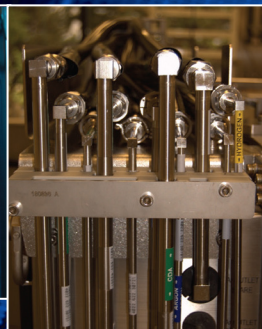
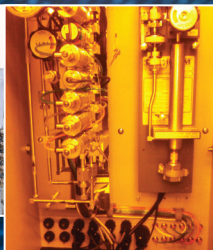


# Ultra-High Purity Gas Handling Solutions Nippon Sanso Matheson's Advanced Technology



Equipment. Gas. Purification.

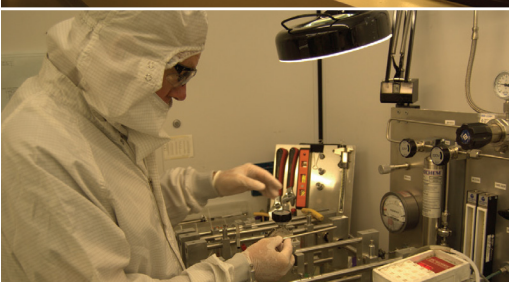




UHP assembly clean room

Nippon Sanso Matheson's Ultra-High Purity Equipment & Purification Technology Team develops, designs and manufactures custom equipment to solve the most challenging ultra-high purity gas management and purification requirements.

Our core capabilities allow us to deliver prototype systems rapidly and to ramp quickly to production volume.



UHP orbital welding

Whether you require process gas modules or advanced turnkey process systems, Nippon Sanso Matheson will collaborate with you from concept - to prototype - to optimized production.

## Dedicated Research in a Purpose-Built Facility

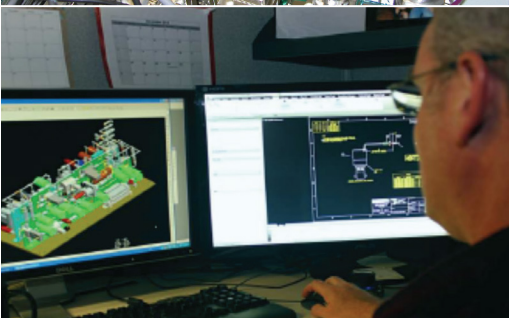
Nippon Sanso Matheson's Advanced Technology Center (ATC), located in Longmont, Colorado, USA, is dedicated to advanced research and development of pure gases, gas handling equipment, micro-contamination studies, and the latest purification technologies.



UHP compact surface mounted manifold

If you can't measure it, you can't improve it. Nippon Sanso Matheson's ATC has one of the most extensive in-house evaluation laboratories and testing facilities in the industry to assess the quality of gases, purifiers, and gas system components.

## UHP Equipment Design and Manufacturing



Computer aided modeling

As a gas manufacturer we understand that producing pure molecules is just the first step. Gas users need to control and move those molecules, and maintain the purity from the source to the point of use.

Nippon Sanso Matheson's full complement of skilled professional scientists and engineers will work side-by-side with you to design, test and produce custom gas handling equipment solutions to address your most difficult gas management and purification challenges. Meeting, then exceeding, your expectations is our goal.



HMI and controller development

The Advanced Technology Center is ISO 9001:2008 certified, and all employees are rigorously trained in ISO 9001 manufacturing and operations processes, as well as Lean Six Sigma principles for quality improvement and efficiency.

## Purity is What We Do

As producers of our own high purity gases, we understand the challenges of gas purification.

Since 1985, Nippon Sanso Matheson's Nanochem® purifiers have provided best-of-kind purification solutions to the electronics industry, and were the first point-of-use purifiers to deliver up to nine 9's purity gas to the semiconductor industry.



Nanochem® Purification

Our ultra-purification technologies may have been born in the semiconductor industry, but they are not confined there. We have built a comprehensive set of solutions for the source, point-of-use, and bulk purification requirements of gas users in any industry.

## Our Core Competencies

### Design

### Engineering

### Documentation

### UHP Equipment Manufacturing

Clean Room Operations  
Class 10 Welding  
Class 1,000 Module Assembly and Test  
Class 1,000 Cabinet Assembly and Final Testing  
Kan-Ban Racks for All Gas Modules  
Manufacturing Engineering Supported  
Qualified Test Stations

### UHP Equipment Testing

Dedicated Testing for Gas Systems  
Class 1000 Clean Room  
PLC/HMI Driven Test Panels  
Helium Leak Testing  
 $1 \times 10^{-9}$  atm-cc / sec  
Moisture Testing  
< 10 ppb Limit  
Specialize Testing Requirements  
TOC Testing  
Particle Testing  
Surface Cleanliness  
UV Black Room

### Analytical Technology

Gas Analysis Methods:  
Mass Spectrometry, APIMS, TOF-MS & RGA  
FTIR Spectroscopy  
Gas Chromatography (GC-PDHID, GC-AED, GC/MS)  
Moisture Analyzers (CRDS, Quartz Crystal,  $P_2O_5$ ,  
Chilled Mirror)  
Oxygen Analyzers  
Inert Gas Particle Analyzers, Corrosive Gas Particle  
Analyzers  
Inductively Coupled Plasma Mass Spectrometry  
R&D Materials Analysis:  
Class 100 Clean Room  
XRD/XRF Spectrometer  
Thermal Analysis  
Glove Boxes for Sensitive Materials  
Ventilated Walk-In Hoods  
R&D Wafer Metrology:  
Reflectometry  
Surface Profilometry  
Microscopy (Optical and FTIR)

### Gas Purification

Gas-Dependent Purification Media  
12 Different Media  
40 Different Gases Purified  
 $O_2$  Species to 100 ppt  
 $H_2O$  /  $CO$  /  $CO_2$   
Halocarbons & Hydrocarbons  
Volatile Metals  
Ultra-High Purity Hardware  
Flow and Pressure Dependent

## Core R&D Focus



### FROM SOURCE TO POINT OF USE

#### Ultra-Pure Process Gas Manufacture

New gas product synthesis, purification and pilot scale up



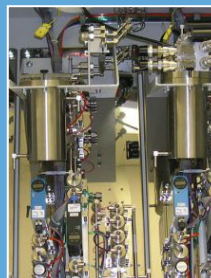
#### Trace Gas Analysis

Trace impurity detection and in-situ process monitoring



#### Gas Packaging and Delivery Technology

Cylinder materials & preparation, microcontamination studies



#### New Process and Equipment Development

Novel UHP equipment, mixtures and precursors for next generation processes



#### Point-of-Use Purification

New media / equipment for removing critical impurities

## About Nippon Sanso Matheson

Nippon Sanso Matheson is a single source for industrial, medical, specialty and electronic gases, gas handling equipment, high performance purification systems, engineering and gas management services, and on-site gas generation. Our mission is to deliver innovative solutions for global customer requirements.

Nippon Sanso Matheson (founded in 1927) is the largest subsidiary of the Taiyo Nippon Sanso Corporation Group (founded in 1910). Taiyo Nippon Sanso Corporation (TNSC) is the largest supplier of industrial gases in Japan, and one of the five largest suppliers of industrial, specialty, and electronics gases in the world. Nippon Sanso Matheson became a subsidiary of TNSC in 1984.

We have a depth of technology and resources that can come only from a global enterprise.

## Nippon Sanso Matheson and Safety

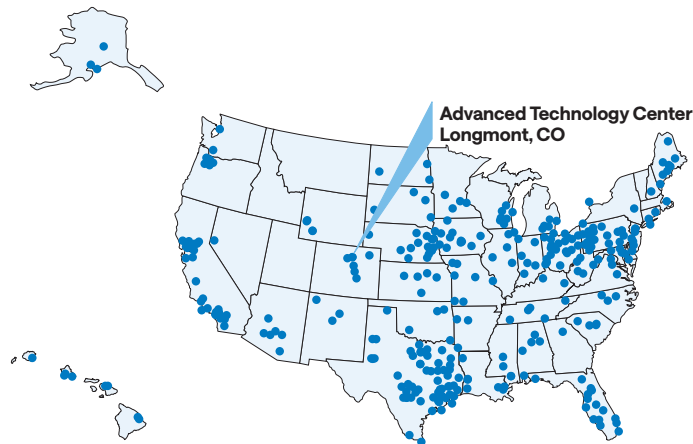
Nippon Sanso Matheson places the highest value on Safety – every day. We value our safety record, and we've received many industry awards for our safe operations. All of our employees are thoroughly trained on an ongoing basis to deliver Nippon Sanso's safety standards.

## Nippon Sanso Matheson and Quality

Nippon Sanso Matheson also places the highest value on Quality. Our plants are certified to ISO 9001 standards, and we employ Lean Six Sigma principles to measure and improve our quality results on a basis of continuous improvement

## Nippon Sanso Matheson and Sustainability

Nippon Sanso Matheson is committed, at all levels, and in all locations, to principles of Sustainability and Corporate Responsibility. Our principles embrace Environmental Sensitivity, Community Support, and Financial Performance. Our aim is to ensure uninterrupted access to our products and services. The Advanced Technology Center (including equipment) is ISO 9001:2015 certified.



Over 300 locations coast-to-coast

## Our Mission:

The UHP Equipment & Purification Business Unit develops, designs and manufactures custom equipment to solve the most challenging ultra-high purity gas management and purification problems in any industry. Our core capabilities allow us to deliver prototype systems rapidly and to follow up with production units, which exceed customer expectations – consistently.

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