Gas Module SE™

Summary of Features and Benefits

- Unique, straight-forward user interface – a hallmark of the Passport® 2 and Spectrum® OR series – easily configured to meet specific requirements. Ideal for multiple users. Requires no extensive training
- Bright, easy-to-read, user-selectable real-time Fast O_2, CO_2, N_2O, and agent waveform and numeric display, status messages, and alarms greatly simplify procedural monitoring – even at a distance
- Breath-by-breath Fast O_2, CO_2, and N_2O monitoring with automatic 5-agent identification and measurement for real-time display of all critical inspired and expired gases
- Optional Spirometry Module* provides real-time measurement of patient airway pressures and volumes for optimal ventilation
- Compact, light-weight design ensures convenient use across clinical environments
- Passport 2 and Spectrum OR provide comprehensive vital signs monitoring capability and trending. Quick-action keys offer one-touch operation

Spectrum OR and Gas Module SE with Spirometry Module

The Gas Module SE delivers state-of-the-art gas monitoring and analysis capabilities: identification and quantification of inspired and expired Fast O_2, CO_2, N_2O, and 5 anesthetic agents – Halothane, Isoflurane, Sevoflurane, Desflurane, and Enflurane. The Spirometry option* performs real-time measurement of airway pressures and volumes directly at the patient's airway. Providing impressive capabilities and highly reliable performance, this leading-edge breath-by-breath gas analyzer was designed to meet the comprehensive anesthesia monitoring requirements of virtually every hospital and free-standing surgical center – whatever its size, specialty, or patient base.

*The Spirometry option is only supported by the Spectrum OR monitor.

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Gas Module SE™

This device communicates with the Passport® XG, Passport 2, Expert, Spectrum® and Spectrum OR at 19,200 Baud via the RS232.

Sampling Rate:	200 ml/min ±20 ml/min with sampling line ≤6 m, under normal conditions
Sampling Delay:	2.5 sec typical with a 3 m sampling line
Total System Response Time:	2.9 sec typical with a 3 m sampling line; includes sampling delay and rise time
Display Update Rate:	Breath-by-Breath
Compensation:	Automatic for pressure, CO_2–N_2O, and CO_2–O_2 collision broadening effect
Warm-Up Time:	For CO_2, O_2, and N_2O: 2 min to operation, for anesthetic agents: 5 min. to operation; for full accuracy specifications: 30 min
Auto-Zeroing Interval:	
Initiated by Gas Module SE:	At startup and at 2 and 4 minutes of operation
Initiated by the host system:	At 10, 15, 30, 45, and 60 minutes of operation, and every 60 minutes thereafter

Normal Operating Conditions after 30-minute warm-up

Ambient Temperature:	+18 to +28°C, within ±5°C of calibration
Ambient Pressure:	500–800 mmHg, within ±50 mmHg of calibration
Ambient Humidity:	20–80% RH, within ±20% RH of calibration

CO_2

Measurement Range:	0–15 vol%; 0-15 kPa; 0–113 mmHg
Measurement Rise Time:	<400 ms
Accuracy:	±(0.2 vol% +2% of reading)
Gas Cross Effects:	<0.2 vol% for O_2, N_2O, and anesthetic agents
Threshold:	0.1vol%; 0.0% is displayed if value <0.1%
Respiration Rate Breath Detection:	1.0% change in CO_2 level
Measurement Range:	4 to 60 BPM

O_2

Measurement Range:	0–100 vol%
Measurement Rise Time:	<400 ms
Accuracy:	±(1 vol% +2% of reading)
Gas Cross Effects:	<2 vol% for N_2O; <1 vol% for anesthetic agents

N_2O

Measurement Range:	0–100% N_2O
Measurement Rise Time:	<400 ms
Accuracy:	±(2 vol% +2% of reading)
Gas Cross Effects:	<2 vol% anesthetic agents

Anesthetic Agents

Measurement Range:	Halothane: 0–6 vol%; Isoflurane: 0–6 vol%; Enflurane: 0–6 vol% Desflurane: 0–20 vol%; Sevoflurane: 0–8 vol%
Measurement Rise Time:	Halothane: <1000ms; Isoflurane/Enflurane/Desflurane/Sevoflurane: <600ms
Accuracy:	±(0.15 vol% +5% of reading)
Gas Cross Effects:	<0.15 vol% N_2O
Resolution:	Two digits for Anesthetic Agent concentrations <1.0 vol%; 0.0% is displayed if value <0.1% Threshold: 0.15 vol%
Identification Time:	<20 sec for single agents
Mixture Identification Threshold for Second Agent:	0.2 vol% +10% of total concentration

Spirometry (optional module*)

Accuracy specifications under normal conditions, after 10-minute warm-up period:

Ambient Temperature:	+10 to +40°C
Ambient Pressure:	500–800 mmHg
Ambient Humidity:	10–98% RH
Airway Humidity:	10–100% RH
Respiration Rate:	4–35 BPM (Adult), 4–50 BPM (Pediatric)
I:E Ratio:	1:4.5 to 2:1
Intubation Tube:	5.5–10 mm (Adult), 3–6 mm (Pediatric)

Spirometry (optional module*) continued

Airway Pressure (PIP, Pplat, Pmean, PEEP)

Measurement Range:	-20 to +100 cmH_2O
Resolution:	1 cmH_2O
Accuracy:	±1 cmH_2O

Flow

Measurement Range: (for both directions)	1.5 to 100 l/min. (Adult) 0.25 to 25 l/min. (Pediatric)

Tidal Volume

Measurement Range:	150 to 2000 ml (Adult), 15 to 300 ml (Pediatric)
Resolution:	1 ml
Accuracy:	±6% or 30 ml (Adult), ±6% or 4 ml (Pediatric)

Minute Volume

Measurement Range:	2 to 20 l/min. (Adult), 0.5 to 5 l/min. (Pediatric)
Resolution:	0.1 l/min. (Adult), 0.1 l/min. (Pediatric)

Compliance

Measurement Range:	4 to 100 ml/cmH_2O (Adult), 1 to 100 ml/cmH_2O (Pediatric)
Resolution:	1 ml/cmH_2O (Adult), 0.1 ml/cmH_2O (Pediatric)

Airway Resistance

Measurement Range:	0 to 40 cmH_2O/ l/s
Resolution:	1 cmH_2O/ l/s

Mechanical

Size (maximum):	30.3 cm W x 11.3 cm H x 27.7 cm D / 11.9" W x 4.4" H x 10.9" D
Weight (maximum):	4.35 kg (9.6 lbs)

Power Requirements

AC Voltage Input:	100 VAC to 240 VAC, 50/60 HZ, with an operating range of ±10% (90 to 264 VAC)
Power Consumption:	<18 watts (41 VAC)

Environmental

Humidity:	10 to 95% RH, noncondensing in airway: 0–100% RH, condensing
Operating Temperature:	+50° to +104°F /+10° to +40°C
Storage Temperature:	-13° to 158°F /-25° to +70°C
Atmospheric Pressure:	67–106 kPa/ 50–800 mmHg/ 666–1060 mbar

Alarms: Anesthetic Gases**

Expired CO_2:	High / Low	Expired Isoflurane:	High / Low
Inspired CO_2:	High	Inspired Isoflurane:	High / Low
Expired O_2:	High / Low	Expired Sevoflurane:	High / Low
Inspired O_2:	High / Low	Inspired Sevoflurane:	High / Low
Expired N_2O:	High / Low	Expired Enflurane:	High / Low
Inspired N_2O:	High / Low	Inspired Enflurane:	High / Low
Expired Halothane:	High / Low	Expired Desflurane:	High / Low
Inspired Halothane:	High / Low	Inspired Desflurane:	High / Low

On Spectrum OR, a medium priority alarm is indicated when a mixed agent is detected.

Alarms: Spirometry parameters**

PIP:	High / Low	Inspired Vt:	High / Low
Pplat:	High / Low	Expired Vt:	High / Low
Pmean:	High / Low	Inspired MV:	High / Low
PEEP:	High / Low	Expired MV:	High / Low

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**Alarm ranges are monitor-specific.

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