Technical Specifications (In-Cash Procurement)

Technical Specification for Engineering Support on Instrumentation, TF Coils and Magnet Supports

This technical specification describes Engineering Work support for the Instrumentation of Coils and Feeders for the SS&A section of the Magnet Division and includes the preparation of Technical Specifications, technical support during calls for tender and contract follow-up outside of the IO premises in the different Member Countries.

<table>
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<tr>
<th>Approval Process</th>
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<tr>
<td><strong>Name</strong></td>
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<td><strong>Signatory</strong></td>
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<td><strong>Co-signatories</strong></td>
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<td><strong>Approver</strong></td>
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Document Security: level 1 (IO unclassified)

RO: Foucher de Brandois Cécile

Read Access: RO, project administrator, LG: Admin Tokamak, LG: Magnet division's external secretary, LG: Magnet external, LG: Finance, GG: IO DDGs (and Senior Advisors), AD: Division - Procurement and Contract, AD: Division - Magnet
# Table of Contents

1 PURPOSE...............................................................................................................................2  
  1.1 Background..........................................................................................................................2  

2 SCOPE ..................................................................................................................................2  
  2.1 Main tasks: Instrumentation procurement support ...............................................................2  
  2.2 Tasks related to the TF coils and structures.........................................................................3  
  2.3 Tasks related to Magnet supports..........................................................................................4  
  2.4 Other Engineering support tasks............................................................................................4  

3 DEFINITIONS.......................................................................................................................4  

4 REFERENCES.......................................................................................................................4  

5 ESTIMATED DURATION........................................................................................................4  

6 WORK DESCRIPTION.........................................................................................................4  
  6.1 Instrumentation Tasks............................................................................................................4  
  6.2 Other Engineering Support Tasks..........................................................................................5  

7 RESPONSIBILITIES.............................................................................................................5  

8 LIST OF DELIVERABLES AND DUE DATES ......................................................................5  
  8.1 Instrumentation-related deliverables .....................................................................................5  
  8.2 TF Coil and Structure-related deliverables ............................................................................5  
  8.3 Magnet support-related deliverables......................................................................................5  
  8.4 Engineering support-related deliverables ..............................................................................5  

9 ACCEPTANCE CRITERIA........................................................................................................6  

10 SPECIFIC REQUIREMENTS AND CONDITIONS............................................................6  

11 WORK MONITORING / MEETING SCHEDULE..............................................................6  

12 PAYMENT SCHEDULE / COST AND DELIVERY TIME BREAKDOWN........................6  

13 QUALITY ASSURANCE (QA) REQUIREMENT....................................................................6
1 Purpose

The primary purpose of the contract is to cover the need for Engineering Work in the Magnet Division related to the Instrumentation of the Coils and Feeders of the ITER Magnet System in order to guarantee the availability of the instrumentation components according to the technical, quality and schedule requirements.

The secondary purpose is to provide support in the domain of TF coil and structure manufacturing.

1.1 Background

Instrumentation and Control (I & C) components are required in the Magnet Systems (coils, feeders, structures, electronics cubicles) for safety, investment protection, control actions and system monitoring in order to contribute to the reliable operation of the ITER machine.

The instrumentation of the ITER magnets includes the following components:

a) Voltage taps for quench detection and their protection resistances,
b) Co-wound tapes around the superconducting cables for quench detection,
c) Sensors for temperature measurements on superconducting cables, current leads, thermal shields and structures,
d) Sensors for pressure measurements at the inlets and outlets of the cooling circuits,
e) Flow meters for mass flow measurements, mainly on the return lines of the cooling circuits,
f) Strain gages, displacement sensors and contactless optical sensors to monitor the behaviour of the structures,
g) Insulating Breaks, both at room and low temperature,
h) Electrical Heaters for Current Leads,
i) Feedthroughs for electrical wires and pressure tap pipes,
j) Valves.

The procurement for the Magnet I&C System is entirely budgeted In Fund. All sensors, instrumentation cables, conventional control systems, quench detection systems, etc. are procured directly by the ITER Organization.

Part of the Instrumentation shall be delivered to the DAs for integration according to the signed PAs in compliance with the official schedules. The remaining part will be used during the assembly phase on the ITER site.

2 Scope

The scope of the work is divided into different tasks as described below.

2.1 Main tasks: Instrumentation procurement support

These tasks shall represent 60% of the contractor’s working time.

a) Preparation of Technical Specifications for the series procurements of the instrumentation as listed in Table 1.
b) Preparation of the assembly procedures that describe how to integrate and install the different instrumentation components in the coils, feeders and structures (see detailed list in Table 1).
c) Preparation of the individual test procedures for each instrumentation item after installation (see detailed list in Table 1).
d) Preparation of the installation procedures and rules to follow for all the wiring done at the IO premises (only for the thermo-mechanical instrumentation of the structures). (See Table 1.)

Table 1 – List of documents for Instrumentation

<table>
<thead>
<tr>
<th>Item</th>
<th>Preparation of the specifications for the series procurements</th>
<th>Preparation of the assembly procedures that describe the integration and installation of the different instrumentations in the coils, feeders and structures</th>
<th>Preparation of the individual test procedures for each item after installation</th>
<th>Preparation of the installation procedures and rules to follow for all the wiring done at the IO premises (only for the thermo-mechanical instrumentation of the structures)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulating Breaks</td>
<td>31-Sep-12</td>
<td>17-Jan-13</td>
<td>07-May-13</td>
<td>07-Sep-13</td>
</tr>
<tr>
<td>Laser Distancemeters</td>
<td>30-Mar-13</td>
<td>17-Jan-13</td>
<td>07-May-13</td>
<td>07-Sep-13</td>
</tr>
<tr>
<td>Capacitive sensors</td>
<td>30-Mar-13</td>
<td>17-Jan-13</td>
<td>07-May-13</td>
<td>07-Sep-13</td>
</tr>
<tr>
<td>Strain Gages and Potentiometers</td>
<td>30-Mar-13</td>
<td>17-Jan-13</td>
<td>07-May-13</td>
<td>07-Sep-13</td>
</tr>
<tr>
<td>Optical Systems (incl. fibres)</td>
<td>30-Mar-13</td>
<td>17-Jan-13</td>
<td>07-May-13</td>
<td>07-Sep-13</td>
</tr>
<tr>
<td>Temperature sensors</td>
<td>31-Oct-12</td>
<td>20-Aug-13</td>
<td>08-Dec-13</td>
<td>08-May-14</td>
</tr>
<tr>
<td>Instrumentation Plugs</td>
<td>31-Dec-12</td>
<td>02-Dec-13</td>
<td></td>
<td>22-Mar-14</td>
</tr>
<tr>
<td>Voltage taps and Current Limiting Resistors</td>
<td>30-Sep-12</td>
<td>17-Nov-13</td>
<td>07-Mar-14</td>
<td>07-Sep-13</td>
</tr>
<tr>
<td>Quench detectors</td>
<td>31-Jun-13</td>
<td>20-Jul-14</td>
<td>07-Nov-14</td>
<td>07-Sep-13</td>
</tr>
<tr>
<td>HV Feedthroughs</td>
<td>30-Mar-13</td>
<td>20-Aug-13</td>
<td>08-Dec-13</td>
<td>08-May-14</td>
</tr>
<tr>
<td>LV Feedthroughs</td>
<td>31-Dec-13</td>
<td>19-Sep-13</td>
<td>07-Jan-14</td>
<td>07-Sep-13</td>
</tr>
<tr>
<td>HV Cables</td>
<td>30-Nov-13</td>
<td>04-Jul-13</td>
<td>22-Oct-13</td>
<td>07-Sep-13</td>
</tr>
<tr>
<td>LV cables</td>
<td>31-Oct-12</td>
<td>19-Sep-13</td>
<td>07-Jan-14</td>
<td>07-Sep-13</td>
</tr>
<tr>
<td>Co-wound tapes</td>
<td>30-Sep-12</td>
<td>17-Jan-14</td>
<td>07-May-14</td>
<td>07-Sep-13</td>
</tr>
<tr>
<td>Flow metres + conditionners</td>
<td>30-Nov-12</td>
<td>19-Jun-13</td>
<td>07-Oct-13</td>
<td>07-Sep-13</td>
</tr>
<tr>
<td>Pressure transducers + conditionners</td>
<td>30-Nov-12</td>
<td>19-Jun-13</td>
<td>07-Oct-13</td>
<td>07-Sep-13</td>
</tr>
<tr>
<td>Cubicles</td>
<td>30-Sep-15</td>
<td>19-Jul-16</td>
<td>06-Nov-16</td>
<td>07-Sep-13</td>
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<tr>
<td>PLC</td>
<td>30-Sep-14</td>
<td>21-Apr-15</td>
<td>09-Aug-15</td>
<td>07-Sep-13</td>
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</tbody>
</table>

e) Technical support during calls for tender;
f) Contract follow-up outside of the IO premises in the different Member Countries during the qualification and production phases.

Each instrumentation system has to comply with all necessary technical requirements, applicable standards and law requirements.

2.2 Tasks related to the TF coils and structures

These tasks shall represent 25% of the Contractor’s working time.

a) Active participation in the analysis of the detailed TF winding and structure production schedules in collaboration with the EU and JA DAs for the mitigation of delays and risks;
b) Follow-up of intermediate acceptance tests during qualification and quality control; feedback of the lessons learnt into series production;

c) Participation in the discussions with the DAs related to the definition of acceptance tests (high voltage, leak testing, Paschen test) according to the technical specifications;

d) Writing of documentation describing the tolerance analysis, integration and installation of the windings into TF cases during the magnet insertion and assembly process.

2.3 Tasks related to Magnet supports

These tasks shall represent 10% of the Contractor’s working time.

a) Active participation in the analysis of the detailed Magnet Support production schedule in collaboration with the CN DA for the mitigation of delays and risks;

b) Follow-up of the intermediate acceptance tests for the qualification and quality control of the material, welding and machining; feedback of the lessons learnt into series production.

2.4 Other Engineering support tasks

These tasks will represent 5% of the Contractor’s working time

a) Support in the review and improvement of Detailed Work Schedules;

b) Support in the development of solutions for critical issues related to the design, manufacturing, QA, safety, acceptance tests, delivery and assembly of superconductive components, i.e. cables, coils and feeders.

c) Support for technical integration issues.

3 Definitions

IO: ITER Organization
DA: Domestic Agency
DWS: Detailed Work Schedules
QA: Quality Assurance
IDM: ITER Document Management system

4 References

Not applicable.

5 Estimated Duration

The contract duration shall be 2 years, ideally starting in September 2012. The IO may extend these services for an additional period of one year.

6 Work Description

6.1 Instrumentation Tasks

The deliverables corresponding to the documents listed in Table 1 shall be prepared according to the quality standards of the ITER project and using the corresponding templates. They shall be submitted in IDM for official review by the IO.

The different versions of the documents shall be tracked in order to have full traceability.
The list provided in Table 1 is not exhaustive as other documents related to the procurement process may also be required as needed (these are for instance explanatory notes that accompany the technical specifications, cost breakdowns, visit reports, notes, etc.). Should drawings or models be required, the contractor shall be responsible for providing the input to and liaising with the ITER Design Office to perform the corresponding actions.

6.2 TF Coil and Structure Tasks

The deliverables corresponding to these Tasks shall be prepared according to the quality standards of the ITER project and using the corresponding templates. They shall be submitted in IDM for official review by the IO.

The different versions of the documents shall be tracked in order to have full traceability.

Should drawings or models be required, the contractor shall be responsible for providing the input to and liaising with the ITER Design Office to perform the corresponding actions.

6.3 Other Engineering Support Tasks

They will consist in implementing the work required to solve critical issues related to the design, manufacturing, QA, safety, DWS, acceptance tests, delivery, integration and assembly of the superconductive components, i.e. cables, coils and feeders.

7 Responsibilities

Not applicable

8 List of deliverables and due dates

8.1 Instrumentation-related deliverables

Table 1 shows the list of planned documentation deliverables and due dates. As stated in Section 6.1, other documents related to the procurement process shall be delivered on the IO’s request.

In case of follow-up activities for contracts in the DAs, a report shall be provided following each visit.

8.2 TF Coil and Structure-related deliverables

For task a), which is a continuous activity, monthly reports shall be delivered to describe the progresses made.

In the frame of task b), and in line with Phase 2 and Phase 3, individual reports shall be prepared on TFC winding, impregnation qualification and quality control (4 reports expected, one every 6 months).

In the frame of task c), and in line with Phase 2, individual reports shall be prepared acceptance tests (two reports expected in February 2013 and September 2013, respectively).

In the frame of task d), and in line with Phase 2 and Phase 3, individual reports shall be prepared on tolerance and WP insertion specification analysis (one report in February 2013, another in June 2013).

8.3 Magnet support-related deliverables

For task a), which is a continuous activity, monthly reports shall be delivered.
In the frame of task b), and in line with Phase 2 and Phase 3, individual reports shall be prepared on the Quality Control of the magnet support procurement (material, welding process, machining) (reports expected by February 2013, April 2013 and September 2013).

8.4 Engineering support-related deliverables
A monthly report shall be delivered for tasks described in 6.2.

9 Acceptance Criteria
After delivery, the IO shall have two calendar weeks to accept the documents/reports mentioned in Section 2 and 6. After this delay, and in the absence of any comment from the IO, these documents shall be deemed accepted by the IO.

10 Specific requirements and conditions
In terms of qualification and experience, the contractor shall:
- have at least 20 years’ post graduate experience in electrical engineering applications related to problems associated with superconductivity, cryogenics and vacuum systems;
- be familiar with magnet design manufacturing, testing and superconductivity;
- be proficient in English to communicate and write technical reports and specifications in English.

Other requirements:
- A work plan shall be established and agreed by the IO every two months. Travelling and missions shall be only upon agreement with the IO;
- This contract shall be executed by a single staff. Splitting it into parts and sharing those between several parties or individuals is not permitted;
- The staff working on this contract shall be available full time and deployed on the IO site in St Paul-lez-Durance, France.

11 Work Monitoring / Meeting Schedule
Regular meetings will take place to make sure that all the information required for the development of the activities is available; the frequency of those meetings should be at least once a week.

12 Payment schedule / Cost and delivery time breakdown
The deliverables shall be provided to the IO as specified in Table 1 and Section 8: List of deliverables and due dates.
For travel, subsistence and other expenditure incurred in the mission done by the Contractor personnel to accomplish the work entrusted by the IO, a budget of 10 k€ per year is fixed. Cost will be sustained by the Contractor, and then invoiced to the IO.
Monthly payments are foreseen after delivery of the corresponding reports as specified above.

13 Quality Assurance (QA) requirement
The organisation conducting these activities should have an ITER approved QA Program or an ISO 9001 accredited quality system.
The general requirements are detailed in ITER Procurement Quality Requirements (ITER_D_22MFG4).

Prior to commencement of the task, a Quality Plan must be submitted for IO approval giving evidence of the above and describing the organisation for this task; the skill of workers involved in the study; any anticipated sub-contractors; and giving details of who will be the independent checker of the activities (see Procurement Requirements for Producing a Quality Plan (ITER_D_22MFMW)).

Prior to commencement of any manufacturing, a Manufacturing and Inspection Plan must be approved by ITER who will mark up any planned interventions (see Requirements for Preparing and Implementing a Manufacturing and Inspection Plan (ITER_D_22MDZD)).

Deviations and Non-conformities will follow the procedure detailed in ITER Requirements Regarding Contractors Deviations and Non Conformities (ITER_D_22F53X).

Prior to delivery of any manufactured items to the IO Site, a Release Note must be signed in accordance with ITER Requirements Regarding Contractors Release Notes (ITER_D_22F52F).

Documentation developed as the result of this task shall be retained by the performer of the task or the DA organization for a minimum of 5 years and then may be discarded at the direction of the IO. The use of computer software to perform a safety basis task activity such as analysis and/or modelling, etc. shall be reviewed and approved by the IO prior to its use, in accordance with Quality Assurance for ITER Safety Codes (ITER_D_258LKL).