**Task 4.1 Calibration**

**Overview of the calibrating facility**

Contact Details

NAME/DESIGNATION (if any): Centro di Taratura Oceanografica (CTO)

MANAGING INSTITUTE/ORGANIZATION: Istituto Nazionale di Oceanografia e di Geofisica

 Sperimentale – OGS

DEPARTMENT (if any): Department of Oceanography

ADDRESS: Borgo Grotta Gigante 42/C

 34010 Sgonico (Trieste)

 Italy.

COUNTRY: Italy

TEL: +39 040 2140323

FAX: +39 040 2140266

Name of contact-person: Rajesh Nair

E-mail: rnair@ogs.trieste.it

Part a: General Information

 1. Does your calibrating facility possess a well-defined organizational framework with

Dedicated staff? **Yes**

Clear hierarchy? **Yes**

Transparent chain of responsibility for management, technical/scientific

and operational decisions)? **Yes**

(If **No** to any of the above, pleaseprovide a brief description of how your facility is organized below)

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(Add lines as necessary)

 2. Briefly describe the size and nature of the annual operating budget of your facility.

Is it funded by your Institute/Centre? **Yes**

 If **Yes,** is the funding constant? **No**

Is it funded by Projects? **Yes**

Is there separate funding for upgrading or acquiring new instrumentation, etc.? **No**

(Kindly provide an estimate of the annual operating budget and any additional information you think may be helpful below)

Annual operating budget: 27500 € (approx., excluding personnel costs and purchase of instrumentation/equipment.

 3. Does your facility employ Quality Management Standards - ISO 9000:2000,

ISO 10012, Good Laboratory Practice (GLP), and the like - to its calibration

systems? **No**

(If **Yes**, please specify below)

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(Add lines as necessary)

 4. Does your facility possess any kind of accreditation for the calibrations? **No**

(If **Yes**, please specify the parameter/s or measurand/s concerned, the kind

of accreditation and the issuing body below)

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(Add lines as necessary)

 5. Does your facility actively endorse a policy of continual training/education of

personnel actively involved in calibration activity? **No**

(If **Yes**, please provide a brief description of the kind of activities promoted below)

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(Add lines as necessary)

 6. Does your facility maintain a documented in-house Quality Assurance Programme? **No**

 7. Does your facility maintain a formal Quality Manual (containing, at the

very least, listings and descriptions of equipment and procedures,

maintenance/calibration records and certificates for instrumentation, and

safety precautions and regulations)? **Yes**

 8. Does your facility make use of control charts (Shewhart Charts, other) for

Quality Control purposes? **Yes**

(If **Yes,** please give details below)

 Shewhart charts.

 9. Can your facility assure an effective traceability chain to primary standards or,

in their absence, to conventionally accepted reference material (certified or

otherwise)? **Yes**

10. Does your facility furnish uncertainty estimations for its calibration systems? **Yes**

11. Does your facility maintain links of any kind with the National Metrology

Institute/s (NMI/s) of your country? **No**

(If **Yes**, please describe the nature of the relationship/s below) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(Add lines as necessary)

12. In the list of sensors below, please indicate only the ones that you currently **never** calibrate yourselves; in each case, kindly report the calibration provider (manufacturer, other) and the typical calibration interval (trimonthly, half-yearly, yearly, other) you are presently employing.

*Physical sensors for*:

 Temperature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Conductivity (Salinity): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**√** Dissolved oxygen: laboratory or monthly on-site calibration in air after change of sensor

 electrolyte and membrane.

**√** Water Currents: calibration by manufacturer, when necessary.

**√** Pressure: calibration by manufacturer, when necessary.

*Optical sensors for*:

**√** Chlorophyll a: in-house control testing, and calibration by manufacturer when necessary.

**√** Turbidity: in-house control testing, and calibration by manufacturer when necessary.

**√** Photosynthetically Active Radiation (PAR): absent.

*Chemical sensors for*:

**√** Phosphates: absent.

**√** Silicates: absent.

**√** Nitrates: absent.

**√** Nitrites: absent.

**√** Ammonia: absent.

**√** Dissolved oxygen: absent.

**√** pH: yearly calibration by manufacturer.

**√** Total alkalinity: absent.

**√** Total carbon dioxide: yearly calibration by manufacturer.

 **√** Dissolved organic carbon: absent.

**√** Total organic carbon, absent.

***Please complete the questionnaire using the forms furnished in the following pages to provide details regarding your calibration practices for all the sensors in the above list that you do calibrate routinely*.**

**Task 4.1.1 Physical Sensors**

(\* Please provide a separate sheet for each parameter)

Part b: Calibration

Parameter/measurand\*: Temperature.

Unit of measurement: degrees Celsius (°C), International Temperature Scale – 1990 (ITS-90).

Range: 0 °C to 30 °C

Accuracy: 0.002 °C

Precision: 0.0005 °C

Calibration uncertainty (if available): 0.0024 °C (expanded uncertainty, k = 2).

 1. How often do you calibrate the sensor/s or sensor system/s you are presently using for the specified parameter/measurand: please list the typical calibration interval/s you are employing; note that if you are calibrating irregularly, kindly specify why and when (e.g. before a deployment, following a malfunction, etc.).

Once every 6 months;

Prior to deployment or following a malfunction, always.

 2. Please provide a brief description of the calibration setup, including a list of the principal equipment, reference material (certified and/or conventionally accepted) and instrumentation involved in a typical calibration operation.

|  |  |
| --- | --- |
| **Test instrumentation** | **Specifications** |
| Hart 1590 Precision Digital Thermometer with Metal-sheath SPRT (Rosemount 162CE / Hart 5699) | Range: 0.00 to 30.00°CAccuracy: > ±0.0015°C |
| SBE41 CP-OGS Conductivity & Temperature Monitor | Range: 0.00 to 30.00°CAccuracy: > ±0.003°C |
| Hart 7312 TPW Maintenance Bath | Range: -5 to 110°CStability: ±0.001°C at 0°C |
| Hart 9230 Ga Cell Maintenance Bath | Range: 15 to 35°CStability: ±0.02 °C |

|  |
| --- |
| **Reference Material** |
| Jarrett B13 Triple Point of Water cells Hart 5901 Triple Point of Water cellHart 5943 Gallium Melting Point cellStandard resistors (L&N 4030B/Guildline 9330 series) |

3. Do you employ reference material which are mutable or unstable

(e.g. secondary standards, reagent solutions, gas mixtures,

pressure generators, etc.) to calibrate the sensor/s or sensor system/s

you are presently using for the specified parameter/measurand. **No**

(if **Yes**, please list the types of this kind of reference material you are employing; kindly specify also the measures you take to guarantee the reliability of the reference material in terms of batch-to-batch uniformity of characteristics)

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(Add lines as necessary)

 4. In your view, does your facility ensure an effective traceability chain for the

specified parameter/measurand? **Yes**

 5. Please provide a brief description of the procedures employed to ensure adherence of the performances of the principal equipment and reference instrumentation of the calibration setup to factory specifications (in-house monitoring of performance, in loco re-calibration, servicing by the manufacturer, etc.).

All of the elements of the reference measuring systems are maintained to within declared specifications by regular in-house monitoring of their performances, adhering to recommended usage and upkeep practices, and scheduling servicing with a manufacturer immediately when laboratory quality assurance procedures indicate a developing problem.

 6. Does your facility maintain a Manual with a description of the calibration method

and the measuring procedures, together with details of sample treatment and

preparation when these steps are present? **Yes**

(If **Yes**, kindly attach a copy to the completed questionnaire, otherwise please provide a short, description below)

The manual is an internal document requiring authorization for release, and is written in Italian. Kindly refer to the contact-person for further information.

 7. In your view, is regular factory calibration/servicing necessary to obtain

optimal performances from your sensors/instrumentation for the

specified parameter/measurand in the field? **Yes**

(If **Yes**, please provide details of the sensors/instrumentation, indicating also the intervals you recommend for factory calibration/servicing, below)

 Hart 1590 Precision Digital Thermometer: factory calibration/servicing every 2/3 years.

 Metal-sheath SPRT

(Hart 5699): factory calibration/servicing every 3 years.

 8. Do you perform field calibrations for the specified parameter/measurand? **No**

(If **Yes**, please provide a brief description of the method and procedures)

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(Add lines as necessary)

9. Does your facility perform:

* internal quality audits to monitor and assess its

 calibration system for the specified parameter? **Yes**

 - independent quality audits to monitor and assess its

 calibration system for the specified parameter? **Yes**

(If **Yes** to any of the above, please provide a brief description of the procedure/s applied, including a list of the principal equipment and instrumentation involved)

The Rosemount 162CE SPRT is checked and, when necessary, recalibrated to subrange 11 (0.018– 29.76468C) of the International Temperature Scale of 1990 (ITS-90) using a Hart Scientific 5901 Triple Point of Water Cell and a Hart Scientific 5943 Gallium Melting Point Cell. The 1590 Precision Digital Thermometer is controlled using an externally calibrated, certified Hart Scientific 5699 SPRT with the same ITS-90 fixed-point cells. This SPRT also serves as an independent temperature reference for comparisons if required.

10. Does your facility actively maintain an archive containing issued calibration

reports/certificates for the specified parameter/measurand? **Yes**

(If **Yes**, please specify the document retention time/s)

Retention time for documents (reports/certificates): Indefinite.

11. Do you have any suggestions or ideas for improving the quality of your

calibrations for any particular sensor/sensor system you are presently using

for the specified parameter/measurand (e.g. innovative reference material,

modifications to existing methodologies or new methodologies

you have developed, etc.)? **No**

(if **Yes**, please provide a brief description of your ideas and/or suggestions, including the details of the sensor/s or sensor system/s)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(Add lines as necessary)

12. Do you have any suggestions or ideas for improving the general quality

of the calibration of sensors or instruments for measuring the specified

parameter/measurand (e.g. testing and promoting the use of new

reference material, development of new methodologies, etc.)? **No**

(if **Yes**, please provide a brief description of your ideas and/or suggestions) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(Add lines as necessary)

Submitted on: 02 February, 2012

 (Date)

Compiled by: Rajesh Nair

 (Name of respondent)

**Task 4.1.1 Physical Sensors**

(\* Please provide a separate sheet for each parameter)

Part b: Calibration

Parameter/measurand\*: Conductivity (salinity).

Unit of measurement: Siemens/meter (S m-1).

Range: 2 to 42 (equivalent PSS salinity).

Accuracy: 0.002 (equivalent PSS salinity).

Precision: 0.001 (equivalent PSS salinity).

Calibration uncertainty (if available): 0.00034 S m-1 (expanded uncertainty, k = 2).

 1. How often do you calibrate the sensor/s or sensor system/s you are presently using for the specified parameter/measurand: please list the typical calibration interval/s you are employing; note that if you are calibrating irregularly, kindly specify why and when (e.g. before a deployment, following a malfunction, etc.).

Once every 6 months;

Prior to deployment or following a malfunction, always.

 2. Please provide a brief description of the calibration setup, including a list of the principal equipment, reference material (certified and/or conventionally accepted) and instrumentation involved in a typical calibration operation.

|  |  |
| --- | --- |
| **Test instrumentation** | **Specifications** |
| Hart 7052 Seawater Calibration Bath | Range: -10.00 to 110.00°CStability: >±0.001°C |
| Guildline 5010 Seawater Calibration Bath | Range: -9.90 to 65.00°CStability: ±0.002°C over 24 hours |
| Hart 1590 Precision Digital Thermometer withMetal-sheath SPRT (Rosemount 162CE / Hart 5699) | Range: 0.00 to 30.00°CAccuracy: > ±0.0015°C |
| SBE41 CP-OGS Conductivity & Temperature Monitor | Range: 0.00 to 6.000 S m-1Accuracy: > ±0.0003 S m-1 |
| Laboratory Salinometer (Guildline Autosal 8400B) | Range: 0.005 to 42 (PSS)Accuracy: > ±0.002 (PSS) over 24 hours |

|  |
| --- |
| **Reference Material** |
| IAPSO Standard Seawater |

3. Do you employ reference material which are mutable or unstable

(e.g. secondary standards, reagent solutions, gas mixtures,

pressure generators, etc.) to calibrate the sensor/s or sensor system/s

you are presently using for the specified parameter/measurand. **No**

(if **Yes**, please list the types of this kind of reference material you are employing; kindly specify also the measures you take to guarantee the reliability of the reference material in terms of batch-to-batch uniformity of characteristics)

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(Add lines as necessary)

 4. In your view, does your facility ensure an effective traceability chain for the

specified parameter/measurand? **Yes**

 5. Please provide a brief description of the procedures employed to ensure adherence of the performances of the principal equipment and reference instrumentation of the calibration setup to factory specifications (in-house monitoring of performance, in loco re-calibration, servicing by the manufacturer, etc.).

All of the elements of the reference measuring systems are maintained to within declared specifications by regular in-house monitoring of their performances, adhering to recommended usage and upkeep practices, and scheduling servicing with a manufacturer immediately when laboratory quality assurance procedures indicate a developing problem.

 6. Does your facility maintain a Manual with a description of the calibration method

and the measuring procedures, together with details of sample treatment and

preparation when these steps are present? **Yes**

(If **Yes**, kindly attach a copy to the completed questionnaire, otherwise please provide a short, description below)

The manual is an internal document requiring authorization for release, and is written in Italian. Kindly refer to the contact-person for further information.

 7. In your view, is regular factory calibration/servicing necessary to obtain

optimal performances from your sensors/instrumentation for the

specified parameter/measurand in the field? **Yes**

(If **Yes**, please provide details of the sensors/instrumentation, indicating also the intervals you recommend for factory calibration/servicing, below)

 Hart 1590 Precision Digital Thermometer: factory calibration/servicing every 2/3 years

 Metal-sheath SPRT

(Hart 5699): factory calibration/servicing every 3 years.

 Laboratory Salinometer (Guildline Autosal 8400B): factory servicing/alignment every 2 years.

 8. Do you perform field calibrations for the specified parameter/measurand? **No**

(If **Yes**, please provide a brief description of the method and procedures)

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(Add lines as necessary)

 9. Does your facility perform:

* internal quality audits to monitor and assess its

 calibration system for the specified parameter? **Yes**

 - independent quality audits to monitor and assess its

 calibration system for the specified parameter? **Yes**

(If **Yes** to any of the above, please provide a brief description of the procedure/s applied, including a list of the principal equipment and instrumentation involved)

The Rosemount 162CE SPRT is checked and, when necessary, recalibrated to subrange 11 (0.018– 29.76468C) of the International Temperature Scale of 1990 (ITS-90) using a Hart Scientific 5901 Triple Point of Water Cell and a Hart Scientific 5943 Gallium Melting Point Cell. The 1590 Precision Digital Thermometer is controlled using an externally calibrated, certified Hart Scientific 5699 SPRT with the same ITS-90 fixed-point cells. This SPRT also serves as an independent temperature reference for comparisons if required. The Guildline

8400B Salinometer is standardized using a bottle of IAPSO P-Series Normal Standard Seawater (salinity = 35) prior to every salinity sample analysis run. Immediately after

standardization, a bottle of IAPSO 38H-Series High Salinity Standard Seawater (salinity = 38) is measured to determine the instrument offset and linearity in the characteristic salinity range of the Mediterranean Sea where we operate. The standardization and the offset and linearity checks are always repeated every 24 h during testing. A full-scale linearity check of the salinometer (10 ≤ salinity ≤ 38) is performed at least once every 6 months in-between returns to the factory employing IAPSO P-Series, 10L-Series (salinity = 10), 30L-Series (salinity = 30), and 38H-Series Standard Seawaters.

10. Does your facility actively maintain an archive containing issued calibration

reports/certificates for the specified parameter/measurand? **Yes**

(If **Yes**, please specify the document retention time/s)

Retention time for documents (reports/certificates): Indefinite.

11. Do you have any suggestions or ideas for improving the quality of your

calibrations for any particular sensor/sensor system you are presently using

for the specified parameter/measurand (e.g. innovative reference material,

modifications to existing methodologies or new methodologies

you have developed, etc.)? **No**

(if **Yes**, please provide a brief description of your ideas and/or suggestions, including the details of the sensor/s or sensor system/s)

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(Add lines as necessary)

12. Do you have any suggestions or ideas for improving the general quality

of the calibration of sensors or instruments for measuring the specified

parameter/measurand (e.g. testing and promoting the use of new

reference material, development of new methodologies, etc.)? **No**

(if **Yes**, please provide a brief description of your ideas and/or suggestions) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(Add lines as necessary)

Submitted on: 02 February, 2012

 (Date)

Compiled by: Rajesh Nair

 (Name of respondent)