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D-FL 100
Volume flow measuring system

System for continuous volume flow measurement in dry gases

- QAL1 certified in accordance with EN 15267
- Reliable, even under extreme operating conditions

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FEATURES

- Continuous measurement of velocity and volume flow
- Double-sided installation for measurement over the entire duct diameter or single-sided installation
- Robust and resistant probe material for use in aggressive gases or at high temperatures (optional)
- Probe individually adapted to the application

TECHNICAL DATA

Measuring principle	Differential pressure measuring principle, in-situ measurement, continuous measurement, single-sided or double-sided installation
Measuring variable	• Volume flow (operation) • Volume flow (standardized) • Velocity • Differential pressure • Absolute pressure • Temperature
Measuring range	Velocity: 3 … 50 m/s Volume flow: 0 … 3,000,000 m³/h
Certified measuring range	0 … 30 m/s
Certificates	QAL1, MCERTS
Conformities	IED 2010/75/EU, EN 15267-1, EN 15267-2, EN 15267-3, EN 14181, EN 16911-2, 13th/ 17th/ 27th/ 30th BImSchV, TA Luft
Interfaces*	• Analog output: 1x 4 … 20 mA, maximum 400 Ω, potential-free • Digital output: 2x NC/NO, maximum 60 V⎓, 30 VAC, 0.5 A • Modbus RS 485 RTU • USB
Operating voltage	24 V
Ambient conditions	• Installation location: Indoor or outdoor installation** • Temperature: –20 … +50 °C (certified) –40 … + 60 °C (optional) • Humidity: 30 … 60% relative humidity, non-condensing
Operating conditions	In duct: • Temperature: 850 °C, higher available on request • Relative humidity: 0 … 95%, non-condensing • Relative pressure: –50 … +50 hPa • Dust concentration: Maximum 30/100/150 mg/m³, depending on probe version

* Additional interfaces with D-ISC 100 operating unit
** A weather protection cover is required for outdoor installation
*** Enables remote access via web interface, requires PC with Windows operating system

BENEFITS

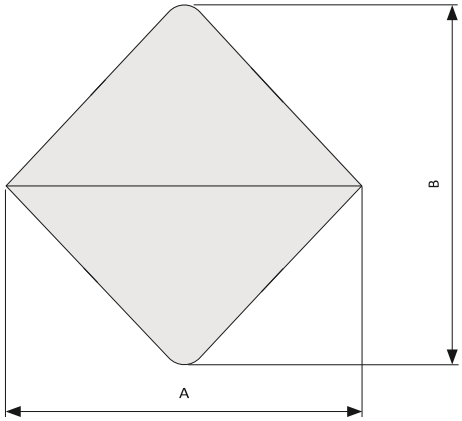
- Certified for official emission monitoring
- Precise measurement of velocity and volume flow even under demanding operating conditions
- Simple and space-saving single-sided installation (optional)
- Suitable for use in potentially explosive atmospheres (optional)
- Suitable for use in hot gases

Dimensions	• Inner duct diameter: 0.4 … 9 m • Wall thickness: Maximum 0.3 / 0.8 / 1.3 m, depending on probe version
Check functions	Manual zero point and reference point measurement
Degree of protection	• Evaluation unit: IP65 (version in housing) IP20 (version as top-hat rail module) in accordance with EN 60 529 • Differential pressure sensor: IP67 in accordance with EN 60 529
Connections	• Process: Flange • Probe profile: DN40 PN6 /ASME 2 1/2"-150RF • Probe profile: DN65 PN6 /ASME 3"-150RF • Probe profile: DN100 PN6/ASME 4"-150RF, others available on request
Explosion protection	ATEX (optionally available): II 2 GD Ex d IIC T5 Gb Ex tb T100°C Db
Operation and display	• Status LED • D-ESI 100 software*** • Or D-ISC 100 operating unit
Material	Housing: Polycarbonate Fire class: B1 (UL 94 V0)
System components	• D-FL 100 dynamic pressure probe • D-FL 100 differential pressure sensor • Absolute pressure sensor • Temperature sensor • D-FL 100-20 evaluation unit • D-ISC 100 operating unit (optional) • D-ESI 100 software*** • Accessories

Materials	Application area
Stainless steel	Standard material for temperatures up to 450 °C
Hastelloy	For corrosive flue gases (high SO2 content) up to 600 °C
Inconel 600	For flue gas temperatures between 450 °C and 850 °C
Inconel 602A	For high-temperature applications, on request

D-FL 100 | P ROBE PROFILES, FEATURES AND DIMENSIONS

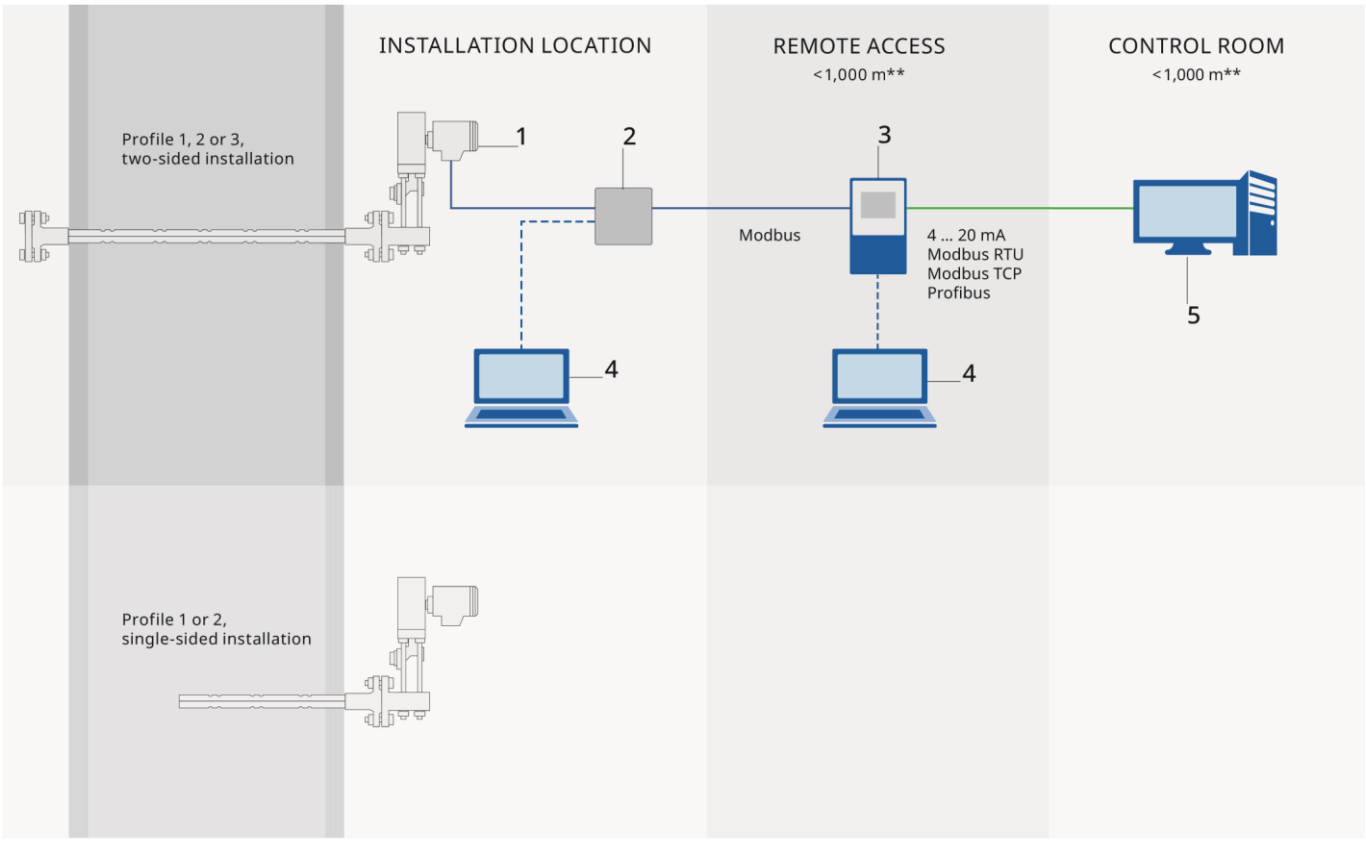
Features	Profi le 1	Profi le 2	Profi le 3
Single-sided installation, maximum probe length	1.5 m	2 m	–
Two-sided installation, maximum probe length	0.4 … 2 m	2 … 4 m	4 … 8 m
Measuring point diameter	5 mm	10 mm	12 mm
Dust concentration	< 30 mg/m³	< 100 mg/m³	< 150 mg/m³



Probe profile dimensions

Dimensions	Profi le 1	Profi le 2	Profi le 3
A	22 mm	50 mm	90 mm
B	23.9 mm	53.4 mm	100 mm

EXAMPLES OF SYSTEM CONFIGURATIONS* | STANDARD + OPTIONAL WITH REMOTE ACCESS



1 Volume flow measuring system
2 D-FL 100-20 and software
3 Operating unit
4 PC with Windows operating system
5 Emission evaluation system

* All system components shown are available on request
** Maximum permitted cable length

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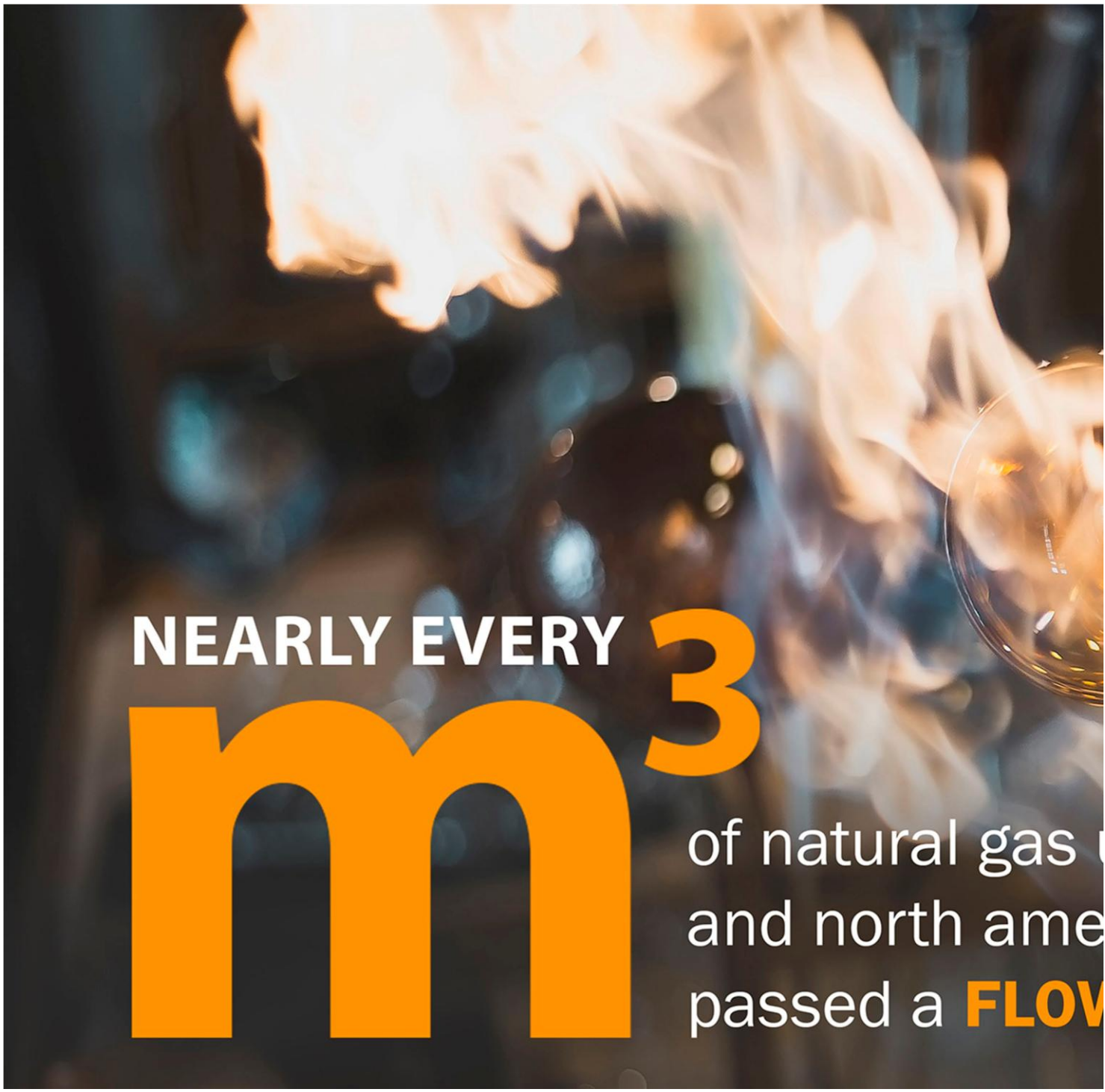
FLOWSIC FLOW METERS AND INSTRUMENTS

Precise quantity measurement — for accurate billing and process control

Endress+Hauser
People for Process Automation

FLOWSIC Flow measurement

The FLOWSIC gas meter and instrument products set a benchmark in a variety of applications, such as fiscal metering, flare venting or emission monitoring. With an installed base of over 55,000 (year 2023) the technology is long term proven. Our experts support operations in more than 50 countries around the globe.



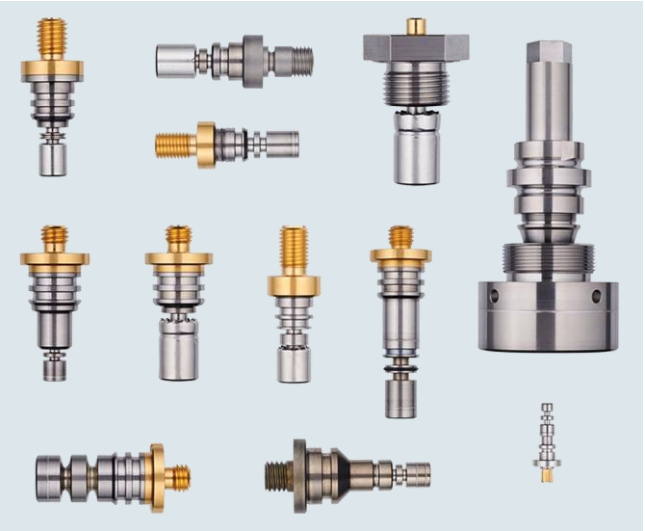
More Information online

For more information, enter the link or scan the QR code to get direct access to technical data, operating instructions, software, application examples, and much more.

www.endress.com

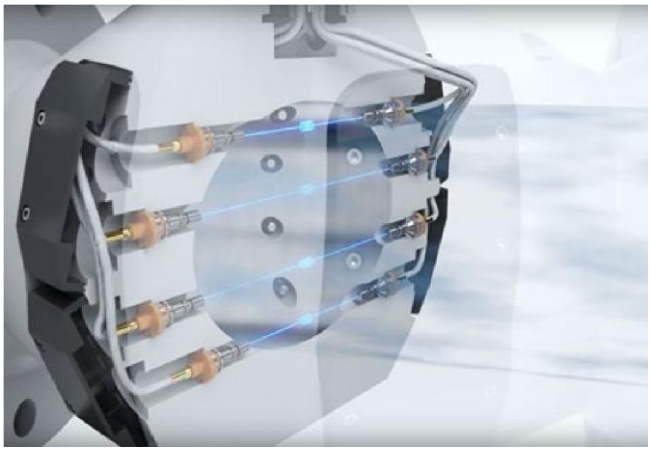
Proven Sensor Technologies

Ultrasonic sensors from Endress+Hauser



All FLOWSIC products are equipped with high-performance ultrasonic sensors developed and produced by Endress+Hauser in Germany. A hermetically sealed titanium housing contains ultrasonic transducers that operate at a selectable ultrasonic frequency of 14 kHz to 3500 kHz to match the operating conditions. The sensors can also be deployed at very high or very low temperatures (from –196 °C to +280 °C (-320 °F to 536 °F)), at high pressures (up to 450 bar(g) (6527 psi(g))), under corrosive conditions, and with heavy background noise. They enable unrivaled reliability also in dampening gases e.g. with high carbon dioxide concentrations. The FLOWSIC devices feature an efficient sensor for performing measurements at atmospheric pressure, allowing calibration using air. The high parameter quality of the sensors provides the basis for precise transit time measurement that is stable in the long term and accurate to within a few nanoseconds. The ultrasonic sensors are electrically intrinsically safe ("ia", with device protection level Ga).

Measurement principle: Direct path layout

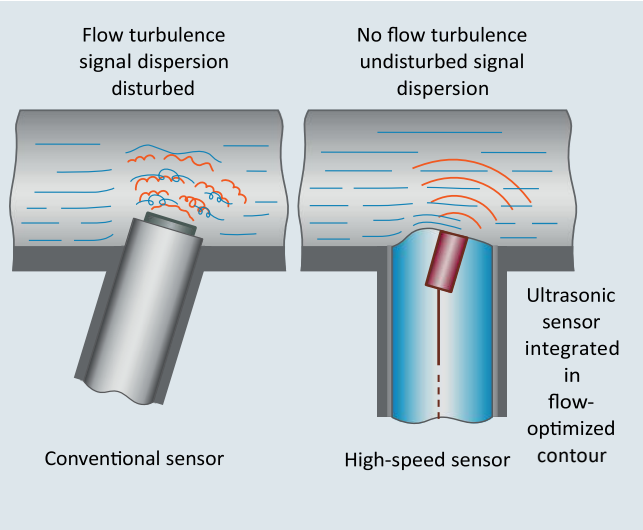


The transit time difference principle is used for performing ultrasonic gas flow measurement. This measurement principle uses ultrasonic transit time to determine the gas flow rate. The direct path layout minimizes the influence of turbulence, contamination, moisture, and background noise. Two ultrasonic sensors are installed opposite each other at a specific angle to the gas flow and operate alternately as a transmitter and receiver.

If no gas is flowing, the ultrasonic signals spread out at the same speed (speed of sound) in both directions. In a flowing gas, the signal in the direction of flow moves faster and the pulse against the direction of flow is slower. This means that the transit time in the direction of flow (tAB) is shorter and the transit time against the direction of flow (tBA) is longer. The transit time differences of the acoustic signals are thus an indication of the flow rate of the gas in the measuring volume.

High-speed sensor design

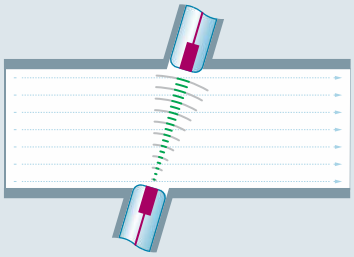
An innovative sensor design has been developed for the challenging measurement of flare gas. The ultrasonic sensors are embedded in a flow-optimized contour that has been specially designed for high gas flows – for example for flare gas. The unique sensor design reduces flow noise and signal drift to a minimum and provides stable and reliable measured values. The optimized two-stage signal algorithm offers optimum signal processing across the entire measuring range. The innovative design is used in the FLOWSIC100 Flare and enables measurement of gas velocities of up to 120 m/s (394 ft/s).



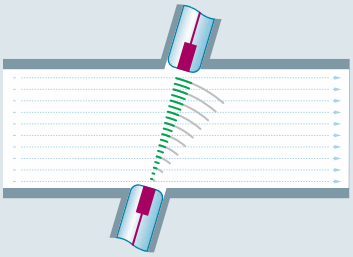
Range extension using patented ASC technology

Ensuring measurement availability even at the highest gas velocities is one of the most important characteristics of a flare measurement system. Thanks to its innovative ASC technology (active sound correlation), FLOWSIC100 Flare-XT thus allows even better coverage of possible flare gas events. is now extending the previous maximum flow range by up to 30%. ASC correlates the gas velocity with application specific noise generated under high flow conditions. The patented ASC technology

Flow measurement with ultrasonic transit time difference measurement

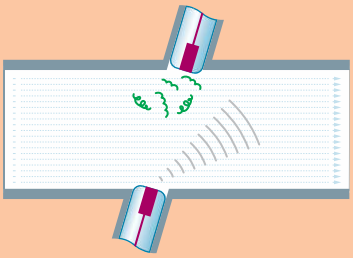


The ultrasonic sensors made of titanium are long-term stable and allow safe and reliable operation.



The innovative, flow-optimized sensor contour allows optimal measurement results even at very high gas velocities.

Flow measurement with ASC technology



If the signal is blown away due to extreme gas velocities, the patented ASC technology algorithm ensures uninterrupted measurement.

Gas Quality Indicator (GQI)

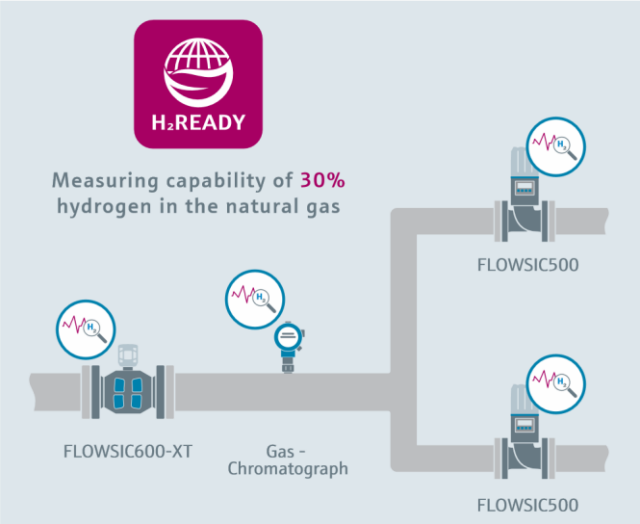
The modern gas market is characterized by the presence of a large number of different gas suppliers. With the FLOWSIC500 and FLOWSIC600-XT, plant and network operators are prepared for this challenge because the Gas Quality Indicator allows the hydrogen content in the natural gas to be monitored. If the configured limit value is exceeded due to fluctuations in the gas qualities, the FLOWSIC reports this automatically to a control center. This enables changes in the hydrogen content and therefore also the heating value to be detected in real time and substantial savings in time and costs to be achieved. The Gas Quality Indicator, which is based on the i-diagnostic™ technology, assists in optimizing the network balance. It thereby makes a significant contribution to guaranteeing the contractually agreed gas qualities when measuring the gas quality using a gas chromatograph or measuring the hydrogen content is not possible.

Advantages: the big five

High level of measurement certainty and self-diagnosis The FLOWSIC devices are self-monitoring. In the event of an issue, such as change in electronics performance or contami-nation, the meter will generate an alarm. This means that there is no need for maintenance on a timed basis – resulting in a reduced cost of ownership.

Power supply: no problem Due to PowerIn Technology™, both FLOWSIC500 and FLOWSIC600-XT measure fail-safe in intrinsically safe line-powered operation with battery backup. This allows to continue operating even when the main power supply fails.

Insensitive to overload Ultrasonic gas flow meters from Endress+Hauser do not get harmed by overloading. They process dynamic load changes without any loss in accuracy. Measuring ranges of more than 100 : 1 can be realized.



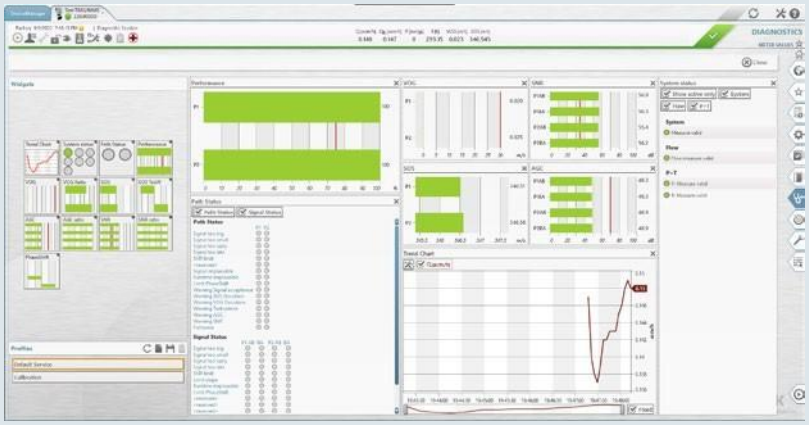
Approved worldwide FLOWSIC devices comply with all relevant standards and regulations for natural gas. This also includes the international requirements for explosionproof areas.

Increased measurement reliability The ultrasonic technology ensures the highest level of availability. It operates with no mechanical moving parts, and is not liable to wear. This provides stable measurement certainty in the long term.

FLOWgate™ operating software

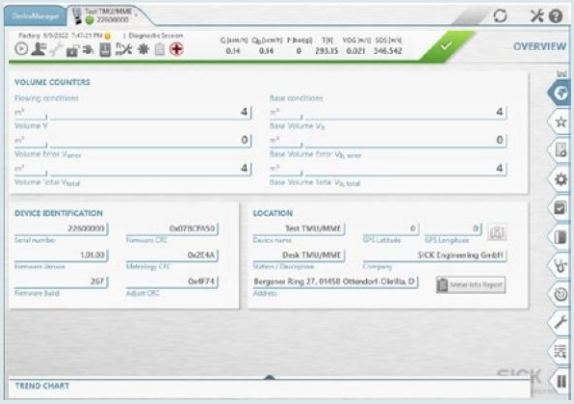
- The FLOWgate™ user software offers a user-friendly and results-oriented solution for all life cycle management tasks of the FLOWSIC devices.

- FLOWgate™, with its wizards for calibration, commissioning and device diagnostics, supports the almost maintenancefree operation of the gas flow meter and can also be used to remotely monitor the gas flow meter.
- The intuitive operation and multi-language support of FLOWgate™ makes the FLOWSIC gas flow meter easy to use.



Meter values

Device manager



Overview

- The Device Manager shows all registered devices, and offers device grouping and a convenient data backup function. Thanks to the integrated database the stored data are accessible offline or online at any time.

360°- Customer approach

Endress+Hauser pursues a solution-oriented 360° approach in order to provide customers with gas measurement solutions tailored to their individual requirements. Our customers benefit from detailed personalized advice and flexibility throughout the entire project - from project planning to lifetime maintenance. Everything from a single source means improved schedules, lower costs and reduced risk.

Flow metering systems from Endress+Hauser are equipped with leading ultrasonic measurement technology and are provided as complete solutions that can be integrated into any plant. Our portfolio ranges from pre-feed to project execution: flow metering systems tailored to operators needs and all out of one hand.

Design and Engineering:

The design is finalized down to the last detail, optimizing the commercial costs. This step requires a lot of experience and must be done with due diligence, since it determines whether or not the following steps go as planned.

Project Management:

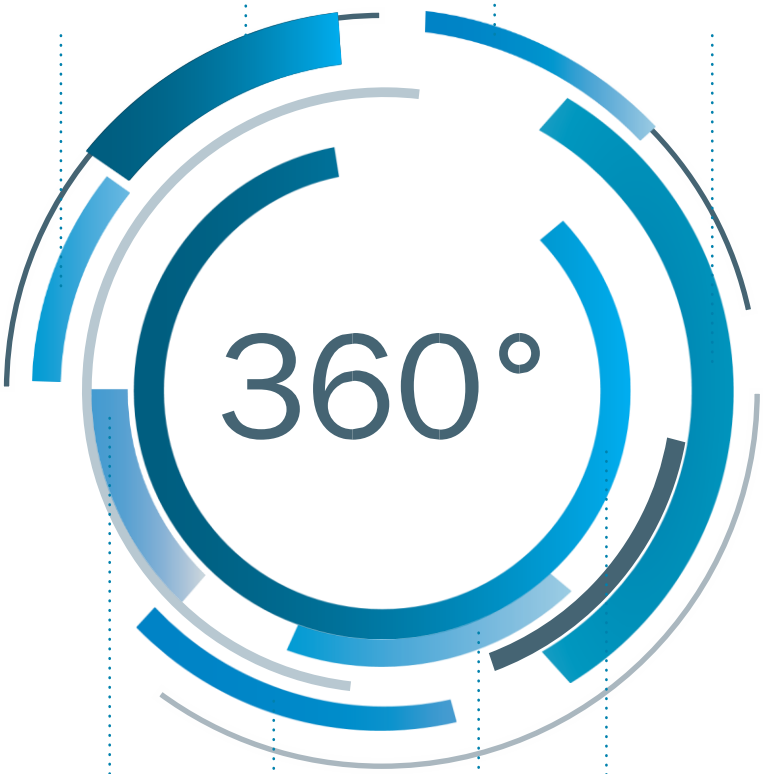
The Endress+Hauser project manager works closely together with the customer's project manager to ensure the project runs smoothly, and all changes and challenges are made transparent to the customer.

Consultancy Feed:

Feed stands for: 'Front-End Engineering and Design'. This first step is absolutely crucial for flawless operation. Our highly skilled experts offer valuable consultation on the initial system design while taking into account any process challenges.

Manufacturing:

With Endress+Hauser as a partner from the start, everything comes together successfully at this stage. The project progresses on time, meeting the high-quality criteria of our customer as well as international regulations such as ISO, DIN, ANSI, and ASME certificates.



Training and Lifetime Services:

Should any issues arise with the installed system at any point in its lifecycle, our dedicated experts will provide timely technical support. Endress+Hauser also offers comprehensive service training, enabling system operators to diagnose and maintain all system components.

Calibration and Integrated Tests (FAT/SAT):

When calibrated, the system is certified for custody transfer applications and complies with regulations that require low uncertainty. The customer can now inspect the system's performance during a factory/site acceptance test.

Start-up and Commissioning:

After installation, Endress+Hauser offers support to help with the start-up and commissioning process to ensure the system runs smoothly. This includes the identification of potential challenges that may arise from the specific conditions at the customer's site.

Shipping and Packaging: Endress+Hauser packages the system according to customer specifications — presenting photographic proof of having done so — and sends it on its way.

FLOWSIC600-XT

Custody transfer natural gas measurement with intelligent diagnostic functions

As the successor to the successful FLOWSIC600, the FLOWSIC600-XT u ltrasonic gas flow measuring instrument is setting new standards in its market segment. The FLOWSIC600-XT is available in variants with 4, 4+1, 4+4, and 8 measurement paths to meet the requirements of every application, whether it is being used as a stand-alone or system solution. In addition to the OIML R 137 Class 1.0 requirements, the FLOWSIC600-XT meets the requirements of Class 0.5 and AGA9 in their entirety.

The FLOWSIC600-XT contains i-diagnostics™ – an intelligent application diagnostics function – and PowerIn Technology™, which enables continuous measurement operation for up to three weeks in the event of a mains voltage failure. These functions help ensure usability and unparalleled operational safety – and what's more, the equipment offers the very best possible measurement accuracy and long-term stability.

Specifications at a glance

Measurands	Volumetric flow, a. c., volume a. c., gas velocity, speed of sound, optional volume correction via integrated EVC
Measuring ranges*	5 m³/h ... 120,000 m³/h (176 ft³/h ... 423,776,0 ft³/h)
Gas temperature*	–196 °C ... +230 °C (-320 °F ... +446 °F)
Operating pressure*	0 bar(g) ... 450 bar(g) (0 psi(g) ... 6527 psi(g))
Ambient temperature*	–60 °C ... +70 °C (-76 °F ... +158 °F)
Diagnostic functions	i-diagnostics™: Integrated device diagnostics, and advanced intelligent device and application diagnostics via FLOWgate™ operating software

* Depending on the device version

At a glance

- User-friendly product family
- Automatic correction of pressure and temperature influences
- Available for all operating conditions
- PowerIn Technology™ for reliable backup operation
- Intelligent application diagnostics with i-diagnostics™
- Can be extended to include flow computers using connect-and-go technology
- Measuring capability up to 30% H_2 in the natural gas

- Gas Quality Indicator for quantifying the H_2 content

Your benefits

- Low measurement uncertainty in every application
- High measurement data reliability and availability
- The right ultrasonic gas flow meter for every application – without compromise
- Simple device integration – even in compact systems
- Quick and easy commissioning and checking
- Cost-effective quantification of the H_2 content in natural gas

FLOWSIC900

Custody transfer ultrasonic LNG meter

LNG drives energy diversification and reduces emissions in the mobility and energy sector. Plant operators however still face technical, operational, and commercial challenges during LNG transfer. FLOWSIC900 solves these challenges. It is the result of our many years of experience in natural gas measurement: A flow meter specially tailored to the needs of the LNG-industry.

FLOWSIC900 offers the required custody transfer accuracy for volume flow measurement and meets the highest standards. FLOWSIC900 and the proven products FLOWSIC600-XT and FLOWSIC100 Flare-XT significantly increase measurement performance and reliability in LNG plants - a complete solution portfolio from a single source.

Specifications at a glance

Measurands	Volume a.c., volumetric flow a.c., velocity of fluid, speed of sound
Measuring ranges*	0.5 m/s … 13 m/s (1.64 ft/s ... 43 ft/s)
Operating temperature*	-200 °C ... +60 °C (-328 °F ... +140 °F)
Operating pressure*	0 bar(g) ... 19 bar(g) (0 psi(g) ... 276 psi(g))
Ambient temperature	-40 °C … +60 °C (-40 °F ... -140 °F)
Material	Meter body (wetted) - Stainless steel (316/316L /1.4401/1.4404) Ultrasonic transducers (wetted) — Titanium Grade 5 SPU housing — Aluminum (copper-free)

* Depending on the device version

At a glance

- Custody transfer ultrasonic liquid flow meter
- Conform to OIML R117 Cl. 0.3 and API MPMS Ch. 5.8
- Real time measurement and diagnostics
- Intrinsically safe and reliable ultrasonic transducers
- Full bore design without pressure drop or need for flow conditioner
- Compact meter design without junction boxes

- Factory thermal pre-insulation
- Remote Signal Processing Unit

Your benefits

- Low measurement uncertainty directly at the custody transfer point reducing financial risks during an LNG-transaction
- Increased transparency during LNGtransaction by dynamic
  & real-time measurement & diagnostics
- Nearly maintenance-free due to intrinsically safe transducers from Endress+Hauser with over 30 years ultrasonic expertise
- Operational expenditure savings by reduced boil-off gas losses and efficient LNG transfer due to minimized pressure drop
- Capital expenditure savings by simplified meter integration and installation due to compact design and factory pre-insulation
- Easy and fast access during commissioning and regular checks with remote SPU

The cutting-edge technology for the ultimate in measurement accuracy: The FLOWSIC500 ultrasonic compact gas meter from Endress+Hauser ensures highly accurate metering in natural gas distribution. In the absence of mechanical moving parts, the FLOWSIC500 is a rugged, reliable, and low-maintenance device – allowing for a significant reduction in operating costs. It is overload-proof, accurate and is monitored by an intelligent diagnostics system. The modern interfaces and the option of wireless communication make it easy to integrate into remote data management systems. Continuous monitoring provides a transparent picture of the current device status as well as changes in the gas quality. When used in transfer stations and measuring stations, the FLOWSIC500 provides the security of a continuous and blockage-free gas supply.

FLOWSIC500

Custody transfer measurement in natural gas distribution

Specifications at a glance

Measurands	Volume a.c., volume flow a.c., gas velocity In addition, for integrated volume correction: volume s.c., volume flow s.c.
Measuring ranges*	1.0 m³/h ... 1,000 m³/h (35 ft³/h ... 35,314 ft³/h)
Gas temperature*	-40 °C ... +70 °C (-40 °F ... +158 °F)
Operating pressure*	0 bar(g) ... 20 bar(g) (0 psi(g) ... 290 psi(g))
Ambient temperature*	–40 °C ... +70 °C (-40°F ... +158 °F)
Diagnostic functions	Permanent monitoring of measured values, Gas Quality Indicator

* Depending on the device version

At a glance

- Rugged and time-proven technology: ultrasound technology
- Diagnostics and continuous operational checks
- Measuring capability up to 30% H_2 in the natural gas
- Gas Quality Indicator for quantifying the H_2 content
- Integrated volume conversion and load recording
- No straight inlet/outlet piping required

- Large measuring span, no moving parts
- Extended interfaces and protocols
- Autarkic operation or failsafe network operation with battery backup

FLOWSIC550

High-pressure gas flow meter for natural gas distribution

- Remote communication (DATCOM)

Your benefits

- Ability to digitize the gas network
- Unique remote gas network monitoring based on i-diagnostics™
- Ultimate measurement certainty and safety of continuous gas supply
- Simple installation, compatible with conventional technologies (turbine and rotary meters)
- All-in-one solution: gas flow meter + volume correction + data registration + data communication (DATCOM)
- Reduced maintenance effort thanks to remote maintenance
- Simplified recalibration through straightforward "cartridge exchange"

The cutting-edge technology for natural gas measurement:

The new FLOWSIC550 ultrasonic compact gas meter from Endress+Hauser ensures highly accurate metering for low volumes at high pressures in gas distribution - a perfect addition to FLOWSIC500. In the absence of mechanical moving parts, the FLOWSIC550 is a robust, fail-safe and low-maintenance device – allowing for a

Specifications at a glance

Measurands	Volume a.c., volume flow a.c., gas velocity In addition, for integrated volume correction: volume s.c., volume flow s.c.
Measuring ranges[1]	2.5 m³/h ... 1,600 m³/h (88 m³/h ... 56,503 m³/h
Gas temperature[1]	-40 °C ... +70 °C (-40 °F ... -158 °F)
Operating pressure[1]	up to 97.2 bar(g) (up to 1,409 psig)
Ambient temperature[1]	–40 °C ... +70 °C (-40°F ... +158 °F)
Diagnostic functions	Permanent monitoring of measured values

[1] Depending on the device version

At a glance

- Rugged and time-proven ultrasound technology
- Diagnostics and permanent operational self-monitoring
- Durable and reliable without moving parts
- Compact meter installations
- Integrated volume correction correction
- Battery or intrinsically safe power supply
- Bluetooth Low Energy (BLE) (PC and App)
- Minimal operating costs due to being nearly maintenance-free
- Reliable even when the gas flow fluctuates
- Self-sufficient operation

Your benefits

- Ultimate measurement certainty and safety of continuous gas supply
- Simple installation, compatible with turbine gas meters
- Reduction of installation costs due to integrated volume
- Easy Commissioning and data reading via FLOWgate™

(on/off applications)

significant reduction in operating costs. It is overload-proof, accurate and is monitored by an intelligent diagnostics system. FLOWSIC550 can easily be integrated into existing measuring stations. The FLOWSIC550 operates either in an energy self-sufficient configuration or in network operation. When utilized in transfer and measuring stations, FLOWSIC550 ensures a continuous and blockage free gas supply.

FLOWSIC100 Flare-XT

Flare gas measurement redefined

The gas flow measuring device FLOWSIC100 Flare-XT features a unique flow-optimized sensor design, which allows reliable measurements at high gas velocities and changing gas compositions. The rugged design and patented ASCtechnology ensure improved measurement availability even under the most adverse conditions.

FLOWSIC100 Flare-XT observes several applicable standards and is suitable for use in new and existing plants. Measurement and diagnostic data are easily visualized by FLOWgate™ software. Thanks to the intelligent diagnostic function i-diagnostics™ the system checks itself and reports independently if maintenance is required.

Specifications at a glance

Measurands	Mass flow rate, volumetric flow s. c. (standard condition), volumetric flow a. c. (actual condition), molecular weight, gas volume and mass, gas velocity, gas temperature, sound velocity
Measuring ranges	0.03 m/s ... 120 m/s (0.10 ft/s ... 394 ft/s)
Gas temperature	-70 °C ... +280 °C (-94 °F ... +536 °F)
Operating pressure	up to 20 bar(g) (up to 290 psi(g)
Ambient temperature	–40 °C ... +70 °C (-40 °F ... +158 °F)
Diagnostic functions	Automatic check cycle and i-diagnostics Extended device diagnosis with FLOWgate

Depending on the device version

At a glance

FLOWSIC100

Volume flow measuring devices for continuous emission monitoring

- Measurement availability under all operating conditions, at high gas velocities and with changing gas compositions
- Individual application evaluation
- i-diagnostics™ for self monitoring, easy verification and condition-based maintenance of the system
- Retrofit solutions for existing measurement systems

Your benefits

- Comply with environmental regulations
- Maximum plant availability
- Ultrasonic sensors, interface unit, Spool Piece from a single source as well as globally available services
- Independent maintenance through verification on demand and support by Endress+Hauser when required
- Easy replacement of existing measurement systems, with suitable retrofit or upgrade solutions available
- Compatible with current and future communication architectures

The FLOWSIC100 product family was developed for emission monitoring. The “H” versions are suitable for large duct diameters and applications with high dust levels, while the “M” versions are ideal for medium duct diameters. With the probe version “PR”, the two ultrasonic transducers are mounted on one sender/receiver unit (measuring probe) with a fixed measuring distance. The “-AC” device versions feature innovative internal cooling for use at gas temperatures up to 450 °C (842 °F). The purged “Px” device versions are used in gases with a high content of sticky or wet dust. Rugged titanium transducers are used in the standard version and are suitable for difficult application conditions. The measuring system consists of two sender/receiver units or one measuring probe and the MCU control unit. The MCU is used for signal input and output, calculation with reference conditions (standardization), as well as for userfriendly operation via LC display.

Specifications at a glance

Measurands	Volume flow in actual conditions, volume flow in standard conditions, gas velocity, speed of sound, gas temperature
Measuring ranges	0 m/s ... ±40 m/s (0 ft/s ... ±131 ft/s)
Gas temperature*	-40 °C ... +450 °C (-40 °F ... 842 °F)
Operating pressure*	–100 hPa ... 100 hPa (-1.45psi ... +1.45 psi)
Ambient temperature*	–40 °C ... +60 °C (-40°F ... +140 °F)
Diagnostic functions	Automatic check cycle for zero and reference point Extended device diagnosis with SOPAS ET software

* Depending on the device version

At a glance

- Rugged titanium transducers for long service life
- Corrosion-resistant material for use with aggressive gases (option)
- Integral measurement across the duct diameter for versions H, M, and S
- Probe version PR for cost-saving, single-sided installation on duct
- Automatic operational check with zero and reference point test

Your benefits

- Reliable flow measurement in small to very large duct diameters
- Long service life
- No purge air is required for gas temperatures up to 260 °C (500 °F)
- Minimal operational and maintenance costs
- Accurate measurement results even under difficult measurement conditions
- Measurements free of pressure loss and without influencing the process
- User-friendly operation via SOPAS ET software
- Extended diagnostics ensure reliable operational monitoring

FLOWSIC300

Non-custody transfer measurement and process monitoring

The FLOWSIC300 ultrasonic flowmeter features a unique combination of high-quality components, large measuring range, simple installation and low installation costs. It can be used anywhere where custody approval is not required: for internal measurements in the natural gas grid and with process measurements in the petrochemical industry. The FLOWSIC300 incorporates proven technology and components of the custody transfer gas flow meters from Endress+Hauser for custody transfer and combines these to produce a cost-effective flowmeter for a variety of applications. The transmitter at a distance of up to 15 m (50 ft) away from the measuring point facilitates a high level of flexibility in installation and includes continuous selfdiagnostics. The ultrasonic measurement principle does not generate any pressure loss, has no moving parts, is resistant to pulsations and pressure regulator noise and is ideal for reliable and drift-free operation.

Specifications at a glance

Measurands	Gas velocity, operational volume flow, volume flow s.c., gas temperature, gas pressure, speed of sound
Measuring ranges	0 m³/h ... 1,800 m³/h (0 m³/h ... 63,566 m³)
Gas temperature	≤ +600 °C (≤ 1,112 °F)
Operating pressure	700 hPa ... 1,300 hPa (10 psi ... 19 psi)
Ambient temperature	–10 °C ... +40 °C (14 °F ... 104 °F)
Diagnostic functions	Self-test and fault diagnosis

Depending on the device version

At a glance

- Quality components
- Modular flexible installation
- Non-contact ultrasonic technology without pressure loss
- Measuring range span greater than 100 : 1
- Sensors can be replaced under pressure
- Low sensitivity to pulsation and pressure regulator noise • Remote electronics (max. 15 m (49 ft))
- Bi-directional measurement with automated diagnostics

Your benefits

- Reliable flow measurement for checking purposes
- Simple installation into existing pipelines
- Efficient solution, especially for pipe diameters over 12 inches, thanks to installation onto existing pipelines and without the need for a meter body
- Reduced acquisition costs – the sensor extraction tool can be used for multiple devices
- Low maintenance, wear and no deterioration
- Low operating costs thanks to automated diagnostics and condition-based maintenance

- Suitable for installation in underground compartments via remote electronics and sensors with enclosure rating IP 68

FLOWSIC600 DRU-S

Simple and robust upstream gas flow measurement

Specifications at a glance

Measurands	Volume flow rate a. c., Volume a. c., Gas velocity, Sound velocity
Measuring ranges	4 m³/h ... 1,600 m³/s (141 ft³/h ... 56,503 ft³/h)
Gas temperature	-40 °C ... +100 °C (-40 °F .. 212 °F)
Operating pressure	16 bar(g) ... 100 bar(g) (232 psi(g) ... 1,450 psi(g))
Ambient temperature	–40 °C ... +60 °C (-40°F ... +140 °F)

Depending on the device version

FLOWSIC600 DRU-S is the compact and innovative ultrasonic gas flow meter for gas production. FLOWSIC600 DRU-S extends the successful product family FLOWSIC600 DRU. The gas meter is especially developed for wellhead and gas lift applications. With a measuring span of up to 150 : 1[1], flow ranges can be measured with only one device, for which several orifices were previously required.

Its special wet gas robust sensor design ensures continuous measurement even with permanently higher liquid loading. FLOWSIC600 DRU-S enables remote monitoring of measurement and diagnostic data. Thus, the process can be monitored in real time and the maintenance effort can be reduced. Service inspections can be planned according to demand. We think that's intelligent.

At a glance

- Ultrasonic sensors made of titanium
- High measuring span
- No pressure loss - installation without flow conditioner
- Suitable for wet gas applications
- Small meter footprint
- Possibility for remote monitoring thanks to digital interfaces
- Simple commissioning via the Endress+Hauser operating software

Your benefits

- Easy remote commissioning away from harsh and challenging environmental conditions
- Low initial investment – accurate measurement without expensive flow calibration
- Optimum availability – almost wear-free operation and the possibility of remote maintenance

- Highly reliable – continuous measurement even under challenging process conditions
- Long service life – wet gas robust ultrasonic sensors made of titanium

FLOWSIC200

The tunnel flow measuring device for long-term operation

The FLOWSIC200 is used for the non-contact and accurate measurement of flow velocity and flow direction inside tunnels or exhaust ventilation ducts. The ultrasonic measurement process provides the mean average value of the flow velocity across the tunnel width. The measuring device is vital for ensuring efficient and economical tunnel ventilation control when air flow is dictated by climatic conditions or by traffic. Even in the event of a fire in the tunnel, reliable, exact, and representative measurement of the flow velocity and direction over the entire tunnel width is now a requirement. Only in this way can, the smoke dispersion be measured and the required information for optimal ventilation regulation be received.

Specifications at a glance

Measurands	Flow velocity, flow direction, temperature
Measuring ranges*	0 m/s ... ±20 m/s (0 ft/s ... ±66 ft/s)
Tunnel width*	3.5m ... 35 m (11.5ft ... 115 ft)
Ambient temperature*	–40 °C ... +60 °C (-40°F ... 140 °F)
Diagnostic functions	Internal zero and reference point check Extended device diagnosis with SOPAS ET software

* Depending on the device version

At a glance

- Internal non-contact measurement
- High acoustic power for measuring across large tunnel widths
- Rugged components are made of titanium, stainless steel, or die cast
- Versions for corrosive tunnel atmospheres
- No mechanical moving parts
- Advanced diagnostics for early detection of faults

At a glance

- Representative measurement across the entire width of the tunnel
- Very reliable measuring, compared to spot-measuring process
- Exact measurement of even very low flow velocities
- Long maintenance interval of up to five years

- Low operating costs thanks to reliable operation and low maintenance
- High device availability and therefore also the measurement data
- Low cost of investment thanks to mobile application with various test benches
- Convenient installation without feedback on engine characteristics and exhaust gas analysis systems
- Extended operating time through patented sensor cooling
- Low operating costs thanks to minimal maintenance requirements

The Flow-X flow computer provides gas volume conversion, event logging, para meter logging, and reports using stateof-the-art technology. Identical modules are combined in different housings, offering a multi-stream version Flow-X/P for 1–4 measuring distances with a local touch screen, or the Flow-X/S version for smaller installations with one measuring distance. Each module combines high-precision measurement technology, fast digital signal processing, abundant processing power, versatile data communication, and high storage capacity in a fully equipped flow computer. The Flow-X flow computer meets the requirements of even the most demanding applications and is the ideal partner for custody transfer gas measurements using the FLOWSIC600-XT ultrasonic gas flow meter.

FLOW-X

The ideal flow computer for gas metering

Specifications at a glance

Ambient temperature	–40 °C ... +75 °C (-40°F ... +167 °F)*
Conformities	2014/32/EU Measuring Instruments Directive (MID) 2014/30/EU Electromagnetic Compatibility Directive 2012/19/EU WEEE Directive (WEEE) 2011/65/EU RoHS

* Depending on the device version

At a glance

- MID-approved configuration for gas measuring streams with FLOWSIC600-XT
- Powerful modules for demanding applications
- Each module features CPU, memory, and standardized inputs/outputs
- Appealing 7 inch graphics display with touch operation
- Intuitive user interface for graphics display and in web browser
- True remote access via Ethernet
- Station computer for measuring multiple streams

At a glance

- Reduced planning and installation costs thanks to standard configurations
- Very exact flow conversion due to s everal calculation cycles per second
- High reliability thanks to independent modules with their own volume conversion and storage of measured values, counter readings, and events
- Systems are easy to extend thanks to modules with standardized inputs/outputs that are fully configurable via software

- Very simple operation thanks to an intuitive user interface featuring identical menus and displays on the device and in the control room
- Reduced service and maintenance costs with tamper proof remote maintenance
- Cost-efficient and flexible system integration of multiple measuring distances

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D-FL 220

Volume Flow Measuring System

Continuous, contactless volume flow measurement
in dry and humid gases

- QAL1 certified in accordance with EN 15267, compliant with US EPA 40 CFR 60 PS6
- Automatic control functions
- Reliable, even under demanding operating conditions

DURAG
DURAG GROUP

FEATURES

- Continuous measurement of velocity
- Precise measurement of gas velocity
- Corrosion resistant ultrasonic transducers
- Measurement over the entire duct diameter
- Automatic control functions
- Low maintenance

BENEFITS

- Certified for official emission monitoring and volume flow
- Contactless measurement and volume flow
- Suitable for measurement in humid and aggressive gases
- Long life time and high availability even under extreme plant conditions

TECHNICAL DATA

Measuring principle	Ultrasonic transit time difference method, in-situ, continuous measurement, double-sided installation, contactless measurement
Measuring variable	• Volume flow (operation) • Volume flow (standardized) • Velocity • Temperature
Measuring range	Velocity: 0 … 40 m/s Volume flow: 0 … 5,000,000 m³/h
Certified **measuring range**	0 … 30 m/s
Certificates	QAL1, MCERTS
Conformities	IED 2010/75/EU, EN 15267-1, EN 15267-2, EN 15267-3, EN 14181, EN 16911-2, US EPA 40 CFR 60 PS6, 13., 17., 27., 30. BImSchV, TA Luft
Interfaces*	• Analog output: 1x 4 … 20 mA, maximum 400 Ω, potential-free • Digital output: 2x NC/NO, maximum 60 VDC, 30 VAC, 0.5 A • Modbus RS 485 RTU • USB
Nominal voltage	24 V⎓
Ambient conditions	• Installation location: Indoor or outdoor installation** • Temperature: –40 … +70 °C (measuring device) –40 … +60 °C (certified)
Operating conditions	In duct: • Temperature: Maximum 300 °C • Relative humidity: 0 … 100 %, condensation permissible • Relative pressure: –50 … +20 hPa

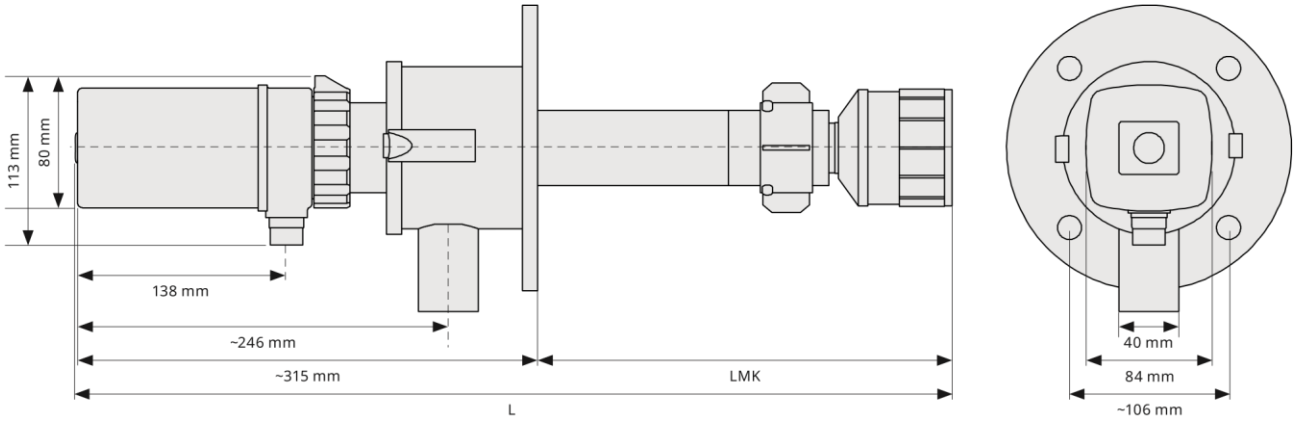
Dimensions	• Inner duct diameter: 0.5 … 14 m, depending on the operating conditions in the duct • Wall thickness: Maximum 0.8 m
Control functions	Automatic zero point and reference point measurement
Degree of protection	IP65 in accordance with DIN EN 60 529
Connections	• Process: Flange, DN80 PN6 • Device: M23 DURAG Standard • Purge air connection: Ø 40mm
Explosion protection	N/A
Operation and display	• Status LED • D-ESI 100 software *** • or D-ISC 100 operating unit
Material	• Housing: Polyamide / B1 (UL 94 V0) • Transducer: PA, PBT, FRP • Process parts: Stainless steel V4A
System components	• 2 D-FL 220 measuring devices configured as A (master) and B (slave) • D-BL purge air unit • D-TB 100 Terminal Box • D-ESI 100 software *** • or D-ISC 100 operating unit

* Additional interfaces with D-ISC 100 operating unit

** A weather protection cover is required for outdoor installation

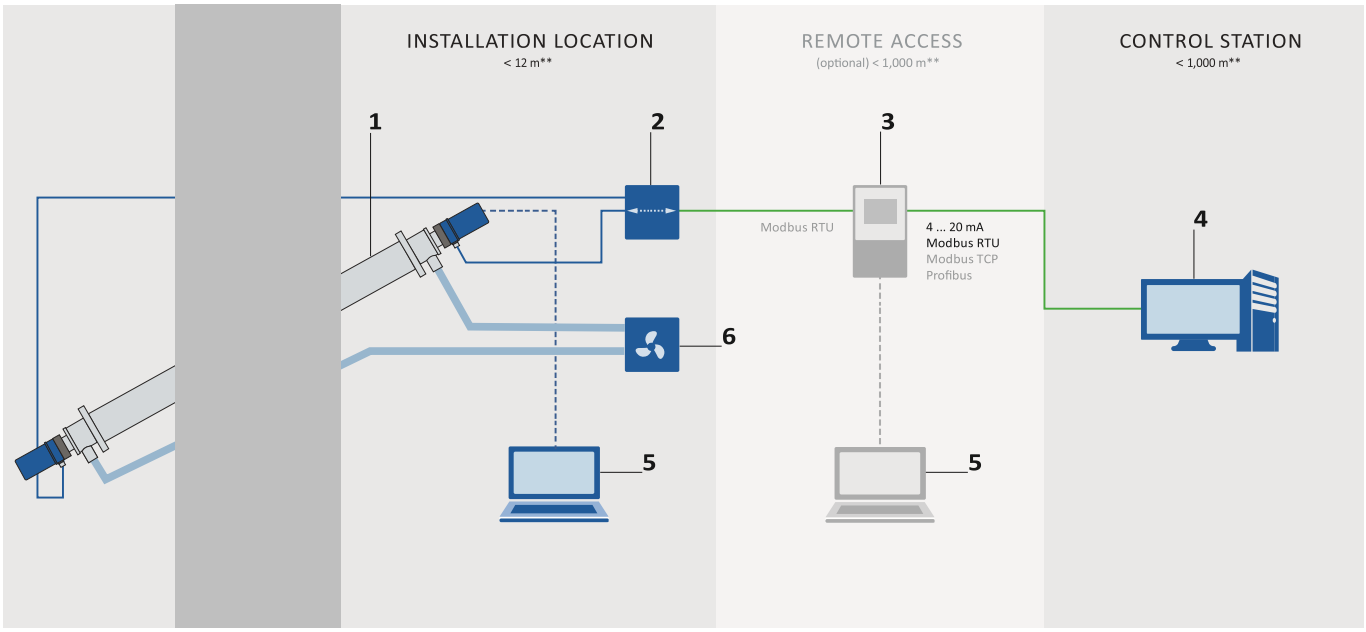
*** Enables remote access via web interface, requires PC with Windows operating system

D-FL 220 | DIMENSIONS AND WEIGHT OF DIFFERENT PRODUCT VARIANTS



Product variants	L=Total length	LMK=Immersion depth	Weight
D-FL 220 MK2-L0410-LMK0100	410 mm	100 mm	2.88 kg
D-FL 220 MK2-L0610-LMK0300	610 mm	300 mm	3.58 kg
D-FL 220 MK2-L0810-LMK0500	810 mm	500 mm	4.28 kg
D-FL 220 MK2-L1010-LMK0700	1,010 mm	700 mm	4.98 kg
D-FL 220 MK2-L1210-LMK0900	1,210 mm	900 mm	5.68 kg
D-FL 220 MK2-L1410-LMK1100	1,410 mm	1,100 mm	6.38 kg

EXAMPLES OF SYSTEM CONFIGURATIONS* | STANDARD + OPTIONAL WITH REMOTE ACCESS



1 Volume flow measuring device **2** Terminal Box **3** Operating unit **4** Emission evaluation system **5** PC with Windows operating system and software **6** Purge air unit

* All system components shown are available on request
** Maximum permissible cable and hose length (different for sensor head B: 25 m)

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