Analytical Specifications

Detection Limits	SEM: < 100 ppb (without peak interference)
Mass Range	1 – 200 u (300 u and 512 u on request)
Mass Resolution	Unit resolution
Response Time	t_{90} < 300 ms (2-stage gas inlet)

Technical Specifications

Number of Channels		Up to 1024 channels per run
Ion Source Configuration	Standard	Crossbeam ion source with two filaments (yttrium or tungsten)
Communication Interfaces		Ethernet to PC, IoT-enabled OPC UA, PROFIBUS, PROFINET, MQTT, others on request
Dimensions		20 x 41 x 22 in. (w x h x d), approx. 245 lbs 500 x 1025 x 550 mm (w x h x d), approx. 110 kg

System Requirements

Gas Quality	Temperature	> Dew point
	Humidity	Not condensing
	Particles	< 4 µm particle size
Environmental Conditions (During Operation)	Temperature	+15 to +35 °C (59 to 95 °F)
	Humidity	< 75 %, not condensing
Power		230 VAC, 50 Hz, approx. 1.2 kVA (115 VAC, 50/60 Hz on request)
Exhaust		Push-in fitting for connection to customer's exhaust system
Compressed Air		Min. 85 psia (6 bar), filtered and oil-free

IPI InProcess Instruments

Analytical Solutions. Tailor-made.

GAM 2000 *BioR*
Gas Analysis System for Bio Reactors

- Fast and reproducible monitoring of up to 8 fermenters
- Suitable for every type of fermenter and bio reactor
- Concentration range from ppb to %
- Seamless data transfer to third-party software

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GAM 2000 *BioR*

The Perfect Analytical Match for Fermenters and Bio Reactors

A great benefit of mass spectrometric techniques in online gas analysis is their ability to monitor gaseous compounds over a wide range of concentrations (ppb to %), gas pressures and gas flows.
This allows the control, monitoring, improvement, and automation of chemical and biochemical processes in research or industrial applications.

The GAM 2000 *BioR* in its basic configuration can sequentially monitor the exhaust lines of up to eight bio reactors. In contrast to gas specific sensors, the mass spectrometer is able to measure all gaseous components and vapors.

The gas analysis system can be upgraded with optional Gas Stream Selectors which include gas switching valves for up to 64 gas streams in a single unit, for example. Gas Stream Selectors can be interconnected which allows to create even the most complex gas inlet systems at a very small footprint.
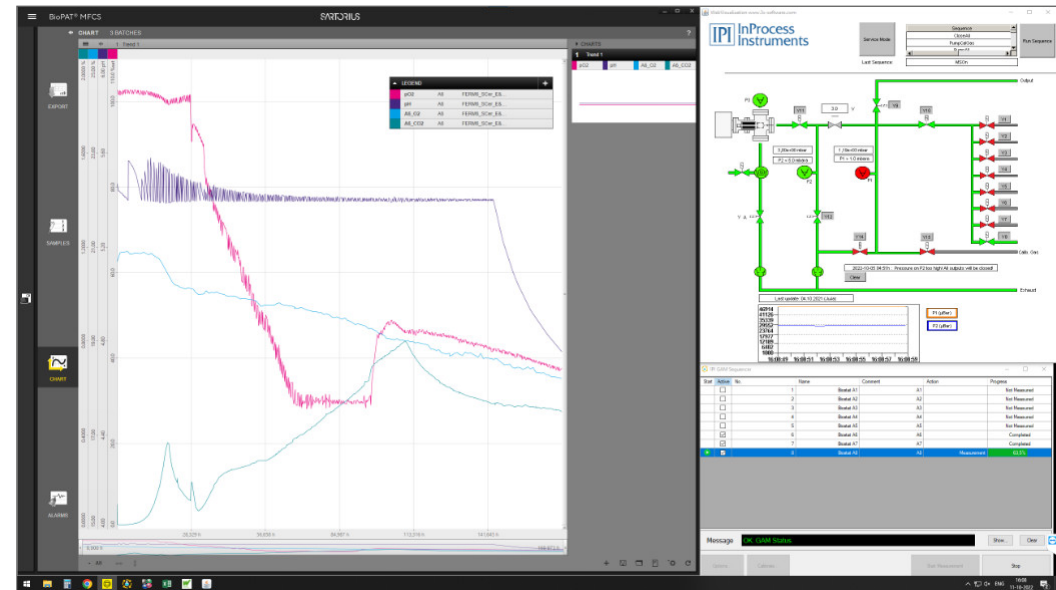
Software

The IPI GAM Sequencer software is the main component of an application specific software package especially designed to be used in fermenter monitoring and bio reactor applications.
In the graphical interface the user can select the gas inlet ports that will be sequentially analyzed.

The measurement data are processed and the calculated concentration values can be transferred into third-party software packages like Sartorius BioPAT® MFCS software.

The GAM 2000 *BioR* can for example provide off-gas concentration values of O_2 and CO_2 (other gaseous and volatile components can be added depending on the measurement task), which can be displayed in a third-party software interface together with other parameters from third-party devices (e.g. pH value). This enables an insight into the fermentation process for research purpose and to optimize it.

With an optional available software expansion package the system will meet **21 CFR Part 11**

requirements. With this package all parameter changes in the software or in the system configuration are automatically recorded in an audit trail log. User and group management capabilities allow restricting the access of the systems database and specific software features.

Gas concentrations are calculated online in the IPI software package and sent via OPC UA to the Sartorius BioPAT® MFCS software. The status of the fermenters and the measurement data are displayed on the same time scale.

Gas Inlet System

- Fully automated and software controlled gas stream selection
- Possibility to connect up to eight fermenters and one calibration gas
- Heatable up to 60 °C (120 °C optional)
- Pressure control valve for stable analytical conditions
- Upgradeable for the connection of further fermenters (up to 192 process gas streams)
- Safety interlock system

Gas Analysis System

- Robust and reliable design
- Long service life
- Fully digital RF generator
- Hyperbolic rod system
- 100 ppb to 100 % dynamic range

Pumping System

- Rotary vane or dry running membrane or scroll pumps depending on application
- Optional sealing gas and sorption traps for the use of aggressive gases

The GAM 2000 *BioR* is an application specific variant of IPI's well established GAM 2000 Gas Analysis System. In the basic configuration it can analyze the exhaust gas streams of up to eight fermenters or bio reactors.

More Information