

GEDRA

Gas quality analyzer



TECHNICAL BROCHURE

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Who we are

We are a global organization that specializes 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 solutions that span the whole natural gas chain.

We are constantly evolving 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 level of professionalism.



Pietro Fiorentini advantages



Localised technical support

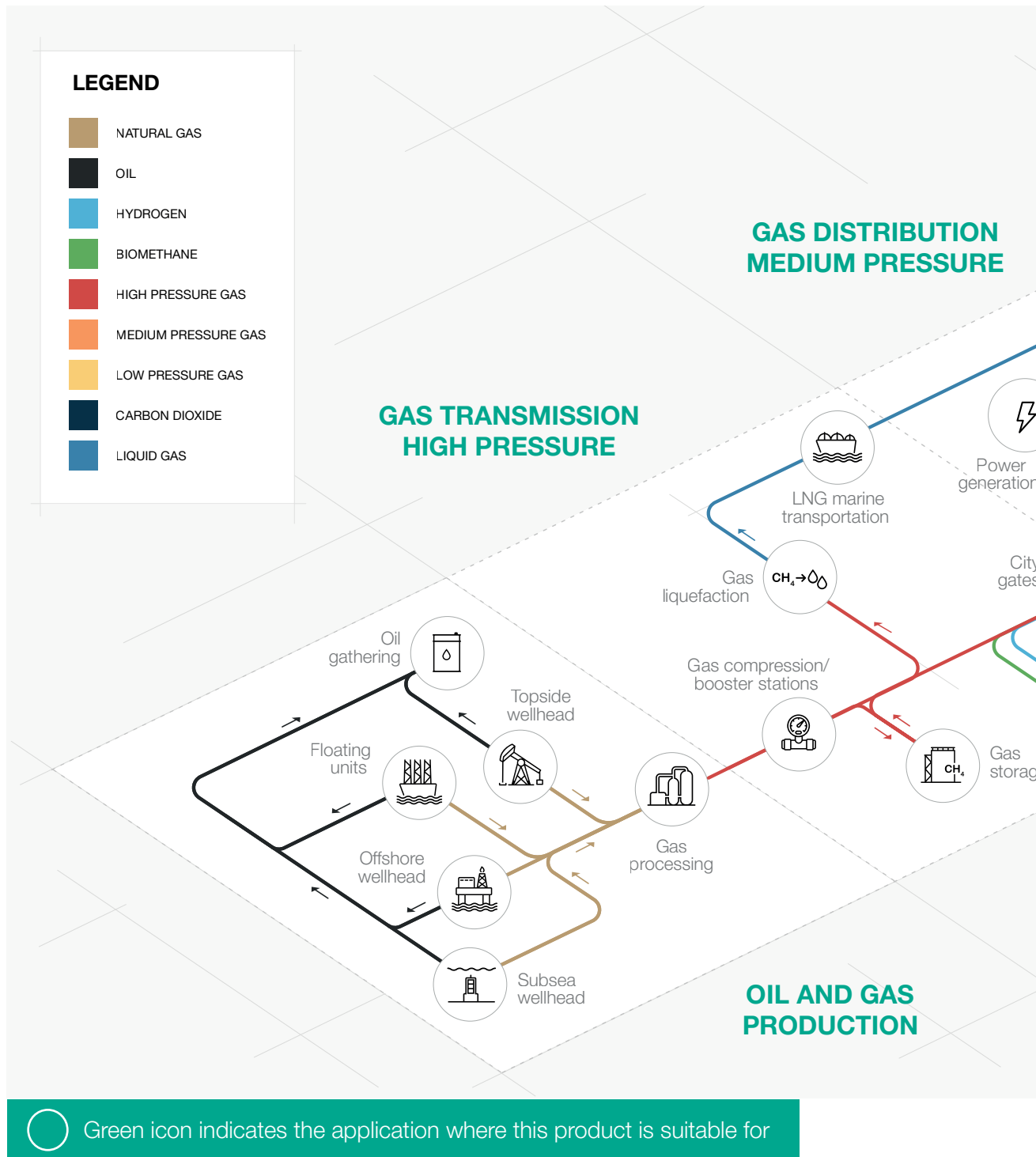


Experience since 1940



Operating in over 100 countries

Area of Application



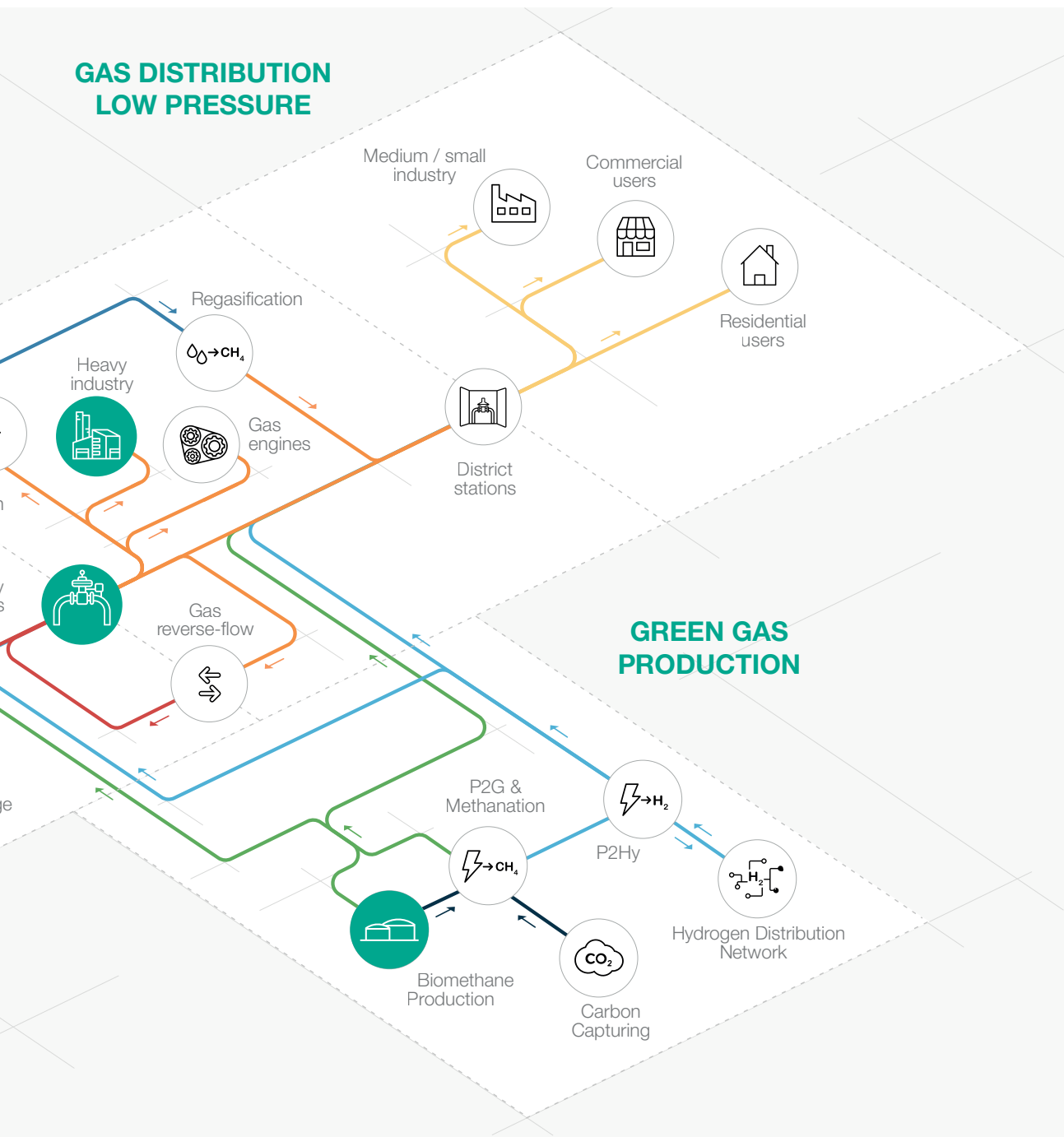


Figure 1 Area of Application Map

Introduction

GEDRA (Gas Energy Density Raman Analyser) is a **real time gas analyser** tailored for natural gas and hydrogen analysis.

The decarbonization of gas supply and subsequent reconfiguration of gas flows through the grid will substantially affect the gas network operator business. The shared goal is to increase the use of alternative green gas sources such as biomethane and hydrogen-enriched natural gas.

In this future with a such **heterogeneous gas network**, GEDRA will play a crucial role on the way to renewables in **monitoring fundamental gas parameters**. It measure a wide range of gas mixtures without any hardware reconfiguration or any needs of consumable supplies, ready for remote monitoring and control.

Designed to **withstand harsh environmental conditions**, GEDRA can be installed **anywhere** along the gas pipelines, including **remote unmanned locations**. Thanks to its peculiar features, it represents an effective alternative to gas chromatographs for monitoring calorific value.

It is capable of injecting the gas into the process **without any emissions into the atmosphere**. GEDRA is compliant with EU Regulation 2024/1787.

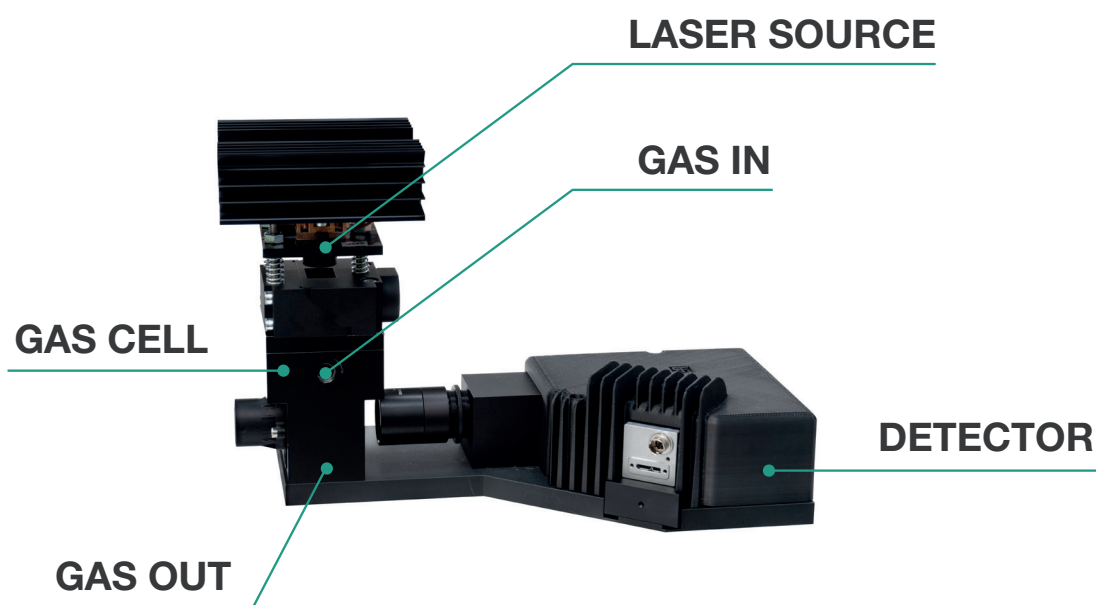


Figure 2 GEDRA

How it works?

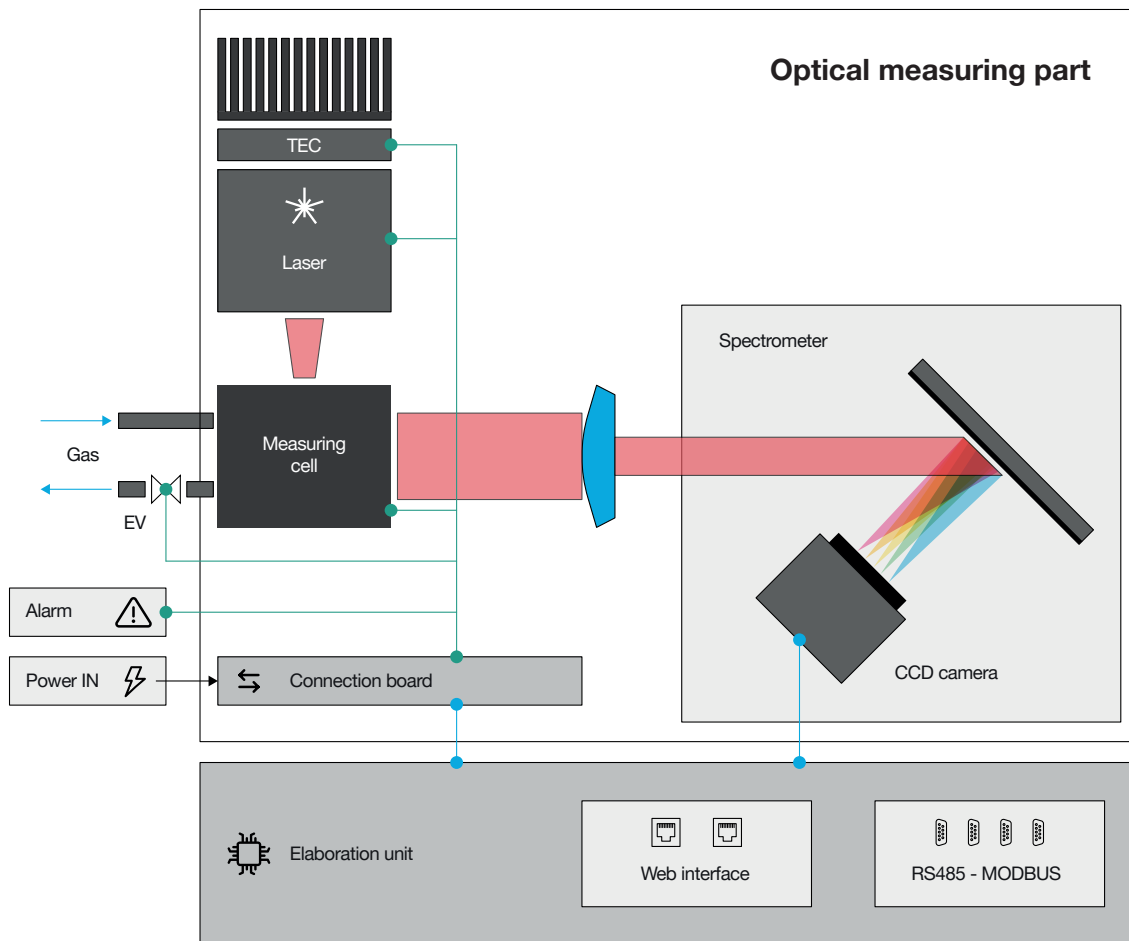


Figure 3 GEDRA - working principle

The operating principle of GEDRA is based on Raman spectroscopy, a technique that exploits the ability of light to interact with matter.

When a beam of light from a laser source hits the gas in the cell, the gas responds by scattering part of the light. A small part of the scattered light has a peculiar wavelength as a result of the interaction of the light with gas molecules: different molecules have a characteristic Raman emission, a 'fingerprint' of the gas. This phenomenon is called Raman scattering.

Through an optical system, the Raman emission is captured, split by wavelengths and read by the detector. In this way, the instrument detects simultaneously the signals of all components of the gas mixture. These signals are then separated, analysed and used to calculate the concentrations of the components and the calorific value.



Gas analysis

The primary function of GEDRA is to measure the heating value of gas mixture.

GEDRA patented measurement technology is based on optical Raman spectroscopy, with no gas release in atmosphere (for installation type 1) and no need of calibration and carrier gas.

As a by-product provides natural gas main components, including hydrogen, and provides gas mixture's calorific value, density, Z-factor and many other parameters with high accuracy.

The output gas parameters are:

- **HHV** (Higher heating value / Gross calorific value) with accuracy in natural gas ± 0.5 (rel) and repeatability 0.2% (rel.).
- **LHV** (Lower heating value / Net calorific value)
- **HWI** (Higher Wobbe index)
- **LWI** (Lower Wobbe index)
- **RD** (Relative density)
- **Z-factor**

Substance	Concentration detection (mol/mol %)	
	MIN	MAX
Methane	80	100
Ethane	0.05	15
Propane	0.05	4
n-Butane	0.05	4
i-Butane	0.05	4
Heavier hydrocarbons ($>C_4$)	NOTE 1	NOTE 1
Nitrogen	0.05	10
Carbon dioxide	0.05	4
Hydrogen	0.05	20
NOTE 1: Hydrocarbons heavier than butanes are detected by GEDRA. Their typical concentration in natural gas is far lower than 0.05%, thus their calibration could be added according to customer requirements.		

Table 1 Substance and their concentration detection

GEDRA competitive advantages



High accuracy



High repeatability



No carrier gas
No calibration gas mix



In-line installation



Fast response time



H₂ ready



No gas release in atmosphere
with installation type 1



Low power consumption

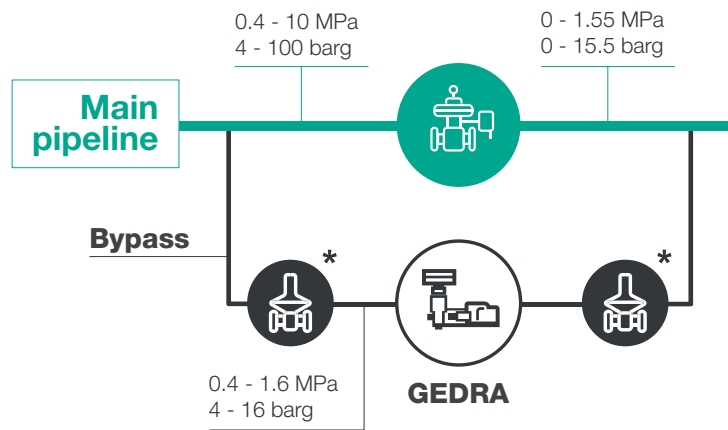
Technical features of GEDRA

Features	Values	
Accuracy (OIML R 140)	Class A (0.5 %)	
Pressure range	- For installation type 1: 0.4 - 100 barg; - For installation type 2: > 16 barg. Detail in “Figure 4 Installation scheme”	
Flow rate	Max 54 NL/h	
Temperature range	From -20 °C to +50 °C From -4 °F to +122°F	
Certified Higher Heating Value (HHV) range	Minimum value	Maximum value
	33.59 MJ/Stm³	43.34 MJ/Stm³
Power supply	24 VDC	
Power consumption with field display	Average: 18 W Maximum: 25 W	
Communication ports	2x Ethernet 4x Serial (RS 485)	
Lower limit of quantification (LOQ)	500 ppm	
Communication interfaces	- Modbus ASCII according to UNI 11885 - Integrated web server - Field display (available upon request)	
Detectable compounds	Methane; heavier hydrocarbons (ethane, propane, butanes, n-butane, i-butane); nitrogen; carbon dioxide; hydrogen	
Installation in hazardous area	Zone 1, II B+H2, T6 Zone 1, II C, T6	
NOTE: Different functional features available on request.		

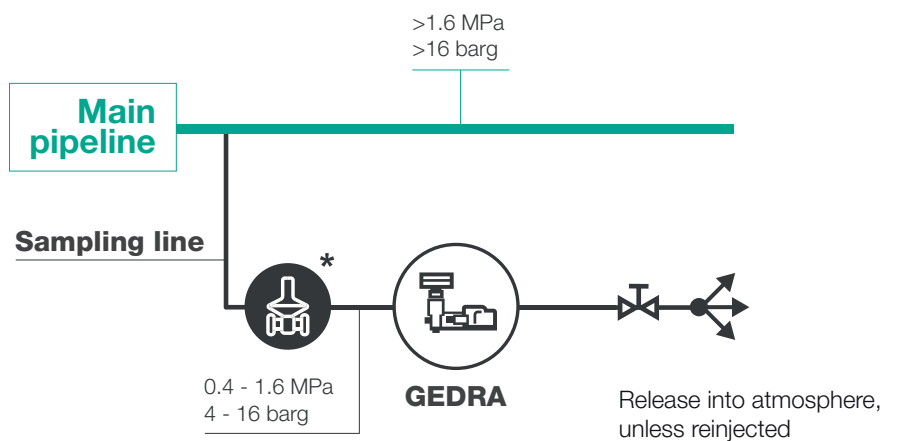
Table 2 Technical features of GEDRA

Installation

Type 1



Type 2



*To be defined according to the use case

Figure 4 Installation scheme

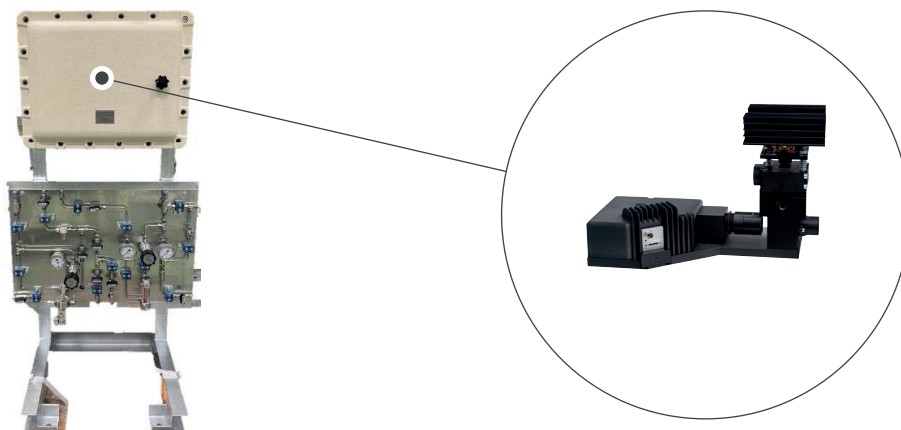


Figure 5 Acquisition module of GEDRA real installation

GEDRA® VS Gas chromatograph

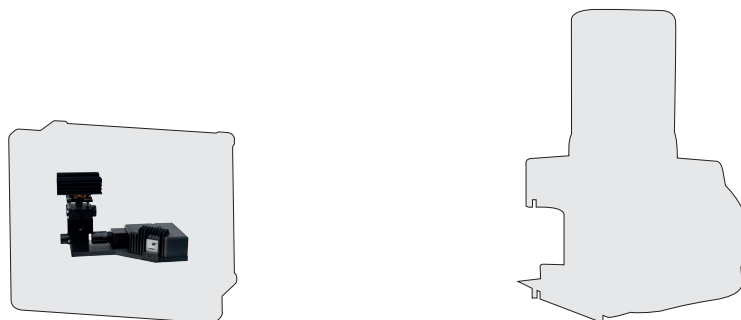


Figure 6 Dimensions comparison - GEDRA on the left; a gas chromatograph on the right

Both instruments quantify the main components of **natural gas**, **H₂ blending** and **biomethane**, calculating calorific values and other quantities according to ISO 6976:2016.

Gas chromatography uses separation techniques of the mixture at low pressure using carrier gas (such as He or Ar). Different chemical species reach the detector at different times, which quantify each component of the mixture.

GEDRA uses a technique that provides an **instantaneous image of the gas mixture** without the need to reduce pressure or use a carrier gas. When a laser is directed onto the gas sample, the light is scattered, some of which has a unique characteristic closely linked to the gas composition, Raman frequencies, similar to a fingerprint. GEDRA is able to detect these frequencies of main components of the gas mixture. These signals are then separated, analysed and used to calculate the concentrations of the components.

GEDRA provides a **good balance between accuracy, sensitivity and response**, needs only a power supply and avoids the use of carrier gases and calibration gas mix.

	GEDRA	Micro GC	GC
Measurement principle	Raman spectroscopy	Gas chromatography	Gas chromatography
CAPEX	● medium	● medium	● high
OPEX	● low	● variable	● high
Accuracy (OIML R 140)	● class A (0.5 %)	● class A (0.5%)	● class A (0.1 %)
Operating pressure	● up to 1.6 MPa up to 16 barg	● up to 0.4 MPa up to 4 barg	● up to 0.4 MPa up to 4 barg
Power consumption	● medium	● medium	● high
Response time	● < 2 min	● < 3 min	● 5 min

Table 3 Comparison of gas analysis technologies



Operation and maintenance



Particulate filters to be replaced during periodic maintenance or when clogged



The laser source estimated minimum life is 40,000 hours (equivalent to approximately > 3.5 years with every 15 min measuring cycle and 0.5 MPa (5 barg) of operating pressure)



O-ring every 6 years

GEDRA approvals

GEDRA is designed according to UNI 9167-3 and UNI 1776.

Calorific values and other quantities are calculated according to ISO 6976:2016.

The product is certified according to European Directives 2014/34/EU (ATEX), IECEx, 2014/30/EU (EMC), OIML R140, European Directive 2004/22/CE (WELLMEC 7.2) and compliant with EU Regulation 2024/1787.



UNI
9167-3



UNI
1776



ISO
6976:2016



EU
2024/1787



ATEX



OIML
R140



EMC



IECEx

Field connections

GEDRA is divided in two modules:

- The **Acquisition Module (AM)** performs the measurement and send the results to the Field Display (FD). It can be equipped with a pneumatic panel with integrated pressure regulators, according to the use case.
- The **Field Display (FD)** provides Human-Machine Interface (HMI), remote communication and power supply for the Acquisition Module (AM).

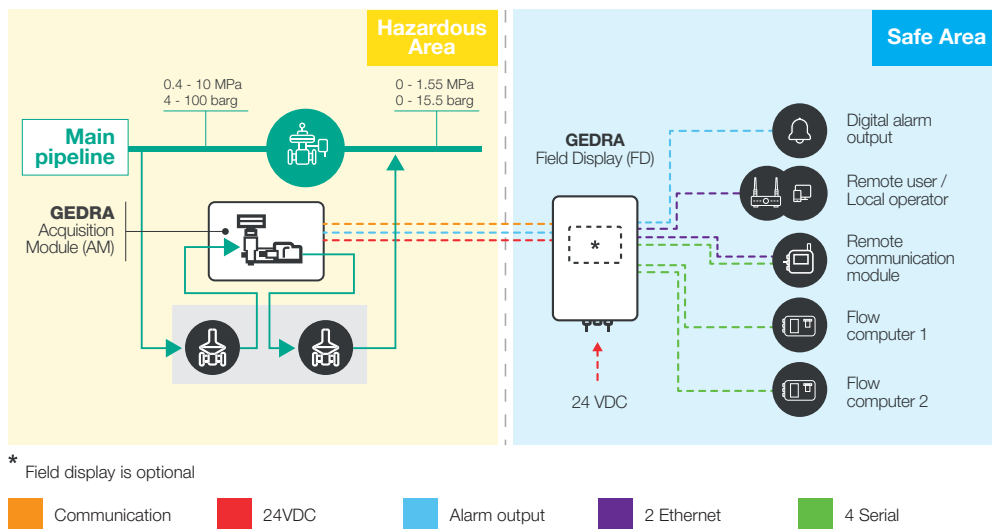


Figure 7 Connection diagram with type 1 configuration

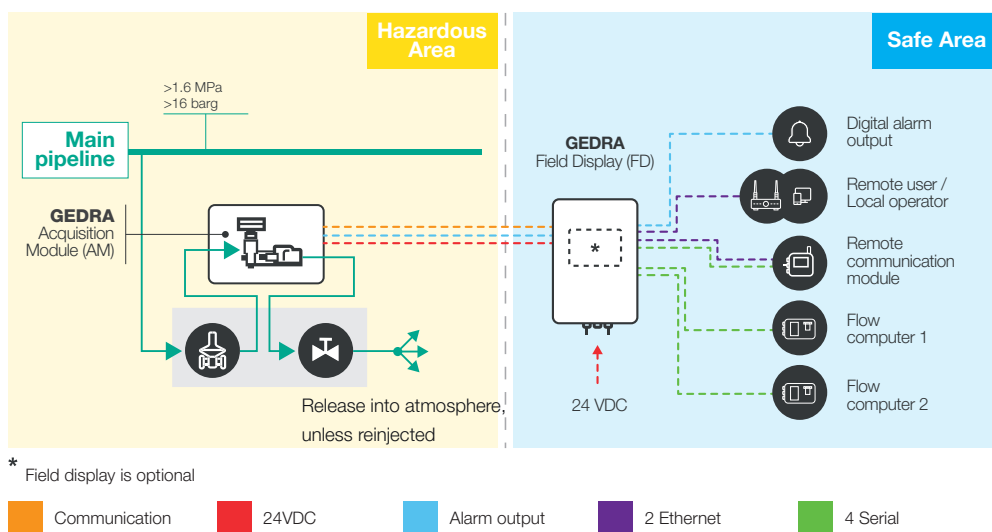


Figure 8 Connection diagram with type 2 configuration

Weights and Dimensions

Acquisition module for hazardous area

- Analysis module

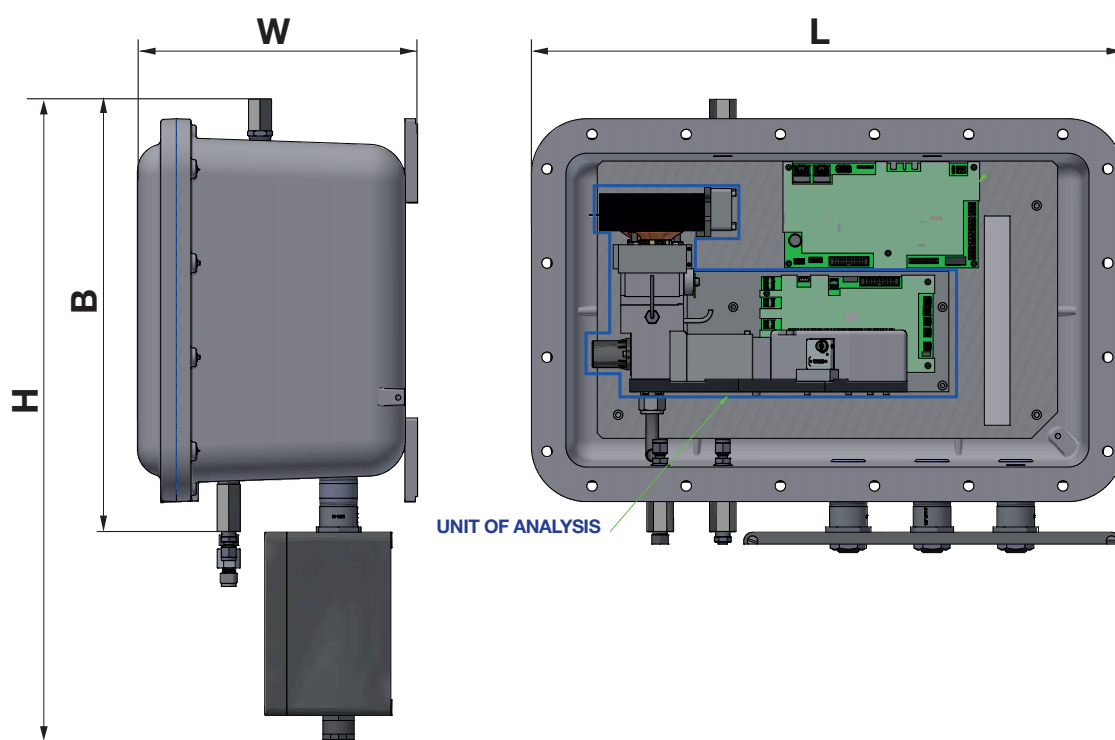


Figure 9 Dimensions of the analysis module

Weights and Dimensions (for other connections please contact your closest Pietro Fiorentini representative)		
	[mm]	inches
H	619	24.4"
B	440	17.3"
L	640	25.2"
W	278	10.9"
Weight	Kg	lbs
	50	110.0

Table 4 Analysis module weights and dimensions

Interface module for hazardous area

- Pneumatic panel

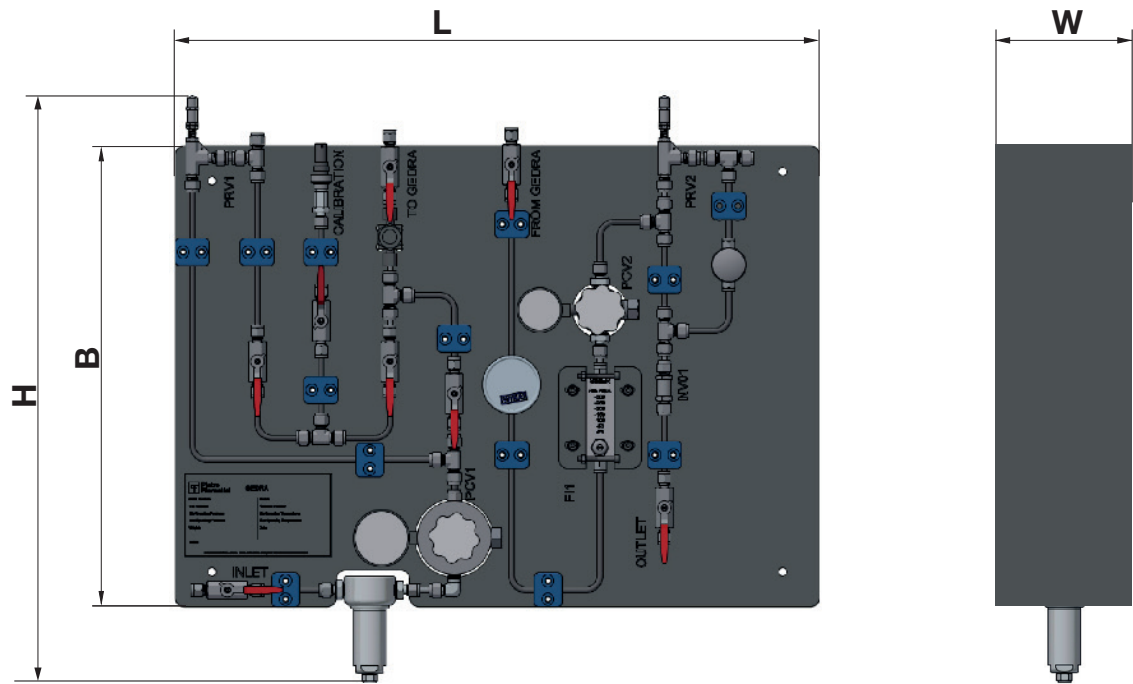


Figure 10 Dimensions of pneumatic panel

Weights and Dimensions (for other connections please contact your closest Pietro Fiorentini representative)		
	[mm]	inches
H	631	24.9"
B	500	19.7"
L	700	27.5"
W	150	5.9"
Weight	Kg	lbs
	20	44

Table 5 Pneumatic panel weights and dimensions

Safe area

- Field display

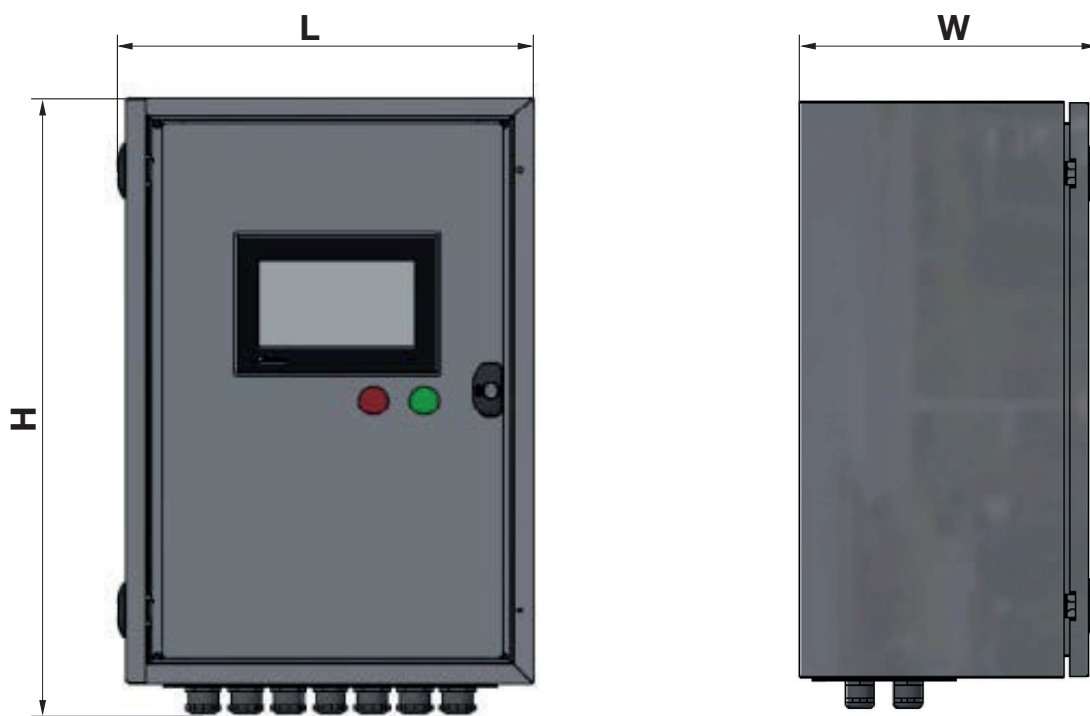


Figure 11 Dimensions of field display

Weights and Dimensions (for other connections please contact your closest Pietro Fiorentini representative)		
	[mm]	inches
H	500	19.7"
L	400	15.7"
W	200	7.9"
Weight	Kg	lbs
	35	77.2

Table 6 Field display weights and dimensions

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.



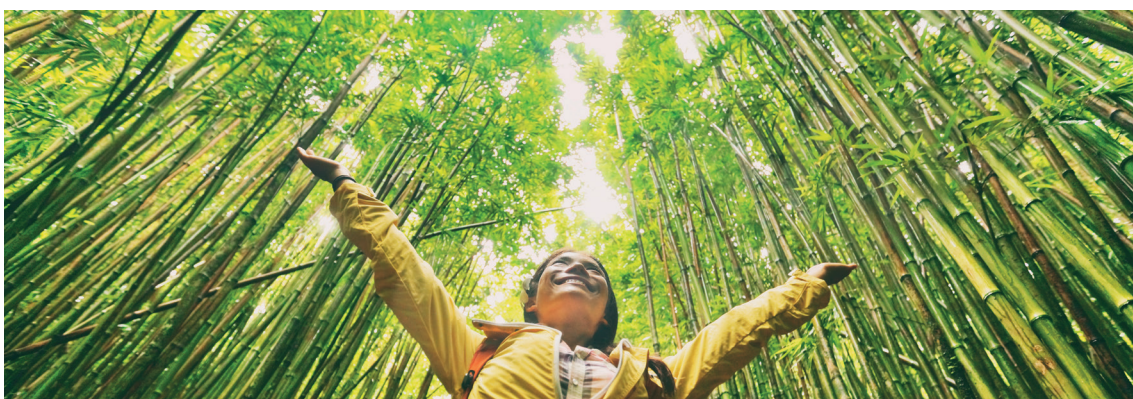
Customer Relation Management (CRM)

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

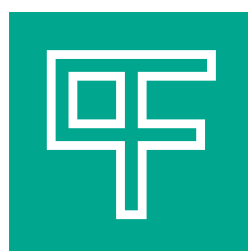
Here at Pietro Fiorentini, we believe in a world capable of improvement through technology and solutions that can shape a more sustainable future. That is why respect for people, society and the environment form the cornerstones of our strategy.



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.





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