

FioSonic Mini

Industrial metering



TECHNICAL BROCHURE

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FioSonicMini_technicalbrochure_USA_revA

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Who we are

We are a Global organization specialized in designing and manufacturing technologically advanced solutions for natural gas treatment, transmission and distribution systems.

We are the ideal partner for operators in the Oil & Gas sector, with a business offer that goes across the whole natural gas chain.

We are in constant evolution to meet our customers' highest expectations in terms of quality and reliability.

Our aim is to be a step ahead of the competition, with customized technologies and an after-sale service program undertaken with the highest grade of professionalism.



Pietro Fiorentini advantages



Localised technical support



Experience since 1940

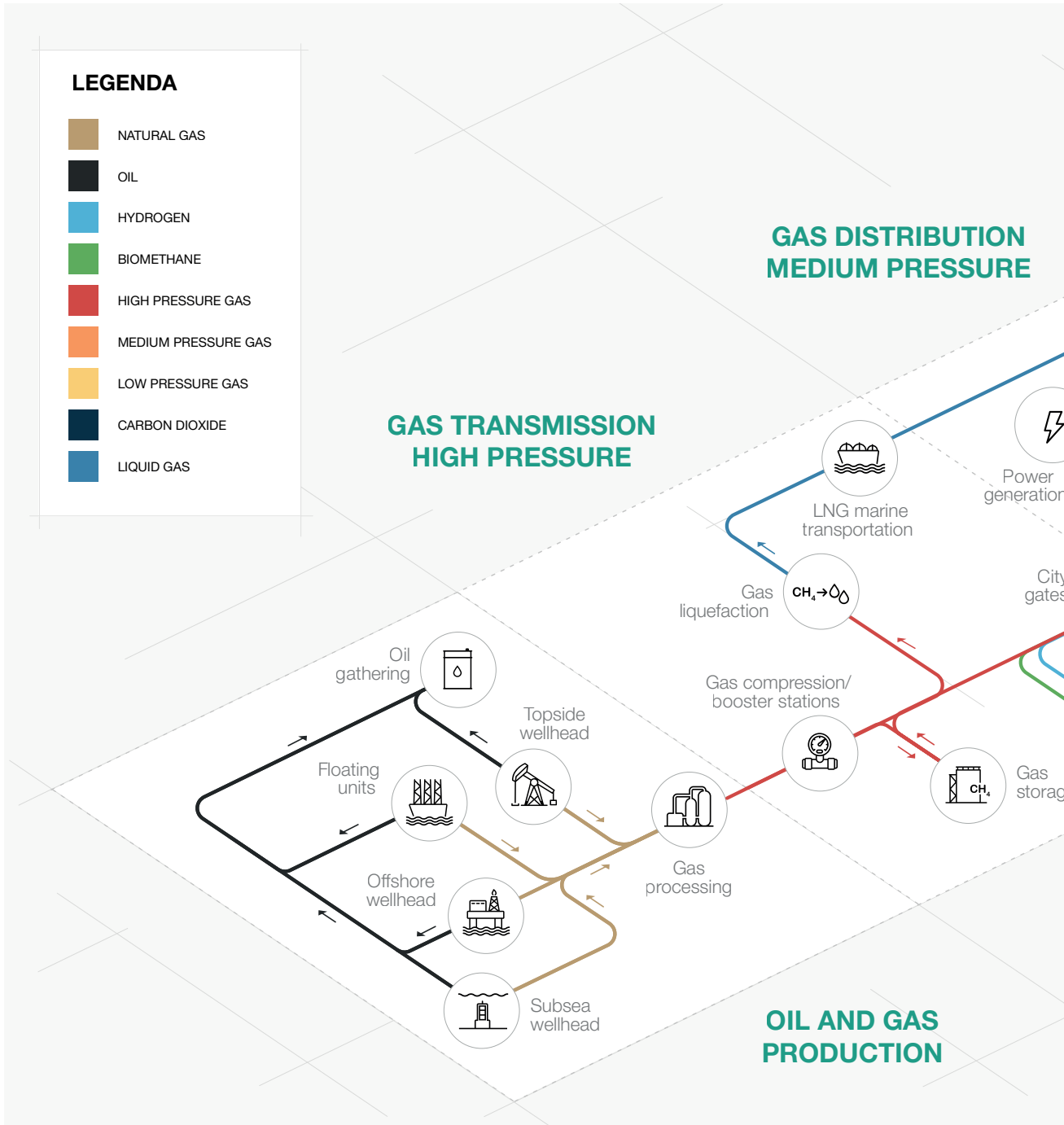


We operate in over 100 countries

Area of Application

LEGENDA

- NATURAL GAS
- OIL
- HYDROGEN
- BIOMETHANE
- HIGH PRESSURE GAS
- MEDIUM PRESSURE GAS
- LOW PRESSURE GAS
- CARBON DIOXIDE
- LIQUID GAS



Green icon indicates the application where this product is suitable for

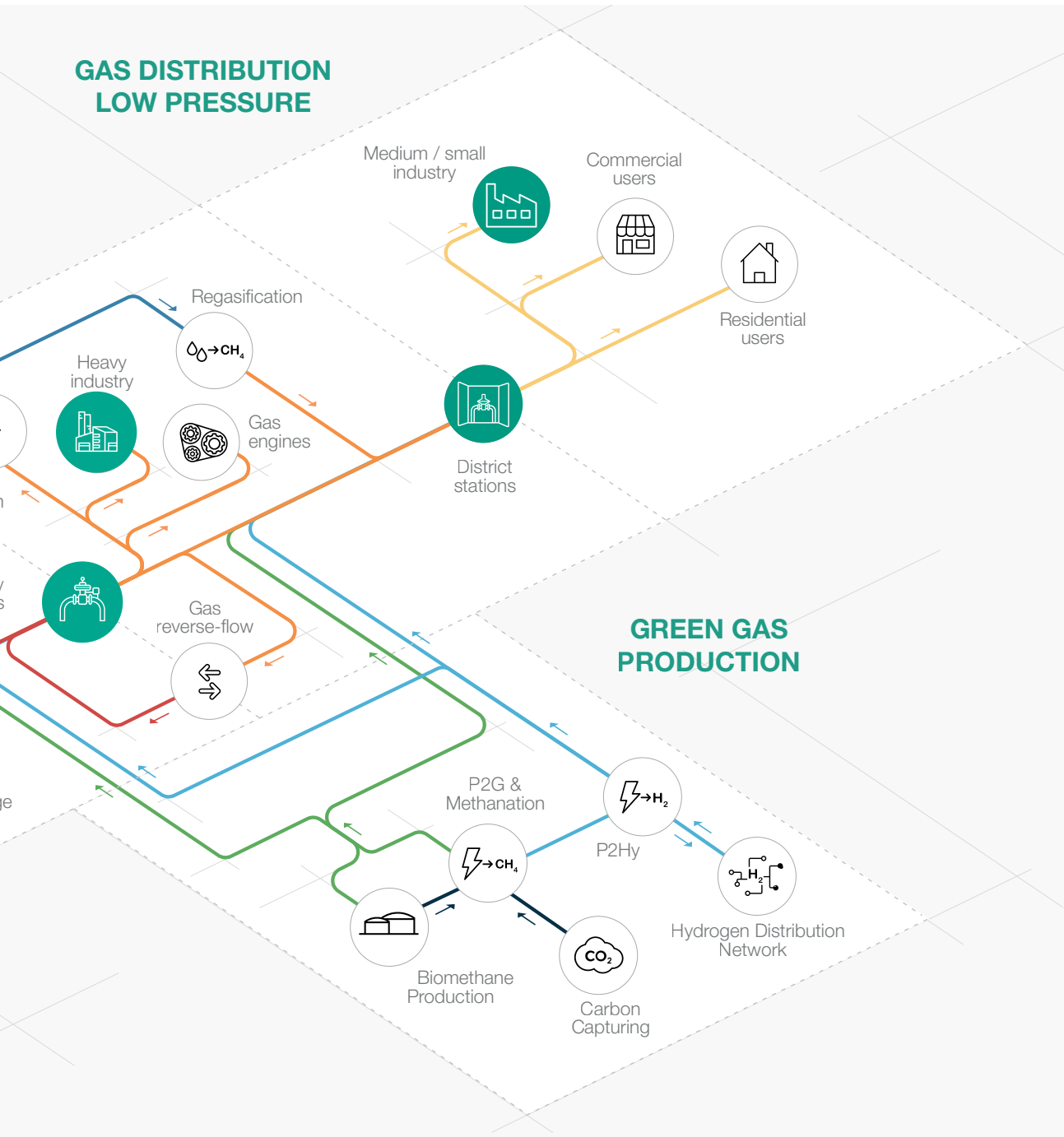


Figure 1 Area of Application Map



Introduction

Fiosonic Mini is Pietro Fiorentini's **industrial ultrasonic gas flow meter** designed for custody transfer applications in gas distribution networks.

Its multi-path chordal technology provides real-time diagnostics, high accuracy, and redundancy.

Fiosonic Mini is suitable for use with dry gases and is also Hydrogen Ready for NG-H₂ blending up to 30%.

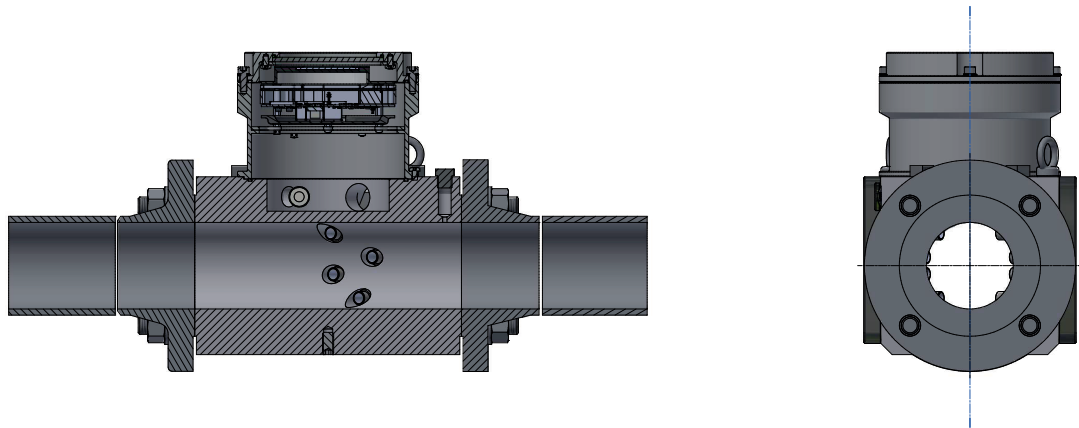


Figure 2 FioSonic Mini ultrasonic flow meter

Features

The design of FioSonic Mini ensures **stable** and **accurate flow readings** over the entire range of **flow rates, pressures** and **gas compositions**.

Broadband continuous wave (BCW) signal processing allows more than one measuring chord to be interrogated simultaneously, avoiding the slow response typical of earlier generations of ultrasonic meters.

The frequency of the FioSonic Mini transducers is between 200 and 250 kHz depending on the size of the meter to **ensure the best performance**.

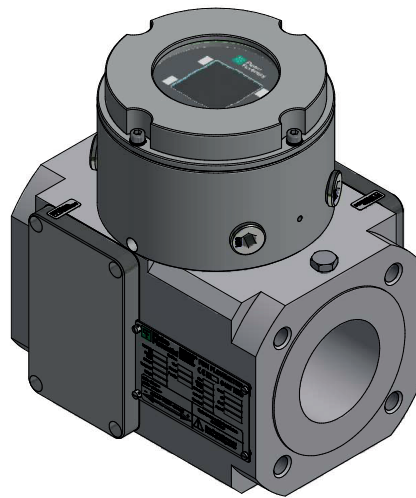


Figure 3 FioSonic Mini

Natural gas blended with hydrogen

FioSonic Mini is suitable for use with conventional natural gas or blended with up to 30% hydrogen.



Titanium transducers

Titanium ultrasonic sensors are remarkably efficient and, combined with broadband continuous wave (BCW) processing, **can accurately measure even the most demanding applications such as wet and dirty gases**. The combination of efficient transducers and broadband continuous wave processing makes it **resistant to acoustic interference, such as control valve noise**, which was impacting earlier generations of ultrasonic meters.

The efficient design of ultrasonic transducers allows them to operate with a very low supply voltage of 3.6 V compared to the tens or even hundreds of volts required by other manufacturers.

All surfaces in contact with the fluid are metallic to provide the best resistance against the harshest conditions. Transducers are available up to 2 MPa(a) | 290 psi(a).

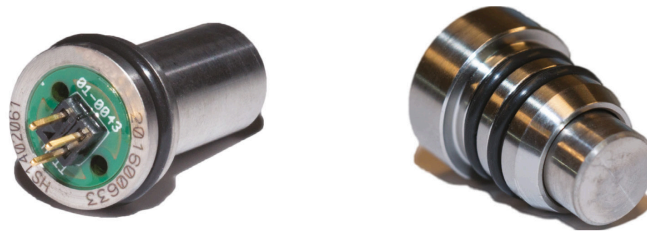


Figure 4 Ultrasonic transducer

Broadband continuous wave (BCW) signal processing

Most ultrasonic flowmeters transmit a limited amount of ultrasonic pulses between one and four pulses per measurement cycle.

Some ultrasonic flowmeters use a short pulse train, generally less than 100 cycles. The **FioSonic Mini flow meter transmits several thousand cycles in an almost continuous stream of encoded pulses**. The signal is **decoded in real time** to reconstruct the received signal, which is **accurate and resistant to signal noise and interference** in difficult applications.

The broadband continuous wave system allows simultaneous transmission of two or more measuring chords without interference. Simultaneous transmission **means faster response time** and **better performance** in fluctuating and/or pulsating range conditions.

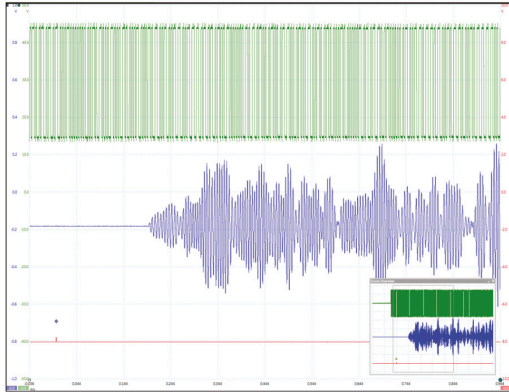


Figure 5 Coded transmitted signal (green) and received signal (blue)

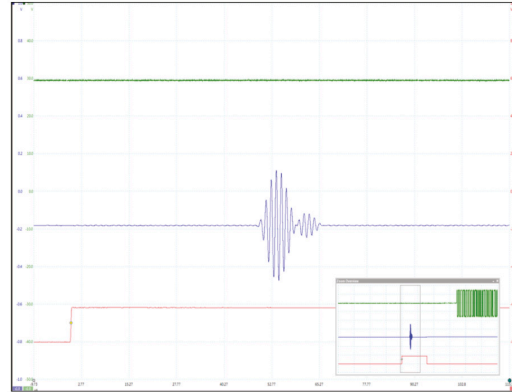


Figure 6 Decoded receive signal (blue)

Designed to be simple

With all on-board electronics on a single circuit, the FioSonic Mini offers a design for **easy maintenance**.

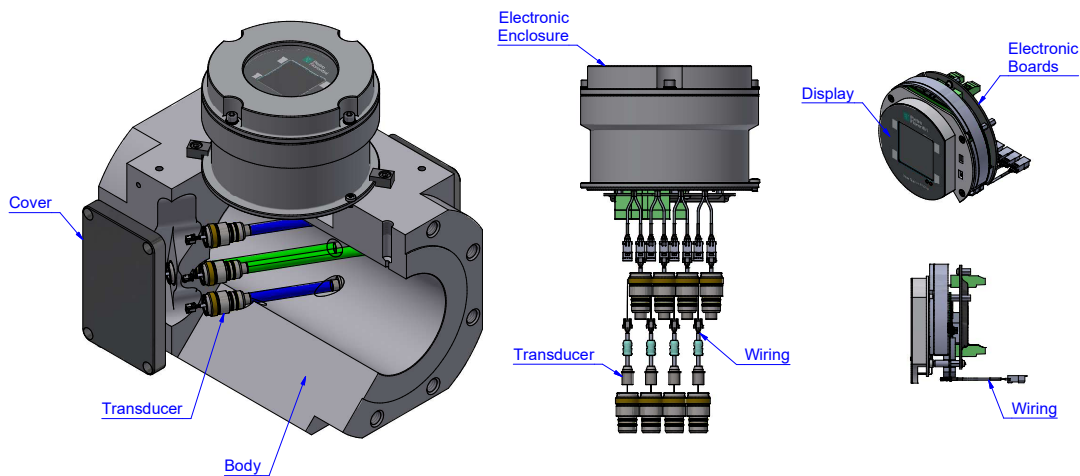


Figure 7 On-board electronics



Additional boards

Extended I/O board

FioSonic Mini products come standard with a frequency pulse output and a USB port for commissioning in combination with field operations. Optional I/O boards can provide an isolated **RS485**, two additional isolated pulse outputs and a 4-20 mA output.

Pressure and temperature input board

For applications requiring **integrated volume conversion**, the **FioSonic Mini can interface directly with pressure and temperature sensors**. Standard volume flow is calculated using traditional volume conversion equations, using fixed parameters for gas composition.

Connectivity with flow computers

The **FioSonic Mini** flow computer **can be connected to all brands** of flow computers on the market, either via pulse output or serial line (**Modbus protocol**).

Environmental protection

The casing that protects the electronics is made of **aluminium alloy** with epoxy paint to **class IP66** and **NEMA 4X**. It is designed to allow the FioSonic Mini series to be used outdoors in almost **any environmental condition**. The ambient operating temperature covers the range from -40°C to $+60^{\circ}\text{C}$ | -40°F to $+140^{\circ}\text{F}$. The ultrasonic sensors have all titanium fluid contact surfaces and are designed to operate in a process gas temperature range of -30°C to $+75^{\circ}\text{C}$ | -22°F to $+167^{\circ}\text{F}$.

Intrinsic safety

The FioSonic Mini has a **fully intrinsically safe (Exia)** design for **both transducers and circuit board** components. This design increases **safety** and allows **uninterrupted maintenance** of the gas measurement.

Performance monitoring and diagnostics

The FioSonic Mini series provides **detailed diagnostic information**, both on the screen and via the PC software interface called PF Instruments Manager.

Flow information and diagnostics can be recorded over time to **show trends** and enable **real-time condition monitoring**. The velocity profile is a function of the upstream pipeline.

By calculating the velocity ratios between the ultrasonic measuring chords, a good indication of the flow profile is obtained. The flow meter **calculates Profile** and **Symmetry Factors**, which are useful for monitoring the measurement condition and gas flow.

In addition, the FioSonic Mini flowmeter **provides diagnostics for turbulence** by means of the standard deviation of instantaneous chord velocity measurements. The standard deviation is an excellent diagnostic for turbulence fluctuations and can serve as an indicator of upstream anomalies. Other diagnostics such as signal-to-noise ratio velocity and signal strength are also available to the user.

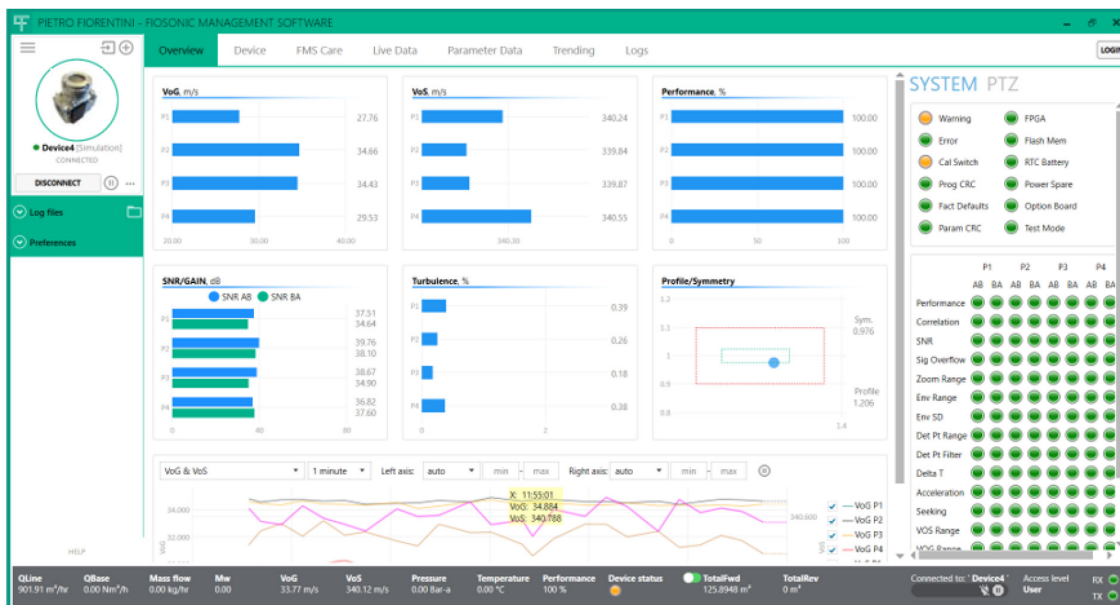


Figure 8 FioSonic Mini Management Software Interface



FioSonic Mini competitive advantages



Titanium transducers for long durability



Low voltage sensors



No moving parts



Bi-directional flow measurements



BCW processing for reduction of noise interferences



Easy maintenance



30% Hydrogen blending compatible. Higher blending available on request



Metallic wetted parts



Light weight aluminium body

Features

Features	Values	
Design pressure*	Up to 2 MPa(a) Up to 290 psi(a)	
Ambient temperature*	<ul style="list-style-type: none"> Ambient Temperature for Non custody Transfer: from -40 °C to +60 °C from -40 °F to +140 °F Ambient Temperature Custody Transfer (MID and OIML certified): from -25 °C to +55 °C from -13 °F to +131 °F 	
Operating (gas) temperature*	From -30 °C to +75 °C From -22 °F to +167 °F	
Accuracy	Class 1 ($Q_{min} \leq Q < Q_t \pm 2\%$ & $Q_t \leq Q \leq Q_{max} \pm 1\%$) with air calibration	
Rangeability	Up to 1:67	
Repeatability	Better than 0.1%	
Ingress Protection	IP 66 / NEMA 4X	
Applicable metrology standards	AGA-9; OIML R137-1&2 ; MID 2014/32/EU	
Power supply and consumption	Main power supply	Voltage: 14 VDCmin Power: 710 mWmax
	Optional I/O board power supply	Voltage: 10,8 VDCmin Power: 1626 mWmax
Hazardous area certification	<ul style="list-style-type: none"> ATEX II 1 G Ex ia IIC/IIB T4 Ga (intrinsically safe) IECEX Ex ia IIC/IIB T4 Ga (intrinsically safe) CQPSUS Class 1 Div.1 Gr. ABCD T4-T1 (intrinsically safe) 	
Accessories	Flow conditioner TI-TWIN (material: SS316)	
Nominal sizes DN	DN 80 3", DN 100 4"	
Connections*	Class 150 RF / RTJ according to ASME B 16.5 or PN 16 according to EN 1092-1	
<p>REMARK: Different functional features and/or extended temperature ranges available on request. Stated temperature ranges are the maximum for which the equipment's full performance, including accuracy, are fulfilled. Standard product may have a narrower range.</p>		

Table 1 Features

FioSonic Mini for fiscal use:

Four measuring chords for greater precision and reliability

The FioSonic Mini has four measuring chords. It has been **designed** and **certified** to meet international standards for fiscal meter measurement, including **AGA-9, OIMLR137 1&2 (class 0.5 - 1)** and **MID class 1**.

The integration of flow through multiple measuring chords provides accurate measurement even with varying flow profiles caused by changes in flow velocity, gas composition and pressure or upstream pipe configuration. Fast response is maintained by simultaneous transmission over more than one measuring chord using broadband continuous wave processing. The measured flow profile also provides a diagnostic tool.

Should an error occur in a measuring chord, the replacement algorithm will autonomously use the historical data to continue to have reliable flow measurements. This situation will continue until the chord autonomously resumes measuring correctly or corrective action is taken.

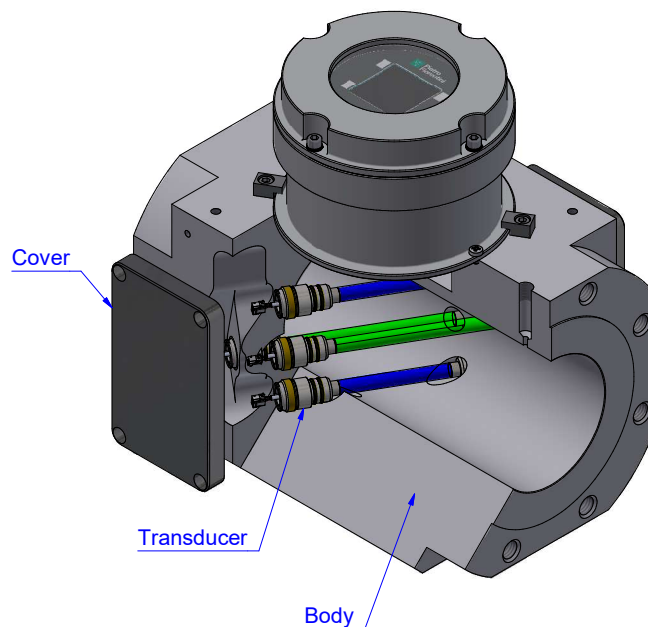


Figure 9 FioSonic Mini



Materials and Approvals

Materials and Approvals

Part	Material
Body	Aluminium 6082
Electronic enclosure	Anodized aluminum alloy Stainless Steel 316, on request
Transducers	Titanium ASTM B348 Ti GR.2
Sealing ring	FKM or other material according to process conditions

NOTE: The materials indicated above refer to the standard models. Different materials can be provided according to specific needs.

Table 2 Materials

Construction Standards and Approvals

The **FioSonic Mini** is designed to meet AGA report N.9, ISO 17089-1, OIML R137-1&2 requirements.



AGA9



ISO17089-1

The product is certified according to European Directives 2014/68/EU (PED) as well as 2014/32/EU (MID), OIML R137 -1&2, ATEX, IECEx, CSA, UL (cQPS_{US}).



PED-CE



MID



OIML
R137-1&2



ATEX



IECEx



cQPS_{US}

Measuring ranges

Measurements for fiscal applications with OIML R137-1&2 or MID certification

FioSonic Mini OIML R-137 class 1 and MID class 1									
Nominal size		Pipe schedule	Flow rate per hour						
			Qmin		Qt		Q max		Turndown
Inches	DN	SCH	m ³ /h	cfh	m ³ /h	cfh	m ³ /h	cfh	
3"	80	STD	9	300	60	2,100	601	21,200	67
4"	100	STD	15	500	99	3,400	991	34,900	66

Table 3 Capacities and rangeability

Measurements for non-fiscal applications (technical measurement) without OIML R137-1&2 or MID certification and up to 0.2% accuracy

FioSonic Mini 3P and 4P extended range									
Nominal size		Pipe schedule	Flow rate per hour						
			Qmin		Qt		Q max		Turndown
Inches	DN	SCH	m ³ /h	cfh	m ³ /h	cfh	m ³ /h	cfh	
3"	80	STD	7	200	62	2,100	620	21,800	89
4"	100	STD	12	400	102	3,600	1,022	36,000	85

Table 4 Capacities and rangeability



Accessories

For electronics:

- Extended I/O board
- PT Board

For the meter:

- Flow conditioner

Flow conditioner

The FioSonic Mini flow conditioner is **mandatory for fiscal applications**.

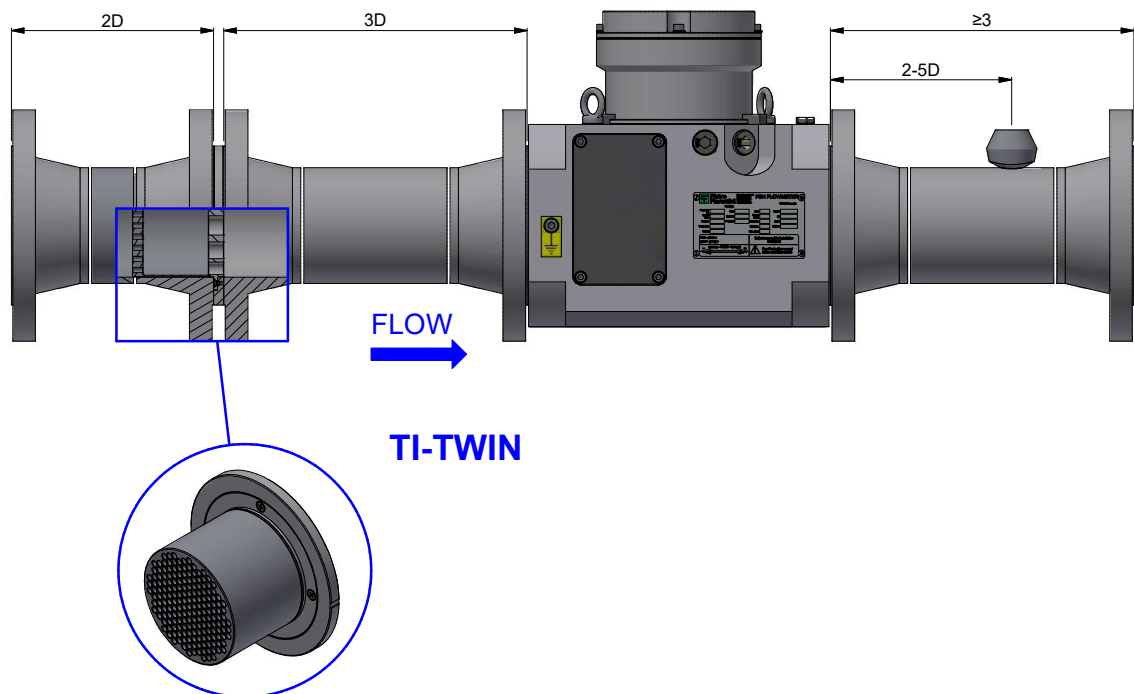


Figure 10 Measurement trunk configuration with flow conditioner type TI-TWIN

Weights and Dimensions

FioSonic Mini

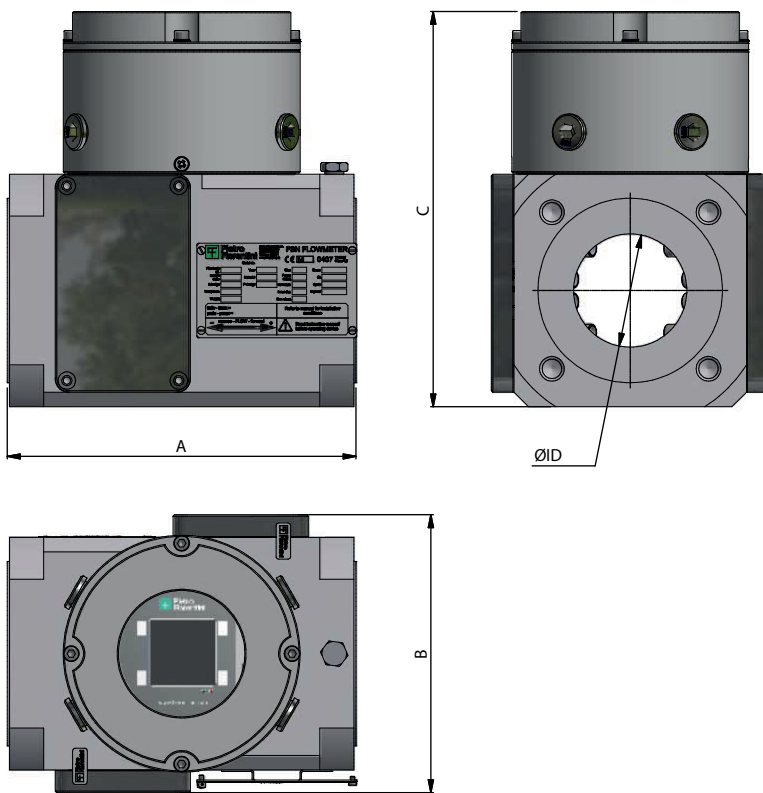


Figure 11 FioSonic Mini dimensions

Nominal size table

All meters have 3D length as standard.

ØID nominal size inches [DN]	Class [ANSI] PN	A length [mm] inches	B width [mm] inches	C height [mm] inches	Weight [kg] lbs
3" DN80	150 16	240 9.45	190 7.48	272 10.70	21 46.3
4" DN100	150 16	300 11.81	230 9.06	312 12.28	32 70.5

The table above shows the dimensions of the FioSonic Mini gauge in the standard design. Different dimensions (e.g. face-to-face length, which is typically 3DN) can be customised according to customer requirements.



Customer Centricity

Customer centricity is a way of running your business — implementing a perfect customer experience at each stage of the pipeline. Pietro Fiorentini is one of the main Italian international company with high focus on product and service quality.

The main strategy is to create a stable, long-term relationship, putting the customer's needs first. Lean management and customer centricity are used to improve and maintain the highest level of customer experience.



Support

Pietro Fiorentini's top priority is to provide support to the client in all phases of project development, during installation, start up and operation. Pietro Fiorentini has developed a highly standardized Intervention-Management-System (IMS), which helps to facilitate the entire process and putting the customer at the forefront of every decision in our process while manufacturing or developing a product to help improve the product and service. With our IMS business model many services are available remotely, avoiding long waiting times, improving service, and avoiding unnecessary expenses.



Training

Pietro Fiorentini offers training services available for both experienced operators and new customers. The training is offered for all levels of our customers which can include one or all of the following: sizing of equipment, application, installation, operation, maintenance and is prepared according to the level of use and the customer's need.

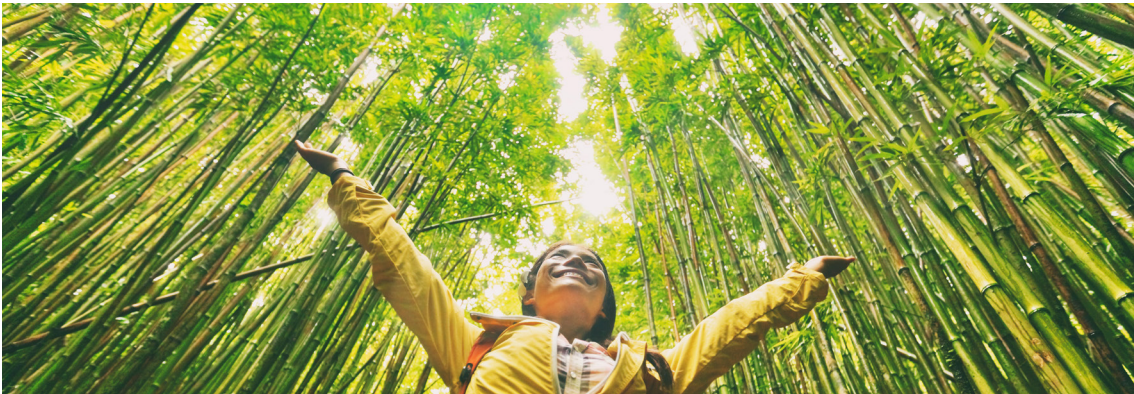


Customer Relation Management (CRM)

The service and care of our customers are one of the main missions and vision of Pietro Fiorentini. For this reason, Pietro Fiorentini has enhanced the customer relation management system. This enables us to track every opportunity and request from our customers into one single information point and allows us to coordinate information allowing us to give the customer improved service.

Sustainability

Here at Pietro Fiorentini, we believe in a world capable of improvement through technology and solutions that can shape a more sustainable future. That is why respect for people, society and the environment form the cornerstones of our strategy.



Our commitment to the world of tomorrow

While in the past we limited ourselves to providing products, systems and services for the oil & gas sector, today we want to broaden our horizons and create technologies and solutions for a digital and sustainable world. We have a particular focus on renewable energy projects to help make the most of our planet's resources and create a future in which the younger generations can grow and prosper.

The time has come to understand how and why we operate now.





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