CHAUVIN ARNOUX
PYROCONTROLE

TEMPERATURE MEASUREMENT & CONTROL IN THE HYDROGEN PROCESS



HYDROGEN

HYDROGEN

Measure up

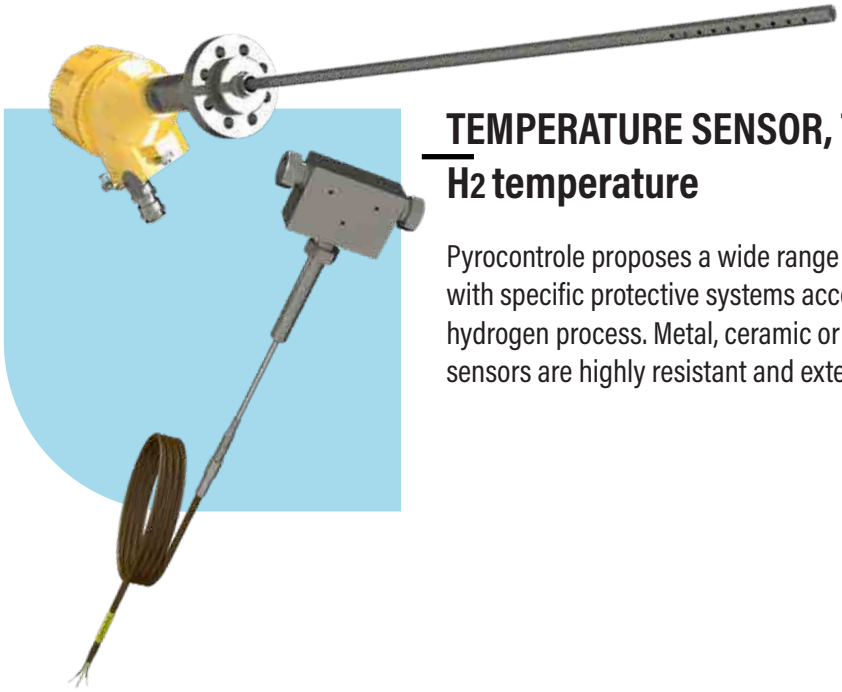
Pyrocontrole, you temperature measurement expert



Pyrocontrole, your partner for measurement and process control

Pyrocontrole, a French subsidiary of the Chauvin Arnoux Group, designs and manufactures industrial temperature measurement and control systems. A major partner of demanding industries such as hydrogen, the nuclear sector, petrochemicals, aviation and metallurgy, Pyrocontrole has developed unique know-how based on complete mastery of the qualification, production and temperature control processes.

To meet the specific requirements linked to heat treatment, Pyrocontrole designs and proposes a wide range of temperature sensors, temperature and power controllers and data loggers to improve the quality of your products and industrial processes. Our measurement expertise helps to reduce your maintenance costs and cut your energy spending.



TEMPERATURE SENSOR, THERMOCOUPLE PROBE
H_2 temperature

Pyrocontrole proposes a wide range of reliable, rugged temperature sensors equipped with specific protective systems according to the requirements of your application for the hydrogen process. Metal, ceramic or composite protectors ensure that the temperature sensors are highly resistant and extend their life span.



STATOP
Temperature measurement and control

For precise temperature measurement and to guarantee the treatment times, Pyrocontrole proposes a wide range of single and bi-loop STATOP temperature controllers which are easy to integrate in your equipment for the hydrogen value chain.

Whether for simple or complex control with several independent zones or in cascade, STATOP temperature controllers guarantee the quality of the heat treatment of the load with the required control accuracy. The maximum temperature (safety temperature) must be monitored by a different controller system to ensure the installation and people remain safe.

- Single-loop or bi-loop PID
- Simple, intuitive configuration and operation
- Customizable alphanumeric messages
- Self-adjusting (PID) or self-adapting
- Programmer for up to 16 programs, 128 segments
- USB socket for software configuration
- Possibility of securing the menus and parameters

For your Hydrogen processes

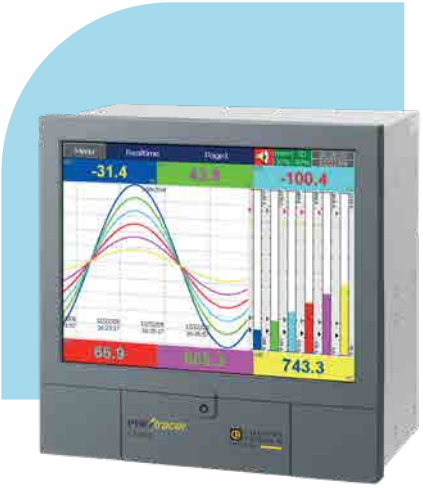


THYRITOP
Power controller

Pyrocontrole proposes a complete range of THYRITOP thyristor power units for controlling the electrical power transmitted for your hydrogen processes, from 16 A to 600 A.

THYRITOP is the crucial element for reducing your energy bills. Power control helps to improve master temperature accuracy by integrating a slave power loop. The control accuracy is less than 1%, depending on the settings used. The THYRITOP models are suitable for all types of electrical loads. They help to manage the limitations due to the load, such as current and power limitation and monitor the integrity of the load.

- Single-phase / Three-phase with 2 or 3-phase control
- Load current from 40 to 600 A
- Mains voltage from 24 Vac to 690 Vac
- Power control (UxI, U^2 , I^2 , U, I)
- External measurements (I, U) possible
- Current and/or power limitation
- Fieldbus
- Modbus RS485 communication



PYROTRACER
Logger

The PYROtracer CA 6500 is a range of new-generation paperless data recorders/ loggers benefiting from the latest technological developments and a more robust design.

High speed, accuracy, data security, simple configuration, easy data processing, and openness to the network are among the features available to optimize use of your PYROtracers.

The CA 6500 range contains 3 loggers to meet every requirement. It offers extensive recording capacity on 3 to 144 channels (including 96 external channels) with an acquisition time of 100 ms per channel for the most demanding applications.

- LED touch screen
- 3 to 144 channels for recording
- 100 ms acquisition rate
- Ethernet as standard
- Multilingual: 19 languages
- Modbus master, web server
- Reduced depth of casing

SCAN ME!

Check out all our documentation at
www.pyrocontrole.com



1 PRODUCTION

PEM electrolyzer (Temperature 80° to 120°C)

Electrolysis of water in a cell equipped with a solid polymer responsible for conduction of the protons, separation of the gases produced and electrical isolation of the electrodes.

High-temperature steam electrolysis

High-temperature or steam electrolysis is a method under study for producing hydrogen from water, with oxygen as a by-product.

Biomass (high-temperature H_2 production, known as BioHydrogen)

Hydrogen production using biomass rich in carbohydrates as a renewable resource is one of the different methods in which the processes may take place by means of anaerobic organisms and photosynthesis.

Steam methane reforming and CO_2 capture

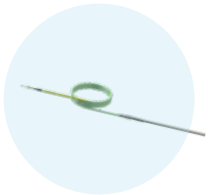
Steam reforming is a process for producing hydrogen-rich 'syngas" (synthesis gas). This reaction of hydrocarbons, mainly methane, in the presence of water is strongly endothermic. This type of hydrogen production generates large amounts of CO2 which is captured at the source and stored.



ID50 modular sensor



Thyritop



TCG3i thermocouple sensor

2 STORAGE

Gaseous form

The storage of hydrogen gas under pressure, usually in steel bottles filled to a pressure of 200 or 250 bars, is standard practice. This storage mode has two main disadvantages: the volume and weight.

Liquid form

This storage mode is still reserved for space launchers but could be used in the future for land vehicles and air transport. The main difficulty is the fact that the hydrogen has to be cooled to a temperature of –253 °C which must then be maintained.

Chemical vector

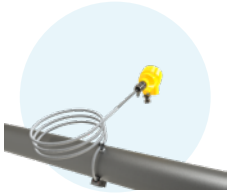
This involves housing the gas in the middle of molecules of hydrogen-bearing organic liquids. Toluene is the initial molecule which is then bound to the hydrogen by means of a hydrogenation reaction.

The hydrogen is therefore subjected to a pressure of 30 bars at 150 °C. This reaction gives rise to a storage molecule. The energy can be recovered by coupling this first stage with a heat network.

To "release" the captured hydrogen, a chemical dehydrogenation reaction is necessary. This takes place at atmospheric pressure but requires a very high temperature of 320 °C.



ID50 modular sensor

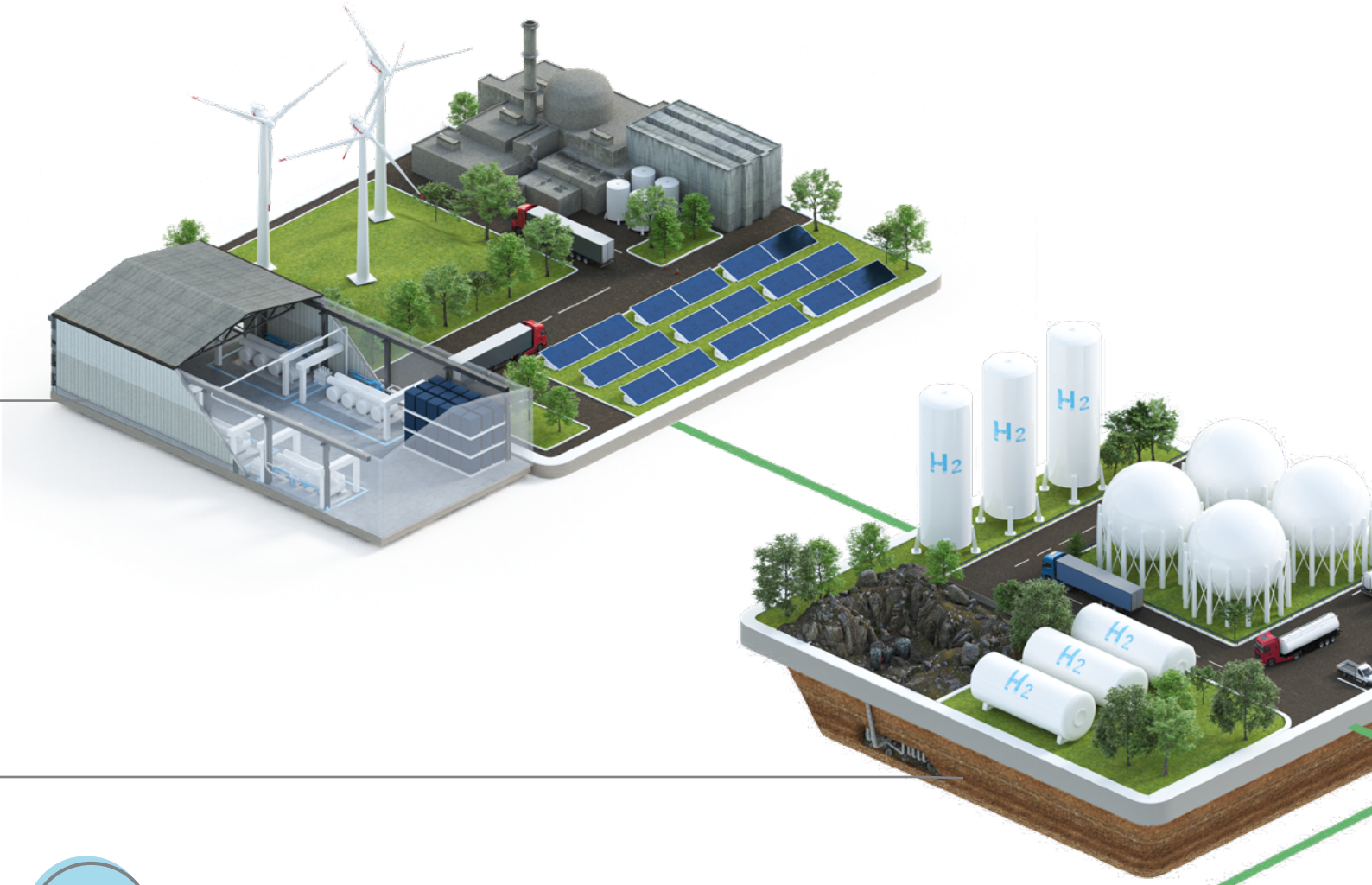


TSI Pt100 sensor



SA3 Pt100 sensor

Value chain



3

TRANSPORT

Transport under pressure by truck

Gaseous hydrogen at low, medium and high pressure, from 1 to 700 bars. It is transported either in a tank or in steel bottles.

Transport in liquid form by truck

Hydrogen becomes a liquid at -253°C so it is important to keep it at very low temperature.

Transport by pipeline

The existing hydrogen pipeline networks currently use a pressure from 4 to a maximum of 100 bars, but distributors plan to raise it to 150 bars and 300 bars in new pipelines.

Total annual capacity is estimated at nearly 100,000 million Nm3. There are several thousand kilometres of hydrogen gas pipelines which have been in operation for more than 50 years.

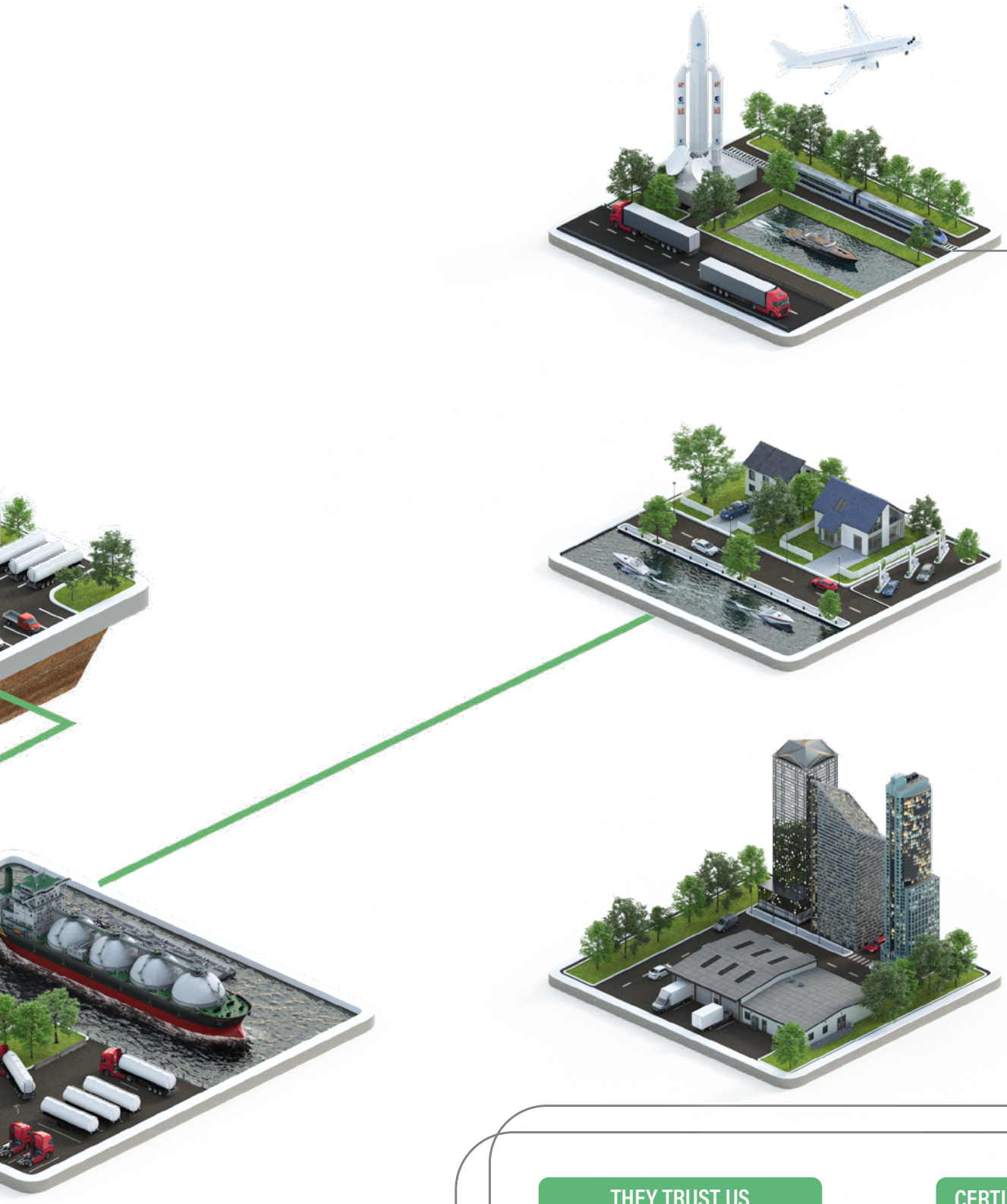


ID50 modular sensor



SA3 Pt100 sensor

Pyrocontrole Hydrogen



THEY TRUST US

- Airbus Industrie
- Air Liquide
- McPhy
- Michelin
- Safran
- Atawey
- Total Energies
- PSA Groupe

CERTIFICATIONS

ATEX

SIL IEC 61508 / IEC 61511

4

USAGE

Hydrogen offers genuine potential for the coming energy transition by encouraging the development of decentralized renewable energy and the rapid spread of green mobility solutions.

Today, hydrogen is used almost exclusively for industrial purposes (steel production, high-temperature processes for glass manufacturing), in the chemicals sector (production of ammoniac and fertilizer) and in refining.

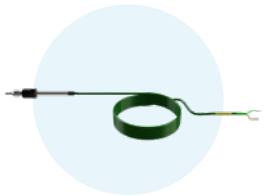
In electric vehicles powered by fuel cells, hydrogen is used as a fuel to produce electricity on demand. The reaction between hydrogen and oxygen releases energy which is recovered as electricity and heat.

For maritime, rail and air transport, work is under way in various countries to commercialize sustainable, competitive solutions. For example, a hydrogen-powered passenger train has been in service in Germany since 2018 and other European countries are following this up with similar projects. A project to develop zero-emission aircraft is also the focus of intense technological research.

In the future, these capabilities as an energy vector could play a major role in the transport sector, the gas sector and electricity and heat production.

USE FOR ENERGY STORAGE

Hydrogen can also be used to store electricity. The gas is stored temporarily and then used when the electricity needs are greater. This is called "power-to-gas".



HPTEMP thermocouple sensor



SA4 Pt100 sensor



SA3 Pt100 sensor



SX2 Pt100 sensor

MADE IN FRANCE

The equipment is designed, machined, assembled and checked in France by experienced, qualified teams, thus guaranteeing quality and reliability. Pyrocontrole is an active member of France Hydrogène and La French Fab.

INTERNATIONAL PRESENCE

Thanks to its membership of the Chauvin Arnoux Group, Pyrocontrole is present worldwide, represented by a network of ten subsidiaries and an Export Department which explores new markets. Commercial and technical sites in Europe, Asia and the United States enable us to respond quickly anywhere in the world, backed by a high-performance strategy.



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SCAN ME!

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