

# Continuous Gas Analysis Solutions in CCUS

## Application Note

As the global demand for energy grows, so too does the need to transition towards sustainable energy sources. For many process manufacturers, Carbon Capture, Utilization, and Storage (CCUS) is a central part of their efforts to reduce emissions of one of the most prevalent greenhouse gases, carbon dioxide (CO<sub>2</sub>). With CCUS, CO<sub>2</sub> emissions are captured at the source, and then either stored or used in other industrial processes, often requiring transportation from the production site.

### Measurement Challenges

CCUS measurement requirements vary from installation to installation, requiring a range of analysis technologies and product capabilities. Depending on whether the CO<sub>2</sub> is being sequestered or utilized in another process, and whether transportation is required before these activities take place, there can be a variety of components that are required to be measured and concentration ranges may also vary. A single gas analyser solution is preferred but not always possible, and multiple technology solutions may be necessary. Speed of response, accuracy and long-term reliability are also key considerations in this application.

### Rosemount Continuous Gas Analysis Solutions

Rosemount has two product types under its Continuous Gas Analysis solutions, laser-based analysers incorporating quantum cascade laser (QCL) and tunable diode lasers (TDL), and process gas analysers (PGA) that employ a range of technologies such as non-dispersive infrared or ultraviolet (NDIR/UV), paramagnetic oxygen (PO<sub>2</sub>), thermal conductivity (TC) and electrochemical (EC). The two product lines offer a wide range of measurements and can be complimentary.



Figure 1 Rosemount X-STREAM Enhanced Continuous Gas Analyzer family

### X-STREAM Enhanced Process Gas Analyzers

The Rosemount X-STREAM *Enhanced* Process Gas Analyzers (PGAs), shown in Figure 1, can incorporate up to 5 measurement benches from a selection of technologies. This flexible platform allows users to select up to 5 measurements to match their application requirements. The products have a variety of enclosure types to allow installation within safe and hazardous areas. In CCUS, PGA analysers can measure the bulk CO<sub>2</sub> gas concentration, as well as a number of common impurities including H<sub>2</sub>O, trace O<sub>2</sub>, NO<sub>x</sub> and SO<sub>x</sub>. A typical analyzer specification with the range of components measurable by the X-STREAM *Enhanced* PGAs is given in Table 1.

Key features and benefits:

- Flexible multi-component, multi-technology continuous gas analysis
- Available in four housing options: half 19-inch and 19-inch general purpose, flame proof housing for outdoor installation including hazardous area, and field housing
- Excellent long-term stability and accuracy in demanding process gas applications
- Wide dynamic measurement range and low detection limits
- Very low thermal dependency from -4 °F (-20 °C) to +122 °F (+50 °C)
- Integrated web interface with configuration and monitoring capabilities

## Quantum Cascade Laser Analyzers

The Rosemount CT5000 product family, shown in Figure 2, is the world's first hybrid laser analyzer platform utilising both quantum cascade lasers (QCLs) and tunable diode lasers (TDLs). Up to 6 lasers can be built into each analyzer, allowing up to 8 continuous measurements in a single system. Laser spectroscopy is an inherently stable measurement technique, which greatly reduces the calibration frequency and total cost of ownership of a laser analyzer. The products have a range of enclosure types to allow installation within safe and hazardous areas. In CCUS, laser-based analysers can measure the bulk CO<sub>2</sub> gas concentration, as well as a range of impurities including H<sub>2</sub>O, CH<sub>4</sub>, NO<sub>x</sub> and SO<sub>x</sub>. A typical analyzer specification with the range of components measurable by the CT5000 laser-based analyzers is given in Table 1.

Key features and benefits:

- First hybrid QCL and TDL laser-based analyzers with up to 6 lasers per system and up to 8 continuous measurements in CCUS applications
- Available in three housing options: 19-inch rack general purpose, flame proof housing for outdoor installation including hazardous area, and purged, wall mount housing including hazardous area
- Excellent long-term stability and negligible drift from the inherent stability of laser technology
- Wide dynamic measurement range and low detection limits
- Very low thermal dependency from +32 °F (+5 °C) to +113 °F (+45 °C) and ability to measure gas up to +374 °F (+190 °C)

- Easy to use local user interface and a range of data communication options



Figure 2 Rosemount CT5000 QCL and TDL Continuous Gas Analyzer family

## Engineered Sample Handling Systems

Continuous gas analyzers are only as good as the quality of the sample that they measure. Tested rigorously before shipment, Emerson provides custom engineered sample handling systems designed to meet the application's specifications.

## Lifecycle Services and Support

Our team of trained and certified field experts know and understand the requirements needed to develop a customized service program to suit your application. We provide complete turnkey services to support your operation. From pre-installation services to on-going maintenance and support, we have the expertise to ensure your Rosemount Analyzers run at ideal operating conditions during their entire lifecycle.

Field services include start up and commissioning, scheduled maintenance, on-site support, field upgrades and training.

TABLE 1.

COMPONENT	GAS	RANGE MIN.	RANGE MAX.	PRIORITY	PGA	QCL
Carbon Dioxide	CO <sub>2</sub>	96 mol%	100 mol%	High	✓	✓
Water	H <sub>2</sub> O	0	50 ppmv	High	✓ (app)	✓
Oxygen	O <sub>2</sub>	0	10 ppmv	Medium	✓ (app)	
Hydrogen Sulfide	H <sub>2</sub> S	0	20 ppmv	Medium	✓ (app)	
Oxides of Nitrogen	NO <sub>x</sub>	0	20 ppmv	Medium	✓	✓
Oxides of Sulfur	SO <sub>x</sub>	0	100 ppmv	Medium	✓	✓
Methane	CH <sub>4</sub>	0	4 mol%	Low	✓	✓

✓ (app) indicates that the measurement is application dependent