外部委託業者の募集

References: IO/25/OT/10032323/ERA

"Procurement of In-vessel Supports "

（容器内支持具の調達）

IO 締め切り 2025 年 7 月 4 日(金)

〇はじめに

本事前情報通知（PIN）は、作業契約の入札授与および実行につながる公開入札調達プロセスの最初のステップです。

〇背景

ITER は平和利用の核融合発電の科学的および技術的な実現可能性の実証を目的とした、国際共同研究開発プロジェクトです。ITER 機構の 7 つのメンバーは、;欧州連合（EURATOM が代表）、日本、中華人民共和国、インド、大韓民国、ロシア連邦、および米国です。

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〇作業範囲

本入札プロセスは、炉内支持具、特にジャンクションボックスおよびクリップの供給契約の締結を目的としています。

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- クリップは、VV内部でBOIおよびDOIの電気・光学ケーブルを固定するために使用されます。
  契約者は、ジャンクションボックスおよびクリップの供給、ITERサイトへの納入、そして本技術仕様書で定義された要件を満たす製品の確保に責任を持ちます。

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- 製造前サービスおよび製造準備審査
- 製造および組立に必要な材料および部品の調達
- ジャンクションボックスおよびクリップの製造
- 認証試験および工場受入試験

〇調達プロセスと目的

目的は、競争入札プロセスを通じて供給契約を落札することです。
この入札のために選択された調達手続きは公開入札手続きと呼ばれます。
オープン入札手順は、次の 4 つの主要なステップで構成されています。

- ステップ 1-事前情報通知（PIN）
  事前情報通知は公開入札プロセスの第一段階です。IO は、関心のある候補企業に対し、以下の概略日程に示された 10 作業日までに担当調達担当官に添付の関心表明フォームで以下の情報を提出し、競争プロセスへの関心を示すよう正式に要請します。

  特に注意:
  関心のある候補企業は、IO Ariba の電子調達ツール 「IPROC」 に登録してください（まだ登録していない場合）。手順については、
  https://www.iter.org/fr/proc/overview
  を参照してください。

  Ariba（IPROC）に登録する際には、お取引先様に最低 1 名の担当者の登録をお願いします。この連絡担当者は、提案依頼書の発行通知を受け取り、必要と思われる場合は入札書類を同僚に転送することができます。

- ステップ 2-入札への招待
  PIN の発行から 10 作業日経過後、提案依頼書（RFP）を 「IPROC」 に掲載します。この段階では、担当の調達担当者に関心を示し、かつ IPROC に登録している関心のある候補企業は、RFP が公表された旨の通知を受けることができます。その後、RFP に詳述されている入札説明書に従って提案書を作成し、提出します。

  このツールに登録されている企業のみが入札に招待されます。

- ステップ 3-入札評価プロセス
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- ステップ 4-落札
  認定は、公開されている RFP に記載されている、コストに見合った最適な価格または技術的に準拠した最低価格に基づいて行われます。

〇概略日程

概略日程は以下の通りです：

マイルストーン	暫定日程
事前指示書（PIN）の発行	2025 年 6 月 20 日
関心表明フォームの提出	2025 年 7 月 4 日
iPROC での提案依頼書の発行	2025 年 7 月 18 日
入札提出	2025 年 8 月 22 日
契約授与	2025 年 9 月 5 日
契約調印	2025 年 10 月
サービス開始	2026 年 10 月

*新しい契約者が現地の活動や手順に慣れるため、また旧契約者がスムーズに解約作業を行うために、3ヶ月の重複期間が予定されています。

〇契約期間と実行

ITER機構は2026年10月ごろ供給契約を授与する予定です。予想される契約期間は、18か月とします。

〇経験

入札者は、付属書 I 詳述される作業範囲に従って、技術的、産業的な経験を実証する必要があります。

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どのコンソーシアムメンバーも IPROC に登録する必要があります。

【※　詳しくは添付の英語版技術仕様書「**Procurement of In-vessel Supports**」をご参照ください。】
ITER 公式ウェブ　http://www.iter.org/org/team/adm/proc/overview からもアクセスが可能です。

「核融合エネルギー研究開発部門」の HP：　http://www.fusion.qst.go.jp/ITER/index.html
では ITER 機構からの各募集（IO 職員募集、IO 外部委託、IO エキスパート募集）を逐次更新しています。ぜひご確認ください。

イーター国際核融合エネルギー機構からの外部委託
に関心ある企業及び研究機関の募集について

＜ITER 機構から参加極へのレター＞

以下に、外部委託の概要と要求事項が示されています。参加極には、提案された業務に要求される能力を有し、入札すべきと考える企業及び研究機関の連絡先の情報を ITER 機構へ伝えることが求められています。このため、本研究・業務に関心を持たれる企業及び研究機関におかれましては、応募書類の提出要領にしたがって連絡先情報をご提出下さい。

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PRIOR INDICATIVE NOTICE (PIN)

OPEN TENDER SUMMARY

IO/25/OT/10032323/ERA

For

Procurement of In-vessel Supports

Abstract

The purpose of this summary is to provide prior notification of the IO's intention to launch a competitive Open Tender process in the coming weeks. This summary provides some basic information about the ITER Organisation, the technical scope for this tender, and details of the tender process for the procurement of the engineering services to perform maintainability analyses at ITER GBS levels to support the Maintainability activity.

1 Introduction

This Prior Indicative Notice (PIN) is the first step of an Open Tender (OT) Procurement Process leading to the award and execution of a Supply Contract.

The purpose of this document is to provide a basic summary of the technical content in terms of the scope of work, and the tendering process.

2 Background

The ITER project is an international research and development project jointly funded by its seven Members being, the European Union (represented by EURATOM), Japan, the People's Republic of China, India, the Republic of Korea, the Russian Federation and the USA. ITER is being constructed in Europe at St. Paul–Lez-Durance in southern France, which is also the location of the headquarters (HQ) of the ITER Organization (IO).

For a complete description of the ITER Project, covering both organizational and technical aspects of the Project, visit www.iter.org.

3 Scope of Work

The present tender process is aiming to set up a Supply Contract for the provision of In-Vessel Supports, specifically the Junction Boxes and Clips.

- Electrical Junction Boxes will be used inside the VV of the ITER machine. The Junction Boxes are required for connection of electrical cables of Blanket and Divertor Operational Instrumentation system (BOI and DOI respectively). They will be fixed to the VV inner wall by bolts screwed into the VV bosses.
- Clips will be used for fixing BOI and DOI electrical and optical cables inside the VV. The Contractor is responsible for the supply of the Junction Boxes and Clips its delivery to the ITER Site and for ensuring that the product meets the requirements defined in this Technical Specification.

The scope of work, as further detailed in the Technical Specification, includes the following tasks:

- Pre-manufacturing services and Manufacturing Readiness Review
- Procurement of materials and parts necessary for manufacturing and assembly
- Manufacturing of the Junction Boxes and Clips
- Qualification and Factory Acceptance Tests
- Delivery to the ITER site in three batches

4 Procurement Process & Objective

The objective is to award a Supply Contract through a competitive bidding process.

The Procurement Procedure selected for this tender is called the **Open Tender** procedure.

The Open Tender procedure is comprised of the following four main steps:

- Step 1- Prior Information Notice (PIN)

  The Prior Information Notice is the first stage of the Open Tender process. The IO formally invites interested Suppliers to indicate their interest in the competitive process by returning to the

Procurement officer in charge the attached "Expression of Interest and PIN Acknowledgement" by the date indicated under the procurement timetable.

Special attention:

Interested tenderers are kindly requested to register in the IO Ariba e-procurement tool called "IPROC". You can find all links to proceed along with instruction going to: https://www.iter.org/fr/proc/overview.

When registering in Ariba (IPROC), suppliers are kindly requested to nominate at least one contact person. This contact person will be receiving the notification of publication of the Request for Proposal and will then be able to forward the tender documents to colleagues if deemed necessary.

- Step 2 - Invitation to Tender

After at least 10 working days of the publication of the PIN, normally the Request for Proposals (RFP) will be published on our digital tool "Iproc". This stage allows interested bidders who have indicated their interest to the Procurement Officer in charge AND who have registered in IPROC to receive the notification that the RFP is published. They will then prepare and submit their proposals in accordance with the tender instructions detailed in the RFP.

Only companies registered in this tool will be invited to the tender.

- Step 3 – Tender Evaluation Process

Tenderers proposals will be evaluated by an impartial evaluation committee of the IO. Tenderers must provide details demonstrating their technical compliance to perform the work in line with the technical scope and in accordance with the particular criteria listed in the RFP.

- Step 4 – Contract Award

A Service contract will be awarded on the basis of the Best Value for Money methodology according to the evaluation criteria and methodology described in the RFP.

Procurement Timetable

The tentative timetable is as follows:

Milestone	Date
Publication of the Prior Indicative Notice (PIN)	20th June 2025
Submission of expression of interest form	4th July 2025
Invitation to Tender (ITT) advertisement	18th July 2025
Clarification Questions (if any) and Answers	22nd August 2025
Tender Submission	5th September 2025
Tender Evaluation & Contract Award	October 2025
Contract Signature	October 2025

5 Quality Assurance Requirements

Prior to commencement of any work under this Contract, a "Quality Plan" shall be produced by the Supplier and submitted to the IO for approval, describing how they will implement the ITER Procurement Quality Requirements.

6 Contract Duration and Execution

The ITER Organization shall award the Supply Contract around October 2025. The estimated contract duration shall be 18 months.

7 Experience

The tenderer shall demonstrate their technical and industrial experience related to the scope of work as detailed in Annex I.

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

8 Candidature

Participation is open to all legal entities participating either individually or in a grouping/consortium. A legal entity is an individual, company, or organization that has legal rights and obligations and is established within an ITER Member State, being, the European Union (represented by EURATOM), Japan, the People's Republic of China, India, the Republic of Korea, the Russian Federation and the USA.

Legal entities cannot participate individually or as a consortium partner in more than one application or tender of the same contract. 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.

In order for a consortium to be acceptable, the individual legal entities included therein shall have nominated a consortium leader with authority to bind each member of the consortium, and this leader shall be authorised to incur liabilities and receive instructions for and on behalf of each member of the consortium.

It is expected that the designated consortium leader will explain the composition of the consortium members in its offer. Following this, the Candidate's composition must not be modified without notifying the ITER Organization of any change. Evidence of any such authorisation to represent and bind each consortium member shall be submitted to the IO in due course in the form of a power of attorney signed by legally authorised signatories of all the consortium members.

Any consortium member shall be registered in IPROC.

9 Sub-contracting Rules

All sub-contractors who will be taken on by the Contractor shall be declared together with the tender submission. Each sub-contractor will be required to complete and sign forms including technical and administrative information which shall be submitted to the IO by the tenderer as part of its tender.
The IO reserves the right to approve any sub-contractor which was not notified in the tender and request a copy of the sub-contracting agreement between the tenderer and its sub-contractor(s).
Sub-contracting is allowed but it is limited to one level and its cumulated volume is limited to 30% of the total Contract value.

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VERSION CREATED ON / VERSION / STATUS
23 May 2025 / 1.2 / Approved

EXTERNAL REFERENCE / VERSION

Technical Specifications (In-Cash Procurement)

Technical specification for procurements of In-vessel Supports

Technical specification for procurements of In-vessel Supports

Table of Contents

1 Background

ITER is a large-scale scientific experiment that aims to demonstrate the technological and scientific feasibility of fusion energy. ITER is identified in France as a Nuclear Facility according to the INB order 7th February 2012 (“Installation Nucléaire de Base”).

During its operational lifetime, ITER will test key technologies necessary for the next step: the demonstration fusion power plant that will prove that it is possible to exploit fusion energy for commercial use. ITER is based on the 'tokamak' concept of magnetic confinement, in which the plasma is contained in a doughnut-shaped Vacuum Vessel (VV). The fuel — a mixture of deuterium and tritium, two isotopes of hydrogen — is heated to temperatures over 150 million °C, forming a hot plasma. Strong magnetic fields are used to keep the plasma away from the walls; these are produced by superconducting coils surrounding the vessel, and by an electrical current driven through the plasma.

The VV is a hermetically-sealed steel container that houses the fusion reaction and acts as a first safety confinement barrier. It operates at 100°C and can be baked up to 240°C to guarantee clean ultra-high vacuum needed to operate plasmas.

Internal components such as the Blanket and Divertor are located inside the VV. They are equipped with Operational Instrumentation for measurement of thermal, mechanical and electromagnetic parameters during operation. These measurements are performed by two types of sensors:

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

The signals from the electrical sensors are transmitted inside the VV via different parts of electrical cables. The junctions between the different parts of the cables are performed inside the Junction Boxes.

Clips will be used for fixing BOI/DOI electrical and optical cables to the surface of the VV.

This technical specification outlines the scope of supply and the associated technical requirements for the fabrication of Junction Boxes and Clips used as in-vessel supports.

2 Subject

This Technical Specification defines the technical requirements for the procurement of In-Vessel Supports, specifically the Junction Boxes and Clips.

- Electrical Junction Boxes will be used inside the VV of the ITER machine. The Junction Boxes are required for connection of electrical cables of Blanket and Divertor Operational Instrumentation system. They will be fixed to the VV inner wall by bolts screwed into the VV bosses.
- Clips will be used for fixing BOI and DOI electrical and optical cables inside the VV.

The Contractor is responsible for the supply of the Junction Boxes and Clips its delivery to the ITER Site and for ensuring that the product meets the requirements defined in this Technical Specification.

The ITER Organization (IO) will provide to the Contractor the final design of all the elements that should be procured as well as related references and applicable documents, e.g. CAD models and drawings at final design maturity.

3 Scope of supply

The scope of the current Technical Specification includes the following tasks:

- Pre-manufacturing services and Manufacturing Readiness Review (Section 6)

- Procurement of materials and parts necessary for manufacturing and assembly (Section 7)
- Manufacturing of the Junction Boxes and Clips (Section 8)
- Qualification and Factory Acceptance Tests (Sections 9 and 10)
- Delivery to the ITER site (Section 12)

The table below summarises the total quantity of each element that should be procured. All drawings can be found in [RD5]

Table 1. Total scope of supply

Component	Type	Batch#1	Batch#2	Batch#3	Total
Junction Boxes	"Type 1" for MFL	17	17	17	51
	"Type 2" for TC	47	47	47	141
	"Type 3" for RC (Left)	33	33	33	99
	"Type 4" for RC (Right)	11	11	11	33
Crimp Clips	Clips for Ø1.9 mm cable	1305	1305	1305	3915
	Clips for Ø4 mm cable	488	488	488	1464
Plane Clips	Clips for BOI RC Ø6 mm 1x15H	171	171	171	513
	Clips for Ø1 mm 1x10_H	58	58	58	174
	Clips for Ø1 mm 1x10	116	116	116	348
	Clips for Ø1.9 mm 1x15_H	150	150	150	450
	Clips for Ø1.9 mm 1x15	220	220	220	660
	Clips for Ø1.9 mm 2x15	136	136	136	408
	Clips for Ø1.9 mm 3x15	45	45	45	135
	Clips for Ø1.9 mm 4x15	8	8	8	24
	Clips for Ø1.9 mm 1x30	209	209	209	627
	Clips for Ø1.9 mm 2x30	88	88	88	264
	Clips for Ø1.9 mm 3x30	63	63	63	189
	Clips for Ø1.9 mm 4x30	16	16	16	48
	Clips for Ø4 mm 1x15	56	56	56	168
	Clips for Ø4 mm 2x15	42	42	42	126
	Clips for Ø4 mm 1x30	87	87	87	261
	Clips for Ø4 mm 2x30	30	30	30	90
	Clips for Ø1.9 mm 1X10_H	39	39	39	117
	Clips for Ø1.9 mm 2X15_H	8	8	8	24
	Clips for Ø1.9 mm 1X10	17	17	17	51
	Clips for Ø1.9 mm FC	3	3	3	9
	Clips for Ø1.9 mm 1x30 H	90	90	90	270

	Clips for Ø1.9 mm 2x30 H	5	5	5	15
	Clips for Ø1.9 mm 6x15	6	6	6	18
	Clips for Ø1.9 mm 5x30	10	10	10	30
	Clips for Ø1 mm 1x10_S	104	104	104	312
	Clips for Ø4 mm 1x30_H	11	11	11	33
	Clips for Ø4 mm 3x30	27	27	27	81
	Clips for Ø4 mm 3x15	33	33	33	99
	Clips for Ø4 mm 1x15_H	18	18	18	54
Spare attachments for junction boxes	Captive screws M4x13	67	67	67	201
	SPRING_WASHER_DIN_6796_4	67	67	67	201
	Tab washers DIN 463	67	67	67	201
	Screws M6x12	23	23	23	69
	SPRING_WASHER_DIN_6796_6	23	23	23	69
	WUERTH_0412006_WASHER_DIN_463_6.4_A4_BLK	23	23	23	69
	BUTTON_HEAD_SOCKET_SCREW_ISO_7380_M3X6	23	23	23	69
	SPRING_WASHER_DIN_6796_3	134	134	134	402
	Shim ring DIN 988	23	23	23	69
	STEEL_ZIP_TIE_1	41	41	41	123
	STEEL_ZIP_TIE_2	7	7	7	21

3.1 Schedule of delivery batches

Please refer to the Table 1 for the scope of each delivery batch.

Table 2 Batches to be delivered.

Batch	Name	Need date
Batch #1	Delivery of In-vessel Supports for installation on the VV Sector #6	June 2026
Batch #2	Delivery of In-vessel Supports for installation on the VV Sector #3	September 2026
Batch #3	Delivery of In-vessel Supports for installation on the VV Sector #9	November 2026

4 Definitions

For a complete list of ITER abbreviations see: ITER_D_2MU6W5 - ITER Abbreviations

BOI	Blanket Operational Instrumentation
CAD	Computer-Aided Design
DC	Direct Current
DOI	Divertor Operational Instrumentation
IVH	ITER Vacuum Handbook
JB	Junction Box
LDS	Linear Displacement Sensor
MFL	Magnetic Flux Loop
MI	Mineral Insulated
MIP	Manufacturing and Inspection Plan
MRR	Manufacturing Readiness Review
OFS	Optical Fiber Sensors
PIC	Protection Important Component
PNI	Part Number of ITER
RC	Rogowski Coils
SB	Shield Block
SIC	Safety Importance Classification
SN	Serial Number
TC	Thermocouple
VQC	Vacuum Quality Class
VV	Vacuum Vessel

5 Baseline Design Description

This section provides a generic design overview of each type of the Junction Boxes and Clips in the scope of this Technical Specification.

5.1 Junction Boxes

The Junction Box is an enclosure housing the electrical connections and an essential part of the wiring system. This is a metal box structure that protects the electrical connections from mechanical damage.

The Junction Box for Rogowski Coil sensor is shown on Figure 1 as an example of application in BOI/DOI system. This Junction Box is intended for electrical connection between the Rogowski Coil sensor's tail and a transport electrical cable for sensor's signal transmission.

During the 1st assembly Phase of the ITER machine, Junction Box base will be screwed to the bosses already welded to the VV. For this operation, M6 bolt will be used. Then there will be the installation of the inlet and outlet cables and finally the closure of the Junction Box. The Junction Box lid will be bolted to the base plate using M4 captive bolts.

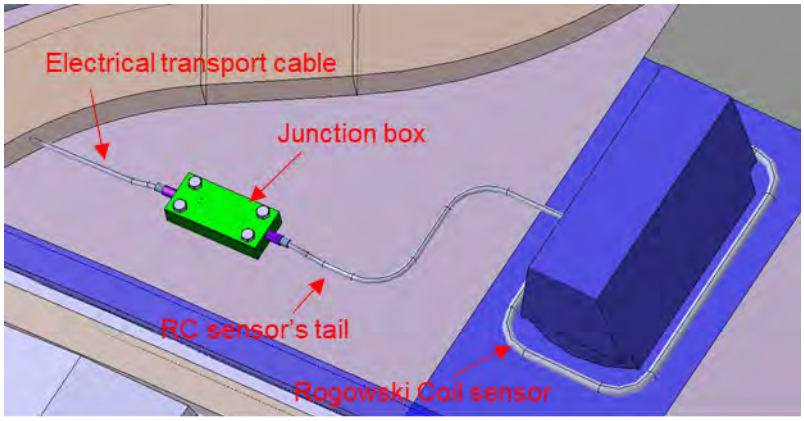


Figure 1 Connection between the Rogowski Coil sensor's cable and the transport electrical cable

Totally four types of Junction Boxes are used in the system and in the scope of this Technical Specification:

- **Type 1** – Junction Box for Magnetic Flux Loops sensors with OD=1.9 mm.
- **Type 2** – Junction Box for Thermocouples sensors with OD=4 mm.
- **Type 3** – L-type Junction Box for Rogowki Coils with OD=4 mm.
- **Type 4** – R-type Junction Box for Rogowki Coils with OD=4 mm.

Junction Box drawings are located in

5.1.1 Junction Box "Type 1"

The Junction Box "type 1" is intended for electrical connections between two input single wire electrical cables with OD = 1.9 mm and output transport bifilar cable with OD = 4 mm. This type of Junction Box will be used for electrical connections between the Magnetic Flux Loops and transport electrical cables. The design of the Junction box is shown on Figure 2.

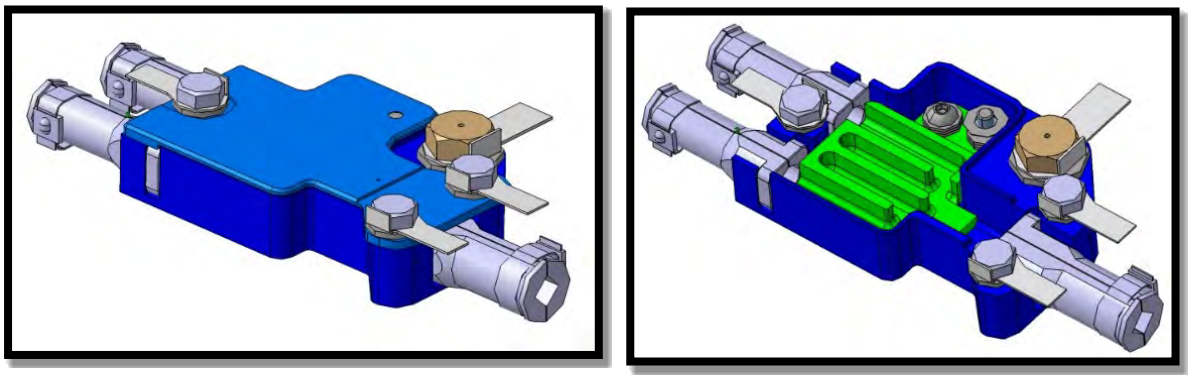


Figure 2 Electrical Junction Box "type 1"

5.1.2 Junction Box “Type 2”

The Junction Box “type 2” is intended for electrical connections between the two bifilar electrical cables with OD = 4mm. This type of Junction Box will be used for electrical connections between the sensors like Rogowski Coils and Thermocouples with transport electrical cables. The design of the Junction Box is shown on Figure 2.

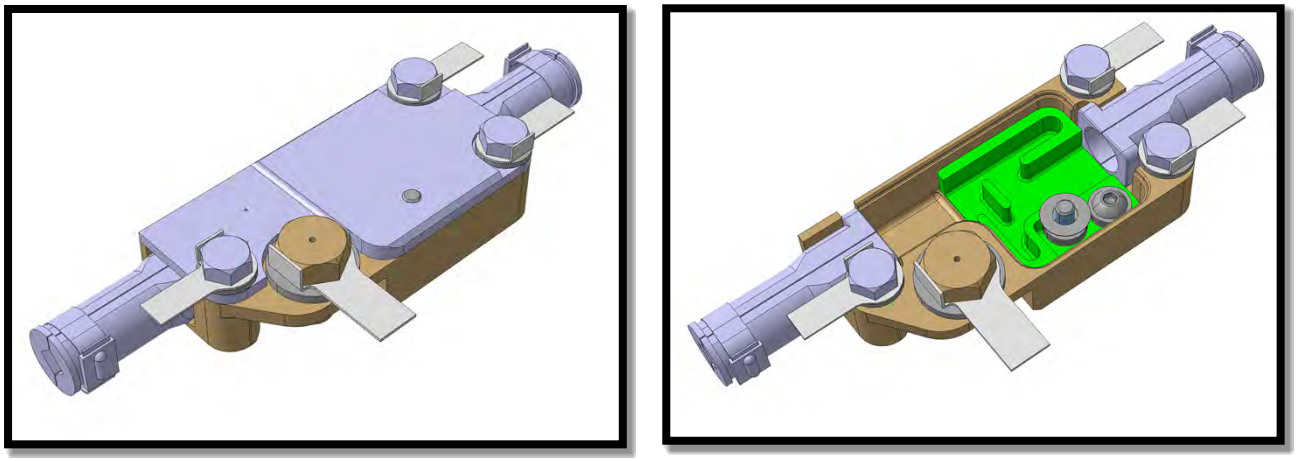


Figure 3 Electrical Junction Box "type 2"

5.1.3 Junction Box “Type 3”

The Junction box “type 3” is practically of the same design as “type 2” but reversed (see Figure 4 .

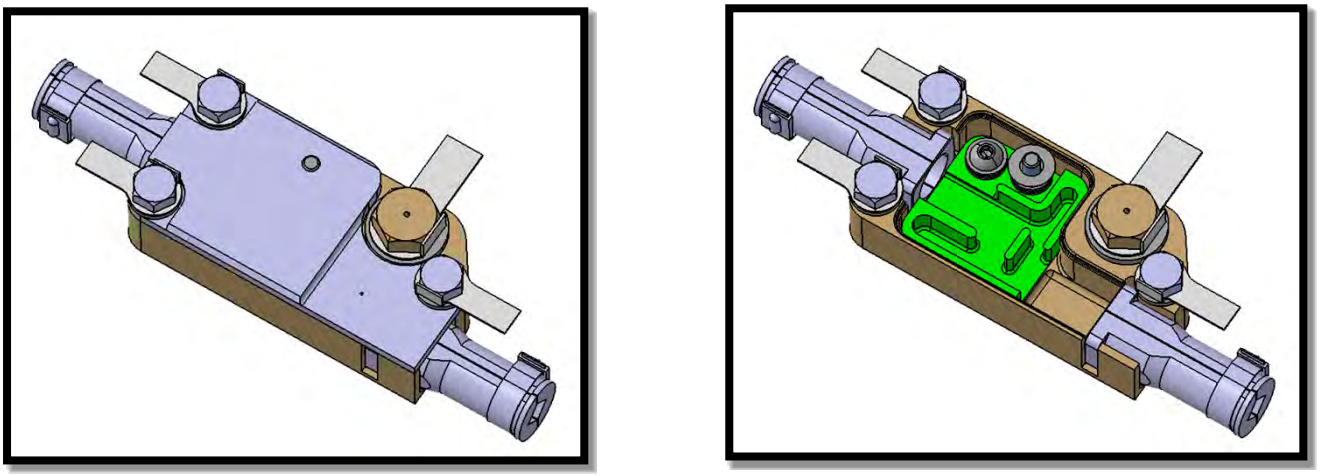


Figure 4 Electrical Junction Box "type 3"

5.1.4 Junction Box “Type 4”

The Junction box “type 3” is the same design as “type 2” The design of the Junction Box is shown on Figure 5.

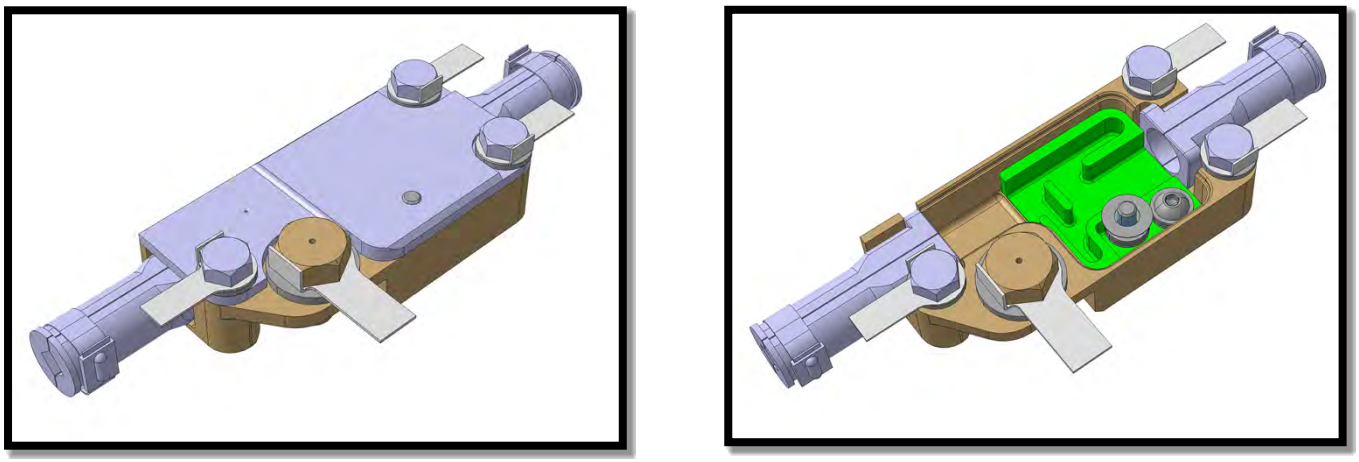


Figure 5 Electrical Junction Box "type 4"

All drawings can be found in [RD5]

5.1.5 Spare attachments for junction boxes

Spare attachments for junction boxes are listed in Table 1Table 3 and shown on the Figure 6. Electrical Junction Box spare attachments

Table 3. Spare attachments

Spare attachments for junction boxes	Captive screws M4x13	201
	SPRING_WASHER_DIN_6796_4	201
	Tab washers DIN 463	201
	Screws M6x12	69
	SPRING_WASHER_DIN_6796_6	69
	WUERTH_0412006_WASHER_DIN_463_6.4_A4_BLK	69
	BUTTON_HEAD_SOCKET_SCREW_ISO_7380_M3X6	69
	SPRING_WASHER_DIN_6796_3	402
	Shim ring DIN 988	69
	STEEL_ZIP_TIE_1	123
	STEEL_ZIP_TIE_2	21

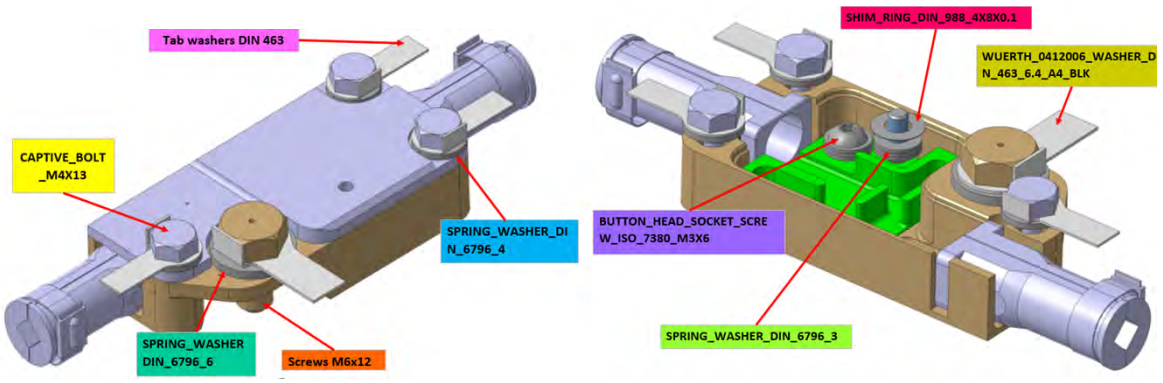


Figure 6. Electrical Junction Box spare attachments

5.2 Clips

Two main types of clips are in scope of the current technical specification:

- "Crimp Clips" with diameter of 1.9 and 4 mm for the optical fiber sensor's tails, MI electrical cables and optical fiber cables,
- "Plane Clips" with different sizes for the optical fiber sensor's tails and for Rogowski Coils sensors.

The design of all types of clips is shown in Table 4.

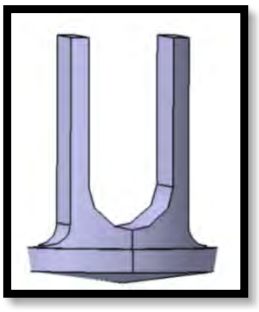
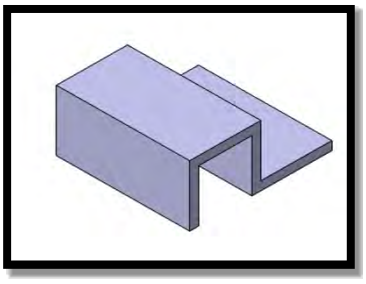
The Clips will be installed onto the VV by welding operation.

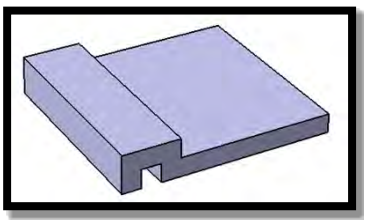
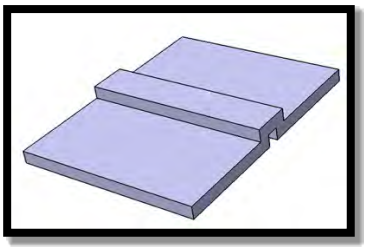
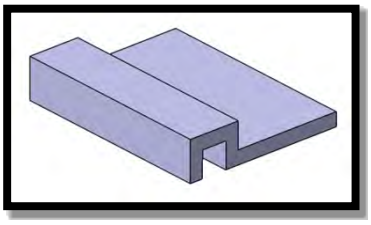
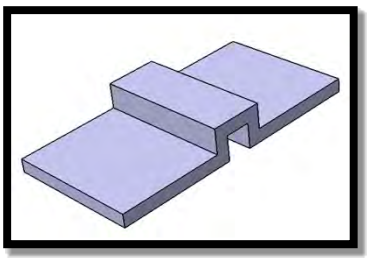
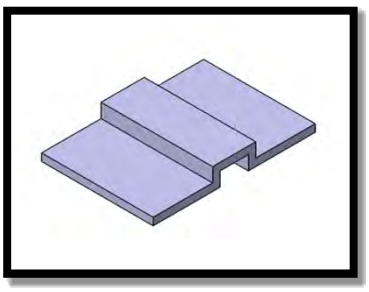
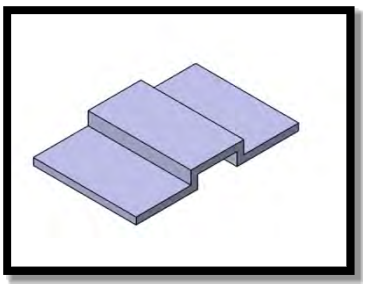
The crimp clips will be installed by Short Cycle dawn arc stud welding technique. The plane clips will be TIG-welded to the VV surface.

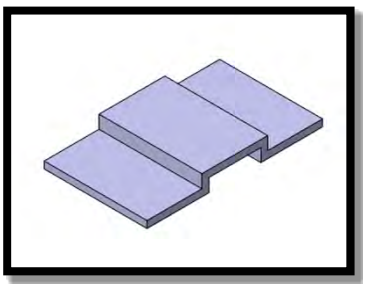
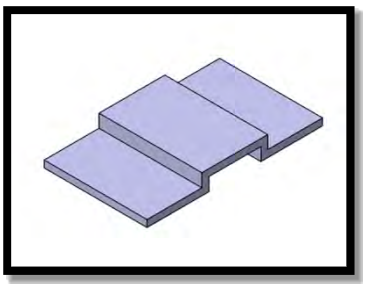
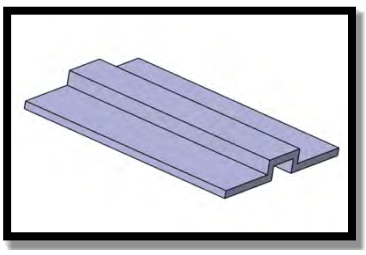
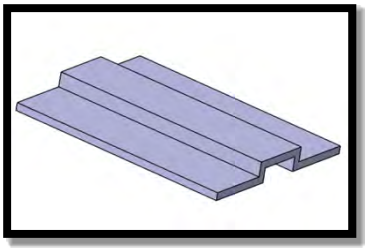
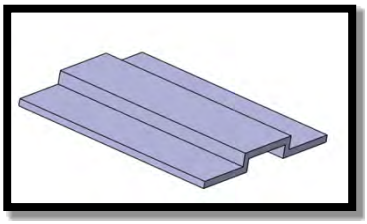
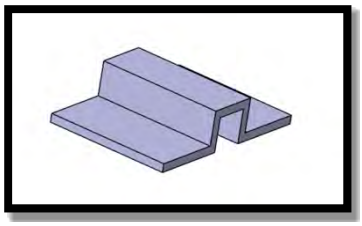
After the installation of the cable inside the 1.9 mm and 4mm clips, the clip's fingers will be crimped, and spot welded for its closure.

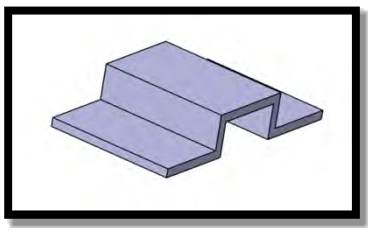
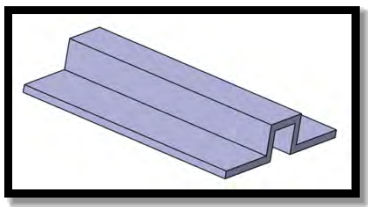
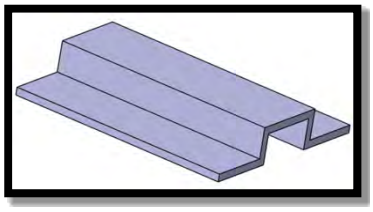
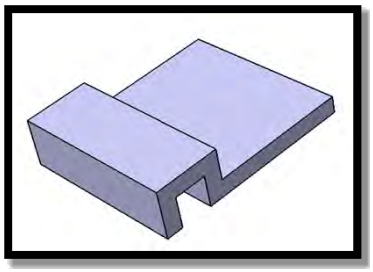
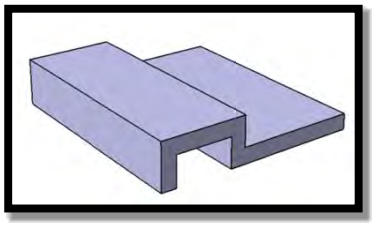
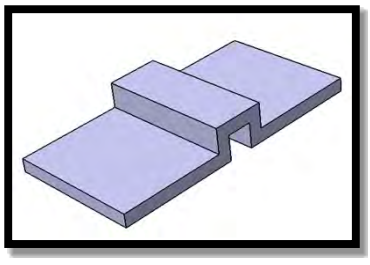
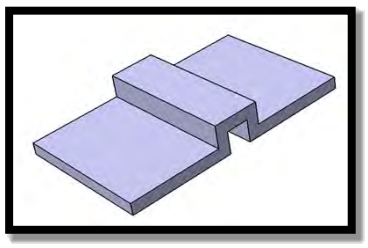
Table 1 contains the scope of supply of each type of clips. All drawings can be found in [RD5]

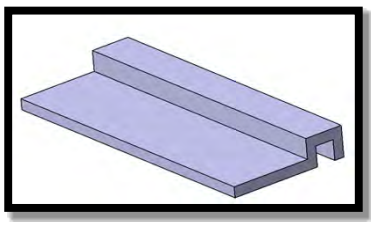
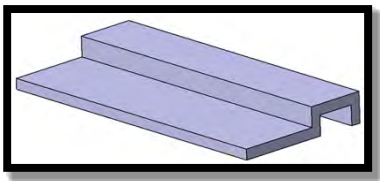
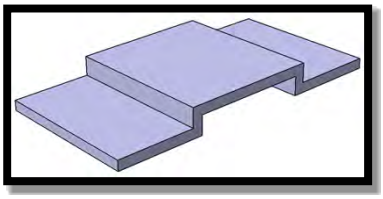
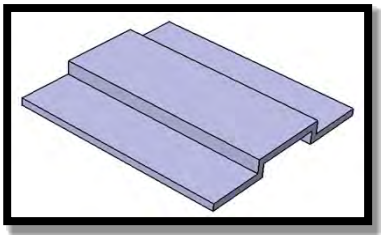
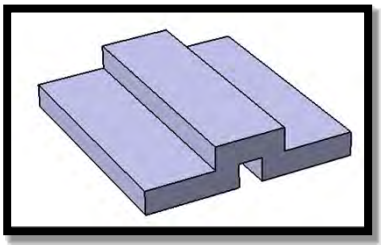
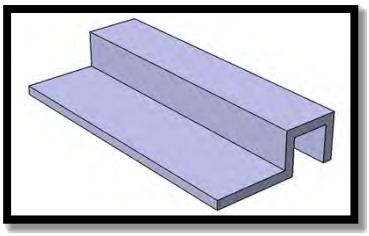
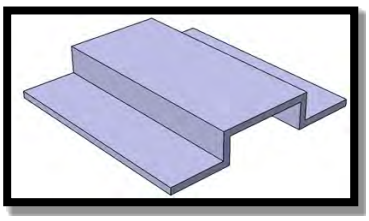
Table 4. Type of clips and their view

Type	Name	View
Crimp Clips	Clips for Ø1.9 mm cable	
	Clips for Ø4 mm cable	
Plane Clips	Clips for BOI RC Ø6 mm 1x15H	

	Clips for Ø1 mm 1x10_H	
	Clips for Ø1 mm 1x10	
	Clips for Ø1.9 mm 1x15_H	
	Clips for Ø1.9 mm 1x15	
	Clips for Ø1.9 mm 2x15	
	Clips for Ø1.9 mm 3x15	

	Clips for Ø1.9 mm 4x15	
	Clips for Ø1.9 mm 1x30	
	Clips for Ø1.9 mm 2x30	
	Clips for Ø1.9 mm 3x30	
	Clips for Ø1.9 mm 4x30	
	Clips for Ø4 mm 1x15	

	Clips for Ø4 mm 2x15	
	Clips for Ø4 mm 1x30	
	Clips for Ø4 mm 2x30	
	Clips for Ø1.9 mm 1X10_H	
	Clips for Ø1.9 mm 2X15_H	
	Clips for Ø1.9 mm 1X10	
	Clips for Ø1.9 mm FC	

	Clips for Ø1.9 mm 1x30 H	
	Clips for Ø1.9 mm 2x30 H	
	Clips for Ø1.9 mm 6x15	
	Clips for Ø1.9 mm 5x30	
	Clips for Ø1 mm 1x10_S	
	Clips for Ø4 mm 1x30_H	
	Clips for Ø4 mm 3x30	

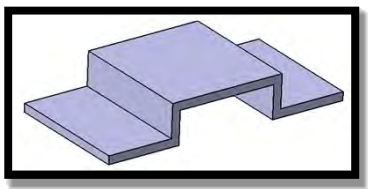
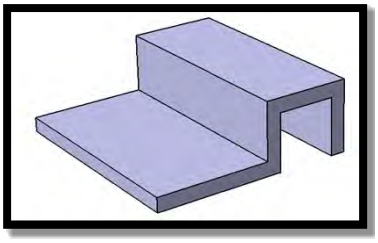
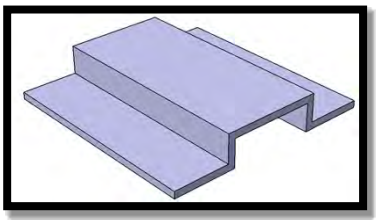
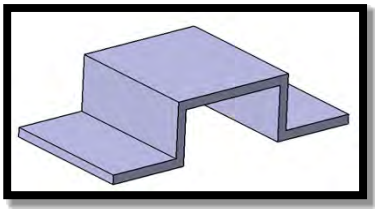
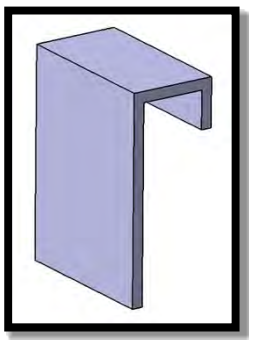
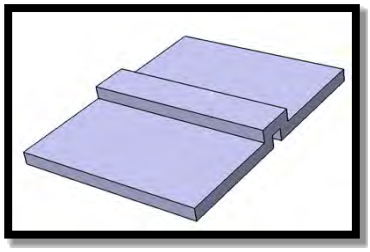
	Clips for Ø4 mm 3x15	
	Clips for Ø4 mm 1x15_H	
	Clips for Ø4 mm 4x30	
	Clips for Ø6 mm 2x15	
	Clips for Ø6 mm 1x15_D	
	Clips for Ø1 mm 1X15	

Figure 1 shows three types of the clips welded to the VV with optical and electrical cables.

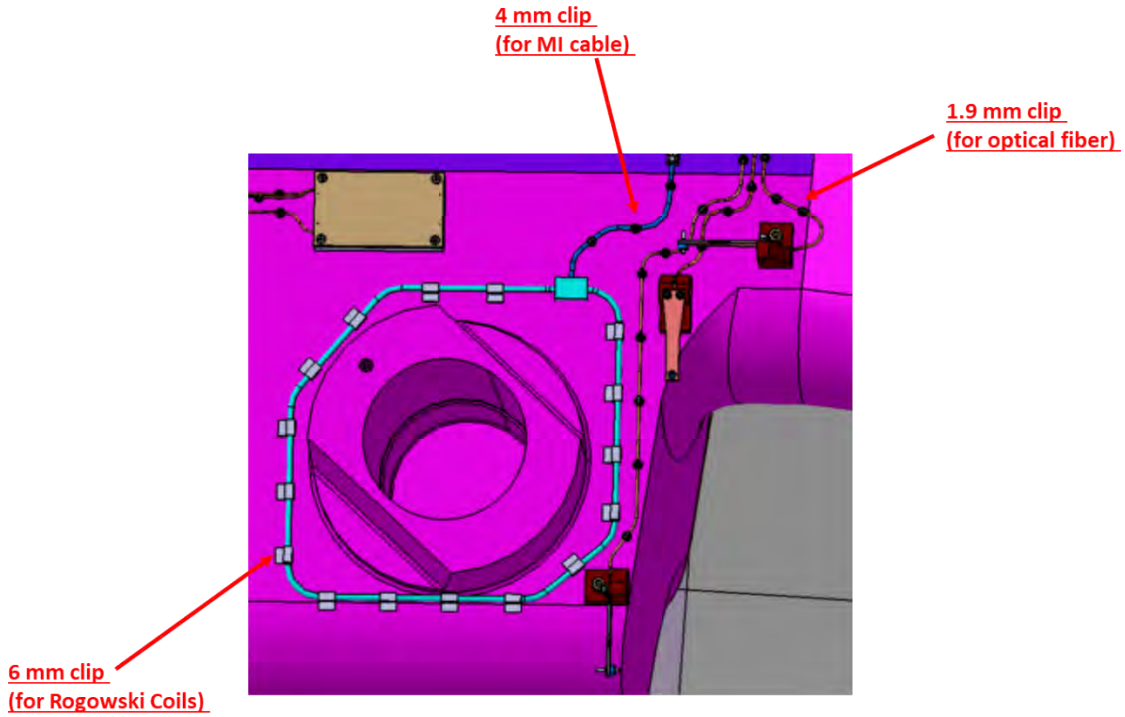


Figure 7. Allocation of the Clips on the ITER machine

6 Manufacturing Readiness Review

The Objective of the Manufacturing Readiness Review (MRR) is to verify that:

- The manufacturing design of the Junction Boxes and Clips satisfies all requirements of this technical specification.
- The manufacturing design is complete, technically correct, economical, and constructible and that the manufacturing is ready to start without incurring unacceptable risks.
- Confirms that the Contractor can procure or already has access to the materials and parts to be used for manufacture and assembly of the Junction Boxes and Clips.

At MRR stage, the deliverable documents D# 7 - D# 13 (see Section 13) shall be prepared by the Contractor for IO approval.

[REQ-1]

MRR is a Hold Point and shall be carried out by in-person meeting at IO or Contractor's premises. MRR can be held by videoconference in case of in-person meeting can't be organized.

The Contractor can proceed to the manufacturing when the MRR report is approved by the IO.

[REQ-2]

The preparation of the MRR shall be entirely under the responsibility of the Contractor.

7 Procurement of materials and parts

7.1 Raw materials

[REQ-3]

The Contractor shall purchase (or confirm access to) needed raw materials (see Section 8.5 Material Requirements) in accordance with:

- Quantities indicated in Table 1. Total scope of supply.
- Component drawings provided in Appendices A and B to this technical specification.
- Materials Specification accepted by IO by the time of MRR.

7.2 COTS items

[REQ-4]

The Contractor shall provide a manufacturer's certificate of conformity for each commercial off-the-shelf (COTS) Item used, showing conformity to the Contractor's specification for the Item.

8 Technical Requirements

8.1 Codes and Standards

The following codes and standards are referred to in this technical specification:

Standard	Description
ISO 2819:2017	Metallic coatings on metallic substrates -- Electrodeposited and chemically deposited coatings -- Review of methods available for testing adhesion
EN 10204:2004	Metallic products. Types of inspection documents (or equivalent standard)
ISO 4287:1997	Geometrical Product Specifications (GPS) -- Surface texture: Profile method -- Terms, definitions and surface texture parameters
DIN 988	Shim rings and supporting rings – Edition 1990-03
DIN 34824	12 point socket for bolts and screws - Edition 2007-11
BS EN ISO/IEC: 17025:2005	General requirements for the competence of testing and calibration laboratories
ISO 4042:2018	Fasteners — Electroplated coating systems
ISO 14644-1:2015	Clean rooms and associated controlled environments — Part 1: Classification of air cleanliness by particle concentration
IEEE Std 4-2013	IEEE Standard for High-Voltage Testing Techniques
ASTM B 734-97	Standard Specification for Electrodeposited Copper for Engineering Uses

8.2 Electrical Requirements

Electrical requirements of the Junction Box ceramic insulation pieces are defined in [REQ-16] Section 8.5.1 and [REQ-17] Section 8.5.2.

8.3 Vacuum Compatibility Requirements

[REQ-5]

The vacuum classification of both components in this technical specification is "VQC 1B" and it shall be marked on any drawing related to and stated in any specification of these components.

[REQ-6]

The Contractor shall design and manufacture the Junction Boxes and Clips according to the requirements applicable for the VQC-1B components. The main vacuum quality requirements are incorporated in this Technical Specification.

The exhaustive list of vacuum quality requirements is established in the ITER Vacuum Handbook [AD1] and its Appendices:

- ITER Vacuum Handbook ITER_D_2EZ9UM - ITER Vacuum Handbook
- Appendix 2 Environmental Cleanliness ITER_D_2EL9Y6 - Appendix 2 Environmental Cleanliness
- Appendix 3 Materials ITER_D_27Y4QC - Appendix 3 Materials
- Appendix 4 Accepted Fluids ITER_D_2ELN8N - Appendix 4 Accepted Fluids
- Appendix 13 Cleaning and Cleanliness ITER_D_2ELUQH - Appendix 13 Cleaning and Cleanliness

[REQ-7]

Trapped volumes shall be avoided. The manufacturing design shall be assessed for the presence of any trapped volumes, and any identified trapped volume shall be eliminated by incorporating appropriate venting holes.

[REQ-8]

Assemblies shall have a maximum steady state outgassing rate at 100 °C for hydrogen isotopes of $1x10^{-7}$ $Pa \cdot m^3 \cdot s^{-1} \cdot m^{-2}$ and for other gases of $1x10^{-9}$ $Pa \cdot m^3 \cdot s^{-1} \cdot m^{-2}$.

The Supplier can demonstrate compliance with this requirement by:

- Qualification of prototypes
- Using the same materials as the prototypes in items manufacturing
- Using an approved clean work plan
- Performing wipe tests

8.4 Junction Box Specific Design Requirements

[REQ-9]

The junction box conical spring washers for M3 size, M4 size and M6 size screws shall be standard DIN 6796 type products.

[REQ-10]

The junction box tab washers for M4 size and M6 size screws shall be standard DIN 463 type products.

[REQ-11]

The junction box “type 3” and “type 4” Nord-Lock washers for M6 screws shall be standard NL6SS product.

[REQ-12]

The cable ties shall be BAND-IT™ Mini Tie-Lok® products type AS4219, or any other equivalent product having the following properties:

- Thickness: 0.25 – 0.4 mm
- Width: 4.4 – 6.5 mm
- Min. Bundle Diameter: 8 mm
- Length: >100 mm

- Min. Loop Tensile Strength: >440 N
- Locking mechanism: Fold or dimple lock to avoid loss of tension in the tie

Note: ball lock ties shall not be used due to the inherent “slack” in this locking mechanism which means the tightening force is not retained.

[REQ-13]
The Junction Box Ceramic Insulators shall either be machined from machinable Aluminium Nitride (AlN) ceramics or formed by AlN sintering as per Sections 8.5.1 and 8.5.2 respectively.

8.5 Materials Requirements for Junction Boxes

This section defines the materials for all the subparts of the Junction Boxes identified on the Figure 8. All four types of the Junction Boxes are composed by the same types of the components.

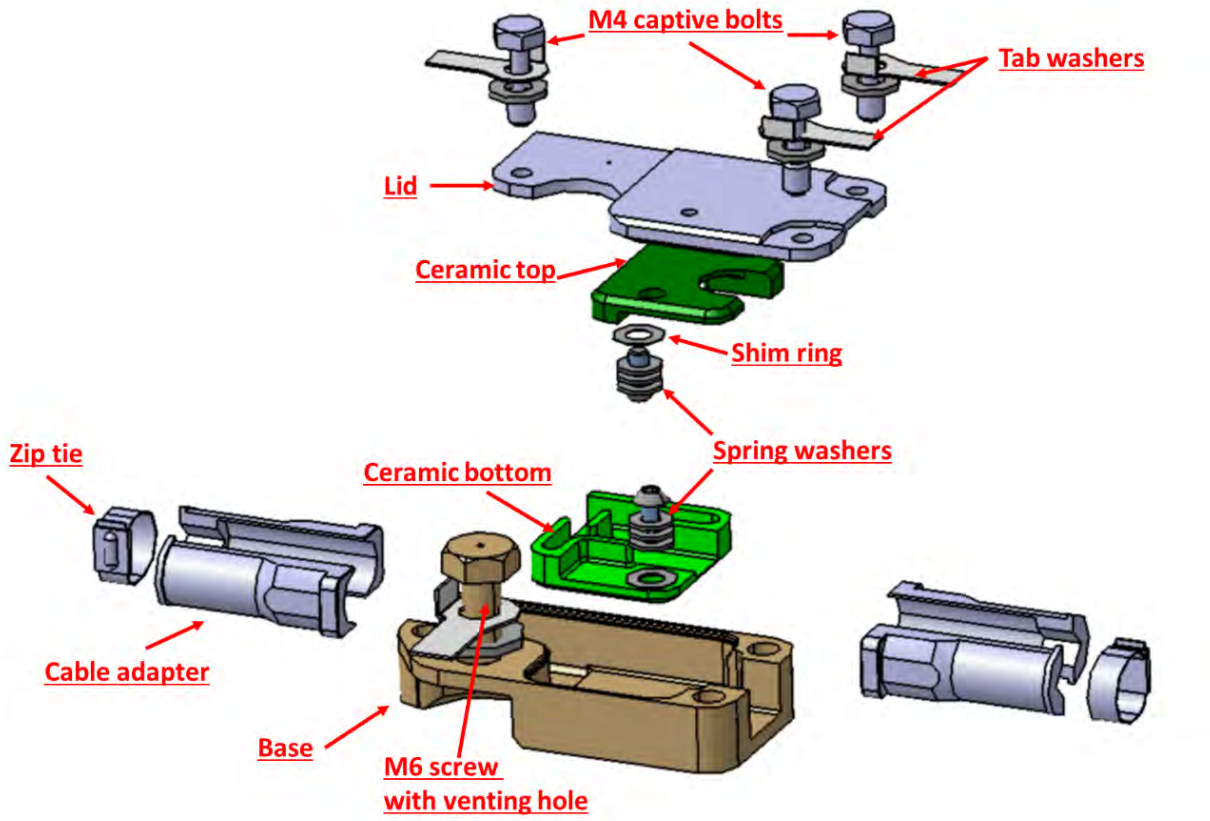


Figure 8 Composition of the Junction Box assembly

[REQ-14] Junction boxes shall be made of the materials listed in Table 5

Table 5: Material requirements for the Junction Boxes components

Component	Material
For the Junction Box's base and lid, cable adapters (1.9mm/4mm) one of the following grade of **Copper Chromium Zirconium** alloy shall be used:	• UNS: C18150. Impurities shall not exceed any of the following limits: 0.100 weight % Cobalt; 0.050 weight % Niobium and 0.050 weight % Tantalum. • CW106C in EN standards. Impurities shall not exceed any of the following limits: 0.100 weight % Cobalt; 0.050 weight % Niobium and 0.050 weight % Tantalum. With a thermomechanical treatment of a solution annealing at 980-1000°C for 30-60 minutes, water quench, followed by cold working 40-70% and ageing at 450-470°C for 2-4 hours.
For the zip ties, Nordlock washers and DIN 463 tab washers one of the following grades of **Stainless Steel** shall be used:	• 316L (UNS S31603). Impurities shall not exceed any of the following limits: 1.000 weight % Cobalt; 0.200 weight % Niobium and 0.200 weight % Tantalum. • X2CrNiMo17-12-2 (EN 1.4404). Impurities shall not exceed any of the following limits: 1.000 weight % Cobalt; 0.200 weight % Niobium and 0.200 weight % Tantalum.
For the custom M6 screws with venting holes, captive bolts M4 one of the following grades of **Stainless Steel**:	• Grade 660 (UNS S66286), Impurities shall not exceed any of the following limits: 1.000 weight % Cobalt; 0.200 weight % Niobium and 0.200 weight % Tantalum. • X6NiCrTiMoVB25-15-2 (EN 1.4980), Impurities shall not exceed any of the following limits: 1.000 weight % Cobalt; 0.200 weight % Niobium and 0.200 weight % Tantalum.
For conical spring washers DIN 6796 the following grade of **Ni-based alloy** shall be used:	• Inconel 718 (UNS N07718, EN 2.4668).
Ceramic bottom and top:	• Machinable AIN Ceramic (refer to section 8.5.1) • Sintered AIN ceramic (refer to section 8.5.2)
For coating of the JB components (listed in Section 8.7.5) and for JB shims one of the following grades of **Copper** shall be used:	• Oxygen-Free Electronic Copper (Cu-OFE, EN CW009A, UNS C10100), purity > 99% • Oxygen-Free Copper (Cu-OF, EN CW008A, UNS C10200), purity > 99%

[REQ-15]

All material shall be clearly specified and certified in accordance with EN 10204 3.1 or 3.2 before being used in manufacturing. Besides:

- Materials intended to be used shall be accepted by IO at the "Release of procurement of raw materials" milestone (see D# 3 - D# 6).
- Certificates shall be provided after purchase order.

8.5.1 Machinable AIN Ceramics

Machinable Aluminium Nitride (AIN) ceramic may be used for ceramic bottom and top of the Junction Boxes.

[REQ-16]

The machinable aluminium nitride (AlN) shall be Shapal ™ Hi-M soft or any other equivalent product having the following properties:

- Porosity: < 0.05%
- Compressive strength: >1000 N/mm^2
- Thermal conductivity (at 100°C): >85 W/m K
- Thermal expansion (20-400°C): 4.5 – 5 x 10^{-6}/K
- Volume Resistivity (25°C, DC): >5 x 10^{14} Ωcm
- Dielectric strength (at 20°C, 50 Hz AC): >30 kV/mm
- Composition: As per Table

Table 6 Machinable AIN ceramic chemical composition

Chemical Composition of Shapal ™ Hi-M Soft (weight %), mar or range		
AIN+BN	**O**	**Other impurities**
bal	1.0	0.2

8.5.2 Sintered AIN Ceramics

Sintered Aluminium Nitride (AIN) ceramic may be used for ceramic bottom and top of the Junction Boxes.

[REQ-17]

The sintered AlN ceramic shall have the following properties:

- Porosity: < 0.05%
- Compressive strength: >1000 N/mm^2
- Thermal conductivity (at 100°C): >85 W/m K
- Thermal expansion (20-400°C): 4.5 – 5 x 10^{-6}/K
- Volume Resistivity (25°C, DC): >5 x 10^{14} Ωcm
- Dielectric strength (at 20°C, 50 Hz AC): >30 kV/mm
- Composition: As per Table 5

Table 5 Sintered AIN ceramic chemical properties

Chemical composition (weight %)		Accepted additives	Sintering process
AIN (purity > 99.5%)	Additives	Y_2O_3, CaO, CaO_3, CaC_2	See paragraph 8.7.1
Bal.	5% max.		

8.5.3 Copper Chromium Zirconium

[REQ-18]

The Copper Chromium Zirconium alloy shall have the mechanical properties shown in Table 6 after the thermomechanical treatment, when tested at 20°C.

The same properties shall be measured at 250°C and the values reported for information only, when ordering the material

Table 6 Mechanical properties of Copper Chromium Zirconium

Tensile Strength, MPa (minimum)	455
Yield Stress, 0.2% offset, MPa (minimum)	410
Total Elongation, % (min)	10

8.6 Materials Requirements for Clips

[REQ-19]

Clips are classified as Vacuum Class VQC-1B.

The Crimp Clips shall be made up from austenitic Stainless Steel hot rolled or forged bars and rods with a diameter not greater than 50 mm for the application in the ITER Vacuum Vessel [AD5].

[REQ-20]

The Plane Clips shall be made from one of the following grades:

- 316L (UNS S31603). Impurities shall not exceed any of the following limits: 1.000 weight % Cobalt; 0.200 weight % Niobium and 0.200 weight % Tantalum.
- X2CrNiMo17-12-2 (EN 1.4404). Impurities shall not exceed any of the following limits: 1.000 weight % Cobalt; 0.200 weight % Niobium and 0.200 weight % Tantalum.
-

8.7 Manufacturing Requirements

The manufacturing shall follow the drawings from Appendixes A and B which describe:

- Geometry of the components
- Dimensional tolerances and surface finish
- List of materials

8.7.1 Sintering

Sintering is an accepted alternative to machinable ceramics as per Section 8.5.

[REQ-21]

Sintering shall proceed with AlN powder in reduced air (e.g. N2, CO) for at least 5 hours, at a minimum temperature of 1800 °C.

8.7.2 Cutting Machining and surface finish

[REQ-22]

Care shall be taken in manufacturing processes so as not to introduce contaminants into surfaces that may be difficult to remove later and which might result in degraded vacuum performance.

[REQ-23]

Cutting fluids shall be water soluble, no halogenated and phosphorus and sulphur Free. The maximum allowable content of halogens, phosphorus, and sulphur is 200 ppm (each).

Accepted cutting fluids are listed in Appendix 4 of ITER VHB. The use of other cutting fluids requires prior acceptance.

[REQ-24]

Files, harsh abrasives, sand, shot or dry bead blasting, polishing pastes shall not be used.

[REQ-25]

If grinding is essential during the production of any Items referenced in this specification, the grinding wheel shall be free of organic components and shall have been manufactured in an oil-free, clean environment. The material and manufacturing process of the grinding wheel shall be accepted by IO before use.

[REQ-26]

All processes for modification of the surface roughness of any part shall be followed by appropriate cleaning of the surface.

[REQ-27]

The surface roughness of metallic parts shall be Ra $\leq$ 6.3 micrometres measured by electric stylus. Surface roughness is defined following ISO 4287: 2009.

8.7.3 Tapping and threading

[REQ-28]

Tapped holes and threads shall be cut using only the approved cutting fluids referred in [REQ-23].

8.7.4 Intermediate cleaning

This section refers to cleaning between manufacturing steps. Final cleaning before packing shall refer to Section 11.2.

[REQ-29]

Halogenated solvents and chemical etching shall not be used at any stage in the production of the Items.

8.7.5 Coating

The copper coating is required to prevent thread seizing, which is common when stainless steel bolts are used with stainless steel threads. Copper acts as a dry lubricant, reducing friction and allowing reliable assembly and disassembly, especially in vacuum or high-temperature conditions.

Copper coating applies specifically to:

- M6x12 Custom screw with venting hole
- M4x13 Captive Bolts
- M6x14 Hexagon socket head cap screw

[REQ-30]

The copper coating process shall be electro-plating. The purity of the deposited copper shall be > 99% [AD6].

[REQ-31]

If an intermediate layer for the copper coating is required, the material used shall be Nickel.

[REQ-32]

The anodes to be used in the coating process shall be made of Oxygen Free Copper (Cu-OF, CW008A, UNS C10200) or Oxygen Free Electronic Copper (Cu-OFE, CW009A, UNS C10100).

[REQ-33]

The thickness of the copper coating shall be 3-5 µm (the thickness of the interlayer, if present, is excluded in the measurement of the copper coating thickness). For the screws and bolts, this corresponds to “C1A” description as per ISO 4042 – Attachment E and refers to coating of the complete bolt/screw (i.e. head and threads).

[REQ-34]

Halogenated fluids shall not be used in any coating or pickling activity without prior IO approval and a demonstrated capability to effectively remove all traces of halogens from the product.

[REQ-35]

Electrical insulation materials are required on inner side of the junction box adapter to avoid any electrical loops that may induce electromagnetic forces due to fast magnetic transients. Al_2O_3 shall be used as insulation materials.

8.7.6 Pickling and passivation

[REQ-36]

If pickling of steel or copper components is performed, this shall be followed by passivation.

[REQ-37]

Pickling and passivation shall be followed immediately by an appropriate cleaning process.

8.8 Marking

[REQ-38]

Any marking on surfaces shall be made by scribing with a clean sharp point or by a laser scribing method.

[REQ-39]

Chemical etching shall not be used to mark the parts unless accepted by the IO.

[REQ-40]

Dyes, marker pens, paints, etc. shall not be used to mark the parts.

[REQ-41]

Identification code shall be specified in English and Western Arabic Numbers.

[REQ-42]

The marks shall be clearly made with the IO official numbering system according to the IO MQP Procedure ITER_D_U344WG - Procedure for Identification and Controls of Items.

[REQ-43]

The Supplier shall include the following codes on each junction box lid and base:

- Functional Reference Number (FR) with the format 17OIXX-BJ-YYYY
- Part Number of ITER (PNI) with the format I00XXXXXX, where XXXXX is the ITER part number.
- Serial Number (SN) to be provided by the Contractor.

A list correlating these three codes shall be provided by the Contractor.

The list of Part Numbers of ITER and Functional References will be provided to the Contractor by IO.

If the area is limited, at least one Item-ID-Number to enable tracing back the data/ documents.

The list of Part Numbers of ITER and Functional References will be provided to the Contractor by IO by the time of the MRR.

9 Items Qualification

This section contains qualification tests to be conducted for review at the MRR. They include outgassing, copper coating adhesion after thermal shock, copper coating adhesion after tensile test and dimensional measurement tests. Tests need to be performed with the prototype items.

The same prototype can be used for more than one test (i.e. to fulfil more than one requirement).

[REQ-44]

Junction Boxes and Clips shall have a maximum steady state outgassing rate at 100 °C for hydrogen isotopes of $1x10^{-7}$ $Pa \cdot m^3 \cdot s^{-1} \cdot m^{-2}$ and for other gases of $1x10^{-9}$ $Pa \cdot m^3 \cdot s^{-1} \cdot m^{-2}$. Before each outgassing test, the Contractor shall clean and dry the Item in accordance with Section 11.2.

[REQ-45]

The Copper coating on prototype Items shall not show signs of peeling, chipping or flaking after a thermal shock test at 300°C according to the ISO 2819 standard.

[REQ-46]

The Copper coating on prototype Items shall not show signs of detachment from the base metal after a tensile test according to the ISO 2819 standard.

[REQ-47]

Dimensional check shall be performed to measure the prototype Items to verify all the dimensions indicated on the component drawings.

[REQ-48]

If sintered ceramics are used, an electrical test shall be performed to measure the withstand voltage of a test coupon, manufactured using the same procedure as the First of Series Junction Box ceramic pieces, to verify the electrical parameters indicated in Section 8.5.2 [REQ-17]. The test shall follow Section 6.2.1 “Withstand voltage tests” of IEEE Standard 4, using a test duration of 1 minute (test voltage to be determined by the thickness of the coupon being tested).

10 Factory Acceptance Testing

This section describes the tests and testing conditions that each component needs to pass once manufactured.

10.1 Testing and reporting requirements

[REQ-49]

Unless otherwise specifically indicated, all tests in this specification shall be conducted at room temperature.

[REQ-50]

For each Junction Box, Bolt, Washer and Clip produced, Factory Acceptance Tests shall be performed by the Contractor before the components are shipped to the final destination.

[REQ-51]

All metrology equipment used for Alignment and Metrology tasks shall hold a current calibration certificate issued by an accredited laboratory (Reference standard BS EN ISO/IEC 17025: 2005).

[REQ-52]

Factory Acceptance Test measurement equipment shall be fit for the purpose of validating the corresponding requirements e.g. measurement uncertainty and accuracy, and for the selected measurement process; e.g. considering speed of data acquisition, measurement geometry, local environmental conditions etc.

[REQ-53]

Factory Acceptance Test Reports shall be produced, recording the results of each test (including pass/fail) in electronic, print-compatible tabular format for each Item tested, supported, as agreed with IO at the MRR, by test data records and evaluation (fully traceable to the result), equipment calibration status and certificates, list of NCRs and deviations from accepted procedure and pictures from the test set-up and test execution.

10.2 Specific visual inspection, assembly, and dimensional inspection requirements

[REQ-54]

The Supplier shall verify that the identification marks are visible and readable to verify requirements Section 8.8 and Section 11.1.

[REQ-55]

Tests shall be performed to measure:

- The first example of each Item produced (the “First of Series”),
- At least 5% of each Junction Box type per batch (including sub-components),
- At least 1% of each Clips type per batch

in order to verify the compliance of all the dimensions with the Manufacturing Drawings.

[REQ-56]

Fitting tests shall be performed on all the components described in this document, in order to verify their constituent parts fit together.

[REQ-57]

The Contractor shall demonstrate (either through certification or testing) that dimensional measurement errors shall not exceed 20%, unless otherwise specified, of the tolerance applicable to the feature measured.

Maintaining a dimensional measurement error of 10% or less is recommended to optimise the available tolerance applicable to the feature concerned.

10.3 Specific copper coating requirements

[REQ-58]

For one Item per copper coating batch, the copper coating shall successfully pass a burnishing test according to the ISO 2819 standard (pass criteria: no blistering or flaking of the coating).

[REQ-59]

For one Item or coupon per copper coating batch, the Contractor shall measure the thickness of the copper coating in three different locations. The measurement method can be destructive (on a copper coated coupon) or non-destructive (applied directly on the Item).

The coupon shall have a representative shape, and the same materials, possible interlayer and surface properties as the Item being coated.

10.4 Specific electrical testing requirements

[REQ-60]

If sintered ceramics are used, a test shall be performed to measure the withstand voltage of a test coupon, manufactured using the same procedure as the First of Series Junction box ceramic pieces, in order to verify the electrical parameters indicated in Section 8.5.2, [REQ-17]. The test shall follow [REQ-48] “Withstand voltage tests” of IEEE Standard 4, using a test duration of 1 minute (test voltage to be determined by the thickness of the coupon being tested).

11 Labelling, Cleaning, Packaging, Handling, Storage And Shipment Requirements

11.1 Labelling

[REQ-61]

All component packaging marking shall be in English and French.

[REQ-62]

Chemical or radiological hazards, etc., shall be identified on the packaging.

[REQ-63]

Products labels shall include:

1) Title of Product,
2) Manufacturer Part Number, MN,
3) PNI,
4) SN,
5) Safety Classification, e.g. PIC/SIC, ESPN,
6) Quality Class.

11.2 Cleaning

[REQ-64]

Manufactured parts and COTS shall undergo final cleaning before packing.

[REQ-65]

Parts and sub-components shall be degreased using solvents or alkaline detergents (using one of the accepted cleaning fluids for VQC 1B usage given in Appendix 4 of the IVH [AD2]), rinsed with demineralized water, and dried in hot gas or an oven.

[REQ-66]

After cleaning of the Items, the Contractor shall perform a wet wipe test on at least two randomly selected samples of each item types per batch using the procedure described below (taken from Section 13.22.1.2 of Appendix 13 of the ITER Vacuum Handbook [AD3]) in order to confirm that repetition of the cleaning is not necessary.

Cleaning procedure:

The procedure uses a clean lint free cloth dipped in a solvent which evaporates at room temperature, such as isopropanol, ethanol or acetone.

Appropriate safety precautions against fire hazard, breathing in of solvent fumes, eye and skin protection must be taken.

1. The cloth is dipped in the solvent which is then be allowed to evaporate in a safe manner. There should be no change in the appearance of the surface of the dry cloth.
2. The cloth is dipped in the solvent and the surface of the component is wiped gently while the cloth is still wet.
3. The solvent is allowed to evaporate from the cloth and the surface of the component until they are dry.
4. If there is any evidence of a deposit on the cloth (i.e. a stain or a change in colour) then the item should be regarded as unclean.
5. Similarly, if the surface of the component which has been wiped shows any evidence of a change in colour or reflectivity of light, then the item should be regarded as unclean.

If required, the deposit on the cloth may be analysed by a suitable means to determine the chemical nature of the contamination.

Abrasive techniques to clean or to attempt to improve the appearance of the surface of any Item should be avoided where possible.

The Supplier shall prepare a Clean Work Plan including:

- Precautions to be taken and the procedures to be followed during the handling of products during manufacture to avoid the contamination of the products and to define the proper cleaning before shipment
- Specific instructions on how cleanliness will be maintained throughout the manufacturing process of the Items.
- When specific cleaning procedures shall be applied to the Items and all of the controls which will be in place to maintain cleanliness of the Items including handling.

To prepare the Clean Work Plan, the Supplier could make use of the proposed cleaning procedures for VQC1 Items presented in Appendix 13 of the IVH (Cleaning and cleanliness for the ITER project) [AD3].

11.3 Handling

[REQ-67]

The handling of the Items shall be minimised and strictly controlled to preserve cleanliness.

[REQ-68]

The continuing suitability of any given area used for handling vacuum equipment shall be checked on a regular basis by monitoring the airborne particulate count, which shall not exceed 5 x 10^6 particles of size > 0.5 µm per m^3. This is intermediate between Class 8 and 9 according to ISO 14644-1 Cleanroom Standards.

11.4 Storage

It is highly recommended to pack the Items immediately after completion of cleaning and once dry.

[REQ-69]

If not immediately packed after completion of cleaning and once dry, the Items shall be stored in a segregated clean area.

[REQ-70]

The environment of the segregated clean area shall be monitored accordingly:

- Daily air quality checks (to confirm compliance with the limits specified in [REQ-68]);
- Weekly cleanliness test of the area

[REQ-71]

Access to this segregated clean area shall be limited to authorised and trained personnel only.

[REQ-72]

Personnel entering the segregated clean area shall wear adequate personal protective equipment (PPE), consisting of (but not limited to) the following:

- Hairnets,
- Clean powder free latex (or nitrile) outer gloves,
- Clean white overalls,
- Clean job specific footwear,
- Overshoes.

[REQ-73]

Equipment in the segregated clean area shall be authorised (i.e. to ensure it complies with the cleanliness requirements) and it shall only be operated by trained personnel to approved procedures.

[REQ-74]

The cleanliness of this segregated clean area shall be preserved by daily cleaning of floor and surfaces and through use of sticky mats at the entrance to the area.

[REQ-75]

For the deliverable batch, the Contractor shall include a clean storage area monitoring report.

11.5 Packing

[REQ-76]

The components of each delivery Item shall be grouped and enclosed in heat sealed polyethylene bag to prevent contamination during transportation and storage. Components for one full junction box assembly per polyethylene enclosure (ceramic pieces pre-installed and cable ties not installed, as per drawings in Appendix A).

[REQ-77]

The polyethylene enclosure shall be purged and backfilled with dry air (<4000 ppm H_2O).

[REQ-78]

Adhesive tape used for packaging or protection shall not come into contact with any surface of the Items.

[REQ-79]

The crates, in which the polythene enclosures are packed for shipment, shall be as specified below:

Non-returnable wooden crates, also labelled VQC 1B and with clear handling instructions;

- Sufficiently rigid to avoid deforming under the weight of the Items;
- Packed with shock absorbing material to support the polythene enclosures and avoid the potential for impact loading on the Items due to sudden movements or accidental drop of the crates;
- The crates' labels shall be agreed at the MRR, however, the labels:
  - Shall be visible from all sides of the packing.
  - Shall state the Packing List Reference Number written in English and Western Arabic numbers.
  - Shall have a scannable QR or bar code.
- At least two accelerometers shall be rigidly fixed onto each crate and shall be capable of recording the acceleration along three perpendicular directions.

[REQ-80]

The shipping label of each crate shall include:

1) Title of crate,
2) Purchase Order, PO, Contract Number, PA code, etc.
3) Shipping/Crate Num.,
4) Supplier Ref. Num.,
5) Manufacturer Part Number, MN,
6) PNI,
7) SN (batch common digits if relevant),
8) Safety Classification, e.g. PIC/SIC, ESPN,
9) From (CON-M) / To,
10) Net / gross weight,
11) Responsibility,
12) Packing Date (MM/YYYY).

11.6 Delivery Readiness Review

The Delivery Readiness Review (DRR) is a Hold Point to ensure that the components can be released for shipment.

The purpose of the DRR:

- To perform the final check and the verification of components, packages and corresponding documentation before they leave the Sending Entity and transport to the IO;

- To validate that the IO has all mandatory documentation, customs documents, and/or any other technical or logistical information that is needed so that the material can be adequately managed through transportation, reception, storage, and ultimately into ITER construction and assembly.

DRR mandatory documents:

- Contractor Release Note (CRN)
- Delivery Report
- Packing List (PL)
- Equipment Storage and Preservation Form
- Shipping Plan of Load (SPL) with a specific transportation quality plan containing special requirements for the lifting, handling, etc. – to be prepared by the Logistics Service Provider.

The DRR shall follow the procedure Working Instruction for the Delivery Readiness Review [AD10].

11.7 Shipment

[REQ-81]

If requested by IO, the Supplier shall withhold shipment of one or more batch(es) for up to one month to allow preparations at destination for Site Acceptance Testing.

[REQ-82]

The Contractor shall ensure that the transport organization, and the transport company are insured for damage and/or loss of the components.

DAHER is the preferred supplier for the shipment, one quote shall be requested from them.

[REQ-83]

The Supplier shall bear the risk of loss or damages to the Items until IO Final acceptance.

[REQ-84]

The items shall be delivered to the ITER Organization at the following address under the responsibility of the Contractor.

ITER Organization, Zone 2, B 89 , Logistic Platform

Route de Vinon-sur-Verdon –

13115 St Paul Lez Durance,

France

12 Delivery Acceptance

[REQ-85]

Upon receipt of the shipment at the delivery location, the crates shall be opened by IO or its authorised representatives for visual inspection to confirm that:

- the integrity of the crates and internal packages has been preserved, including identifying visible damage;
- the number and type of components contained in the packages is correct;
- the enclosed documentation (materials certificates, test results, etc.) is complete;
- the reading of the accelerometers or other sensors is consistent with handling of fragile items;
- the integrity of the components and cleanliness has been preserved.
- the existence and correctness of the markings on the Items

Acceptance of delivery will be completed by signature of Delivery Report by IO after successful conclusion of the inspection. Following such confirmation, the shipment will be accepted.

13 Deliverables and Due Dates

Deliverable	Due Date
D# 1 Project Plan and Schedule	Kick-off meeting
D# 2 Contractor's Quality Plan	Kick-off meeting
D# 3 Materials Specifications: Specifications prepared by the Supplier for purchase of all raw materials to be used for the manufacture of the Items	Release of procurement of raw materials
D# 4 Draft manufacturing drawings for all variants of the Items	Release of procurement of raw materials
D# 5 Inspection plan: Plan for inspection of incoming materials	Release of procurement of raw materials
D# 6 The Material Supplier documentation	Release of procurement of raw materials
D# 7 Manufacturing and Inspection Plan	MRR
D# 8 Manufacturing Specification (detailed procedures and templates for all activities related to manufacturing, inspections and verification of the quality of the Items). The specification shall contain as minimum: - Procedures for VQC 1B marking, part and component identification, tracking scheme for all the Items. - Clean Work Plan and cleaning procedure for VQC 1 - Heat treatment and surface treatment records (if such treatment is applied) - Procedure for copper coating - Dimensional Inspection Plan	MRR
D# 9 Material certificates for each material demonstrating compliance with the requirements	MRR
D# 10 Factory Acceptance Test Plan	MRR
D# 11 Packing, Handling, Transportation and Storage Plan	MRR
D# 12 Manufacturing Drawings for each type of Junction Box and Clips (including any approved deviations, final dimensions, methods of joining, materials, tolerances and any other changes arising from the chosen manufacturing path)	MRR
D# 13 Qualification Tests Report	MRR
D# 14 Factory Acceptance Test Report	FAT
D# 15 Contractor Release Note (CRN)	DRR
D# 16 Delivery Report	DRR
D# 17 Packing List (PL)	DRR

D# 18	Equipment Storage and Preservation Form	DRR
D# 19	Shipping Plan of Load (SPL)	DRR
D# 20	Delivery of the Batch #1	June 2026
D# 21	Delivery of the Batch #2	September 2026
D# 22	Delivery of the Batch #3	November 2026

14 Quality

14.1 Quality Class

All in-vessel supports within the scope of this Technical Specification are classified as Quality Class 2 and are designated as non-PIC/non-PIA.

14.2 Assurance Requirements

The Contractor conducting the presented activities shall have an ITER approved QA Program or an ISO 9001 accredited quality system. The general requirements are detailed in Quality Requirements for IO Performers [AD7]

Prior to commencement of the task, a Quality Plan must be submitted for IO approval giving evidence of the above and describing the organization 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 Quality Requirements for IO Performers [AD7]).

Prior to commencement of any manufacturing, a Manufacturing Inspection Plan must be approved by ITER who will mark up any planned interventions.

Deviations and Nonconformities shall follow the procedure detailed in Procedure for the management of Deviation Request [AD9] and Procedure for management of Nonconformities [AD8].

Prior to delivery of any manufactured items to the IO Site, a Release Note shall be signed in accordance with ITER requirements regarding Quality Requirements for IO Performers [AD7].

Documentation developed as the result of the tasks here included shall be retained by the performer of the task for a minimum of 5 years and then may be discarded at the direction of the IO.

15 Contract follow-up

15.1 Control Points

To ensure a close oversight of the entire activities foreseen in the present technical specification, a system of Control Points will be implemented by the IO in order to keep track of the work advance in accordance with the approved Manufacturing and Inspection Plans (MIP).

The control points shall be integrated into the agreed schedule and defined as the following:

- A **Notification Point (NP)** is a milestone where the Contractor is required to notify the IO that it has completed a specific task or a specific deliverable and is proceeding to the next task or to the next action on the specific deliverable. A NP is meant to enable the IO personnel to follow the progress of the Contract and possibly to witness a critical manufacturing step at the Contractor’s premises. The Notification shall be sent by the Contractor to the IO at least 10 working days prior to the scheduled manufacturing step. The IO shall decide whether or not they want to attend. A NP shall not affect the

production flow of the Contractor that shall continue the work even without a reply from the IO.

- A **Hold Point (HP)** is a milestone where the Contractor is required to notify the IO, that it has completed a specific task or a specific deliverable and must stop the associated processes until a HP Clearance is issued. The HP Clearance shall be issued on the basis of clearly identified Quality Control and data and Acceptance test results to be provided to the IO at the time of the request. The IO shall have a maximum of 5 working days to review the Contractors data and to notify the Contractor of its decision. In case of clearance the Contractor shall resume its activity. In case of rejection, the Contractor shall develop a recovery plan that shall be submitted and reviewed by the IO within 10 working days of submission.
- A **Witness Point (WP)** is a milestone which identifies an operation to be witnessed. Adequate notice shall be given to the IO, in order to allow the IO to participate to the operation.

15.2 Milestones

No	Name	Control Point	Deliverables
M1	Kick-off Meeting (HP)	HP	D# 1 - D# 2
M2	Release of procurement of raw materials (HP)	HP	D# 3 - D# 6
M3	Manufacturing Readiness Review (HP)	HP	D# 7 - D# 13
M4	Factory Acceptance Tests Report (HP)	HP	D# 14
M5	Delivery Readiness Review (HP)	HP	D# 15 - D# 19
M6	Arrival of the delivery batch to ITER site	-	D# 16 signed by IO

15.3 Work monitoring

15.3.1 Data management

The documents generated during the execution of this contract, which the Contractor and its Suppliers shall submit to IO (e.g. technical and QA documents, Minutes of Meetings) will be handled electronically in the ITER Document Management System (IDM).

15.3.2 Periodic meetings

[REQ-143]

The Contract shall start with an official Kick-Off Meeting where the following items (as a minimum) shall be discussed and agreed:

- Confirmation of the specifications, specific requirements and contractual input.
- The Contractor's Quality Plan.
- The Detailed Work Schedule of the contractual activities, including milestones.

[REQ-144]

Progress meetings shall be conducted throughout the whole duration of the Contract at a minimum frequency of one per calendar month. The meetings shall be held by video conference or in-person at the IO's premises or at the Contractor's premises.

[REQ-145]

The Minutes of Meeting (MoM) shall be prepared by the Contractor and submitted to the IO no later than one week after the meeting.

16 Applicable Documents

[AD1] ITER_D_2EZ9UM - ITER Vacuum Handbook
[AD2] ITER_D_2ELN8N - Appendix 4 Accepted Fluids
[AD3] ITER_D_2ELUQH - Appendix 13 Cleaning and Cleanliness
[AD4] ITER_D_2EXDST - Appendix 17 Guide to Outgassing Rates and their Measurement
[AD5] ITER_D_2RFZ4B - Product Procurement Specification for the supply of X2CrNiMo17-12-2 austenitic stainless steel rolled or forged bars for clips
[AD6] ITER_D_TLLFHC - Copper Antiseize coating specification for In vessel components
[AD7] ITER_D_22MFG4 - Quality Requirements for IO Performers
[AD8] ITER_D_22F53X - Procedure for management of Nonconformities
[AD9] ITER_D_2LZJHB - Procedure for the management of Deviation Request
[AD10] ITER_D_X3NEGB - Working Instruction for the Delivery Readiness Review (DRR)

17 Reference Documents

[RD1] ITER_D_QVEKNQ - Release Note Template
[RD2] ITER_D_WZPYVZ - Delivery Report Template
[RD3] ITER_D_XBZLNG - Package & Packing List Template
[RD4] ITER_D_WU9636 - Template - Equipment Storage & Preservation Requirements Form
[RD5] https://user.iter.org/default.aspx?uid=AXWV63

EXPRESSION OF INTEREST & PIN ACKNOWLEDGEMENT

To be returned by e-mail to: Emilio.Rondinella@iter.org copy Takakazu.Kimura@iter.org

TENDER No.	**IO/25/OT/10032323/ERA**
DESIGNATION of SERVICES:	**Procurement of In-vessel Supports**
OFFICER IN CHARGE:	**Emilio Rondinella – Procurement Division ITER Organization**

☐ WE INTEND TO SUBMIT A TENDER

Signature: COMPANY STAMP

Name: .....

Position: .....

Company: .....

Tel: .....

E-mail.....

Date: .....