Vx Spectra
Surface multiphase flowmeter for accurate flow rate measurement and improved production testing
Vx Spectra
Surface multiphase flowmeter
Oilfield operators deal with complex operating conditions. The nature of produced flow is no exception. Oil, gas, and water travel in many different multiphase flow patterns, from heavy oil to wet gas. Launched in 2000, Vx* multiphase well testing technology leads the market in multiphase flow metering technology.
The Vx Spectra* surface multiphase flowmeter uses advanced full-gamma spectroscopy to accurately capture multiphase flow dynamics while enabling real-time data monitoring and analysis, helping you make better-informed decisions to maximize your reservoir productivity.

**Applications**
- Offshore topside and land production well testing
- Continuous production monitoring
- Fiscal allocation and custody transfer
- Well performance evaluation
- Artificial lift system surveillance and optimization
- Flow rate measurement in unstable, foaming, or emulsion-prone wells and in low-rate producers
- Production measurement for resources ranging from heavy oils to gas condensates
Benefits
- Accurate flow rate measurements under unstable flow conditions
- Highly accurate phase measurements unaffected by foams or emulsions
- Understanding of well dynamics
- Elimination of major pressure loss in the production stream
- Precise allocation factor
- Delivery of real-time measurements
- Updated flow rates for reservoir monitoring and production forecast
- Reduced field development costs
- Unmanned metering operations
- Simplified surface systems
- Significant space savings with smaller footprint compared with bulk tanks or separator
- Easy to maintain

Features
- Accelerated lead time
- Full-gamma spectroscopy
- Verified metrological performance in reference flow loops
- Single-point measurement
- Five venturi sizes for an expanded operating envelope
- High-frequency measurement for detailed flow dynamics
- Compact, robust design
- Modular system with versatile configuration
- Remote operation and data acquisition
- No need for separation and flow calibration
- No moving parts
Metrology
Measure multiphase flow with industry-leading accuracy

**Full-spectrum analysis**
Conventional nuclear interpretation relies on empirical correlation to correctly allocate photons to the proper energy-level window. The Vx Spectra flowmeter uses full-gamma spectroscopy to precisely measure in all energy levels of the gamma-source spectrum, providing the most accurate individual oil, gas, and water fraction measurements to date.

**High-frequency, single-point measurement**
Based on the robust principle of Vx multiphase well testing technology, the Vx Spectra flowmeter is the only multiphase meter in the industry that measures in high frequency at a single point in the venturi throat, thereby avoiding cross correlation of measurements from multiple locations throughout the system. This technique ensures accurate and repeatable flow rate measurements in any multiphase flow regime and in production fluids ranging from heavy oil to wet gas.

**Improved production allocation factor**
Accurate production monitoring secures a precise allocation factor that helps you make better-informed decisions to maximize reservoir productivity.
Conventional nuclear interpretation uses empirical correlation to allocate photons to their proper energy levels.

The advanced nuclear system in the Vx Spectra flowmeter brings a continuous photon count across the full spectrum of gamma measurements, providing accurate multiphase flow measurements.
Innovative Design
Streamline production testing and monitoring with a fit-for-purpose system

**Reduced footprint**
Specially engineered for surface production facilities, the compact Vx Spectra flowmeter saves significant rig space on offshore platforms compared with conventional metering equipment.

**Greater reliability**
Its modular design and advanced electronic components increase reliability to minimize downtime and reduce running costs while improving measurement integrity.

**Modular equipment**
With a highly versatile configuration, the Vx Spectra flowmeter enables customization to fit your surface equipment requirements.
The simplified design of the Vx Spectra flowmeter comprises three distinct sections. First, a venturi section and multivariable transmitter account for the fluid mechanics in measuring the total flow rate. Second, a gamma source and advanced detector make up the nuclear system, obtaining holdup of oil, gas, and water. Third, a compact data-acquisition flow computer performs all calculations and converts flow measurements from line to standard conditions.

Cover all your measurement applications with five venturi sizes

Based on more than 20 years’ experience in multiphase flowmetering, the Vx Spectra flowmeter is available in five venturi sizes to cover the majority of wells worldwide.

- The 19-mm venturi version successfully monitors low-rate producers.
- The 29-mm and 40-mm venturi versions introduce solutions to midrange multiphase metering operations and are applicable to the majority of the world’s oil production fields.
- The 65-mm venturi version addresses high-rate oil producers and the majority of wet gas flow rates worldwide.
- The 88-mm venturi version is primarily for high-rate wet gas wells but also serves commingled production metering.
Data Management and Analysis
Maximize the value from high-frequency production data with continuous online monitoring

Production data analysis and diagnostics
Extract the maximum benefit from high-frequency multiphase flow measurements with PRODcast Vx* production testing monitoring software. Historical and real-time data can be analyzed by functional workflows fed by SCADA, historians, and corporate databases. PRODcast Vx software is built on the Avocet* production operations software platform, and the solution stores and manages your production testing data.

Well test management
PRODcast Vx software enables the continuous evaluation of production tests for one well or a group of wells to optimize the well test sequence, frequency, and duration. Users can apply unique practices to each well based on behavior, instead of using a standard approach. The streamlined workflow is integrated with traceable actions for production test validation.

- Identify well test candidates
- Quickly validate production well tests
- Reduce well test rejection rates with an intuitive interface linked to your production data repository.
PRODcast Vx software simplifies production data management so production engineers and specialists can focus on value-adding tasks such as data interpretation and analysis.
Engineering and Manufacturing
A technology center dedicated to the development and manufacturing of multiphase metering products

Development and engineering
The team of engineers and scientists at the Singapore Well Test Technology Center and multiphase manufacturing facility works continuously on the development and refinement of the Vx Spectra flowmeter.

Manufacturing
The assembly line for the Vx Spectra flowmeter was fully conceived based on the principles of lean manufacturing. As a consequence, the Vx Spectra flowmeter has set a new standard in low lead time for multiphase flowmeters. An optimized supply chain and rigorous quality control of individual components complete our commitment to excellence that resides in absolute attention to detail—from start to finish—to ensure that every Vx Spectra flowmeter is manufactured to the highest quality possible.
From pressure integrity to complete functional analysis, each component of a Vx Spectra flowmeter is extensively tested throughout the entire build process.
State-of-the-Art Flow Laboratory

Extensive physical tests in flowing conditions to confirm metrological performance

Flow loop verification
Adjacent to the assembly line at our Singapore facilities, Schumberger has built a state-of-the-art multiphase flow loop. This flow laboratory is used for the research and development of multiphase products. It is also used for conducting onsite flow checks of the manufactured Vx Spectra flowmeters as required by internal quality control processes or on customer request. The Singapore Well Test Technology Center’s flow laboratory complies with the highest standards of quality and full auditability for calibration laboratories, rendering it suitable for independent flow loop testing for performance verification purposes, as often witnessed by customers.

Flow loop tests verify flowmeter accuracy under diverse conditions.
### General Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fluids</strong></td>
<td>Nitrogen, Exxsol™ D80, water†</td>
<td></td>
</tr>
<tr>
<td>Pressure, bara [psia]</td>
<td>3–30 [43–435]</td>
<td></td>
</tr>
<tr>
<td>Temperature, degC [degF]</td>
<td>20–40 [68–104]</td>
<td></td>
</tr>
<tr>
<td>Gas flow rate, am³/h [acf/d]</td>
<td>5–1,140 [4,000–960,000 (~25 MMscf/d)]</td>
<td></td>
</tr>
<tr>
<td>Oil flow rate, m³/h [bbl/d]</td>
<td>0.5–180 [75–27,000]</td>
<td></td>
</tr>
<tr>
<td>Water flow rate, m³/h [bbl/d]</td>
<td>0.5–180 [75–27,000]</td>
<td></td>
</tr>
<tr>
<td>Max. liquid flow rate, m³/h [bbl/d]</td>
<td>200 [30,000]</td>
<td></td>
</tr>
<tr>
<td>Gas volume fraction, %</td>
<td>0–100</td>
<td></td>
</tr>
<tr>
<td>Water/liquid ratio, %</td>
<td>0–100</td>
<td></td>
</tr>
</tbody>
</table>

†Other synthetic oils can be used as required. Water salinity (NaCl) from 0 to 20,000 ppm.

### Metrology

<table>
<thead>
<tr>
<th>Specification</th>
<th>Uncertainty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas reference uncertainty (mass flow), %</td>
<td>0.8</td>
</tr>
<tr>
<td>Oil reference uncertainty (mass flow), %</td>
<td>0.5</td>
</tr>
<tr>
<td>Water reference uncertainty (mass flow), %</td>
<td>0.3</td>
</tr>
</tbody>
</table>

Flow cross-checks: Yes
Flow visualization: Sight glasses
**Configurable Options**

<table>
<thead>
<tr>
<th>Service</th>
<th>Sour per NACE MR0175/ISO 15156</th>
<th>Sour per NACE MR0175/ISO 15156</th>
<th>Sour per NACE MR0175/ISO 15156</th>
<th>Sour per NACE MR0175/ISO 15156</th>
<th>Sour per NACE MR0175/ISO 15156</th>
</tr>
</thead>
<tbody>
<tr>
<td>Venturi body</td>
<td>UNS S31803 (duplex stainless steel) or UNS N06625 (INCONEL® 625)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hazardous area certification</td>
<td>ATEX, IECEx, CSA, UL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ingress protection</td>
<td>IP† 66/67 or NEMA 4X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure sensor connections</td>
<td>Remote seals combined with isolation blocks</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical power</td>
<td>100–240 V AC or 24 V DC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data connectivity</td>
<td>RS-485 or Ethernet TCP/IP (Modbus®)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Typical process connections‡</td>
<td>ANSI flange, API flange, Grayloc®, weld neck, compact NORSOK§</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Specifications**

<table>
<thead>
<tr>
<th>Venturi size</th>
<th>19 mm</th>
<th>29 mm</th>
<th>40 mm</th>
<th>65 mm</th>
<th>88 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service</td>
<td>Sour per NACE MR0175/ISO 15156</td>
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<td>Sour per NACE MR0175/ISO 15156</td>
</tr>
<tr>
<td>Max. working pressure, psi [MPa]</td>
<td>5,000 [34.5]</td>
<td>5,000 [34.5]</td>
<td>5,000 [34.5]</td>
<td>5,000 [34.5]</td>
<td>5,000 [34.5]</td>
</tr>
<tr>
<td>Design temperature, degF [degC]</td>
<td>–50 to 250 [–46 to 121]</td>
<td>–50 to 250 [–46 to 121]</td>
<td>–50 to 250 [–46 to 121]</td>
<td>–50 to 250 [–46 to 121]</td>
<td>–50 to 250 [–46 to 121]</td>
</tr>
<tr>
<td>Electronics temperature, degF [degC]</td>
<td>–40 to 185 [–40 to 85]</td>
<td>–40 to 185 [–40 to 85]</td>
<td>–40 to 185 [–40 to 85]</td>
<td>–40 to 185 [–40 to 85]</td>
<td>–40 to 185 [–40 to 85]</td>
</tr>
<tr>
<td>Water/liquid ratio, %</td>
<td>0 to 100</td>
<td>0 to 100</td>
<td>0 to 100</td>
<td>0 to 100</td>
<td>0 to 100</td>
</tr>
<tr>
<td>Gas volume fraction, %</td>
<td>0 to 100</td>
<td>0 to 100</td>
<td>0 to 100</td>
<td>0 to 100</td>
<td>0 to 100</td>
</tr>
<tr>
<td>Liquid viscosity at line conditions, cP [Pa.s]</td>
<td>0.1 to 2,000 [0.0001 to 2]</td>
<td>0.1 to 2,000 [0.0001 to 2]</td>
<td>0.1 to 2,000 [0.0001 to 2]</td>
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<td>0.1 to 2,000 [0.0001 to 2]</td>
</tr>
<tr>
<td>Max. flow capacity Liquid flow rate, bbl/d [m³/d]</td>
<td>4,000 [635]</td>
<td>11,000 [1,749]</td>
<td>21,000 [3,340]</td>
<td>55,000 [8,745]</td>
<td>100,000 [15,898]</td>
</tr>
<tr>
<td>Gas flow rate at 10 MPa, MMscf/d [MMm³/d]</td>
<td>11 [0.31]</td>
<td>26 [0.74]</td>
<td>50 [1.42]</td>
<td>130 [3.68]</td>
<td>250 [7.08]</td>
</tr>
<tr>
<td>Repeatability (total mass rate at line conditions)</td>
<td>Better than 1%</td>
<td>Better than 1%</td>
<td>Better than 1%</td>
<td>Better than 1%</td>
<td>Better than 1%</td>
</tr>
<tr>
<td>Resolution (total mass rate at line conditions)</td>
<td>Better than 0.1%</td>
<td>Better than 0.1%</td>
<td>Better than 0.1%</td>
<td>Better than 0.1%</td>
<td>Better than 0.1%</td>
</tr>
<tr>
<td>Power consumption, W</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

† Ingress Protection
‡ Example of typical process connections available; additional options may be applicable depending on requirements to Standards Relating to Equipment for Use in Explosive Atmospheres
§ Norsk Sokkels Konkurranseposisjon

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