Dissolved Carbon Dioxide Analysis System

- IN-LINE AND CONTINUOUS REAL TIME CARBON DIOXIDE (CO₂) MEASUREMENT.
- LOW COST OF OWNERSHIP
  - Eliminates the need for a sampling system or bypass lines
  - Eliminates pumps and evacuators
  - Eliminates purge and carrier gases
  - Minimizes routine maintenance.
- BAROMETRIC PRESSURE AND TEMPERATURE COMPENSATION.
- POLISHED, RUGGEDIZED 316L SS SENSOR.
- SIP, CIP MEMBRANE SENSOR.
- WIDE DYNAMIC RANGE 3-10 g/l and 1.5-5.0 vol/vol.

SUPERIOR BENEFITS

Improves Beverage Quality
Superior quality, taste, and storage life in beverages are achieved by attaining the specified levels of carbonation (dissolved CO₂), accurately. The Model D-CO₂ analyzer, with its continuous, real-time measuring technique, ensures that carbonation measurement and correction take place simultaneously. Without in-line continuous readings, a time lag may create a mismatch between actual carbonation levels and the necessary corrective action, resulting in imprecise control and compromised quality.

Increases Yield, Reduces Downtime, Minimizes Product and Costly CO₂ Waste
Real-time measurement of carbonation levels ensures accurate carbonation levels in the product. Over-carbonation (too much fizz) prevents bottles and cans from being completely filled, while under-carbonation may create a flat fizz and reduces shelf-life. Given the high speed of processing, in extreme cases, by the time the problem is caught, a large quantity of product may need to be dumped. To fix the problem and remove the faulty product, the process might need to be shut down and restarted.

Using more CO₂ than is necessary not only destroys otherwise salable product, but wastes costly CO₂ and other manufacturing ingredients. Because the process can be controlled more tightly with the Model D-CO₂, product yield is increased and waste is minimized.

Temperature and Pressure Compensation Enhance Accuracy Even Further
The Model D-CO₂ analyzer provides pressure and temperature compensation, both of which also help to increase the measurement accuracy of dissolved CO₂. Since temperature affects the level of dissolved CO₂ in beverage, temperature compensation ensures that the reading is correct for the given temperature. In the case of pressure, compensation is even more important. Pressure compensation allows a tenfold increase in CO₂ measurement accuracy.

Eliminates Cost, Shortens Maintenance Time, Reduces Human Error
The expertise, gained from over a century of experience, of three Fisher-Rosemount Divisions (Rosemount Analytical in sensor membrane...
technology, Rosemount Measurement in temperature and pressure, and Brooks in flow) have been integrated to create this revolutionary in-line CO\textsubscript{2} analysis system. Using this system eliminates the need for other sampling equipment, such as pumps and bypass lines. Maintenance time is dramatically reduced, because the system can be cleaned with standard Steam-in-Place and Clean-In-Place. More importantly, because the system is simpler and features a robust and easy-to-use membrane sensor, it won’t drift with time, like most typical optical systems today. Therefore, you don’t have to calibrate as frequently. Calibrating less frequently not only saves time, but reduces the opportunity for human error. Reducing this source of error means more accurate data for in-line blending, audit trails, and correlation with traditional laboratory grab sampling for quality analysis and control.

Fits Most Installations
The highly polished 316L stainless steel sensor is designed to fit industry standard plant installations. The rugged membrane sensor is compatible in both SIP and CIP application environments.

The wide range of 3 - 10 g/l concentration and 1.5 - 5.0 vol/mol meet the measurement requirements of conventional beverage facilities. The partial pressure of CO\textsubscript{2} (carbonation levels) is a standard output and is displayed on screen, allowing continuous measurement and continuous control.

The Next Level in Control
The configuration described above allows the in-line and continuous real-time capability of the Model D-CO\textsubscript{2}, which results in more accurate measurement of dissolved carbon dioxide. Given the ultra high bottling and canning speeds, dictated by tight production schedules, only a system that uses in-line and continuous real-time measurement can take beverage manufacturers to the next level in control, beyond today’s conventional batch and intermittent measurement techniques.

MEASUREMENT PRINCIPLE
The measurement of dissolved carbon dioxide is based upon the diffusion rate of CO\textsubscript{2} through a reinforced selective membrane. The sensor assembly allows CO\textsubscript{2} to flow freely across the membrane to the mass flow device.

The mass flow measurement is close-coupled to the sensor assembly for fast response. The barometric pressure compensation and mass flow operate to generate real time inputs used to calculate the partial pressure of CO\textsubscript{2}. The temperature is measured to compensate for CO\textsubscript{2} solubility effects and is also available for display.

The Model D-CO\textsubscript{2} continuously calculates real time levels of dissolved CO\textsubscript{2} in g/l and vol/mol concentration and millibar (mbar) partial pressure. The D-CO\textsubscript{2} Analyzer is designed to accurately measure dissolved carbon dioxide concentrations above 1.0 g/l. Pressure compensation ensures that an accurate reading is realized.

The validity of the measurement may be further enhanced by the addition of a process flow switch alarm to signal low or stopped flow. In the event of a flow alarm response, the analyzer warns the user that the measurement is out of range. Simultaneously, an alarm signal is made available for input to the plant control system.

Product specific constants may be directly entered through the operator key pad. These constants ensure that subtle product variations and fill pressures are accurately determined. This flexibility and ease of use are absolutely essential for accurate control of high speed batch processing applications. The CO\textsubscript{2} analysis system allows users to monitor a wide variety of products.

The output signal from the analyzer may be connected directly to the carbonation process controller to provide a fully integrated dissolved CO\textsubscript{2} measurement and injection control loop.

APPLICATIONS
The liquid dissolved CO\textsubscript{2} analysis system is suitable for a range of applications and processes to provide monitoring and control data for many natural and artificially carbonated liquids. The following applications are deemed appropriate:

- Mineral Water
- Beer
- Soda Water
- Cask Filling
- Soft Drinks
- Carbonization
- CO\textsubscript{2} Recovery
- Sparkling Wines

The above applications are predominant in the beverage industry. Carbon dioxide measurements are required for quality control and product certification. The point-of-use of the carbon dioxide analysis system is either downstream of CO\textsubscript{2} blending or upstream of the bottling filler.
SYSTEM SPECIFICATIONS

Display: Back lit LCD, 4 lines/20 characters
Keypad: Colored functional groups
Security: Password protected
Display Resolution: 6 digits
Ranges: 3-10 g/l and 1.5-5.0 volume/volume (v/v)
Concentration CO₂ and 2,000 - 8,000 mbar
partial pressure CO₂ (PCO₂)
Resolution: 32 bit
Accuracy Partial Pressure CO₂ g: 1.0% Full Scale (FS)
Accuracy Concentration CO₂: 1.0% FS
Response Time: < 15 s
Sensor Assembly: 6 lb (2.5 kg)
2.5 in. (62.33 mm) fitting size
Analyzer-Sensor Cable: 33 ft (10 m)
Minimum Sample Flow: 1 ft/s (.3 m/s)
Outputs: 2 x 4-20 mA (PCO₂ mbar and CO₂ concentration g/l)
Alarms: Front panel display

Material: 316 L Stainless steel, silicone, Viton®
Electronics Housing: Stainless steel
NEMA 4 (IP65)
14.25 height x 12.25 width x 6.35 depth in.
(362 height x 311 width x 162 depth mm)
35 lb (13 kg)
32 to 122°F (0 to 50°C)
115 V ac ± 10% 50/60 Hz ± 6%
230 V ac ± 10% 50/60 Hz ± 6%
Operating Temp Sensor: Max 302° F (150°C)
Operating Pressure: 5 bar (73 psig); Max 8.2 bar
(120 psig)
Relative Humidity: 0-95%
Electronic Temp Operating Range: 32° to 140°F
(0° to 60°C)
Mass Flow Meter Operating Range: 40° to 150°F
(5° to 65°C)

Viton is a registered trademark of E.I. du Pont de Nemours & Co.
Model D-CO₂ Wiring Diagram

Sensor Assembly
Dissolved CO$_2$ Analysis System for the Beverage Industry

Polished, Ruggedized 316L Stainless Steel Sensor which is CIP and SIP compatible

Compatible with 316 Stainless Steel process pipe systems used in the beverage industry. A Varivent pipe fitting is depicted above. Tri-Clamp fittings are also available.
ORDERING INFORMATION

The Model D-CO₂ Dissolved Carbon Dioxide Analysis System provides in-line and continuous, real-time dissolved CO₂ measurement. The sensor membrane may be mounted with either Tri-Clamp™ or Varivent™ fitting accessories. Process flow switches can either be supplied by Rosemount Analytical or supplied by the user. A calibration device can be purchased through the accessories. Factory specified calibration can also be selected.

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<td>3 - 10 g/l</td>
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D-CO₂ - 01 - 12 - 21 - 33 EXAMPLE

Tri-Clamp™ is a registered trademark of Tri-Clover, Inc. of the Alfa-Laval Group.
Varivent™ is a registered trademark of Tuchenhagen.

ACCESSORIES

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<th>ACCESSORIES</th>
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<td>23780-00</td>
<td>Fisher-Rosemount Calibration Device Assembly</td>
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The right people, the right answers, right now.

ROSEMOUNT® ANALYTICAL
FISHER-ROSEMOUNT™ Managing The Process Better.