Measurement›News
CONTACT
Spring/Summer 2004

SPECIAL REPORT

Qualimetry

Theory
Calibrating and using surface temperature sensors

Applications
Measurement of the LF field

n°19

CHAUVIN ARNOUX GROUP

Will 2004 be the year of economic recovery?

Economists' opinion is divided, industry remains cautious. However, if the relative recovery of the American market is taken into account, which in general is ahead of Europe, we can pin all our hopes on a global recovery and even more optimistically, more specifically on our measurement market. For Chauvin Arnoux, 2004 will be the year of expansion on international markets through its different businesses: Chauvin Arnoux – Test and Measurement (hand-held instrumentation), Enerdis (fixed equipment), Pyro-Controle (temperature measurement and checking equipment and sensors) and its ten international subsidiaries which support its world-wide strategy. In France, our longstanding expertise, the **palette of ranges that we now offer** (Multimetrix®, Chauvin Arnoux®, Metrix®, Enerdis®, Pyrocontrole®) suited to each market, the diversity of our products (from simple socket tester to oscilloscope, from power relay to peak sensor, from electricity meter to voltage quality analyser), **enable us to present a global product offer combined with full After-sales service and** multi-brand **metrology service**, developed by our French company Manumesure. **We intend to consolidate our lead position by means of integrated production at our Normandy sites**, technology-watch by our research and development centres and our quality control process from end to end of our manufacturing chain. Thus, **2004 will be seeing the introduction of new key products** (some can be seen in our articles) **making use of the very latest technologies**, in response to current European standards and in line with the current challenges on your markets. They are bound to be of positive interest to you. To support winning new markets, new potential, increased exports of our products, we decided to work on developing our various logos, as they are the conveyors of our companies' brand image, to build a means of presentation both nationally and internationally. **A Group Corporate logo has been created** and our brands are now identified by the combined "Chauvin Arnoux Group" name that you will see previewed in the article on page 1. **Our intention here is to promote immediate brand recognition in all countries**. We also wanted to change the layout of your magazine, **Contact Measurement News**, to add further impetus. As ever, consolidating a strategy of expansion requires, a permanent, iron will to truly serve our customers, to unite creativity and efficiency for all staff in the business. **Three key words will thus be directing our view of the Company: Experience, Innovation and Anticipation**. The expertise of the past and Chauvin Arnoux's continuity in the measurement sphere, the ability to constantly create new products and anticipate new possibilities for markets or products. This is why we are now the sole French manufacturer-designer of measuring instruments to continue to expand.

Axel Arnoux
Chairman

SUMMARY

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Discussing experience TUNISIA

Chauvin Arnoux, represented by members of the export department and the head of the educational market went to Tunisia last October for a "discovery" seminar. The seminar on new technologies applied to measuring, designed for the most senior people in Tunisian education, was held in Hammamet, followed by events at three training centres.

Further information on the "instrumentation supplements" can be downloaded in French from our site: http://www.leclubdumesurage.com/club_mesurage/cahiers_instrumentation.asp

Collective ISO 9001 certification version 2000

The ISO 9001 certification version 2000 was gained by the Swiss and Italian subsidiaries and by France in 2003, running through to 2006. The certification covers all quality aspects of the industrial process: from design, manufacturing and calibration through to the sale of measuring equipment and programs, for all this, for Chauvin Arnoux Group brands.

A second subsidiary for Chauvin Arnoux SCANDINAVIA AND FINLAND

To extend its sales area to Northern Europe, Chauvin Arnoux with its local partner PIAB, created the subsidiary **CA Mätsystem** based in Stockholm, Sweden. It is tasked with developing Chauvin Arnoux products in Scandinavia (Sweden, Norway, Denmark) and Finland while maintaining its distribution business in the force measurement field (Mecmesin, Teckscan, DGH ETL, Aoip and other brands).

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A stronger visual identity

In order to develop the Group's global and international view, Chauvin Arnoux has acquired a new unifying corporate logo, while at the same time clarifying the notion of brand by adding the registered trademark symbol®, to the brand's logos.

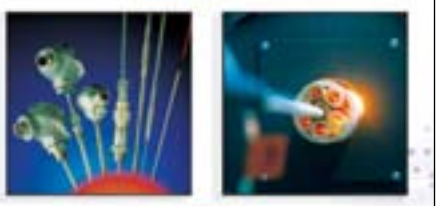
CHAUVIN® ARNOUX CHAUVIN ARNOUX GROUP
metrix®
PYRO® CONTROLE CHAUVIN ARNOUX GROUP
CHAUVIN ARNOUX GROUP
ENERDIS® CHAUVIN ARNOUX GROUP
Multimetrix
MANUMESURE

www.Instrumexpert.com

This is the forum that is now on the web in partnership with five manufacturers in the industrial instrumentation field to create and unite as a community the technicians and experts working in the sector. Primarily a place for free comment and sharing ideas, the forum hosts users, integrators and installers from all branches of the industry. The manufacturers on the site act as a source of expert advice on their own respective technologies.

Pyro-Contrôle (Chauvin Arnoux subsidiary expert in the thermics field), Vega®, initiator of the project, Yokogawa®, Masoneilan® and Eurotherm® are in the undertaking and want to create a thriving "community of instrumentation technicians".

PYRO CONTROLE



Black and yellow

What a story!

Every tale has a beginning.
The story of Chauvin Arnoux as inventors
and manufacturers of measuring equipment
since 1893 is one of development and innovation.
As its products now bear witness, reflecting changes
in society, technology and industrial innovations
which symbolize the last century. An enthusing story
which explains the why and how of Chauvin Arnoux's image
and personality … in two-tone.

1895 reflection galvanometer

We are used to saying that in the beginning was the word, or that at the origin of an innovation, an idea… and yet, it is actually the individual, the person who is at the origin of knowledge and discoveries.

And so it is for electricity, not discovered in the 19th century, but in the 6th century BC, by a Greek philosopher and scientist, Thalès, the original discoverer of the electrostatic properties of amber.

From the beginning of the 19th century one colour, the yellow of amber, then in manufacturing, the yellow of brass and copper, materials used in measurement equipment either in electrical measurement indicator casings or connections for measuring instruments in the electricity sector. The colour beige also arrived through the use of varnished wood for casings whereas black is kept for indicator zones on instruments. From the outset in 1893, the contrast between the black and yellow colours of the varnished wood used for instruments at that time was applied in the manufacture of Chauvin Arnoux measurement equipment.

Quickly, between 1900 and 1936, with advancing technology and work on matter, the use of yellow brass merged with the use of black Bakelite which became universal for almost all instruments.

This 1900 calibration potentiometer was used with a standard battery and a galvanometer like the one shown above.

Chauvin Arnoux, already known for its design and the marriage of its original colours, yellow brass and black, in its measuring instruments, introduced these colours into its first company logo from 1927.

Logo on the Company's old entrance door

In the forties, many measuring instruments used black alone or black and the silver grey of ferrous metals, sometimes painted. Chauvin Arnoux adapted its original house style to these trends in the style of the times, which also matched the technical criteria of safety, long life or weight connected with the metals used and the manufacturing process. The fifties saw the appearance of rubberised materials as base stands for portable instruments, then as impact-resistant cladding in black neoprene for which the very first designers were Metrix® and Chauvin Arnoux in 1958 (patented). Those impact-resistant claddings then became increasingly common on the hand-held instruments market.

The Monoc in its sleeve

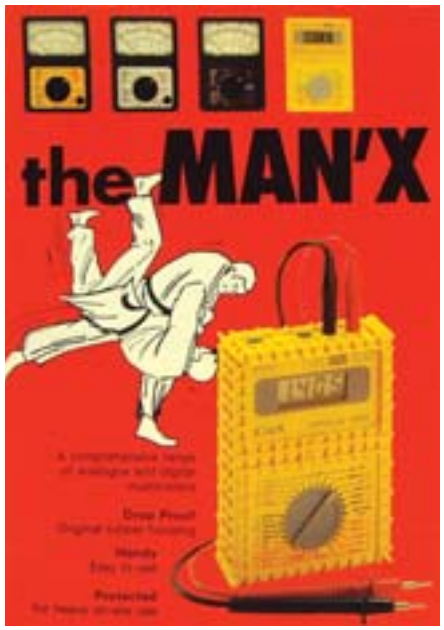
CdA 600 clamp-on multimeter (1982)

Whether on the 1985 French MICA multimeter or on the ANAGRAF version, sold from the same year on the American market, yellow, symbol of Chauvin Arnoux is very evident.

The first steps in plastics came in the seventies when Chauvin Arnoux launched world-wide its first innovative product in yellow and black plastic - the CdA 8 tester in 1979, the clamp-on multimeter CdA 600 in 1982 and the whole of the range. Some 1985 Terca earth testers and 1989 Prowatt wattmeters also use a yellow casing. The combination of the colour and black for equipment used at work sites is increasing, in line with its use as safety markings or to identify danger areas in building sites.

Hence the creation by Chauvin Arnoux of the IMEG 500 and ISOL1000 series recognised in Europe, then on the American market too with the Company's two colours.

The MAN'X 500 series launched by Chauvin Arnoux, which introduced multimeters in flexible material to the measurement world, here too follows the Company's house style.



At the same time, Metrix brought out several products with yellow and platinum black casings, including in its instruments in the 1988 MX 44 series then the MX 51 series.

MX 51

IMEG 500

C.A 5220 a key product

Over the years, Chauvin Arnoux has developed its house style throughout its products: multimeters, wattmeters, megohmmeters and other electrical testers also sporting the Company's colours.

And as a last glance at colours: although yellow is always likened to the colour of the sun, of some kings or Asian emperors, what is less well known is that black, in the physical sciences field, is the symbol of the "black body", in other words a system that absorbs all light that it receives. Black and yellow? A truly historic pair for Chauvin Arnoux which was the first to make them its house style at the beginning of the 20th century, with the introduction of its logo in 1927.

Axel Arnoux

Insulation: a new expert... graphic!

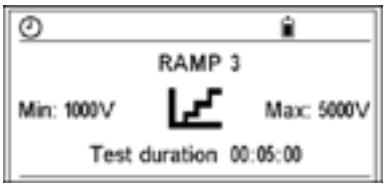
Boosted by the success of its 5 kV C.A 6545 and C.A 6547 insulation testers, marketed in 2002, Chauvin Arnoux confirms its expertise with the C.A 6549, a "high performance" instrument (up to 10 TΩ) and yet intuitive to use.

An industrial casing suited to the toughest conditions and a large-size screen, for expert work anywhere

Designed like its high capacity predecessors, **the C.A 6549 graphic megohmmeter** excels in both the quantitative and qualitative analysis of insulation, essential to industrial companies and manufacturers for checking, maintaining and rating heavy equipment (such as motors and alternators): tests for a programmed time, automatic calculation of DAR, PI and DD quality ratios, etc.

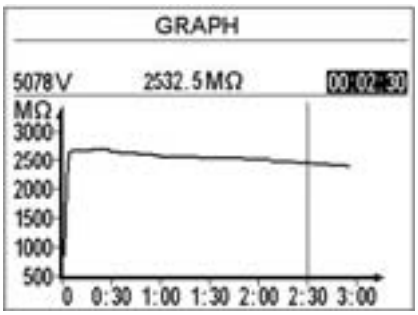
The C.A 6549 provides innovative functionalities that will amaze you

> The **VOLTAGE GRADIENT** mode, accessible directly via the switch, consists of testing the resistance of a faulty insulator by increasing the voltage over 5 stages of 1 minute.

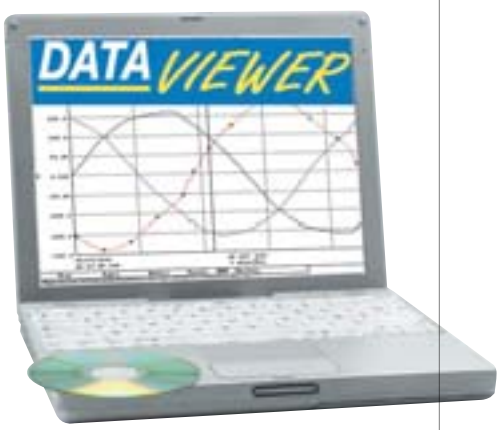


> In the case of monitoring the insulation over time, the **TEMPERATURE** function recalculates the result of the measurement in accordance with a reference temperature, in order to get comparable results, even under different measurement conditions.

> A large format back-lit **GRAPHIC** display simultaneously provides a maximum of information (messages, symbols and bar graph), on which users, by means of the **GRAPH** function, are able to monitor changes in the insulation as a function of the period of application of the test voltage R(t) or as a function of the test voltages applied in gradient mode **R(U)**.



> Designed to used on-site (industrial casing and large-size accessories), **the C.A 6549 megohmmeter** also has an extended memory and an RS232 connection, for printing or processing results in memory. Via DataViewer, platform program useable with many Chauvin Arnoux instruments, the meter can even be remotely controlled!



The DataViewer program is used to recover, process and analysis data

Reader service n° 1

QUALIMETRY

The quality of electrical networks is a current topic. Power suppliers and users are all concerned by interference in the supply voltage. To address, firstly the opening up of the electricity market, and secondly the need to guarantee production at lower cost, the quest for quality is an increasingly topical issue.

Changes in the notion of quality

Not so long ago, guaranteeing the quality of electricity supply meant ensuring continuity for users. **Quality criteria have changed, becoming synonymous with power of consistent quality.** Although the notion of product quality is linked to the degree of customer satisfaction, it has to be recognised that there are objective reasons for the change. This is because interference in networks is very much consequent on the development of equipment whose command and control systems are based on electronics, and such equipment is increasingly found in the business and private spheres. All categories of user affect voltage quality:

> **industry** which uses electronic power components (induction furnaces, arc welders, speed controllers);
> **the service sector,** a major user of computers;
> **the public** who increasingly have computers, televisions and other multimedia equipment, etc.

EN 50160 STANDARD

To classify the quality of the voltage to be supplied - i.e. a voltage at 50 Hz, sinusoidal, as balanced three-phase at a nominal value - the **EN 50160** standard gives the different types of voltage interference found at the point of supply to the customer, according to the wave form, the voltage level, frequency and imbalance of the three-phase system. The parameters to be monitored as well as the length of the monitoring are listed.
(See our full article on the question - CAM n° 54 - available on our web site www.chauvin-arnoux.com).

Different sources of interference

The electrical power quality criteria follow on from the occurrence of electromagnetic interference in electricity networks. Electromagnetic Compatibility classifies the ability of a piece of equipment or device to operate normally in an electromagnetic environment - **immunity** - without itself producing interference adversely affecting other equipment or devices - **emission**. Depending on the way they are transmitted, there are **three major categories of interference**:

> conducted or radiated;
> LF (low frequency) or HF (high frequency) - above 1 MHz;
> transitory (spikes) or sustained.

As regards their **sources**, they may be:

> **natural**, such as lightning and electrostatic discharges;
> **artificial**, in the case of electronic equipment, radio emitters, nuclear electromagnetic impulses, etc.

The quality of electrical power thus covers a number of fields. Its reliability involves the analysis of harmonics, the detection of brown-outs and surges as well as interference, and also monitoring neutral currents.

Responsive power control, not included in French standard EN 50160, is another important criterion of the quality of electricity networks. The distributor is in fact able to supply the power, but here it involves an over-loading of lines and transformers at high cost, both for the distributor as well as for the user.

Consequences, effects and issues

Diagrammatically, the effect of the pollution of networks has substantial costs, both direct (the payment for active power) and indirect (production losses, damage to equipment attributable to cuts in the power supply, peaks, etc.). Although the electrical power supplier is contractually bound to supply quality voltage, it does not in any way solve the question of network pollution. This is because an increasing amount of interference is caused by users installing fluctuating loads and so is their responsibility. Whence the importance of being able to rate your electricity network.

The quality of voltage is interfered with by all kinds of natural phenomena or resulting from human activity.

Symptoms of interference on an electricity network

Qualimetry concerns and interests (not least financially…) a large number of businesses. Before raising the issue of a diagnosis of their electrical system, it is worth knowing the different symptoms, listed in the table below, which indicate faults in an installation.

SYMPTOMS \ POSSIBLE ORIGINS	Flicker	Brown-outs	Under-voltage	Over-voltage	Atmospheric surges	Harmonics	Inter-harmonics	Homo-polar harmonics	Micro-outages	Short power cuts	Long and very long outages	HF spikes	Power surges	Continuous component	Three phase imbalance	Frequency variations	Excess reactive power	EMC
Processes operate erratically		●				●			●									
Random stoppages of process equipment		●	●		●													
Process stoppages					●	●				●	●							
Damage to equipment					●	●	●				●			●	●			
Overheating and noise from equipment			●	●		●	●	●							●		●	
Malfunctions on motors			●			●									●	●		
Abnormal vibration and noise on motors			●			●	●								●			
Stoppages of motors										●	●			●				
Malfunction of the electronic						●			●					●				●
Malfunction of power electronics									●			●	●		●			●
Erratic operation of protection systems				●				●					●		●		●	
Unaccountable tripping of protection systems														●				
Non-operation of protection systems																		
Triggering of arcs					●			●			●	●						●
Problems with monitors	●																	●
Problems with radio-communications					●							●						●
Computer and telecom interference				●	●	●			●	●		●						●
Destruction of electronic cards				●					●			●						●
Destruction of computer hardware				●		●			●			●	●					
Flickering of lighting	●									●								
Electrocution					●			●										
Fire of electrical origin					●			●						●				

Source: GIMELEC

Diagnosis of interference on an electrical network Network analysers

A faulty electrical installation can be diagnosed by Chauvin Arnoux and Enerdis which offer a complete spectrum of means of analysis

The C.A 8352 site electrical network analyser

Chauvin Arnoux site analysers are praised for their performance (FFT analysis functions, oscilloscope mode, power analysis, vector scope mode, flicker measurement, **EN 50160 standard analysis**, logging transients (spikes), recording data, etc.) and their exceptionally intuitive use.

With the new **C.A 8352**, the analysis of network quality parameters has been even further refined and functionalities have been added.

Even better performance

With a working memory boosted from 6 to 10 Gb on internal disc; a LCD graphic screen of 10 inches instead of 7.5; a sampling frequency upped from 25 to 38.4 kHz.

Yet more measurement criteria

Such as the location and logging of control and remote control signals (for example to remotely trigger metering tariffs or public lighting); the "Symmetry" option displaying direct, homopolar component values as volts and amps, and indicating the imbalance of the system as voltage and current; the measurement and monitoring of the load and short-circuit impedances on each phase of the electricity network; "RMS" monitoring of minimum, maximum and mean values calculated on a half-period (of 10 ms) on the integration period set; remote communication by Ethernet to send data to base via the company network, record command and control signals, monitor minimum, maximum and mean values calculated on a half-period, etc.

The all-terrain instrument capable of the best where analysis is concerned.

Reader service n°2

The **MAP range** of permanent analysers for electricity systems, from Enerdis, for continuous monitoring and analysis

The opening up of the electricity supply market required the introduction of new measurement products. To best manage their electricity supply, users must take three additional aspects into account:

> **the cost of the power** which means optimising their contract and checking load curves to best plan production;
> **the quality of the power** with the surveillance of interference;
> **the availability of power** by means of permanently monitoring the system and through corrective as well as preventive maintenance.

To meet these requirements, **Enerdis**, already very much involved in metering, launched the range of **MAP** analysers, products that can be built-in or rack-mounted, and are easy to incorporate into electricity switchboards. MAPs **continuously** monitor all parameters typical of the voltage supplied by a low and medium voltage public distribution system in accordance with current standards.

Together with the **NRGCenter** operating program, they make it possible to send in data remotely via, among other possibilities, an Ethernet link, so as to perform an in-depth analysis of all parameters logged: active, reactive, apparent and distortion power, energy, cosφ and power factor, THD-U and THD-I, harmonics up to the 63rd rank and inter-harmonics, inverse imbalance as voltage and current…

Continuous on-line display of parameters in real time

More than just simple network quality analysers, MAPs provide extended functionalities by means of the different digital and analogue inputs and outputs - which are standard on some models. It then becomes possible to:

> **monitor** the rotation speed, pressure measurements, the temperature of transformers;
> **monitor** status such as the closure or opening of relay trips on the protection system;
> **meter** power;
> **check** equipment - filters, sets of condensers, generators, alarm systems, etc.

MAP 5000

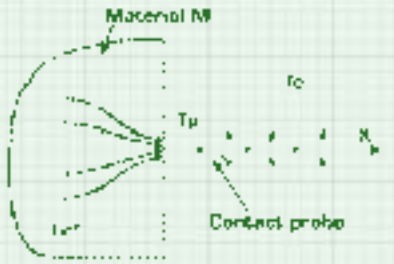
Reader service n°3

Calibration and use of surface temperature sensors

To improve the accuracy of surface temperature measurements, a workgroup run by Pyro-Contrôle, bringing together members from industry and the Laboratoire National d'Essais (French National Test Laboratory) has instituted a project called Gemini-Cats. It is going to produce, in a pre-standard context, a Guide to using surface temperature sensors and a Guide to calibrating them. The project is based on the temperature reference surface principle developed by the LNE, industrialised and marketed by Pyro-Contrôle under the Surfacal name, which enables measurements to be related to national measurement standards. The progress status of Gemini-Cats and the Surfacal equipment, reference surface are given.

Some theoretical aspects of surface temperature measurement and calibration

The most widely held ideas among users of contact temperature measurements is that the temperature measured is the actual temperature. In the case of surface temperatures, this supposition is all the more false because there is a "mandatory" difference linked to the measurement itself, which is made at the interface between two mediums at different temperatures.
It is worth recalling here some basic theory*. Surface temperature is determined by the application of a sensor at the material/environment interface.



At the material/sensor interface, there is a temperature difference that has several kinds of origin:

> macroconstriction, a phenomenon related to the material itself;
> the resistance of the contact related to the surfaces in contact between the material and the sensitive component and lastly,
> the fin effect, related to the construction of the sensor.

Findings

Numerous industrial applications use contact-type surface temperature sensors. However, at the present time there is no reliable industrial method enabling correct calibration and use of this type of sensor. Research has nevertheless repeatedly shown that incorrect use of these contact-type surface temperature sensors can be at the root of very significant measurement errors - from several degrees to several dozen degrees.

The project

Aim of project
It is two-fold:

> firstly to establish a method of calibrating contact-type surface temperature sensors and confirming the method on the basis of calibrating a set of sensors representative of existing technologies;

> secondly, establishing and confirming a method of using contact-type surface temperature sensors based on concrete instances of applications in an industrial environment.

Benefit of the project

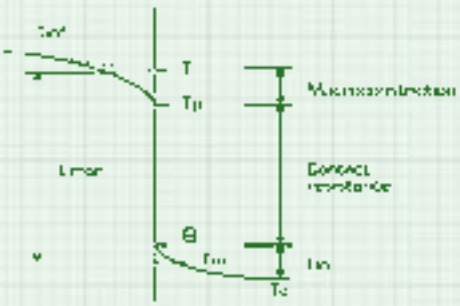
Economic aspect
Better assessment of temperatures actually measured, resulting in improvements in running and monitoring processes.

Quality assurance
Possibility in the near future of checking measurements made by contact-type surface temperature sensors, by COFRAC (or equivalent) calibrations.

Standard aspect
Guides for calibrating and using contact-type surface temperature sensors will be able to form the basis of work on standardisation in the field. … and it concerns many sectors of business, such as aeronautics, iron and steel, and the food and agriculture industries.

Participants in the project

The project group which is coordinated by Pyro-Controle, is made up of equipment manufacturers and calibration laboratories: AOIP, Berruet Monnet and users directly concerned by the issue: EDF, Airbus, Apave and the LNE's National Bureau of Metrology.



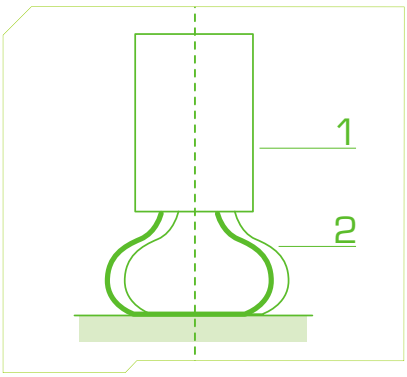
This causes the following known difficulties:

> two different sensors applied to the same surface will give two different measurements (fin effect and contact resistance);
> a sensor applied to two different surfaces of the same temperature, will give two different temperatures (macroconstriction of the material and contact resistance);
> and in all cases, the accuracy of measurements thus made cannot be narrowed by calibrating the sensor by the traditional method (by immersion).

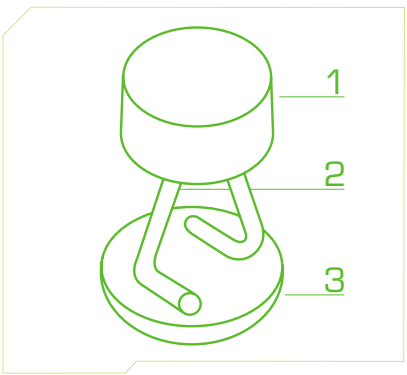
The present state of the art

What is the current practice, first of all as regards using the sensors themselves, then calibrating them?

Measuring surface temperatures
Users have a huge variety of surface sensors for manual entries (hand-held sensors). Most applications concern checking or monitoring industrial processes. The measurements thus made do not come within the ambit of process regulation. They are external to the process itself. In practice, only a few models are suitable from the metrology point of view, i.e. with "acceptable" accuracy. This is the case with the sensor below**:



At the end of the sensor's body (1), the thermocouple fins (2) are soldered and guarantee proper application of the hot point to the surface. Some models marketed with the "surface sensors" description give errors that can be more than 20 °C at high temperature (300 °C). Below is an example of a contact-type surface temperature sensor that is not suitable for measurement purposes**:



The end of the sensor's body (1), the thermocouple fins (2) are brazed onto a tip (3).

The substantial errors in accuracy that these measurements are subject to make contact-type surface temperature sensors instruments currently used for a limited number of applications. The sensors used, most often developed to a specific specification, meet the user's requirements as regards process measurement but very few of them for a precise measurement of temperature.

Temperature sensors are at the heart of monitoring industrial processes

Calibrating surface temperature sensors

There is currently no means available for calibrating surface sensors in accordance with a method that is related to national measurement standards. An initial method consists of calibrating by immersion in a bath or insulated container (traditional method for contact-type temperature sensors), which is not necessarily compatible with the integrity of the sensor to be calibrated. This process is not at all representative of subsequent use in application. Even though the calibration is properly done, the value given by the sensor when used is very different from the actual value for the surface to be measured. The difference can sometimes reach about twenty degrees. One method of calibration dedicated to detachable surface sensors has recently been developed by the BNM-LNE. It consists of generating a reference surface temperature, materialised by a heated skin used for applying sensors to be calibrated. The surface temperature is determined by the method termed "extrapolation"**.

The new benches also allow the connection of industrial furnaces dedicated to calibrating surface sensors.

Responses

The Surfacal innovation, Surfacal temperature reference surface

is a furnace generating a known surface temperature, that can be related to national measurement standards. All proportions of accuracy kept, the principle is that of an in-cell calibration: the temperature read by the sensor to be calibrated is compared to the actual temperature of the standard surface given by the instrument. The instrument is used to calibrate sensors by means of metal skins of different kinds, aluminium (metal material that is a good conductor of heat) or stainless steel (metal material that is a poor conductor of heat), in order to cover the broad requirements of measurement. The scale of use is from +35 °C to +300 °C.

Surface sensors can lastly be calibrated under conditions identical to their use.

Producing a Guide to using surface temperature sensors

Tests conducted on-site have demonstrated what the rules for choosing and using these sensors should be.

The guide, which at the present time is still being prepared, will enable users to make a technological choice of sensor, then to put it into use in application.

Several developments are to be expected from the application of the Guide on use:

> first of all with manufacturers: an upgrade of their offer of surface temperature sensors. Some models will be developed for measurement applications, others that cannot be calibrated will be of limited use;

> with users, a better specification of requirements and more relevant use of measurements.

Producing a Guide to calibrating surface temperature sensors

A guide intended for laboratory staff engaged in metrology, enabling them to calibrate such sensors correctly. The errors found and inaccuracies encountered for example in the case of a sensor with fins are given in the table below:

Case of an aluminium skin

Temperature sensor (°C)	Difference (°C)	Uncertainty (°C)
100°C	-1°C	0,5°C
180°C	-2°C	1°C
300°C	-3°C	2°C

Case of a stainless steel skin

Temperature sensor (°C)	Difference (°C)	Uncertainty (°C)
100°C	-2°C	1°C
180°C	-4°C	2°C
300°C	-6°C	3°C

The method of calibration developed has been confirmed by several campaigns of comparisons between laboratories.

A one-day training course is necessary for temperature metrology laboratory personnel to adapt to the special features of these calibrations.

Several developments can be expected from the application of this calibration Guide:

> first of all with calibration laboratories: an upgrade of their offer of surface temperature sensor calibration so as to provide a calibration service related to national measurement standards. Some laboratories will incorporate these procedures into their COFRAC approval;

> with users, better metrological supervision of their surface temperature measuring instruments.

These guides, currently being produced, will be finished some time in mid-2004.

References

** JP. Bardon, B. Cassagne, Température de surface, Mesure par contact, Techniques de l'Ingénieur, 1998, vol. R2730.*

*** R. Morice, E. Devin, "La mesure par contact des températures de surface, étalonnage et traçabilité des capteurs", dans Conférences du congrès française de thermique, SFT2000, Lyon, 15-17 mai 2000.*

Reader service n°4

LF field measurement, the solution to meet the electromagnetic compatibility standards

Electromagnetic radiation, reputed to interfere with equipment and harmful to health should be measured in accordance with numerous standards in force. The new Chauvin Arnoux C.A 42 field meter has been designed with this in mind, while being supplemented by oscilloscope and frequency analysis functions.

All electrical instruments and electronic systems - motors, welders, induction furnaces, high tension lines, transformer stations, electronic instruments, etc. - generate electrical and magnetic fields. The radiation is liable to interfere with the operation of other nearby electrical devices, even making it impossible to use them. Such systems are said to be "electromagnetically incompatible".

In addition to purely technical problems of the electromagnetic compatibility of machines and instruments with one another, attention is increasingly being focused on the effects of electromagnetic fields on the human body, in both private and occupational areas.

The **C.A 42 field meter** has been specially designed to measure electrical and magnetic fields in the low frequency domain, of 400 kHz DC, and to compare the values measured with the requirements of European directives and world standards (IEC, EN, DIN, UTE, VDE, BGV, ICNIRP, etc.). The measurements made by the instrument are displayed either as absolute values (V/m or T, multiple and sub-multiple), or as relative values (%), by comparison with the reference values specified in the standards. They apply equally to the public and private domains as well as to checking the electromagnetic compliance of electrical equipment in industry.

The **C.A 42** also shows variations in electrical or magnetic fields as a function of time, (oscilloscope function) or frequency (harmonic analysis by FFT calculation).

Very easy to use, this field meter is fitted with an internal isotropic magnetic measurement. It is also offered with 4 isotropic probes as an accessory: an electrical field probe (1 V/m to 30 kV/m) and 3 magnetic field probes (10 nT to 1 T), one of which measures the earth's magnetic field.

Reader service n°5

Reminder

Electrical fields	Magnetic fields
Powering up a conductor creates an electrical field.	Passing an electric current through a conductor creates a magnetic field.
Which is measured in volts by a meter (V/m).	Which is measured in amps by a meter (A/m), but magnetic induction is used readily, expressed in Tesla and in multiples (mT, µT, etc.).
The electrical field exists even when an electrical instrument, connected to the network is switched off.	The magnetic field only appears when an electrical instrument is switched on and the current flows.
The intensity of the field reduces as the distance from the source increases	
Most construction equipment gives some protection against electrical fields.	Most existing equipment is not able to reduce the intensity of a magnetic field.

Multifunction installation testers C.A 6114 and C.A 6115N: a complete, effective response to the requirements of NFC 15-100

In order to guarantee safety and security as regards the hazards of electricity, the French NFC 15-100 standard, for any LT installation, requires a series of initial checks (on delivery), then periodically. To meet these requirements, Chauvin Arnoux offers two universal electrical installation testers.

Main measurements to be made

> measurement of the resistance of the standard earth;
> measurement of the resistance of insulation in the installation in relation to earth;
> continuity test on PE conductors;
> check on the correct sizing and operation of protection systems installed.

Every measurement is made with a precise measurement method (in accordance with the IEC/EN 61557 standard -1 to 7) and, frequently, by means of a dedicated instrument (single function).

To facilitate implementation of the inspections and optimise the time spent by qualified staff performing them, Chauvin Arnoux has created a range of multifunction testers, without ever compromising performance for any one of the measurements.

C.A 6114

The latest in the range, the **C.A 6114** aims at ease and speed of use. This instrument performs all checks directly from a mains socket:

earthing, insulation, continuity and **loop** measurements and test on **differentials** as well as measurements of **voltage** and **frequency** and **phase rotation** test.

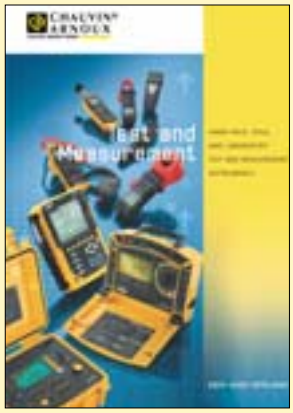
Extremely well designed - industrial casing, large, back-lit display, limited number of keys for simpler and safer operation, marked connections and measurement leads ingeniously conceived, the **C.A 6114** is the ideal partner for professional fieldwork.

C.A 6115N

C.A 6115N is the most complete installation tester of its generation (14 different measurements possible), it is also ideal, because of its current clamp input, in addition for taking earth and selective loop and leakage current measurements.

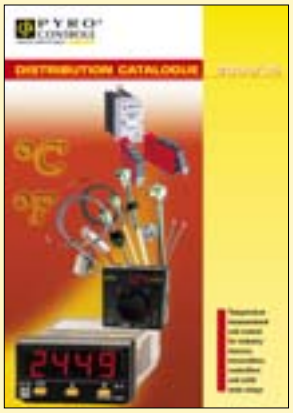
This last feature comes into its own in IT networks. It is used to inspect the insulation while keeping the installation under power and so without, for example, interrupting production in an industrial setting.

Reader service n° 6



Reader service n° 7 (64 pages)

Reader service n° 8 (36 pages)



Reader service n° 9 (12 pages)

2004 Chauvin Arnoux®, Metrix® and Pyro contrôle® catalogues

The Chauvin Arnoux and Metrix - Test and Measurement - catalogues show you the whole of the existing range of portable measuring instruments. It is a special distribution edition - sensors, transmitters, regulators and static power relays for measuring and checking temperature in industry which Pyro-Contrôle presents in its 2004/2005 catalogue.

Temperature measurement and power control for the glass industry

The glass and ceramics industries have harsh requirements when it comes to temperature sensors and power controls. Pyro-Contrôle, with its considerable expertise in the sphere has published documentation dedicated to these industries with the spectrum of its products and services in temperature measurement and control.

Reader service n° 10 (8 pages)

Transmitters and DIN rail converters

For treating all temperature and process signals, a range of 1 or 2 channel converters and transmitters, with analogue or digital output, very easy to configure, install and use.

Reader service n° 11 (8 pages)

Checking the order and rotation direction of phases

The C.A 6605 phase rotation tester and the C.A 6607 phase rotation and motor tester are essential instruments for identifying the order of phases in an electrical installation and the direction of rotation of any industrial equipment that is connected to it.

Reader service n° 12 (2 pages)

Voltage / No-voltage testers with state-of-the-art safety

The C.A 704 - C.A 760 safety testers and the C.A 751 socket tester are simple, tough instruments, meeting the every day needs of electricians. They are suitable for all measurement situations: electricity switchboard terminals or sockets.

Reader service n° 13 (4 pages)

Identify and locate any faults in cables and wiring

Professional and economical, the C.A 7024 digital Fault Mapper™ and the C.A 7026 graphic Fault Mapper™ Pro are portable temporal reflectometers (TDR) designed to detect and locate faults in electrical, sheathed, coaxial and telecom cables over a maximum distance of 2,000 m or 3,500 m respectively. The C.A 7028 Wire Mapper™ is a professional wiring tester and identifier of faults in data and voice networks and on copper connection wiring installed.

Reader service n° 14 (4 pages)

DATAViewer®, operating program on PC

DATAViewer® Pro is a powerful tool for configuring, transferring and processing measurement data, not just for Qualistar, but for many other Chauvin Arnoux instruments too, such as the C.A 6547 and C.A 6549 megohmmeters. DATAViewer® will soon be the sole program platform for all Chauvin Arnoux product ranges.

Reader service n° 15 (2 pages)

Everything for electricity network analysis

C.A 8352

with large touch screen

All the power for network quality analysis in just one instrument:

voltages, currents, powers, energies, harmonics, flicker, unbalances, EN 50160 summary table etc.

More product performance:

- Sampling: 38.4 kHz
- Memory: 10 GB
- Graphic color display
- Operating software

More parameters:

- Remote control signals
- Symmetry components
- Load impedance

Easy to use

Communication via ETHERNET network

Reader service n° 2

CHAUVIN ARNOUX

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