

 **ingrid**

the future of natural gas
odorization: maximum safety
in each and every application!

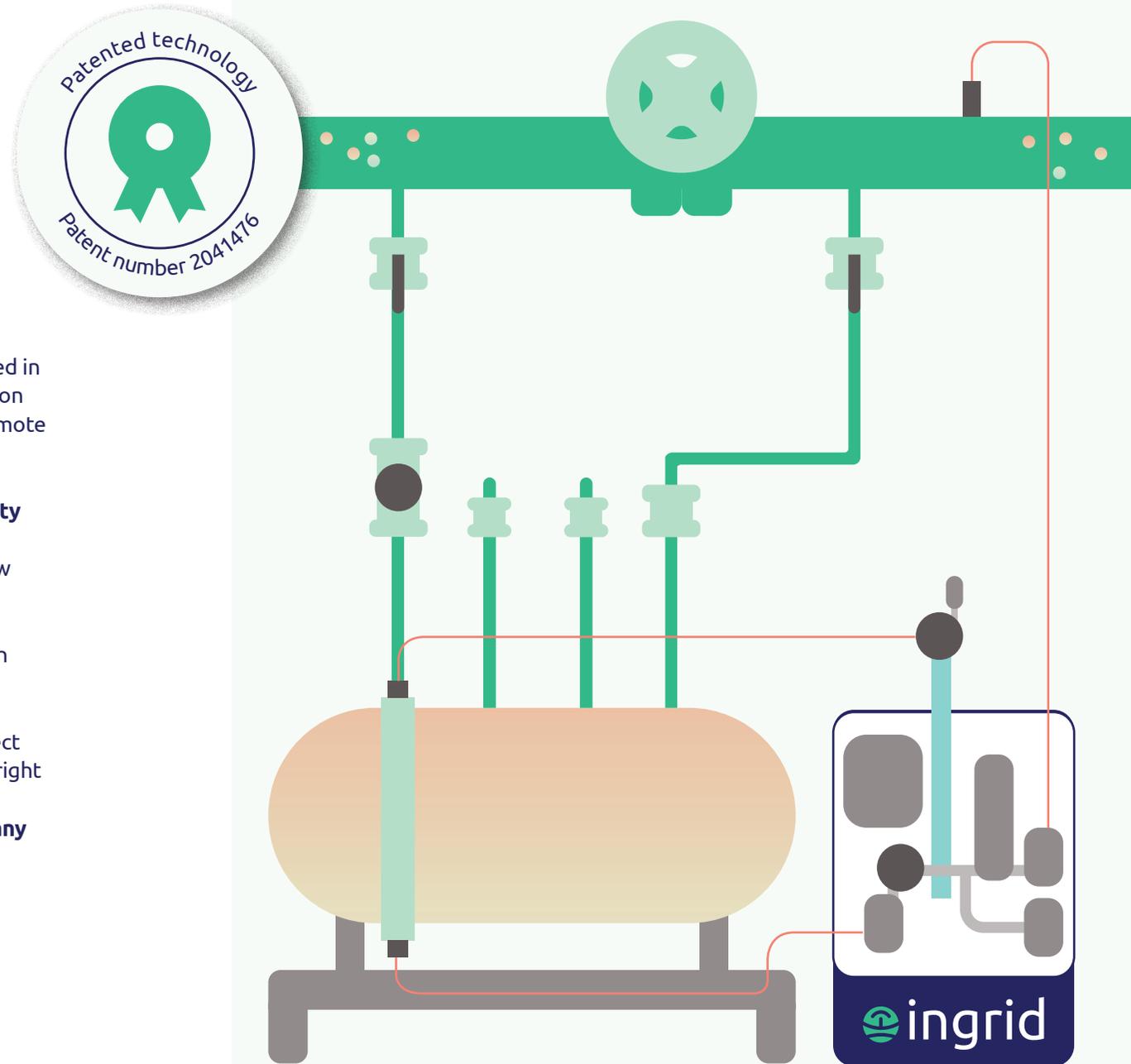


ingrid

Natural gas odorization is a crucial process for all those involved in the gas supply chain: production sites, transport and distribution operators, industrial users, LPG and LNG plant operators at remote sites, biomethane producers etc.

Ensuring the level of odorization necessary for **complete safety when managing gas** depends on a number of factors such as odorant dosage, the speed of gas moving inside the pipes, flow conditions, material of the pipes and their age.

When the demand for gas is reduced or intermittent, such as in summer months or in remote supply points, the management of traditional odorizing systems, both mechanical and pump-based, is extremely critical. Therefore, guaranteeing the correct distribution and maintenance of the desired odorant content right up to end users is an arduous task, and is the mission of Ingrid, advanced technology created specifically to **reliably resolve any problem** relating to odorization.



what is ingrid?

Ingrid is the **automatic odorization system**, available in a wide range to meet the most diverse application requirements. All Ingrid models can be managed completely remotely and are based on patented technology that ensures accurate and

reliable performance in each and every application. Ingrid automatically adjusts operations in relation to the different network operating conditions, ensuring optimal odorization which, in turn, results in lower operating costs and greater safety.

Ingrid has been designed to fully meet the needs of market innovation and flexibility and is built as a **modular injection system suitable for the most diverse operating scenarios**: transport and distribution systems, individual industrial users, biomethane input systems, LNG and LPG powered remote plants etc.



what is ingrid?

The injection process can be **monitored and managed remotely**, therefore the storage of the product in the tanks and the level of odorization are always under control.

Technology has always driven Ingrid's evolution with the aim of increasing performance and lowering operating costs, integrating the state-of-the-art with reliable **IoT sensors** with **Industry 4.0** in mind.

Ingrid odorization means making sure that your network operates in total safety at all times, thanks to **intelligent algorithms for automatic adjustment and fault prevention**. No more worries.



key-points

1 Innovative technology with international patents

2 Modular configuration providing maximum flexibility and adaptability to each and every network scenario

3 Uniformly odorized gas

4 Optimization of odorant consumption: reduced operating costs

5 Lower risk of calls for excess odorization

6 *Fail-safe philosophy:* maximum reliability in the event of malfunctions

7 Perfect operations even at low and variable flow rates

8 Automatic correction of the system as per changes in conditions thanks to a closed-loop control algorithm

9 Constant monitoring of odorant consumption with high precision electronic level meter

10 Remote management and total compatibility with third-party SCADA systems

11 Easy maintenance, low management costs

12 Easy to use

13 Innovative and predictive performance control with IoT sensors

14 Tried and tested efficiency: more than 1600 Ingrid systems up and running

how does ingrid work?

The heart of the Ingrid system is its **advanced closed-loop control algorithm** that is able to auto-adjust injector operations according to the actual amount of odorant needed, enabling it to react quickly to sudden changes in working conditions such as flow, pressure, etc. This ensures the stability of the odorization process, also in particular and critical application scenarios.

To implement this system, Ingrid uses a **high-definition magnetostrictive electronic** level that continuously measures the quantity of odorant injected and compares the real data with the theoretical consumption forecasts.

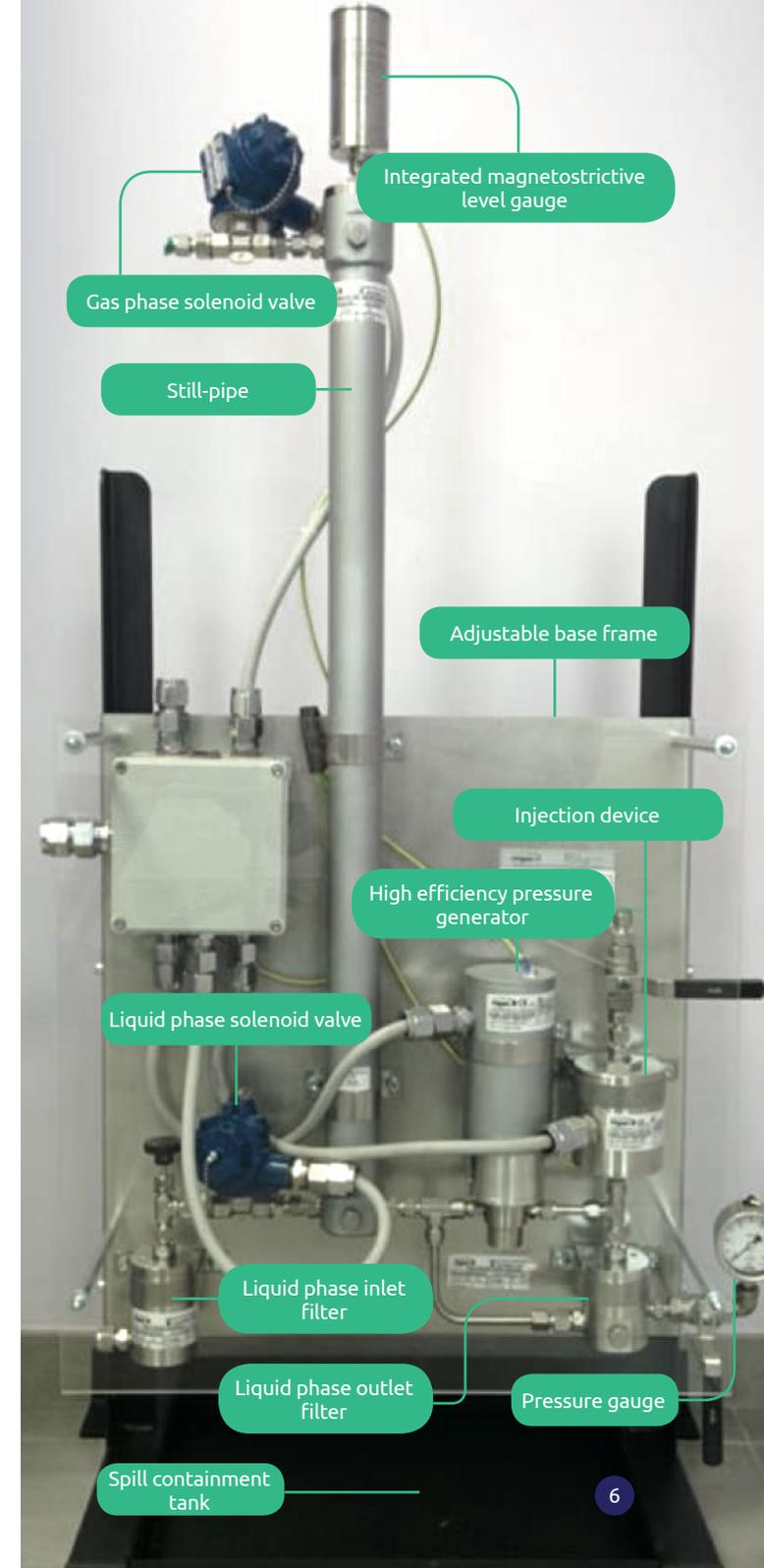
Odorization can take place in different ways depending on the required Ingrid version. Nevertheless, the technological base of the system ensures a uniform and very high-resolution distribution of the odorizing liquid within the gas flow.

This results in **extremely flexible and reliable operations**, able to adapt to network and operating conditions in a completely autonomous manner, without the need for external interventions.

All process information can be consulted remotely, **in real time**, via the control unit, which is equipped with the most up-to-date communication vectors and a Modbus communication protocol compatible with almost all SCADA platforms on the market.

The real time control of the odorant injected through the level sensor and multi-compatible remote-control system guarantee **maximum effectiveness in monitoring odorization processes**, also in complex systems and with distant inlet points.

The robust and essential components of the system ensure that **maintenance operations** have a low impact on the operating costs of the plants, also thanks to the integration of anomaly predictive detection algorithms.



available versions

Ingrid is available in more than 10 sizes, which vary depending on the flow rate, and in different versions based on the different application contexts (natural gas, biomethane, LPG and LNG odorization).

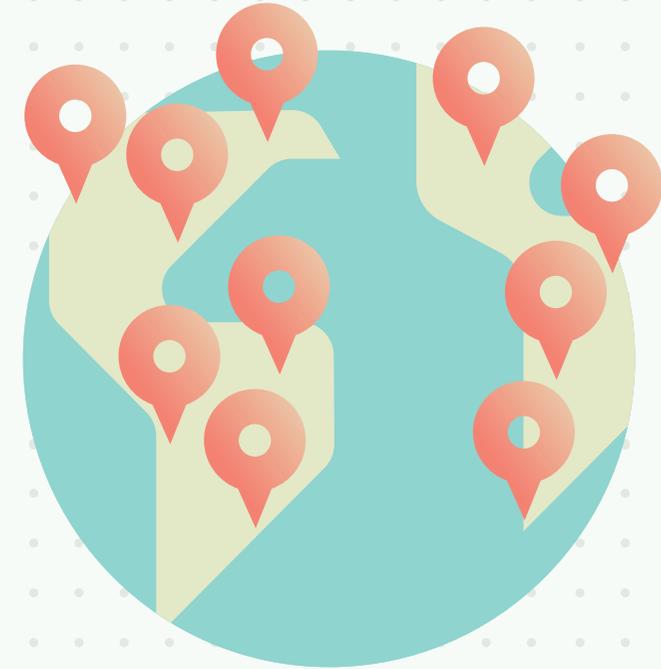
Ingrid systems cover a pressure range from 6 to 300 bar and can serve flow rates between 50 and 500,000 Sm³/h and higher, in 3-50 mg/Sm³ concentration range.

1 – Ingrid low flow rates

Ingrid has been designed to respond to the difficulties of odorization at low flow rates, and is the perfect solution: very high accuracy, uniform dosage and automatic adaptation to performance variations. The range allows to odorize at a minimum flow rate of 5 Sm³/h without compromising process reliability or odorization precision.

2 – Ingrid high pressure

Ingrid systems offer a complete range of sizes suitable for operating at distribution network pressures (PN100, ANSI600) and can be supplied complete with a storage tank, equally operable at the same network pressure.



+1600
Successfully installed

available versions

3 – Ingrid CNG

Up to 300 bar, for automotive and virtual pipeline applications.

4 – Ingrid bio-methane

This version has very high sensitivity and is suitable for odorizing the very low flow rates typical of biomethane distribution; for this type of application the reactivity of the system has also been increased to cope with sudden supply interruptions, and consequently, to avoid excess odorization.

5 – Ingrid Low Emission

This version stems from the 'green' need to reduce emissions of natural gas in the atmosphere and integrates a traditional pump system, Ingrid's advanced closed-chain control algorithm and high performance at low flow rates.

6 – Ingrid ducted LPG/LNG plants

This version integrates specific algorithms for odorant dosing in batch logic for the odorization of LPG/LNG ducted plants, which guarantee the robustness required by the process, combined with solid and reliable components.

7 – Ingrid Flex

With a view to increasing safety and redundancy of the service, Ingrid Flex combines a fully pneumatic pump backed up to a standard electric pump, guaranteeing full functionality also in the event of a prolonged power failure or malfunctioning of the main pump. Management is completely automatic, guaranteeing a high degree of reliability without added operating costs.

8 – Ingrid package

This version of Ingrid is supplied in package mode, assembled on a skid together with the storage tank, inside a stainless-steel cabinet for outdoor installation. It therefore allows the installation in plants without suitable environments, or where the available space is limited and does not allow the installation of new equipment.

9 – Ingrid custom made

Ingrid's high configurability can be easily adapted to totally custom-made solutions to satisfy every need of users, also adapting to the most diverse applications in terms of capacity, pressure, plant configuration, measurement, integration with third party systems.

Ingrid is the response to each and every demand of odorization.

technical characteristics

May vary by size and version

Pneumatic section

- Liquid phase filter
- Liquid phase solenoid valve
- Gas phase solenoid valve
- Magnetostrictive level and still tank
- Bypass switching valve

Materials

- Panel: A304 and A316 stainless steel
- Seals: PTFE and Viton
- Injector unit: A304 stainless steel
- Still tank: A304 stainless steel
- Electronic level: transducer housing A304 stainless steel, sensor tube and ballcock A316 stainless steel
- Solenoid valves: A304 stainless steel
- Bypass switching valve: A316 stainless steel
- Fittings: A304 and 316 stainless steel

Weight

- 30 kg (standard version)

Pressure resistance

- LP: PN6 barg
- SP: PS 16 barg, #150
- MP: PN30 barg
- HP: PS 100 barg, #600
- UHP: PS 300 bar #2500

Max odorization capacity

- IN100: 0,17 l/h
- IN500: 0,8 l/h
- IN1000: 1,7 l/h
- IN2000: 3,3 l/h
- IN10000: 12,6 l/h
- Versione HP e UHP: fino a 40 l/h
- Versioni Custom Made: ∞ l/h

Operating temperature

- -20°C ÷ +60°C
- -40°C ÷ +85°C (extended temperature)

Installation

- Wall mounted
- On chassis
- Package
- In a cabinet

Liquid phase filter (standard version)

- Cartridge: printed A304 stainless steel
- Filter capacity: 60 µm
- Filter surface: 3 x 2050 sq.mm.
-

technical characteristics

Integrated electronic level

- Guided wave magnetostrictive/radar technology
- Accuracy: up to +0.5 mm.
- Resolution: up to +0.1 mm.
- Loop-powered

Liquid phase and gas phase solenoid valves

- Passing surface: 5 sq.mm (standard version) and up to 200 sq.mm. (HP/UHP version)
- Type: solenoid valve/servo-activated
- Power: 12V DC / 24V DC

Bypass switching valve

- On/off type with mixed/servo-activated drive
- Operation without engine gas intervention
- Power: 12V DC / 24V DC

Master/slave architecture

- Installation of double injection systems in fail-safe mode
- Intelligent exchange logic for system wear compensation
- Automatic priority management

Ex compatibility

- Pneumatic: Zone 1, class 2
- Control electronics: area not classified
- Customized versions available for CSA/UL standards, and hazardous area control systems.

Regulatory compliance

- EN 60950, EN 61000-3-2, EN 61000-3-3, EN 55022, EN 50082-1, 73/23/CEE, 89/336/CEE, 999/5/EC, UNI-CIG 9167:2009, UNI-CIG 9463:2012, UNI-CIG 9571:2012, UNI-EN 12186:2006

technical characteristics

standard version

Pump-motor

- Magnetic drive pump
- Without seals
- Peek gears
- Power: 24V DC

Injector unit

- Variable openings
- Up to 50 cycles per second
- Power: 12V DC

hp and uhp version

Uhp membrane pump

- Power: 400V AC
- Up to 60 cycles per minute
- Maximum capacity 49 l/h
- Membrane rupture sensor
- Stroke counting sensor

low emission version

Low emission membrane pump

- Power: 230V AC
- Up to 120 cycles per minute
- Maximum capacity 1 l/h
- Membrane rupture sensor
- Stroke counting sensor

available as an option on all versions

Redundant pump unit

- Double parallel pump unit
- Increased reliability thanks to fail-safe logics
- Back-up intervention in the event of system performance decline
- Automatic exchange management



REGAS provides state-of-the-art solutions expressly designed to support companies operating in the natural gas transmission and distribution sector

Our flagship products

EMMA, which optimizes the preheating process by reducing gas consumption

INGRID, which injects odorant into the grid in an accurate, precise and innovative way

GRETA, which provides gas-chromatographic analysis in real time and an advanced management of gas processes remotely

Our Goal

Our goal is to promote disruptive innovation in the natural gas industry and to develop advanced technologies that maximize efficiency in its entire value chain

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