PREMIUM INSIGHTS
INTO PROCESS

Extrel

MAX300-RTG 2.0 Product

Premium Insights Into Process

Agenda

- Process Insights Portfolio
- Quadrupole Mass Spectrometer Overview
- Q & A

About Us

- Providing **engineered** and **fit-for-purpose technologies** – when and where you need them - field-proven industry-leading, turnkey analytical process and quality control solutions that **fit and work together**
- Large, **global installed-base** of customer-success stories
- Cost-effective solutions to meet your budget needs
- **One vendor accountability** - reduces integration and purchasing complexities
- Supported by a **global service, engineering** and **expert** network
- Process Insights is a portfolio company of **Industrial Growth Partners**, a private-equity firm that specializes in industrial technology investments

Our Centers of Excellence

As we continually expand our operations, our primary goal remains the same: to meet the increasing demand for safe, intelligent, and sustainable innovation, products and systems back with global service capabilities.

AMERICAS & HEADQUARTERS

Process Insights
14400 Hollister St.
Suite 800B
Houston, TX 77066 USA
☎+1 (713) 947-9591
info@process-insights.com
sales.hou@process-insights.com
support.hou@process-insights.com

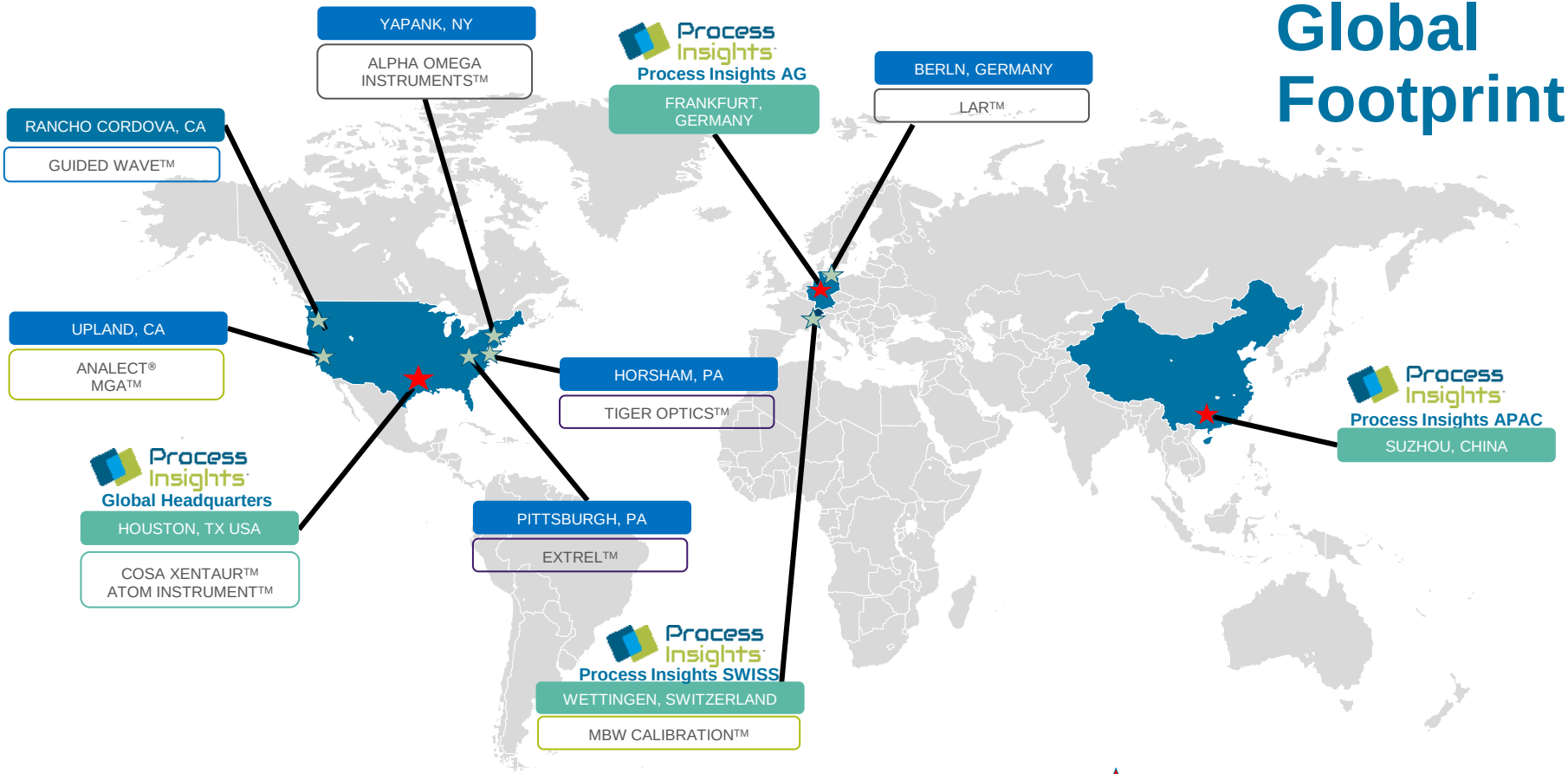
EMEA

Process Insights AG
ATRICOM
Lyoner Straße 15
60528 Frankfurt, Germany
☎+49 (0) 69 20436910
info@emea.process-insights.com
sales@emea.process-insights.com
service@emea.process-insights.com

APAC

Process Insights APAC
Wujiang Economic and Technology Development Zone
215200 Suzhou, Jiangsu Province, China
☎+86 400 086 0106
info@process-insights.com
sales@emea.process-insights.com
service@emea.process-insights.com

Global Footprint



Center of Excellence
Manufacturing, Engineering, Service & Sales

Process Insights

Our Core Expertise & Product Identities

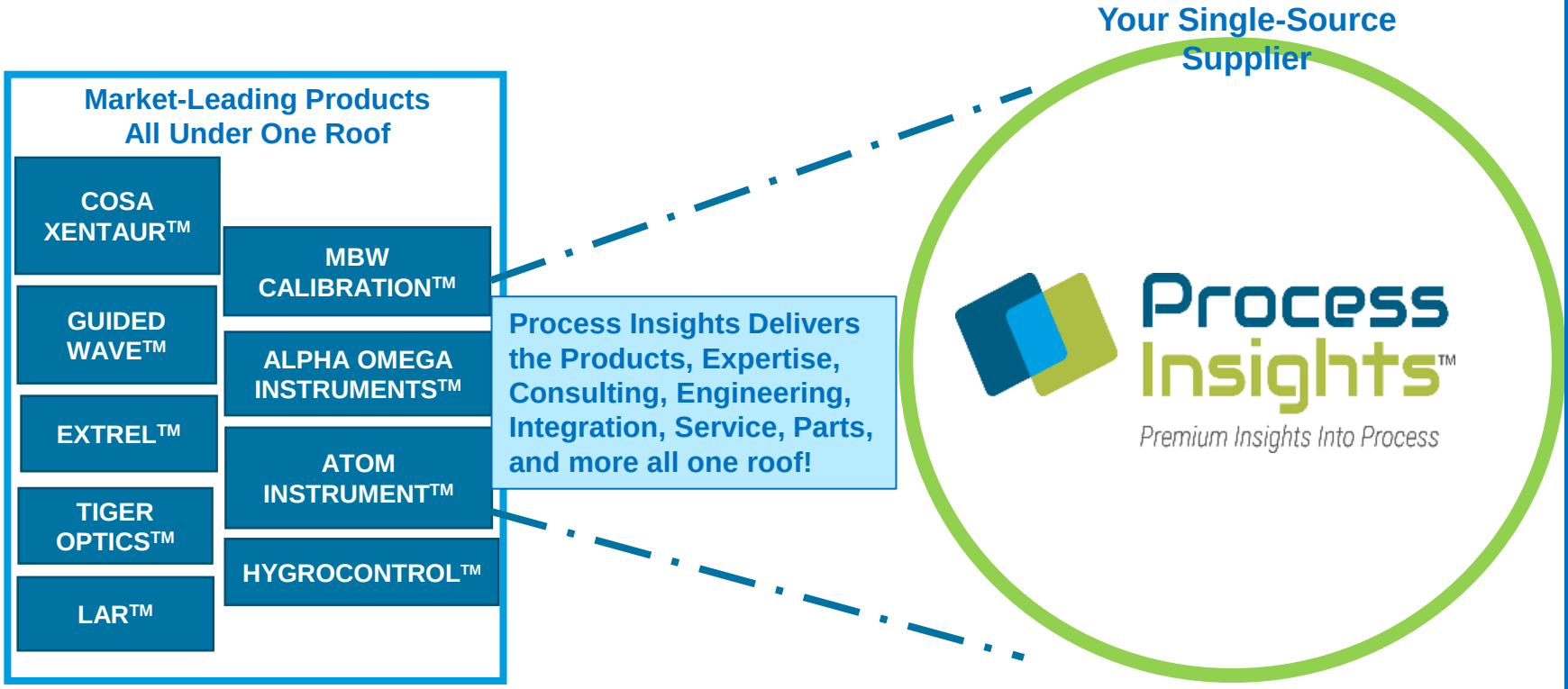
By leveraging our core expertise, premium engineering, and world renown turnkey, product portfolio, we have established ourselves as leaders in the market.

Dew Point Moisture Analyzers, Transmitters & Sensors COSA XENTAUR™	Quadrupole Industrial Process & Lab Mass Spectrometers EXTREL™	Fixed Magnet Industrial Process & Lab Mass Spectrometers MGA™	NIR UV-VIS Lab & Process Spectrometers GUIDED WAVE™	Optical Absorption Spectroscopy Analyzers GUIDED WAVE™
Probes & Flow Cells GUIDED WAVE™	Total Sulfur-Nitrogen Process & Lab Analyzers ATOM INSTRUMENT™	FTIR FT-NIR Process & Lab Analyzers ANALECT™	TOC COD BOD TN Water Quality Analyzers LAR™	Cavity Ring-Down Spectroscopy (CRDS) Gas Analyzers TIGER OPTICS™
BTU Wobbe CARI Injection Style & Direct Calorimeters COSA XENTAUR™	Temperature and Relative Humidity Hygrometers HYGROCONTROL™	Trace & Percent Oxygen Analyzers ALPHA OMEGA INSTRUMENTS™	Dew Point Chilled Mirror Analyzers Hygrometers MBW CALIBRATION™	

Process Insights

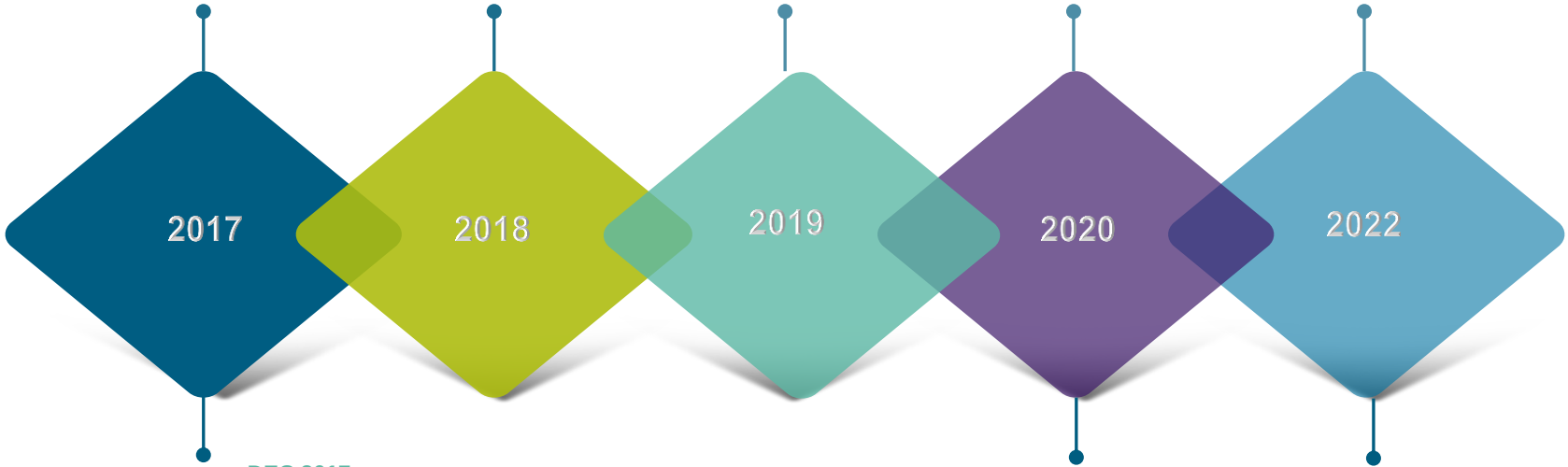
VISIT WEB PAGE

Our Market-Leading Products



Serving a Global Customer Base

Process Insights **Acquisition Timeline**



AUG 2017
COSA XENTAUR
Calorimeters
Dew Point Meters

AUG 2017
HYGROCONTROL
Hygrometers

JUN 2018
TIGER OPTICS
CRDS Gas Analyzers

NOV 2019
ATOM INSTRUMENT
Total Sulfur-Nitrogen Analyzers

MAR 2020
EXTREL CMS
Quadrupole Mass Spectrometers

MAR 2022
GUIDED WAVE
NIR & UV-VIS Lab & Process Analyzers
Probes & Flow Cells

NOV 2017
LAR PROCESS ANALYSERS GMBH
TOC Water Analyzers

DEC 2017
ALPHA OMEGA INSTRUMENTS
Oxygen Analyzers

DEC 2020
MBW CALIBRATION
Chilled Mirror Hygrometers

JUN 2022
SCHNEIDER AIT ANALYZERS
FTIR FT-NIR Lab & Process Analyzers
Fixed Magnet Mass Spectrometers

Process Insights

Age of Our Technologies

Process Insights™

Location	COSA XENTAUR Houston, TX	ATOM INSTRUMENT Houston, TX	ALPHA OMEGA INSTRUMENTS Yaphank, NY	LAR PROCESS ANALYSERS Berlin, Germany	HYGROCONTROL Berlin, Germany
Age of Technology	**55 Years**	**15 Years**	**35 Years**	**37 Years**	**33 Years**

Dew Point & Moisture Sensors

Calorimeters

- Dew Point Measurement Analyzers
- Moisture Measurement
- Aluminum Oxide Sensors
- Relative Humidity Measurement
- Wobbe Index Calorimeters
- BTU Analyzers

Online Total Sulfur Analyzers

Total Sulfur and Nitrogen Lab Analyzers

- Elemental Analyzers for Total Sulfur and Nitrogen
- Patented Excimer Technology

O_2 Sensors and Analyzers

Oxygen Transmitters

- Trace & Percent Oxygen Transmitters and Analyzers
- Safety Monitors
- Electrochemical Sensors
- Zirconium Oxide Sensors

TOC Water Analyzers

BOD Water Analyzers

- Pure/Ultra-Pure, Process & Wastewater Analyzers
- Total Organic Carbon (TOC)
- Chemical Oxygen Demand (COD)
- Biochemical Oxygen Demand (BOD)
- Total Nitrogen Bound (TN)
- Toxicity
- Relative Humidity

Hygrometers

- High-precision relative humidity and temperature meter (hygrometers)

Age of Our Technologies

Location	TIGER OPTICS Horsham, PA	EXTREL Pittsburgh, PA	MBW CALIBRATION Wettingen, Switzerland	GUIDED WAVE Rancho Cordova, CA	SCHNEIDR AIT ANALYZERS Upland, CA
Age of Technology	**20 years**	**57 years**	**60 years**	**45 years**	**35 years**
					
	Single Gas Trace Analyzers **Multi Gas Trace Analyzers** • Cavity Ring-Down Laser Spectroscopy (CRDS) • Ultra-Trace Gas Analyzers • Quantum Cascade Laser Spectroscopy (QCLS) • Myriad of molecular species (toxic, corrosive, hydride, stack gases, etc.)	**Process Mass Spectrometers** **Lab Gas Mass Spectrometers** • Online and Process Quadrupole Mass Spectrometers (QMS) with Speciation • Residual Gas Analyzers (RGAs) • Gas-phase process analyzers	**Dew Point Chilled Mirrors** **Accredited Calibration Laboratory Systems** • Process and laboratory high-quality chilled mirror dew point hygrometers • SF_6 gas quality analyzers • ISO/IEC 17025 Accredited laboratory systems and services for humidity & temperature calibration	**NIR UV-VIS Lab & Process Spectrometers** • Process and laboratory high-quality chilled mirror dew point hygrometers • SF_6 gas quality analyzers • ISO/IEC 17025 Accredited laboratory systems and services for humidity & temperature calibration	**FTIR/FT-NIR Lab & Process Mass Spectrometers** • FTIR/FT-NIR analyzers and the fixed magent process mass spectrometers to measure physical and chemical properties of liquids, solids and gases. • Complement sour Guided Wave brand of NIR and UV-VIS solutions

At A Glance: Some End Markets We Serve

Chemical

Many end products involve processes with chemicals that when mixed with certain gas or liquid contamination will cause harmful effects on the final product.

Industrial

Many welding applications require the use of inert gases that are free of oxygen. Excess oxygen promotes poor welds due to oxidation.

Semiconductor

Exposure of wafers to Airborne Molecular Contaminants (AMCs) is of great concern to semi suppliers and manufacturers. This can cause yields to drop and greatly impact the quality.

Laboratories

Third party standards laboratories will operate a number systems which are used to calibrate 'transfer' standards to the market. Field instruments can then be calibrated against the transferred primary standard for traceability.

Petrochemical

When natural gas is extracted from a field, it requires processing before it can be sold as a pipeline gas. In order to make the gas suitable for sale and use, the heavier components must be removed.

Life Sciences

Drying of solvent-based pharmaceutical products often requires use of process centrifuges. To avoid flash fires, oxygen levels are kept under certain levels.

Energy

All power generation forms present specific challenges to safely measure a range of combustion by-products in a harsh process environment.

Agriculture

Used to determination chemical properties such as Solid Fat Content (SFC) or moisture content in milk powder to assist in usability of the end product.

Environmental

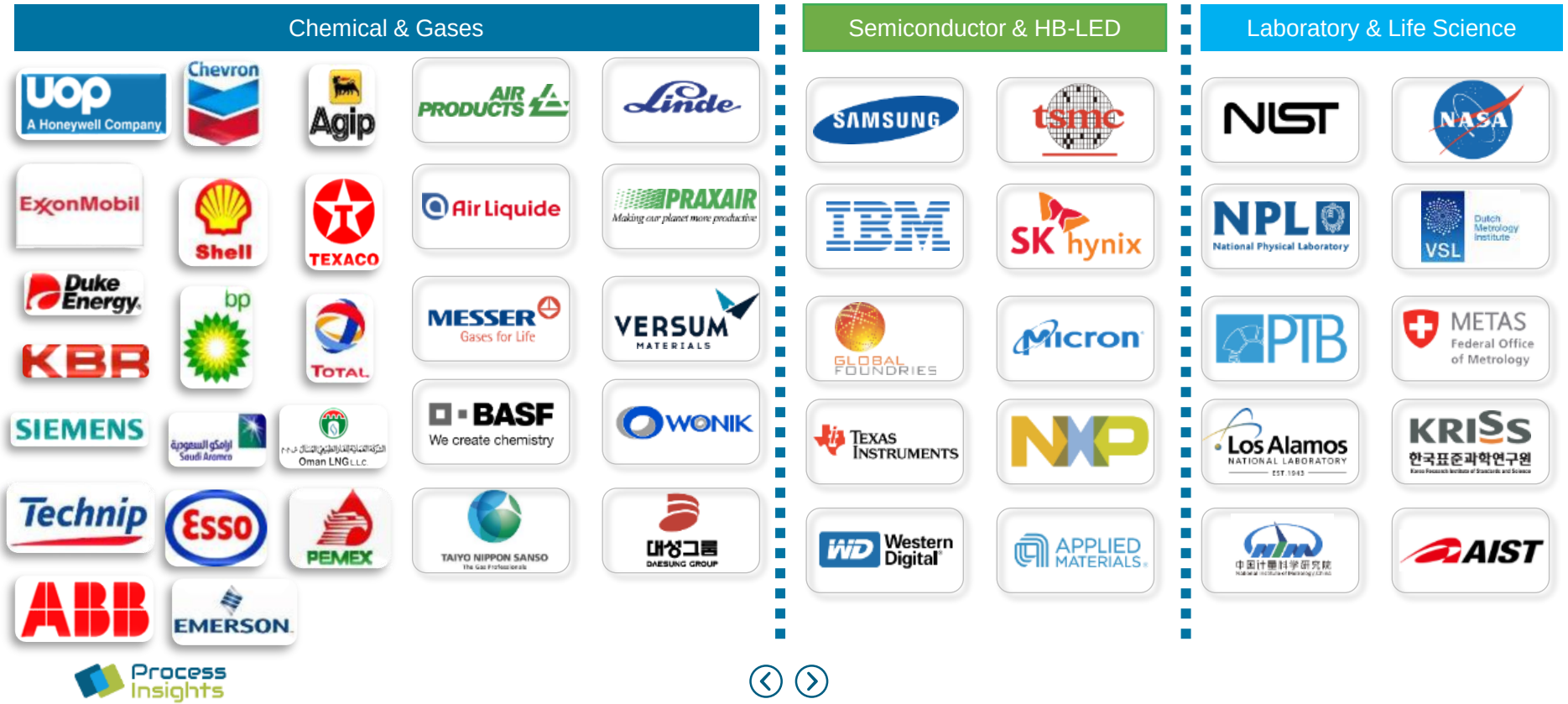
To protect the environment and reduce health issues, government regulators aim to limit the emission of harmful air and water pollutants.

Aerospace & Military

Airplanes and all runways are de-iced with the help of harsh chemicals resulting in the pollution of storm water. The disposal of this waste water needs to be continuously monitored.

Process Insights

Some of Our Trusted Customers



Quadrupole Mass Spectrometer Overview

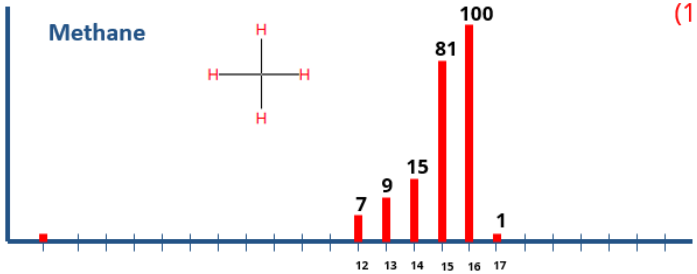
Quadrupole Mass Spectrometer Overview

- Over 55-year history of perfecting Mass Spectrometry technology
- Fast, accurate analyzers that give you more information
- Proven Quality, Consistency and Outstanding Warranty
- Unparalleled Service and Support

Mass Spectrometer Principle of Operation

How Does Online Mass Spectrometer Work?

- Constant flow of gas enters the analyzer
- Sample is ionized and subsequent ions are filtered by mass
  - Each scan produces a set of peaks specific to the composition of the ionized gas
  - All gases can be ionized, filters, and detected with a mass spectrometer
- Measured ion intensity correlates to concentration



(16) CH_4^+ → $CH_3^+ + H$ (15)

→ CH_2^+ (14)

→ CH^+ (13)

→ C^+ (12)

→ H^+ (1)

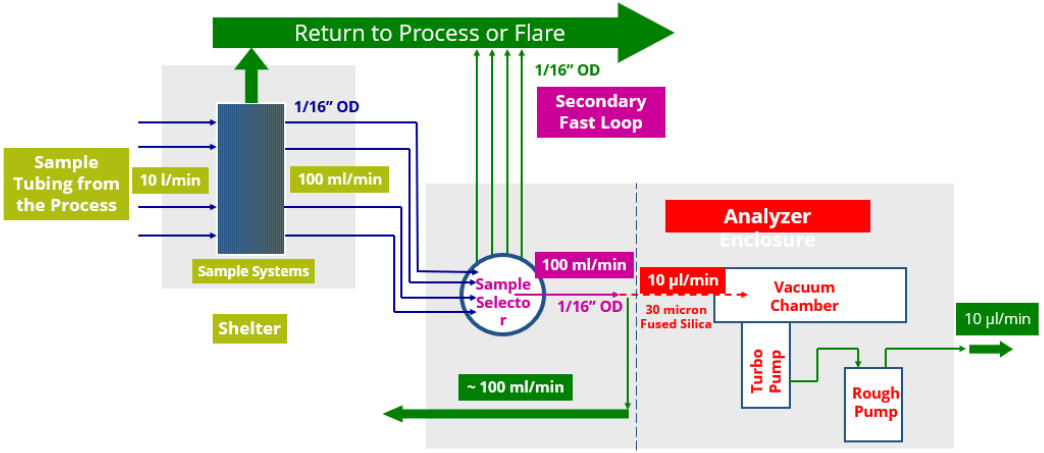
Mass Spectrometer Principle of Operation

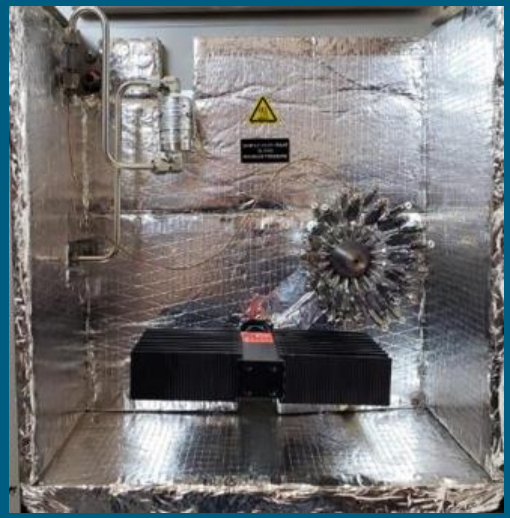
Components of a Mass Spectrometer

- Inlet
  - Stream Selection and Introduction
- Ionizer
  - Electron Impact (EI) Ionization
- Mass Filter
  - Quadrupole
- Detector
  - Faraday and Electron Multiplier
- Data System
  - Signal Acquisition, Processing, and Display

Mass Spectrometer Principle of Operation

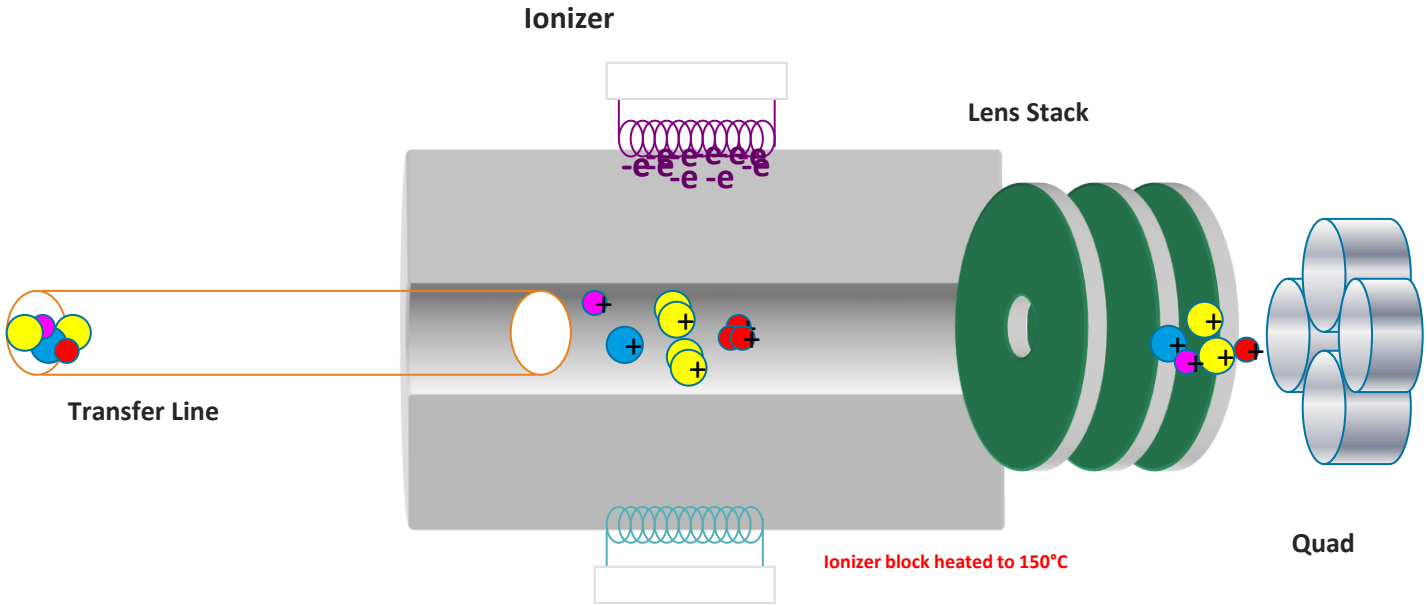
Sampling Handling and Stream Selection





TITELMASTERFORMAT DURCH KLICKEN BEARBEITEN

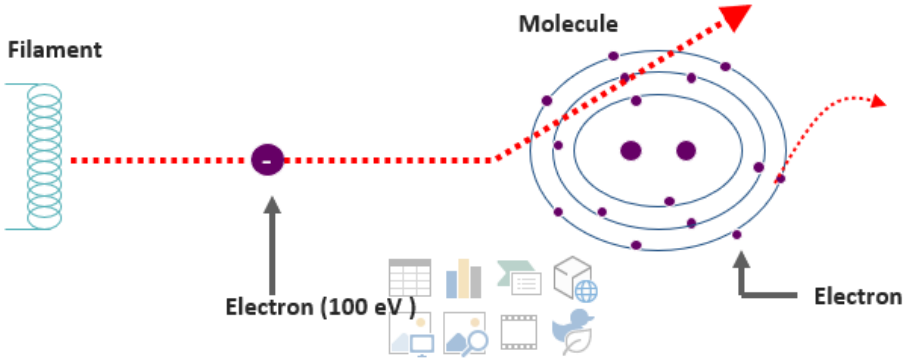
Positive charged ions are pulled out of the ionizer and pushed into the quadrupole mass filter.

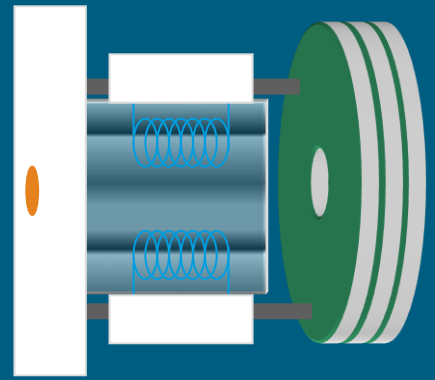


Process Insights

Mass Spectrometer Principle of Operation

Mechanism of Electron Impact Ionization





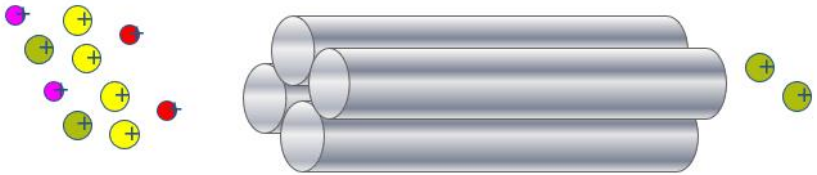
$M + e \rightarrow M^{+} + 2e$ Single Ionization

$M + e \rightarrow M^{++} + 3e$ Double Ionization

$M + e \rightarrow M_1^{+} + R^{\bullet} + 2e$ Fragmentation

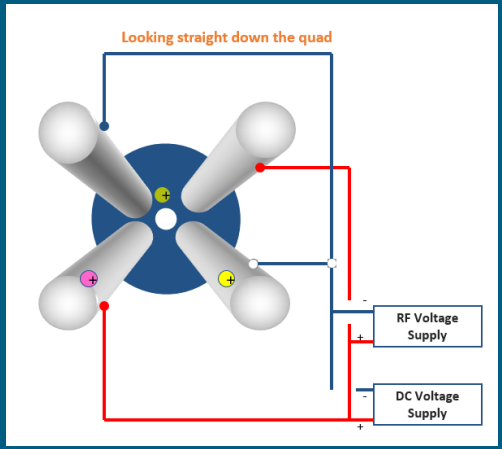
Mass Spectrometer Principle of Operation

Quadrupole Mass Filter

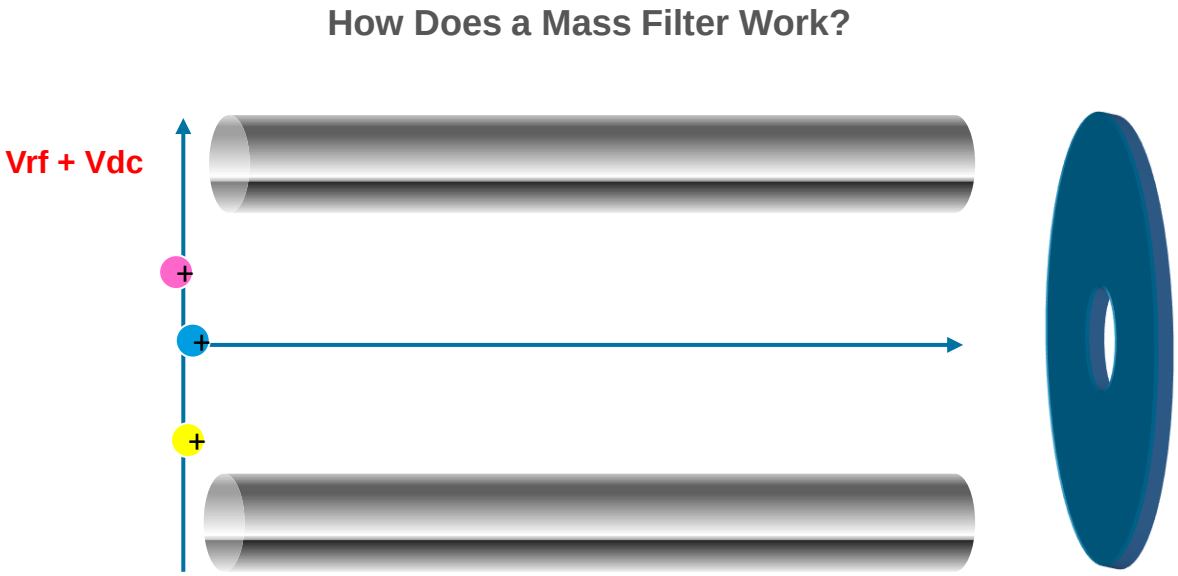


Ions of many masses

Ions of selected masses



Mass Spectrometer Principle of Operation

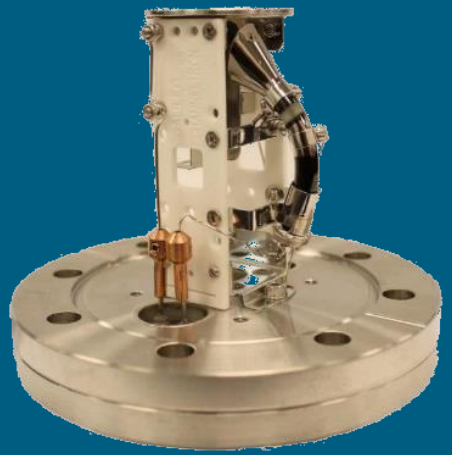


Mass Spectrometer Principle of Operation

Detector Options

- Faraday Plate
  - 5 parts per million (ppm)*
  - Appropriate Applications
    - Process Control
    - Flare Gas
    - Fuel Gas
- Dual Detector
  - Faraday Plate and Electron Multiplier
    - 5 parts per billion (ppb)*
  - Appropriate Applications
    - Ambient Air Monitoring
    - Purity Application

*Application Dependent

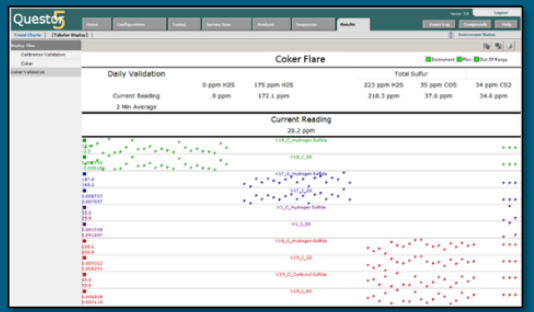


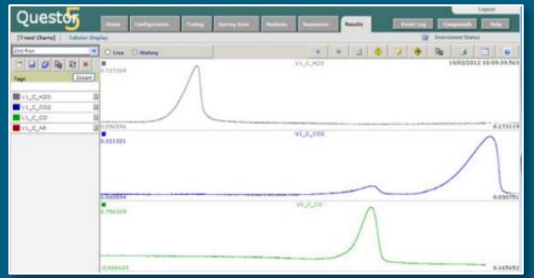
Mass Spectrometer Principle of Operation

Questor5 Software and Graphical User Interface

- Intuitive and Configurable
- Long term, continuous operation
- Automate validations, calibrations, database back up, and more
- Network accessible
- 21 CFR Part 11 Compliant
- Integrated Touchscreen to avoid need for additional resources

(laptop, monitor/keyboard/mouse, etc.) to access Q5 software





MAX300 Product Configurations

- MAX300 - RTG 2.0 Real Time Gas Analyzer with Integrated Touch Screen
  - Rugged design for industrial spaces
    - Air conditioner and heater to maintain temperature inside enclosure for stability and system health
    - Area Classification – C1D2/ATEX Zone 2 or GP
  - Ability to meet variety of customer requirements
    - Power Requirements – 115VAC or 230VAC
    - Communications – Modbus (TCPIP/Serial), OPC, Fiber Optic, Analog and Digital I/O, External Control
  - Additional Application Specific Configuration
    - Valves – Rotary Valve, FastValve, Solenoids
    - Detector – Faraday or Faraday/Multiplier
    - Valve Box Heaters – T3 or T4
  - Configurable for any industrial application

MAX300 Product Configurations

- MAX300 - RTG Real Time Gas Analyzer
  - Differences between MAX300-RTG 2.0
    - C1D1/ATEX Zone 1 Area Classification
    - No touch screen interface

- MAX300 - LGA Laboratory Gas Analyzer
  - Benchtop analyzer for laboratory or general purpose/climate-controlled environments
    - Limitations on valve options, area classification, and communications
  - Lower cost option for GC replacements in general purpose locations (ambient air)

System Specifications

Detectable compounds:
Any gas or vapor sample

Integrated touch screen:
15" display
Customizable and interactive
Full Access to Questor5 software

Detection range:
Faraday detector: 100% – 5 ppm
Electron multiplier: 100% – 5 ppb*
Membrane inlet: 100% – 10 ppt*

Number of sample streams:
16, 31,40, 80, 120, 160+

Analysis rate:
0.1 – 16 seconds per component
Customizable

Number of components: Unlimited

Number of analysis routines: Unlimited

Number of user configurable data tags:
Unlimited

Precision: <0.05% RSD over 24 hours**

Stability: <0.5% RSD over 30 days**

Filaments: Two, one active and one spare with automatic switchover

Analyzer maintenance: 1-3 years†

Roughing pump: 6-12 months†

Manual or fully automated calibration and validation: 3-12 month calibration intervals

Mass range options: 1 to 250, 300, or 500 amu

Mass filter: 19mm quadrupole for high precision, sensitivity and stability

MAX300-RTG System Specifications

Power Supply Options:
- 115 VAC (+/- 10%), 50/60 Hz, Two 20 Amp Circuits
- 230 VAC (+/- 10%), 50/60 Hz, One 20 Amp Circuit

Power Consumption:
- Nominal 2740 Watts
- Heat Load: 2991 Watts (10,200 BTU/hour)

Weight:
- Standard Enclosure: 450 lbs (205 kg)*
- Optional cart: 40 lbs (18 kg)

Ambient Requirements:
- Temperature: -4°F to 120°F (-20°C to 49°C)
- With A/C, cold start ≥54°F (12°C)

Area Classification Options:
- General Purpose
- Class 1, Division 2, Groups A,B,C,D, T4 or T3
- IEC/ATEX, Zone 2, Group IIC or IIB +H2*, T3 or T4

Additional Utilities:
- Purge gas (for hazardous area installations)
- Calibration gas cylinders: minimum 2*

Data System and Communications:
- External Control Interface: Modbus (TCP/IP, Fiber Optics, Serial) or Analog Input
- Login security levels: Administrator, User, Viewer
- External Communications: Modbus (TCP/IP or Serial), Analog and Digital I/Os, Fiber Optics

Analyzer requirement

Purging gas	Air or inert
Minimum purge flow rate	300 NL/m
Minimum purge time	12 m
Supply pressure	4 to 8 bar
Maximum sample flow rate	0.034 L/
Maximum sample supply pressure	20 PSIG

Analyzers that give you more Information

Extrel Features	Description	Benefit
Speed of Analysis	- Extrel analyzers can analyze all the gases in a sample in seconds	Increased Production
Full, Speciated Composition	- Extrel analyzers can measure any gas or vapor - H_2, N_2, He, AR, hydrocarbons, sulfurs, H_2O, NH_3, HAPs, solvents and more	Fewer Analyzers Required Safer Operation
Sensitivity and Dynamic Range	- Low Detection Limits (LDL) in the low parts per trillion (ppt) - Linear analysis from the LDL to 100%	Lower Cost of Ownership

Initial MAX300 Preventative Maintenance
Scheduled at 6 Months

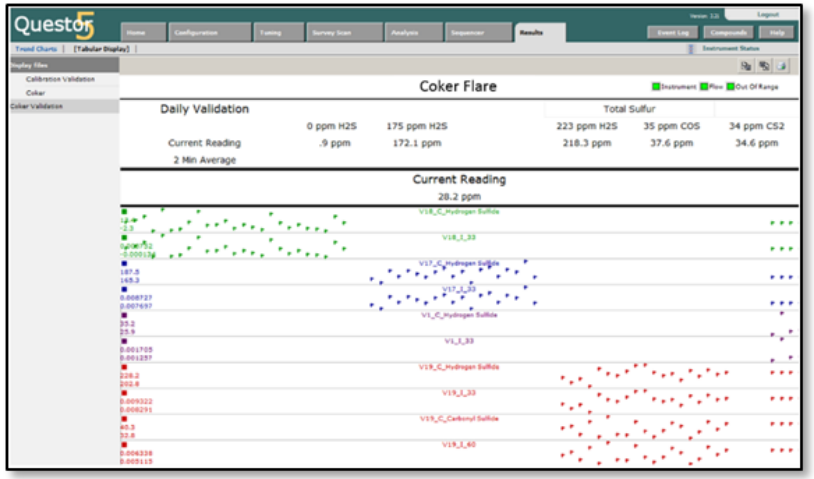
- 6 Months
  - Rotary Pump oil- replace
  - Tune and Calibration Check
- 12 Months
  - Rotary Pump oil- replace
  - Rotary valve seal- replace
  - Ionizer replacement (as required)
  - Quadrupole cleaning- detergent scrub, mild degreaser, water rinse
  - Tune and Calibration
- Turbo pump oil wick- replace at 4 years
- Inlet capillary tubing- emergency replacement only
  - Liquid breakthrough in sample system can plug the component

Calibration

- Calibration gases are used:
  - Any time instrument does not accurately validate
  - Following maintenance that involves venting the vacuum chamber
  - Typically, once every 3-6 months
  - Each calibration step requires <500 atm cc of gas
  - Calibration can be fully automated in the control software
- 3 types of calibration
  - Background- “zero gas” x1 bottle
  - Sensitivity- “span gas” x 1-2 bottles
  - Fragmentation- mass spec specific:
    - Number of fragment bottles is determined by the level of speciation requested by the user
    - Fragment calibration may only be required 1-2 times per year
    - Small cylinders (a few L total volume) are unlikely to run out prior to expiration of certificate

Software

- Intuitive
- Set up for long-term, continuous operation
- Track and record data
- Automate validations
- Automate calibrations



Top 10- Best, established mass spec customer sites

#	Industrial Site	Applications
1	Oil refinery	**Flare Gas**, **fuel gas**, **BTX ambient air analysis**
2	Syngas- ammonia/hydrogen/methanol plants	**Process control**
3	Ethylene	**Process control**, **flare gas**
4	Ethylene oxide/ethlyene glycol	**Process control**, **flare gas**
5	Polyethylene	**Process control**, **flare gas**
6	Polymer Plants (PVC, ABS)	**Ambient air analysis- acrylonitrile, VCM, EDC**
7	Renewable Natural Gas (RNG)	**Process control** and product quality
8	Steel	**VOD/BOP - Carbon content control**
9	Pharmaceuticals	**Solvent drying, bioreactor control, ambient air**
10	Government and university Laboratories	**Gas and ion analysis**

Thank You