MATHESON STACK EMISSION CALIBRATION PROGRAM

“Experience the MATHESON Commitment to Supply Chain Excellence”
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MATHESON is a single source for industrial, medical, specialty, and electronics gases ... as well as gas handling equipment, high-performance purification systems, engineering and gas management services, and onsite gas generation.

MATHESON is the largest subsidiary of the Taiyo Nippon Sanso Corporation, one of the five largest suppliers of gases in the world. We have a depth of technology and resources that can come only from a global enterprise.

We also work hard to hold onto our local values, with personalized service and a real interest in understanding — and resolving — your gas use and management requirements.

Our mission is to deliver innovative improvements ... in ways that have tangible benefit and cost effectiveness for our customers.

MATHESON is an established manufacturer of NIST traceable calibration gas mixtures for Stack Emissions Monitoring and environmental compliance. MATHESON offers standard and custom EPA Protocol and daily standard gas mixtures complying with Federal and State regulations. The MATHESON EPA Protocol gases are in aluminum cylinders, with 1% certification accuracy validated using direct NIST traceability. MATHESON Acid Rain CEM grade Air and Nitrogen meet the U.S. EPA zero gas specifications.

MATHESON’s commitment to accuracy and quality is validated by our accomplishment of ISO 17025 accreditation of EPA Protocol and Cal-MAT grade standards in 2015.

For U.S. EPA regulated minor components, MATHESON has an automated dynamic blending system. Dynamic blending ensures very tight blend tolerances, plus the system has capability to conduct +/-1.0% certification accuracy that is required of 40CFR60 daily standards. For the 40CFR75 and 40CFR60 compliant EPA Protocols with +/-1% certification accuracy, MATHESON always conducts individual cylinder analysis and certification on our automated NDIR/chemiluminescent instrument benches. MATHESON maintains NIST SRM, NIST NTRM, and VSL PRM to achieve the +/-1% accuracy — and minimize cylinder to cylinder biases.

The MATHESON Microshield treatment of the inner cylinder surfaces maximizes the reactive minor component stability. While all EPA Protocol manufacturers must apply the standard U.S. EPA shelf-lives, MATHESON Microshield treatments ensure that the minor component concentrations stay within the +/-1% certification accuracy for the duration of the shelf-life.

When repeatability and high volume are keys to your success, MATHESON also uses the UniBlend automated batch blending technology for 2-12 identical cylinders.

Our 85+ years of experience in industrial gas applications and equipment makes MATHESON an ideal provider for your gas, equipment, and services requirements.

Call us at 800-416-2505 or email us at info@mathesongas.com and let us know how we can help you.
The MATHESON Stack Emission Calibration Program will maximize your operating efficiencies by addressing the six key parameters that customers must have from their suppliers to achieve supply chain excellence.

- **CONVENIENCE** using the MATHESON Item Master process that ensures fast re-ordering
- **QUALITY** system certification to ensure consistent reliability and safety; plus continuous efforts to reduce lead-times and on-time deliveries. MATHESON participates in the U.S. EPA Protocol Gas Verification Program
- **PRODUCTS** and measurement systems designed to comply with the certification accuracy for the duration of the shelf-life; also NOx mixtures often have less than 1% relative NO2 impurity
- **HEALTH & SAFETY** hazardous gas monitoring products plus equipment design integrity to protect your personnel and work environment
- **SUPPORT** whenever you need it from our sales, technical and service support teams
- **DELIVERY** options tailored to your operating needs

**CONVENIENCE**

The MATHESON Item Master Process

MATHESON works with our customers to capture all gas mixture components, concentrations, mixture grade and cylinder size. All of this information is applied order after order, and cylinder after cylinder. All you have to tell us is your item number.

Additional MATHESON Convenience Features:

- Selected stocked products to provide emergency or “24-hour” delivery service
- Additional Certificate of Analysis copy available on request

**QUALITY**

Systems Designed for EPA Protocol Gas Mixture Optimization

- **ISO 9001:2008 Certified Manufacturing Facilities**: Gas and equipment products manufactured to international industry standards
- **ISO 17025: 2005 Accreditation**: Confirms laboratory and technical programs capable of the accuracy and stability of EPA Protocols
- **U.S. EPA Verified**: Participation in the U.S. EPA Protocol Gas Verification Program
- **Direct NIST Traceability**: EPA Protocols with direct NIST traceability from use of NIST SRM and NTRM during laboratory analysis
- **Stability**: Microshield cylinder treatments that ensure the long term stability of reactive minor components, plus minimization of the NO2 impurity in NOx EPA Protocols
- **“C of A’s”**: Certificates of Analysis that provide the U.S. EPA contents for EPA Protocols, plus MATHESON includes the measurement triad data to gauge the high precision of the MATHESON measurement systems
- **Automation**: Automated analysis, data acquisition, calculations, and generation of the Certificate of Analysis that provides high volume capacity plus enhances accuracy of the certificate of analysis contents

**Analyzers used for MATHESON EPA Protocol Mixture Testing and Certification**

<table>
<thead>
<tr>
<th>Analyzer Principle</th>
<th>Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>NDIR: Non Dispersive Infrared</td>
<td>• Carbon Monoxide</td>
</tr>
<tr>
<td></td>
<td>• Sulfur Dioxide</td>
</tr>
<tr>
<td></td>
<td>• Carbon Dioxide</td>
</tr>
<tr>
<td>Chemiluminescent</td>
<td>• Nitric Oxide</td>
</tr>
<tr>
<td></td>
<td>• Nitrogen Dioxide</td>
</tr>
<tr>
<td></td>
<td>• Total NOx</td>
</tr>
<tr>
<td>FID (Flame Ionization Detector)</td>
<td>• Methane</td>
</tr>
<tr>
<td></td>
<td>• Propane</td>
</tr>
<tr>
<td></td>
<td>• Total Hydrocarbons</td>
</tr>
<tr>
<td>Paramagnetic</td>
<td>• Oxygen</td>
</tr>
</tbody>
</table>
### Products for Stack Emissions and Monitoring

<table>
<thead>
<tr>
<th>Utility Analyzer</th>
<th>Test for</th>
<th>Zero Gases</th>
<th>Quarterly Calibration Gases</th>
<th>40CFR60 Daily Gases</th>
</tr>
</thead>
<tbody>
<tr>
<td>NDIR</td>
<td>Carbon Monoxide</td>
<td>Nitrogen, CEM</td>
<td>EPA Protocol Concentrations from: ≥ 2 ppm in Nitrogen</td>
<td>CalMat 1, CalMat 2 Certified Plus Grade Concentrations from: ≥ 2 ppm in Nitrogen</td>
</tr>
<tr>
<td>NDIR</td>
<td>Carbon Dioxide</td>
<td>Nitrogen, CEM</td>
<td>EPA Protocol Concentrations from: ≥ 100 ppm in Nitrogen</td>
<td>CalMat 1, CalMat 2 Certified Plus Grade Concentrations from: ≥ 100 ppm in Nitrogen</td>
</tr>
<tr>
<td>NDIR</td>
<td>Sulfur Dioxide</td>
<td>Nitrogen, CEM</td>
<td>EPA Protocols Concentration from: ≥ 10 ppm</td>
<td>CalMat 1, CalMat 2 Certified Plus Grade Concentrations from: ≥ 10 ppm</td>
</tr>
<tr>
<td>Chemiluminescent</td>
<td>NO and NO₂</td>
<td>Nitrogen, CEM</td>
<td>EPA Protocol Concentrations from: ≥ 2 ppm in Nitrogen</td>
<td>CalMat 1, CalMat 2 Certified Plus Grade Concentrations from: ≥ 2 ppm in Nitrogen</td>
</tr>
<tr>
<td>FID</td>
<td>Propane, Methane</td>
<td>FID Fuel, 40% Hydrogen/Balance</td>
<td>EPA Protocol Concentrations from: ≥ 0.3 ppm in Air</td>
<td>CalMat 1, CalMat 2 or Certified Plus Grade Concentrations from: ≥ 0.3 ppm in Air</td>
</tr>
</tbody>
</table>

### Calibration Gas Chart for Stack Emissions and Monitoring

<table>
<thead>
<tr>
<th>Polluter</th>
<th>U.S. Regulation</th>
<th>Daily CEMs</th>
<th>Quarterly CEMs</th>
<th>Annual CEMs</th>
</tr>
</thead>
</table>
| Stationary Gas Turbines   | 40CFR Part 60 subpart GG | • Daily Zero and Span Check  
• CEM Zero Air or N₂ Gas  
• Span Gas CalMat 2 | • Linearity  
• 3-Point Test  
• EPA Protocols | RATA/once/yr EPA Protocols; 
Agree with Auditor at 15% Accuracy |
| Industrial & Utility Stacks Plus Cogeneration Plants | 40CFR Part 60 | • Daily Zero and Span Check  
• CEM Zero Air or N₂ Gas  
• Span Gas CalMat 2 | • Cyl. Gas Audit  
• 2-Point Test  
• EPA Protocols | RATA/once/yr EPA Protocols; 
Agree with Auditor at 20% Accuracy |
| Acid Rain Utilities       | 40CFR Part 75 | • Daily Zero and Span Check  
• EPA Protocols  
• Acid Rain CEM Zero Air or N₂ Gas | • Linearity  
• 3-Point Test  
• EPA Protocols | RATA/once/yr EPA Protocols; 
Agree with Auditor at 10% Accuracy; If agree < 7.5% can exempt one quarterly test |
| Also: HCl                 | MACT issued December, 2011 | HCl is periodically measured to validate the system as meeting the U.S. EPA MACT standard | | |
| Boiler & Industrial Furnaces | 40CFR Part 266 | • Daily Zero and Span Check  
• CEM Zero Air or N₂ Gas  
• Span Gas CalMat 2 | • Linearity  
• 3-Point Test  
• EPA Protocols | RATA/once/yr EPA Protocols; 
Agree with Auditor at 15% Accuracy |
| Municipal Waste Combustors| 40CFR Part 60 subpart Ea | • Daily Zero and Span Check  
• CEM Zero Air or N₂ Gas  
• Span Gas CalMat 2 | • Linearity  
• 3-Point Test  
• EPA Protocols | RATA/once/yr EPA Protocols; 
Agree with Auditor at 15% Accuracy |
| Portland Cement Kilns     | 40CFR Part 60 subpart F | • Daily Zero and Span Check  
• CEM Zero Air or N₂ Gas  
• Span Gas CalMat 2 | • Linearity  
• 3-Point Test  
• EPA Protocols | RATA/once/yr EPA Protocols; 
Agree with Auditor at 15% Accuracy |
| Also: THC, HCl            | New Source Performance Standard in 2013 | • NSPS requires validation | | |
| Refineries                | 40CFR Part 60 subpart J | | Refer to the Refinery Brochure | |

### EPA Protocol Certificate of Analysis Content

- Certificates of Analysis and Cylinder Tags Comply with U.S. EPA Protocol documentation requirements
- MATHESON reports NOx as a reported value per the latest revision of U.S. EPA Method 7E for Nitric Oxide EPA Protocols
- MATHESON adds the measurement triad data to demonstrate our excellent measurement precision
HEALTH & SAFETY
Monitoring for OSHA Compliance
• MATHESON Portables LEL and H₂S/CO/Methane/Air mixtures for your safety and industrial health programs. Many more standard and custom mixtures and pure gases, and gas delivery products are available (see the MATHESON Portables Catalog)
• Gas Cabinets and Panels for safe gas handling and delivery to point of use
• Hazardous gas monitoring systems including fixed and portable instruments, plus Kitagawa tubes
• On-site safety training programs and education products to enhance and improve safety awareness

SUPPORT
MATHESON Technical and Service Support:
• Expert Mixture Phase Engineering using state-of-the-art software
• Specialty Gas Team who understand stack emissions products and cylinder package options - (Product Manager, Technical Service Coordinator, Gas Operations Team, and Customer Service Team)
• Personalized service at your door with field sales, and on the phone with dedicated customer service representatives
• Dedicated customer service representatives assigned to your account
• MATHESON’s Customer Arrangements systematize your products and pricing

MATHESON Equipment To Support Facility Gas Usage:
• Cylinder regulators for quantitative gas delivery
• Gas panels for control of gas supplies
• Automated manifolds and alarms for control of high volume gas usage

DELIVERY
• Designed to suit your facility and operating hours
• Options for delivery

MATHESON is committed, without limitation, to be your “go to” company for maximizing profits and minimizing operating costs.

Thank you for your interest in our specialty gas and equipment products. For more information, please visit the MATHESON website @ www.mathesongas.com, or call our customer service center @ 800-416-2505 to have one of our sales representatives contact you directly.

“Experience the MATHESON Commitment to Supply Chain Excellence”
MATHESON'S EPA Protocol Certificate of Analysis:
The passport to Measurement Quality and Reliability

Certificate of Analysis - EPA Protocol Mixtures

Customer: 
Protocol: G1 
Reference # T198486-01 
Lot# 9304610861

Cylinder Number: SX48980 
Cylinder Pressure: 1000psi 
Last Analysis Date: 8/27/2014 
Expiration Date: 8/20/2022

DO NOT USE THIS CYLINDER WHEN THE PRESSURE FALLS BELOW 100 PSI

REPLICATE RESPONSES

Component: Sulfur Dioxide Date: 8/20/2015  Date: 8/27/2015
Certified Conc: 199.4ppm +/-0.8ppm ABS 199.3 199.3
Component: Nitric Oxide Date: 8/13/2015  Date: 8/20/2015
Certified Conc: 198.7ppm +/-0.8ppm ABS 198.4 198.2
Component: Carbon Monoxide Date: 8/13/2015
Certified Conc: 198.9ppm +/-0.7ppm ABS 198.9
Component: Carbon Dioxide Date: 8/13/2015
Certified Conc: 8.93% +/-0.03% ABS 8.93 8.93

NOx 198.7ppm REFERENCE ONLY

BALANCE GAS: Nitrogen

REFERENCE STANDARDS:

Component: Sulfur Dioxide Component: Nitric Oxide Component: Carbon Monoxide Component: Carbon Dioxide
Cylinder #: FF22334 Cylinder #: CALD17857 Cylinder #: FF20783 Cylinder #: D249783
Concentration: 94.4ppm Concentration: 493.1ppm Concentration: 493.1ppm Concentration: 19.814%
Exp. Date: 6/30/2021 Exp. Date: 10/6/2017 Exp. Date: 9/20/2021 Exp. Date: 10/3/2017
NIST Sample#: 64-31 NIST Sample#: 42-JA-06 NIST Sample#: 2-K-08 VSL Primary

Component: Sulfur Dioxide Component: Nitric Oxide Component: Carbon Monoxide Component: Carbon Dioxide
Make/Model: Horiba VIA-510 Make/Model: Horiba CLA-510SS Make/Model: Horiba VIA-510 Horiba VIA-510
Serial Number: G2000DLR Serial Number: M80V/SNN Serial Number: RL77YOG 41679086021

Notes:
The certification was performed according to EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards May 2012, using procedure G1 and/or G2. U.S EPA Vendor ID Number: DS2014, PGVP
Participation Date: 01/01/15, PGVP Renewal Date: 01/01/16

Analyst: __________________________ Date: 8/27/2015

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