

TEMPERATURE MEASUREMENT AND CONTROL



About the CHAUVIN ARNOUX Group



Founded in 1893 by **Raphaël Chauvin** and **René Arnoux**, CHAUVIN ARNOUX is an expert in the measurement of electrical and physical quantities in the industrial and tertiary sectors.

Total control of product design and manufacturing in-house enables the Group to innovate constantly and to propose a very broad product and service offering meeting all its customers' needs.

The Group's quality policy ensures that the products delivered comply with its commitments and with both the national and international standards in terms of metrology, the environment and user safety.

**CHAUVIN ARNOUX is a major force on the
measurement market in France and internationally.**

A few figures

100
million
euros in sales
revenues

6 R&D
departments
worldwide

11%
of revenues
invested
in R&D

8 production
sites

| | |
|------------------------------|--------------------------|
| 3 in Normandy (France) | 1 in Milan (Italy) |
| 1 in Lyon (France) | 1 in Dover (USA) |
| 1 in Montpellier (France) | 1 in Shanghai (China) |

10 subsi-
diaries

| | |
|---------|-------------|
| Austria | Spain |
| China | Sweden |
| Germany | Switzerland |
| Italy | UK |
| Lebanon | USA |

1,000
employees

CA PYROCONTROLE

a CHAUVIN ARNOUX Group company

CHAUVIN ARNOUX draws on its Chauvin Arnoux, Metrix and Multimetrix brands to offer a broad range of measuring instruments. The offering covers electrical measurement (testers, multimeters and current clamps), electrical safety testing, wattmeters and electrical network quality analysers. Its expertise also extends to oscilloscopes, instruments for testing electronic devices and measurement of physical quantities.

CHAUVIN ARNOUX ENERGY

designs automation relays and critical measurement relays for the most demanding environments.



Portable test & measurement instrumentation
Chauvin Arnoux, Metrix & Multimetrix brands



Metering, control and supervision



Temperature sensors in industrial processes



Design of optical sensors for the laboratory and in-line process quality control.

INDATECH

Designers of spectroscopic sensors capable of measuring the physical and chemical properties of complex products simultaneously in real time. These spectral solutions are used in the pharmaceutical industry, biotechnology and the chemicals sector.



Measurement of the quality of agri-food and cereal products by means of fluorescence

SPECTRALYS

develops fluorescence-based analytical solutions for the dairy industry, the agri-food sector (cereals, oilseed crops) and any products treated at high temperatures.



Metrology & regulatory testing

MANUMASURE

is the Chauvin Arnoux Group company specialized in metrology and regulatory testing. Its offering is structured around three major market segments: Industry, the Environment and Health.

6 expert measurement companies



CA PYROCONTROLE

The specialist for temperature measurement in industrial environments



For all thermal process industries, **PYROCONTROLE** designs high-accuracy sensors for severe environments and solutions adapted to meet their temperature measurement and control requirements.

A wide range of sensors and industrial process expertise built up over many years make **PYROCONTROLE** the ideal partner for industries such as the nuclear sector, petrochemicals, glassmaking, metallurgy, etc.

CA PYROCONTROLE's Advantages



LONG-TERM SUPPORT

With over 70 years' experience in pyrometry and 20 years in industrial process control, **CA PYROCONTROLE** provides incomparable continuity of service. We now also export our know-how to Africa, Latin America, the Middle East and Asia.

As part of the Chauvin Arnoux Group since 1997, **CA PYROCONTROLE** benefits from the support of a Group specialized in instrumentation and acknowledged worldwide.



PERFORMANCE

Alongside its R&D team with its industrial pyrometry expertise, **CA PYROCONTROLE** also has specialists in the regulations governing the Nuclear Industry.

Thanks to its long experience, **CA PYROCONTROLE** is capable of offering proven solutions adapted to handle your constraints. For the most restrictive environments, we propose to qualify prototypes according to the standards applied.



PROXIMITY

Present in many countries worldwide through its sales teams and its network of specialist agents, **CA PYROCONTROLE** stays close to your concerns.

Its temperature measurement and process control engineers inspect your installations in order to understand your needs and help you draft your technical specifications.



CUSTOMIZATION

CA PYROCONTROLE designs new sensors every day. Our teams' extensive experience helps us to ensure that these new products comply with the severest requirements (temperature measurement range, withstand at very high pressures, explosive atmospheres, etc.).

CA PYROCONTROLE also offers the possibility of adjusting your supervision instruments (HMI) to suit your needs in terms of process control.

Our professions



MEASUREMENT

With more than 70 years of expertise, **CA PYROCONTROLE** is specialized mainly in the measurement of very high temperatures. The company designs temperature sensors, probes, pyrometric sensors and thermocouples for cutting-edge industries: nuclear, chemicals, petrochemicals, cement manufacturing, metallurgy and transport.



CONTROL

Every industrial manufacturing process requires the implementation of instruments and solutions for mastering and controlling temperature and power. **CA PYROCONTROLE's** temperature and power controllers guarantee correct operation of your processes.



SUPERVISION

Because it is essential to keep an eye on all manufacturing processes, **CA PYROCONTROLE** has developed a range of paperless data recorders and supervision equipment which is crucial for validating a process, monitoring in real-time and then subsequently analysing and understanding what has happened on your installation. It also guarantees reliable, unfalsifiable recordings.



METROLOGY

Using its COFRAC-accredited metrology laboratory, **CA PYROCONTROLE** provides calibration services (which may be performed in situ) and temperature measurement equipment.

Our key sectors



Nuclear power

- Sensors qualified for primary circuits
- Safety in extreme conditions (irradiation, earthquake, high temperatures and pressures)
- Quality documentation
- Traceability
- Reference documents / codes



Chemicals & petrochemicals

- **Explosive atmospheres**
- ATEX 2014/34/EU directives
- EN 60079-11
- **Pressurized equipment:**
 - Bored thermowells
 - Pyrometric sensors
 - PED 97/23/CE



Cement manufacturing, glassmaking, ceramics, metallurgy, agri-food

- Reduction of energy spending on processes
- Safety of melting furnaces and power control
- Ceramic temperature assemblies
- Dome and bottom thermocouples
- 1 n-situ calibration

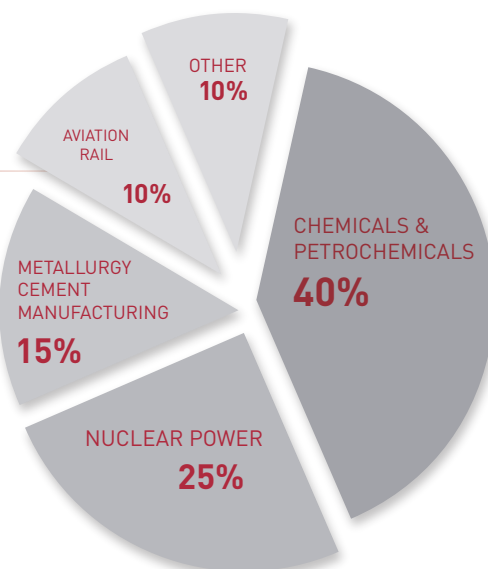


Rail, aviation

- Temperature control for the production of engine parts
- Temperature measurements on aircraft engine jets and in the boosters of Ariane rockets
- Temperature monitoring of the batteries, traction systems, axle boxes and air-conditioning on railway rolling stock

A few figures

- 90 staff
- 10 million euros in sales revenues
- Sales coverage of 70 countries



CA PYROCONTROLE

Our know-how



Qualified temperature measurement for refineries and chemical plants

OUR EXPERTISE

Alongside energy suppliers, operators, manufacturers, R&D teams, research institutes and nuclear safety authorities, **CA PYROCONTROLE develops unique expertise** backed by complete mastery of the qualification, production and testing processes.

At each strategic point in a nuclear installation, from the reactor building through the auxiliary buildings to the machine sets, **the sensors designed by CA PYROCONTROLE are qualified to withstand the most extreme conditions** in terms of irradiation, earthquake, temperature and pressure.

OUR OFFERING

- For the REP 900 MW, 1300 MW and N4 Series and for the third-generation EPR power plants: temperature sensors qualified as K1, K2, K3 and NC.
- Accurate, instantaneous temperature measurements in the primary loop: fast-response sensors (DT034 / T038).
- Non-intrusive duct temperature measurement: surface sensors fitted on safety-critical systems such as the safety valves (DT115).
- Pool temperature measurement: IRWST and BK pool sensors on EPR Series protected by thermowells (DT114).
- Accurate temperature measurement from the pressurizer to the machine sets: multi-purpose sensors with standard response times (DT108 / DT088).
- Monitoring of overheating inside bearings of the primary and secondary pumps, the safety pumps and the lift pumps: motor or pump-bearing sensors (DT110/DT112).



Temperature sensors and controllers for glassmaking, metallurgy and cement manufacturing

OUR EXPERTISE

PYROCONTROLE benefits from **acknowledged expertise** in the design of **temperature sensors suitable for sensitive industrial environments**: explosive atmospheres, high pressures, severe operating constraints.

Designed on the basis of the customer's specifications, these sensors can withstand any thermal stresses (fluid temperatures) or mechanical stresses (pressure, speed, weight) in accordance with the **ATEX**, **IECEX**, **Pressurized Equipment (PED)** or **SIL (Safety Integrity Level) Directives**.



OUR OFFERING

- Measurement of flame, furnace or ambient temperatures: general-purpose temperature assemblies.
- Direct measurement in storage tanks: bimetallic or gas expansion thermometers, with digital display or dial.
- Contact measurement of surface temperatures: non-intrusive skin temperature sensors with in-situ method (the sensitive part of the sensor can be changed without detaching the support).
- Multi-temperature mapping: multi-point temperature assemblies for reactors and fractionating towers.
- Process temperature assemblies with thermowells fitted with HART and LoRa® transmitters.
- High-pressure temperature sensors for pressures up to 4,700 bars with a response time of less than one second.
- Bearing temperature sensors (motor/pump) to prevent overheating inside the pumps and motors.



Qualified sensors for nuclear power plants

OUR EXPERTISE

CA PYROCONTROLE's sensors and controllers offering is based on long experience and thorough knowledge of the manufacturing processes in metallurgy and glassmaking: hollow ware, float glass and the specific heat treatments (bent, tempered or laminated glass), glass wool and glass fibre and ceramic or alumina protective materials.

CA PYROCONTROLE's products are also used in the cement industry: in the mill, the preheating cyclone, waste gas chimneys, etc.



OUR SENSORS OFFERING

- Measurement in the melting furnaces, chambers and working basins at the beginning of the glassmaking process: dome temperature assemblies.
- Temperature monitoring in the manufacturing process: accurate, resistant sole temperature assemblies inserted in the refractory of the furnace.
- Cadid temperature assemblies for floats, lehrs and heat treatments.
- Temperature mapping to monitor the viscosity of the glass flow: immersed multi-level feeder temperature assemblies, siphons and spouts.
- High-temperature sensors capable of withstanding nearly 1,800 °C equipped with protective sheaths made of steel, chrome or heat-resisting steel to withstand mechanical and chemical shocks.

OUR POWER CONTROLLERS OFFERING

- Single or three-phase, from 15 A to 600 A: **THYRITOP power controllers** offer accuracy, flexibility and rugged design, particularly in furnaces and glassmaking processes.

Sensors and temperature control solutions for transport industries

RAIL

Benefiting from its long experience in the transport sector, CA PYROCONTROLE's temperature sensors are used for multiple rolling-stock applications, such as in the train batteries, the air-conditioning systems, gear motors and axle reducers, as well as in rail equipment manufacturing processes.



AVIATION

A long-established supplier of the aviation industry, CA PYROCONTROLE has developed an offering dedicated to aviation specifications and standards (AMS 2750). Our products provide guaranteed performance and rugged design for all curing or specific heat-treatment processes.



CA PYROCONTROLE

A complete offering with a solution for every requirement

With its thorough mastery of the thermal process chain, CA PYROCONTROLE proposes relevant, reliable solutions to meet each customer's needs and is constantly extending its offering by launching new products.

TEMPERATURE MEASUREMENT

- From standardized sensors to tailored sensors from -268°C to $+1,800^{\circ}\text{C}$.
- Temperature sensors: industrial thermocouples, pyrometric sensors, specific sensors, Pt100, etc.



SIGNAL PROCESSING

- CA 3420 universal transmitter for conditioning all temperature and process signals.



METROLOGY

- COFRAC metrology laboratory
- Calibration range from 40°C to $+1,500^{\circ}\text{C}$
- Calibration systems and equipment



COMPLETE MASTERY OF THE THERMAL PROCESS CHAIN

TEMPERATURE CONTROL

- STATOP® temperature controllers: analogue or digital, various formats, with fixed or universal inputs...



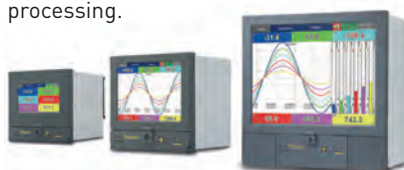
HEATING ELEMENTS

- PHR range



PROCESS RECORDING

- "Plug and play" Pyrotracer® paperless recorders, providing the data instantaneously for immediate processing.



POWER CONTROL

- Thyritop range of thyristor power modules from 16 A to 2,900 A, single-phase or three-phase, for resistive and inductive loads.
- Training and commissioning services: "Control processes".



SUPERVISION

- CPS Touch® Human-Machine Interfaces from 4.3 to 15 inches for high-performance, intuitive industrial supervision.
- PDM Input/Output Modules: a complete range of economical, modulatable converters.



CA PYROCONTROLE

Metrology Expertise



Our skills at your disposal:

When used regularly, the metrological accuracy of even the best measuring instrument deteriorates. To check their performance and prevent any deterioration of measurement quality, calibration is essential. With its total mastery of the thermal process chain, **CA PYROCONTROLE** proposes a set of temperature sensor calibration services for all industrial sectors

CALIBRATION SERVICE

CA PYROCONTROLE possesses its own **COFRAC**-accredited temperature metrology laboratory (accreditation no. 2-1385), allowing it to offer calibration of temperature sensors, whatever their brand.

Equipped with measuring instruments linked to the national and international standards, it performs high-quality calibration, in compliance with the applicable standards, from -40 °C to +450 °C for Pt100 probes and from -40 °C to +1,500 °C for thermocouples.

Two levels of service are available, depending on the requirements:



- Calibration with provision of a report for reliable measurements.
- COFRAC-accredited calibration for quality assurance purposes.

STANDARD REFERENCE SENSORS

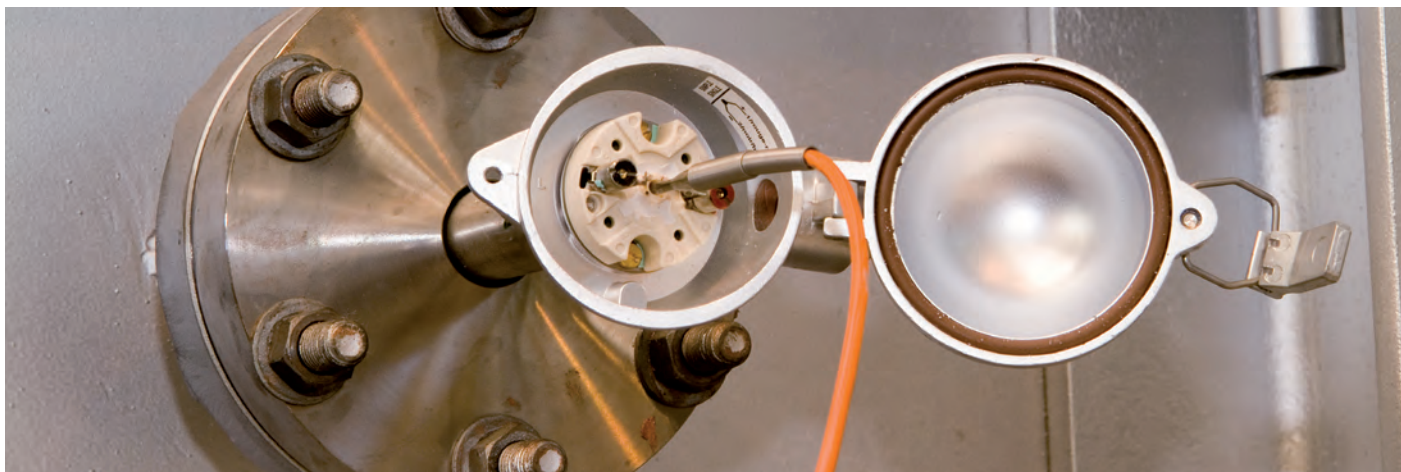
For industrial companies seeking to manage the temperature metrology of their measuring instruments in-house, **CA PYROCONTROLE** proposes reliable, high-performance calibration systems and equipment.

REFERENCE-STANDARD TEMPERATURE SENSORS

Intended for industry and laboratories, these standard sensors are used for calibration by comparison. Depending on the required application, **CA PYROCONTROLE** manufactures both working standards and reference standards.

SENSOR WITH IN-SITU CALIBRATION

This patented in-situ calibration method developed by **PYROCONTROLE's** engineers can be used to check the temperature without dismantling the sensor and without halting the process. This helps to save energy and boost productivity without losing quality, while also allowing calibration of the whole line.



CA PYROCONTROLE

COMMITTED TO QUALITY

CA PYROCONTROLE is a socially-responsible company with extensive expertise in pyrometry which has launched an extremely demanding quality programme. From design via production through to delivery of the finished product, **CA PYROCONTROLE** is committed to achieving the highest level of quality on a day-to-day basis at all levels of its industrial organization:

- qualification and training of the teams,
- traceability of procurement,
- control of the manufacturing process,
- structured documentation,
- recycling of waste precious metals.

CA PYROCONTROLE is certified ISO 9001 (Quality) and ISO 14001 (Environment).



MADE IN FRANCE:

All CA PYROCONTROLE's products are designed and manufactured in France on our industrial site near Lyon. This total integration of production ensures mastery of the production line and the product quality inspections.



Contact us:
info@pyrocontrole.com

PYROCONTROLE
6 bis, avenue du Docteur-Schweitzer,
69330 Meyzieu - France



Find out more about CA PYROCONTROLE at www.pyrocontrole.com



CHAUVIN ARNOUX
12, rue Sarah Bernhardt
2600 Asnières-sur-Seine
France
www.group.chauvin-arnoux.com

