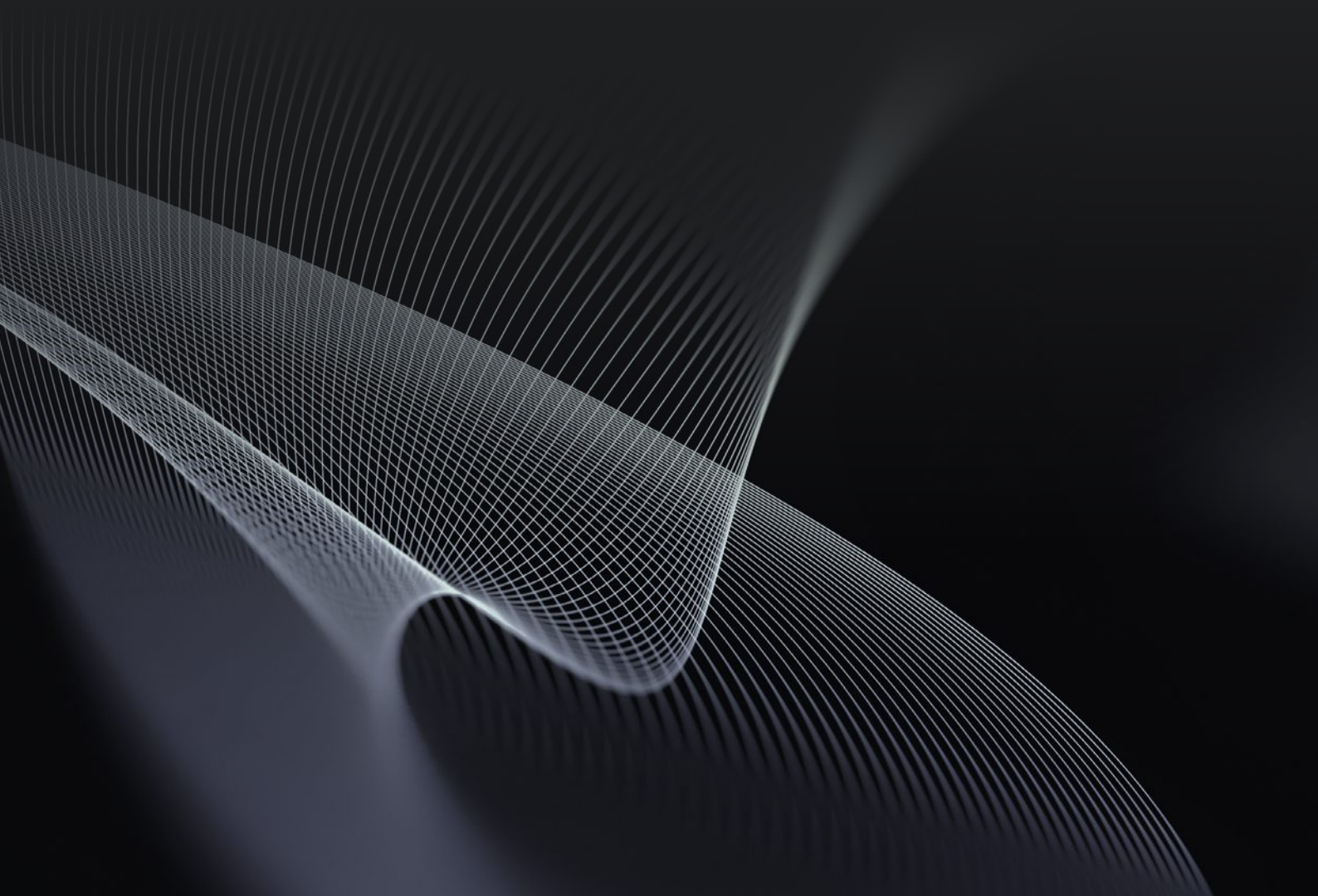
el expand your limits

Invisible To Us, Yet Strictly Precise.

Precision GHG measurement for semiconductor & display industries — backed by 20 years of expertise.



Contents.



Introduction		04
Business Model		06
Organization		07
History		08
Technology		10
Use Cases		12
Partnership		14
Our Services	1. GHG measurement & Consulting(KOLAS)	16
	2. Process Chamber Monitoring	
	3. Gas analysis & Sampling	
	4. Vacuum Consulting	
Our Products	1. iquad	18
	2. iquad-s	
	3. icomby	
	4. itof	
	5. ioes	
	6. imerge	
	7. ivacuum	

Introduction.

For over 20 years, we have measured what others couldn't. Invisible gases. Trace concentrations.
The chemistry happening inside a sealed OLED cell or a plasma process chamber at 2,000 scans per second. From gas analysis to real-time process monitoring — we build the instruments and deliver the data that keeps the world's most advanced manufacturing running.

Who We Are

Founded in 2004, we have grown from a specialist in low-vacuum ultra-trace gas analysis into a trusted partner for Korea's leading semiconductor and display manufacturers, as well as global foundries in Singapore and Taiwan.

What We Do

Built on more than two decades of gas analysis expertise, we provide integrated solutions spanning GHG efficiency measurement, process chamber monitoring, custom gas analysis, and vacuum consulting to help customers improve productivity and manufacturing insight.

Where We Are Going

Looking ahead, we are expanding its global footprint across Asia while pursuing its vision of becoming a leading material quantity measurement research company focused on innovation, customer satisfaction, and sustainable growth.

2004 Founded	+1,000 Total Measurements	+30% 5-Year CAGR	46% R&D Ratio
18 Headcount	₩250M Capital	KT1218 KOLAS Accred.	5 OVERSEAS MARKETS

We focus on our limits.

We offer new approaches to customer challenges.
We do not hesitate to walk roads no one has walked before.
We add happiness to the lives of our people.

Business Model.

01

GHG Monitoring

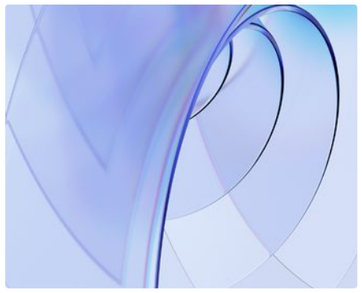
Efficiency measurement of semiconductor/ display GHG reduction devices (scrubbers). KOLAS-accredited test report issuance. Korea's Emissions Trading Scheme compliance.



02

Realtime Process Monitoring

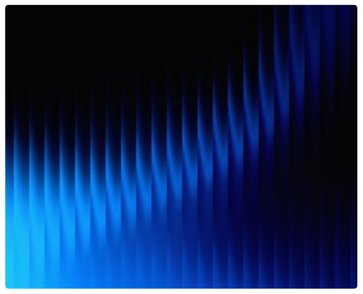
In-situ real-time monitoring of semiconductor/display process chambers using TOF-MS (itof) and OES (ioes). Yield protection and process optimization.



03

Gas Analysis & Sampling

On-site sampling and laboratory QMS analysis of customer-submitted gas samples. Qualitative and quantitative data for any gas type — from OLED cell internal gas to industrial exhausts.



04

Vacuum Consulting

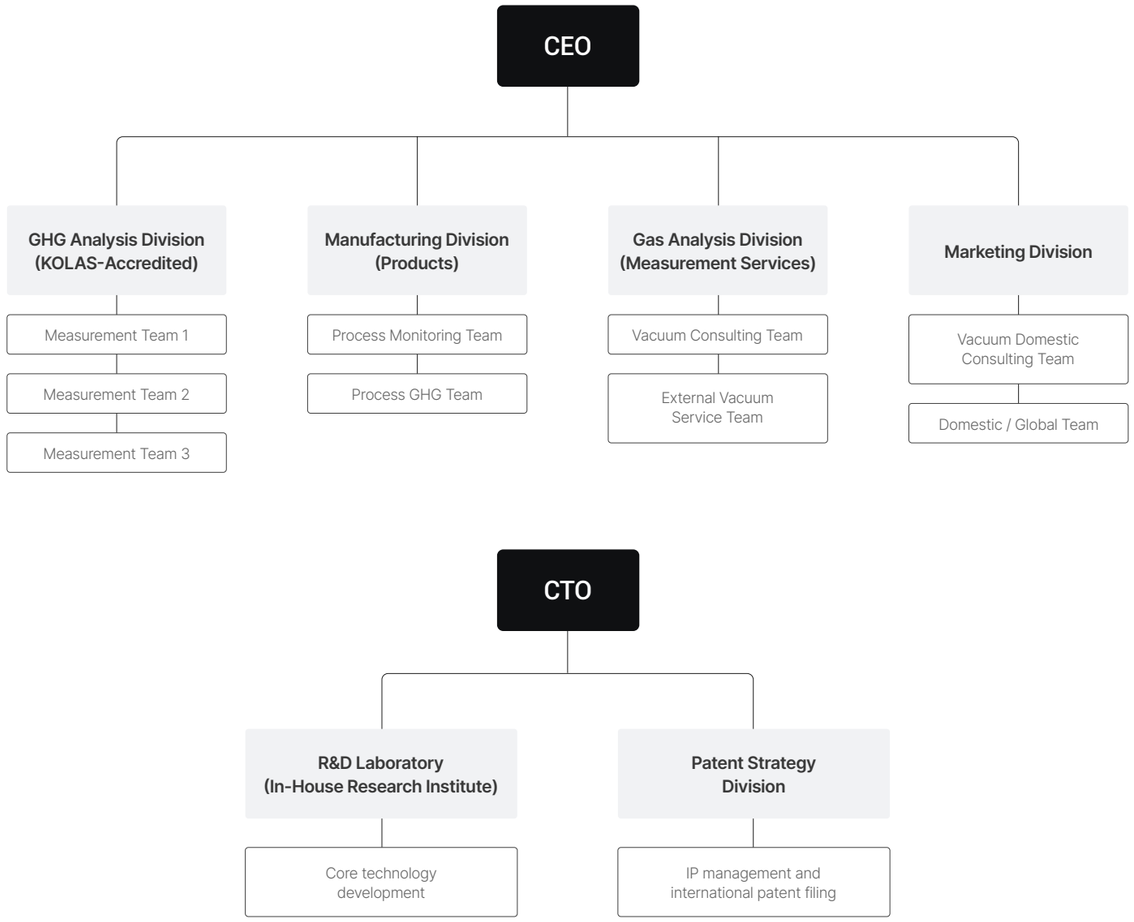
Expert consulting on vacuum system design, component selection (fittings, valves, regulators, pumps), custom pumping station builds, and equipment rental.



Organization.

We have established a robust organizational structure that allows it to leverage its core technological capabilities most effectively. Centered around the C-Suite, the Greenhouse Gas Analysis Division—which holds KOLAS accreditation—the Manufacturing Division, which supplies real-time equipment, the External Gas Analysis Division, which provides customized solutions, and the Domestic and International Marketing Divisions work in perfect synergy. In particular, the in-house research institute and the Patent Strategy Department, both under the CTO, lead the localization of core equipment and the establishment of global intellectual property barriers, providing comprehensive support for the company's future growth engines.

Boasting a technology-intensive infrastructure—with R&D personnel accounting for 46% of the total workforce—the company operates efficiently within a culture of horizontal and open communication that transcends hierarchical boundaries. To fully support our customers' technological innovation, six specialized departments and nine teams communicate in real time as a single, cohesive unit, consistently delivering outstanding results.



History.

2004~2009

2004. 01 **Company Established**

Incorporated in Anyang, Gyeonggi-do. Initial capital ₩200M.

2004. 01 **First Research Contract**

Consignment research agreement with Korea Research Institute of Standards and Science (KRISS) — PFC sample analysis and information survey.

2006. 06 **HQ Relocated to Daejeon**

Headquarters moved to Daejeon. In-house R&D institute established. Technology transfer from KRISS: low-pressure gas quantitative analysis system.

2007. 12 **Vacuum Sampling Technology**

Technology transfer from KRISS: low-vacuum sample gas collection device.

2008. 07 **Venture Certification**

Certified as venture company. In-house R&D institute officially registered (No. 2008210107).

2009. 05 **Government R&D Selection**

Selected for in-house R&D institute upgrade program (Korea SME Agency, 2 years, total project cost ₩500M).

2010~2019

2010. 04 **CDM System Contract**

Selected as CDM system business operator by Samsung Engineering. First major GHG reduction facility analysis system supply.

2010. 08 **NET Certification**

New Excellent Technology certification (No. 0438) for low-vacuum ultra-trace gas component detection and absolute quantitative auto-analysis technology using QMS.

2010. 10 **Innobiz Certification**

Certified as technology-innovative SME (Innobiz, No. 100501-01895).

2015. 04 **Samsung Electronics Contract**

Selected as GHG reduction facility efficiency measurement service provider for Samsung Electronics — the anchor client relationship that continues to the present.

2018. 05 **Major Client Expansion**

GHG reduction facility efficiency measurement services extended to LG Electronics and LG Display in addition to Samsung Electronics.

2019. 04 **POSCO Project**

STS4 steelmaking ladle monitoring project for POSCO BS.





2020~Present

2020. 07 **GHG Automation System**

Selected for Korea Ministry of Environment commercialization support program: fully automated GHG reduction facility efficiency measurement system for the electronics industry.

2020 **TOF-MS Localization**

Successful development and miniaturization of Korea-domestic TOF(Time-of-Flight)-MS technology — 100% Korean-developed.

2021. 05 **OES Supply (1st)**

First delivery of OES system to Samsung Display for real-time process monitoring.

2022. 04 **OES Supply (2nd)**

Second delivery of OES system to Samsung Display.

2022. 04 **National R&D Project**

Selected for Korea MOE-funded project: non-CO_2 GHG emission factor development for semiconductor/display industry (2022–2025).

2022. 06 **TOF-MS to Samsung Display**

Supplied TOF-MS system to Samsung Display for real-time CVD process monitoring.

2023 **Process Monitoring Expansion**

Samsung Electronics TOF-MS field evaluation and purchase. icomby GHG integrated system supply to Samsung Electronics. MOTIE-funded 5-year R&D project launched: display process GHG reduction monitoring.

2024. 09 **KOLAS Accreditation**

Obtained KOLAS accreditation for GHG reduction facility efficiency measurement (Accreditation No. KT1218) — internationally recognized under ILAC MRA.

2025. 01 **KIMM Technology License**

Technology licensing agreement with Korea Institute of Machinery & Materials (KIMM) for transmission-based optical sensor technology for semiconductor/display process monitoring.

2025. 05 **OES Supply (3rd)**

Third delivery of OES system (ioes) to Samsung Display.

2025. 05 **Global Market Entry**

GHG reduction facility efficiency measurement services delivered to GlobalFoundries (Singapore) and Micron Technology (Taiwan) — first overseas service deployments.

Technology.

Technology Development Milestones

2006. 06
Low-Pressure Gas Quantitative Analysis System
Inlet system and gas analysis technology for low-vacuum ultra-trace gases
Tech Transfer (KRISS)

2007. 12
Low-Vacuum Sample Gas Collection Device
Vacuum-breaking device for low-vacuum sample gas collection
Tech Transfer (KRISS)

2013. 09
Charged Particle Size Filtering Technology
Electrical filter-based particle filtering by charge size (PBMS)
Tech Transfer (KRISS)

2020 – 21
GHG Efficiency Measurement Automation
Fully automated scrubber efficiency measurement system (semiconductor/display)
Commercialized

2020 – 24
TOF-MS In-Situ Process Monitoring Localization
Domestic development of TOF-MS for real-time chamber gas monitoring
Commercialized

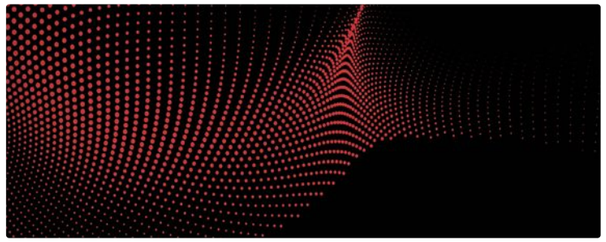
2022 – 25
Non-CO_2 GHG Emission Factor Development
N_2O, NF_3 national emission factor development (Korea MOE project)
Ongoing

2023 – 28
Display GHG 20% Reduction Monitoring System
Process and residual gas monitoring for 20% GHG reduction recipe development
Ongoing (MOTIE, 5yr)

2023. 07
KIMM OES Technology License
High-reliability optical sensor for semiconductor/display process diagnostics
Tech Transfer (KIMM)

2024. 09
KOLAS Accreditation (KT1218)
KSI0587:2023 & ES13501 GHG reduction efficiency measurement accreditation
Accredited

2025. 01
KIMM Transmission Optical Sensor License
Transmission-based optical sensor for next-gen process monitoring (ioes-Ad)
Tech Transfer (KIMM)



Patents & IP

2012. 03
OLED Auto-Input Destruction Device
Turntable-type auto destruction device for OLED cell internal measurement
Patent Registered

2012. 03
QMS Absolute Quantity Measurement System
Absolute quantitative analysis of low-vacuum ultra-trace gases using QMS
Patent Registered

2016. 01
Particle Detector Deflector Structure (×2)
Electrical deflector design improvements for PBMS detection efficiency
Patent Registered

2016. 05
Calibration Automation for GHG Measurement
Automated calibration using tracer gas (inert gas) for absolute quantitative accuracy
Patent Registered

2020. 03
TOF-MS Gas Mass Analysis Monitoring System
Short-cycle monitoring system exceeding conventional RGA — 100% Korean technology
Patent Registered

2020. 09
GHG Reduction Facility Efficiency Auto-Analysis
Automated analysis system per KSI0587 and national process test standards
Patent Registered

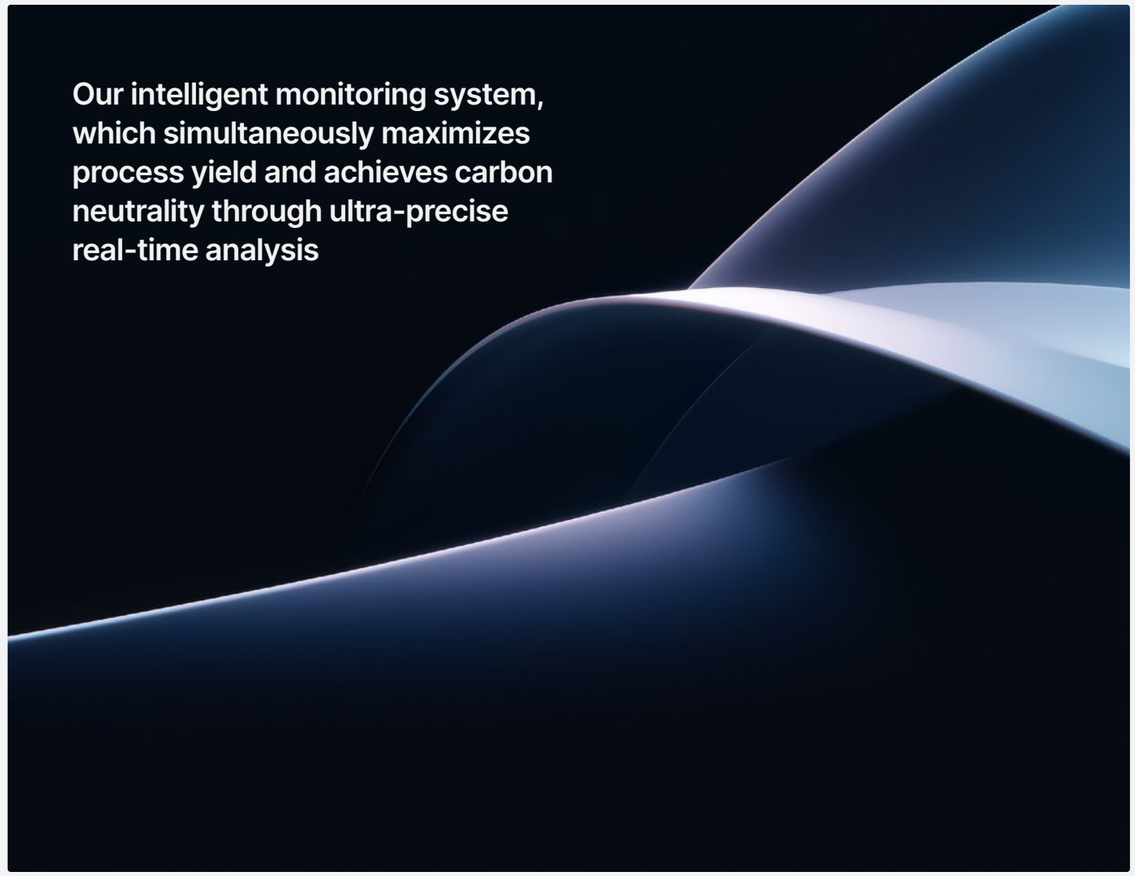
2021. 10
Variable Flow GHG Reduction Efficiency System
Auto-measurement with variable gas inlet/outlet flow per KSI0587 standards
Patent Application

2023. 05
Si Nanoparticle Fabrication via ICP (US, JP)
Monodisperse silicon nanoparticle manufacturing technology using ICP
Foreign Patent (Acquired)

2023. 08
OES CVD Process Monitoring System (EPD + Film)
Real-time temperature-corrected OES system for CVD process & film thickness
Patent Registered

2020 - 21
GHG Auto-Measurement System (China)
International patent application in China for overseas market protection
Foreign Patent Filing

Use Cases.



Our intelligent monitoring system has demonstrated tangible benefits from its adoption, including visible improvements in yield and reductions in operating costs in high-precision, cutting-edge high-tech processes. Global display manufacturers have established a robust diagnostic system that uses our TOF-MS equipment to detect minute changes in composition in real time—changes that could not be captured by conventional RGA systems—thereby preventing process defects before they occur.

In the case of specialty process gas manufacturers, we have achieved thorough automation of quality control by integrating its quadrupole mass spectrometer (QMS)-based automatic calibration technology to create a fully automated hydrogen measurement gas analysis system. Furthermore, through participation in national power facility demonstration projects, we are successfully operating an optimized system that monitors the treatment efficiency of SF6 neutralization facilities—which handle the greenhouse gas SF6—in real time based on standard methodologies.

Our efficiency measurement and monitoring solutions mitigate the risk of equipment downtime and, through accurate carbon emissions forecasting, simultaneously support the transition to carbon neutrality and enhance competitiveness in green manufacturing.

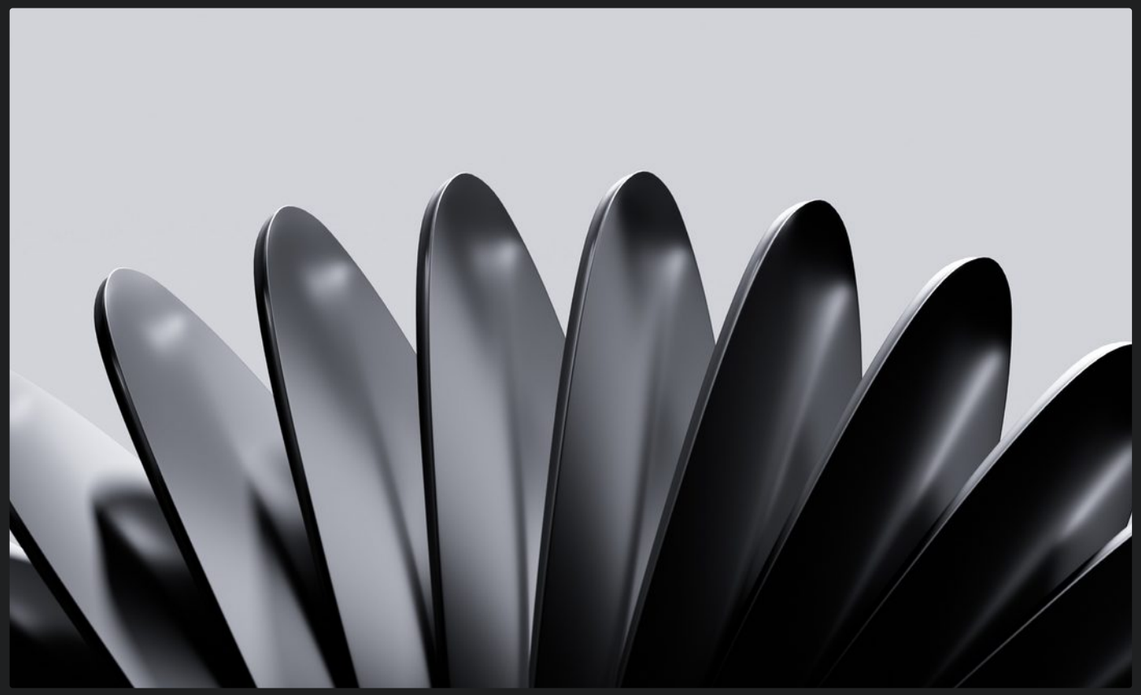
Customer Requirements	Implementation(Planned) and Use Cases
Display manufacturer A. Request to establish a process diagnostic system for real-time monitoring of reaction gases in CVD process chambers	itof [1]Implementation of a TOF-MS system; [2] Utilization for real-time monitoring of components that cannot be measured using other companies' RGA systems
A manufacturer of specialty gases for semiconductor processes B. Domestic development of TOF (Time of Flight) technology for real-time gas monitoring in semiconductor and display process chambers	iquad-s icaly [3]Development of an Automatic Calibration System Using QMS; Utilization in Quality Control via an Automated Hydrogen Measurement System
Researcher at the Electric Power Research Institute C. Development of National Emission Factors for N_2O and NF_3 for Calculating National Greenhouse Gas Emissions	iquad Establishment of an automated measurement system based on the standard methodology for measuring the efficiency of greenhouse gas reduction facilities; real-time monitoring of the treatment efficiency of SF_6 neutralization equipment
Display manufacturer D (joint development). Developed a process recipe that reduces greenhouse gas emissions by 20% as part of its carbon neutrality initiatives	icomby Joint Development to Accurately Assess Greenhouse Gas Emissions at Facilities and Ensure the Efficient Operation of Greenhouse Gas Treatment Facilities
National Research Institute E (Joint Development). Technology for measuring refractive index and film thickness through real-time monitoring of display process chambers	iquad-s Joint Development of a Multi-Sensor Monitoring System to Demonstrate the Development of a Recipe for a 20% Reduction in Greenhouse Gas Inputs in Process Operations

[1] TOF-MS(Time of Flight) [2] RGA(Residual Gas Analyzer) [3] QMS(Quadrupole Mass Spectrometer)

Partnership.

our technological journey over the past 20 years is the result of the strong trust we have built with global giants driving the worldwide high-tech market and leading national think tanks. Samsung Electronics and Samsung Display are key partners that have adopted and are operating our real-time process diagnostic sensors and integrated greenhouse gas analysis and monitoring systems in their dedicated facilities. Furthermore, we maintain unwavering partnerships not only with world-class manufacturing companies such as SK Hynix, LG Electronics, and LG Display, but also with leading firms in Korea's key industries, including Hyosung Heavy Industries, Air First, and POSCO.

In addition, we lead the ecosystem of core technologies by continuously licensing promising future technologies from top government-funded research institutes and university laboratories, such as the Korea Research Institute of Standards and Science (KRISS), the Korea Institute of Machinery and Materials (KIMM), and KAIST. On the global stage as well, we are pushing the boundaries of manufacturing worldwide by successfully supplying greenhouse gas efficiency measurement solutions to production sites of GlobalFoundries in Singapore and Micron Technology in Taiwan.



Semiconductor

SAMSUNG · SK hynix · GlobalFoundries · Micron · CSK · OXMT · GST

Display

SAMSUNG DISPLAY · LG Display · Hanwha NxMD · SEMES · SFA · KCC GLASS

Energy & Steel

kepco · posco · Hanwha · HYOSUNG HEAVY INDUSTRIES · AIRFIRST · TES

Research Institutions

KIMM KOREA INSTITUTE OF MACHINERY & MATERIALS · KRISS Korea Research Institute of Standards and Science · KAERI 한국원자력연구원 Korea Atomic Energy Research Institute · KAIST · HANYANG UNIVERSITY

Our Services.

From measurement to monitoring and consulting — we deliver the full spectrum of gas analysis as a one-stop solution.

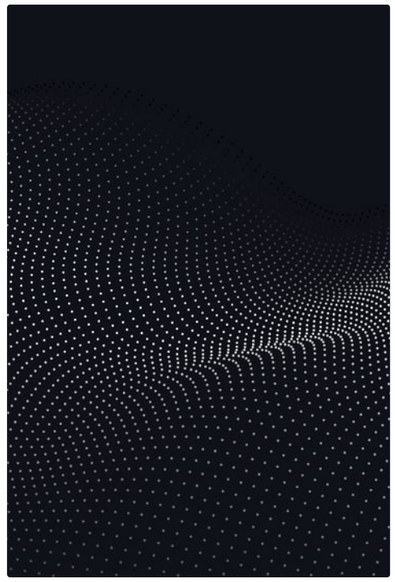
01

GHG Measurement & Consulting (KOLAS)

GHG Reduction Facility Efficiency Measurement

As a KOLAS-accredited lab, we accurately measure high-GWP greenhouse gas reduction in semiconductor and display processes, issuing internationally recognized test reports.

ES13501 | KSI0587:2023 | SF_6 / NF_3 / CF_4 | Fully Automated



02

Process Chamber Monitoring

Real-Time Process Chamber Monitoring

We analyze the gas composition inside plasma process chambers in real time using our proprietary itof (TOF-MS) and ioes (OES) systems.

Anomalies are detected the moment they occur — preventing yield loss, protecting equipment, and building the data foundation for AI-driven process automation.

OES | TOF-MS | Plasma Chamber | CVD Process



03

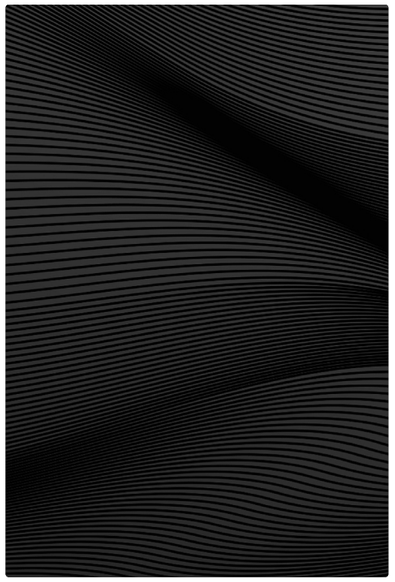
Gas Analysis & Sampling

Client-Requested Gas Analysis & Sampling

We provide qualitative and quantitative gas analysis services for customers who cannot easily perform gas analysis in-house.

Using QMS-based technology, we cover what conventional GC and FT-IR cannot — including low-vacuum ultra-trace gases, above-atmospheric pressure samples, and absolute component quantification — all in a one-stop service from on-site sampling to laboratory-grade precision.

QMS Analysis | 5ppm±3% | Out-gassing | OLED Cell



04

Vacuum System Total Consulting & Design

System Consulting, Design & Parts Sales

Gas analysis begins with vacuum. We provide expert consulting on vacuum system design, optimal component selection — fittings, valves, regulators, pumps, and gauges — custom pumping station builds, on-site troubleshooting, and equipment rental. Whether you need a single fitting or a complete multi-port high-vacuum station, we deliver solutions optimized for your process and budget.

Vacuum | Consulting



Our Products.

Our in-house developed analysis systems, built on 20 years of field experience. Designed with fully automated software so that anyone — not just gas analysis experts — can operate them with ease.

iquad

iquad is a Quadrupole Mass Spectrometry (QMS) gas analysis system designed for reliable multi-component measurement in laboratory environments. With fully automated software, it delivers accurate quantitative data without requiring expert operators — from out-gassing tests to sealed OLED cell analysis.



iquad-s

iquad-s is a compact, portable QMS gas analysis system designed for on-site real-time measurement where sampling-then-analysis is impractical. It injects target gas directly for immediate analysis, and uses monoatomic tracer gas (Kr) concentration to calculate total volumetric flow rate — a method capable of measurements that FTIR cannot perform.



icomby

icomby integrates QMS and FTIR in a single system to measure both the concentration and volumetric flow rate of greenhouse gases simultaneously. By eliminating the inter-system timing gap and integration errors of separate instruments, icomby reduces measurement uncertainty and delivers real-time emission output at the moment measurement ends — the definitive tool for Emissions Trading Scheme compliance.



itof

itof uses Time-of-Flight Mass Spectrometry (TOF-MS) to simultaneously detect all gas-phase species in a process chamber — not sequentially, like QMS. With a mass scan speed of 2,000 scans/sec and a mass range of 0.7–500 amu, itof captures the complete gas composition profile at every moment of the process cycle, enabling true real-time monitoring of complex semiconductor and display manufacturing chemistry.



ioes

ioes uses Optical Emission Spectroscopy (OES) to analyze light emitted by plasma species inside process chambers — without contacting the gas stream. By monitoring spectral intensity across 200–1050 nm, ioes tracks endpoint detection (EPD), plasma temperature, species concentrations, and real-time film thickness and refractive index of deposited layers on wafers and glass substrates.



imerge

imerge integrates iquad-s (QMS), itof (TOF-MS), and ioes (OES) into a single monitoring platform for semiconductor and display manufacturing processes. By combining mass spectrometry and optical emission data in synchronized real time, imerge delivers a complete picture of process chamber chemistry — enabling greenhouse gas usage optimization, process drift detection, and emission monitoring from a single instrument.



ivacuum

ivacuum is our custom-configured high-vacuum pumping station — combining a turbomolecular pump (TMP), backing pump, and vacuum gauges in a compact, application-optimized enclosure. With pumping speeds from 80 to 700 l/s and an ultimate pressure below 10^{-6} mbar, ivacuum delivers the stable, clean vacuum environment required for gas analysis instruments, research chambers, and advanced semiconductor/display process equipment.





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