PY-IMS Datasheet

Qualitech Technology Pte Ltd

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CHAPTER 1

PY-IMS DataSheet

1.1 Introduction

XXXX Technology Limited Company is a technology company specializing in the research and development of ion mobility spectrometry (IMS) technology. It is mainly engaged in the development and sale of IMS-related detection equipment and has multiple national invention patents. It is a technology innovation enterprise integrating research and development, production, sales, and technical services, dedicated to providing high-quality products and system solutions for customers in many fields such as public safety, environmental monitoring, pharmaceuticals, industry, biomedicine, and medicine. The company has a team of research and production personnel with strict product development experience and IMS research technology, as well as a complete set of IMS research, production, testing, and inspection facilities and equipment. Our company has joint research and development partnerships with universities, research institutes, and multiple chemical and explosion prevention companies. The development of IMS sensors has received project funding. Our company focuses on independent research and development in the field of IMS technology. In the future, we will pay more attention to future-oriented thinking on social needs and provide higher-quality products, becoming a high-quality supporting service provider in the relevant detection instrument industry.

1.1.1 What's Ion Mobility Spectrometry (IMS)?

Ion Mobility Spectrometry (IMS) is a technique that separates and detects ions by their migration through a neutral gas under the influence of an electric field, with the tested substance possessing a unique characteristic.

1.1.2 What can Ion Mobility Spectrometry sensors do?

1. Can be widely used for trace substance detection: IMS using a high ionization efficiency bipolar atmospheric pressure ionization source can achieve detection limits in the range of 10^{-10}, which can be widely used for trace substance detection.
2. Convenient implementation of GC-IMS, IMS-MS coupling: The IMS analysis can be completed in milliseconds, is orthogonal to chromatography and mass spectrometry separations and is therefore convenient for implementing GC-IMS and IMS-MS coupling.
3. It is the only instrument capable of obtaining material CSS (collision cross-section) information: the ion mobility K is directly related to ion shape, size, and other structural information, and it can operate at atmospheric pressure and separate isomeric compounds. It can be used for scientific research, with a 5-120 seconds detection time.

1.1.3 Advantages of our company's Ion Mobility Spectroscopy sensor technology

- High sensitivity: The detection limit is as low as ppbv(parts per billion) level, with high sensitivity, ensuring a response to trace amounts of the target substance.
- High resolution: With a resolution of up to 60-90 FWHM, it can reliably detect and distinguish more substances.
- Non-radioactive source: The bipolar atmospheric pressure ionization source is used, and the entire process is pollution-free and requires no regulation, making it convenient and worry-free.
- One-piece structure: The main body is a PEEK-reinforced integrated ceramic inner liner, which is not easily damaged and is more earthquake-resistant, saving the hassle of subsequent maintenance problems.
- High flexibility: all parameters are controllable, and different parameters can be set for different test substances to obtain more accurate detection results. One device can meet different application needs.
- In addition to using air as a buffer gas, other gases such as nitrogen and helium can also be used as options to meet the needs of detecting specific substances, greatly expanding the scope of substances to be tested.
- Product series: includes IMSS-L, IMSS-S, IMSS-P, IMSS-V, IMSS-R, and other different series of sensors, suitable for different choices from professional applications to experimental research, can meet the application requirements in different places, with strong adaptability.

1.1.4 What services does our company offer?

We are dedicated to becoming a high-quality supplier of testing instrument equipment for manufacturers in various industries in China. We do not provide services to direct customers.

1. Cooperation mode: OEM/ODMThe partner proposes the requirements for the complete machine, and we are responsible for any aspect of design, testing, validation, production, and service, or we can support you in doing any aspect of design, testing, validation, production, and service, without directly participating in the user market.
2. Provided Support:

- Provide EVK (Evaluation Kit) and SDK (Software Development Kit) for IMS whole machine verification platform, as well as relevant documents.
- Protocol, control board, and all software materials.

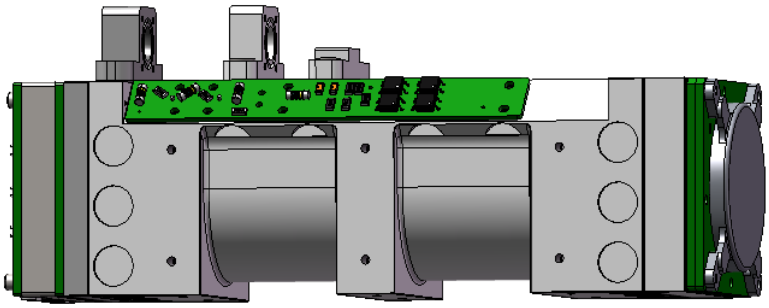
- Sensor testing software.
- Sensor application document: IMSS Sensor Application Technical Document.
- Maintenance and repair work for IMSS sensors.
- Zero-risk cooperation mode.

1.1.5 Our company currently has Ion Mobility Spectrometry sensor products in various models.

Currently, two types of sensors are available that can be adapted to most industrial and civil applications.

1. Fixed-type: It has a large volume, high resolution, and sensitivity, and is suitable for continuous operation conditions.
2. Hand-held type: It has a small volume, slightly lower resolution, and sensitivity; it has good power adaptability, can be used in hand-held devices, and can also be applied to situations where size and weight are sensitive, such as drones.

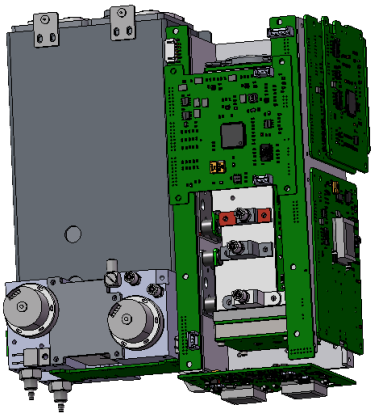
1.2 IMSS-L High-Resolution IMS Sensor



The IMSS-L series sensors are designed for fixed indoor and outdoor comprehensive monitoring applications.

- High resolution, up to 40-60FWHM
- High sensitivity, detection limit as low as ppbv level
- Wide range, can monitor toxic and harmful industrial gases, odors, aromatics, etc.
- Long time, continuous working time, can adapt to uninterrupted work
- Maintenance cycle of more than 180 days
- Easy to expand, can expand detection library and sampling device
- High standards, meet GJB environmental adaptation requirements.

1.2.1 Typical application prototype of IMSS-L.



1.2.2 Main indicators of IMSS-L sensor

- Weight (kg): 4 (excluding outer shell)
- Dimensions (mm): $200 * 200 * 100$
- Power consumption (W): <20
- Power supply (V): 8 ~ 16 (nominal 12VDC)
- Sensitivity: ppbv level, DMMP 19.7ppb
- Response time (s): 10 (MS 30ppbv), 180 (MS 10ppbv)
- Resolution: >50 M
- SIon source: bipolar high-voltage atmospheric ionization, avoid use of radioactive source
- Operating pressure (kPa): 57 ~ 101
- Operating temperature (℃): -20 ~ +50
- Storage temperature (℃): -40 ~ 60
- Communication interface: 2*RS232, 460800bps
- Continuous operational stability: $7 * 24$

- Alarm identification (optional): toxic industrial gases (CL2, H2S, HCL, HF, NH3), odorants (methanethiol, ethanethiol, etc.), aromatic compounds (toluene, xylene, etc.), expandable to support user-built library
- Shock resistance: 15G
- Sampling method: pump suction, pump life > 5000 hours

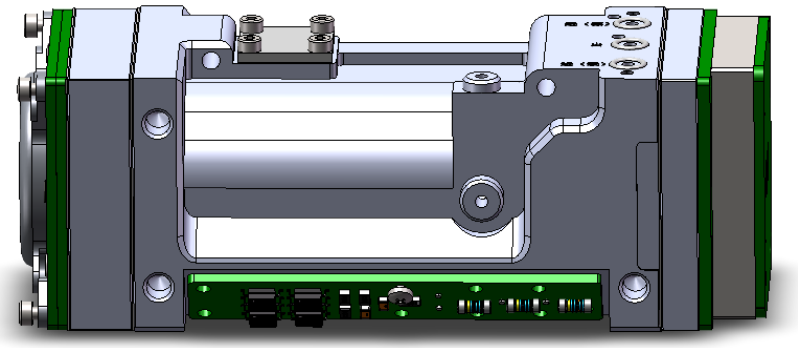
1.2.3 Advantages

- High sensitivity
- Expandable detection library
- Real-time response
- Non-radioactive source
- Easy to integrate
- Integrated alarm recognition function

1.2.4 Application scenarios

- Civil defense engineering
- Fortification engineering
- Airport, subway, large-scale venue security check
- GC-IMS hybrid instrument
- Environmental monitoring
- Hazardous chemical storage leak warning monitoring

1.3 IMSS-S compact IMS sensor



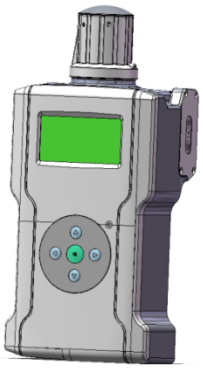
The IMSS-S series sensors are designed for general applications in personal handheld devices, drones, and other environments.

- Small in size, easily integrated into various products or projects.
- Lightweight, suitable for developing handheld gas alarms, UAV-mounted equipment, etc.
- Low power consumption, powered by two lithium batteries.

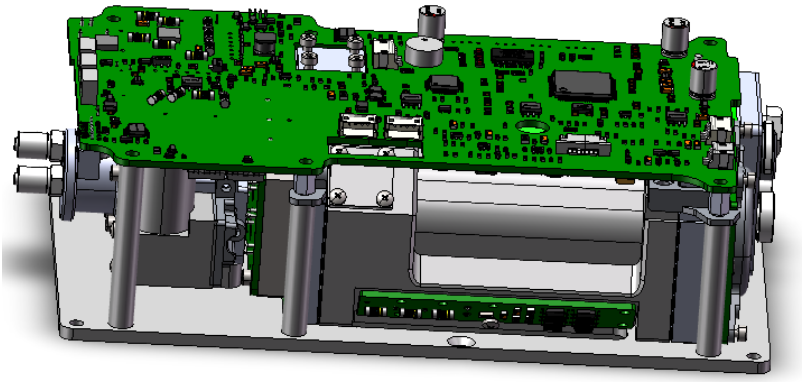
- High sensitivity, detection limit as low as ppm level.
- Wide range, including toxic and harmful industrial gases, odors, benzene series substances, etc.
- Easy to expand, can expand detection library and sampling device.
- High standard, meets GJB environmental adaptability requirements.

1.3.1 Typical applications of IMSS-S

HandHeld Device:



Drone Mounting:



1.3.2 Main indicators of IMSS-S sensor

- Weight (g): 650 (excluding outer casing)
- Size (mm): $168 * 95 * 56$
- Power consumption (W): 8
- Power supply (V): 7.6 (2 lithium batteries, adapts to 7-16VDC power supply)
- Sensitivity: parts per million (ppm) level, MS 1ppmv
- Resolution: >15, MS
- Response time (s): <15, MS 1ppmv
- Ion source: bipolar high-voltage atmospheric ionization, eliminating the use of radioactive sources
- Working pressure (kPa): 57 ~ 101
- Operating temperature (℃): -20 ~ +50
- Storage temperature (℃): -40 ~ 60
- Communication interface: 1*RS232, speed 460800bps
- Continuous operation stability: >4 hours
- Alarm substance identification (optional): toxic industrial gases (CL2, H2S, HCL, HF, NH3), odorants (methyl mercaptan, ethyl mercaptan, etc.), benzene series (toluene, xylene, etc.), expandable to support user-built libraries
- Anti-shock capability: 15G
- Sampling method: pump suction type, pump life>2000 hours.

1.3.3 Advantages

- High sensitivity
- Expandable detection library
- Real-time response
- Non-radioactive source
- Easy integration
- Integrated alarm identification function

1.3.4 Application scenarios

- Handheld gas alarm
- UAV mounting
- Robot intelligent perception application
- Grid-based large-area monitoring
- System integration application

1.4 Comparison of Common Gas Sensor Performance

表 1: Comparison of Common Gas Sensor Performance

Feature	IMS/ion mobility spectrometry	Mass spectrometry	Electrochemistry	Semiconductor
Sensitivity	10^{-6} - 10^{-10}	10^{-6} - 10^{-9}	10^{-2} - 10^{-6}	10^{-2} - 10^{-6}
Resolution	10-90	>1000		
Volume(mm)	$< 200 * 100 * 50$	$> 300 * 200 * 200$	Component level	Chip level
Weight	<650g	>20kg	<20g	<10g
Power Comsumption	<10W	>50W	<1W	<0.1W
Ability to identify substances	Extensible	Extensible	Specializing in one category	Single species
Market reference price (SGD)	<20K	>140K	<1000	<200
Usage Condition	Atmospheric pressure	High vacuum	PCB	PCB
Ionization source	Radiation source, corona discharge, electro-spray, ultraviolet lamp	Radiation source, corona discharge, ultraviolet lamp	No need	No need
Environmental adaptability	Widely adaptable	Limited	Limited	Widely adaptable
Application scenarios	From industrial sites to laboratory, widely adaptable	Mainly on Laboratory Analysis	Industrial	Home Usage