RamanStation 400 and 400F Technical Specifications

Introduction
PerkinElmer® RamanStation™ 400 spectrometers are built to the highest ISO-9001 manufacturing standards. This document presents confirmed performance specifications based on 100% product testing. All instruments will meet or exceed the confirmed specifications under normal conditions of use as described in the user manual.

The PerkinElmer RamanStation 400 dispersive Raman spectrometer offers research grade performance while maintaining push-button ease of use. The unique Echelle spectrograph and CCD detector deliver complete spectral coverage at high resolution in a single acquisition. With its stabilized near-infrared 785 nm laser, the system is able to obtain the highest quality and most reproducible data with exceptional ease. A built-in motorized stage and optional fiber-optic accessory increase the sampling flexibility. The RamanStation 400 delivers outstanding performance, accuracy and reliability ensuring long-term confidence in your results. The RamanStation 400F is available with fiber optic capability.

Optical Performance

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specifications</th>
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<tbody>
<tr>
<td>Excitation source</td>
<td>350 mW near infrared 785 nm laser; delivering 100 mW at the sample</td>
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<tr>
<td>Spectral range</td>
<td>95 - 3500 cm⁻¹ Raman shift</td>
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<tr>
<td>Peak resolution</td>
<td>4 cm⁻¹ FWHM, (measured using the calcite band full width half maximum)</td>
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<tr>
<td>Pixel resolution</td>
<td>1 cm⁻¹ with linear cm⁻¹ dispersion across entire spectral range</td>
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Full spectral range can be acquired at this resolution in a single acquisition.
**Optical System**

**Spectrograph**
Proprietary F2 Raman Echelle spectrograph with no moving parts

**Rayleigh filters**
Environmentally stable dielectric edge filters allowing measurements to within 95 cm\(^2\) from the excitation line

**CCD detector**
High sensitivity open electrode CCD detector, 1024 x 256 pixel sensor
Hermetically sealed vacuum
Air-cooled, operated at -50 °C

**Optional CCD upgrade**
Ultra high sensitivity deep depletion CCD detector, 1024 x 256 pixel sensor
Hermetically sealed vacuum
Water-cooled, operated at -90 °C

**Optics**
Kinematically mounted, zero alignment optics. All optics are optimized for NIR performance, offering unsurpassed response at long wavelengths.

**Stage**

**Objective lens**
15 mm working distance

**Laser spot size**
100 micron laser spot size, larger areas can be examined by movement of the stage. Macro mode offering 600 micron excitation area, line scan ability for continuous excitation along a specified coordinate, mapping mode for large area analysis, acquisition of maps and chemical images.

**Range of motion**
XYZ motion, 120 x 80 x 10 mm

**Step resolution**
XY < 1 micron, Z < 2 microns

**Video camera**
USB CCD video camera for sample alignment
Enables auto video focus

**Sample holders**
The XYZ Stage accommodates the following samples:
- microscope slides
- 10 x 10 mm cuvettes, 10 x 20 mm cuvettes
- 7 mm diameter glass vials
- capillary tubes
- 96-, 384- and 1536-well plates

**Custom sample holders**
The system can be easily programmed to allow automated analysis of multiple samples including non-standard micro-titer plates, custom sample holders and blister packs.

**Optional Fiber Optic Probe (Only compatible with RamanStation 400F)**

**General**
Switching from sample compartment to fiber optic probe is provided under software control. Data quoted here refer to the standard Raman probe. A wider range of probes is available.

**Probe cable**
5 m, armor clad with stainless steel

**Probe head length**
150 mm

**Probe head diameter**
12.7 mm
Optional Fiber Optic Probe (Only compatible with RamanStation 400F) (continued)

- **Working distance**: 7.5 mm
- **Probe spectral range**: 230 - 3500 cm\(^{-1}\) Raman shift
- **Max temperature**: 80 °C
- **Upgrade option**: Optional immersion sleeve for liquid immersion.

Additional lengths of fiber optic cabling are available for use in environments where the sample is located at a distance from the spectrometer.

A range of high temperature and high pressure probes is also available.

## Bench Details

- **Size**: 480 x 440 x 500 mm
- **Weight**: 44 kg
- **Laser class**: RamanStation 400 is a Class 1 laser device and can be routinely used in regular laboratory environments.
  
RamanStation 400F is a Class 3B laser device; appropriate laser safety precautions should be observed.

- **Power requirements**: 110/230 VAC, 50/60 Hz

## Software

### General

Spectrum™ software incorporates all of the functions required for Raman data acquisition and processing. This includes instrument control, data manipulation and analysis and flexible report utilities. A suite of optional software packages provides advanced capabilities or functions designed for specific applications.

### Sample table

Increases productivity by enabling multiple samples to be defined in batches. Integrates with Go button™ allowing remote continuous operation.

### User interface

Password-protected user login function. Access to methods and routines, menu, toolbar and toolbox functions can be controlled by a supervisor.

### Reports

Quick print facility for graphs, spectra and results windows. User defined templates can be created to enable custom printed and electronic reports.

### Processing

1\(^{st}\) - 4\(^{th}\) derivative with a variable filter, smooth (Savitsky-Golay, moving average and triangular), difference, normalization, baseline correction, deconvolution, interpolate, peak table, peak height and peak area.

### Materials testing

Patented COMPARE™ spectral comparison algorithm and Euclidean searching available. Spectral searching against commercially available or customer-developed libraries.

### Quantitative analysis

Spectrum includes Beer's Law single-frequency quantitative method development software. The software is also able to perform PLS and PCR quantitative predictions.

### Validation

Software allows calibration to ASTM and NIST standards and performance verification to ASTM standards. Comprehensive IQ/OQ documentation and services available.
Optional software packages

Quant+

Powerful chemometrics calibration building software

Insight

Visualization of chemometric method results through the Insight software. Quantitative information from Quant+ is displayed in a simple to understand format. Depending on the type of data collected, Insight can represent the data in several ways:

- High throughput mode: data shown in multiwell view using false color, grayscale or red/green (Pass/Fail).
- Mapping mode: up to three-color RGB chemical images can be displayed and manipulated.
- Reaction monitoring: multiple concentrations to be viewed in graph format, screen is updated in real time.
- Spreadsheet: data is presented in a spreadsheet format (compatible with Microsoft® Excel®).

RamanStation 400

RamanStation 400F

CLASS 1 LASER PRODUCT