MERCURY

# Flow Measurement Fundamentals: Liquid and Gas Meters

26 – 30 April 2027
Amsterdam (Netherlands)

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# Flow Measurement Fundamentals: Liquid and Gas Meters

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Flow Measurement Fundamentals: Liquid and Gas Meters is a one-week foundation course for operators, technicians and junior engineers who read, check or look after flow meters. You learn how fluids behave in pipes, how the common meter types work, why installation matters and how to spot a meter that is drifting. You leave with your own Flow Meter Field Checklist. The course is delivered by Mercury Training Center.

## About This Course

Many meter problems are not faults in the meter: a missing straight run, gas in a liquid line or a blocked impulse tube gives wrong readings for months. You should already work around process plant or utility lines. You practice with meter cutaways, sample datasheets, simple calculations and fault scenarios.

## Who It Is For

- Operators who read flow indications and react when numbers look wrong.
- Technicians who install, check and clean meters in the field.
- Junior engineers who are starting to specify or review meter installations.
- Laboratory and quality staff who use flow data in balances and reports.
- Maintenance planners who schedule meter checks and calibrations.

This course is not for metering engineers who already select meters for custody transfer and run proving and uncertainty work, who are better served by an advanced flow measurement course. It also does not suit control engineers who need loop tuning, which a process control course covers.

## Competencies You Will Build

- Flow Basics: you explain flow rate, velocity, Reynolds number and flow profile in plain words to colleagues.
- Meter Recognition: you identify a meter type in the field and know what it actually measures.
- Installation Checks: you spot poor straight runs, wrong orientation and trapped gas or liquid.
- Data Sense: you notice when a flow trend or balance does not add up and raise it.
- Routine Meter Care: you clean, zero-check and record meters to a set routine.

## What You Will Be Able to Do

By the end of the course you will be able to:

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- Given pipe size, flow rate and fluid data, calculate velocity and Reynolds number and say whether flow is laminar or turbulent.
- From a meter datasheet, state its principle, range, accuracy and limits for liquid or gas service.
- Using a piping sketch, mark where an orifice, vortex or ultrasonic meter can and cannot be installed.
- From a week of flow data, identify drift, spikes or flat-lining and suggest likely causes.
- Given a meter that reads high in wet gas service, list the checks to run before calling a specialist.
- Using your site's meter list, draft a routine check and calibration schedule.

## Course Content

### Day 1: How Fluids Flow in Pipes

- Volumetric and Mass Flow Rate, Units and Conversions
- Velocity, Reynolds Number and Laminar Versus Turbulent Flow
- Flow Profiles, Swirl and Why Straight Runs Matter
- Liquid and Gas Properties: Density, Viscosity, Pressure and Temperature
- Reading Process Flow Diagrams for Meter Locations

### Day 2: Differential Pressure and Mechanical Meters

- Orifice Plates and ISO 5167 Basics for Liquid and Gas Lines
- Venturi Tubes, Flow Nozzles and Pitot Tubes
- Impulse Lines, Transmitters and Common Installation Errors
- Turbine and Positive Displacement Meters for Liquids
- Variable Area Meters for Local Indication

### Day 3: Electronic Meter Types

- Vortex Meters and Their Low-Flow Limits
- Electromagnetic Meters for Conductive Liquids
- Ultrasonic Transit-Time and Clamp-On Meters
- Coriolis Meters for Direct Mass Measurement
- Thermal Mass Meters for Gas Service

### Day 4: Gas, Wet Gas and Accuracy Basics

- Natural Gas Measurement and Pressure-Temperature Correction
- Wet Gas and Two-Phase Effects on Meter Readings
- Accuracy, Repeatability, Turndown and Error Sources
- Calibration Methods and Reference Standards
- Meter Selection Checklist by Fluid, Range and Installation

## Day 5: Meter Care and Troubleshooting Practice

- Exercise: Diagnosing Faults From Sample Flow Trends
- Exercise: Reviewing a Meter Installation Sketch
- Exercise: Selecting a Meter for a Given Duty
- Routine Maintenance, Records and Links to Control Systems
- Completing Your Flow Meter Field Checklist

## Case Studies and Exercises

The following are suggested activities.

- Case study: An oil and gas production line shows a gas meter reading high after liquid carryover; you decide which checks to run and what to report.
- Case study: A water treatment plant's magnetic meter drifts after a pipe repair; you trace the cause to installation and decide the fix.
- Exercise: For a chemical plant transfer line, you choose between a turbine and a Coriolis meter and justify the choice.
- Exercise: You review an orifice installation drawing and mark errors in straight run and impulse line routing.

## What You Take Back

You return with your Flow Meter Field Checklist, built around meters on your own site. In your first month back you use it on routine rounds to check installations, spot suspect readings and record meter condition before raising maintenance requests.

- A meter identification and principle sheet.
- Installation check points for each meter type.
- A fault symptom and cause table.
- A routine check and calibration schedule.

## Quick Answers FAQ

### What do I need before Flow Measurement Fundamentals: Liquid and Gas Meters?

You need basic arithmetic and some time around process or utility lines. No engineering degree is needed; the course starts from how fluids move in pipes and builds up to each meter type.

### How does a flow measurement fundamentals course differ from an advanced flow measurement course?

A fundamentals course explains how meters work, how to install and check them and how to spot bad readings. An advanced course goes into meter selection for complex duties, custody transfer, proving and measurement uncertainty.

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## Which flow meter is best for gas measurement?

There is no single best meter. Orifice, ultrasonic, turbine, thermal and Coriolis meters all measure gas; the choice depends on pipe size, pressure, range, cleanliness of the gas and required accuracy.

## What do I take back from flow meter training for technicians?

You take back a Flow Meter Field Checklist with meter identification sheets, installation check points, a fault table and a check schedule built for meters on your site.

## For Your Manager

After this course the team member can identify meter types, check installations, recognize suspect flow readings and carry out routine meter care with proper records. They bring back a Flow Meter Field Checklist built on the site's own meters, first used on routine rounds and when raising meter maintenance requests.

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