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**Volume X: The World Market  
for Flowmeters, 9<sup>th</sup> Edition  
*and*  
Module A: Strategies, Industries, &  
Applications, 9<sup>th</sup> Edition**

**Overview**



**Publication Date: May 2024**  
[www.flowvolumex.com](http://www.flowvolumex.com)



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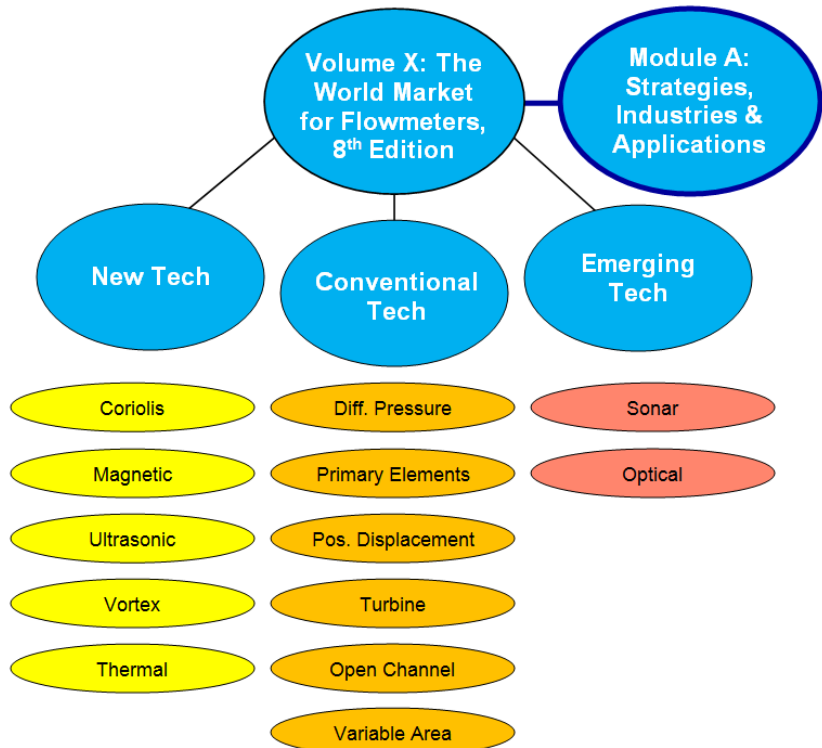
## Volume X: The World Market for Flowmeters Module A: Strategies, Industries, & Applications 9<sup>th</sup> Edition

*Volume X: The World Market for Flowmeters, 9<sup>th</sup> Edition*, presents a complete picture of the worldwide flowmeter market, all in one place. The standalone companion study, *Module A, Strategies, Industries, & Applications, 9<sup>th</sup> Edition*, includes sales strategies, applications, and industry segmentation for each flowmeter type.

### Volume X

Our comprehensive core study researches both new-technology and conventional flowmeters, as well as the emerging flow technologies of sonar and optical. This full-color, two-volume study includes:

- **Market size** of the worldwide markets for 11 flowmeter technologies for **2022**
- Market size **forecasts** for each flowmeter type through **2027**
- **Market shares** worldwide and by each flowmeter type in 2022
- Both **worldwide** and **regional** market size and market share data
- A **technology description and analysis** for each flowmeter type, including major competitive strengths and weaknesses
- **Growth factors** for each flowmeter technology
- **Company profiles** with product information for easy comparison



## Make great decisions with our data

We believe the better information, the better the decision – and Flow Research has always been a source of reliable, accurate data that companies can trust. This study will quickly bring you up-to-speed on the global flowmeter market and its many components.



*The view from 20,000 feet*

### *A few of the ways businesses tell us they use our studies to succeed:*

- Compare the growth rates and market sizes of various flow technologies
- Gain a worldwide perspective of competing suppliers in an industry, market, or technology
- Make an informed choice when considering a product purchase
- Use as a training or educational document
- Quickly survey and assess merger and/or acquisition opportunities
- Accurately forecast market demand for the many flowmeter technologies
- Understand the technical differences between new, conventional, and emerging technologies
- Have a reference standard of competitive technologies and models

## Why we are publishing this study

The main goal of this study is to determine the size of the worldwide flowmeter market. We provide 2022 data on revenue, units, and average selling price for all 11 flow technologies, segmented by region, as well as market forecasts through 2027. We also provide product analysis and growth factors for each flowmeter type.

Flow Research has been providing comprehensive data on the entire flowmeter market since 2003, when we published our first *Volume X* study. Other editions followed in April 2008, October 2010, January 2013, August 2014, January 2017, May 2019, and January 2022. Our first *Volume X* study found that the worldwide flowmeter market equaled \$3.1 billion in 2002. Twenty years later our 8<sup>th</sup> edition, found the market to be \$7.0 billion in 2019. That edition used 2019 as the starting base year, and incorporated supplier input and available 2020 and 2021 data to assess the effects of the COVID-19 pandemic and report the growing signs of recovery. Now that the market has stabilized, we believe it is important to gather 2022 data for a fresh look at all flowmeter types.

## Segmentation covers what our clients want

In order to make this market more understandable, we divide it into three flowmeter groups: new-technology, conventional, and emerging technology. From there, we look at each of the flowmeter technologies individually. Then we build up the total market from the individual flowmeter types. This technique gives you a comprehensive view of the parts and the whole.

This study provides the following worldwide **geographic breakouts** for each flowmeter technology:

- North America (United States and Canada)
- Western Europe
- Eastern Europe/FSU (Former Soviet Union)
- Mideast/Africa
- Japan
- China
- Asia/Pacific
- Latin America (Mexico, Caribbean, Central and South America)

The following **market segments** are common to each flowmeter technology chapter:

- Market size in dollars and units
- Manufacturer market shares
- Average selling prices by technology by region
- Technology analysis
- Product summaries by major manufacturer

#### **Individual flowmeter technologies included in this study**

##### **New-Technology Flowmeters**

- Coriolis
- Magnetic
- Ultrasonic
- Vortex
- Thermal

##### **Emerging Technology**

- Sonar and Optical

##### **Conventional Technology**

- Multivariable and Differential Pressure Flow Transmitters
- Primary Elements
- Positive Displacement Flowmeters
- Turbine Flowmeters
- Open Channel Flowmeters
- Variable Area Flowmeters

#### **Key issues addressed in the 9<sup>th</sup> Edition of this study**

- Factors affecting growth of markets
- Growth rates for each flowmeter type in each of the geographic regions
- Effect of large line size meters on the Coriolis flowmeter market
- Impact of the oil & gas industries on the flowmeter markets
- Continued expansion of magnetic and vortex flowmeter opportunities and markets
- Growth in the ultrasonic market, especially in custody transfer applications
- Comparison of DP flowmeters and primary elements to other flowmeter markets
- Impact of new-technology flowmeters on the turbine and positive displacement markets
- Mergers and acquisitions in the worldwide flowmeter market
- Effects of growth in China, India, and other developing countries on global markets
- A comparison of the new-technology and conventional flowmeter markets

## Supplier information helps you compare manufacturer offerings

Detailed company profiles of all major suppliers in each of the individual flowmeter markets, including a manufacturer-by-manufacturer product analysis allow you to quickly compare the product lines of all major suppliers. There is no other report available today with this critical information combined into a single overall market view.

The company profiles include important data such as contact information, revenues, product lines, company history and organization, recent acquisition activity, and sales strategies. Each company's flowmeter product line is summarized in easy-to-read tables.

### Company Profiles

The following are many of the leading companies profiled in this study:

- Armstrong: Veris
- Azbil: Vortek
- Badger Meter
- Baker Hughes
- Bopp & Reuther Messtechnik
- Canalta Flow Measurement
- Danaher – Hach, McCrometer
- Daniel
- Emerson Automation Solutions – Micro Motion, Rosemount
- Endress+Hauser
- FLEXIM
- Fluid Components International (FCI)
- Fuji Electric
- Honeywell International: Honeywell Elster Group
- GWF MessSysteme AG
- IDEX: Accusonic, Liquid Controls, SAMPI
- ITW: Brooks Instrument
- KROHNE
- OVAL Corporation
- Primary Flow Signal
- Red Seal Measurement
- Roper/CD&R – FTI Flow Technology and Neptune Technology Group
- RMG Messtechnik
- Sensia
- Schneider Electric: Foxboro by Schneider Electric
- SICK AG
- Siemens AG
- TASI Group Companies
- TechnipFMC
- Tokyo Keiso
- Toshiba
- Yokogawa Electric Corporation

## Valuable summary data by technology

The **New-Technology Flowmeters** overview chapter provides technology descriptions, compares new-technology flowmeters to the differential pressure (DP) standard, describes the paradigm case method and its several criteria, and details new-technology flowmeter shipments on a worldwide and regional basis. Our paradigm case method of analysis determines the most suitable applications for each flowmeter type, backed up by our customer survey results, extensive supplier questionnaires, and other knowledge from our long-term involvement in the instrumentation field.

The **Conventional Flowmeters** and **Emerging Technology Flowmeters** overview chapters are equally as detailed. We also include **individual chapters for each of the flowmeter types** in the new-technology and conventional groups.



Flow Research has conducted individual studies of each flowmeter type over the years, with periodic updates. *The World Market for Flowmeters, 9<sup>th</sup> Edition* brings our research on these individual flowmeter markets together into a comprehensive overview. Our method has always been to use a bottom-up approach when analyzing any market to both confirm data accumulated and trends we have been tracking as well as to discover important new trends.

### Table of Contents: The World Market for Flowmeters, 9<sup>th</sup> Edition

<i>Chapter One:</i> Executive Summary	<i>Chapter Thirteen:</i> Primary Elements
<i>Chapter Two:</i> Scope and Method	<i>Chapter Fourteen:</i> Positive Displacement Flowmeters
<i>Chapter Three:</i> Paradigm Case Analysis	<i>Chapter Fifteen:</i> Turbine Flowmeters
<i>Chapter Four:</i> Worldwide Flowmeter Market	<i>Chapter Sixteen:</i> Open Channel Flowmeters
<i>Chapter Five:</i> New-Technology Flowmeters	<i>Chapter Seventeen:</i> Variable Area Flowmeters
<i>Chapter Six:</i> Coriolis Flowmeters	<i>Chapter Eighteen:</i> Emerging Technology Flowmeters
<i>Chapter Seven:</i> Magnetic Flowmeters	<i>Chapter Nineteen:</i> Market Shares
<i>Chapter Eight:</i> Ultrasonic Flowmeters	<i>Chapter Twenty:</i> Company Profiles
<i>Chapter Nine:</i> Vortex Flowmeters	
<i>Chapter Ten:</i> Thermal Flowmeters	
<i>Chapter Eleven:</i> Conventional Flowmeters	
<i>Chapter Twelve:</i> Multivariable and Differential Pressure Transmitters	

### Why you must have this study

- Stay current with data on flowmeter shipments
- Assess your competitive positions
- Understand how the flow technologies stack up against each other
- Benefit from knowledge gleaned from 30+ years of data and 280+ studies
- Be among the first to own an ‘instant classic’ – at a price you can afford
- Leverage insights from our onsite visits to suppliers and end users in the Middle East, Europe, the United States, and Australia
- Profit from strategies to help you build your product line

**Plus** over 150 informative tables like this one, and many color charts illustrating the data:

**Shipments of All Flowmeters Worldwide by Technology  
(Millions of Dollars)**

Technology	2022	2023	2024	2025	2026	2027	CAGR
Coriolis	xxx.x	xxx.x	xxx.x	xxx.x	xxx.x	xxx.x	x.x%
Magnetic	xxx.x	xxx.x	xxx.x	x,xxx.x	x,xxx.x	x,xxx.x	x.x%
Ultrasonic	xxx.x	xxx.x	xxx.x	xxx.x	xxx.x	xxx.x	x.x%
Vortex	xxx.x	xxx.x	xxx.x	xxx.x	xxx.x	xxx.x	x.x%
Thermal	xx.x	xx.x	xx.x	xx.x	xx.x	xxx.x	x.x%
Diff. Pressure	xxx.x	xxx.x	xxx.x	xxx.x	xxx.x	xxx.x	x.x%
Primary Elements	xxx.x	xxx.x	xxx.x	xxx.x	xxx.x	xxx.x	x.x%
Pos. Displacement	xxx.x	xxx.x	xxx.x	xxx.x	xxx.x	xxx.x	x.x%
Turbine	xxx.x	xxx.x	xxx.x	xxx.x	xxx.x	xxx.x	x.x%
Open Channel	xxx.x	xxx.x	xxx.x	xxx.x	xxx.x	xxx.x	x.x%
Variable Area	xxx.x	xxx.x	xxx.x	xxx.x	xxx.x	xxx.x	x.x%
<b>Total</b>	x,xxx.x	x,xxx.x	x,xxx.x	x,xxx.x	x,xxx.x	x,xxx.x	x.x%



## Module A: Strategies, Industries, & Applications, 9<sup>th</sup> Edition

*Module A: Strategies, Industries, & Applications* complements and builds on the data in *Volume X: The World Market for Flowmeters* to provide a complete world view of the flowmeter market. It can be ordered as a standalone report or as an add-on to the main study. This content-rich module discusses strategies, industries, and applications in depth. Charts illustrate the worldwide market data for nine major flow measurement technologies: Coriolis, magnetic, ultrasonic, vortex, thermal, differential pressure, primary elements, positive displacement, and turbine.



**Strategies.** Our tactical and strategic strategies for both the entire flowmeter market and individual flowmeter product lines can benefit companies already in the flowmeter market as well as companies considering joining the market.



**Industries.** Our focused insights into industry trends explain product improvements and the advantages and disadvantages inherent to each flowmeter type.

**Applications.** *Module A* includes data on the following industries common to all the flowmeter types:

- Oil and Gas
- Refining Industry
- Chemical Manufacturing
- Pharmaceutical Manufacturing
- Food and Beverage
- Pulp and Paper
- Metals and Mining
- Power
- Water and Wastewater

### Key topics addressed in Module A

- Tactical and strategic recommendations for suppliers in each market segment
- Discussion of market forces at work
- Best areas for future growth
- Strategic action perspectives
- Real-world success stories

We also provide data specific to each flowmeter type on these and many other applications:

- Custody Transfer
- Process Measurement
- Compressed Natural Gas
- LNG
- Slurries
- Sanitary/Hygienic
- Water Flow
- Water-based Chemicals





Module A details worldwide shipments **by industry and application in dollars and percentages** for the nine types of new-technology and conventional technology flowmeters, in the following geographic breakouts:

- North America (United States and Canada)
- Western Europe
- Eastern Europe/FSU (Former Soviet Union)
- Mideast/Africa
- Japan
- China
- Asia/Pacific
- Latin America (Mexico, Caribbean, Central and South America)



You will find:

- Shipments by industry and application in dollars and percentages, broken out by flowmeter type for base year 2022
- Forecasted growth rates by both application and industry through 2027
- Essential information on market outlook and industry trends by flowmeter type
- Realistic strategies for success for those entering or already in the flowmeter market

### **New-Technology vs. Conventional Flowmeters – what's the difference?**

**New-Technology** flowmeters include Coriolis, magnetic, ultrasonic, vortex, thermal, and multiphase. They share four features:

1. Introduced since 1950
2. Incorporate technological advances that avoid some of the problems inherent in earlier flowmeters
3. Are the focus of more of the product development efforts by the major manufacturers
4. Feature superior measured performance, especially accuracy, on a standard basis

**Conventional Technology** flowmeters include differential pressure, (primary elements used with DP), positive displacement, turbine, open channel, and variable area.

## Applications by Flowmeter Type

### New-Technology Flowmeter Applications

#### Coriolis

- Custody Transfer of Petroleum Liquids
- Custody Transfer of Natural Gas
- Allocation Metering
- Liquefied Natural Gas (LNG)
- Compressed Natural Gas (CNG)
- Dosing / Blending
- Process Measurement
- Other

#### Magnetic

- Water Flow
- Water-Based Chemicals
- Hydrofracking
- Slurries
- Sanitary/Hygienic
- Process Control
- Custody Transfer
- Dosing/Filling Machines
- Other

#### Ultrasonic

- Custody Transfer of Natural Gas
- Custody Transfer of Petroleum Liquids
- Custody Transfer of Non-petroleum Liquids
- Check Metering
- Leak Detection
- Liquefied Natural Gas (LNG)
- Process Measurement
- Water Treatment
- Other

#### Vortex

- Custody Transfer of Petroleum Liquids
- Custody Transfer of Natural Gas
- Custody Transfer of Steam
- Non-custody Transfer of Petroleum Liquids
- Non-custody Transfer of Natural Gas
- Non-custody Transfer of Steam
- Non-petroleum Liquids
- Slurries
- Water
- Other

### Thermal

- Continuous Emissions Monitoring (CEM)
- Flare Gas/Stack Gas
- Landfill Gas
- Biogas
- Biomass
- Coal Mine Methane
- Boiler Inlet
- Wastewater Treatment
- Air/Compressed Air
- Sanitary/Hygienic
- Submetering
- Other

### Conventional Technology Flowmeter Applications

#### Differential Pressure Transmitters

(See applications for Primary Elements.)

#### Primary Elements

- Custody Transfer of Oils/Petroleum Liquids
- Custody Transfer of Gas
- Non-custody Transfer of Gas
- Non-custody Transfer of Liquids
- Wet Gas Metering
- Allocation Metering of Gas
- Steam
- LNG
- CNG
- HVAC
- Gas Gathering Stations
- Wellhead Monitoring
- In-plant Measurement
- Other

#### Positive Displacement

- Municipal Water
- Municipal/Industrial Gas
- Petroleum Liquids
- Industrial Liquids

#### Turbine

- Municipal Water
- Municipal/Industrial Gas
- Oil
- Industrial Liquids

## Flow Research, Inc.

Flow Research is the only market research company that publishes studies on all nine flowmeter types and whose primary mission is to research process control instrumentation markets. In addition to studies on both new and conventional flowmeter types, we have researched pressure transmitters; temperature sensors and transmitters, infrared thermometers and thermal imagers; level devices; analytical instrumentation; and selected API-certified valves. We also publish studies on oil & gas and other major flowmeter markets. In addition, Flow Research started a working group on flowmeter calibration (FRWG.org) and published two studies on flowmeter calibration facilities, one each for liquids and gas.

## Partnerships and Alliances

Flow Research helps flowmeter companies form alliances and partnerships to provide specific solutions or broaden their customer base and distribution channels. These partnerships can include manufacturers of valves, hoses, transmitters, or other flow-related products, as well as other flowmeter manufacturers.



*Dr. Jesse Yoder, president and founder of Flow Research*

## Distributorships

Are you expanding your presence in the U.S.? We can help you find distributors for your flowmeters.

## Custom Projects

Companies commission us for custom projects when they want more detailed information on a specific subject than is possible in an off-the-shelf report. They may be evaluating the future or expansion of a product line, determining whether to acquire or merge with another company, or seeking to better understand their customer needs.

## Consulting

We also work with companies individually to formulate strategies that help them succeed in an increasingly complex world. Dr. Yoder and his team have studied hundreds of companies and have advised most of the top flowmeter suppliers on market and product strategies.

## Research Team Background

**Dr. Jesse Yoder**, the lead analyst for this study, is President of Flow Research Inc., which he founded in 1998. He has worked as a writer and analyst in process control and instrumentation since 1987 and has created market research studies since 1990. Since then he has written over 280 market research studies, most of them on flow and instrumentation, and over 300 articles on flow and instrumentation for trade journals. (See [www.flowarticles.com](http://www.flowarticles.com).)

Dr. Yoder received a PhD in philosophy from the University of Massachusetts Amherst in 1984 and spent 10 years as an adjunct philosophy professor at the University of Massachusetts Lowell and Lafayette College. Dr. Yoder also worked 10 years as a technical writer, including for the process control division of Siemens, and taught technical writing at Northeastern University and the UMass Lowell.

Dr. Yoder has received two U.S. patents for the flowtube meter, a new dual tube/dual sensor method of measuring flow, in 2015 and 2017. This meter's two prototypes have been tested at CEESI in Nunn, Colorado.

CRC Press published Dr. Yoder's two-book set, [\*Advances in Flowmeter Technology\*](#), on the history, operating principles, growth factors, representative companies, and frontiers of research for all 10 types of flowmeters. The first volume, *New-Technology Flowmeters*, published September 6, 2022, was followed by *Conventional Flowmeters* on December 15.

In 2015, ISA published Dr. Yoder's book, [\*The Tao of Measurement\*](#), with Richard E. Morley as co-contributor. Topics included temperature, pressure, flow, time, length, and area.



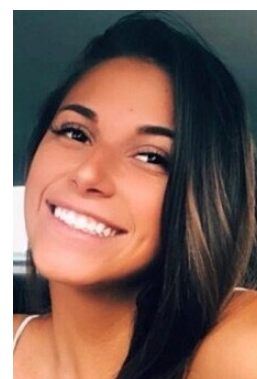
*Belinda Burum*

**Belinda Burum**, Vice President, joined Flow Research in 2002. She has served as senior strategic advisor and has been involved with most of our projects and publications. She has also worked as a writer and editor in journalism, advertising, and high tech marketing communications and customer references for 30+ years in the U.S. and Switzerland and is a published author and book editor. She also taught English in Massachusetts, California, and Ecuador and has travelled extensively.

**Leslie Buchanan**, Research and Publication Production Associate, joined Flow Research in 2010 with skills from work and life experiences here and abroad. She assists with research and writing, and handles many publication aspects of Flow Research studies.

**Vicki Tuck**, Administrative Assistant, joined Flow Research in 2012 with experience in both the fast-paced law firms of Boston and in various nonprofit organizations. She assists with administrative tasks, including database and collecting news for the Worldflow publications.

**Kaleigh Flaherty**, Director of Marketing, created social media posts for us starting in May 2021 before going back to school to finish her degree in marketing at Coastal Carolina University in Conway, South Carolina. She rejoined us in August 2022 to expand our social media presence and manage other outreach activities.



*Kaleigh Flaherty*

*For more information on Flow Research, please visit our website at [www.flowresearch.com](http://www.flowresearch.com). Please follow us on Facebook, LinkedIn, Twitter, and Instagram. We also invite you to join our Flow Research LinkedIn group.*

## **Recent and Currently Scheduled Flow Research Studies**

### **New-Technology Flowmeter Studies**

Mass Flowmeter Series	<a href="http://www.massflows.com">www.massflows.com</a>
The World Market for Mass Flow Measurement (Core Study)	
The World Market for Coriolis Flowmeters, 7 <sup>th</sup> Edition	<a href="http://www.flowcoriolis.com">www.flowcoriolis.com</a>
The World Market for Thermal Flowmeters, 3 <sup>rd</sup> Edition	<a href="http://www.flowthermal.com">www.flowthermal.com</a>
The World Market for Mass Flow Controllers, 4 <sup>th</sup> Edition	<a href="http://www.flowmfc.com">www.flowmfc.com</a>
The World Market for Magnetic Flowmeters, 7 <sup>th</sup> Edition	<a href="http://www.flowmags.com">www.flowmags.com</a>
The World Market for Ultrasonic Flowmeters, 6 <sup>th</sup> Edition	<a href="http://www.flowultrasonic.com">www.flowultrasonic.com</a>
The World Market for Vortex Flowmeters, 6 <sup>th</sup> Edition	<a href="http://www.flowvortex.com">www.flowvortex.com</a>
The World Market Update for Mass Flow Controllers	<a href="http://www.flowmfc.com">www.flowmfc.com</a>
The World Market for Multiphase Flowmeters, 2 <sup>nd</sup> Edition	<a href="http://www.flowmultiphase.com">www.flowmultiphase.com</a>
Multiphase: Module A: The World Market for Watercut Meters	<a href="http://www.watercutmeters.com">www.watercutmeters.com</a>

### **Conventional Flowmeter Studies**

The World Market for Pressure Transmitters, 5 <sup>th</sup> Edition	<a href="http://www.worldpressure.com">www.worldpressure.com</a>
The World Market for Primary Elements, 2 <sup>nd</sup> Edition	<a href="http://www.flowplate.com">www.flowplate.com</a>
The World Market for Positive Displacement Flowmeters, 3 <sup>rd</sup> Edition	<a href="http://www.flowpd.com">www.flowpd.com</a>
The World Market for Turbine Flowmeters, 3 <sup>rd</sup> Edition	<a href="http://www.flowturbine.com">www.flowturbine.com</a>
The World Market for Variable Area Flowmeters	<a href="http://www.flowva.com">www.flowva.com</a>

### **Cross-Technology Flowmeter Studies**

Volume X: The World Market for Flowmeters, 8 <sup>th</sup> Edition	<a href="http://www.flowvolumex.com">www.flowvolumex.com</a>
Volume X: Module A: Strategies, Industries, and Applications	<a href="http://www.flowvolumex.com">www.flowvolumex.com</a>
The World Market for Gas Flow Measurement, 4 <sup>th</sup> Edition	<a href="http://www.gasflows.com">www.gasflows.com</a>
Gas Module A: Applications and Strategies for Gas Flow Measurement	<a href="http://www.gasflows.com">www.gasflows.com</a>
Gas Module B: Natural Gas Production, Consumption, and Flow Measurement in the Oil & Gas Industry	<a href="http://www.gasflows.com">www.gasflows.com</a>
Flowmeters in the Oil & Gas Industry	<a href="http://www.oilflows.com">www.oilflows.com</a>

### **Flow Calibration Studies**

Core Study: Worldwide Gas Flow Calibration Facilities and Markets	<a href="http://www.flowcalibration.org">www.flowcalibration.org</a>
Module A: Worldwide Liquid Flow Calibration Facilities and Markets	<a href="http://www.flowcalibration.org">www.flowcalibration.org</a>

### **Temperature**

Market for Temperature Sensors in the Americas, 3 <sup>rd</sup> Edition	<a href="http://www.tempresearch.com">www.tempresearch.com</a>
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# Volume X: The World Market for Flowmeters, 9<sup>th</sup> Edition *and* Module A: Strategies, Industries, & Applications, 9<sup>th</sup> Edition



*Bergen, Norway – photo by Flow Research*



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## Why Flow Research? We . . .

- Specialize in flowmeter markets and technologies
- Research all flowmeter types
- Study suppliers, distributors, *and* end users
- Provide a unique perspective through our worldwide network of contacts
- See our mission as supplying the data to help your business succeed