



smolsys ltd.

NEW
1000 bar cell



The new Tritium Micro **Raman Spectrometer**
Engineered, based on our experiences

Tritium «Micro Raman Spectrometer μ RA»

Developed and perfected for three decades at the Tritium Laboratory Karlsruhe (TLK) of the Karlsruhe Institute for Technology (KIT) and successfully in operation 24/7 for the KATRIN experiment, the Raman technology is now made accessible for the Tritium community exclusively through smolsys.

The smolsys Raman Spectrometer is a compact and reliable «off the shelf, plug and produce» device. It is the optimal tool for cost-efficient inline isotopologue differentiation.

Its compact, modular design and real-time measurement capabilities makes it the ideal solution for continuous monitoring in sealed gas-handling systems.

System pressure range 10^{-10} mbar to 1.4 bar/ typical level of detection (per isotopologue) >10 mbar after 5 minutes.

New available: Optional - High-Pressure Raman Cell.

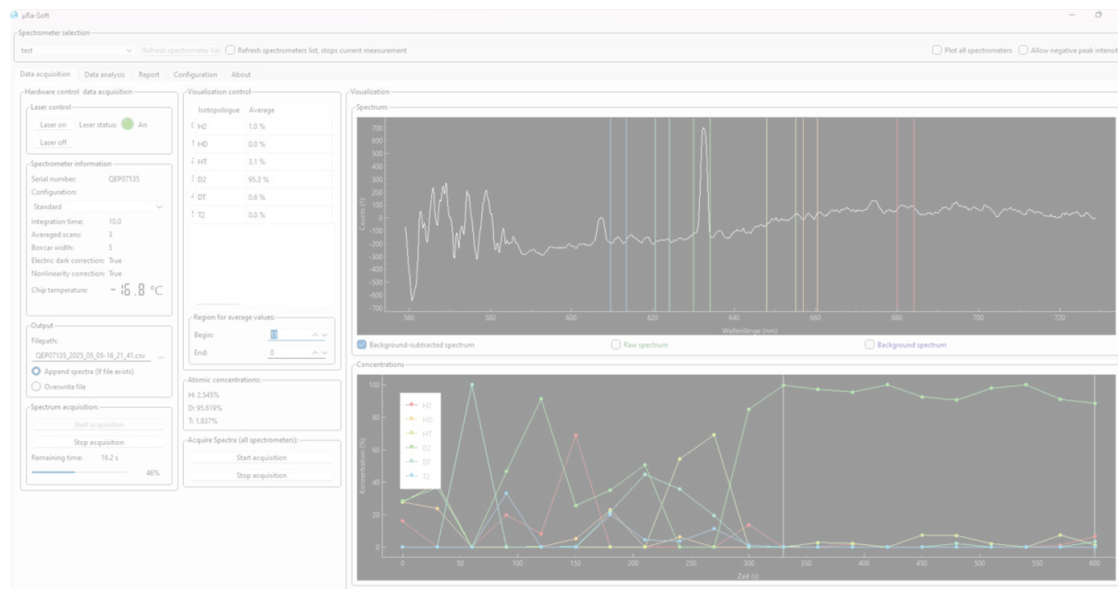


Weight:	5 kg
Size (LxWxH):	26x13x7 cm
Housing:	19" Rack Version
Warranty:	3 years

Key Advantages

Tritium «Micro Raman Spectrometer μ Ra»

- In line (in Situ) application, no bypass needed
- High pressure option available on request
- Tested thoroughly in high level tritium processes
- Fast and easy to use - three clicks to first measurement
- Ultra compact and reliable
- Cost efficient
- Fully tritium compatible



Technical Overview

Tritium «Micro Raman Spectrometer μ Ra»

Trueness:	+/- 2.5 %
Measurement range:	0-100 % (10 - 1400 mbar)
Pre-Set isotopes:	Tritium/ Deuterium/ Protium
Custom molecules:	On request

Pressure range of cell:	10 ⁻¹⁰ mbar to 1.4 bar abs. (20 psi) (0.01 μ Pa to 140 kPa)
Fibre length:	Custom (max. 5m)
Fibre feed-throughs:	e.g. into glovebox: Custom (optional)
Voltage range:	120/240 V
Laser power:	200 mW
Laser class:	1 (3B if disconnected)
Wavelength:	Green, 532 nm (DPSS laser)

Chamber connectors:	DN16CF/ or compatible 1/2 VCR® (optional)
Data connectors:	HDMI/ RJ45/ USB-A 2.0
Integrated computer:	Intel Blackview
Software:	μ Ra-Soft, tritium optimized
Measurement interval:	20 s (can be individually set between 0.1-3600 s)
Data:	Comma-separated values (CSV), dated, raw data archive.
Software supported:	Windows
High-pressure cell	optional on request

Price μ Ra device:	CHF 87'850.- / ExWorks Root D4
Price High-pressure cell:	Price upon request depending on the pressure range

Custom Options



- Fibre/ Glovebox transit
- Data Protocols
- Integration of additional molecule species
- Software integration
- Piping/ system adapters
- Hardware Installation Service
- High-Pressure Raman Cell up to 1000 bar (infos pages 7-10)

Application Areas/ Industries

- Fusion research
- Tritium Battery & Gaseous Light Sources manufacturing
- Hydrogen Isotope separation
- Deuterium processing
- Hydrogen processing and storage (renewable energies)
- Chemical Industry (Hydrolysis)



High-Pressure Raman Cell

WORLD FIRST

Optional pressure cell for enhanced low partial-pressure measurements at elevated total pressures.

The Raman spectrometer's partial-pressure detection limit of 10 mbar (7.5 torr) can be effectively lowered by increasing the pressure within the measurement chamber only.



Available in
100 bar (1,450 psi)
400 bar (5,800 psi)
1000 bar (14,500 psi)

Exploring the unknown

For the first time, our tritium-compatible Raman cell—featuring an integrated fused-silica optical window and a verified burst pressure exceeding 1500 bar (21,700 psi)—enables measurements at pressures up to 1000 bar (14,500 psi).

The optical window is neither welded nor soldered, eliminating heat-affected zones and reducing stresses associated with mounting the glass window.

The cell remains stable over a wide temperature range. From liquid-nitrogen temperatures to a gas temperature of +180°C (356°F).

High-Pressure Raman Cell

100% production testing

The Raman cell is available in 100 bar (1,450 psi), 400 bar (5,800 psi) and 1000 bar (14,500 psi) pressure classifications, with testing and qualification tailored to the respective pressure rating. Each cell is individually leak- and pressure-tested. The following protocol is representative of the 400 bar classification:

- Helium leak test in vacuum and at 400 bar (5,800 psi) using vacuum and sniffing techniques
- 10 pressure cycles between atmospheric pressure and 400 bar
- Helium leak test in vacuum
- Cryogenic exposure to liquid nitrogen with rated pressure
- Heating to 200°C (392°F)
- Final helium leak test in vacuum

Maximum specified helium leak rate in vacuum: 1×10^{-9} mbar·l/s
Testing is based on established pressure-vessel testing principles, with additional application-specific qualification available on request.

Customized solutions for specific pressure, gas and measurement requirements are available on request.

Compatibility

- Hydrogen isotopes
 - inert or non-corrosive gases
- Other gases or specific process media on request

High-pressure hydrogen measurements

The smolsys high-pressure Raman cell enables investigations of tritium and other hydrogen isotopes at elevated pressures. By pressurizing only the Raman measurement chamber, the surrounding tritium system does not need to withstand the same high pressure.





All our products are
engineered based on experience.
Fully compatible out of the box

smolsys ltd.

TECHNOPARK (R) Luzern
Platz 4
6039 Root D4
Switzerland

E-mail: daniel.jakob@smolsys.com
Direct: +41 41 510 87 57
Centrale: +41 41 455 26 05

www.smolsys.com

