



Level



Pressure



Flow



Temperature



Liquid  
Analysis



Registration



Systems  
Components



Services



Solutions

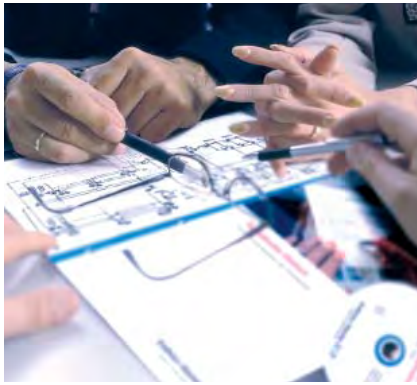
## Flow measurement in utilities

Energy management in your hands – customized solutions for compressed air, gas, steam and water

Endress+Hauser 

People for Process Automation

# Endress+Hauser – Your Partner



Endress+Hauser is a global provider of solutions for instrumentation and automation. Supplying the production and logistic sectors of the process industry, the company develops sensors and systems that obtain information from the process, transmits this data and processes it. High-quality products and cutting-edge services support our customers' competitiveness with top-notch quality, dependability and efficiency.

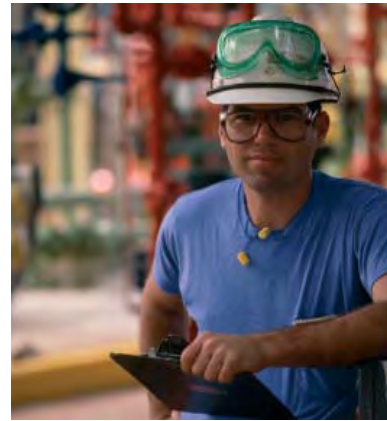
Endress+Hauser works closely with universities and research institutes, and also cooperates with business partners and competitors. The company is committed to continuously expanding its industry-specific know-how and ensuring the competence of its sales, marketing and service. The closely knit network of affiliated production and marketing companies and regional representatives establishes and maintains the group's powerful presence in all the world's markets – in other words right on your doorstep.

Endress+Hauser is a byword for independence, continuity and long-term customer relationships. Our 50-plus years of application experience are the foundation on which we have built our wide range of products for metering flow, level, pressure and temperature, complete with liquid analysis, recording and system components.

Endress+Hauser is a single-source supplier, so you can always be confident that we will have the optimum solution for your measurement requirements.

## Flow measurement as competence

Endress+Hauser ranks internationally as one of the leading producers of industrial flowmeters for liquids, gases and steam. As a competence center, we have achieved a top position in the global market within the last 28 years. High accuracy, dependable metering, simple commissioning and low maintenance outlay – these are only some of the properties that our customers can always rely on.



# Saving energy and costs – together!



Are you the maintenance technician, engineer or plant manager whose job it is to maintain competent support for the gas, steam or water utilities of your company? Are you the process or finance manager who has to balance the trade-off between increasing plant efficiency and reducing operating overheads and energy costs? Do you find that the dictates of quality audits, standard operating procedures and environmental protection require ever-stricter process monitoring?

Yes? Then you can count on Endress+Hauser fully and completely in regard to “Energy and Cost Savings”!

As a single-source supplier of process instrumentation we can offer the all-inclusive solutions package you need:

- Wide range of premium flowmeters
- Customized solutions for your applications
- Competent planning, commissioning and maintenance (engineering, project management)
- Professional support from specialists in all sectors
- Worldwide service network

Put us to the test!



## Did you know ... ?

- that electricity accounts for 75% of the total operating costs for air compressors over a ten year period?
- that a  $\frac{1}{8}$  in. leak in a compressed-air pipe will cost you \$750 in energy losses per year?
- that the energy cost of compressed air goes up approximately 9% for every unnecessary 14.7 psig of pressure?
- that 18 to 30 ft/s is the recommended maximum flow velocity for economical operation in compressed-air distribution systems and that the corresponding figure for steam pipes is 75 ft/s?
- that leaks in outdated, underground distribution networks for steam or hot water can push energy costs up by as much as 50%?

# You can control only what you measure!

Utilities such as gas, steam and water provide energy for plant operation in all sectors of industry. Vast quantities of energy are expended in producing, transporting and distributing fluids, e.g. compressed air, saturated steam, natural gas, cooling or heated water. Every plant operator's goal must therefore be to run and control his process as efficiently as possible.

Merely installing meters for flow, temperature or pressure is not enough to save energy. This is why Endress+Hauser has a comprehensive product range for the recording and

evaluating of data. These tools enable the objective assessment of energy consumption and plant efficiency as a first step towards leveraging improved plant performance that will translate into measurable energy savings.

Endress+Hauser offers you high-quality meters, system components and intelligent solutions – matched to your application, matched to your needs.



- Accurate and reliable measurement
- Continuous data collection
- Optimized evaluation
- Ensure long term competitiveness



Flowmeters from Endress+Hauser take high process temperatures and process pressures in their stride.



## Monitoring utilities

Whether in heated or cooling systems, boilers or burners, whether compressed air or steam – the central tasks for monitoring utilities are always the same, regardless of the fluid or where it is measured:

Distribution

Delivery / End-user consumption

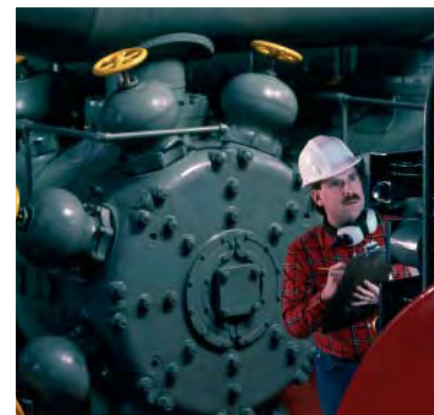
Allocation

Energy efficiency

Monitoring (limit values, alarms)

Leakage minimization

Filter monitoring



# Flowmeters in utilities



## Vortex

Vortex meters are extremely robust. These versatile devices have long been in use for metering liquids, gases and steam in all industries. Frequently used in combination with a flow computer, pressure and/or temperature sensors for energy and heat metering.



Prowirl

### Benefits at a glance

- High long-term stability and repeatability
- Installed base of more than 100,000 meters
- Low pressure loss
- Large turndown of 10:1 to 30:1 (gas/steam) or 40:1 (liquids)
- Mass and energy metering of liquids, gases and steam by a flow computer or optionally with an integrated temperature sensor (multivariable sensor)

### Applications

- Universal measurement of gases, steam and liquids
- Nominal diameters: ½" to 12" (DN 15 to 300)
- Process pressure: max. 3625 psi (250 bar)
- Temperature: -328 to +752°F (-200 to +400°C)



## Differential pressure

Thanks to the large wealth of experience, differential-pressure flow metering has been accepted and widely used for over 100 years throughout the world. Some primary elements, e.g. orifices, can be replaced or calibrated at any time under operating conditions, even in pipes with nominal diameters larger than 65 ft. (2 meters).



Deltatop/-set

### Benefits at a glance

- Worldwide standards (since 1929)
- Long tradition in metrology, widely accepted
- Robust and application-specific designs (orifice, nozzle, venturi, pitot)
- Pitot tube for reduced pressure loss
- Combinable with flow computers for mass, energy and volume measurement of liquids, gases and steam; and for increased turndown (split range)

### Applications

- Universal measurement of gases, steam and liquids
- Nominal diameters: ¾" to >80" (DN 10 to >2000)
- Process pressure: max. 5800 psi (400 bar)
- Temperature: -328 to +1832°F (-200 to +1000°C)



## Thermal

The principle of thermal mass flow measurement has become widely accepted by industry in recent years and is used successfully in many applications involving gases. By comparison with other techniques, this principle allows the measurement of gases at very low flow rates and process pressures with high accuracy.



t-mass

### Benefits at a glance

- Simultaneous measurement and output of mass flow and fluid temperature (multivariable sensor)
- Suitable for leakage detection
- Cost-effective insertion sensors for very large pipe diameters
- Large turndown up to 100:1
- Negligible pressure loss (<2 mbar)

### Applications

- Direct mass flow measurement of gases, e.g. air, compressed air, clean gases (Ar, O<sub>2</sub>, N<sub>2</sub>, CO<sub>2</sub>) or natural gas
- Nominal diameters: ½" to 60" (DN 15 to 1500)
- Process pressure: max. 580 psi (40 bar)
- Temperature: -40 to +266°F (-40 to +130°C)

## Tooling



### Planning / Selection

Only correctly selected flowmeters ensure highest measuring accuracy during operation. This in turn prevents product losses generating unnecessary follow-up costs. Using Applicator, a software package proven for over 10 years, measuring locations can be easily designed and documented without a large amount of specialized knowledge.





### Coriolis

Maximum accuracy is the outstanding feature of this measuring principle for liquids and gases. Another feature is the ability to measure multiple process variables simultaneously with one single sensor: mass flow, volume flow, density and temperature. This opens up completely new perspectives for optimizing and monitoring utilities (e.g. burner control).



Promass

#### Benefits at a glance

- Multivariable measurement: several process parameters simultaneously measurable
- High measuring accuracy
- Independent of the fluid's properties
- No inlet/outlet runs necessary
- Approvals for custody transfer
- Combinable with flow computers for gas and liquid energy metering

#### Applications

- Direct mass flow measurement of liquids and gases, e.g. fuels, oils, natural gas, liquefied gas or technical gases
- Nominal diameters: 1/2" to 10" (DN 1 to 250)
- Process pressure: max. 5075 psi (350 bar)
- Temperature: -58 to +662°F (-50 to +350°C)



### Electromagnetic

From just a few gallons to nearly 30 million gallons per hour – for measuring electrically conductive liquids like cooling water or hot water, this measuring principle has proven itself as a standard worldwide in all industries for over 50 years.



Promag

#### Benefits at a glance

- High degree of measuring reliability and repeatability
- Good long-term stability
- Installed base of more than 1,000,000 meters
- Free pipe cross-section, no pressure loss
- Very high turndown
- Approvals for custody transfer
- Combinable with flow computers and temperature sensors for delta-heat applications (energy)

#### Applications

- Volume measurement of all electrically conductive liquids, e.g. cooling water, hot water or saline solutions
- Nominal diameters: 1/2" to 90" (DN 2 to 2000)
- Process pressure: max. 580 psi (40 bar)
- Temperature: -40 to +356°F (-40 to +180°C)



### Ultrasonic

With the ultrasonic transit time differential method, flow can be metered accurately, regardless of the liquid's electrical conductivity. This method is ideal for hot and cold water and for demineralized water. The portable clamp on sensors can be directly strapped to the outside of existing pipings.



Prosonic Flow

#### Benefits at a glance

- Cost-effective flow measurement
- Ideal for retrofitting without process interruption, e.g. for cross-checking existing flowmeters or for temporary flow measurement
- Free pipe cross-section, no pressure loss
- Not affected by process pressure
- Combinable with flow computers and temperature sensors for delta-heat applications (energy)

#### Applications

- Volume measurement of all liquids, e.g. boiler feedwater, cooling water, hot water or demineralized water
- Suitable for sonically conductive pipes and homogeneous liquids
- Nominal diameters: 1/2" to 160" (DN 15 to 4000)
- Temperature: -40 to +338°F (-40 to +170°C)

#### Commissioning / Configuring

Besides commissioning via the local display, the ToF Tool – Fieldtool Package configuration and service program supports further process optimization and field support for flowmeters: device parameterization, data transfer, display of measured data, diagnostics and data monitoring, complete with evaluation and documentation.



#### Maintenance / Verification

In many processes, the function of flowmeters must be periodically checked and tested due to internal or legal requirements. Fieldcheck is a NIST traceable test and simulation device that permits in-situ checking of your installed flowmeters without their removal or process interruption.



Process transmitters



Data registration



Display



Flow/energy computer



Prowirl



Deltatop/-set



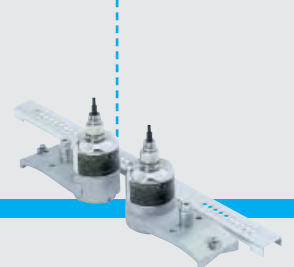
t-mass



Promass



Promag



Prosonic Flow



# Our solutions, your benefits

## Turnkey solutions

Endress+Hauser has one of the world's most comprehensive product portfolios for industrial instrumentation. Visualization and evaluation of process data, however, are the real keys to benefit fully from flow measurement. Therefore, Endress+Hauser provides you with a full range of special software packages long proven in the field. The choice includes P-View, ControlCare, ToF Tool – Fieldtool Package and FieldCare:

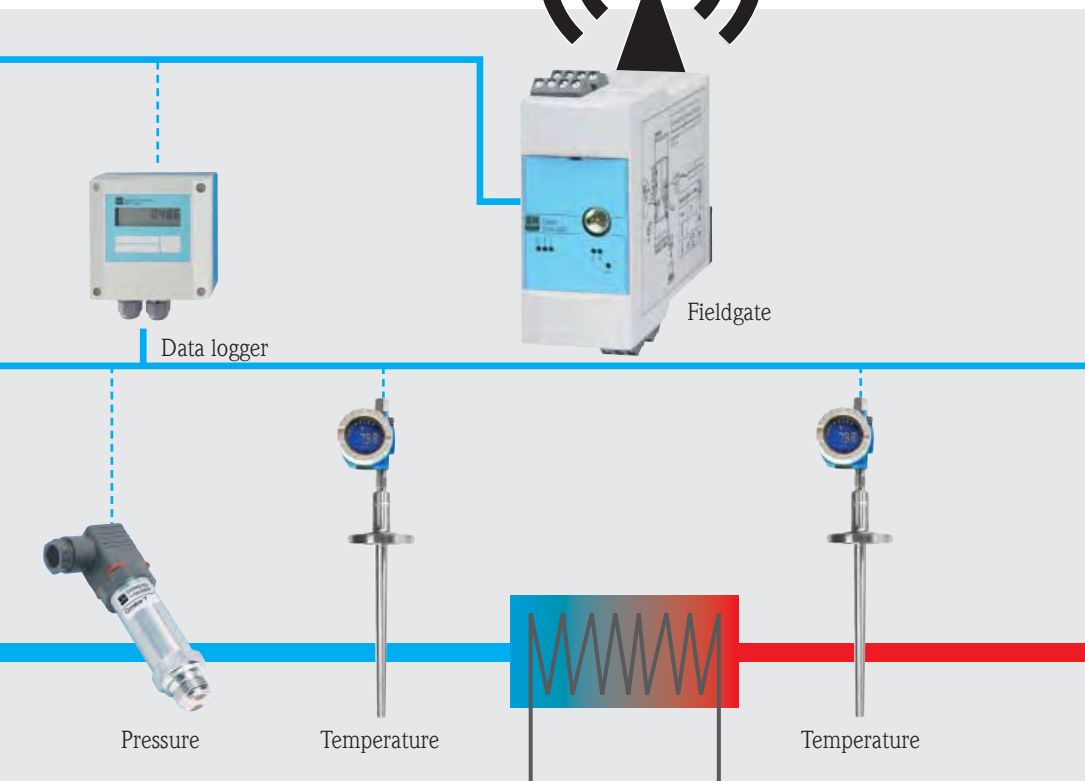
- Display of all measuring points and measured variables (building layout)
- Account balancing (consumption per hour, day, month or year)

- Allocation of consumption to cost centers
- Efficiency comparisons (energy supply vs. consumption)

## Saving energy costs

Maintaining an overview is crucial to efficient operation and cost optimization. The benefits are:

- Centralized availability of measured data
- Transparency of all fluid and energy flows
- Detection of energy losses (leakage)
- Reliable allocation for cost centers
- Security by continuous monitoring of plant operation and process variables

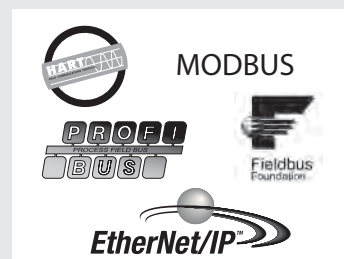


## Fieldbus technology

### Value-adding through more information

Modern flowmeters like those from Endress+Hauser deliver a wealth of information on process-related parameters. Digital signal transmission by fieldbus, however, enables process data to be transferred and utilized along with device parameters. The benefits are:

- Advanced diagnostics
- More efficient process management
- Fewer downtimes
- Maximum process reliability
- Higher system accuracy



# Our calibration competence sets standards

## Traceable and highly accurate

Flowmeters with long-term stability and guaranteed, traceable accuracy are essential for monitoring utilities. These are the reasons why Endress+Hauser subjects all its flowmeters to continuous quality checks throughout production and tests, calibrates and adjusts them on most state-of-the-art calibration systems in the world. These facilities combine 28 years of experience in the construction of calibration systems with cutting-edge metrology and automation technology. They are accredited by A2LA in the United States according to ISO/IEC 17025. That enables us to perform certified and traceable calibrations within the framework of ISO 9000 for our customers.

The advantages of recognized, accredited calibration facilities worldwide are:

- Traceability back to national standards
- Worldwide acceptance
- With official SCS, A2LA or CNAS certificate (ISO/IEC 17025)
- Periodic inspection by the national standard authorities

### Global calibration concept

As an international player, Endress+Hauser operates in accordance with internationally accepted standards for the accreditation of its products and test methods. One unique facet of the company's operations is that all Endress+Hauser's flow calibration facilities are accredited by different national authorities – including for example SAS, A2LA and CNAS – in accordance with ISO/IEC 17025. Since all test resources are seamlessly traceable back to national standards, customers can invariably look to Endress+Hauser to provide the same uniformly high standard of quality, be it in product quality or in field testing of their process facilities.





# Always at your service

## Around the world, any time of day

It is our aim that all devices manufactured by Endress+Hauser should ensure high measuring accuracy and operational safety – around the clock, seven days a week, throughout the entire life cycle of your plant. In order to keep things that way, we have established our own sales and service centers in more than 40 countries around the world. No matter whether you are located in Europe, Americas, Asia, Africa or Australia – we're always close at hand!

### Consulting and planning

Competent technicians, engineers and application consultants come on site to help you find the technically and economically ideal solution for your application.

### Commissioning and maintenance

Need some fast advice on the phone, or support for a maintenance schedule? You decide what we should provide, because our sales and service centers are not only there to help in emergencies. They also maintain a helpdesk and ensure that spare parts and consumables are available whenever and wherever they are needed.

The services at your disposal include:

- Commissioning and configuration
- Inspection and maintenance (maintenance contracts)
- On-site, traceable calibration, control measurements
- Repair service, spare parts, conversion kits
- Individual maintenance concepts  
(IMS: Instrument Management Solutions)

### Training and information

Being informed means being confident. We organize training courses and seminars to pass on our know-how:

- Industry-specific seminars ■ Service seminars
- Specialist seminars ■ Workshops ■ Technology forums
- Introductory seminars ■ Special-interest subjects

### W@M

The web-based asset management W@M™ from Endress+Hauser is an open information system which provides technical and operative management tools with complete data transfer and archival – from commissioning to maintenance and service within a plant, at any time or location. This is attained within an open system based on Internet/Intranet technology, and incorporating software programs, products and services from Endress+Hauser.



# Supplementary documentation



## Flow Measurement For Liquids, Gases and Steam Products and Services at a Glance

FA005D/24/en



## Flow Measurement Selection Guide

CP001D/24/en



## On-site calibration Focusing on meeting the special needs of our customers through cost reduction and increasing process up-time

CP988H/24/en

ISO 9001 Certified

10.10/SCUSA

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