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JOINT EUROPEAN RESEARCH INFRASTRUCTURE NETWORK FOR COASTAL OBSERVATORIES

Calibration Best Practice
Temperature & Conductivity

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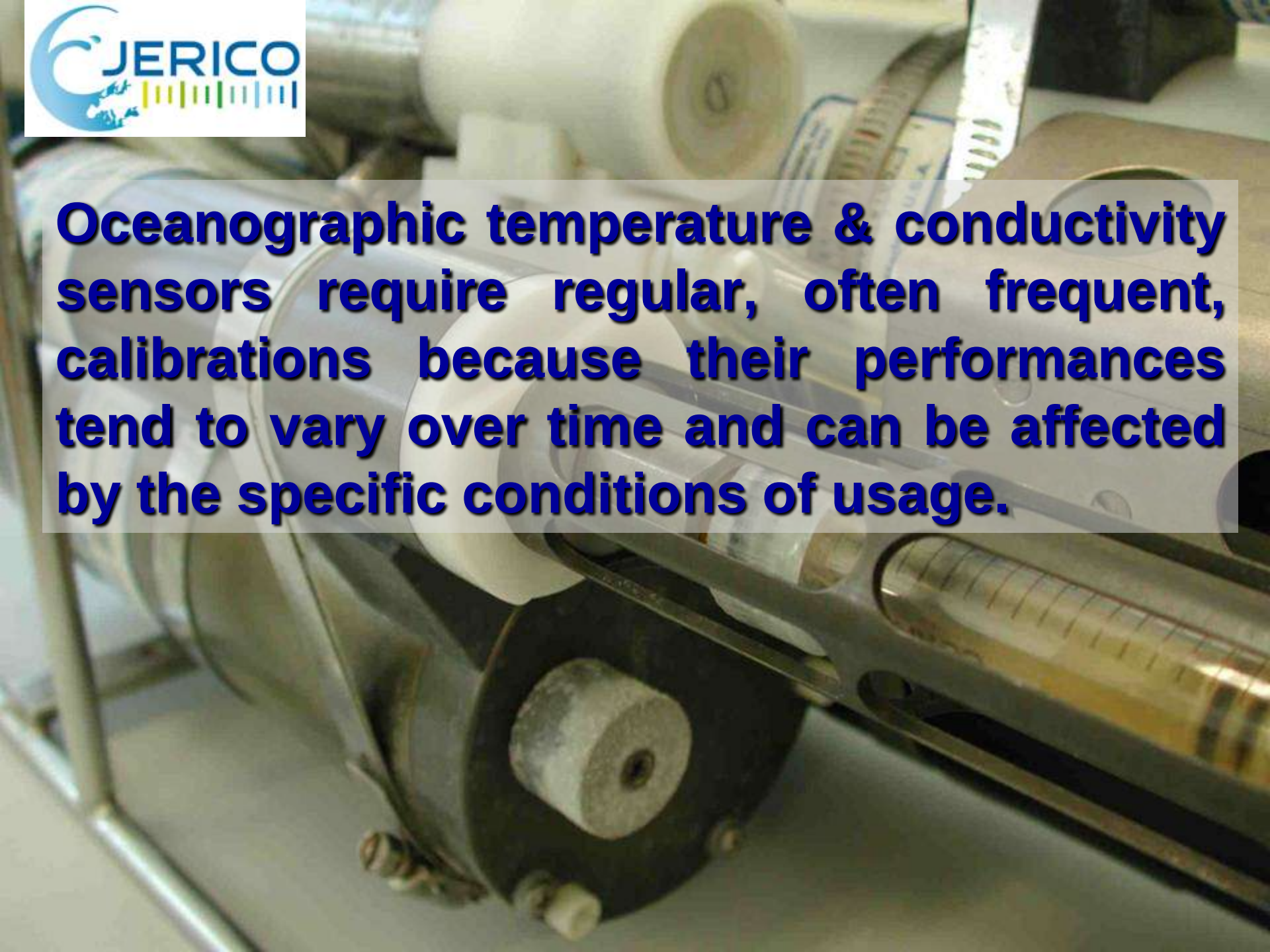


Oceanographic temperature & conductivity sensors require regular, often frequent, calibrations because their performances tend to vary over time and can be affected by the specific conditions of usage.

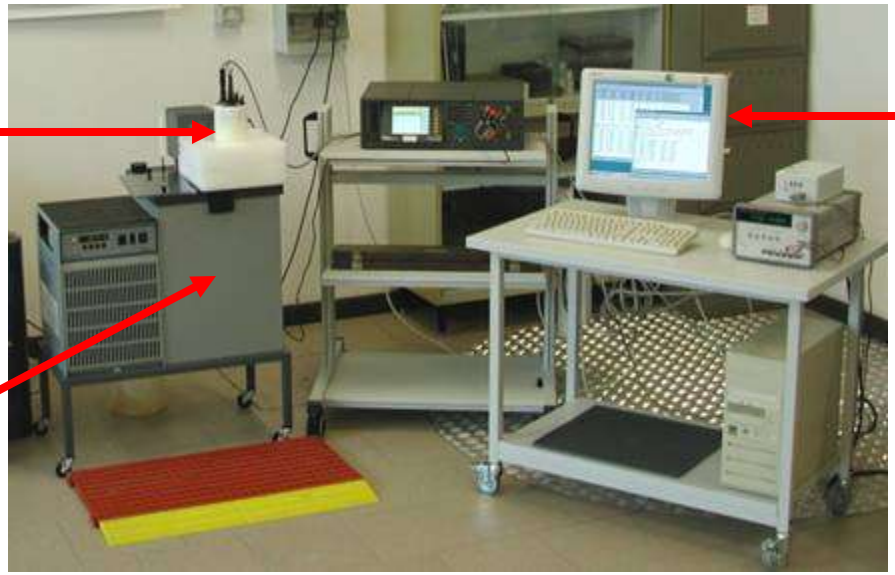
The main aims of calibrating

- **Ensure continuing conformity of instrument/sensor performance to required/declared specifications in a way compatible with accepted international regulations and practice;**

- **Provide documented evidence attesting to the proper functioning of an instrument/sensor over time.**

Overview of a temperature calibration

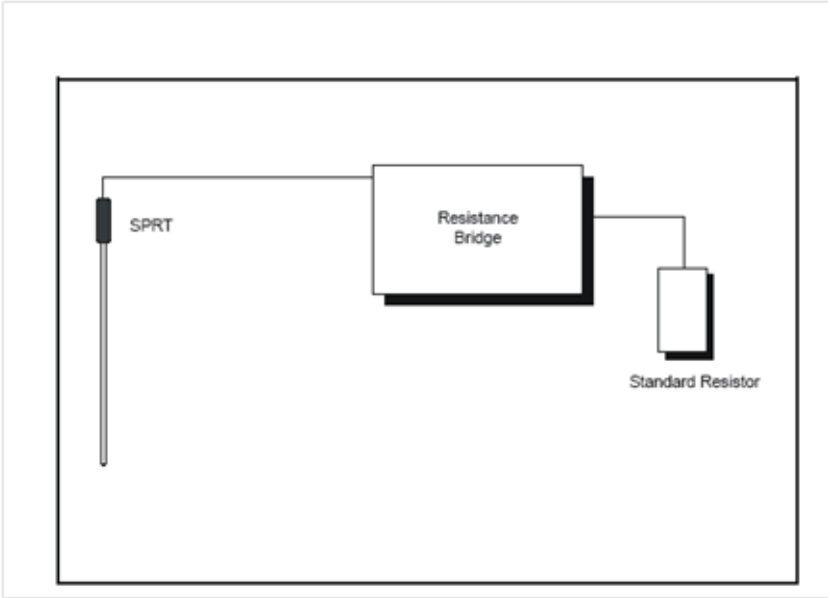
A temperature calibration is performed by comparing the temperature readings of the instrument being tested with those of a Reference System in a thermostatic bath.



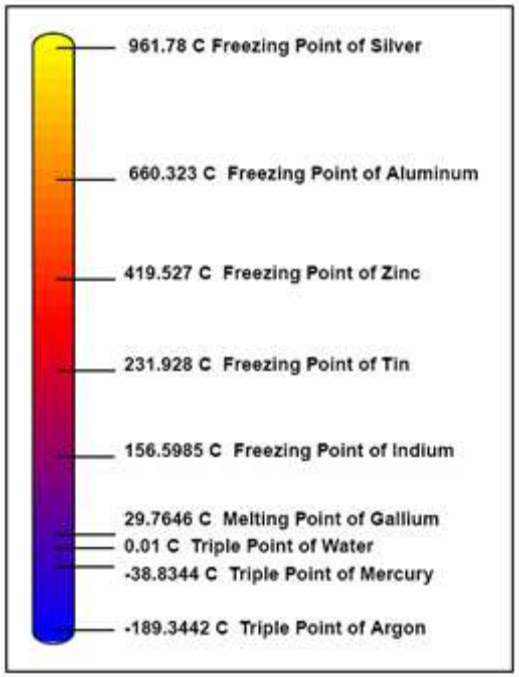
The Reference System for Temperature

Constituted by a high-precision Digital Thermometer (Resistance Bridge), a Standard Platinum Resistance Thermometer (SPRT) and a Standard Resistor.

Resistance Bridge



The principal fixed points of the International Temperature Scale of 1990 (ITS-90) used in Oceanography



Triple Point of Water (TPW) = 0.01° C

Melting Point of Gallium (MPGa) = 29.7646° C

Overview of a conductivity calibration

A conductivity calibration is performed in a thermostatic bath; the conductivity readings of the instrument being tested are compared with those obtained from the salinity analysis of appropriately collected discrete water samples using a recognized Reference System.

Reference Conductivity

Reference values for conductivity are calculated from measured sample salinities and reference bath temperatures using the standard a**lgorithms for computation of fundamental properties of seawater** (*UNESCO Technical papers in marine science, no. 44, 1983*)

The salinity analysis

The salinities of bath water samples are measured using a Laboratory Salinometer, standardized using **IAPSO Standard Seawater** as Reference Material

Bottle with water sample

Guildline 8400B Laboratory Salinometer

Best Practice: Operations

Fouling can alter the performance of a temperature sensor, depending on thickness, extension and characteristics.

Fouling and hydrocarbons are a dangerous combination for a conductivity sensor. They can form thin gelatinous coatings on the measuring electrodes of the sensor which can dry out in air if not removed completely, thereby providing a base for new layers of Fouling on successive deployments.

Best Practice: Operations

Proper field maintenance is the the key to successful calibrations.

Poorly maintained instruments often need to be subjected to long and complicated procedures in order to restore them to a condition that would permit a proper calibration to be performed.

Best Practice: Calibration

Remember, you cannot calibrate temperature and conductivity sensors in the field!
(But you can monitor performance…)

It would be wise to have your temperature sensor calibrations verified at least once a year!

You need to have your conductivity sensor calibrations verified at least once a year!
(Once every six months would be even better…)

Wherever possible, calibrate the sensor together with the mother instrument!

Pretend an "As Received" evaluation of your sensor prior to a calibration.

Best Practice: Calibration

Calibrating temperature & conductivity sensors/instruments properly requires expertise, specialized equipment and procedures, dedicated staff and most of all experience. If you lack these resources in-house, don't improvise!

Every once in a while, use a calibration service provider different from the one you habitually use (if you perform your own calibrations, have your sensors calibrated by someone else); over time, this practice will provide you with information useful for QA.

Keep your calibration records up-to-date; calibration histories of sensors can often help to pre-empt potential problems with them in time.

Best Practice: Calibration

The results of a calibration may or may not be accredited but they must always be accompanied by the following:

- **a declaration of the uncertainty associated with the calibration process.**
- **information evidencing traceability to reference material (certified or otherwise): ITS-90 fixed points for temperature and IAPSO Standard Seawater for conductivity.**

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Thank you!