Route de Vinon-sur-Verdon - CS 90 046 - 13067 St Paul Lez Durance Cedex - France

TECHNICAL SUMMARY

Supply Contract

In-Vessel Clamps and Marshalling Area Connectors Manufacturing

IO/21/CFT/10021589/LLU

1 Scope

The Diagnostic Electrical Services provide signal and power transmission lines to link vital diagnostic sensors and instrumentation in the ITER Vacuum Vessel with their associated electronics and power supplies in the surrounding buildings. This contract focusses on the In-Vessel Electrical Services (55.NE.V0) for cables in the marshalling areas of upper ports, lower ports and the lower region of the vacuum vessel: work package C3. The scope of work includes the manufacturing design and supply of connector housings, cable supports and cable ancillaries.

Tenderers will be expected to demonstrate their ability in manufacturing small and medium range series of components and deliver assembly kits of components for use in ultra-high vacuum and to highest quality standards.

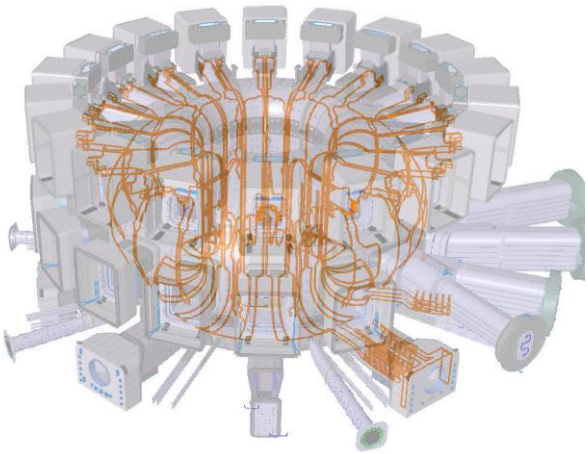

Figure 1 Overview of in-vessel electrical services within the vacuum vessel

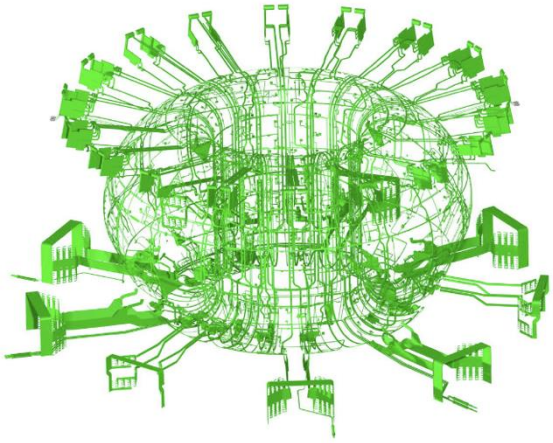

Figure 2 Overview of the diagnostics and in-vessel electrical services

2 Estimated Duration

The ITER Organization (IO) plans to award a Contract before during the second quarter of 2022. The estimated contract duration is 2 years including successive delivery batches over the last 6 months.

3 Indicative Schedule of this Call for Tender

The indicative Call for Tender milestones are:

Call for Nomination	July 2021
Issuing of Prequalification invitations	End of July 2021
Issuing of Call for Tender	End of October 2021
Submission of Tenders	Beginning of 2022
Award of Contract	Beginning of May 2022

4 Work Description

The selected contractor will be required to work on a range of tasks, including:

- **Phase 1 Manufacturing design**
  - Production of a quality assurance plan
  - Production of 3D CAD models, 2D drawings for manufacturing purpose based on input models and drawings provided by IO;
  - Preparation of manufacturing documentation (e.g. MIPs, manufacturing specifications…);
  - Production of a clean workplan in line with IO vacuum handbook and applicable requirements.
  - Production of prototypes
  - Preparation of manufacturing readiness review
- **Phase 2 Supply**
  - procuring the raw material and parts (according to IO specification),
  - machining components,
  - cleaning of the parts based on clean workplan,
  - quality control
  - outgassing testing,
  - Preparation and submission of delivery documentation
  - Packing in assembly kits and delivery in the frame of the clean workplan.

5 Description of the components

This procurement contract focusses on parts of the Diagnostic Electrical Services inside the ITER Vacuum Vessel, attached to its inner surfaces (55.NE.V0) and located in the lower and upper region: inside the vessel and in upper ports and lower ports. These components will be exposed during operation to radiation, high magnetic fields and temperature cycling. They shall comply with strict restriction in the selection of materials and cleanliness all along the manufacturing process to ensure suitability for ultra-high vacuum. The selection of materials includes limitation in the level of impurities: e.g. Cobalt, Niobium and Tantalum impurity content in stainless steel, often requiring specific material orders.

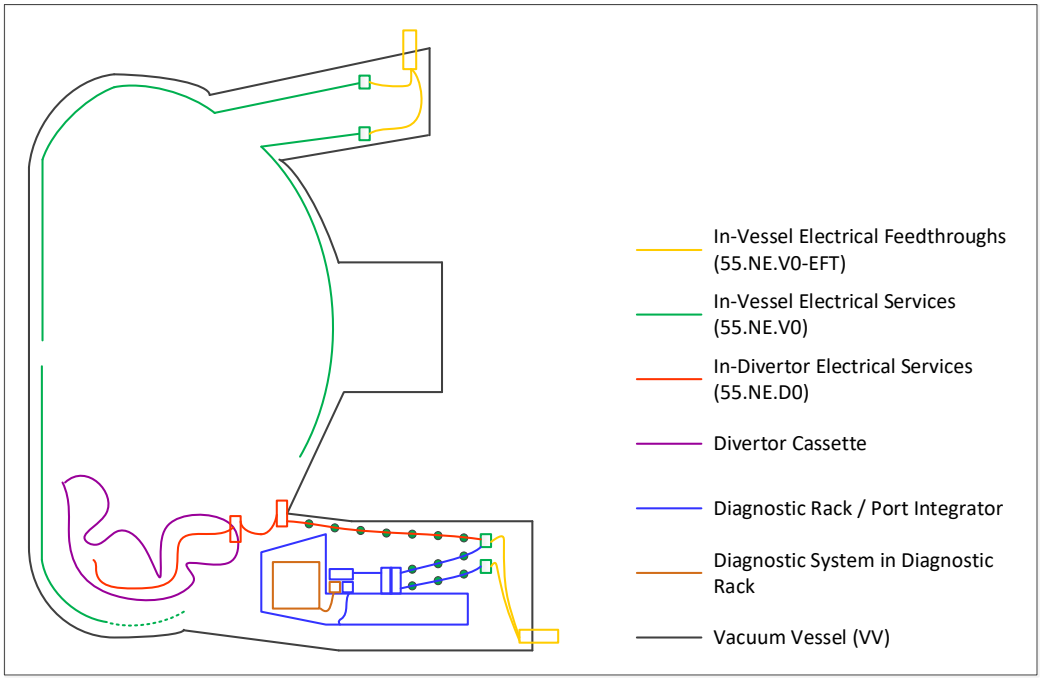

Figure 3 schematic of ITER vacuum vessel section and in-vessel electrical services

The 55.NE.V0 Electrical services are not safety classified because they do not form part of the vacuum boundary. However, due to the classification of the vacuum vessel, the candidate shall acknowledge relevant policies and regulations; further information is provided in section 7.

The candidate having a quality assurance program ISO 9001 or equivalent, shall implement works to the highest quality standards to reflect the quality program of the ITER Organization.

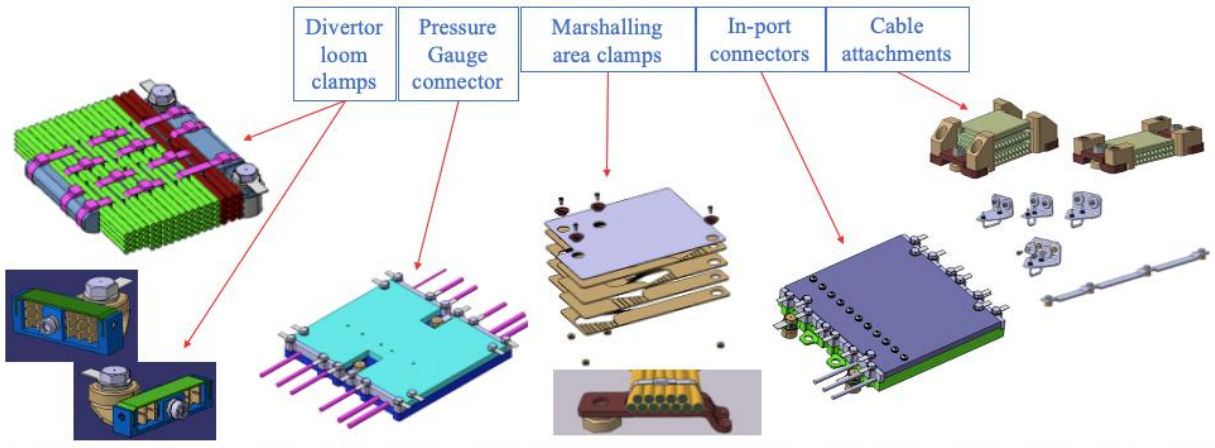

Figure 4 type of components included in the scope of work

The various components included in work package C3 (Figure 4) include:

- Cable loom clamps
- In-port connectors and pressure gauge junction box
- Marshalling area clamps
- Cable attachments and ancillaries

These types of components are described in more details below. Variants and indicative quantities are provided with the purpose of assessing the volume of manufacturing. Quantities may vary during the final implementation of components to the 3D mock-up.

5.1 Cable loom clamps

Table 1 Variants and quantities of cable clamps

Variants	Quantity[1]
Central Cassette 2-2 OD6 clamp (Var 1)	208
Central Cassette 3-2 OD5 clamp (Var 2)	218
Central Cassette 4-3 OD3 clamp (Var 3)	306
Divertor loom clamp Var 1	39
Divertor loom clamp Var 2	152
Divertor loom clamp Var 3	18
Divertor loom clamp Var 4	18
Divertor loom clamp Var 5	115
Diag Rack loom clamp	44

Central cassette clamps (Figure 5) have a body made of CuCrZr. Other parts shall be made of stainless steel, while bolts are made of alloy 660. The typical size of a central cassette clamp is 70x60x15mm. The parts include standard M6 bolts, lock washers and grub screws.

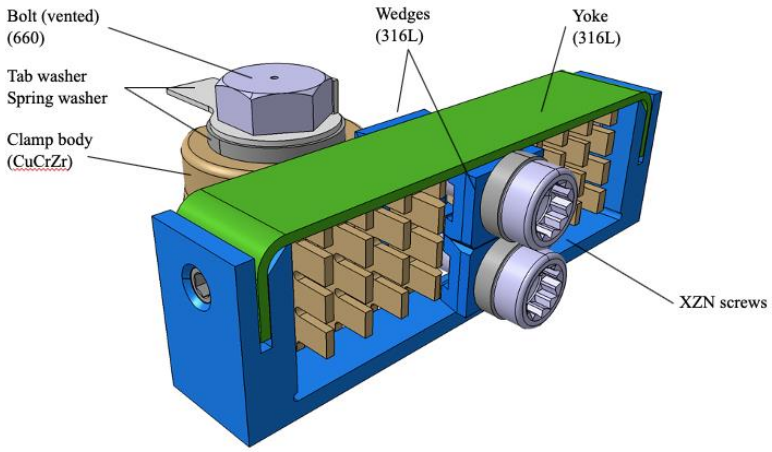

Figure 5 Central cassette clamps

Divertor loom clamps (Figure 6) have a stainless-steel body made of 316L characterized by precise dimensional tolerances. The assembly kit shall include stainless steel cable ties with a dimple lock.

[1] Indicative quantity not including spares

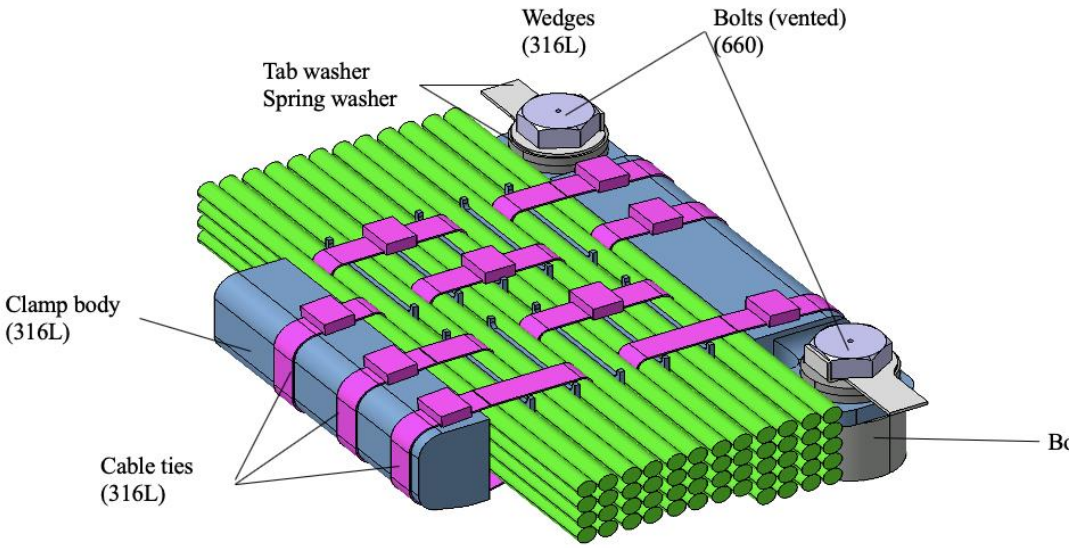

Figure 6 A divertor loom clamp

5.2 In-port connectors and pressure gauge junction box

Table 2 Variants and quantities of in-port connectors and pressure gauge junction box

Component name	Quantity[2]
In-Port Connector (1.6mm)	8
In-Port Connector (2mm)	2
In-Port Connector (3mm/4mm)	361
In-Port Connector (5mm) Filament power	16
In-Port Connector (5mm) Triaxial	12
In-Port Connector (6mm) RF	44
Pressure Gauge JB	16

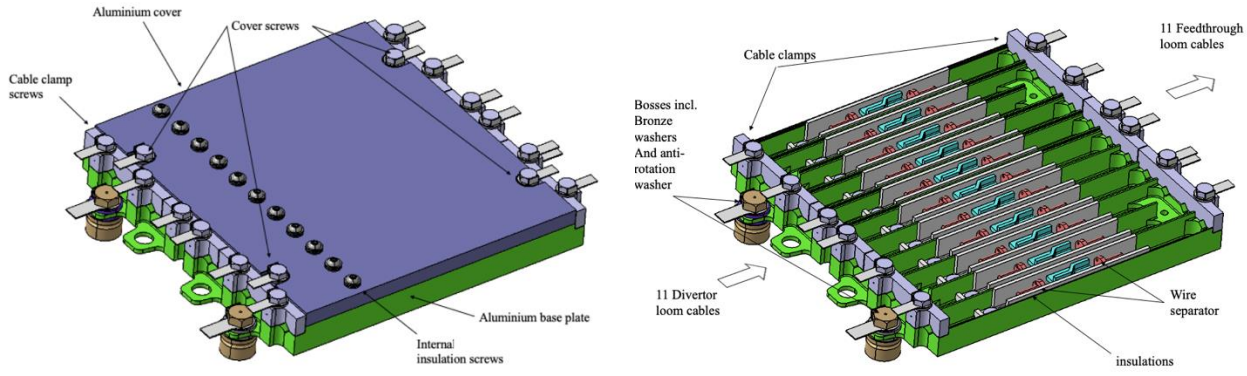

Figure 7 An in-port connector (3mm/4mm variant)

In-port connector housings and lids are made of aluminium or CuCrZr (for filament power variant only). Internal insulations shall be made of Vespel® or equivalent material. The in-port connector have standard parts including stainless steel and alloy 660 screws,

[2] Indicative quantity not including spares

lock-washers and spring washers. The typical size of an in-port connector is 160x150x20mm.

The pressure gauge junction box is similar to in-port connectors however its housing is made of stainless-steel grade 316L.

5.3 Marshalling area clamps

Table 3 Variants and quantities of marshalling area clamps

Component name	Quantity[3]
Divertor loom marshalling clamp	543
Upper Inboard Marshalling plate kit 1L	12
Upper Inboard Marshalling plate kit 2R	11
Upper Inboard Marshalling plate kit 3L VS	4
Upper Inboard Marshalling plate kit 4L CLIP	1
Upper Inboard Marshalling plate kit 5R CLIP	3
Outboard Marshalling plate kit 1L	13
Outboard Marshalling plate kit 2R	18
Outboard Marshalling plate kit 3L VS	4
Lower Inboard Marshalling plate kit 1L	13
Lower Inboard Marshalling plate kit 2R	12
Lower Inboard Marshalling plate kit 3R HC	2

Marshalling area clamps are made of stainless steel 316L and aluminium. They include standard stainless-steel screws and washers. The typical size of a marshalling area kit is in the range of 300x400x40mm.

5.4 Cable attachments and ancillaries

Table 4 Variants and quantities of cable attachments and ancillaries

Component name	Quantity[4]
Feedthrough loom clamp L1	122
Feedthrough loom clamp L2	328
Feedthrough loom clamp L3	117
Feedthrough loom clamp L4	53
Feedthrough loom clamp L5	100
Feedthrough loom clamp L6	14
Feedthrough loom clamp L1 Wide I	11
Feedthrough loom clamp L2 Wide M	6
Feedthrough loom clamp L3 Wide J	6
Feedthrough loom clamp L4 Wide H/L	28
Feedthrough loom clamp L5 Wide D/O	26

[3] Indicative quantity not including spares
[4] Indicative quantity not including spares

Feedthrough loom clamp L6 Wide P	4
Feedthrough loom clamp 5mm L2 Narrow	16
Feedthrough loom clamp 5mm L2	37
Feedthrough loom clamp Circular Single	9
Feedthrough loom clamp Circular Double	21
Feedthrough loom clamp Circular Triple	6
UP shielding plates	16

The variants of feedthrough cable attachment range from single stainless steel tie attachments to threaded rod type attachments not requiring milling. UP shielding plates are made of CuCrZr.

Noteworthy, the cabling and parts directly welded onto the vacuum vessel (in-vessel clips, studs and bosses) represented above are in manufacturing, through contracts managed by one of ITER's Domestic Agencies and therefore out of scope of this contract.

Mineral Insulated cables that interface with the components described above are managed by a different contract and therefore out of scope. The are delivered with terminations at both sides.

6 Specific requirements and conditions

The tenderer shall demonstrate their knowledge, experience and capabilities in the manufacturing and supply of components in accordance with the IO technical requirements, including:

- Experience in manufacturing stainless steel parts for nuclear applications and relevant quality assurance
- Experience in machining electrical insulation parts (polyimide or other materials)
- Experience in preparation of manufacturing dossier.
- Experience in manufacturing parts for use in clean environment (experience dealing with high or ultra-high vacuum components is a significant advantage)
- Experience in manufacturing and follow up for complex, high precision components

The working language of ITER is English, and a fluent professional level is required (spoken and written).

7 Safety requirements

ITER is a Nuclear Facility identified in France by the number-INB-174 ("Installation Nucléaire de Base").

For Protection Important Components and in particular Safety Important Class components (SIC), the French Nuclear Regulation must be observed, in application of the Article 14 of the ITER Agreement.

In such case, the Suppliers and Subcontractors must be informed that:

- The Order 7th February 2012 applies to all the components important for the protection (PIC) and the activities important for the protection (PIA).
- The compliance with the INB-order must be demonstrated in the chain of external contractors.
- In application of article II.2.5.4 of the Order 7th February 2012, contracted activities for supervision purposes are also subject to a supervision and surveillance done by the Nuclear Operator.

For the Protection Important Components, structures and systems of the nuclear facility, and Protection Important Activities the awarded contractor shall ensure that a specific management

system is implemented for his own activities and for the activities done by any Supplier and Subcontractor following the requirements of the Order 7th February 2012.

NOTE: There are no Protection Important Activities (PIAs) within the scope of this work.

8 Candidature

Participation is open to all legal persons participating either individually or in a grouping (consortium) which is established in an ITER Member State. A legal person cannot participate individually or as a consortium partner in more than one application or tender. A consortium may be a permanent, legally-established grouping or a grouping, which has been constituted informally for a specific tender procedure. All members of a consortium (i.e. the leader and all other members) are jointly and severally liable to the ITER Organization.

The consortium groupings shall be presented at the pre-qualification stage. The tenderer's composition cannot be modified without the approval of the ITER Organization after the pre-qualification.

Legal entities belonging to the same legal grouping are allowed to participate separately if they are able to demonstrate independent technical and financial capacities. Candidates (individual or consortium) must comply with the selection criteria. The IO reserves the right to disregard duplicated reference projects and may exclude such legal entities from the pre-qualification procedure.

9 . Reference

Further information on the ITER Organization procurement can be found at:

http://www.iter.org/org/team/adm/proc