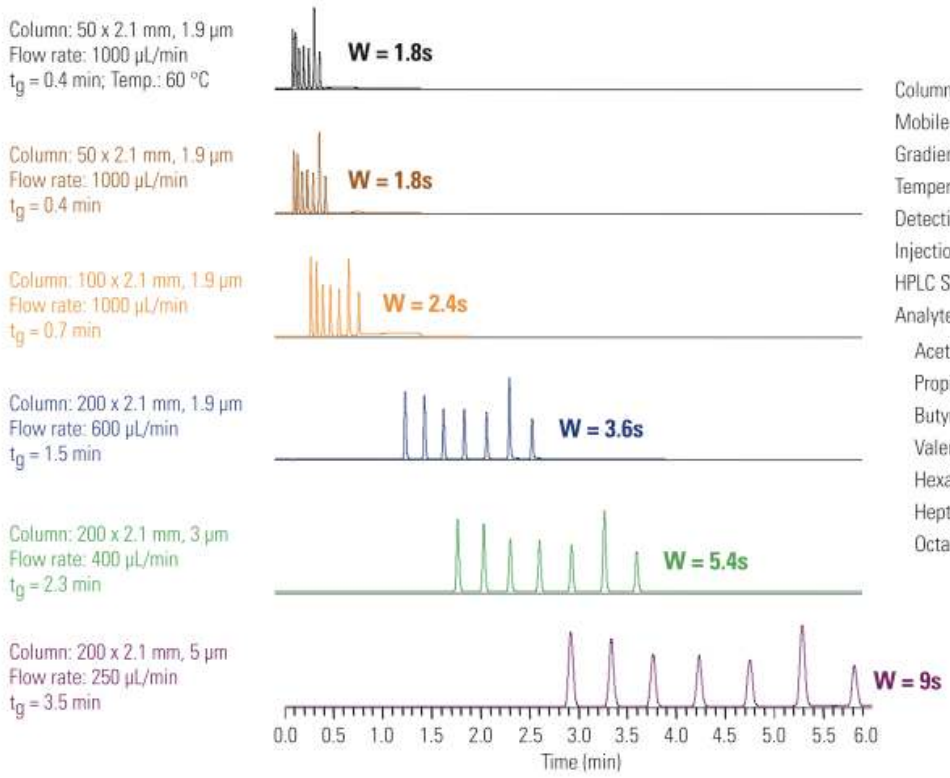

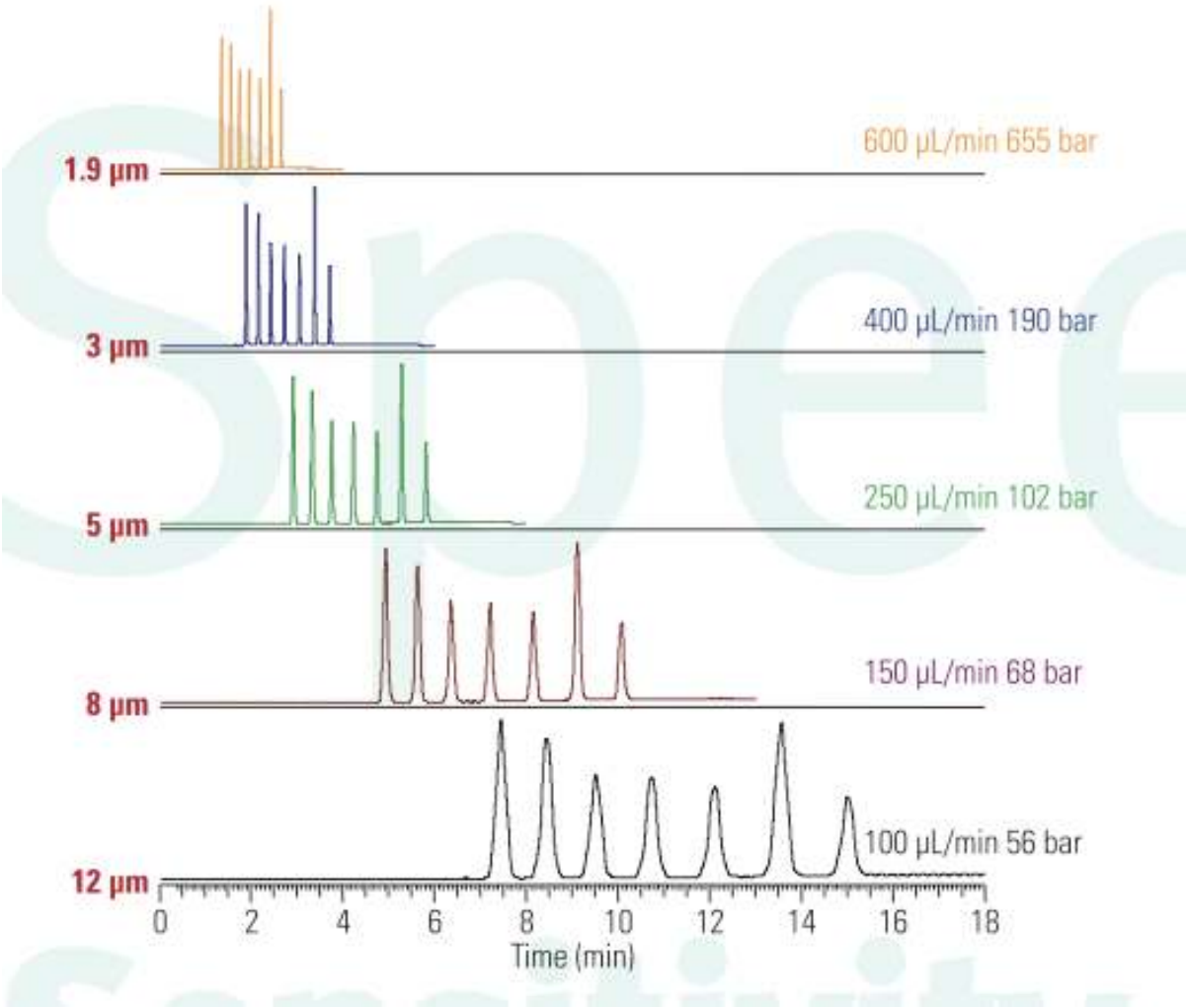

Thermo Accela Autosampler

The Accela High Speed Autosampler's optimized sample pathway ensures fast chromatographic separations. Complete temperature management enables the user to control the temperature of the sample, mobile phase, injector valve, and column, providing maximum reproducibility.

- **Optimized for high-throughput applications and sub two micron column particles**
- **Isothermal injection and separation**
- **Multiple sample formats with 200 vials or 3 multi-well plates**
- **Specialized diamond coated high pressure valve**
- **Easy access with door mounted syringe**

Isothermal Injection and Separation

The integrated temperature controlled column and valve compartment provides complete temperature control for superior separation efficiency and reproducibility. The 3 µL mobile phase preheater quickly and efficiently heats the mobile phase to the same temperature as the sample and column, 5–95°C selectable in 1°C increments. This

temperature compartment enables the mobile phase and the sample to stay at one consistent temperature, eliminating all external environmental influences to the chromatography.

Maximum Flexibility

The flexibility of the Accela Autosampler is maximized with the ability to accommodate multiple sample formats and multiple injection modes. This autosampler holds 200 standard 1.8 mL sample vials or three 96- or 384-well plates allowing a maximum of 1,152 samples. Multiple injection modes provide the user the flexibility to choose the best injection mode for their sample and method. Full loop injection modedelivers a sample that is commensurate with the sample loop. Partial loop injection modeenables the user to choose the exact amount of sample to deliver. No waste injection modepreserves limited sample by enabling the user to inject 1 µL from as small as 5 µL of sample. The Accela Autosampler's uniquely designed door mounted syringe provides easy access to the sample vials, wash station, and needle. The column holder enables one-handed column placement, providing fast and easy exchange of columns. This easy-to-use column holder allows for multiple column lengths and diameters.

Sample Temperature Control

The Accela Autosampler provides integrated sample temperature control for a stable and uniform sampling environment. Method optimization is maximized with the ability to heat or cool the samples, 0–60°C selectable in 1°C increments. Integrated temperature management minimizes the effects of ambient temperature fluctuations.

Specifications

Vial Capacity
200 vials with tray temperature control
Three 96- or 384-well plates

Variable Volume
Injection Precision: 1.0% RSD at 5 µL and higher

Minimum Sample Volume: 1 µL can be injected from a 5 µL sample

Injection Volume: 25 µL loop standard, up to 1000 µL injections with larger loops and syringe

Sample Carryover
< .005% with UV detection (254 nm) and a 1 mL 100% MeOH needle wash

Needle Height
Programmable in 0.1 mm increments.
Active vial bottom search selectable on/off

Column Oven
5–95°C ±0.5°C selectable in 1°C increments

Tray Temperature Control
0–60 °C ±0.5°C selectable in 1°C increments

Communications
Remote Inputs: Pump Ready and Inject Hold
Remote Outputs:Pump Stop, Autosampler
Ready, Inject, and Gradient Start
4 Timed Events

Remote Controls
Ethernet interface for PC-based software control

Sample Preparation
Capacity for four 15 mL reagent vials for flushing, washing, sample dilution, and/or reagents for sample derivatization

Ambient Environment
10–40 °C, 5–95% relative humidity, non condensing

Operating Temperature
10 °C to 40 °C

Dimensions
37×36 ×50 cm (H ×W ×D)

Weight
30 kg

Power Requirements
100/120/220/240 Vac nominal;
550 VA, 50/60 Hz

Product Certification
EMC
CE
TUV-C/US
FCC (EMI)

Ordering Information

Part Number Description
60057-60030 Accela LC System
60057-60040 Accela PDA with 1 cm LightPipe™ flow cell
60057-60050 Accela PDA with 5 cm LightPipe flow cell
60057-60060 Accela System Kit
60057-60070 Hypersil GOLD™, 50 ×2.1 mm, 1.9 µm column

Thermo Accela Pump

The Accela High Speed Pump provides rapid and reproducible transfer of even the most complex and aggressive gradients. This quaternary pump is capable of handling pressures up to 15,000 psi with a delay volume of only 65 µL, enabling high speed chromatographic separations.

• 65 µL delay volume ensures high speed separations
• Integrated, self-adjusting vacuum degasser assures reproducibility
• Two LC systems in one, spanning from standard LC pressures up to 15,000 psi
• Optimizes the performance of sub-two micron particle columns

High Speed Solvent Delivery

The Accela Pump is designed for high speed chromatographic separations. With a delay volume of only 65 µL, the pump ensures rapid transfer of complex gradients to the column. Accela provides the flexibility of quaternary solvent delivery with better performance than a binary pump. Specialized cams provide excellent flow reproducibility over the expansive pressure range, from conventional analytical LC pressures up to 15,000 psi for long- column separations. The Accela pump optimizes the performance of sub-two micron particle columns with the ability to pump precise gradient profiles over the entire pressure range.

Integrated Vacuum Degassing

The Accela Pump has an integrated, self- adjusting constant vacuum level, membrane degasser that effectively removes dissolved oxygen from the mobile phase. This results in more stable flow rates, accurate gradient composition, low pulsation, and stable baselines.

Ease of Use
Regular preventive maintenance is simplified with self-aligning piston chambers that ensure a perfect fit every time.

Specifications

Minimum Flow Rate
1.0 µL/min

Maximum Flow Rate

1000 µL/min

Flow Rate Resolution
0.1 µL/min

Pressure Range
0 to 15,000 psi (0 to 1000 bar)

Pressure Resolution
0.15 psi (0.01 bar)

Solvent Capacity
Quaternary valve system

Delay Volume
65 µL

Compositional Accuracy
±1% at a flow rate of 25–500 µL/min

Primary Piston Volume
24 µL

Degasser Type
Integral, self-adjusting, 4 channel vacuum membrane (Teflon®AF)

Degasser Hold Volume
< 500 µL per channel

Pulse Dampener
3 µL, dynamic

Wetted Parts
316SS, titanium, PEEK™, sapphire,TZP-ceramic, FEP, GFP, ruby

Remote Controls
Start, USB interface for software control

Ambient Environment
10–40 °C, 40–80% relative humidity, non-condensing

Operating Temperature
10 °C to 40 °C

Dimensions
18 ×36 ×47 cm (H ×W ×D)

Weight
12 kg

Power Requirements
100/120 Vac, 220/240 Vac nominal;
500 VA max, 50 to 60 Hz

Product Certification
EMC
CE
TUV-C/US
FCC (EM)

Software Control
The Accela Pump can be controlled as a component of the Accela High Speed LC by either the Thermo Scientific ChromQuest™ Chromatography Data System or the Xcalibur™Mass Spectrometry Data System. Both software solutions provide computer control of the pump to ensure automated data handling of the high speed system.

Thermo Accela PDA

The Accela High Speed PDA Detector uses Thermo's patented LightPipe technology to ensure fast chromatographic separations with photo diode array detection.

• Patented LightPipe technology for highest sensitivity
• Specialized 1 cm path length, 2 µL LightPipe flowcell for fast separations
• Fiber-optic beam shaper provides maximum peak resolution
• Easy maintenance with integrated wavelength validation

High Speed Sample Detection

The Accela PDA is optimized for the detection of high speed chromatographic separations. The short 1 cm path length, combined with the incredibly minimized cell volume of 2 µL, renders this LightPipe flowcell as the premium choice for fast separations. The extremely low level of dispersion in the LightPipe enables the flowcell to retain the excellent peak shape and chromatographic resolution from the column.

The innovative fiber-optic beam shaper converts the circular beam of light exiting the flowcell into a vertical beam, emulating a slit while providing nearly 100% light throughput to the diodes. The maximization of the light throughput ensures the highest spectral resolution.

The combination of the patented LightPipe technology with the fiber-optic beam shaper provides the high sensitivity and resolution needed for high speed chromatographic applications.

EasyMaintenance

The Accela PDA has an integrated holmium oxide solution-filled cuvette for validating wavelength accuracy. This holmium oxide in perchloric acid solution is immensely advantageous to the solid holmium oxide filters used by most manufacturers, because it provides wavelength verification across the entire spectral range.

Specifications

Wavelength Range
190–800 nm at 1 nm increment

Wavelength Accuracy
±1 nm at 254 nm and 640 nm

Wavelength Calibration
Using Holmium oxide solution

Wavelength Resolution
1.2 nm (512 pixel array)

Absorbance Non-Linearity
< 5% at 2.0 AU at 256 nm

Absorbance Range
– 2.0 to + 4.0 AU, 20-bit resolution

Drift
< 1 mAU/hr after warm-up at 254 nm at a stable temperature (±1°C)

Light Source
Pre-aligned Deuterium and Tungsten lamps

Rise Time
User selectable: 0, 0.1, 0.2, 0.5, 1, 2, 5, or 10 sec

Scan Rate
User selectable: 0.5, 1, 2, 4, 5, 10 or 20 Hz

Discrete Channels
Three wavelength selectable channels

Short-Term Noise
< 6 µAU/cm at 254 nm, using a 50 mm LightPipe flow cell

Warm-up Time
90 min required to meet noise and drift specifications

Cell Dimensions

10 mm, 2 µL LightPipe flow cell
50 mm, 10 µL LightPipe flow cell

Cell Pressure Range
0–1000 psi

Analog Outputs
20-bit digital/analog conversion, unattenuated
at 10 mV/AU, 100 mV/AU, or 1.0 V/AU

Diodes
512

Diode Spacing
1.2 nm

Remote Controls
Ethernet interface for PC-based software control

Operating Temperature
10 °C to 30 °C

Ambient Environment
10–40 °C, 5–95% relative humidity,
non condensing

Dimensions
18 ×36 ×47 cm (H ×W ×D)

Weight
19.5 kg

Power Requirements
100/115 or 230 Vac, 50/60 Hz, 225 VA
maximum power

Product Certification
EMC
CE
TUV-C/US
FCC (EMI)

Software Control
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