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PRODUCT SPECIFICATIONS

Thermo Scientific Prima PRO process mass spectrometer

Highly precise, multiport magnetic sector gas analyzer

The advanced Thermo Scientific™ Prima PRO Process Mass Spectrometer is a highly reliable, precise, and flexible gas analyzer ideal for analyzing gases in industrial processes that can achieve the work of 10 gas chromatographs.

Features

- Scanning magnetic-sector technology
- Up to 64-port Rapid Multistream Sampler (RMS)
- High analytical precision, accuracy, and stability
- Ideal for gas analysis in the petrochemical, iron and steel, and pharmaceutical and biotechnology industries

Analytical platform

The primary feature of the Prima PRO mass spectrometer is the magnetic sector analyzer. This field-proven technology has demonstrated the strongest performance for industrial on-line gas analysis. Magnetic sector technology offers precision, accuracy, long intervals between calibrations, and resistance to contamination. This is convenient in large batch manufacturing with lots of process materials, where the analyzer must be resilient to contamination to increase yield and profits.

Rapid multi-stream sampling

The unique RMS inlet system allows for the selection of 32 up to 64 streams and sets new standards for speed and reliability of multi-stream sampling and maintenance intervals. Avoid multiple gas chromatographs, extra maintenance of multiple instruments, and rely on one Prima PRO mass spectrometer to analyze up to 64 samples of gases simultaneously.

Cross-Industry applications

The analytical precision, accuracy and stability of the Prima PRO analyzer are desired characteristics across industries for gas analysis. Monitor gases with the Prima PRO analyzer during natural gas processig, olefin production, cracking furnace optimization, ethylene oxide and ammonia production. Optimize primary and secondary steel production and control iron processing with the Prima PRO gas analyzer. Achieve high yielf of product in cell cultures and fermentations in biotechnology and pharmaceutical applications.

Thermo Scientific™ Prima PRO Process Mass Spectrometer

Operating principles

The sample gas is introduced via a stream selector and a pressure reduction system. Using an electron emitting filament, the ionization chamber converts the sample molecules into ions which are positively charged molecules or parts of molecules. These ions are then separated according to their mass by a variable magnetic field. The different mass ions are then quantified by the detector.

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Specifications	
Ion source	Enclosed electron impact with dual filaments, temperature controlled (settable over range 120-200°C, to ± 0.1°C)
Analyzer type	Scanning, laminated electromagnet, 6 cm radius, 80° deflection
Mass range	1-200 amu
Resolution	Switchable between two collector resolving slits, resolving powers of 60 (1mm) and 20 (4 mm) are standard. Optionally 140/85 (0.36 mm/0.69 mm) or 100/45 (0.56 mm/1.45 mm) or 140/45 (0.36 mm/1.45 mm) may be fitted
Mass scale stability	Measured at mass 28 < 0.013 amu over 24 hours
Peak shape	At 60 resolution, the ratio of the width of the flat-top (99% height width) to the base peak width (5% height width) 0.5
Abundance sensitivity	<250 ppm for 27/28 amu
Detector	Faraday and optional Faraday/SEM dual detector
Inlet	Temperature controlled micro-capillary with Molecular leak and bypass (standard configuration)
Vacuum system	Turbo-molecular pump and external rotary pump Alternatively, turbo-molecular Pump and internal diaphragm pump
Sample flow	Digitally measured and recorded for each stream for any instrument with RMS option
Analysis time	0.3-1.0 sec/gas component
Ambient temperature	12-42°C
Lower Detection Double SEM	10 ppb typical (may vary with gas matrix)
Lower Detection Single SEM	0.1 ppm typical (may vary with gas matrix)
Lower detection faraday	20 ppm typical (may vary with gas matrix)
Precision	Better than 0.1% relative over 24 hours
Linearity	<1% relative over a decade change in concentration (typical, application dependent)
Dynamic range	1 ppm – 100% (theoretical, application dependent)
Stability	Better than 10% relative over one month
Power requirements	115/230 VAC, consumption 1500 VA
Physical dimensions	65 cm (26") L × 150cm (59") H × 70 cm (28in) W 300 kg (660lbs) configuration dependent
Area classification options	General purpose: Z-purged Div 2 (optional); X-purged Div 1 (optional); CENELEC/ATEX Zone 1, IIC T3 (optional)

Accuracy considerations

It is often the case, that the peaks being measured are 'overlapped' or composite with contributions from more than one component. A de-convoluting data reduction technique is involved in deducing the component contributions to the peaks. With the Prima BT this is performed automatically by an embedded processor in the mass spectrometer. An important assumption is made (and is generally obeyed) that the overlapping peaks, when combined, obey the principle of linear peak superposition. The principle states that the composite peak height at a particular mass is simply equal to the sum of the peak heights which correspond linearly to the individual concentrations of the contributing components in the complex mixture. The effect of overlapping peaks will necessarily influence the accuracy of measurement in the event that minor components in the sample gas are heavily overlapped by much larger concentrations. The Applications Group at Thermo Fisher Scientific will provide a detailed performance guarantee (to be included in any quotation) on submission of a customer stream specification. The most appropriate analytical method and calibration scheme will also be defined for each of the sample streams to be measured.

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