

## Thermo Scientific Velos Pro

# Accelerating innovation

Dual-pressure linear ion trap

### Product highlights

- Novel detection system provides up to 6 orders of linear quantitation
- Unique dual-pressure linear ion trap and proprietary S-lens gives superior scan speed, resolution, and sensitivity
- Generation II ion optics improve robustness and reduces downtime
- Dissociation by CID, PQD, ETD, and now novel HCD functionality provide the ultimate in structural information
- Upgradable to accurate mass and ultra-high resolution Orbitrap™ technology

The Thermo Scientific Velos Pro LC-MS<sup>n</sup> delivers ultimate performance on the world's fastest, most sensitive ion trap. A novel wide dynamic range discrete dynode detection system produces low RSDs and unprecedented quantitation from an ion trap. The Velos Pro™ broadens the MS<sup>n</sup> capabilities of the ion trap with a powerful new fragmentation technique, HCD (Higher-Energy Collisional Dissociation), with access to low mass fragments for complete structure characterization by



tandem mass tag labeling. A new rapid scan mode that reads ions at 66.7 kDa/s increases the duty cycle of the ion trap and allows data dependent acquisition of search quality spectra at >10 Hz. Generation II ion optics feature a neutral blocking technology that elevates robustness to a new level. The Velos Pro enables the identification and robust quantitation of even very low abundance compounds and provides absolute confidence in every result.

### Hardware features

#### Ion Max API source

- Enhanced sensitivity and ruggedness
- Sweep Gas reduces chemical noise
- 60° interchangeable ion probe orientation
- Removable metal ion transfer tube provides vent-free maintenance

### Transfer ion optics

- S-lens technology
- Generation II Ion optics with novel neutral blocking technology for improved robustness
- High stability and ion transmission efficiency

### Dual-pressure linear ion trap mass spectrometer

- Dual-pressure for optimized performance
- Isolation waveforms during injection
- Balanced rf field
- Automatic system calibration
- High-efficiency radial ion ejection

### Vacuum system

- Differentially-pumped vacuum system to  $10^{-5}$  Torr
- Split-flow turbomolecular pump controlling vacuum in three regions
- Dual rotary vacuum pump configuration
- High-vacuum aluminum analyzer chamber

### Detection system

- Dual conversion dynode detector
- Two off-axis discrete dynode electron multipliers with extended dynamic range
- 24-bit electrometer for high level linearity
- Digital electronic noise discrimination

### Integrated liquid delivery

- Fully-automated data system with valve control enables user to divert the solvent front, gradient end point, and any other portion of the HPLC run to waste
- Syringe Pump allows automated infusion under data system control

### Options

- HCD: Higher-Energy Collisional Dissociation
- ETD: Electron Transfer Dissociation
- HESI II probe compatible with liquid flow rates of  $<1$   $\mu\text{L}/\text{min}$  to  $1$   $\text{mL}/\text{min}$ , without splitting
- APCI/APPI source compatible with liquid flow rates of  $50$   $\mu\text{L}/\text{min}$  to  $2$   $\text{mL}/\text{min}$ , without splitting

- Nanospray source supports static packed tip and dynamic nanospray experiments, compatible with liquid flow rates of  $50$   $\text{nL}/\text{min}^*$  to  $2$   $\mu\text{L}/\text{min}$
- Metal needle options for high- and low-flow analyses

*\*Lower limit is dependent on gauge of needle used*

### Software features

#### Data system

- Thermo Scientific™ Xcalibur™ processing and instrument control software
- Microsoft® Office software package
- Microsoft Windows® operating system
- High-performance PC
- High-resolution LCD color monitor

#### Scan functions

- Predictive Automatic Gain Control (AGC) delivers up to  $10$  Hz data dependent MS/MS acquisition
- Full-scan mass spectra for sensitive analyses and rapid screening of unknown compounds
- Full-scan product ion spectra at sensitivities higher than any ion trap mass spectrometer
- Selected Reaction Monitoring (SRM) for traditional LC/MS/MS quantitative analytical experiments
- MS<sup>n</sup> for multi-stage MS experiments to probe the structure of ions
- ZoomScan a high-resolution, full-range scan to resolve isotopic envelopes often used for charge state determination
- Ultra ZoomScan for ultimate resolution
- Rapid Scan, the fastest scan mode for UPLC analytical data collection
- TurboScan an ultra-fast scan to improve signal-to-noise and sampling rate
- Unique, Automatic Gain Control (AGC) ensures that the ion trap is always filled with the optimum number of ions for any scan type
- Dynamic Exclusion allows acquisition of MS/MS and MS<sup>n</sup> spectra from lower intensity ion species
- WideBand Activation generates more structurally informative spectras
- Normalized Collision Energy provide reproducible data from instrument to instrument

## System specifications

### MS/MS sensitivity

*Heated electrospray ionisation (HESI)* – 2 µL of a 50 fg/µL solution of reserpine (100 femtograms total) injected at a flow of 500 µL/min will produce a minimum signal-to-noise ratio of 100:1, for the transition of the isolated protonated molecular ion at  $m/z$  609 to the largest two product ions,  $m/z$  397 and  $m/z$  448, when the mass spectrometer is operated at unit resolution in the full-scan MS/MS mode, scanning the product ion spectrum from  $m/z$  165–615.

*Atmospheric pressure chemical ionization (APCI)* – 2 µL of a 50 fg/µL solution of reserpine (100 femtograms total) injected at a flow of 500 µL/min will produce a minimum signal-to-noise ratio of 100:1, for the transition of the isolated protonated molecular ion at  $m/z$  609 to the largest two product ions, 397 and 448, when the mass spectrometer is operated at unit resolution in the full-scan MS/MS mode, scanning the product ion spectrum from  $m/z$  165–615.

### Installation requirements

#### Power

- One 230 Vac  $\pm$ 10.0%, 15 Amps, 50/60 Hz, single phase, with earth ground dedicated to the instrument
- 120 or 230 Vac single phase, with earth ground for the data system

#### Gas

- One high-purity (99% pure, flow rate 15 L/min) nitrogen gas supply for the API source
- One ultra-high-purity helium gas supply (99.998% pure) with less than 1 ppm each of water, oxygen, and total hydrocarbons for the mass analyzer

### Environment

- System averages 2300 W (8000 BTU/h) output when considering air conditioning needs
- Operating environment must be 15–27 °C (59–80 °F) and relative humidity must be 40–80% with no condensation
- Optimum operating temperature is 18–21 °C (65–70 °F)

### Dimensions/weight

- MS: 56 cm  $\times$  79 cm  $\times$  59 cm (h  $\times$  w  $\times$  d)
- MS: ~120 kg
- Roughing pumps: 38.6 kg

### Performance specifications

#### Mass range

- $m/z$  15–200
- $m/z$  50–2000
- $m/z$  200–4000

#### Linear dynamic range

- Under typical experimental conditions, at least six (6) orders of magnitude

#### Resolution, scan speed, and mass accuracy

See Table 1

#### Scan power

- MS<sup>n</sup> for n = 1 through 10

#### Analog inputs

- One (1) analog Input (0–1 V)
- One (1) analog Input (0–10 V)

**Table 1. Resolution, scan speed, and mass accuracy specifications.**

<b>Velos Pro</b>	<b>Mass Accuracy (Da)</b>	<b>Peak Width (FWHM)</b>	<b>Scan Rate (Da/Sec)</b>
Turbo	1.5	3	125,000
Rapid	0.15	0.6	66,667
Normal	0.1	0.5	33,333
Enhanced	0.1	0.35	10,000
Zoom	0.1	0.25	2,222
Ultrazoom	0.1	0.075	28

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