



# Procurement of Optical Fiber Feedthroughs

## Call for Nomination (CFN) Summary of Technical Specifications

### 1 Purpose

The purpose of this contract is the procurement of Optical Fiber Feedthroughs.

### 2 Background

ITER is a magnetic fusion device, based on the so-called “Tokamak” concept, that has been designed to prove the feasibility of fusion as a large-scale and carbon-free source of energy based on the same principle that powers our Sun and stars. The ITER Members - China, the European Union, India, Japan, Korea, Russia and the United States - are now engaged in a 35-years collaboration to build and operate the ITER experimental device, and together bring fusion to the point where a demonstration fusion reactor can be designed. General information on the scope and design of the ITER machine is described in the [www.iter.org](http://www.iter.org) website.

ITER internal components such as the Blanket, Divertor and First Plasma Protection Components are located inside the vacuum Vessel (VV). They are equipped with Operational Instrumentation for the measurement of thermal, mechanical and electromagnetic parameters during operation. These measurements are performed by two types of sensors:

- Optical for strain sensors, linear displacement sensors, temperature sensors;
- Electrical for Rogowski coils, magnetic flux loops, thermocouples.

The Optical Fiber Feedthrough (OFF) allows the transmission of measured signals from optical fiber sensors located in the VV to the data acquisition system by routing the optical fibers through the VV barrier.

The optical fibers connected to sensors will be routed from the inside of the VV using Optical Fiber Feedthrough located at the VV port wall and containing multiple optical fibers to transmit the optical signals to the Control Cubicles and data acquisition system, see Figure 1.

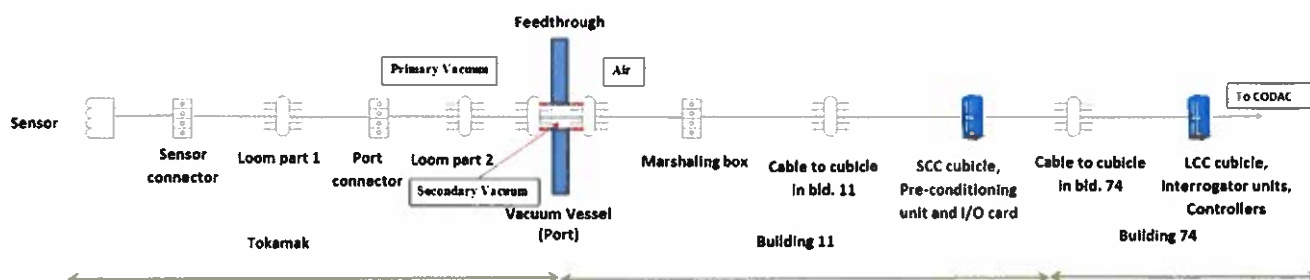


Figure 1. Routing of optical fibers from sensors up to processing equipment.

Working conditions inside the Vacuum Vessel of ITER combine ultra-high vacuum, high temperatures, high radiation and demanding electromagnetic conditions.

Feedthroughs fall in the following ITER classifications:

- Protection Important Class: PIC-1;
- Vacuum Quality Class: VQC-1A.

One of the main consequences of this classification is that a secondary vacuum (so-called guard vacuum) enclosure containing optical feedthroughs with interspace connected to the Service Vacuum System (SVS) is needed to allow pumping and leak monitoring.

### **3 Scope of Work**

The scope of the work includes the following.

Phase I: Manufacturing design development

- Verification of the design developed by the ITER Organization (IO)
- Manufacturability assessment
- Development of the manufacturing design

-Phase II: Qualification

- Prototype manufacturing
- Qualification of welds
- Qualification of brazed joints
- Qualification tests of the prototype

Phase III: Manufacturing Readiness Review

Phase IV: Manufacturing of fourteen Optical Fiber Feedthroughs

- 10 with design for the Upper Port;
- 4 with design for the Lower Port

Phase V: Factory Acceptance Testing

Phase VI: Delivery to IO site.

The Optical Fiber Feedthrough in the Upper Ports are designed for the transmission of 21 optical fibers (3 bundles of 7 fibers each).

The Optical Fiber Feedthrough in the Lower Ports have an extension for the transmission of 140 optical fibers (20 bundles of 7 fibers each) (see Figure 2).

The Optical Fiber Feedthroughs consist of a 114 mm diameter stainless steel tube with a double barrier inside. Bundles of 7 fibres are routed through the barriers being inserted in 1.6 mm tubes that are brazed to the barrier. The sealing of the fibers inside the tube is ensured as well by brazing.

The Optical Fiber Feedthroughs have two vacuum boundaries with permanently pumped interspace between them (the valve to the Service Vacuum System SVS as indicated in Figure 2).

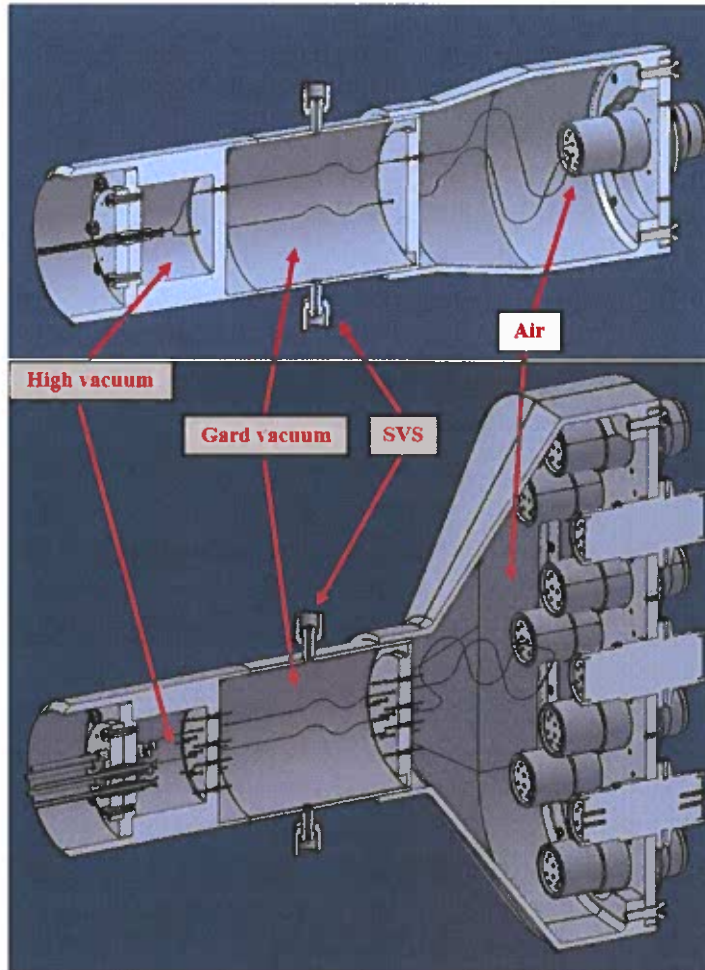


Figure 2: Optical Fiber Feedthroughs design for Upper port (upper picture) and Lower port (lower picture)

## 4 Experience Requirements

The ITER Organization is looking for Suppliers with demonstrated experience in developing and manufacturing feedthroughs for vacuum application. The Supplier must prove to be able to provide in an organised way the competences specified in the Scope of Work above.

The Tenderer shall have and maintain a valid ISO 9000 certification and shall have the duty to verify and document the equivalent quality level of all its subcontractors and consultants.

## 5 Award of the Contract

It is planned that the ITER Organization will award one contract for the whole scope of work.

Suitable teaming arrangements for multiple companies are possible, where appropriate, to enhance the offering of the tenderer.

The language used at ITER is English. A fluent professional level is required (spoken and written English)

## **6 Candidature – Expression of Interest**

Candidature is open to all companies participating either individually or in a grouping (consortium) which is established in an ITER Member State. A consortium may be a permanent, legally-established grouping or a grouping, which has been constituted informally -- but formalized with engagement letters -- 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 consortia shall be presented at the pre-qualification stage, where they will be assessed as a whole. Consortia cannot be modified later without the prior approval of the ITER Organization.

### **Withdrawal of the United Kingdom from the European Union (BREXIT)**

The UK is not a party to the ITER Agreement but to EURATOM Treaty. The draft Withdrawal Agreement between the EU and the UK provides that the provisions of the EURATOM treaty continue to apply to and in the UK for a transition period following its withdrawal from the EU and EURATOM. If the Withdrawal Agreement is not ratified (a no-deal Brexit) the EURATOM Treaty ceases to apply to and in the UK on the withdrawal date. Until the Withdrawal Date, the UK remains a full member of the EU and EURATOM and until that date UK entities retain the right to participate in IO procurement procedures. In case they are selected, a Brexit clause is included in the contract. Likewise, during the Transition period UK entities may participate in IO procurement procedures.

After the end of the Transition Period, when the Euratom Treaty ceases to apply to and in the UK, any UK entities bidding as a prime contractor or consortium partner will be rejected from the IO procurement procedures. UK entities will no longer be recognised as entities of an ITER Member and will no longer have the right to participate in IO procurement procedures, unless the UK has entered into an Agreement with Euratom. Where UK entities can demonstrate a unique and specific competence in a certain field the IO, with approval of the ITER Council, may also allow them to participate in a procurement procedure.

The ITER Organization may decide to broaden the eligibility to other countries as deemed appropriate.

## 7 Timetable for the Tender Process

The tentative schedule for this tender process is as follows:

Call for Nomination (C4N)	<i>February 2020</i>
Invitation for Call for Tender	<i>April 2020</i>
Pre-Qualification	<i>May 2020</i>
Tender Submission	<i>July 2020</i>
Contract placement	<i>November 2020</i>
Delivery of the items	<i>May 2022</i>