O P E R A T I N G   M A N U A L

Quantus™ LP100

Gas Analysis System

IPN 074-510-P1B

INFICON

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Quantus™ LP100
Gas Analysis System

IPN 074-510-P1B

INFICON Instruments for Intelligent Control®

www.inficon.com   reachus@inficon.com

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DECLARATION OF CONFORMITY

This is to certify that this equipment, designed and manufactured by:

INFICON Inc.
Two Technology Place
East Syracuse, NY 13057
USA

meets the essential safety requirements of the European Union and is placed on the market accordingly. It has been constructed in accordance with good engineering practice in safety matters in force in the Community and does not endanger the safety of persons, domestic animals or property when properly installed and maintained and used in applications for which it was made.

In addition, this is to certify that this equipment has also been designed and manufactured; having regard to the state of the art, to ensure complies with the Protection Requirements of EMC directive 2004/108/EC.

A Technical Documentation File is also available for review by competent authorities and will be maintained for a period of ten years after the date on which the equipment was last manufactured. In additional to this file technical, safety, installation, maintenance and application related information concerning this equipment can also be found in the Operating Manual(s) for this product or product family.

Equipment Description: Quantus LP100

Applicable Directives:
2006/95/EC (LVD)
1999/5/EC (R&TTE / EMC)
2004/108/EC (General EMC)
2002/95/EC (RoHS)

Applicable Standards :

Safety: EN 61010-1:2001

Emissions:
EN 61326-1:2006: 1998/A2: 2001 (Radiated & Conducted Emissions)
Class A: Emissions per Table 3
(EMC – Measurement, Control & Laboratory Equipment)

Applicable Standards – Units without wireless communications:

Safety: EN 61010-1:2001

Emissions: EN 61326-1:2006: 1998/A2: 2001 (Radiated & Conducted Emissions)
Class A: Emissions per Table 3
(EMC – Measurement, Control & Laboratory Equipment)

Immunity:	EN 61326-1:2006: 1998/A2: 2001 (General EMC) Class A: Immunity per Table A.1 (EMC – Measurement, Control & Laboratory Equipment)
RoHS:	Due to the classification of this product it is currently exempt from the RoHS directive.
CE Implementation Date:	August 2011
Authorized Representative:	Jerry Wander

Stephen Chabot

Business Line Manager, ISS
INFICON Inc.

Vice-President , Operations
INFICON Inc

ANY QUESTIONS RELATIVE TO THIS DECLARATION OR TO THE SAFETY OF INFICON'S PRODUCTS SHOULD BE DIRECTED, IN WRITING, TO THE ENVIRONMENTAL BUSINESS LINE MANAGER AT THE ABOVE ADDRESS.

Warranty

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NOTE: These instructions do not provide for every contingency that may arise in connection with the installation, operation or maintenance of this equipment. Should you require further assistance, please contact INFICON.

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Chapter 1
Introduction

1.1 System Overview

INFICON Quantus™ LP100 gas analysis system operates using the principal of optical emission spectroscopy. A gas sample or gas-flow of interest is presented to a proprietary Microplasma Sensor Cell inside the sensor that excites the gas, causing it to produce a plasma. The light emitted by the plasma has a spectrum that provides information about the atoms and molecules present. The optical emission is detected by a spectrometer inside the sensor. The resulting spectra are analyzed by INFICON FabGuard™ analysis software on a control computer.

1.2 Safety

The LP100 generates high voltages, radio-frequency signals, and light (ultra-violet, visible, and infrared light). Aside from a field-replaceable Microplasma Sensor Cell, the LP100 has no user-serviceable parts.

WARNING

To prevent injury, and to prevent voiding the factory warranty, repairs to the LP100 should only be performed by factory-authorized personnel.

1.2.1 Definition of Notes, Cautions and Warnings

When using this manual, please pay attention to the NOTES, CAUTIONS and WARNINGS found throughout. For the purposes of this manual they are defined as follows:

NOTE: Pertinent information that is useful in achieving maximum instrument efficiency when followed.

CAUTION

Failure to heed these messages could result in damage to the instrument.

WARNING

Failure to heed these messages could result in personal injury.

1.2.2 Before You Begin

1. REVIEW the installation process thoroughly before beginning work.
2. CONFIRM that the sensor materials of construction and surfaces are compatible with the exposed process environment.
3. CONFIRM that the sensor is installed in an approved manner.

1.2.3 General Warnings and Cautions

WARNING

NEVER operate the sensor without its protective enclosures. The sensor should only be powered when fully mounted using the KF vacuum flange interface to an appropriate system to be monitored.

WARNING

NEVER install or power the sensor in a position where a user can physically access, or view directly the microplasma.

WARNING

NEVER touch the microplasma source or its assembly within its containment cavity.

WARNING

NEVER view directly the microplasma discharge.

CAUTION

NEVER operate the sensor when the interior of the microplasma sensor cell is exposed to ambient or other sources of light such as other processes.

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CAUTION

NEVER prevent airflow by blocking the vent holes or the cooling fan on the sensor. Unpredictable results or damage to the sensor may result.

CAUTION

NEVER power the sensor with an unapproved power supply.

1.3 Terminology

In describing the use of the sensor in this guide, the following terms will be used:

Sensor: A complete LP100 sensor that includes an Electronic Control Module (ECM) and Microplasma Sensor Cell (MSC).

Electronic Control Module (ECM): The ECM contains a spectrometer and electronics. This unit is powered by a 24 V (dc) 2.5 A supply.

Microplasma Sensor Cell (MSC): The MSC contains the microplasma light source. The MSC is field-replaceable.

Software: Quantus is operated by INFICON FabGuard analysis software running on an INFICON FabGuard Controller or Windows®-based PC.

Controller: The computer running INFICON FabGuard analysis software to operate Quantus is an INFICON FabGuard Controller or Windows-based PC.

Tool or Process Tool: A process tool or other system onto which the sensor is attached. The sensor should only be used when properly installed onto an appropriate vacuum system or process tool.

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1.4 How To Contact Customer Support

Worldwide support information regarding:

- Technical Support, to contact an applications engineer with questions regarding INFICON products and applications, or
- Sales and Customer Service, to contact the INFICON Sales office nearest you, or
- Repair Service, to contact the INFICON Service Center nearest you,

is available at www.inficon.com.

If you are experiencing a problem with your instrument, please have the following information readily available:

- the serial number for your instrument,
- a description of your problem,
- an explanation of any corrective action that you may have already attempted,
- and the exact wording of any error messages that you may have received.

To contact Customer Support, see Support at www.inficon.com.

1.4.1 Returning Your Instrument to INFICON

Do not return any component of your instrument to INFICON without first speaking with a Customer Support Representative. You must obtain a Return Material Authorization (RMA) number from the Customer Support Representative.

If you deliver a package to INFICON without an RMA number, your package will be held and you will be contacted. This will result in delays in servicing your instrument.

Prior to being given an RMA number, you will be required to complete a Declaration Of Contamination (DOC) form to identify what process materials your instrument has been exposed. DOC forms must be approved by INFICON before an RMA number is issued. INFICON may require that the instrument be sent to a designated decontamination facility, not to the factory.

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1.5 Purpose of the Quantus LP100 Gas Analysis System

The Quantus LP100 detects changes in gas characteristics such as composition, pressure or concentration. Detecting such changes allows the user to detect leaks, contaminants and process endpoints in critical process environments.

1.6 Computer System Requirements

The Quantus gas analysis system utilizes INFICON FabGuard analysis software with the following computer system requirements.

Table 1-1 Computer System Requirements

	Minimum Requirement	Recommended
Processor	Intel Pentium 4, 3 GHz	Intel Core 2 or greater
Memory	1 GB	2 GB or greater
Hard Drive	80 GB	160 GB or greater
Resolution	15" (1024 x 768)	17" (1280 x 1024)

1.7 Operating System Requirements

INFICON FabGuard analysis software requires Windows XP Operating System or higher.

Quantus requires the Java™ Runtime Engine, Version 6. Many computers already have the Java Runtime Engine installed. If necessary, the Java Runtime Engine can be downloaded from www.java.com. Note that 32-bit operating systems require the 32-bit Java Runtime Engine, while 64-bit operating systems require the 64-bit Java Runtime Engine.

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1.8 Description of the Quantus LP100

1.8.1 Introduction

The INFICON Quantus LP100 gas analysis system is designed for monitoring changes in gas composition over the pressure range of 10 mTorr to 1 Torr, including many corrosive gas environments. In some cases, the LP100 may function beyond this pressure range. However, the ability to ignite plasma may be affected by the species of gas present. Therefore, the pressure range for plasma ignition, or for sustaining the plasma, may be greater or lesser depending on the application. For application specific support, please contact your nearest INFICON representative.

1.8.2 LP100 Sensor Overview

The LP100 (Figure 1-1) is designed for applications that operate between 0.01 and 1 Torr. Exact pressure range is application dependent. Range of 0.01 to 1 Torr is tested with argon. The LP100 is designed and manufactured to withstand exposure to corrosive and aggressive gases such as Chlorine, Fluorine and other chemicals. The LP100 has two main sections, an Electronic Control Module (ECM) and a Microplasma Sensor Cell (MSC). The ECM occupies the larger portion of the housing while the MSC occupies the smaller portion of the housing.

Figure 1-1 LP100

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1.8.3 LP100 Microplasma Sensor Cell

Figure 1-2 LP100 Microplasma Sensor Cell

The Quantus LP100 creates a plasma by coupling energy into the gas utilizing a patented planar antenna in the Microplasma Sensor Cell. The antenna is protected by a sapphire window so it is not exposed to the process chamber or gas sample. This provides the LP100 its unique operating capabilies that allow the sensor to operate in corrosive and aggressive environments. The planar antenna is built using PCB techniques that provide tight tolerances and high performance. The Microplasma Sensor Cell can be replaced in the field.

1.8.4 LP100 Electronic Control Module

The Electronic Control Module includes an optical spectrometer and control electronics. It is powered by a 24 V (dc) power supply, has a cooling fan and six status LEDs. Primary communication is through a USB port. Auxiliary I/O is available through a 15-pin D-sub connector.

1.9 AUX I/O Connector

1.9.1 Auxiliary I/O Specifications

1.9.1.1 Mechanical

15-pin D-sub male connector used on Electronic Control Module. 15-pin D-sub female mating connector required.

1.9.1.2 Electrical

1.9.1.2.1 Digital I/O

Signals I/O 0 to I/O 3 can be set or read by the Quantus. These four (input or output) bi-directional auto-sensing level shifters are TTL-compatible I/O connections rated for 0 to 5V (dc) with 10 k-ohm pull-up impedance. As digital output connections, each can source a maximum of 0.5 mA. As digital input connections, each can sink a maximum of 1.0 mA. The user is responsible for limiting the input current to the 1.0 mA maximum.

1.9.1.2.2 Relay

A contact closure relay, single-pole double-throw (SPDT) is included in the Quantus Electronic Control Module. Maximum current is 0.5 A, maximum voltage is 50 V (ac). The relay is controlled by FabGuard software. The normal (inactive) state is electrical continuity between pins 1 and 3, pin 2 open. The active state switches to continuity between pins 2 and 3, pin 1 open.

1.9.1.2.3 Valve Driver

24 V Valve Driver, powered by the Quantus Electronic Control Module and controlled by FabGuard software. Valve is open when circuit is active, which is when pin 7 is grounded by the Quantus Electronic Control Module.

1.9.2 Auxiliary I/O Pin Designations

Table 1-2 AUX I/O Pin Designations

AUX I/O 15-pin D-sub Connector	
Pin #	**Signal**
1	Relay NC
2	Relay NO
3	Relay Common
4	I/O 2
5	I/O 1
6	I/O 0
7	Valve Control Return

Table 1-2 AUX I/O Pin Designations (continued)

AUX I/O 15-pin D-sub Connector	
Pin #	**Signal**
8	Valve + 24 VDC
9	I/O 3
10	No Connection
11	No Connection
12	GND
13	GND
14	GND
15	GND

1.10 Quantus LP100 Specifications

Table 1-3 details the specifications for the Quantus LP100 gas analysis system. As a result of the continuous product improvement and quality assurance programs in place at INFICON, these specifications are subject to change without notice or obligation.

NOTE: All specifications are measured after a 1 hour warm-up period.

Table 1-3 Quantus LP100 Specifications

Parameters	LP100
Performance	
Technology	Optical Emission Spectroscopy using proprietary and integrated ICP microplasma, spectrometer and RF power supply
Spectrometer Performance	200 to 850 nm wavelengths (UV-Vis) 16-bit full-scale resolution, 2048 pixels
Integration Time	Minimum of 1ms
Detection Limit	To low PPM levels (Application dependent)
Gas Sampling Interface	
Process Environment [1]	0.01 to 1 Torr (Application dependent)
Vacuum Fitting	KF25
Maximum Flange Temp	80°C

Table 1-3 Quantus LP100 Specifications (continued)

Parameters	LP100
Serviceability	Sensor Cell is field replaceable
Facilities	
Operating Temp Range	0-50°C (non-condensing, Sensor Cell 80°C)
Power Requirements	24 V (dc) @ 2.5 A (AC/DC converter provided)
Power Consumption	< 25 Watts (typical, steady-state operation)
Carrier Gases	None required
Mounting Options	Direct Mount via KF25 Flange
Approximate Dimensions and Weight	
Dimensions	3.4" H x 5.9" W x 9.5" L (87 mm x 15 1mm x 241 mm)
Weight	5.9 lbs. (2.7 kg)

[1] Pressure range for argon. Pressure range may differ per application.

Chapter 2
Theory

2.1 Introduction to Optical Emission Spectroscopy

The INFICON Quantus gas analysis system utilizes optical emission spectroscopy to monitor gases present in a chamber, delivery line or pump line. This chapter will discuss the theory behind optical emission spectroscopy and then briefly discuss how Quantus utilizes these phenomena for detecting leaks, contaminants, process changes, or process endpoints.

2.2 Origin of Optical Emission Theory

In the early 1900s, Neils Bohr redefined atomic physics with the Bohr model of the atom. His theory stated that atoms had discrete, quantized energy levels where electrons can exist. He also noted that the electrons can excite to higher energy levels if they absorb an energy equivalent to the difference in energy between the two levels. The electron then can exist inside of the "excited" energy level but will eventually relax to the unexcited state. When the electron drops from the excited energy level to the unexcited level, the energy that was absorbed for the excitation must be released. This energy is released in the form of a single photon that has energy equivalent to the difference between the excited and unexcited energy states. A visual depiction of the different quantum energy levels can be seen in Figure 2-1 on page 2-2.

As indicated in Figure 2-1, there are three basic series that are defined for the Hydrogen atom: the Lyman Series, the Balmer Series and the Paschen Series. The Lyman Series includes all of the photons generated when electrons go from an excited state back to the most unexcited state, n=1. The photons generated in the Lyman Series are 94 nm, 95 nm, 97 nm, 103 nm and 122 nm which are all in the UV range of the electromagnetic spectrum. The Balmer Series is the more easily measured series and includes all of the photons generated when electrons go from an excited state down to a less excited state, n=2. The photons generated in the Balmer Series are 410 nm, 434 nm, 486 nm and 656 nm which are all in the visible range. A visual representation of the Balmer Series is presented in Figure 2-2 on page 2-2. The third series, the Paschen Series, includes all of the photons generated from relaxation from an excited energy state to the n=3 energy state. This produces photons with wavelengths of 1084 nm, 1282 nm and 1875 nm which are all in the IR range of the electromagnetic spectrum.

Figure 2-1 Hydrogen Energy Levels

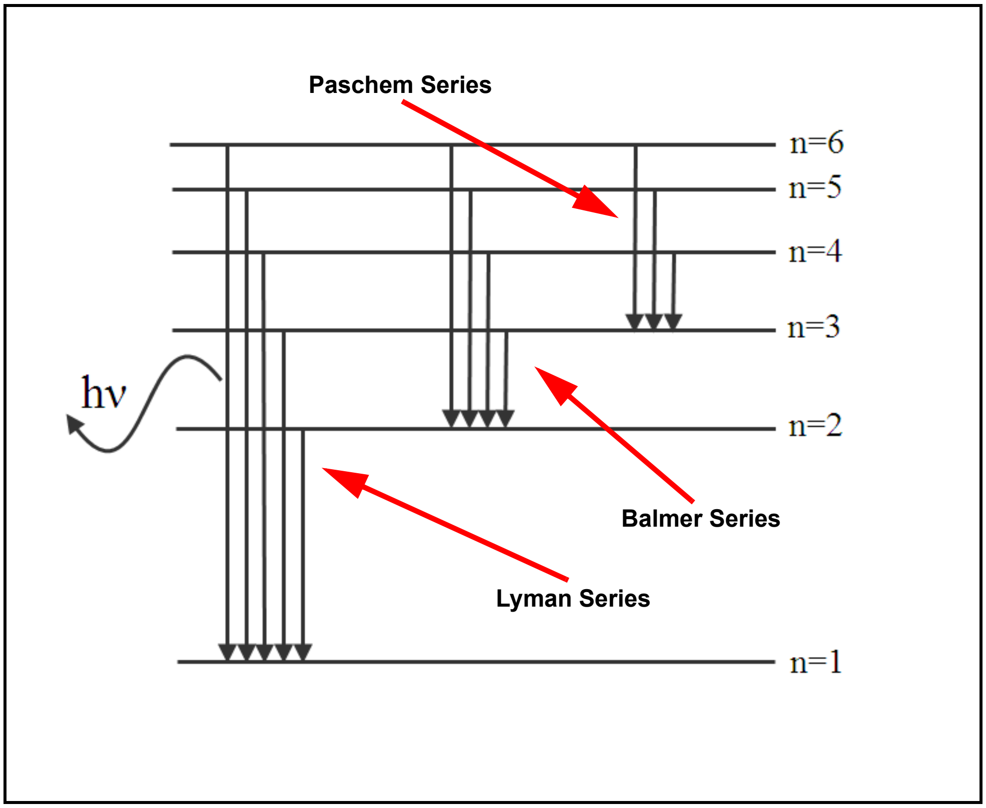
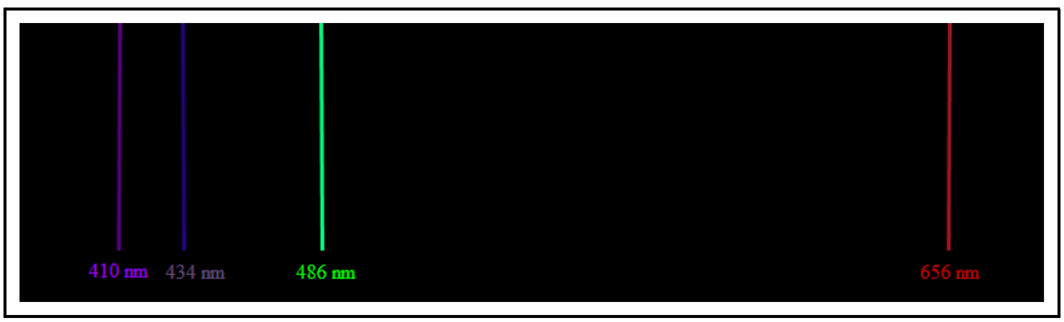


Figure 2-2 Balmer Series



The energy of the photon emitted by the gas can be determined by the following equations:

$$E = h\nu \quad [1]$$

$$\nu = \frac{c}{\lambda} \quad [2]$$

$$E = \frac{hc}{\lambda} \quad [3]$$

Where E = energy, ν = frequency, c = the speed of light (3.00E8 m/s), λ = wavelength and h = Planck's constant (6.626E-34 Js).

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Since the energy is quantized, only a single wavelength of light is emitted for each relaxation. This produces a line in the optical spectrum. Since each element or molecule has a specific set of energy levels, each element or molecule has a unique line spectrum. Also, because each element or molecule produces photons independently, the number of photons of a certain wavelength is related to the concentration of a specific element or molecule.

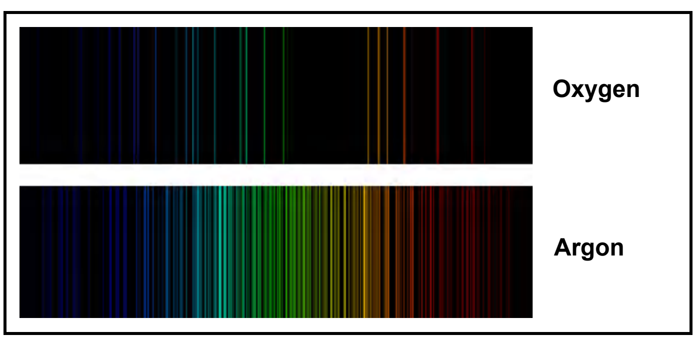
2.3 Complex Optical Emission Spectra

Thus far, the only optical emission spectra discussed has been that of monatomic Hydrogen. Monatomic Hydrogen, of course, has a very simple atomic structure including only one electron. As elements increase in complexity or combine with other elements to form molecules, more electrons are given the opportunity to exist in more energy states producing complex spectra. This section will discuss the two different reasons for complex spectra.

2.3.1 Increasing Numbers of Electrons

Multi-electron systems baffled Neils Bohr during his lifetime, and unfortunately, such is still the case today. Due to this, the underlying physics, mathematics and chemistry that define emission spectra of multi-electron elements include a multitude of assumptions and estimations. However, that is on the theoretical side of science. For our needs, only one rule is important: as elemental complexity increases, so does the complexity of an element's emission spectrum or as the atomic number increases, so does the complexity of the atomic emission spectrum. This can be seen in Figure 2-3 which shows emission spectra of both Oxygen and Argon. When you compare these spectra to the Hydrogen spectrum seen in Figure 2-2, it's easy to see how the complexity increases.

Figure 2-3 Comparison of Elemental Emission Spectra



Remember that each electron can exist in each energy state. Because the electrons have different energy based on spin and ground state configuration, a multitude of different energy photons are released when the electrons relax to a non-excited state.

The other thing to note is that many of these different atomic emission lines have very similar wavelengths (i.e., Oxygen has lines at 394.729 nm, 394.748 nm and 394.759 nm). Depending on the resolution of an instrument, these could appear as three distinct lines or just as one line at 394.7 nm with the intensity of all three lines added together.

Another thing to note is that although each spectrum is unique for a given atom, that does not mean that two elements cannot have overlapping lines. For instance, Argon has lines at 394.6097 nm and 394.8979 nm. Again, depending on the instrument, an Argon/Oxygen mix could show 5 distinct lines at 394.6097 nm, 394.729 nm, 394.748 nm, 394.759 nm and 394.8979 nm or it could show one line at 395 nm that includes the intensity of all 5 lines.

2.3.2 Molecular Combinations of Atoms

When atoms combine to form molecules, their orbitals combine to form new bonding orbitals. These bonding orbitals create more energy states that electrons can exist in. Since there are more energy states, there are more chances for electrons to excite and relax and then release photons. This can create very complex optical emission spectra. The discussion of the theory is outside of the scope of this manual, but it’s worth noting that molecules have more complex spectra than elements.

2.4 Quantus and Optical Emission Spectroscopy

Due to each element or molecule producing their own unique spectra and the amount of photons being related to the concentration of a specific element or molecule, Optical Emission Spectroscopy can be used to detect changes in the relative concentration of gases present in a chamber, gas line, or process. In order to utilize Optical Emission Spectroscopy, the electrons in the gas have to be excited to higher energy states. This is accomplished by the proprietary Microplasma Cell of the Quantus sensor. Inside the Microplasma Cell, the gas molecules are energized to excite the electrons to higher energy levels. When the electrons relax, photons of light are emitted as described above. These photons are then divided according to their wavelength and detected by a CCD in the LP100 system. This allows INFICON FabGuard analysis software to monitor, as a function of time, the intensity versus wavelength optical emission specta generated in the Microplasma Sensor Cell. Analysis of the optical spectra versus time provides for the detection of leaks, contaminants, process changes, or process endpoints. Note that quantitative determination of concentration is not generally possible because the intensity of different wavelengths in the optical emission spectrum depends on the concentration and energy distribution of electrons in the plasma as well as the concentration of the species of interest.

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Chapter 3
Installation

3.1 Installation of the Quantus LP100

The LP100 installs quickly and easily. Listed below are the typical steps required to install the sensor. Please note that your installation requirements may differ.

3.1.1 LP100 Installation Requirements

Power . . . . 24 V (dc) @ 2.5 A

Includes 100-240 V (ac) to 24 V (dc) converter with connector, 50/60 Hz compatible.

Connector pin designations:

Table 3-1 Connector Pin Designations

Pin #	Connection
1	+24 V (dc)
2	+24 V (dc)
3	Ground
4	Ground

Vacuum Chamber Interface . . . . KF-25 flange and clamp (provided)

Communications. . . . . 5 m USB A - B cable (provided), Ethernet to USB converter (optional)

Approximate Weight . . . . 5.9 lbs. (1.8 kg)

Computer Interface. . . . . A Microsoft Windows XP or higher PC with either a USB A, or an RJ-45 Ethernet, interface is required to use FabGuard.

Auxiliary I/O . . . . 15-pin D-sub interface

3.1.1.1 LP100 Dimensions

3.4" H x 5.9" W x 9.5" L (87 mm x 151 mm x 241 mm)

3.1.2 Installation Comments

WARNING

The gas sensors utilize radio-frequency power supplies, high-voltage power supplies, and in their intended use may generate light emission from the ultra-violet to the infrared. High-voltage, radio-frequency, and ultra-violet exposure may be hazardous. It is the responsibility of the user to only operate the sensor when it is installed appropriately.

An appropriate installation meets the following criteria:

- Ensures that the environment is appropriate for operation of the sensors. The LP100 sensor internal materials are stainless steel, viton and sapphire. The user should evaluate if any chemicals, gases, or their byproducts, to which the sensor will be exposed present the potential for attack of these materials and if such attack would present a safety hazard. Should such a hazard exist the user should ensure that appropriate safety monitoring capabilities are installed at the process tool and/or facility level (e.g., facility toxic or hazardous gas monitoring).
- Ensures that users cannot physically access the internal portions of the sensor in which the microplasma operates. Typically the sensor is installed on a vacuum system whose containment vessel prevents access.
- Ensures that the user cannot directly view the microplasma as UV emission may be present.
- Is protected from exposure of the interior of the microplasma sensor cell to other sources of light, including ambient light or light generated elsewhere in the process equipment. Any other light sources seen by the Quantus spectrometer will make data analysis difficult or impossible.

WARNING

Power SHOULD NOT be connected to the sensor unless the above conditions are met. It is the responsibility of the user to ensure through training of personnel and/or provision of interlocks or controls on the power supply that these conditions are met. There are no operating, calibrating, test or other procedures which require personnel to operate the sensor when these conditions are not met.

The LP100 requires a Class 1, Limited Power Supply DC power supply of 24 V (dc), 2.5 A minimum rating. INFICON offers a 100-240 V (ac) to 24 V (dc) power converter which meets all power supply requirements. Should the user supply power independently, the user must ensure that the supply has at least the minimum capability and is short-circuit and over-current protected. At a minimum, the supply should be compliant with UL/CSA 60950-1.

LP100 sensors are intended to be used in clean, protected environments and are not to be used in outdoor installations or inside installation where significant amounts of dust, oil, or other vapors are present, unless a separate provision is made to provide a suitable environmental enclosure. The sensors are intended to be used in cleanroom environments.

WARNING

There are no user serviceable parts in either the ECM or MSC and the user should not attempt to open, disassemble or tamper with these components. Doing so will void the warranty and may either (1) render the product non-compliant with safety certifications and/or (2) expose the user to hazardous voltages or emissions.

3.1.3 Cleaning

Should cleaning be required, clean the enclosure exterior with mild detergents or alcohol applied with a towel or cloth. Cleaning of the interior portions of the microplasma sensor cell cannot be performed and the user should instead install a new MSC assembly.

3.1.4 Connecting the USB Interface

USB communications between the Controller and LP100 are established using the 5 m USB cable provided with the system. The total USB cable distance can be increased by adding one, or more, of the 5 m USB extender cable 962-024-G1.

3.2 LP100 Installation

Before you start:

- CONFIRM that use of a microplasma will not adversely affect the gases, processes or equipment being monitored.
- FOLLOW all safety precautions.
- REVIEW the installation process thoroughly before beginning work.

WARNING

DO NOT operate the sensor without its protective enclosure.

WARNING

DO NOT touch the microplasma within the Microplasma Source Cell's cavity.

CAUTION

DO NOT block the fan or vent holes on the Electronic Control Module.

WARNING

The Quantus system must be electrically grounded through the KF-25 connection flange to the vacuum chamber or system to which it is installed. Failure to ensure proper electrical grounding could result in a shock hazard and/or personal injury.

Follow the steps shown below to install the Quantus LP100 gas analysis system.

1 Remove KF-25 clamp, protective cap and centering ring from Sensor Cell flange.

2 Attach Sensor Cell flange to mating flange on system using KF-25 centering ring and clamp. The Sensor Cell flange, KF-25 centering ring and clamp are shown in Figure 3-1.

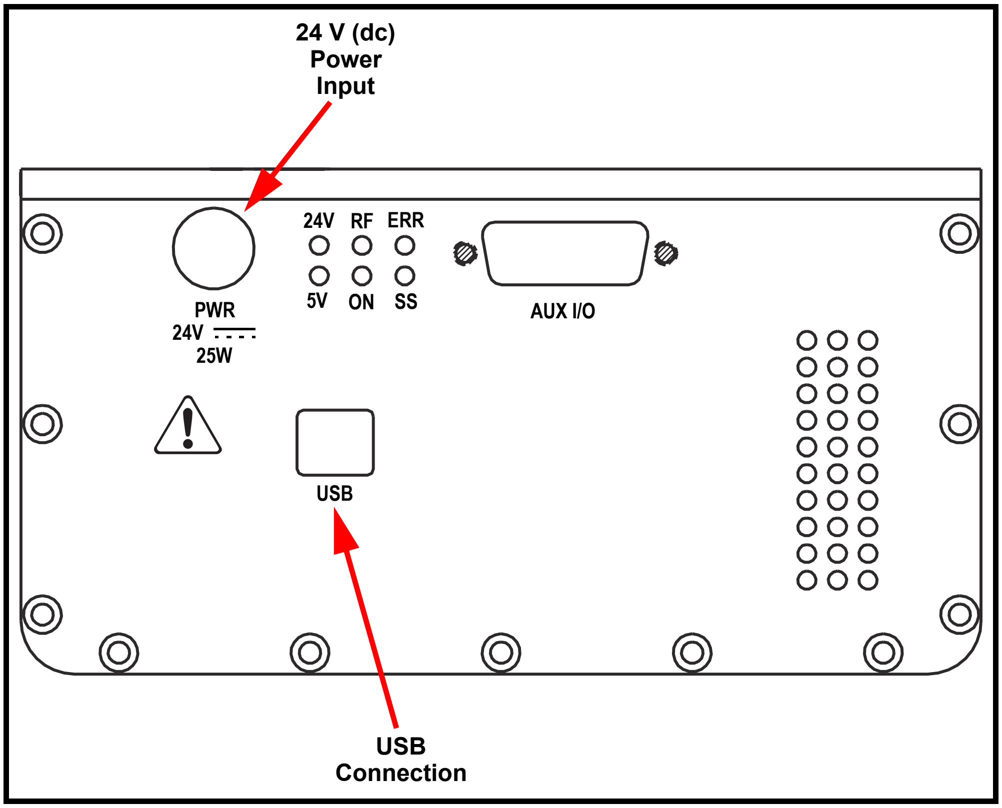
Figure 3-1 LP100 Installation

3 Attach 24 V (dc) power at the PWR connection point shown in Figure 3-2.

4 Attach USB cable at the USB connection point shown in Figure 3-2.

5 The LP100 is electrically grounded through the KF-25 connection flange to the vacuum chamber or system to which it is installed. No other ground connections are necessary.

Figure 3-2 LP100 Connections



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Chapter 4
Operation

4.1 Introduction

Operation of Quantus is controlled by INFICON FabGuard analysis software. Refer to FabGuard user documentation and INFICON applications support for more information regarding sensor setup and operation.

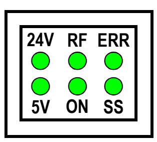
The LP100 is designed to ignite its plasma over a pressure range from 10 mTorr to 1 Torr. However, the ability to ignite plasma can be affected by the species of gas present. Therefore, the pressure range for plasma ignition, or for sustaining the plasma, may be greater or lesser depending on the application.

Optical spectra acquired by the Quantus are analyzed by FabGuard analysis software.

4.2 Sensor Status LEDs

As shown in Figure 4-1, the LP100 is equipped with six green LEDs to indicate sensor status.

Figure 4-1 Sensor Status LEDs



4.2.1 Descriptions of Sensor Status LEDs

The Quantus sensor status LEDs are summarized in Table 4-1. When 24 V (dc) power is applied to the sensor, the 24 V and 5 V LEDs illuminate. During initial power-up, the other four LEDs flash several times to indicate that the LEDs are functioning.

Table 4-1 Summary of Sensor Status LEDs

LED Label	Description
24 V	24 V (dc) Power Present
5 V	5 V (dc) Power Present
RF	RF Amplifier Enabled - RF power being delivered to the antenna to start, or sustain, the microplasma.

Table 4-1 Summary of Sensor Status LEDs (continued)

LED Label	Description
ON	Microplasma On - Light is being detected from the microplasma.
ERR	Hardware Error
SS	Spread Spectrum (Dithering) - Frequency modulation, as described in section 4.3, is active.

CAUTION

If no LEDs illuminate after power is applied, then a fault in the sensor is likely to have occurred. In that case contact INFICON for assistance.

4.3 Spread-Spectrum (SS)

The LED labelled SS in Figure 4-1 indicates, when lit, that the LP100 is operating in spread spectrum mode, a form of frequency modulation also known as dithering. Spread spectrum is the default mode of operation for the LP100. In this mode, the sensor modulates the RF drive frequency about the nominal frequency for a given Microplasma Sensor Cell. While SS is the default mode of operation, it can be disabled through FabGuard software. With SS disabled, the sensor will operate over a wider pressure range and produce higher signal values. However, with SS disabled, the LP100 may not operate entirely within conformity of all standards listed in the Declaration of Conformity.

Chapter 5
Accessories and Spare Parts

5.1 LP100 Spare Parts

Table 5-1 LP100 Spare Parts

INFICON Part Number	Description
962-601-G1	LP100 - Standard and Corrosive Environment Cell
962-401-G1	Power Supply - 100-240 V (ac) @ 50/60 Hz to 24 V (dc)

5.2 LP100 Accessories

Table 5-2 LP100 Accessories

INFICON Part Number	Description
962-020-G1	Isolation Valve Kit
962-024-G1	USB Extender Cable 5m
962-025-G2	USB to Ethernet Kit

5.2.1 USB to Ethernet Kit

Quantus can be controlled by FabGuard software utilizing an Ethernet connection. This is accomplished using an Ethernet to USB Adapter 962-025-G2.

5.2.2 Isolation Valve Kit

Isolation Valve Kit 962-020-G1 is available as an accessory for Quantus. This kit includes an INFICON VAP025-X pneumatic right-angle valve and a control cable to interface the valve directly to the Quantus Electronic Control Module.

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Chapter 6
Maintenance

6.1 Introduction

The Microplasma Sensor Cell (MSC) contains components for igniting and sustaining the microplasma, including a planar antenna. The MSC also contains two sapphire windows. One window isolates the antenna from the vacuum chamber, process gases and microplasma. The second window allows light generated in the microplasma to pass out of the cell to be gathered by the collection optics for analysis by the Quantus system.

The MSC can be replaced when necessary. In order to replace the MSC, vacuum must be broken. The frequency of the new MSC, if different from the previous MSC, must be updated at the Sensor Configuration Screen for this sensor using FabGuard software. The MSC can be returned to INFICON for refurbishment for subsequent re-use on either the same LP100 or another LP100.

6.2 Replacing the Microplasma Sensor Cell (MSC)

CAUTION

Keep the inside of the MSC clean. Do not contaminate the inside of the MSC because it will be exposed to the process chamber or pump line to which it will be connected.

Follow the steps shown below to replace the MSC of the Quantus LP100.

1 Remove the LP100 from the chamber or system it is installed upon by removing the KF-25 clamp and centering ring. See Figure 6-1. Keep the clamp and centering ring for re-installation of the LP100. Keep the centering ring clean.

Figure 6-1 KF-25 Clamp & Centering Ring

2 Remove the sensor cover plate by removing the eight screws as shown in Figure 6-2 and Figure 6-3. Keep the cover plate and screws for re-assembly at the end of this procedure.

Figure 6-2 LP100 with Cover Plate Installed

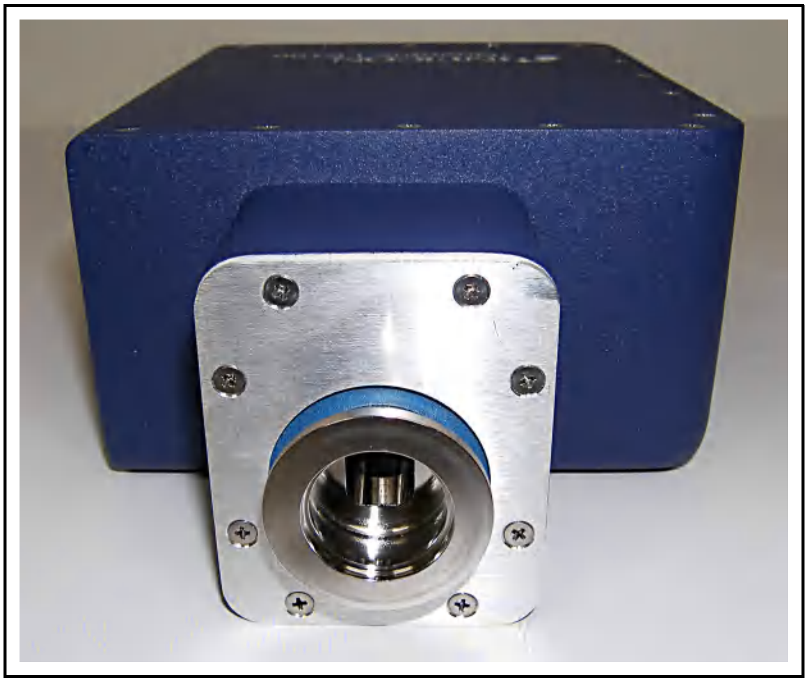
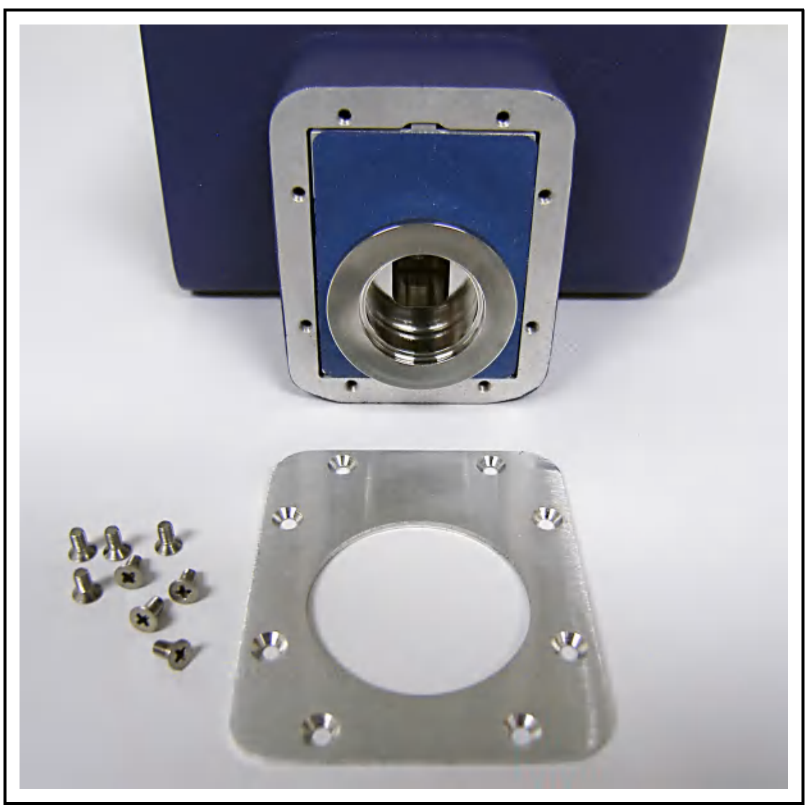
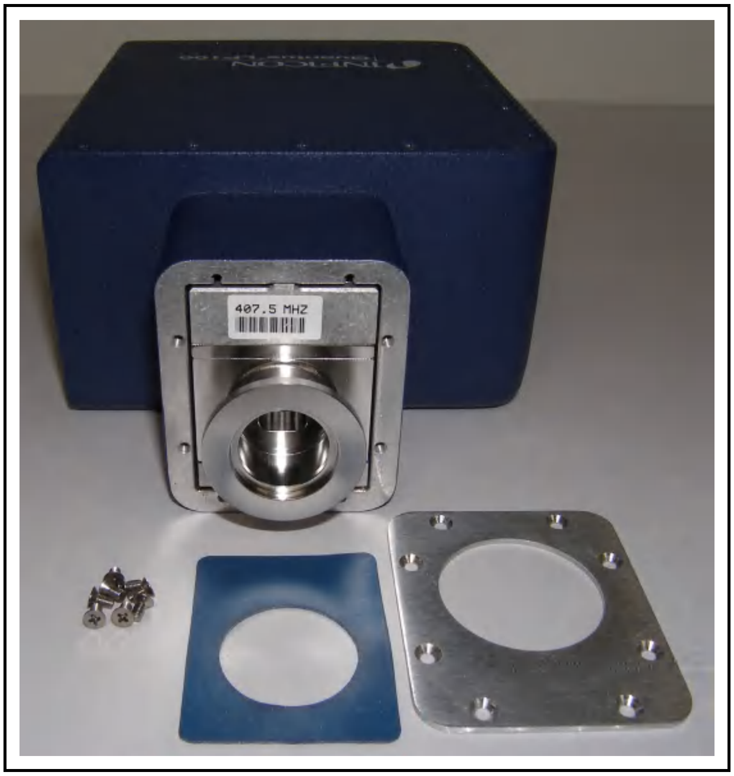


Figure 6-3 LP100 with Cover Plate Removed



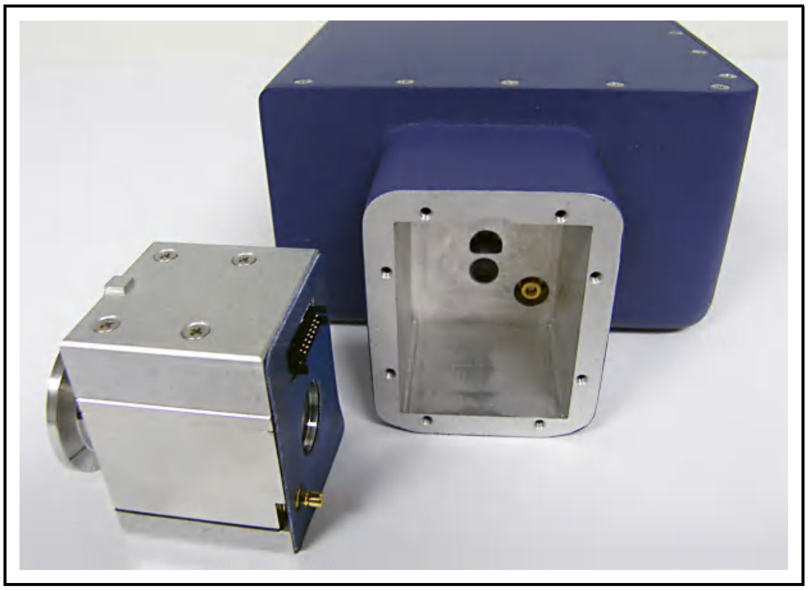
3 Remove the outer gasket by gently stretching it around the MSC flange. See Figure 6-3 and Figure 6-4.

Figure 6-4 Outer Gasket Removed



4 Remove the MSC from the LP100 housing by sliding the MSC forward from the housing. Do not touch the inside of the MSC. See Figure 6-5.

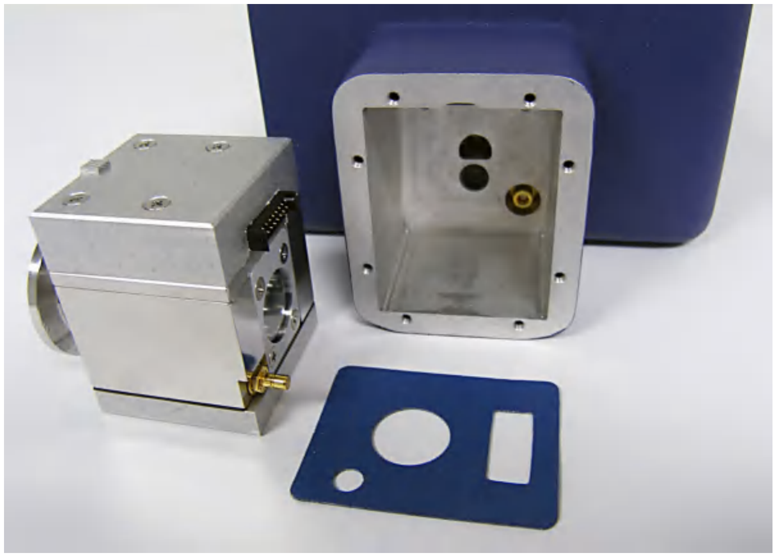
Figure 6-5 MSC Cell Removed



IPN 074-510-P1B

5 Remove the inner gasket. Refer to Figure 6-5 and Figure 6-6.

Figure 6-6 Inner Gasket Removed

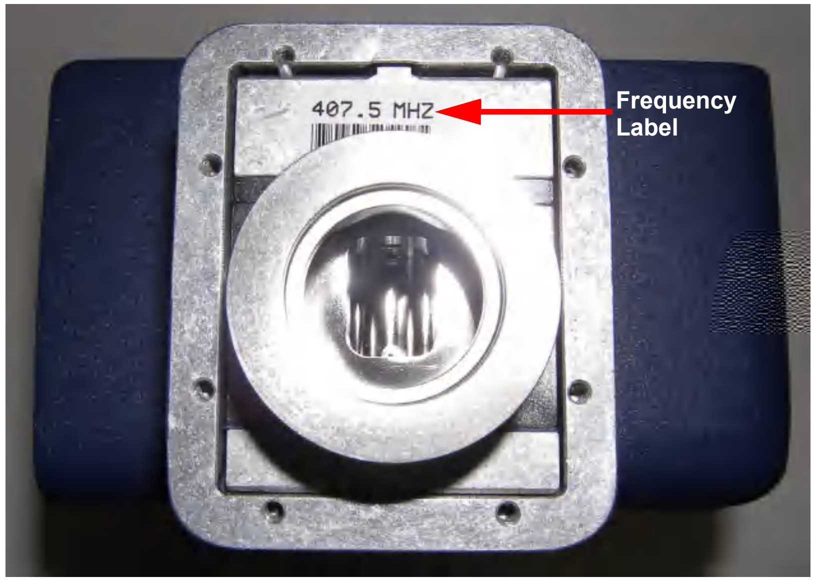


6 Install new inner gasket from replacement MSC kit. If a new inner gasket is not available, then re-use the original inner gasket. To install the inner gasket, place the LP100 upright on the work surface so the gasket can rest at the bottom of the cavity as shown in Figure 6-7. Leave the LP100 in this upright position for the next step, installing the new MSC.

Figure 6-7 Inner Gasket Installed

7 Carefully install the new MSC by slowly sliding it down into the housing. Be careful to do this slowly, without too much force, to ensure the connectors are not damaged and are properly mated. See Figure 6-8.

Figure 6-8 MSC Cell Installed



8 Read the cell frequency, in units of MHz, from the label on the new cell. Refer to Figure 6-8. Note this frequency and update it at the Sensor Configuration Screen for this sensor using FabGuard software.

9 Install new outer gasket from replacement MSC kit. If a new outer gasket is not available, then re-use the original outer gasket. To install gasket, gently stretch it around the flange of the MSC. See Figure 6-9.

Figure 6-9 Outer Gasket Installed

10 Install cover plate with eight screws as shown in Figure 6-3 and Figure 6-10.

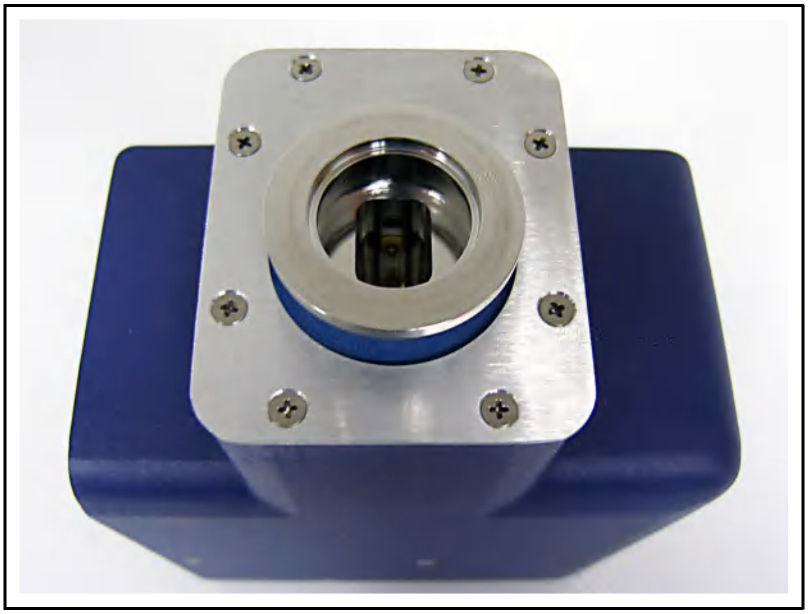


Figure 6-10 LP100 with Cover Plate Installed

11 Be sure to update the MSC frequency at the Sensor Configuration Screen for this sensor using FabGuard software. Refer to FabGuard user documentation or contact INFICON applications support for more information regarding sensor configuration.