

Critical Measurements for Refineries and Petrochemical Processing

Analyzers, systems and portable instruments
for quality, safety and efficient operation

Benefit from Trace Moisture and Gas Analyzers to Ensure Safety, Quality and Efficiency in Petrochemical Processes

Crude oil is the basis of many chemicals, fuels, oils, and other products such as plastics and fabrics. No matter the final product, petrochemical processing relies on careful control and monitoring of moisture, oxygen and often hydrogen.

We offer a wide choice of instrumentation for measuring trace moisture, oxygen, hydrogen and hydrogen sulfide in gases, and dissolved moisture in hydrocarbon liquids.

Moisture has a detrimental effect on plant operation and efficiency as well as on the final quality of the products. Many refinery processes need to be kept as dry as possible so trace moisture measurements down to low ppm ranges are essential for these applications. Excess moisture in processes also results in damage to equipment through corrosion as well as increased overheads for maintenance and shutdowns for repairs.

Oxygen is essential in some processes and in others a potential contaminant which

reduces quality in the final products and poses a safety risk. Most of the processes require inert atmospheres to avoid the risk of fire or explosion. Oxygen analyzers monitor the O₂ levels within the process to allow better control of product quality and to ensure the N₂ used for blanketing applications is pure.

Lack of oxygen poses the risk of asphyxiation for workers in confined spaces: careful monitoring of ambient oxygen levels and reliable alarms are important for workers' safety.

Hydrogen is used or produced as a by-product in several petrochemical processes for example in isomerization reactors and as recycle gas to catalytic reformers. Our process moisture analyzers, oxygen analyzers and binary gas (thermal conductivity) analyzers are certified for use in hydrogen applications.

Gas impurities can deteriorate the catalysts used in several processes in the petrochemical industry, such as ethylene/ propylene production. Our product offering includes both online monitoring and multipoint sampling solutions to retain the quality and efficiency of the end products.

Selected Served Applications

- Ethylene/propylene production: molecular sieve drying system
- Polymerisation - polyethylene, polypropylene production
- Monitor oxygen purity used for polymer production
- Monitor moisture, trace impurities and hydrogen in Semi-Regenerative (SRR) and Continuous Catalyst Regeneration (CCR)
- Sulfur recovery: Monitor oxygen purity in sulfur recovery unit
- Synthetic Rubber Plant: Monitor moisture in feed liquids to co-polymerization
- Feedstock pipelines: Measurement of oxygen levels in pipelines containing natural gas and olefin feedstocks

See full list at processsensing.com/petrochemical

Benefits

- Ensure quality of finished products
- Ensure the safety of staff
- Protect catalysts
- Optimize reactor efficiency

Measurement Parameters

- Moisture content
- Moisture in liquids
- Hydrogen purity and trace hydrogen
- Trace oxygen
- % oxygen
- Gas impurities at ppm_v, ppb_v level

Expertise in Products for Petrochemical and Refineries

We offer analyzers for continuous online monitoring, lightweight portable analyzers for spot checking or transmitters for direct installation where space or cost-efficient measurement matters. For specific needs or large projects, our experienced systems engineering department will work with you to create custom systems and packages.

Product Selector

Application/Service	Purpose of Measurement	Parameter/ Measurement Range	Measured Gas / Background Gas	Recommended Product
Ethylene/propylene production: molecular sieve drying system	To prevent the formation of hydrates and ice compounds which could block pipes and/ or damage equipment	Moisture in liquid (ppm _w) or gas (ppm _v) depending on process sample point and user preference. <5 ppm _v in gas <1 ppm _w in liquid	Cracked petrochemical feedstock (typically naphtha and natural gas)	<ul style="list-style-type: none"> Liquidew I.S. Promet EExd/I.S. QMA601
Ethylene/propylene production: furnace & distillation columns	Ensure optimal cracking process, CO, CO ₂ , H ₂ reduce the catalytic effect of the reactor and increase down-times Measure ethylene/propylene end quality (incl. air gases removal induced with steam)	Trace impurities (H ₂ , O ₂ , N ₂ , CH ₄ , CO, CO ₂) <10 ppm _v	Cracked petrochemical feedstock (typically naphtha and natural gas)	<ul style="list-style-type: none"> MultiDetek3 Ex MultiDetek3 LDetek accessories
Polymerisation – polyethylene, polypropylene production: measure moisture to protect catalyst and ensure feedstock purity	Ensure product quality – physical properties of polymer (moisture reacts with catalytic sites & interferes with polymerisation)	Moisture in liquid (ppm _w) and/ or gas (ppm _v) <5 ppm _v in gas <1 ppm _w in liquid	Ethylene, propylene, solvent (hexane)	<ul style="list-style-type: none"> Liquidew I.S. Promet EExd/I.S. QMA601
Polymerisation – polyethylene, polypropylene production: measure oxygen to protect catalyst and insure feedstock	Prevent contamination with O ₂ which can spoil the process and affect product quality	50 ppb to 10 ppm oxygen	Ethylene, propylene, hexane, N ₂ blanket	<ul style="list-style-type: none"> GPR-18 MS ATEX GPR-18 ATEX GPR-1200 Minox i
Polymerisation – polyethylene, polypropylene production: Monitor levels of impurities to protect catalyst and maintain feedstock purity	Ensure good quality of the final product	Monitoring for typical impurities eg permanent gases (hydrogen, oxygen, nitrogen, and carbon monoxide) and moisture <10 ppm _v	Ethylene, propylene	<ul style="list-style-type: none"> MultiDetek3 MultiDetek3 Ex LDetek accessories
Polymerization: monitor oxygen purity used for polymer production	Enable production cost savings e.g. switching feedstocks to less expensive alkane, reduce explosion hazards	% Oxygen 100 %O ₂	Oxygen	<ul style="list-style-type: none"> XTP601
Reforming: monitor moisture in semi-regenerative catalytic reforming (SRR) and continuous catalyst regeneration (CCR)	Catalyst protection, process efficiency, avoid coking in catalyst bed	Moisture, ppm _v 10...25 ppm _v (up to 1,000 ppm _v during regeneration)	Typically 75 % H ₂ , 25 % C1 - C8 hydrocarbon gas (potentially with HC liquid)	<ul style="list-style-type: none"> QMA601 (asymmetric cycle version) Promet EExd/I.S. (special purge/isolate sampling system)
Reforming: measure trace impurities in semi-regenerative catalytic reforming (SRR) and continuous catalyst regeneration (CCR)	Catalyst protection, process efficiency, avoid coking in catalyst bed	Trace impurities Low ppm _v	Typically 75 % H ₂ , 25 % C1 - C8 hydrocarbon gas (potentially with HC liquid)	<ul style="list-style-type: none"> MultiDetek3 LDetek accessories
Reforming: measure hydrogen level in semi-regenerative catalytic reforming (SRR) and continuous catalyst regeneration (CCR)	Catalyst protection, process efficiency, avoid coking in catalyst bed	% H ₂ 0...100 % 50...100 %H ₂	Typically 75 % H ₂ , 25 % C1 - C8 hydrocarbon gas (potentially with HC liquid)	<ul style="list-style-type: none"> XTC601

Product Selector

Application/Service	Purpose of Measurement	Parameter/ Measurement Range	Measured Gas / Background Gas	Recommended Product
Aromatic HCs: moisture in liquid measurement in BTX fractionation from naphtha reformat	Ensure quality of raw material feeding downstream processes	Moisture in liquid, ppm _w 0...100 ppm _w , normal <1 ppm _w	C6, C7, C8 aromatic HC (benzene, toluene and xylene) liquids	<ul style="list-style-type: none"> Liquidew I.S. Easidew PRO XP LQ
Isomerization: naphtha dehydration – monitor moisture content after molecular sieve dryer	Catalyst protection	Moisture in liquid, ppm _w 0...100 ppm _w , normal <1 ppm _w	C5-C6 HC liquid	<ul style="list-style-type: none"> Liquidew I.S. Easidew PRO XP LQ
Sulfur recovery: monitor oxygen purity in sulfur recovery unit	Reduce SO ₂ emissions and enable use of heavier crude	Oxygen purity 30...100 %O ₂	Natural gas and refined petroleum products	<ul style="list-style-type: none"> XTP601
Hydrodesulfurization (HDS): measure impurities levels during sulfur removal	Reduce SO ₂ emissions and enable use of heavier crude Prevent poisoning of catalyst with H ₂ S	Trace impurities (H ₂ S, COS) <10 ppm _v	Natural gas and refined petroleum products	<ul style="list-style-type: none"> MultiDetek3 Ex LDetek accessories GPR-7500 GPR-7100
Synthetic rubber plant: monitor moisture in feed liquids to co-polymerization	Ensure product quality –physical properties of rubber	Moisture in liquid, ppm _w 0...100 ppm _w , normal <1 ppm _w	1,3-Butadiene, ethylbenzene and styrene liquids	<ul style="list-style-type: none"> Liquidew I.S.
Confined spaced (e.g. storage tanks, reaction vessels)	Monitoring ambient oxygen levels to prevent risk of asphyxiation for workers performing routine maintenance	Oxygen 0...25 %O ₂	Air	<ul style="list-style-type: none"> OxyTx FGD10
Liquid vessels and storage tanks: monitor oxygen levels in blanket chemicals and refined feedstocks	Ensure safety during storage or transport by land or sea	Trace and % O ₂ 0...10 ppm _v , 0...5 %, 0...25 % O ₂	N ₂	<ul style="list-style-type: none"> GPR-18 ATEX GPR-1800 Minox-i XTP601 GPR-1200 for spot checks
Feedstock pipelines: measurement of oxygen levels in pipelines containing natural gas and olefin feedstocks	Detects oxygen leaks and avoids a potentially explosive atmosphere	Trace O ₂ 0...5 ppm O ₂	Ethylene, propylene, butadiene, natural gas	<ul style="list-style-type: none"> GPR-18 ATEX Minox-i GPR-1200 for spot checks
Syngas: steam methane reforming (SMR)	<ul style="list-style-type: none"> Catalyst protection Process efficiency Ensure good quality of the final product 	Trace impurities 0...10 ppm _v	Hydrogen rich syngas (H to CO ratio of 3)	<ul style="list-style-type: none"> HyDetek MultiDetek3 MultiDetek3 Ex LDetek accessories
Syngas: CO ₂ (or dry) reforming	<ul style="list-style-type: none"> Process efficiency Ensure good quality of the final product 	Trace impurities 0...10 ppm _v	SynGas (H to CO ratio of 1)	<ul style="list-style-type: none"> HyDetek MultiDetek3 MultiDetek3 Ex LDetek accessories
Syngas: partial oxidation (POX)	<ul style="list-style-type: none"> Catalyst protection (if catalytic POX) Process efficiency Ensure good quality of the final product 	Trace impurities 0...10 ppm _v	Syngas (H to CO ratio of 2)	<ul style="list-style-type: none"> HyDetek MultiDetek3 MultiDetek3 Ex LDetek accessories
Syngas: all gasification processes	Safety	O ₂ 0...5% or 0...25%	Syngas	<ul style="list-style-type: none"> Minox-i GPR-28
Ethylene oxide: oxidation reactor	Quality and safety	O ₂ 0...5% or 0...25%	Ethylene oxide	<ul style="list-style-type: none"> Minox-i GPR-28

Trace Moisture in Process Gases

Michell Promet EExd/I.S. Process Moisture Analyzer

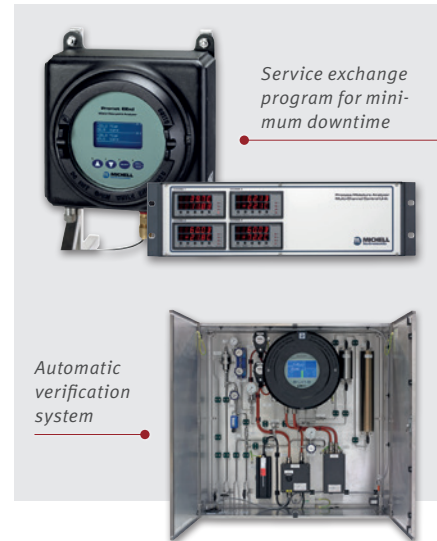
Heavy-duty moisture analyzers for continuous online measurements of water vapor content in low-and high-pressure process gases.

- Fully hazardous area certified for EExd or Intrinsically Safe
- Single or dual channel measurement
- Moisture range from ambient humidity to PPB levels

Michell QMA601 Process Moisture Analyzer

Uses advanced quartz crystal microbalance technology to provide reliable, fast and accurate measurements of trace moisture content. IECEX, ATEX, TC-TR Ex certified for EExd flameproof, cQPSus certified for explosion proof.

- Fast and reliable measurement from 0.1...2000 ppm_v
- Accuracy of ±0.1 ppm_v at <1 ppm_v and 10 % of reading from 1...2000 ppm_v
- Maintenance-free for 3 years



Trace Moisture in Hydrocarbon Liquids

Michell Easidew PRO XP LQ Explosion Proof Dew-Point Transmitter

The Easidew PRO XP LQ moisture transmitter is an explosion-proof dew-point transmitter for trace moisture measurements in liquids in hazardous areas. It is certified by ATEX, cQPSus, IECEX, and GOST for use in any North American, European or Asian zone.

- Measurement ranges -110...20 °Cdp (-166...68 °Fdp)
- Accuracy ±1 °Cdp (±1.8 °Fdp)
- Traceable 13-point calibration certificate

Michell Liquidew I.S. Moisture in Liquids Analyzer

A complete solution for accurate, on-line moisture measurement in process liquids to ensure optimum efficiency for production and maintenance.

- Multi-channel with up to four completely independent measurement channels
- Robust design for undisturbed operation in many non-polar liquids over a long time
- Replaceable sensor element with Michell Calibration Exchange Service for reliable cost-efficient calibration



Oxygen Measurements

Ntron Minox-i – Intrinsically Safe Oxygen Transmitter

A highly reliable and cost-effective two-wire, loop-powered oxygen transmitter based on advanced galvanic fuel cell technology for a long sensor life span.

- Measurement range: 0...25 %
- Industry standard 4...20 mA output
- Process connection KF40



Oxygen Measurements

Ntron OxyTx – Oxygen Analyzer for Hazardous Areas

The OxyTx oxygen analyzer and transmitter is a low-cost compact and rugged device for measurement of % oxygen concentration in hazardous area applications.

- ATEX approved for use in hazardous areas
- Large LCD display for local % or ppm oxygen concentration readout
- Intrinsically safe device with an IP66 ABS housing



Remote oxygen sensor for easy installation and maintenance

Michell XTP601 – Oxygen Analyzer

A robust thermo paramagnetic oxygen analyzer for stable, linear measurements of oxygen in flammable gases.

- Certified by ATEX, IECEx, cQPSus, TC TR Ex
- Integral touch screen display for local operation without the need for a hot works permit
- Minimal maintenance for low cost of ownership

Meets the requirements of IEC61508 SIL2



Analytical Industries Inc GPR-18 – Trace Oxygen Analyzer for Petrochemical Applications

Certified explosion-proof oxygen analyzer for measuring trace oxygen in flammable gases.

- High quality galvanic oxygen sensor technology
- Long O₂ sensor life 24 to 36 months for low maintenance
- No need for frequent electrolyte top-up

Explosion proof



Analytical Industries Inc GPR-28 – % Oxygen Analyzer for Petrochemical Applications

An explosion-proof oxygen analyzer designed to measure percent O₂ concentrations in petrochemical processes containing hydrogen and other flammable gases.

- Galvanic electrochemical oxygen sensor technology
- 4 standard measurement ranges
- Accuracy ±2 % of selected range

Long O₂ sensor life 24 to 36 months for low maintenance



Analytical Industries Inc GPR-1800 – Process Analyzer for Trace Oxygen

An easy to use trace oxygen analyzer for use in demanding process applications.

- Lower detection limit of 50 ppb O₂
- Cost-effective and easy to maintain
- Liquid drain manifold available to extend sensor life

Designed for demanding applications



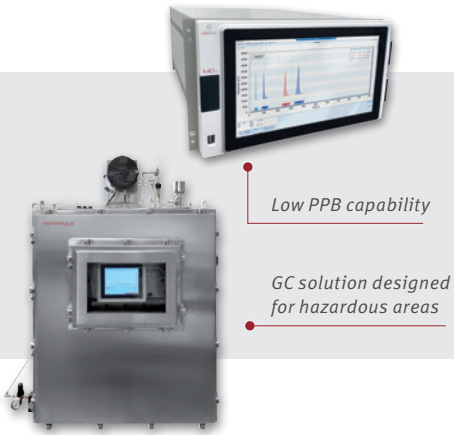
Analytical Industries Inc GPR-1200 – Portable Trace Oxygen Analyzer

A compact portable trace oxygen analyzer suitable for spot checks in hazardous areas. It features a 4-way valve that traps a gas sample in the sensor to reduce the time needed between measurements.

- Measurement range 0...10 ppm
- Accuracy of better than 2 % of range

Up to 30 days battery life





Trace Impurities

LDetek MultiDetek3 and MultiDetek3 EX – Compact Gas Chromatographs

Measures multiple trace impurities and combines the functionality of two GCs in one, as well as the ability to provide online moisture and O₂ measurements.

- Pre-configurable according to application requirements: ready-to-use device
- Temperature controlled to ensure maximum accuracy and stability
- Explosion proof for use in Zone 1 and Zone 2 with MultiDetek3 EX

Accessories for Trace Impurity, Plasma Detection and Online Trace Impurity Detectors

A range gas purifiers, gas dilution systems and stream selectors to optimize and retain gas purity at every stage of sampling to ensure the best performance for trace impurity measurements at ppb levels.



Hydrogen, Toxic and Flammable Gases

LDetek HyDetek – Integrated Gas Chromatograph System for Hydrogen Purity

An all in one unit for measuring trace impurities (ppb/ppm) N₂-Ar-He-O₂-CH₄-CO-CO₂-NMHC-sulfurs-formaldehyde-ammonia-halogenated-formic acid and water in hydrogen.

- Meets UHP requirements for hydrogen used in fuel cells as set out in ISO 14687
- Multiple detectors: PED, TCD and quartz crystal are possible if desired
- Integrated ultra high purity sample stream selector system (remote control)

Michell XTC601 – Binary Gas Analyzer for Hydrogen Monitoring

A robust, linear and stable thermal conductivity analyzer for measurement of binary gas mixes such as air in hydrogen, nitrogen, argon, helium or carbon-dioxide. The sensor is housed in a rugged casing, making it suitable for a wide range of applications.

- Suitable for use in ATEX, IECEx, TC TR Ex & cCSAus certified hazardous areas
- Touch-screen display allows calibration or adjustment without the need for a hot works permit
- Accuracy of better than ±2 % full scale

Analytical Industries Inc GPR-7500 & GPR-7100 – Hydrogen Sulfide Analyzers

These analyzers use low-power electro-chemical sensor technology to provide cost-effective and easy to maintain hydrogen sulfide measurements, either online or as a portable instrument.

- Approved for use in flammable gas streams
- Accurate to <2 % of scale with an LDL of 0.1 ppm H₂S
- Dedicated sample handling systems are included



Measures all critical impurities in hydrogen

Meets the requirements of IEC61508 SIL2



ATEX and UL certified variants



Improving the world, one measurement at a time™

ProcessSensing.com

dwyeromega.com

