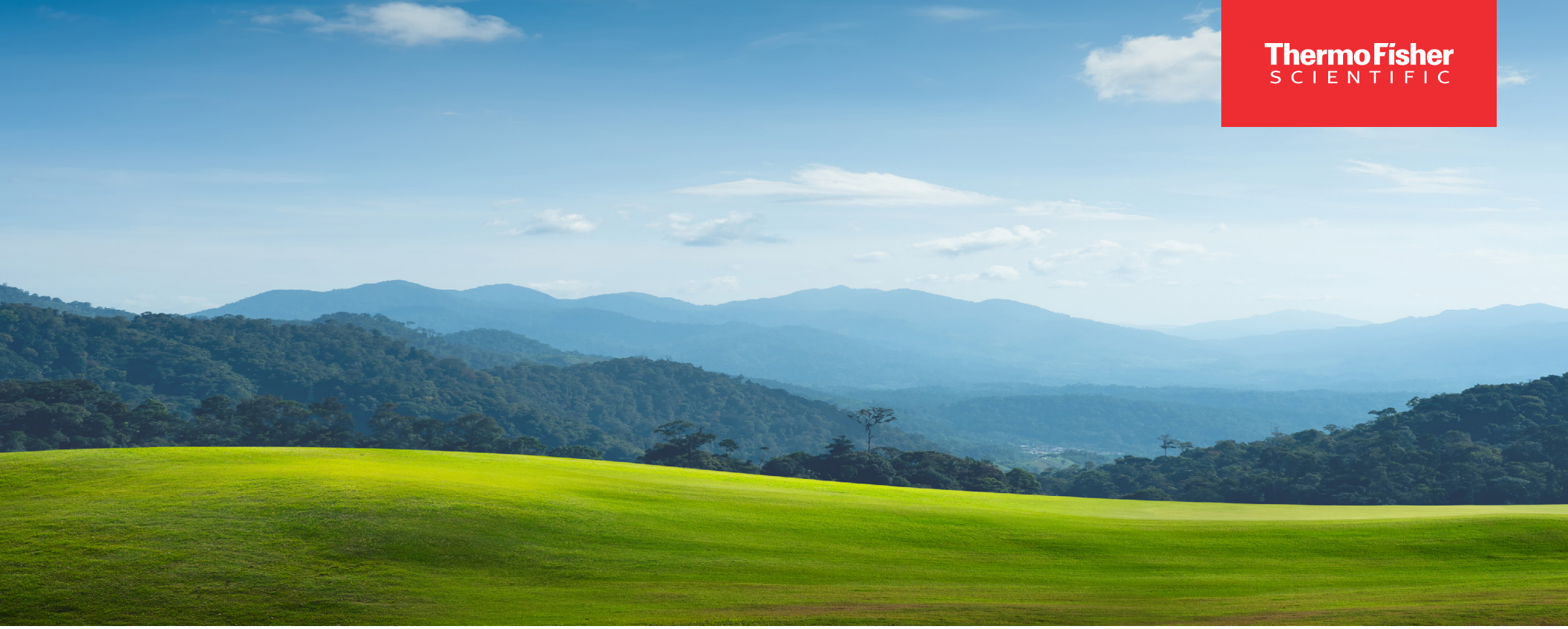
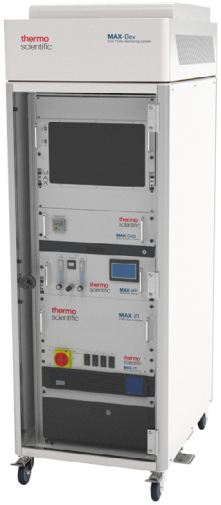


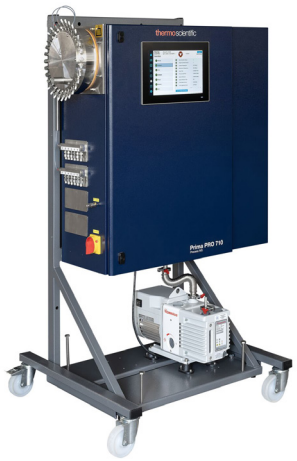
CCUS application & product selection guide

Choose the optimal solution for your application needs

Find the right solution to fit your requirements in the Carbon Capture Utilization & Storage (CCUS) value chain. Beyond the solutions highlighted below, we provide a comprehensive range of laboratory instruments to support research and development (R&D) in both academic and government institutions.

Application need	Solution	Benefits	Applicable regulations	Applications examples in CCUS value chain
Ensuring and maintaining real-time and historical mass flow measurement	Thermo Scientific™ AutoFLEX/Auto XP Flow Computer 	• Accepts inputs from industry leading flow technologies (Coriolis and USM) • Calculates mass and volume simultaneously via NIST14 • Accepts inputs from analyzers to calculate gross and net volumes • Easily configured control and alarm parameters, via interface	TUV SUC CCUS Services (UK)	• **Carbon capture:** accept inputs from flow meters and analyzers to calculate mass/volume of CO_2 • **Transportation:** monitor mass flow throughout network • **Storage (sequestration):** calculate/store/monitor/transmit volumetric or mass flow being stored/sequestered
Monitoring and controlling complex reactions in real-time to improve operational efficiency	Thermo Scientific™ MarqMetrix All-in-One Process Raman Analyzer 	• Has high sensitivity and can detect trace amounts of impurities in the gas stream. This capability makes it an essential tool for monitoring carbon capture processes, as it can identify even small changes in the chemical composition of the gas stream • Performs non-destructive, real-time continuous analysis of molecular compositions • Is easily portable, which makes it ideal for on-site analysis. This allows for monitoring carbon capture processes at various locations without needing laboratory facilities • Optimizes capture efficiency with no special training required and minimal sample prep • Delivers versatility, as it can be used throughout different stages of the carbon capture process, from analyzing incoming feedstock to monitoring transformations and optimizing the quality of the final product • Provides a cost-effective solution for monitoring carbon capture processes over extended periods, making it an excellent choice for long-term environmental management and compliance • Eliminates downtime—no recalibration is needed while maintaining stability and accuracy	EU Emissions Trading System European Green Deal	• **Carbon capture:** in-line carbon stream analysis • **Storage (sequestration):** real-time measurement of CO_2 composition & purity • **Utilization (R&D, production):** sustainable aviation fuel (reaction progress for carbon monoxide transformation into acetic acid & ethanol; sugarcane to ethanol conversion)

Application need	Solution	Benefits	Applicable regulations	Applications examples in CCUS value chain
• Maintaining and protecting pipeline infrastructure • Ensuring the safety of people near the pipelines • Monitoring absolute purity of CO_2 to quality for government tax incentives • Verifying final product purity for utilization	Thermo Scientific™ MAX-Bev CO_2 Purity Analysis System 	• Robust and reliable online analyzer for continuous monitoring and analysis of trace impurities and absolute CO_2 purity; guards against pipeline corrosion and ensures safety • Highly sensitive and accurate, meeting government measurement standards; measures CO_2 purity up to 100% ± 0.02% • Fully automated with minimal downtime and maintenance (99.7% online) • Requires no user intervention; designed for 24/7 data collection • Customizable gas concentration alarms • Remote measurement and data publishing; compatible with Modbus	EU Emissions Trading System European Green Deal American Petroleum Institute	• **Carbon capture:** verify CO_2 purity and impurities in captured streams at facility for custody transfer to other transportation network • **Transportation:** maintain pipeline infrastructure by measuring CO_2 and impurities in captured stream • **Storage (sequestration):** monitor CO_2 purity during chain of custody • **Utilization:** food & beverage-grade certification. Meet ISBT and EIGA standards
• Monitoring pipelines used in transportation of gases on a regular basis to protect against leaks and faults • Providing safe working conditions	Thermo Scientific™ EyeCGas Multi Optical Gas Imaging (OGI) camera 	• Sensitive OGI camera for monitoring fugitive gas emissions, methane, CO_2 and over 400+ VOCs • Interchangeable spectral filters for enhanced detection capabilities • Compliance with regulatory standards • Robust design suitable for harsh conditions	EPA (NSPS) 40 CFR part 60, subpart 0000'a/b/c requirements	• **Transportation:** monitor CO_2 leaks - detection & quantification, rate and volume of leaks, including methane • **Storage (sequestration):** advanced gas leak detection and quantification, video streaming

Application need	Solution	Benefits	Applicable regulations	Applications examples in CCUS value chain
• Determining the efficiency of capture technology and processes • Optimizing process control in utilization processes (chemical & metals sectors)	Thermo Scientific™ Prima PRO Process Mass Spectrometers 	• Fast analysis of complete gas stream compositions in seconds • Flexibility of many application methods with a single analyzer • Low cost of ownership with no carrier gases and minimal maintenance		• **Capture:** direct air capture multi-stream capability • **Transportation:** Monitor and control CO_2 quality across multiple stream and hazardous locations • **Utilization:** e-fuels, sustainable aviation fuel (SAF), SynGas; chemical processes, steel processes

Learn more at **thermofisher.com/CCUS**