

# Process analysis solutions

## Expertise for optimal performance



# Engineering and manufacturing of process analysis solutions

We partner with our clients throughout their project journey, ensuring that each solution meets application specifications and industry standards while delivering maximum performance and longevity. From the initial design phase to production, factory acceptance testing (FAT), and on-site commissioning support, we are with you every step of the way.

## Gas analysis solutions

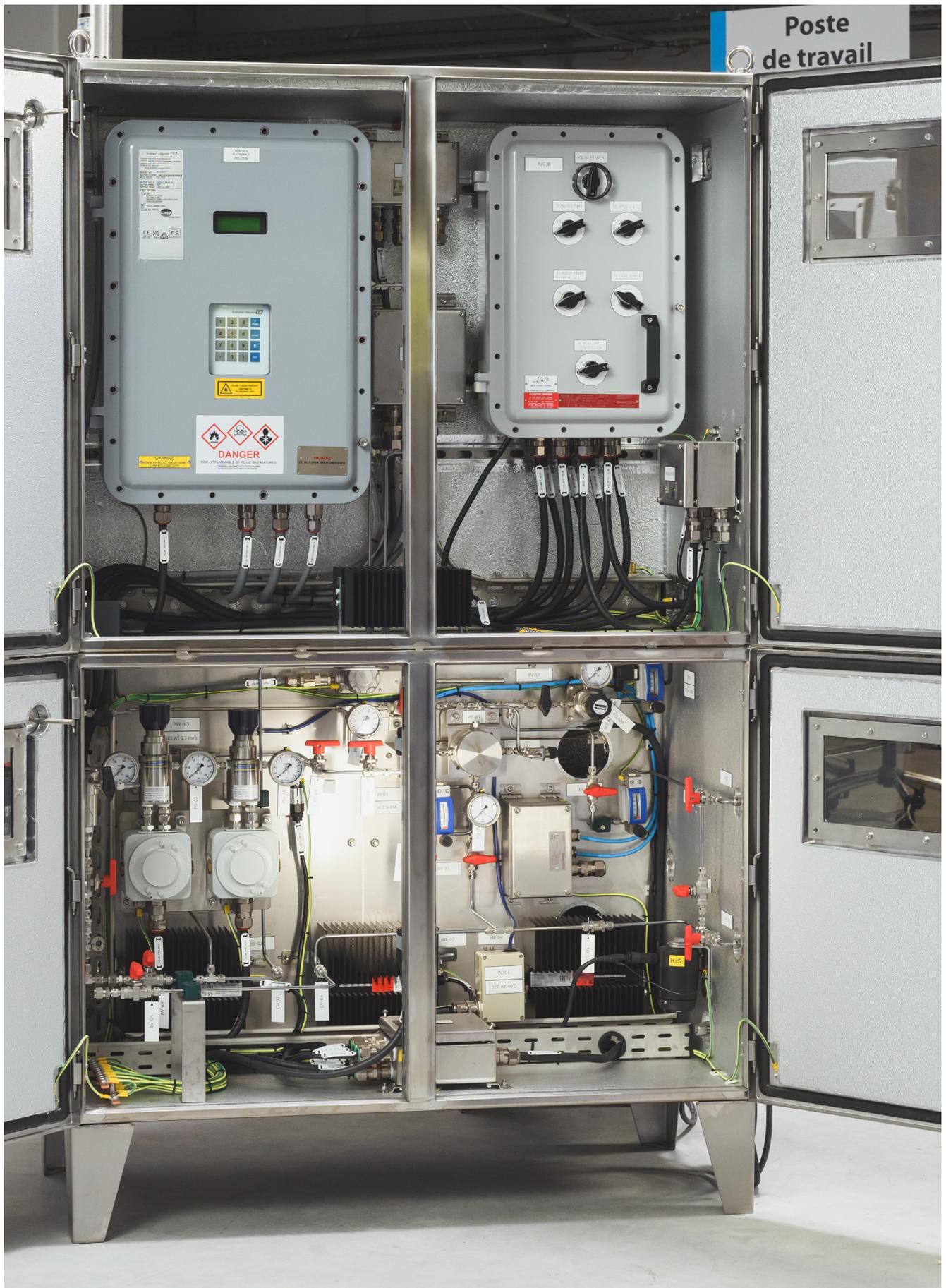
We integrate optical analyzer technologies into turnkey solutions for gas quality and process control. Our gas solutions meet stringent Oil & Gas and explosion areas (ATEX, IECEx) standards from engineering to factory acceptance testing (FAT). Our offering ranges from probe sample tap to distributed control systems (DCS), including double block and bleed (DBB) sample probes, pressure reducing systems (PRS), preconditioning and sampling systems, programmable logic controllers (PLC) and signal converters. Solutions can be customized into shelters, mounted panels, and enclosures upon request.

For repeated solutions, we manufacture typical solutions in series with optimal supply chain management. Our offerings include, but are not limited to, the following solutions:

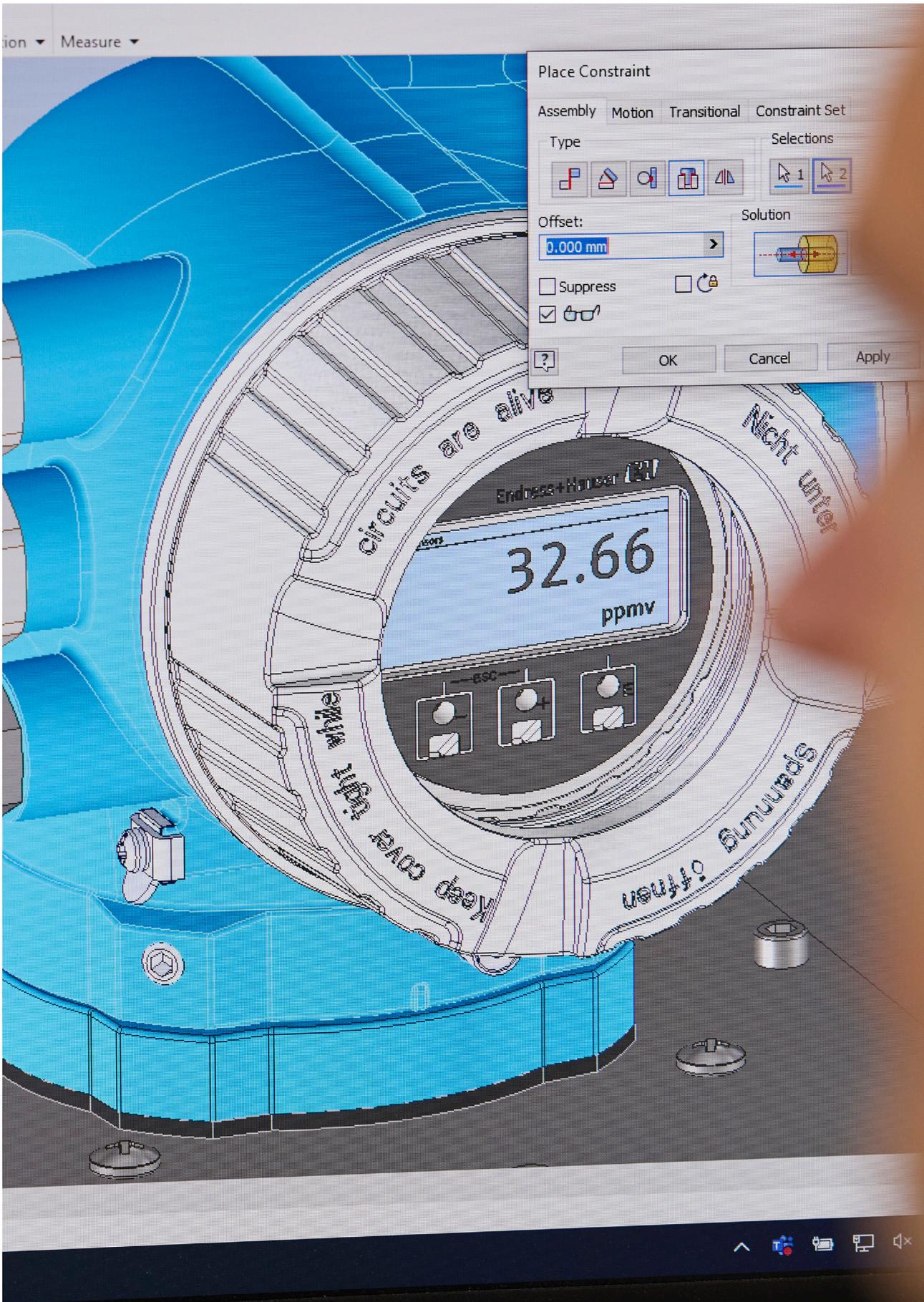
- Biomethane quality control
- Raman LNG bunkering
- Offshore moisture or H<sub>2</sub>S control
- General-purpose Raman spectroscopy systems enclosures
- Pressure reducing systems (PRS)
- Extractive sampling and conditioning systems for TDLAS gas analyzers (H<sub>2</sub>O, H<sub>2</sub>S, and CO<sub>2</sub>)



Production series of double-stage PRS



Moisture analysis for process gas streams containing up to 25% H<sub>2</sub>S, integrated into a dual door heated cabinet. In the lower part of the cabinet: embedded PRS, full sampling (bypass line, online filtration, pressure, and temperature control) and auto-validation. The upper part of the cabinet includes a SS2100i-1 moisture analyzer with Ex d electrical distribution box.



# Solutions design

Our analytical solutions are tailored to customer applications needs. The journey starts with a kick off meeting and continues through all the development stages of the project.

## Solution integration through design expertise

A complete review of the scope of supply and field specifications is performed at the beginning of the execution phase in partnership with the local Sales Center. It builds the foundation of a design that will fulfill the customer expectations. Based on our extensive experience and the project requirements, we are able to design a unique solution from the sample tap to the analyzer outputs. This preliminary design is then reviewed and revised with the customer until we reach a solution that will ensure a perfect integration into the process ecosystem. We have experience in process and quality control, onshore and offshore, as well as pipeline and storage monitoring. Our specialty is the most demanding ATEX and IECEx explosive environments.

**Optical analysis** We provide solutions for both optical technologies, TDLAS and Raman spectroscopy, taking advantage of their specificities. They can be either extractive using a sample conditioning system (TDLAS analyzers and Raman Rxn5 analyzer) or *in-situ* with an optical probe directly inserted into the pipe (Raman Rxn2 and Raman Rxn4 analyzers).

**Documentation package** We supply system design and integration documentation, together with approval drawings and as-built documentation packages, using the most up-to-date engineering tools. The standard documentation package includes the solution drawings (general layout, P&ID electrical drawings), the Bill of Material, components datasheets and Ex certificates, a test report and a Declaration of Conformity. We are also able to provide material certificates if requested.

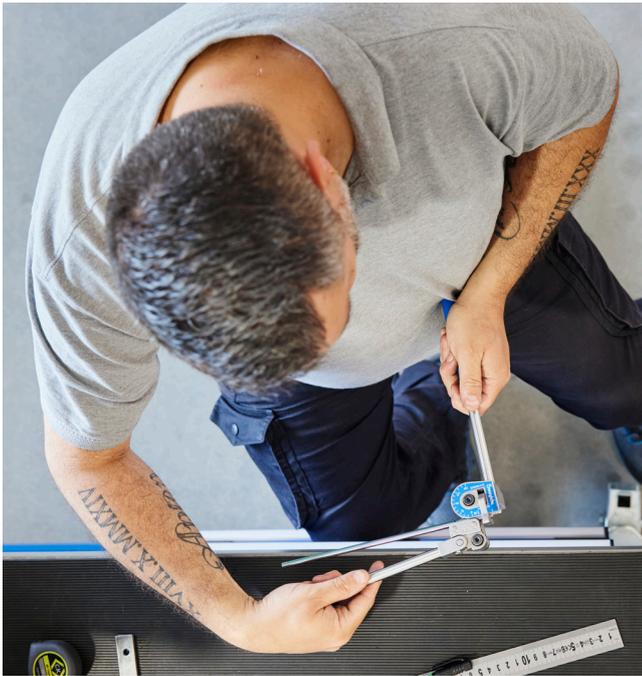
**Project management** Since handling a customer project requires teamwork among people from different organizational units, our Solution teams are trained on project management according to industry standards.



Kickoff meetings and open exchanges with all parties are keys for successful projects.

# Solutions manufacturing know-how

Ensuring seamless integration between piping and electrical systems is fundamental for delivering flawless solutions. Meticulous attention to details is paramount. Correct designs associated with detailed drawings and documentation are essential for comprehensive implementations as well as for service and maintenance.



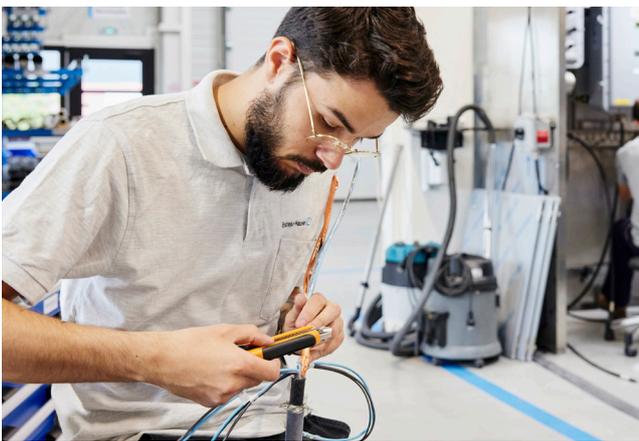
# Solutions materials of construction

We offer materials according to industry standards



**Sampling systems** We assemble components for our sampling systems which are selected in compliance with customer specifications and/or vendor lists.

Most components (electrical or not) are ATEX/IECEX approved and marked and/or suitable for corrosive or highly toxic gases.



**Armored cables** We offer offshore/marine BFOU power and signal cables

- Fire resistant
- Tinned copper braided wire (TCBW)
- Armored
- Flame retardant
- Low smoke zero halogen
- Mud and hydrocarbon resistant

**Ex cable glands**

- Ex d barrier cable gland
- Ex e barrier cable gland



**Tubing** We offer tubing according to the application need.

**Sizes**

- 1/16" up to 1/2"

**Quality**

- |                |                         |
|----------------|-------------------------|
| ■ SS316        | UNS S31602              |
| ■ SS317        | UNS S31700 (3 to 4% Mo) |
| ■ 6MO          | UNS S31254 (6% Mo)      |
| ■ SuperDuplex  | UNS S32750              |
| ■ Inconel I625 | UNS N06625              |
| ■ Inconel I825 | UNS N08825              |
| ■ Monel        | UNS N04400              |



Quality is evidenced in the small details that demand the expertise, focus, and experience of skilled technicians.

## Serialized production capacity

**Producing in series** Highly complex sampling systems require resources with a high skill level to perform multiple tasks, operate machinery, define products using detailed drawings, standardize the creation of product families (called 'modules') and identify bottlenecks (often the slowest step in the production process).

Tightly controlling these factors and applying continuous improvement through regular assessments (including technician feedback), equipment upgrades, and optimized workflows paves the way for achieving serialized production, enhancing efficiencies, and reducing costs.



# Solutions testing

## Internal acceptance tests (IAT) and factory acceptance tests (FAT)



**Factory acceptance test** is a crucial step in our manufacturing process. It involves testing all the equipment before we ship it to the customer. The main goal is to ensure that it is constructed and functioning in accordance with the specifications of the design. FATs are performed at our premises so that customers can see that the equipment being tested works as intended and at a high-performance level, helping to consistently meet expectations. Functional testing takes place in our dedicated room specifically equipped for it. All these tests apply to different parts of the system. Performing these tests allows us to determine any non-conformities or discrepancies and to create an appropriate procedure to determine how these issues will be dealt with. All deviations or irregularities observed during testing are noted in the FAT report within the “punch list” chapter and are rectified before shipment. Our Project Manager and our key engineers conduct FATs systematically and clearly per a procedure shared and approved by our customer a few weeks in advance. Pass/fail criteria and any other desired results are provided for every test item.

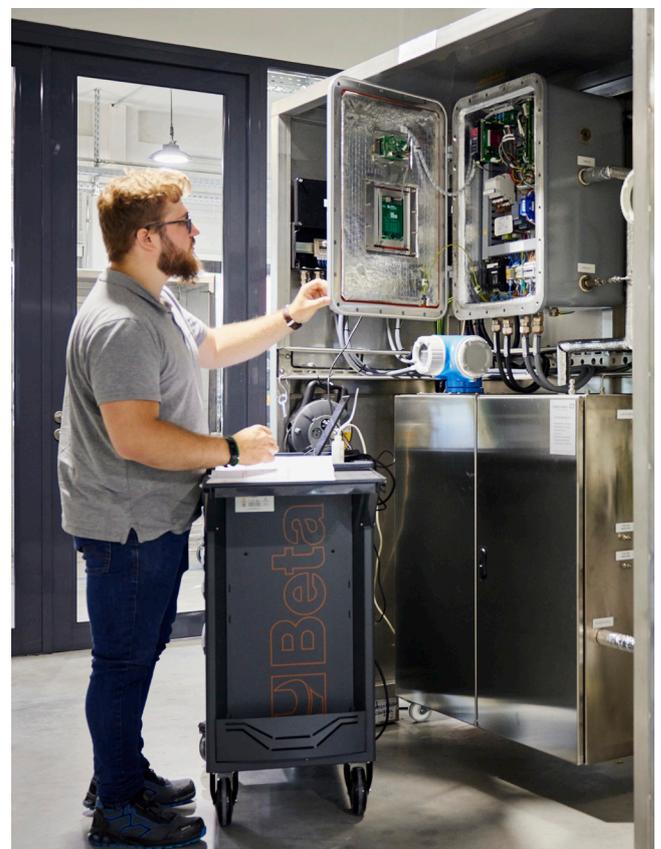
The main points checked and /or performed during the FAT are:

- Dimensions of the skid are per specs and drawings
- The equipment used is set up following the specifications
- The gas inlets and outlets are connected as per the drawings
- The leak test is performed per the procedure
- The validation of the equipment is efficient, and repeatability aligns with specs
- The reset functions, alarms, bypass functions, manual shutdown features, and diagnostic alarms all work per specs
- Documentations (certificates of conformity, datasheets and material certs, calibration certs, etc.) are supplied
- Spare parts and consumables match the requirements

The FAT is not a requirement. However, it is strongly recommended as a best practice.

FAT tests are beneficial so both parties can rest assured that the equipment will meet all specifications of the contract, and any issues can be resolved before arriving at the customer's site. Ensuring problems are addressed while the system remains in our workshop will help the project stay in line and on budget. FATs usually reduce the time and cost of solving issues in the field.

An FAT is an opportunity to discover any issues or malfunctions, determine reliability, and test efficiency. It is also used to evaluate the installation per site safety guidelines. Often, operator hands-on training is requested during FATs, and thus, some days are allocated for it directly after the FAT to avoid any disruption. This training gives the operator greater confidence when operating the solution for the very first time within real-world settings.



A room dedicated to FATs hosts the solutions. When the assembly is finished, specific test procedures may begin.

# Solutions packaging

The packaging is designed to reinforce the protection of the sensitive components of our solutions, which are subject to heavy stress during road transport, particularly vibration.



# Oil & Gas industry solution competences

Experience and advanced knowledge in the Oil & Gas analytical field allows us to generate optimal standardized and customized solutions.



Natural gas quality control integrated into a wall-mounted solution with a trace H<sub>2</sub>S analyzer (SS2100i-1), a double-block and bleed (DBB) sampling system on an SS316 plate, and sunshade plate for pressure reducing system (PRS)

**Our manufacturing operations** are founded on meticulous work definition and configuration, ensuring every project begins with a clear and precise plan.

We provide advanced sampling systems and manage the implementation of various components, customized to meet your specific requirements. Our expertise in cutting and bending tubes, as well as the assembly and connection of fittings, guarantees seamless integration and functionality. We excel in wiring and cabling, ensuring all connections are secure and efficient, and offer thorough labeling of wires and cables for easy identification and maintenance.

We also ensure robust and secure housing for analyzer systems within racks or shelters. Our skilled team handles drilling and insulation, completing each task to the highest standards.



Biomethane quality control complete shelter solution with a trace H<sub>2</sub>S analyzer (SS2100i-1), a moisture analyzer (J22), and an oxygen analyzer (OXY5500). This solution benefits from a centralized power switch, electrical and signal distribution, as well as a cabinet for sample conditioning.

**✓ Biomethane production** captures methane from organic waste, significantly reducing greenhouse gas emissions. Biomethane quality is essential for its effective use and integration into existing and local grid. Purity with trace H<sub>2</sub>O, H<sub>2</sub>S and O<sub>2</sub> as well as calorific value are key parameters of its quality. Our biomethane solution integrates the measure of all of these critical contaminants and the energy value in a compact shelter house. It offers the best quality price ratio to ensure the biomethane meets the requirements of biomethane quality standards.



A typical offshore solution (moisture in raw gas) must be replicated ten times with limited enclosure space, extreme temperature and pressure, and compliance with rigorous customer specifications.

**Pressure reducing systems (PRS)** One of our most popular solutions remains the PRS which is available in different versions:

- One or two reducing stages
- Heated or not heated pressure reducer
- On a plate with or without canopy
- In a small enclosure, heated or not
- Including a sleeve for heated traced line or with bulkhead
- With or without power supply junction box

The version selected depends on:

- Gas composition
- Temperature (process and ambient)
- Gas pressure
- Flowrate
- Dew point phase diagrams



PRS within an heated SS316 enclosure including two heated pressure regulators, isolated valves, pressure safety valves and sleeve for a heated traced line



Natural gas PRS on a Sunshade SS316 plate, including one heated pressure reducer, inlet on/off valve and a pressure safety valves



A panel-mounted solution with an H<sub>2</sub>O analyzer (SS2100i-1) and a sample conditioning system in a stainless steel painted cabinet

**Offshore solution** One of the standard solutions our team offers is continuous gas quality monitoring by measuring H<sub>2</sub>O, H<sub>2</sub>S or CO<sub>2</sub> impurity levels from offshore platforms or FPSO using tunable diode laser absorption spectroscopy (TDLAS) technology. With more than 10 years' experience in this field, we have been recognized as one of the best in the industry. Working directly with leading natural gas suppliers has allowed us to be keenly aware of their specifications, all of which require high quality materials to allow for:

- **Corrosion resistance** Materials used must withstand constant exposure to seawater, which is highly corrosive. Common materials include stainless steel and specialized offshore-rated steel like SuperDuplex, 6MO, Inconel, etc.
- **Structural integrity** The materials must maintain their strength and stability under extreme conditions, such as high winds, waves, and pressure.
- **Durability** Offshore platforms are designed for long-term use, often spanning decades. Materials must be durable enough to handle prolonged exposure to the elements without significant degradation.
- **Maintenance and repair** Regular maintenance is essential to address wear and tear. Materials that are easier to inspect and repair can help reduce downtime and extend the platform's operational life.

# Welcome to the European manufacturing center for process analysis solutions



Endress+Hauser optical technologies are integrated into analytical solutions in Saint-Priest, near Lyon, France, which serves our clients across Europe.

**The facility consists of a 700 m<sup>2</sup> workshop** specifically designed for the manufacturing of process analysis solutions including complete skid, rack, and shelter construction.

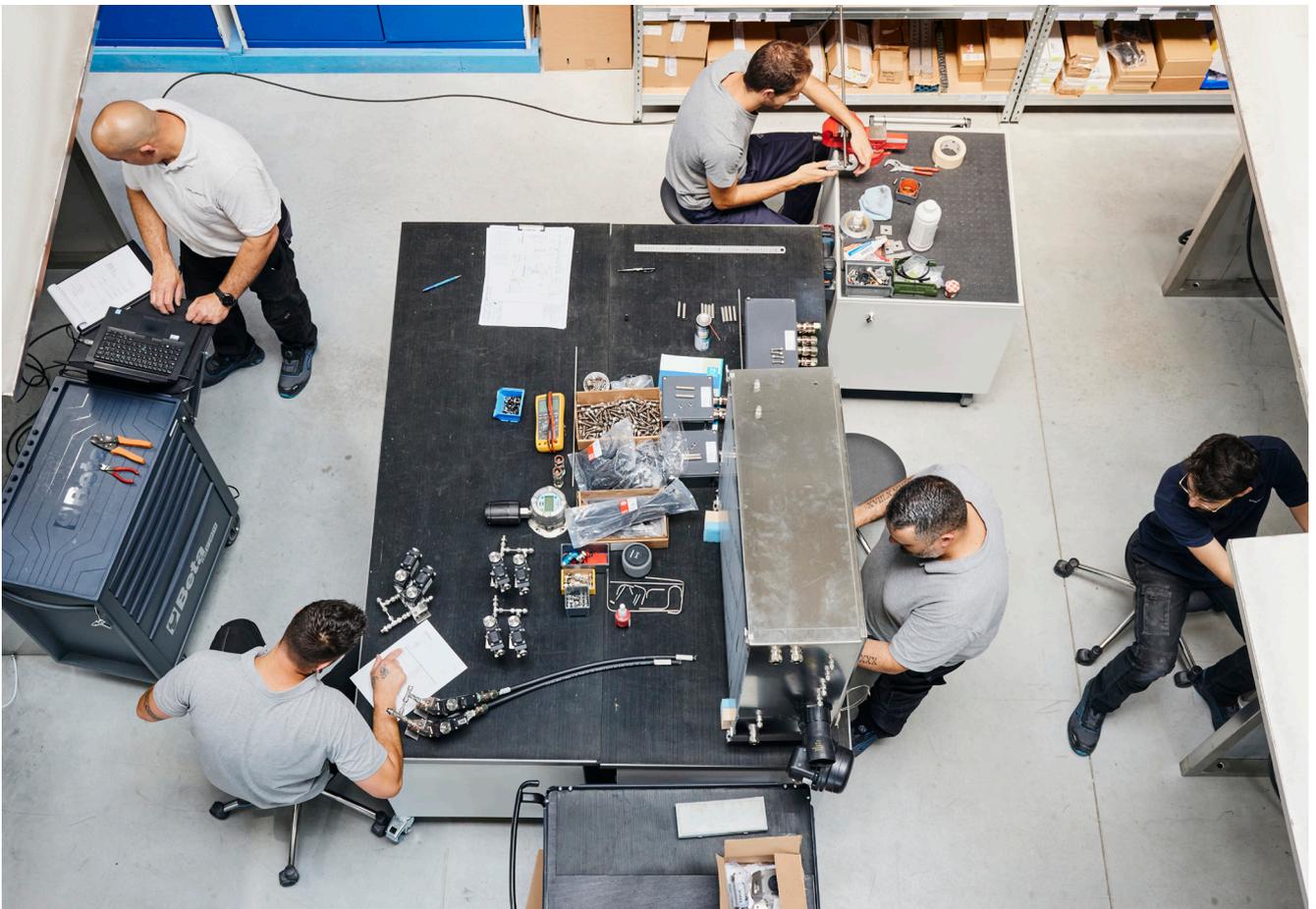
The workshop team consists of skilled technicians specialising in tubing and electrical assembly. They continuously undergo essential training to excel in their roles, ensuring outstanding and safe performance. Training areas include:

- Swaging (Swagelok® Essentials)
- Electrical safety
- Fire extinguisher use
- Lift bridge and forklift operation

The Process Analysis Support Europe team designs, assembles, and tests solutions before field deployment. Our dedicated team members collaborate enthusiastically to deliver exceptional quality and support to our customers. We invite our customers to visit our manufacturing site to meet us and to learn more. Please reach out to your local Endress+Hauser sales representative to arrange a visit.



**ISO 9001 certification** Our ISO 9001 compliance ensures consistent quality in the manufacturing of solutions, which helps in meeting and exceeding customers' expectations. This leads to increased customer confidence, improved continuous operating efficiency through regular internal and external audits, and increased employee engagement and motivation.



[www.addresses.endress.com](http://www.addresses.endress.com)

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