

Technical Specifications Deep Argo Profiling Floats

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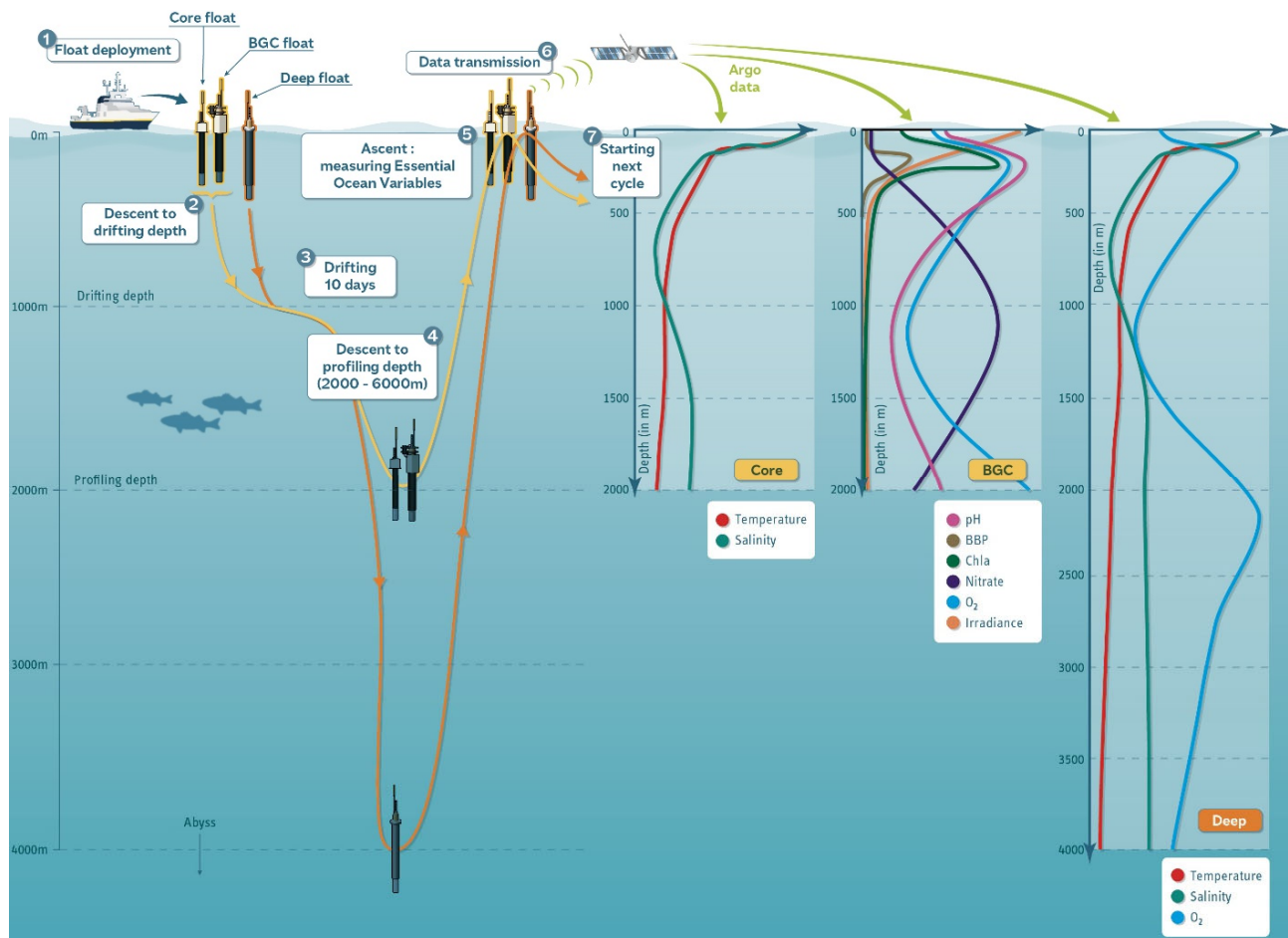
1. Reference documents

- [1] International Argo Program: <https://argo.ucsd.edu>
- [2] Argo-France Program: <https://www.argo-france.fr>
- [3] OneArgo: <https://doi.org/10.3389/fmars.2019.00439>

2. Deep Argo profiling float description

The specifications set out below concern the supply, delivery, maintenance and reconditioning of Deep Argo profiling floats to be acquired by Ifremer through the Argo-France program [2].

The Deep Argo profiling float required must meet the specifications of the international Argo program in its Deep extensions as part of OneArgo ([1], [3]), i.e. the ability of delivering Argo T,S, and O₂ profiles at a minimum depth of 4000m as recalled in the diagram below:



3. Details of technical requirements

The tenderer is required to answer and eventually provide details for all specific requirements below. This shall be done by filling the compliancy table.

The level of compliancy for each requirement must be tagged as FC for Full Compliancy, PC for Partial Compliancy and NC for No Compliancy. In case of FC or PC, detailed explanations are requested with cross-references to the proposals or user manual's text.

For the technical evaluation, each requirement will be scored on a scale from 1 to 5. The score for each requirement is specified in the table (Nmax score).

Deployment

- [R1] The float can be deployed in any oceanic waters ranging from density $1017 \text{ kg.m}^{-3} < \sigma < 1038 \text{ kg.m}^{-3}$ without the need of any prior factory ballasting or initial mass adjustment.
- [R2] The activation of the float shall be as simple as possible (e.g., magnetic switch) without the need of any wired connection to the float.
- [R3] Upon activation, the float shall perform enough self-tests to ensure that it is fully ready for deployment. The completion of those tests should be quick enough (under 5 min) and upon successful testing the float shall emit a clear signal (audible/optical) to the operator.
- [R4] The float shall transmit all self-tests results and/or prelude to its mission including any updates carried out by remote control.

Cycling

- [R5] The float shall have the possibility to alternate different cycling schemes (user programmable).
- [R6] A pressure sensor reset offset mechanism is implemented. Any existing pressure drift observed at the surface shall be offset before the next dive. The pressure value shall be reset to 0 and the difference from the actual value shall be recorded and transmitted.
- [R7] The float shall be able to manage groundings on the seabed autonomously during all its phases. Several grounding scenarios may be proposed.
- [R8] To ensure the integrity of the floats in case of unexpected grounding on the seabed, the manufacturers are asked to certify that their floats are able to survive to groundings, meaning that the float by its construction is able to pursue its operational life.
- [R9] The float shall have a built-in algorithm to handle sea ice at the surface. The ice avoidance solutions shall be accurately described.
- [R10] The float shall acquire its profile data at user-defined intervals on ascent. The minimum available interval shall be at least 1 dbar.
- [R11] The float can also acquire data at user-defined intervals during its other phases: drift, descent to parking and to profiling depth.
- [R12] It shall be possible to activate the sensors in continuous, pulsed or deactivated acquisition mode.
- [R13] It shall be possible to transmit the data of the sensors as raw, decimated or averaged data.
- [R14] The float shall transmit its data acquired during a cycle at the end of the concerned cycle. If data transmission is not possible or incomplete, all data acquired and not transmitted shall be stored in

memory for a next good transmission. The float memory shall allow the storage of at least 60 typical Argo profiles without transmission.

- [R15] At the end of its cycle, the float shall transmit its data and position. It shall have the option to perform a second positioning (after a user programmable delay) before proceeding to the next cycle, in order to assess surface drift.

End-of-life and recovery

- [R16] The normal end of life mode for a float having totally depleted its battery is to stay at depth. Manufacturers are encouraged to provide floats with hardware parts or components that have the least possible impact to the environment (eco-design).
- [R17] The float shall have a “recovery” mode or equivalent. This mode can be activated or deactivated by remote control or automatically enabled in case of serious technical issue at surface or at depth. In recovery mode, the float shall remain at the surface, transmitting its position and technical parameters at programmable regular intervals.
- [R18] The float shall be equipped with gear (e.g., handles) facilitating its recovery at sea.
- [R19] The float shall have visual identification means (e.g., flashlight, reflectors) to maximize its visibility during recovery operations.

Sensors

- [R20] The float shall be equipped with current Argo reference CTD sensors SBE41 or RBR Argo3 (to be specified by the contracting authority at the time the order).
- [R21] As an option to the standard CTD sensor configuration, the float might be equipped with a Dissolved Oxygen concentration sensor of a model currently accepted by the Argo community [1].
- [R22] Should the float be equipped with an optode oxygen sensor, its integration should allow it to be mounted at minimum 20 centimeters above the mean sea level and float shall be able to perform dedicated in-air measurements. A description of the proposed solution shall be provided by the manufacturer.
- [R23] Extensive technical data should allow sensor problem diagnostics.

Data Handling, user interface

- [R24] All floats and sensors metadata (serial numbers, calibration coefficients, etc.) shall be provided electronically upon float delivery, using the platform and sensor .json schemas available at: https://github.com/euroargodev/sensor_metadata_json
- [R25] An intuitive interface enabling full programming of the float’s parameters and its sensors settings shall be provided. Such interface should provide theoretical volume of data to be transmitted by satellite (per cycle) according to the settings chosen by the user.
- [R26] An energy budget tool is available to provide theoretical number of cycles and lifetime achieved by the float, according to user-defined configurations and sensors suite.
- [R27] The contractor shall provide a tool to easily decode and visualize all float’s data transmitted by Iridium.

Technical and after sale support

- [R28] A monitoring interface or service shall be provided by the supplier to provide technical diagnostics and alerts on each float.

- [R29] An efficient customer support and service is available. A management system is available to help track issues. A first answer from the technical support is expected within 5 days after initial contact. Additional answers and support shall be provided within 1 month after initial contact.
- [R30] The contractor shall propose and detail adequate hands-on training on the different type of floats.
- [R31] A maintenance service is available for faulty floats/sensors and floats recovered at sea. A first answer and diagnostic from the technical support shall be provided within 1 month after equipment reception at the vendor premises. Additional answers and quotes for maintenance shall be provided within 3 months. Upon agreed maintenance, the equipment shall be delivered to the buyer no longer than 6 months after maintenance order.
- [R32] The contractor shall detail in the Unit Price List for each type of float basic maintenance operations: battery replacement, sensor maintenance / recalibration, hydraulic maintenance, antenna maintenance, etc.

Other general requirements

- [R33] The float shall be theoretically capable of achieving at least 185 10-days cycles (5 years) at 4,000m with continuous CTD only operation during the ascent profile.
- [R34] The supplier must demonstrate that the observed lifetime of the profilers (i.e., past deployments) can meet their theoretical specifications.
- [R35] The contractor shall detail its basic warranty conditions available for all lots and is free to propose any other at-sea warranty he might find appropriate.
- [R36] The contractor shall detail its full factory test procedures before material delivery including possible metrological testing, hyperbaric and pool validation tests.
- [R37] The float shall be delivered packed in a case approved for international transport.
- [R38] The battery packs shall meet the requirements of the manual of tests and criteria included in the UN recommendations on the transportation of dangerous goods, Part III, sub-section 38.3.

Index	Short description (refer to main document for full description)	Compliance FC/PC/NC	Details	Nmax score
R1	deployment in oceanic waters of density 1017 kg.m-3 < σ < 1038 kg.m-3			2
R2	simple activation without the need of any wired connection to the float			1
R3	short self-tests + clear signal			1
R4	self-tests transmission			1
R5	alternate different cycling schemes			1
R6	pressure sensor reset offset mechanism			2
R7	manage groundings			1
R8	floats are able to survive to groundings			1
R9	ice avoidance solutions			3
R10	acquire its profile data at user-defined intervals on ascent			1
R11	acquire data at user-defined intervals during its other phases			1
R12	activate the sensors in different modes			1
R13	transmit the data in raw, decimated or averaged			1
R14	transmission + memory			1
R15	second positioning before descent			1
R16	stay at depth at death			1
R17	recovery mode			1
R18	gear (e.g., handles) facilitating its recovery			2
R19	visual identification means to maximize visibility during recovery			2
R20	CTD sensors SBE41 or RBR Argo3			4
R21	optional Dissolved Oxygen			4
R22	DO in-air measurement at minimum 20 centimeters above water			1
R23	sensor problem diagnostics			1
R24	float and sensors metadata electronically .json schemas			5
R25	intuitive interface for programming			3
R26	energy budget tool			3
R27	decoding & visualization tool			3
R28	monitoring interface or service			1
R29	efficient customer support			5
R30	hands-on training			1
R31	maintenance service			4
R32	Unit Price List for each type of float basic maintenance operations			1
R33	185 cycles at 4000m			1
R34	observed lifetime			3
R35	warranty conditions			2
R36	factory test procedures			1
R37	case approved for international transport			1
R38	battery packs transport requirements			5