外部委託業者の募集

References: IO/25/OT/10034063/JGO

"Supply Contract for Pressurizer and Pressure Relief Tank of Integrated Blanket, Edge Localized Mode/Vertical Stability, and Divertor (IBED) Primary Heat Transfer System (PHTS)"

（統合ブランケット、エッジ局所化モード／垂直安定性、およびダイバータ（IBED）一次熱輸送システム（PHTS）の加圧器および圧力緩和タンクの供給契約）

IO 締め切り 2025 年 12 月 15 日(月)

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。

この文書の目的は、作業範囲および入札プロセスに関する技術的内容の基本的な概要を提供することです。

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。

ITER の敷地はフランス南東部のブーシュデュローヌ地区にあり、ITER 本社（HQ）もあるフランス CEA サン・ポール・レ・デュランス に近いところに位置しています。詳細については、ITER のウェブサイト http://www.iter.org を参照して下さい。

〇作業範囲

現在の入札プロセスは、統合ブランケット、エッジ局所化モード／垂直安定性、およびダイバータ（IBED）一次熱輸送システム（PHTS）の加圧器および圧力緩和タンクの供給契約を締結することを目的としています。

作業範囲には、以下の要件が含まれます：

材料、設計、調達、製作、検査、試験、認証、梱包、納入

対象機器は次の通りです：

IBED PHTS加圧器（タグ番号：26PHBD-PZ-1001）、関連する比例ヒーター（26PHBD-HT-1001、クラスIV電源）、バックアップヒーター（26PHBD-HT-1002、クラスIV電源）、制御盤および電気スイッチ盤、IBED PHTS圧力緩和タンク（タグ番号：26PHBD-TA-7001）、埋め込み型クーラー（26PHBD-HX-7001）

さらに、契約実行に関する要件も含まれます。

詳細については、以下を参照してください：

付属書Ⅱ：「IBED PHTS加圧器供給の技術仕様書」E32L6X v1.3

付属書Ⅲ：「IBED PHTS圧力緩和タンク供給の技術仕様書」DUJQMP v1.3

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期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

  関心表明提出後、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

  入札者の提案は、IO の公平な評価委員会によって評価されます。入札者は、技術的範囲に沿って、かつ、RFP に記載された特定の基準に従って作業を実施するために、技術的遵守を証明する詳細を提供しなければなりません。

- 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 11 月 25 日
関心表明フォームの提出	2025 年 12 月 15 日
入札開始	2026 年 1 月 9 日
明確化のための質問（もしあれば）と回答	入札提出の 5 日前
入札提出	2026 年 2 月 20 日
入札評価と契約授与	2026 年 3 月
契約調印	2026 年 4 月

〇契約期間と実行

ITER機構は2026年のQ1に供給契約を授与する予定です。予想される契約期間は24か月の予定です。

〇候補

参加は、個人またはグループ/コンソーシアムに参加するすべての法人に開放されます。法人とは、法的権利及び義務を有し、ITER 加盟国内に設立された個人、企業又は機構をいいます。ITER 加盟国は欧州連合(EURATOM メンバー)、日本、中華人民共和国、インド共和国、大韓民国、ロシア連邦、アメリカ合衆国です。

法人は、単独で、またはコンソーシアムパートナーとして、同じ契約の複数の申請または入札に参加することはできません。共同事業体は、恒久的な、法的に確立されたグループ又は特定の入札手続のために非公式に構成されたグループとすることができます。

コンソーシアムのすべての構成員(すなわち、リーダーと他のすべてのメンバー)は、ITER 機構に対して連帯して責任を負います。

コンソーシアムとして許可されるために、その点で含まれる法人はコンソーシアムの各メンバーをまとめる権限をもつリーダーをもたなければなりません。このリーダーはコンソーシアムの各目メンバーのために責任を負わなければなりません。

指名されたコンソーシアムのリーダーは、入札段階で、コンソーシアムのメンバーの構成を説明する予定です。その後、候補者の構成は、いかなる変更も ITER 機構に通知することなく変更してはなりません。かかる認可の証拠は、すべてのコンソーシアムメンバーの法的に授権された署名者が署名した委任状の形式で、しかるべき時期に IO に提出しなければなりません。

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「**Supply Contract for Pressurizer and Pressure Relief Tank of Integrated Blanket, Edge Localized Mode/Vertical Stability, and Divertor (IBED) Primary Heat**

Transfer System (PHTS)」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。

china eu india japan korea russia usa
Route de Vinon-sur-Verdon - CS 90 046 - 13067 St Paul Lez Durance Cedex - France

PRIOR INFORMATION NOTICE (PIN)

OPEN TENDER SUMMARY

IO/25/OT/10033871/JGO

for

Supply Contract for ITER Vacuum Vessel Pressure Suppression System Pressure Sensors and Pressure Differential Sensors

Prior Indicative Notice annexes:
- Annex I: Expression of Interest
- Annex II: Technical Specification CVAS7F_v1_6 and Datasheet CUVUV2_v1_5

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.

1 Introduction

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

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 Supply Contract(s) for all necessary design development, qualification and manufacturing activities that ultimately enable the delivery of the instruments procured for the ITER Vacuum Vessel Pressure Suppression System (VVPSS).

The VVPSS instruments covered in this tender are divided into four (4) Procurement Lots: Lot 1 Pressure Sensors Absolute MP, Lot 2 Pressure Sensors Gauge MP, Lot 3 Pressure Differential Sensors MFT and Lot 4 Pressure Differential Sensors MPD. Depending on the Candidate's capability they may submit a tender covering one or several lots, but as minimum all the scope of one lot shall be covered, split lot or mixed lot will not be accepted by ITER Organization.

Measurement type	**Code**	**Lot**	**Number of sensors**	
			SIC	**Non-SIC**
Pressure Sensors Absolute	MP	1	28 (Gas)	4 (Gas)
Pressure Sensors Gauge	MP	2	3 (Gas)	1 (Gas) 11 (Liquid)
Pressure Differential Sensors	MFT	3	11 (Flow gas) 2 (Flow liquid)	8 (Flow liquid) 2 (Flow Gas)
Pressure Differential Sensors	MPD	4 option A	14 (Level)	0
TOTAL	**-**		**58**	**26**

Table 1: Preferred overall scope of supply for sensors

Measurement type	**Code**	**Lot**	**Number of sensors**	
			SIC	**Non-SIC**
Pressure Sensors Absolute	MP	4 option B	14 (Liquid)	0
TOTAL	**-**		**14**	**0**

Table 2: Alternative scope of supply for lot 4

The Contractor shall demonstrate that the supplied instruments, notably but not limited to Safety classified items, reach their required performances and withstand the environment conditions and loads in normal and accident conditions, including:

- Seismic load,
- Electromagnetic field,
- Irradiation and neutron flux,
- LOCA in the sensor room,
- Fire load,
- Dust load.

Depending on the PE/NPE classification of each item (maximum ESPN N2 category 0 and PE SEP), the Contractor shall demonstrate the compliance with applicable orders. The "Pressure sensors" and the “Pressure Differential sensors” are “Pressure Accessories” and the Contractor is the regulatory manufacture.

Due to the VVPSS planning, IO foresees a staged approach to execute this Contract. The Contractor shall present a proposal to meet the ultimate goal of this specification at the tender stage, which is the delivery to IO of qualified instruments. The following stages are foreseen:

- Task 1: Design – The first task is dedicated to the design of the VVPSS instruments based on the requirements defined in this technical specification. The Contractor shall demonstrate compliance with all the requirements specified in this document.
- Task 2: Manufacturing Preparation – The Contractor shall complete all steps to achieve manufacturing readiness of the VVPSS instruments in line with the requirements defined in this specification.
- Task 3: Manufacturing and Testing – The Contractor shall manufacture the VVPSS instruments and perform all the necessary inspections, qualifications and testing required by the design codes and this technical specification. The Contractor shall complete the Manufacturing dossier.
- Task 4: Delivery to the IO site - The Contractor shall prepare and complete the delivery of the VVPSS instruments to the IO site and hand over all the documentation required by this technical specification and design codes to IO.

NOTES:

- Several exchanges are foreseen between the Contractor and the IO during Task 1 to settle the technical solution and to achieve maturity of the IO design impacting the VVPSS instruments (Line routing, Process Schematic, Qualification of Equipment)
- Task 3 can only start after the completion of the VVPSS Final Design Review, expected in March 2026.

For more details, please refer to - Annex II: Technical Specification CVAS7F_v1_6 and Datasheet CUVUV2_v1_5.

4 Procurement Process & Objective

The objective is to award one or several Supply Contracts 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” (Annex I) 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
  The Request for Proposals (RFP) will be published on our digital tool "Iproc" after the submission of Expression of Interest. This stage allows interested bidders who have indicated their interest to the Procurement Officers 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
  One or several Supply Contracts will be awarded on the basis of best value for money method, 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)	13 November 2025
Submission of Expression of Interest form	No later than 28 November 2025
Tender launch	5 December 2025
Clarification Questions (if any) and Answers	5 days before submission deadline
Tender Submission	30 January 2026
Tender Evaluation & Contract Award	Q1 2026
Contract Signature	Q2 2026

5 Quality Assurance Requirements

Prior to commencement of any work under this Contract(s), a "Quality Plan" shall be produced by the Supplier and Subcontractors 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 is planning to award the Supply Contract(s) in Q1 2026. The estimated contract duration should be 14 months.

7 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 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 changes. Evidence of any such authorisation 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.

8 Sub-contracting Rules

All sub-contractors who will be taken on by the Contractor shall be declared with the tender submission in IPROC. 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.
All declared sub-contractors must be established within an ITER Member State in order to participate.
The IO reserves the right to approve (or disapprove) any sub-contractor which was not notified in the tender and request a copy of the sub-contracting agreement between the tenderer and its subcontractor(s). Rules on sub-contracting are indicated in the RFP itself.

ANNEX I

EXPRESSION OF INTEREST & PIN ACKNOWLEDGEMENT

To be returned by e-mail to: jingyu.gao@iter.org in cc to Andrew.Brown@iter.org

Tender reference: **IO/25/OT/10033871/JGO**

Description: **Supply Contract for ITER Vacuum Vessel Pressure Suppression System Pressure Sensors and Pressure Differential Sensors**

Procurement Officer: **Jingyu Gao**

Company Name: **……**

Country of Origin: **……**

☐ WE ACKNOWLEDGE HAVING READ THE PIN NOTICE FOR THE ABOVE MENTIONED TENDER

☐ WE INTEND TO SUBMIT A TENDER
If yes, please choose which lot(s) you wish to tender for.

☐ Lot 1: Pressure Sensors Absolute MP
☐ Lot 2: Pressure Sensors Gauge MP
☐ Lot 3: Pressure Differential Sensors MFT
☐ Lot 4: Pressure Differential Sensors MPD

☐ WE ARE ALREADY REGISTERED IN IPROC

☐ WE INTEND TO REGISTER IN IPROC

Please list the users of ARIBA/IPROC that you wish to add as response team for this tender:

Name	E-mail
…	…

……

Signature:

COMPANY STAMP

Name: .....
Position: .....
Tel: .....
E-mail.....
Date: .....

				Document Nº	CUVUV2
				Revision Nº	1.5
				Page Nº	4

	REV↓	TAG	Room number	Estmated absolute elevation (m)	Elevation in DTR (m)
1	1.5	24VPHM-MPD-8082	11-B2-01	-13.09	0
2	1.5			-9.5	3.59
3	1.5	24VPHM-MPD-8182	11-B2-01	-13.09	0
4	1.5			-9.5	3.59
5	1.5	24VPHM-MPD-8056	11-B2-01	-13.09	0
6	1.5			-7.45	5.64
7	1.5	24VPHM-MPD-8156	11-B2-01	-13.09	0
8	1.5			-7.45	5.64
9	1.5	24VPHM-MPD-8072	11-B2-01	-13.09	0
10	1.5			-8.87	4.22
11	1.5	24VPHM-MPD-8172	11-B2-01	-13.09	0
12	1.5			-8.87	4.22
13	1.5	24VP00-MPD-8016	11-B2-01	-13.09	0
14	1.5			-8.2	4.89
15	1.5	24VP00-MPD-8116	11-B2-01	-13.09	0
16	1.5			-8.2	4.89
17	1.5	24VP00-MPD-8026	11-B1-01	-8.2	4.89
18	1.5			-3.33	9.76
19	1.5	24VP00-MPD-8126	11-B1-01	-8.2	4.89
20	1.5			-3.33	9.76
21	1.5	24VP00-MPD-8036	11-B1-01	-8.2	4.89
22	1.5			-3.33	9.76
23	1.5	24VP00-MPD-8136	11-B1-01	-8.2	4.89
24	1.5			-3.33	9.76
25	1.5	24VP00-MPD-8046	11-B2-01	-13.09	0
26	1.5			-8.2	4.89
27	1.5	24VP00-MPD-8146	11-B2-01	-13.09	0
28	1.5			-8.2	4.89

VVPSS Pressure measurement Datasheet – Lot 4 Op

GENERAL DATA

PID	PID version	Line number	Measurement description
24VPHM-PID-001/06	F	24VPHM-PI-8581	OFT level
24VPHM-PID-001/06	F	24VPHM-PINST-8081	
24VPHM-PID-001/06	F	24VPHM-PI-8581	OFT level
24VPHM-PID-001/06	F	24VPHM-PINST-8181	
24VPHM-PID-001/02	F	24VPHM-PI-8551	PST level
24VPHM-PID-001/02	F	24VPHM-PINST-8054	
24VPHM-PID-001/02	F	24VPHM-PI-8551	PST level
24VPHM-PID-001/02	F	24VPHM-PINST-8154	
24VPHM-PID-001/05	F	24VPHM-PI-8073	QEN level
24VPHM-PID-001/05	F	24VPHM-PI-8071	
24VPHM-PID-001/05	F	24VPHM-PI-8073	QEN level
24VPHM-PID-001/05	F	24VPHM-PI-8171	
24VP00-PID-001/02	G	24VP00-PI-8510	SLT level
24VP00-PID-001/02	G	24VP00-PI-8514	
24VP00-PID-001/02	G	24VP00-PI-8510	SLT level
24VP00-PID-001/02	G	24VP00-PINST-8114	
24VP00-PID-001/03	G	24VP00-PI-8520	LLT1 level
24VP00-PID-001/03	G	24VP00-PI-8524	
24VP00-PID-001/03	G	24VP00-PI-8520	LLT1 level
24VP00-PID-001/03	G	24VP00-PINST-8124	
24VP00-PID-001/04	G	24VP00-PI-8530	LLT2 level
24VP00-PID-001/04	G	24VP00-PI-8534	
24VP00-PID-001/04	G	24VP00-PI-8530	LLT2 level
24VP00-PID-001/04	G	24VP00-PINST-8134	
24VP00-PID-001/05	G	24VP00-PI-8540	LLT3 level
24VP00-PID-001/05	G	24VP00-PI-8544	
24VP00-PID-001/05	G	24VP00-PI-8540	LLT3 level
24VP00-PID-001/05	G	24VP00-PINST-8144	

tion A – Pressure Differential

Process Fluid	Process Fluid Cleanliness	SERVICE	MAX Hydrogen concentration (mol%)	Molecular weight (kg/mol)
Tritiated water	DIRTY (ACP/Dust)	LIQUID	0%	0.018
AIR / H2	DIRTY (ACP/Dust)	GAS	5%	0.028
Tritiated water	DIRTY (ACP/Dust)	LIQUID	0%	0.018
AIR / H2	DIRTY (ACP/Dust)	GAS	5%	0.028
Tritiated water	DIRTY (ACP/Dust)	LIQUID	0%	0.018
AIR / H2	DIRTY (ACP/Dust)	GAS	5%	0.028
Tritiated water	DIRTY (ACP/Dust)	LIQUID	0%	0.018
AIR / H2	DIRTY (ACP/Dust)	GAS	5%	0.028
Tritiated water	DIRTY (ACP/Dust)	LIQUID	0%	0.018
AIR / H2	DIRTY (ACP/Dust)	GAS	5%	0.028
Tritiated water	DIRTY (ACP/Dust)	LIQUID	0%	0.018
AIR / H2	DIRTY (ACP/Dust)	GAS	5%	0.028
Tritiated water	DIRTY (ACP/Dust)	LIQUID	0%	0.018
AIR / H2	DIRTY (ACP/Dust)	GAS	50%	0.015
Tritiated water	DIRTY (ACP/Dust)	LIQUID	0%	0.018
AIR / H2	DIRTY (ACP/Dust)	GAS	50%	0.015
Tritiated water	DIRTY (ACP/Dust)	LIQUID	0%	0.018
AIR / H2	DIRTY (ACP/Dust)	GAS	50%	0.015
Tritiated water	DIRTY (ACP/Dust)	LIQUID	0%	0.018
AIR / H2	DIRTY (ACP/Dust)	GAS	50%	0.015
Tritiated water	DIRTY (ACP/Dust)	LIQUID	0%	0.018
AIR / H2	DIRTY (ACP/Dust)	GAS	50%	0.015
Tritiated water	DIRTY (ACP/Dust)	LIQUID	0%	0.018
AIR / H2	DIRTY (ACP/Dust)	GAS	50%	0.015
Tritiated water	DIRTY (ACP/Dust)	LIQUID	0%	0.018
AIR / H2	DIRTY (ACP/Dust)	GAS	50%	0.015
Tritiated water	DIRTY (ACP/Dust)	LIQUID	0%	0.018
AIR / H2	DIRTY (ACP/Dust)	GAS	50%	0.015

PROCESS DATA					
MIN Temperature (°C)	MIN pressure (kPa abs)	MIN density (kg/m3)	MIN viscosity (1e-5 kg/m/s)	MAX Temperature (°C)	MAX pressure (kPa abs)
6	84	999.93	147.15	60	114
6	70	0.698	1.689	60	100
6	84	999.93	147.15	60	114
6	70	0.698	1.689	60	100
6	86	999.94	147.15	60	130
6	70	0.698	1.689	60	100
6	86	999.94	147.15	60	130
6	70	0.698	1.689	60	100
6	86	999.94	147.15	60	130
6	70	0.698	1.689	60	100
6	86	999.94	147.15	60	130
6	70	0.698	1.689	60	100
6	20	999.90	147.16	80	200
6	7.5	0.035	1.285	125	180
6	20	999.90	147.16	80	200
6	7.5	0.035	1.285	125	180
6	20	999.90	147.16	80	200
6	7.5	0.035	1.285	125	180
6	20	999.90	147.16	80	200
6	7.5	0.035	1.285	125	180
6	20	999.90	147.16	80	200
6	7.5	0.035	1.285	125	180
6	20	999.90	147.16	80	200
6	7.5	0.035	1.285	125	180
6	20	999.90	147.16	80	200
6	7.5	0.035	1.285	125	180
6	20	999.90	147.16	80	200
6	7.5	0.035	1.285	125	180

MAX density (kg/m3)	MAX viscosity (1e-5 kg/m/s)	Sensor model (summary)	Ingress Protection	Sensor Safety class	Sensor Quality class
983.22	46.64	MPD10	IP68	SIC-2C	QC-1
1.19	1.909				
983.22	46.64	MPD10	IP68	SIC-2C	QC-1
1.19	1.909				
983.22	46.64	MPD10	IP68	SIC-2C	QC-1
1.19	1.909				
983.22	46.64	MPD10	IP68	SIC-2C	QC-1
1.19	1.909				
983.22	46.64	MPD10	IP68	SIC-2C	QC-1
1.19	1.909				
983.22	46.64	MPD10	IP68	SIC-2C	QC-1
1.19	1.909				
971.85	35.44	MPD11	IP68	SIC-2C	QC-1
1.201	1.62				
971.85	35.44	MPD11	IP68	SIC-2C	QC-1
1.201	1.62				
971.85	35.44	MPD11	IP65	SIC-2C	QC-1
1.201	1.62				
971.85	35.44	MPD11	IP65	SIC-2C	QC-1
1.201	1.62				
971.85	35.44	MPD11	IP65	SIC-2C	QC-1
1.201	1.62				
971.85	35.44	MPD11	IP65	SIC-2C	QC-1
1.201	1.62				
971.85	35.44	MPD11	IP68	SIC-2C	QC-1
1.201	1.62				
971.85	35.44	MPD11	IP68	SIC-2C	QC-1
1.201	1.62				

SENSOR DATA

Sensor PED category	Sensor range	Sensor process connection type	DN	Insul. Thick. (mm)	PS (barg)	Td (deg)
Cat 0	0 – 500 mbar	2 x 1/2″ FVCR	50	50	9	125
			50	0	9	130
Cat 0	0 – 500 mbar	2 x 1/2″ FVCR	50	50	9	125
			50	0	9	130
Cat 0	0 – 500 mbar	2 x 1/2″ FVCR	65	50	9	125
			50	0	9	130
Cat 0	0 – 500 mbar	2 x 1/2″ FVCR	65	50	9	125
			50	0	9	130
Cat 0	0 – 500 mbar	2 x 1/2″ FVCR	65	50	9	125
			50	0	9	130
Cat 0	0 – 500 mbar	2 x 1/2″ FVCR	65	50	9	125
			50	0	9	130
Cat 0	0 – 500 mbar	2 x 1/2″ FVCR	80	N/A	15	125
			80	0	15	125
Cat 0	0 – 500 mbar	2 x 1/2″ FVCR	80	N/A	15	125
			80	0	15	125
Cat 0	0 – 500 mbar	2 x 1/2″ FVCR	80	N/A	15	125
			80	0	15	125
Cat 0	0 – 500 mbar	2 x 1/2″ FVCR	80	N/A	15	125
			80	0	15	125
Cat 0	0 – 500 mbar	2 x 1/2″ FVCR	80	N/A	15	125
			80	0	15	125
Cat 0	0 – 500 mbar	2 x 1/2″ FVCR	80	N/A	15	125
			80	0	15	125
Cat 0	0 – 500 mbar	2 x 1/2″ FVCR	80	N/A	15	125
			80	0	15	125
Cat 0	0 – 500 mbar	2 x 1/2″ FVCR	80	N/A	15	125
			80	0	15	125

PIPE DATA (SENSOR vacuum, tritium and ESPN class to be aligned on pipi						
Pipe ID (mm)	Piping class	Piping schedule	Piping thickness (mm)	Pipe Safety class	Pipe Quality class	Pipe Seismic class
49.22	# 300	80S	5.54	SIC-1	QC-1	SC-1 (S) SL2
49.22	# 300	80S	5.54	SIC-1	QC-1	SC-1 (S) SL2
49.22	# 300	80S	5.54	SIC-1	QC-1	SC-1 (S) SL2
49.22	# 300	80S	5.54	SIC-1	QC-1	SC-1 (S) SL2
58.98	# 300	80S	7.01	SIC-1	QC-1	SC-1 (S) SL2
49.22	# 300	80S	5.54	SIC-1	QC-1	SC-1 (S) SL2
58.98	# 300	80S	7.01	SIC-1	QC-1	SC-1 (S) SL2
49.22	# 300	80S	5.54	SIC-1	QC-1	SC-1 (S) SL2
58.98	# 300	80S	7.01	SIC-1	QC-1	SC-1 (S) SL2
49.22	# 300	80S	5.54	SIC-1	QC-1	SC-1 (S) SL2
58.98	# 300	80S	7.01	SIC-1	QC-1	SC-1 (S) SL2
49.22	# 300	80S	5.54	SIC-1	QC-1	SC-1 (S) SL2
77.92	# 300	80S	7.62	SIC-1	QC-1	SC-1 (S) SL2
77.92	# 300	80S	7.62	SIC-1	QC-1	SC-1 (S) SL2
77.92	# 300	80S	7.62	SIC-1	QC-1	SC-1 (S) SL2
77.92	# 300	80S	7.62	SIC-1	QC-1	SC-1 (S) SL2
77.92	# 300	80S	7.62	SIC-1	QC-1	SC-1 (S) SL2
77.92	# 300	80S	7.62	SIC-1	QC-1	SC-1 (S) SL2
77.92	# 300	80S	7.62	SIC-1	QC-1	SC-1 (S) SL2
77.92	# 300	80S	7.62	SIC-1	QC-1	SC-1 (S) SL2
77.92	# 300	80S	7.62	SIC-1	QC-1	SC-1 (S) SL2
77.92	# 300	80S	7.62	SIC-1	QC-1	SC-1 (S) SL2
77.92	# 300	80S	7.62	SIC-1	QC-1	SC-1 (S) SL2
77.92	# 300	80S	7.62	SIC-1	QC-1	SC-1 (S) SL2
77.92	# 300	80S	7.62	SIC-1	QC-1	SC-1 (S) SL2
77.92	# 300	80S	7.62	SIC-1	QC-1	SC-1 (S) SL2
77.92	# 300	80S	7.62	SIC-1	QC-1	SC-1 (S) SL2
77.92	# 300	80S	7.62	SIC-1	QC-1	SC-1 (S) SL2

ng)

Pipe Vacuum class	Pipe Tritium class	Pipe ESPN class	Fluid Group	PSxDN	Pipe PED category
VQC-N/A	TC-2A	N2	2	1000	SEP
VQC-N/A	TC-2A	N2	1	450	I
VQC-N/A	TC-2A	N2	2	1000	SEP
VQC-N/A	TC-2A	N2	1	450	I
VQC-N/A	TC-2A	N2	1	1300	SEP
VQC-N/A	TC-2A	N2	1	450	I
VQC-N/A	TC-2A	N2	1	1300	SEP
VQC-N/A	TC-2A	N2	1	450	I
VQC-N/A	TC-2A	N2	1	1300	SEP
VQC-N/A	TC-2A	N2	1	450	I
VQC-N/A	TC-2A	N2	1	1300	SEP
VQC-N/A	TC-2A	N2	1	450	I
VQC-N/A	TC-2A	N2	1	1200	SEP
VQC-N/A	TC-2A	N2	1	1200	II
VQC-N/A	TC-2A	N2	1	1200	SEP
VQC-N/A	TC-2A	N2	1	1200	II
VQC-N/A	TC-2A	N2	1	1200	SEP
VQC-N/A	TC-2A	N2	1	1200	II
VQC-N/A	TC-2A	N2	1	1200	SEP
VQC-N/A	TC-2A	N2	1	1200	II
VQC-N/A	TC-2A	N2	1	1200	SEP
VQC-N/A	TC-2A	N2	1	1200	II
VQC-N/A	TC-2A	N2	1	1200	SEP
VQC-N/A	TC-2A	N2	1	1200	II
VQC-N/A	TC-2A	N2	1	1200	SEP
VQC-N/A	TC-2A	N2	1	1200	II
VQC-N/A	TC-2A	N2	1	1200	SEP
VQC-N/A	TC-2A	N2	1	1200	II

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CVAS7F

VERSION CREATED ON / VERSION / STATUS
04 Nov 2025 / 1.6 / Approved

EXTERNAL REFERENCE / VERSION

Technical Specifications (In-Cash Procurement)

VVPSS Pressure Sensors and Pressure Differential Sensors - Technical Specification

This specification defines the technical requirements for the design, manufacturing, testing, equipment qualification and delivery of the full set of Pressure Sensors and Pressure Differential Sensors for the Vacuum Vessel Pressure Suppression System (VVPSS). The datasheet is provided in ITER_D_CUVUV2.

SUPPLY

Table of Contents

SUPPLY

Legend: REVISION 1.6

SUPPLY

1 Preamble

This Technical Specification is to be read in combination with the General Management Specification for Service and Supply (GM3S) [AD- 1] that constitutes a full part of the technical requirements. In case of conflict, the content of the Technical Specification supersedes the content of [AD- 1].

2 Purpose

The Purpose of this document is to define the design, manufacture, testing and delivery requirements for the VVPSS instruments: Pressure Sensors, Pressure Differential Sensors.

3 Introduction

The main functions of the Vacuum Vessel Pressure Suppression System (VVPSS) are to maintain the integrity of the primary confinement barrier in the event of ingress of coolant into the vacuum vessel and to maintain dynamic confinement of the vacuum vessel in the event of rupture of the primary confinement barrier. The VVPSS limits the vacuum vessel's internal pressure in case of various incidents or accident events (in-vessel leak of water or non-condensable gas) together with preventing the dispersion of radioactive materials in case of breach of the primary confinement barrier. The VVPSS mitigates the hazard associated with hydrogen that is contained or formed in the vacuum vessel during an incident or accident event.

The VVPSS instruments monitor utility lines and the main process lines. The later see a wide range of process conditions as they always operate in dynamic conditions. IO has selected the desired sizing cases and pre-sized/pre-selected the instruments. Nonetheless, the Contractor shall advise the best suited technology according to their expertise, the guaranteed process conditions, the required performances, the environment conditions and above all to be compliant with this technical specification. The ultimate design will be decided in agreement and upon validation by IO.

4 Scope of the work

This specification defines the sizing, material grades, fabrication, inspection, examination, testing, QA, qualification and other requirements for the instruments, procured for the ITER VVPSS. Above all other requirements of this technical specification, the Contractor shall be responsible for all necessary design development, qualification and manufacturing activities that ultimately enable the delivery of the VVPSS instruments that have been demonstrated to fulfil all the applicable requirements.

The VVPSS instruments covered in this specification are the Pressure Sensors and the Pressure Differential Sensors.

Due to the VVPSS planning, IO foresees a staged approach to execute this Contract. The Contractor shall present a proposal to meet the ultimate goal of this specification at the tender stage, which is the delivery to IO of qualified instruments. The following stages are foreseen:

SUPPLY

- Task 1: Design – The first task is dedicated to the design of the VVPSS instruments based on the requirements defined in this technical specification. The Contractor shall demonstrate compliance with all the requirements specified in this document.
- Task 2: Manufacturing Preparation – The Contractor shall complete all steps to achieve manufacturing readiness of the VVPSS instruments in line with the requirements defined in this specification.
- Task 3: Manufacturing and Testing – The Contractor shall manufacture the VVPSS instruments and perform all the necessary inspections, qualifications and testing required by the design codes and this technical specification. The Contractor shall complete the Manufacturing dossier.
- Task 4: Delivery to the IO site - The Contractor shall prepare and complete the delivery of the VVPSS instruments to the IO site and hand over all the documentation required by this technical specification and design codes to IO.

NOTES:

- Several exchanges are foreseen between the Contractor and the IO during Task 1 to settle the technical solution and to achieve maturity of the IO design impacting the VVPSS instruments (Line routing, Process Schematic, Qualification of Equipment)
- Task 3 can only start after the completion of the VVPSS Final Design Review, expected in March 2026.

5 Acronyms & Definitions

5.1 Acronyms

The following acronyms are the main one relevant to this document.

24VP00 Vacuum Vessel Pressure Suppression System
24VPHM Hydrogen Mitigation System
24VPRP Relief Pipe System
ACS Applicable Code and Standards
AD Applicable Document
ANB Agreed Notified Body
AOC Award Of Contract
ASME American Society of Mechanical Engineers
ASN Autorité de Sûreté Nucléaire (French Nuclear Safety Authority)
ASTM American Society for Testing and Materials
CRO Contract Responsible Officer
DAP Delivery At Place
DRR Delivery Readiness Review
DTR Drain Tank Room
DW Dead Weight
ENF Equivalent Neutron Fluence
ESP Equipements Sous Pression (Pressure Equipment)
ESPN Equipements Sous Pression Nucléaire (Nuclear Pressure Equipment)
ESR Essential Safety Requirement
FAT Factory Acceptance Test

SUPPLY

GM3S General Management Specification for Service and Supply
HRA Hazard and Risk Analysis
ICE Ingress of Coolant Event
IDM UID IO Document Management system Unique Identifier – Unique reference number for IO documents
INB Installation Nucléaire de Base (Basic nuclear installation)
IO ITER Organization
ISO International Organization for Standardization
LOCA Loss Of Cooling Accident
LOVA Loss of Vacuum Accident
MIP Manufacturing and Inspection Plan
MP ITER Functional Number for Pressure Sensor
MPD ITER Functional Number for Pressure Differential Sensor
MRR Manufacturing Readiness Review
MTO Material Take Off
NCR Non-Conformity Request
NDE Non-Destructive Examination
NDT Non-Destructive Test
NPMA Nuclear Particular Material Appraisal
NQA Nuclear Quality Assurance
NRV Non-Return Valve
OD Outside Diameter
PED Pressure Equipment Directive (equiv. ESP)
PIA Protection Important Activity
PIC Protection Important Component
PQR Welding Procedure Qualification Record
PRO Procurement Responsible Officer
PS Maximum Allowable Pressure
PTC Performance Test Code
PWHT Post-Weld Heat Treatment
QA Quality Assurance
QC Quality class
QP Quality Plan
RL Relief Lines
RTPO Recognised Third Party Organisation
SC Seismic Category
SIC Safety Importance Class
SLT Small LOCA Tank
SRD System Requirement Document
SSC Structures, Systems and Components
SSPC Steel Structures Painting Council
TCWS Tokamak Cooling Water System

TID Total Ionizing dose
TNF Total Neutron Flux
VST Vapour Suppression Tank
VV ITER Vacuum Vessel
VVPSS Vacuum Vessel Pressure Suppression System
WPQ Welder Performance Qualification
WPQR Welding Procedure Qualification Record
WPS Welder Performance Specification

5.2 Definitions

Contractor: shall mean an economic operator who have signed the Contract in which this document is referenced.

6 List of applicable and reference documents

6.1 References internal to IO

The design conditions of the instruments are taken from several internal IO documents. The necessary sizing data for the Contractor have been extracted by IO from those documents and are highlighted in this technical specification. These documents are listed in this section to enable clarity and changes tracking for IO but will not and need not be shared with the Contractor.

[IO-1] Static and transient magnetic field maps at level B1 tokamak complex – IDM UID QDFMW9
[IO-2] Static and transient magnetic field maps at level B2 tokamak complex – IDM UID QE42YB
[IO-3] Static and transient magnetic field maps at level L3 tokamak complex – IDM UID QQGFU6
[IO-4] Radiation Maps During Plasma Operations (Mode-0), extracted data – IDM UID RJLLFY
[IO-5] Safety requirement Room book – IDM UID KF63PB
[IO-6] Static and transient magnetic field maps at level L1 tokamak complex – IDM QQEB3J
[IO-7] ESTM-57 EFE Signal conditioners SMF test procedure – IDM UID BGKGDU
[IO-8] Technical Specification: Framework Supply Contract for SCWS-TCWS I&C cubicles – IDM UID 3YV4V5
[IO-9] VVPSS Non-safety IO list – IDM UID BK89B6
[IO-10] VVPSS safety IO list – IDM UID BJZPVE
[IO-11] Vapour Suppression Tanks P&IDs – IDM UID 4CSLSL
[IO-12] VVPSS HMS P&IDs – IDM UID 5PVPZU
[IO-13] VVPSS Relief Pipes P&IDs – IDM UID 5PVJYK
[IO-14] Loads Case Specification VVPSS -RL – IDM UID UXX829
[IO-15] Design Seismic Floor Response Spectra in the Tokamak Complex + annex– IDM UID SVBRJZ
[IO-16] SL-3 Floor Response Spectra for Tokamak Complex – IDM UID SFSN7Q
[IO-17] Tokamak Complex - Floor Response Spectra 2016 -Esteyco – IDM UID TFN4DN

[IO-18] Suitability of B11, B14 & B74, anticipated after the implementation of PCR-755 and its daughter PCRs – IDM UID UX5RXG
[IO-19] Thermal analysis for passive fire protection of the VVPSS lines – IDM UID 4XYEJG
[IO-20] B11 & B74 - Requirements for Fire sensitive system – IDM UID 3VSJHD

6.2 Applicable Documents & Codes and standards for the Contractor

6.2.1 Applicable Documents

This is the responsibility of the Contractor to identify and request for any documents that would not have been transmitted by IO, including the below list of reference documents.

This Technical Specification takes precedence over the referenced documents. In case of conflicting information, this is the responsibility of the Contractor to seek clarification from IO.

Upon notification of any revision of the applicable document transmitted officially to the Contractor, the Contractor shall advise within 4 weeks of any impact on the execution of the contract. Without any response after this period, no impact will be considered.

[AD- 1] General Management Specification for Service and Supply (GM3S) – IDM UID 82MXQK
[AD- 2] VVPSS Pressure and Pressure Differential Measurement Datasheet - IDM UID CUVUV2
[AD- 3] Quality Requirements for IO Performers – IDM UID 22MFG4
[AD- 4] Instruction for Seismic Analysis – IDM UID VT29D6
[AD- 5] Radioprotection guide for ESPN application – IDM UID 2LTQ96
[AD- 6] ITER Numbering System for Components and Parts – IDM UID 28QDBS
[AD- 7] Working Instruction for the Delivery Readiness Review (DRR) – IDM UID X3NEGB
[AD- 8] Working Instruction for Manufacturing Readiness Review – IDM UID 44SZYP
[AD- 9] Allowable values and limits in service level C and D for ITER mechanical components – IDM UID 3G3SYJ
[AD- 10] Software Qualification Policy – IDM UID KTU8HH
[AD- 11] Requirements for DA / Supplier / Subcontractors Deviations & Nonconformities – IDM UID 22F53X
[AD- 12] Quality Assurance for ITER Safety Codes Procedure – IDM UID 258LKL
[AD- 13] Overall supervision plan of the chain of suppliers for Safety Important Components, Structures and Systems and Safety Related Activities – IDM UID 4EUQFL
[AD- 14] List of ITER–INB Protection Important Activities – IDM UID PSTTZL
[AD- 15] Propagation of the Defined Requirements for Protection Important Components Through the Chain of External Interveners – IDM UID BG2GYB
[AD- 16] Specification for Labelling of Equipment on ITER Project – IDM UID TL25DK
[AD- 17] Delivery Report Template – IDM UID WZPYVZ
[AD- 18] Package & Packing List Template – IDM UID XBZLNG
[AD- 19] Release Note Template – IDM UID QVEKNQ
[AD- 20] IO cable catalogue – IDM UID 355QX2
[AD- 21] Plant Control Design Handbook – IDM UID 27LH2V

SUPPLY

[AD- 22] Plant Control Design Handbook for Nuclear Control System – IDM UID 2YNEFU
[AD- 23] Qualification Guidelines – IDM UID WGFF3G
[AD- 24] System Requirement (SRD) Document SRD-24-VP (VVPSS) – IDM UID 28B2U6
[AD- 25] PBS 24 VVPSS for Defined Requirements – IDM UID Q9DVN3
[AD- 26] VVPSS Maintenance & In-Service Inspection Plan – IDM UID 5TK43V
[AD- 27] ITER Policy on EEE in Tokamak Complex – IDM UID 6ZX6S3
[AD- 28] List of manufacturing documents to be prepared and stored for PE and NPE – IDM UID WDBC7H
[AD- 29] Implementation Plan for PE/NPE cat 0 or I – IDM UID YWDJW2
[AD- 30] Guideline to manufacture NPE N2 or N3 cat 0 & PE cat 0 – IDM UID VHC4YM
[AD- 31] Template of Instructions Manuals of PE/NPE – IDM UID XYECVY

6.2.2 Applicable Codes and Standards

This is the responsibility of the Contractor to procure the relevant Codes and Standards applicable to that scope of work. The codes and standards that shall be used in this contract are listed in the table below. The use of other standards may also be acceptable, subject to IO's approval. The Contractor shall demonstrate conformity with the orders, directives, codes and standards in their last version.

For items not covered by the proposed codes and technical specifications, the Contractor shall justify the soundness of the design approach.

[ACS- 1] ASME NQA-1 - Quality Assurance Requirements for Nuclear Facility Applications
[ACS- 2] EN 10204 - Metallic products – Type of inspection documents
[ACS- 3] ISO 17025 - General requirements for the competence of testing and calibration laboratories
[ACS- 4] ISO 9712 - Non-destructive Testing - Qualification and Certification of NDT Personnel
[ACS- 5] IEC 60068-3-3 - Seismic test methods for equipment
[ACS- 6] EN 13480 Metallic industrial piping
[ACS- 7] IEC 61513 Centrales nucléaires de puissance - Instrumentation et contrôle-commande importants pour la sûreté - Exigences générales pour les systèmes
[ACS- 8] IEC 62671 Nuclear power plants - Instrumentation and control important to safety - Selection and use of industrial digital devices of limited functionality
[ACS- 9] ISO 9001 Quality management systems – Requirements
[ACS- 10] EN 3834 Quality requirements for fusion welding of metallic materials
[ACS- 11] EN 15614 Specification and qualification of welding procedures for metallic materials – Welding procedure test
[ACS- 12] ISO 9692 Welding and allied processes — Types of joint preparation
[ACS- 13] EN 2516 Aerospace series - Passivation of corrosion-resisting steels and decontamination of nickel base alloys
[ACS- 14] SSPC-1 Solvent Cleaning
[ACS- 15] SSPC-2 Hand Tool Cleaning
[ACS- 16] SSPC-5 White Metal Blast Cleaning
[ACS- 17] SSPC-10 Near-White Metal Blast Cleaning

SUPPLY

[ACS- 18] EN 17637 Non-destructive testing of welds - Visual testing of fusion welded joints
[ACS- 19] EN 17636 Non-destructive testing of welds - Radiographic testing - Part 1: X- and gamma-ray techniques with film
[ACS- 20] ISO 10675-1 Non-destructive testing of welds — Acceptance levels for radiographic testing — Part 1: Steel, nickel, titanium and their alloys
[ACS- 21] EN 11666 Non-destructive testing of welds - Ultrasonic testing - Acceptance levels
[ACS- 22] EN 17640 Non-destructive testing of welds — Ultrasonic testing — Techniques, testing levels, and assessment
[ACS- 23] EN 9606-1 Qualification testing of welders – Fusion welding – Part 1: Steels
[ACS- 24] ASTM A262-15 Standard Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels
[ACS- 25] IEC 60529 Degrees of protection provided by enclosures (IP Code)
[ACS- 26] NF C32-070 Insulated cables and flexible cords for installations - Classification tests on cables and cords with respect to their behaviour to fire
[ACS- 27] IEC 60332 Tests on electric and optical fibre cables under fire conditions
[ACS- 28] IEC 61034 Measurement of smoke density of cables burning under defined conditions
[ACS- 29] IEC 60754 Test on gases evolved during combustion of materials from cables
[ACS- 30] IEC 60331 Tests for electric cables under fire conditions - Circuit integrity
[ACS- 31] IEEE 383 Standard for Qualifying Electric Cables and Splices for Nuclear Facilities
[ACS- 32] IEC 60544 Electrical insulating materials - Determination of the effects of ionizing radiation on insulating materials
[ACS- 33] NF EN 1991-1-2 paragraph 3.2.1 “standard temperature-time curve”

6.2.3 Applicable Orders and Directives

The orders and directives that shall be used in this contract are listed in the table below.

[AOD- 1] PED/ESP - European Pressure Equipment Directive 2014/68/EU of 15th of May 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of pressure equipment
[AOD- 2] ESPN - Order dated 30th of December 2015 on nuclear pressure equipment. Consolidated version after the 1st of January 2019 shall be taken into account.
[AOD- 3] INB Order - Order dated 7 February 2012 relating to the general technical regulations applicable to INB
[AOD- 4] ASN Guide #8 - Conformity Assessment of Nuclear Pressure Equipment - Version of 2012-09-04 – EN – IDM UID DU9A7L
[AOD- 5] Arrêté du 20 novembre 2017 relatif au suivi en service des equipments sous pression et des recipients a pression simple
[AOD- 6] ASN Guide #19 - Nuclear Pressure Equipment - Application of order dated 12/12/2005 - Version of 21-02-2013 – FR – IDM UID FXQ9NZ

7 General requirements

The quality classification for each item in the scope of supply is defined in [AD- 2]. For QC-1 items, the critical quality activities must be approved by IO before being undertaken. Throughout

the document, special processes are identified. These special processes will require their procedures to be submitted to IO and accepted prior to their undertaking and reports submitted in the manufacturing dossier.

The "Pressure sensors" and the “Pressure Differential sensors” are “Pressure Accessories” and the Contractor is the regulatory manufacturer.

7.1 Units of Measurement

The supplied equipment as well as corresponding documentation shall use SI units.

7.2 Declaration of conformity to PED – ESPN regulations

The PED and ESPN classifications for the pressure instruments and the pressure differential instruments are defined in [AD- 2].

As the regulatory manufacturer of ESPN N2 category 0 and PE SEP instruments [AOD- 2][AOD- 1], the Contractor can be guided by the implementation plan defined in [AD- 29].

Particular attention should be paid to the recommended list of documents defined in [AD- 28][AD- 31], and the radiation protection requirements [AD- 30], to properly assess the additional work related to the ESPN/PED conformity assessment.

7.3 Design codes

Independently from the design code selected, the Contractor shall demonstrate the compatibility of the Pressure sensors and the Pressure Differential Sensors with the stainless-steel pipework, designed according to EN 13480 [ACS- 6].

The expected applicable design codes are specified in the body of this specification. The Contractor may propose alternative design codes where he believes adequate justification may be made. The alternative codes shall be accepted by IO. The responsibility of the Contractor is the full respect of PED/ESPN and the coverage of any gap between the PED/ESPN and the selected code.

The design features not specifically addressed in this specification, codes and standards specified herein shall be performed by good engineering practice.

7.4 Operating conditions

Operating and design conditions to be satisfied are given in [AD- 2] and in the body of this specification. The design of each item shall satisfy the requirements of these specifications as a minimum. The Contractor is expected to supplement these with the Contractor’s design and quality requirements.

Each item shall be designed for safe, proper and continuous operation over the design life of ten (10) years, at their design conditions as specified in [AD- 2]. They shall also be designed to minimize fatigue, thermal transient effects, corrosion, deterioration, vibration, and other operational problems. They shall be designed to permit satisfactory operation at the pressure conditions, accelerations, temperatures, flow rates, differential pressures, system fluid and imposed loads.

SUPPLY

7.5 Design calculation

Each item shall be demonstrated to withstand all the loads applied in normal and accidental conditions (temperature, pressure, interface, seismic, fire, radiation, electromagnetic, etc.). Reports for all analyses performed for the selected instruments shall be submitted to the IO for review and approval before the start of manufacturing.

[AD- 2] provided for procurement may not exactly match the products available from the Contractor. Therefore, in all cases, the Contractor shall provide engineering analysis documenting how the supplied items meet or exceed the requirements detailed in the datasheets. Alternatively, the Contractor may provide engineering recommendations as to available alternatives, including engineering analysis justifying their use in the intended application. All the equations used for the sizing of the instruments shall be explicitly described in the calculation note by the Contractor.

7.5.1 Seismic Qualification

All items shall be capable of withstanding the accelerations associated with the seismic events without loss of confinement.

In [AD- 2], each item is classified as follow:

- Safety class:
  - Safety classified (SIC), if they contribute to a safety function
  - Non-safety classified (Non-SIC), if they do not contribute to any safety function.
- Seismic class:
  - SC-1 (SF) = Structural and functional performance shall be ensured
  - SC-1 (S) = Structural performance shall be ensured

As per the system design requirements [AD- 24], the following apply:

	SL-1	SL-2	SL-3
SIC	SF	SF	S
Non-SIC	SF	S	N/A

The seismic loads to withstand for SL-1, SL-2 and SL-3 events are given in Table 1, Table 2, and Table 3.

The seismic qualification for SC1 (SF) and SC1 (S) rated items shall be provided by the Contractor. Qualification by analytical calculation is acceptable for mechanical integrity verification but qualification by test is expected for operability verification. The methodology for seismic qualification of instruments can be obtained from the ITER Instruction for Seismic Analysis [AD- 4].

The seismic qualification tests, applicable only to those extended structures for which the analytical qualification is deemed not sufficient, shall be performed according to the standard IEC 60068-3-3 [ACS- 5].

It is recommended for the Contractor to provide a detailed quotation and planning of the activities that consider the selected seismic qualification.

7.5.2 Load and Environmental Qualification

Two different plant conditions are expressed:

SUPPLY

- Normal conditions: This corresponds to the normal operation of the plant and for which all systems are requested to operate properly. These conditions are encountered during the whole life of the plant (14 years of nuclear operation and 10 years of commissioning operation),
- Accident conditions: This corresponds to a highly degraded operation of the plant due to unlikely failures or highly hypothetical failure. Safety classified VVPSS instruments are requested to operate properly during accident conditions (with accepted partial degradation of performance). The accident conditions are encountered only once during the whole life of the plant. The negative effect of ageing on component shall be taken into account; that means the safety classified equipment shall operate properly throughout the whole life of the plant.

SUPPLY

	Normal condition	Accident condition
Ambient room temperature	18 °C – 35 °C	5 °C - 130 °C [IO-5]
Ambient room humidity	20% RH – 60% RH	0% RH – 100%
Ambient room pressure	86 – 106 kPa	100 – 200 kPa [IO-5]
Static magnetic field (modulus)	< 20 mT [IO-1][IO-2]	
Transient magnetic field (modulus)	< 3.5 mT/s [IO-1][IO-2]	
Total Ionizing dose (TID, silicon based)	< 2.3E3 Gy [IO-4]	
Dose rate (Ionizing radiation dose, silicon based)	< 1.0 Gy/h [IO-4]	
Equivalent Neutron Fluence (ENF @ 1Mev, silicon based)	≤ 5.5E11 neutron.cm-2 [IO-4]	
Total Neutron Flux (TNF)	≤ 2.4E5 neutrons.cm-2.s-1 [IO-4]	
Seismic [IO-14][IO-15][IO-16][IO-17]	NO	SL-3: X-Y: 5.5 g/Z: 3.5 g SL-2: X-Y : 4.5 g/Z : 2.5 g SL-1: X-Y :1.5 g/Z : 1.0 g
Flooding - submergence	NO	NO
Fire event maximum temperature	NO	< 7.1 m: 142 °C 7.1 to 9.6 m: 277 °C > 9.6 m: 905 °C [IO-20]

Table 1: Environmental conditions applicable in the field (process area) in 11-B2-01 & 11-B1-01 Drain Tank Room (DTR)

	Normal condition	Accident condition
Ambient room temperature	18 °C – 35 °C	5 °C - 130 °C [IO-5]
Ambient room humidity	20% RH – 60% RH	0% RH – 100%
Ambient room pressure	86 – 106 kPa	100 – 200 kPa [IO-5]
Static magnetic field (modulus)	< 7.5 mT [IO-2][IO-3]	
Transient magnetic field (modulus)	< 1 mT/s [IO-2][IO-3]	
Total Ionizing dose (TID, silicon based)	< 1.2 Gy [IO-4]	
Dose rate (Ionizing radiation dose, silicon based)	< 2.1E-4 Gy/h [IO-4]	
Equivalent Neutron Fluence (ENF @ 1Mev, silicon based)	≤ 1.6E6 neutron.cm-2 [IO-4]	
Total Neutron Flux (TNF)	≤ 4.3 neutrons.cm-2.s-1 [IO-4]	
Seismic [IO-14][IO-15][IO-16][IO-17]	NO	SL-3: X-Y: 1.5 g/Z: 6.5 g SL-2: X-Y : 1.0 g/Z : 5.0 g SL-1: X-Y : 0.5 g/Z : 2.0 g
Flooding - submergence	NO	NO
Fire event maximum temperature	NO	SIC: ISO 834 [ACS-33][IO-20] / Non-SIC: N/A

Table 2: Environmental conditions applicable in the field (process area) in 11-L3-02E TCWS Area East

SUPPLY

	Normal condition	Accident condition
Cubicle temperature	10 °C – 15 °C [IO-8]	-15 °C - +60 °C [IO-5]
Ambient room humidity	20% RH – 60% RH	0% RH – 100%
Ambient room pressure	86 – 106 kPa	84 – 120 kPa [IO-5]
Static magnetic field (modulus)	< 20 mT [IO-7]	
Total Ionizing dose (TID, silicon based)	SIC: ≤ 1 Gy (2) [IO-18] Non-SIC: ≤ 10 Gy (3) [IO-18]	
Equivalent Neutron Fluence (ENF @ 1Mev, silicon based)	SIC: ≤ 1E8 neutron.cm-2 (2) [IO-18] Non-SIC: ≤ 1E10 neutron.cm-2 (3) [IO-18]	
Total Neutron Flux (TNF)	SIC: ≤ 10 neutrons.cm-2.s-1 (2) [IO-18] Non-SIC: ≤ 100 neutrons.cm-2.s-1 (3) [IO-18]	
Seismic [IO-14][IO-15][IO-16][IO-17]	NO	SL-3: N/A SL-2: X-Y: 1.5 g/Z: 4.0 g SL-1: X-Y: 0.5 g/Z: 1.5 g
Flooding - submergence	NO	NO
Fire event maximum temperature	NO	N/A

Table 3: Environment conditions applicable in the shielded area (inside SIC and Non-SIC cubicles [IO-9][IO-10])

(1) Based on 1% of total fluence during DT-1 operation.
(2) ITER Maximum threshold for critical electronic functions
(3) ITER Maximum threshold for non-critical electronic functions

In [AD- 2], the installation room is given for each item [IO-11][IO-12][IO-13]. The conditions in each room are defined below:

- In Table 1 for all items located in the 11-B2-01 & 11-B1-01 Drain Tank Room (DTR)
- In Table 2 for all items located in the 11-L3-02E TCWS Area East,

The electronic parts can be deported in cubicles with less stringent environment conditions, defined in Table 3.

7.5.2.1 Electromagnetic field

The general approach is to select passive sensors installed in field while electronic is deported to shielded area (cubicles).

Deviation from this approach could be granted by IO as long as the Contractor can demonstrate that sensors are suitable to operate under applicable environmental conditions as defined in Table 1 and Table 2.

All component deported in the shielded area (cubicle) shall account for the electromagnetic load as specified in Table 3. This includes notably signal conditioners.

As a general remark, IO recalls that the static magnetic field applied for the qualification test shall be between 1.4 and 2.0 times higher than the one experienced by the equipment during operation. IO has an in-house static magnetic field-testing facility and can perform testing on behalf of the Contractor.

SUPPLY

7.5.2.2 Irradiation and neutron flux

It should be noted that there is a very significant level of irradiation as a normal condition (and not only accidental condition) in ITER and it needs to be considered in the design of SIC as well as Non-SIC items (Table 1 and Table 2). Very high neutron flux is present in ITER which is known as problematic for electronic devices due to Single Effect Event as encountered in aeronic and aero-spatial industry.

The proposal of a qualified solution will be preferred. If not available, the vendor can participate to the IO neutron qualification program. The vendor shall then preferably free-issue three (3) sensors to be tested. IO will share the qualification and testing data with the vendor. Following successful qualification of the components in the test program, IO will proceed to procure the required number of components as per the technical specification with the selected vendor. Failure to pass the qualification will eliminate the vendor to progress to the supply stage.

7.5.2.3 Environment ambient conditions

Environmental qualification of the instruments shall be performed at the bounding environmental conditions defined in Table 1, Table 2 or Table 3, depending on their location, to evaluate the function of the instrument components whose failure could prevent the instruments from performing the intended function. The qualification thresholds shall account for the values given in ITER Policy on EEE in Tokamak Complex [AD- 27].

For the adequate qualification of the instruments to operate in the accident conditions (defined in Table 1, Table 2 or Table 3), the pressure and temperature profiles versus time used in the qualification test campaign shall be approved by IO.

The requirements for resistance to accident ambient conditions are as follow:

- SIC items: Structural integrity and functional performance shall be ensured,
- Non-SIC items: Structural integrity shall be ensured.

Maximum conditions during which instruments can maintain process confinement integrity shall be provided. Instrument should be able to maintain process confinement under external temperature/Pressure within the range defined in Table 1, Table 2 or Table 3.

Maximum environmental conditions during which instruments can operate to specifications during at least two hours shall be provided, including at minimum 3:

- Temperature range: - xxx °C < T < xxx °C
- Humidity range: xxx < RH < xxx%
- External pressure (relative to atm): - xxx kPa < P < +xxx kPa

IO will manage any additional containment/protection necessary to respect accidental conditions at each instrument location (Fire event, Water LOCA, etc…). Protective enclosure is out of scope.

7.5.2.4 Fire

The contractor shall specify the maximal operating temperature without degradation of performance, as well as the maximal temperature to which the sensors can be subjected during fire accident.

SUPPLY

The requirements for resistance to fire are listed in the table below (S: Structural integrity shall be ensured & SF: Structural integrity and functional performance shall be ensured & N/A: no requirement):

Scope	24VPRP	24VP00	24VPHM
SIC sensor	SF	SF	N/A
Non-SIC Sensor	N/A	N/A	N/A

Integrity is demonstrated as no loss of confinement after two hours. Integrity and functional performance are defined as no loss of confinement and sensor functionality after two hours.

The maximum temperature achieved during a fire event is given in Table 1 and Table 2. The elevation of components to assess the maximum temperature in the DTR (Table 1) are given in [AD- 2].

The Contractor shall either design the sensor for the maximum fire temperature achieved or specify the required thickness of the fire protection to be installed to protect the structural integrity and/or functionality of the sensor. If a specific fire protection equipment, such as an enclosure for the sensor, is deemed required and the Contractor has the capacity to include it in its scope of supply, it should be included in the quote as an option.

Any supplied equipment shall be specified to minimize the fire-load.

7.6 Neutron irradiation

The instruments in the field and the components deported in shielded area (cubicles) are submitted to irradiation during ITER plasma operation. The irradiation dose is provided in Table 1, Table 2 or Table 3, depending on their location. The Contractor shall demonstrate that the supplied instrument and all related components are qualified against the given thresholds, particularly if equipped with electronic devices. The doses provided by IO shall be used as input for the development of the Maintenance Plan, as it is part of the input data needed from ESPN point of view.

7.7 Hazard and Risk Analysis

For ESPN N2 category 0 and PE SEP instruments [AD- 2], there is no requirement to produce a HRA [AD- 28].

7.8 Material requirements

The material selected for the VVPSS instruments is Austenitic Stainless Steel. Any deviation from this material shall be agreed with IO and, in any case, compatible with the VVPSS piping assembly, which is EN 1.4307, grade 304L. The stainless-steel material shall be suggested by the Contractor and submitted to IO for review and approval. If available, and if cold working is anticipated during manufacturing, the preferred grade is 316L.

To ensure the VVPSS meets the radioprotection guidelines as stipulated in the Radioprotection Guide for ESPN Application [AD- 5], strict requirements are placed on the chemical composition of Cobalt, Niobium, and Tantalum in the materials for the instruments. As a general remark, it is important to highlight the fact that the requirements for the chemical composition of Cobalt, Niobium, and Tantalum apply to all components and not only to the “wet parts”. Table 4 sets additional requirements for the impurities’ maximum concentration.

SUPPLY

Location	Composition, % (Maximum, unless otherwise indicated)		
	Cobalt	Niobium	Tantalum
11-B1-01 11-B2-01 11-L3-02E	<0.2	<0.1	<0.1

Table 4: Maximum Impurities Content for VVPSS instruments [AD- 5]

NOTE, IO may consider deviation from this requirement where the Contractor can demonstrate the component to have a small mass (i.e. bolts, nuts, washers, etc.) and the cost of achieving the above low activation requirements would be excessive compared to the decrease in overall cobalt, niobium or tantalum. No deviation is allowed on large items.

All material shall conform to the Essential Safety Requirements of the PED [AOD- 1] and ESPN [AOD- 2].

Fire resistance material with no or low flammability shall be selected to the extent practical.

7.8.1 Prohibited materials

The Contractor shall be aware of the following requirements, related to the prohibited materials:

- Mercury shall not be used in any manner, including the construction of the instruments, which can result in the exposure of instrument parts to the metal or its vapour.
- The use of lead or other low melting point metals in contact with the working fluid is prohibited.
- The use of nitrided surfaces exposed to the working fluid is prohibited.
- Care shall be taken to prevent contamination of instrument material by red lead-graphite mineral oil, molybdenum disulphide lubricants, halides, sulphur, copper, zinc and phosphorus.
- Teflon and similar elastomers may not be used.
- The use of Halogen products is prohibited. This requirement applies to all components, including gaskets and other non-metallic materials. Any deviation from non-zero halogen content in any of the materials used for the instrument shall be reported to IO and its use shall be subjected to IO approval.
- The use of materials containing asbestos shall be prohibited.

7.8.2 Material testing requirements

For ESPN N2 category 0 and PE SEP instruments [AD- 2], there is no requirement to produce a Nuclear Particular Material Appraisal (NPMA). The Contractor needs to provide the inspection documents (type 3.1 or 3.2) for the Pressure Sensors and Pressure Differential Sensors in final product condition.

Inspection document showing that required tests have been carried out at the source should be submitted. Type 3.1 certificate of EN 10204 [ACS- 2] shall be provided for main pressure retaining materials. The chemical Co, Nb and Ta concentration evaluation shall be included as a result in the Type 3.1 certificate. If the material Manufacturer is not able to issue the type 3.1, type 3.2 shall be provided. Type 2.2 needs to be provided for gasket and filler metal.

SUPPLY

A second material testing certificate, submitted by an independent certified laboratory, shall be included in the list of documentation submitted to the Contractor, after the placement of the supply order.

Materials shall be clearly marked so that they are always readily identifiable with their test certificates and reports. Marking shall be transferred to all pieces when a part is cut to make more than one component. Material without identification shall not be used in the manufacture of the instruments. The method of marking and marking procedures are subject to IO acceptance.

Stainless steel sensitisation shall be tested according to ASTM A262-15 [ACS- 24] Practice A+E.

7.8.3 Impact and Tensile test

Mechanical properties shall be obtained from test specimens representing the final heat-treated condition of the material required by the specification. As specified in [AD- 2], the tensile and impact tests do not need to be carried out at operating temperature.

All tests shall be carried out by an ISO 17025 [ACS- 3] accredited laboratory.

Note, as per PED Essential Safety Requirements, the Offset Yield Point (Proof Stress) shall be evaluated at 0.2% and 1% plastic deformation.

7.8.4 Traceability

The Contractor shall have traceability procedures in place that will guarantee traceability between materials delivered and from the beginning of manufacturing. These procedures shall be submitted to and approved by the IO prior to the start of any manufacturing. Traceability shall be maintained by procedural methods that cover receipt, identification, storage, and transfer to production, temporary storage and for use in production.

7.8.5 Counterfeit Materials

The Contractor shall include a section in the Quality Plan that defines the measures put in place to avoid the procurement of counterfeit materials.

The full supply chain for all materials that become part of the Pressure Sensors and Pressure Differential Sensors (pressure boundary) shall be provided in a document to be presented at the Manufacturing Readiness Review.

In addition to material testing required above, confirmatory material composition and tensile strength testing shall be undertaken on samples taken directly from each batch of the Pressure Sensors and Pressure Differential Sensors raw materials following their delivery to the Contractor’s works.

7.8.6 Technical Qualifications

When a technical qualification is required, the Contractor must demonstrate that the manufacturing operations selected for the component subject to this technical qualification will ensure that the risks of heterogeneity among its mechanical and chemical characteristics are controlled.

SUPPLY

7.9 Welded joints

Welding activities are considered “Special Processes”.

Each welding procedure that is to be followed in fabrication shall be included or cross-referenced in the Manufacturing and Inspection Plan (MIP) and weld map. Additionally, the procedures shall be included in the Weld Data Package.

All joint welds shall be full penetration. No threaded joints or socket welds shall be used.

During manufacturing, particular attention shall be given to cleanliness, especially the removal of weld spatter, debris and other foreign matter. All surface treatment, cleaning, mounting, and vacuum acceptance testing of the Pressure Sensors and Pressure Differential Sensors shall be considered and accounted for in the design.

All repairs, re-work, or scrapping shall be documented and records maintained for each specific item. The base metal repair welding shall be treated through IO NCR database. The location and size of the repairs shall be recorded in the as-built drawing. The records shall relate repairs with the procedure used. A maximum of one weld repair cycle shall be permitted on austenitic stainless steel. The IO shall be notified in the event the weld repair is unsuccessful. The repairing procedure shall follow prescriptions stated in EN 13480 [ACS- 6].

Production welding operations may only be undertaken provided the following requirements are met:

- Personnel satisfy the requirements of EN 13480 and EN 3834-2 [ACS- 10],
- The filler materials shall have Inspection Certificate type 2.2 as per EN 10204 [ACS- 2],
- Welding procedures have been qualified in accordance with EN 15614 [ACS- 11],
- The edges to be welded shall be prepared in accordance with EN 13480 [ACS- 6],
- All the welds shall be identified with a unique number and shall be traceable back to the welder/operator and WPS used,
- Any visible defect liable to affect the correct execution of the next pass shall be removed,
- Cracks or cavities visible on the surface shall be removed by chipping and by grinding and/or milling.

7.9.1 Preparation for Welding

Preparation of welding should comply with EN 13480 [ACS- 6] and ISO 9692 [ACS- 12].

Weld over thicknesses shall not exceed the tolerances given in EN 13480 [ACS- 6]. If they exceed grinding or machining should be applied.

The edges to be welded shall be kept in the position, either by mechanical means temporary attachments, by tack welding or by a combination. Inspections before and after alignment shall be carried out.

The cleaning of internal and external surfaces should conform to EN 2516 [ACS- 13].

7.9.2 Surface Preparation Requirements

Selection, qualification, and application of coating materials should follow applicable sections of the Steel Structures Painting Council (SSPC) specifications. Surface preparation activities should be by the following standards or recommended practices as applicable: SSPC-SP-1 [ACS-14], SSPC-SP-2 [ACS- 15], SSPC-SP-5 [ACS- 16], and SSPC-SP-10 [ACS- 17].

Surface roughness (Ra) shall not exceed 3.2 μm.

Weld joint preparation shall not be performed by thermal processes.

SUPPLY

All coating systems must be applied following the Contractor's recommendations. The blast cleaned surfaces shall be coated with the base coat within 4 hours after blasting and before rusting occurs. All surface preparation and painting work shall be done after the visual examination, as part of the final assessment, and be subjected to the approval of IO. Colour selection shall be subject to IO's approval before the topcoat application.

7.10 Manufacturing Readiness Review

Following the approval of the IO Final Design Review currently scheduled in March 2026, a Manufacturing Readiness Review (MRR) shall be conducted in line with [AD- 8] and closed (by the IO) enabling the start of manufacturing activities. This MRR shall be included on the MIP as a Hold Point. The MRR is a joint ITER-Contractor meeting to give approval for the Contractor to start manufacturing. For the final approval, the following documentation shall be presented:

- Procedures for special processes,
- All manufacturing drawings,
- Material test certificates (Inspection document),
- Engineering (Structural) analysis,
- Personnel qualification.

In addition, when relevant according to the PE/NPE classification defined in [AD- 2], the Contractor shall provide the documents listed in Appendix I of [AD- 28] that are available at the stage of the MRR, except those free-issued by IO as listed in Paragraph 14.1.

7.11 Manufacturing, Inspection and Testing

Before the Manufacturing operations, a Manufacturing and Inspection Plan shall be prepared by the Contractor as detailed in Section 11.3.2. Inspection, examinations and tests shall be conducted to provide compliance with PED/ESPN Essential Safety Requirements [AOD-1][AOD- 2].

Non-destructive examinations (NDE) shall be performed on the cast, forged, rolled, wrought, or fabricated material after heat treatment required by the material specification. Surfaces shall be clean and free of surface conditions that may mask unacceptable indications.

NDE Personnel shall be qualified in accordance with ISO 9712 [ACS- 4].

The IO reserves the right to inspect all Non-Destructive Examination (NDE) reports for auditing purposes. NDE reports shall be catalogued according to the weld maps. Additional documents outside this specification's scope will provide detailed instructions for the commissioning of the components.

7.11.1 Visual Examination

Visual examination is considered a "Special Process".

Visual and dimensional control shall be conducted according to EN 17637 [ACS- 18] before the execution of non-destructive examination after possible heat treatment and before any machining or grinding operations of weld surfaces. During welding, each pass shall be visually examined, after the complete removal of the slag, if necessary.

A complete visual inspection of the pressure boundary parts on all Pressure Sensors and Pressure Differential Sensors is required. The purpose of the visual inspection is to verify all surfaces are

free of cracks, hot tears, arc strikes, marks and/or other detrimental discontinuities. All finished welds shall be subject to visual examination.

7.11.2 Volumetric Examination

For PED/ESPN components, all pressure boundary welds shall be 100% volumetrically inspected. The Contractor may choose Radiography or Ultrasonic inspection as appropriate.

Full volumetric inspection shall be performed also on end-connections.

7.11.2.1 Radiography inspection

Radiography examination is considered a “Special Process”

IO recommends the use of EN 17636 [ACS- 19] and ISO 10675-1 [ACS- 20] for the radiographic procedures and acceptance criteria.

7.11.2.2 Ultrasonic inspection

Ultrasonic examination is considered a “Special Process”.

IO recommends the use of EN 11666 [ACS- 21] and EN 17640 [ACS- 22] for the ultrasonic examination of casting products.

7.11.3 Surface Examination

Surface examination is considered a “Special Process”.

When an item is classified non-ESPN and 100% volumetric inspection is not required, all exterior and all accessible interior surfaces shall be given a surface examination.

7.11.4 Wall thickness measurements

Dimensional inspection is considered a “Special Process”.

The wall thickness of the pressure boundary shall be measured. The minimum thickness shall be nominal - allowable tolerance. The Contractor shall take several measurements and record the location of the measurements on the drawings.

7.12 Factory Acceptance Testing

All components shall be tested to confirm their performances in line with the Manufacturing and inspection plan. The following test are anticipated, to be confirmed by the Contractor and agreed with IO:

- Proof test
- Leak test
- Visual inspection
- Calibration test: The Contractor shall ensure the performance of sufficient calibration of the delivered equipment to ensure that the specified measurement uncertainties are met.

All documentation shall be provided to IO for approval prior to shipment.

7.13 In-Service Inspection and Maintenance

The scope of this specification shall include technical field support and consultation services during the installation, initial operation of all equipment furnished, performance testing and training of IO operating and maintenance personnel.

Pressure Sensors and Pressure Differential Sensors shall be designed to permit inspection, satisfying the provisions given by Instruction manual which shall be prepared by Contractor, in ESPN [AOD- 2] and in [AOD- 5].

The minimum periodicity for preventative maintenance or in-service inspection shall be 18 months.

The Contractor shall include in the operation and maintenance manual instructions on how the internal and external inspections can be undertaken. Any tools required to perform the above inspections shall be included in the scope of supply of this contract (excluding cameras or endoscopes).

The parts requiring adjustment, inspection, or repair shall be accessible and capable of convenient removal, cleaning, replacement, and repair.

A list of these spare parts and recommendation for their shelf life shall be well indicated in the Instruction Manual. The scheduling of the verification and replacement of these subcomponents shall also be included in the Instruction Manual.

The Contractor shall provide the requirements for periodic calibration and preventive maintenance.

7.14 Cleanliness and Packaging

7.14.1 Cleanliness Requirements

The “wet” surfaces of the Pressure Sensors and Pressure Differential Sensors shall meet the requirements for ASME NQA1 [ACS- 1] Table 302.5 Class A cleanness.

The other surfaces of the Pressure Sensors and Pressure Differential Sensors shall meet the requirements for ASME NQA-1 [ACS- 1] Table 302.5 Class A cleanness before packaging.

During cleaning, particular attention shall be given to the removal of weld spatter, debris and other foreign matter, particularly from the coolant passages and sealing surfaces. Final cleaning shall ensure effective cleaning without damage to the surface finish, material properties or metallurgical structure of the materials. The Contractor shall submit to the IO the proposed cleaning procedure for approval/acceptance.

Any expendable materials that come in contact with the Pressure Sensors and Pressure Differential Sensors shall minimize the impact on operating chemistry and shall not cause degradation (e.g., by cross-contamination with carbon steel). Use of expendable material shall be controlled by written procedure. The Contractor shall ensure that all stainless-steel material covered by this specification does not come into contact with any other metals (especially carbon steel), at any stage of the whole manufacturing process (in particular during raw material storage, manufacturing itself, final product storage) and shipping as well, by ensuring a proper segregation from non stainless-steel material. The purpose is to avoid cross contamination of stainless steel by other metallic products. The Contractor shall demonstrate how they achieve segregation of stainless steel and carbon steel materials in their tender offer. In case of proven contamination of stainless steel by carbon steel, contractor shall perform pickling and passivation of the contaminated material. Pickling and Passivation shall be considered as a “special process”.

SUPPLY

Before the start of fabrication, when such materials are used, a listing of proposed materials and products to be used on the Pressure Sensors and Pressure Differential Sensors for the expendable products covered by this specification, along with a Certified Product Report for each product, shall be submitted to the IO for approval. This list shall include grinding wheels, adhesives, dye penetrant materials, rust preventatives, tapes, temperature indicating sticks, paint sticks or inks, ultrasonic testing couplants, weld purge dams, welding/cutting compounds, wrapping materials including temporary insulating materials, desiccants, plugs, caps, layout dyes, machining coolants and lubricants, cleaning agents, and solvents.

All water used for cleaning and hydrotesting shall meet the requirements of ASME NQA-1, Part II, Subpart 2.1, Section 304.1, Water [ACS- 1] for hydrotesting and Grade A water quality according to RCC-M 2012, Annex F-III for cleaning.

7.14.2 Marking and Labelling

The Contractor shall employ a material marking system that ensures the control of the material used in the manufacture of the Pressure Sensors and Pressure Differential Sensors.

For stainless steel materials, electrochemical etching may be used. Etching must be performed to a written procedure and the fluids used must be certified to contain less than 100 ppm of total halogens, lead and sulphur. The process must result in marking with demonstrated legibility and durability.

All components and the main subcomponents shall be clearly marked permanently and in a visible place with the IO official numbering system according to the document “Specification for Labelling of Equipment on ITER Project” [AD- 16].

Final nameplate information shall be approved by IO. In case of PED/ESPN equipment, the nameplate shall be prepared as per PED ESR 3.3 [AOD- 1].

7.14.3 Packaging Requirements

All components requiring re-assembly at the ITER Site shall be clearly labelled and tagged.

All Pressure Sensors and Pressure Differential Sensors shall be prepared for shipment so that handling and unloading may be facilitated. At no time are Pressure Sensors and Pressure Differential Sensors or accessories to be shipped in a disorderly arrangement or situation of disarray to promote damage or hamper inspection of the Pressure Sensors and Pressure Differential Sensors when received on the job site.

The Contractor shall design and supply appropriate packaging, adequate to prevent damage during shipping lifting and handling operations. Where appropriate, accelerometers or other sensors shall be fitted to ensure that limits have not been exceeded. When accelerometers are used, they shall be fixed onto each box and shall be capable of recording the acceleration along three perpendicular directions.

Shock-absorbing material shall be used.

Each shipment shall be accompanied by a Delivery Report shall be prepared by the Contractor, stating as a minimum:

- The packing date,
- The full address of the place of delivery and the name of the person responsible for receiving the package, as well as the Contractor’s name and full address,
- Bill of Materials,
- Security Measures,

- Release Note,
- Packing List,
- Material Safety Sheet,
- The declaration of integrity of the package,
- The declaration of integrity of the components,
- Any additional relevant information on the status of the components.

The packaging for Pressure Sensors and Pressure Differential Sensors shall meet the minimum requirements of ASME NQA-1, Para. 302.3 Level B [ACS- 1], for overseas shipment, and the additional requirements stated herein.

Packaging of the Pressure Sensors and Pressure Differential Sensors shall be provided to ensure adequate protection, yet still allow adequate thermal breathing, during transport and delivery, on-site storage before installation, and during the idle period after the Pressure Sensors and Pressure Differential Sensors are installed and awaiting operations.

Packaging and shipping details, including drawings, shall be prepared by the Contractor and submitted for review and acceptance before shipment.

Materials intended for use in preservation, packaging, and shipping, such as tape, wood, plastic caps, sheets, vapour corrosion inhibitor coverings or other covers which are applied directly to stainless steel and nickel-based alloys shall be compatible with the materials to which they are applied.

All sensors and material shall be protected for ocean shipment, inland transport, and storage at the site, according to applicable International Standards. Individual items shall be packed with adequate sealing to prevent ingress of moisture and with adequate cushioning material to prevent damage during shipment. All openings shall be covered by suitable plastic caps/plugs. Similarly, end connections (Threads) shall be suitably protected.

8 Scope of Supply

This section defines the specific scope of work, in addition to the contract execution requirement as defined in [AD- 1].

8.1 Overview

The Contractor shall submit a proposal to provide items requested in this specification meeting all applicable requirements.

The supply of instrumentation is divided into procurement lots as indicated in Table 5 and Table 6. Depending on the bidder’s capability they may submit bid covering one or several procurement lots, but as minimum the bid shall cover all the equipment in one lot.

Table 5 is the preferred option. if the Contractor can supply both qualified Pressure Sensors and Pressure Differential Sensors. The details are given in the datasheet [AD- 2] in the tabs “Lot-1_MP-absolute”, “Lot-2_MP-gauge”, “Lot-3_MPD and “Lot-4a_MPD-replacable”.

SUPPLY

Measurement type	Code	Lot	Number of sensors	
			SIC	Non-SIC
Pressure Sensors Absolute	MP	1	28 (Gas)	4 (Gas)
Pressure Sensors Gauge	MP	2	3 (Gas)	1 (Gas) 11 (Liquid)
Pressure Differential Sensors	MFT	3	11 (Flow gas) 2 (Flow liquid)	8 (Flow liquid) 2 (Flow Gas)
Pressure Differential Sensors	MPD	4 option A	14 (Level)	0
TOTAL	**-**		**58**	**26**

Table 5: Preferred overall scope of supply [IO-9][IO-10][IO-11][IO-12][IO-13]

In the scenario where the Contractor has no capacity to provide qualified Pressure Differential Sensors fulfilling the requirements in this specification, the alternative scope of supply for Lot 4 is the option B with Pressure Sensors instead of Pressure Differential Sensors, as detailed in Table 6. The details are given in the datasheet [AD- 2] in the tab “Lot-4_option-B_MP-absolute”.

Measurement type	Code	Lot	Number of sensors	
			SIC	Non-SIC
Pressure Sensors Absolute	MP	4 option B	14 (Liquid)	0
TOTAL	**-**		**14**	**0**

Table 6: Alternative scope of supply for lot 4 [IO-9][IO-10][IO-11][IO-12][IO-13]

8.2 Scope

The scope is detailed in [AD- 2].

The Contractor shall supply as a minimum:

- Pressure Sensors / Pressure Differential Sensors depending on the selected lot(s),
- Signal transmitters which will provide 4-20 mA signal output depending on the selected lot(s),
- Comprehensive list of manufacturers recommended Spare Parts.

The insulation is not in the scope of supply.

If chemical seal is required, and there is a compatible option with the environment requirement, the chemical seal arrangement is in the Contractor’s scope of supply.
The short lead cable and its connectors from the sensor to the junction box shall be in the Contractor’s scope of delivery. Short lead cable length shall be 30 meters to reach the junction box.

SUPPLY

The cable selection and design are in the scope of the Contractor and shall comply with IO requirements. It is appreciated that the cable reference is part of the IO Cable Catalogue [AD-20]. Other cables will be in IO's supply scope.

8.3 Design requirements

8.3.1 Sensors - general

Suppliers may propose sensors based on any technology as long as all requirements imposed in this document are fulfilled.

All pressure measurements shall indicate the absolute pressure in order to be consistent with other clients.

The sensors are generally not insulated except for SIC sensors (depending on the location of the sensor).

No local dedicated power supply shall be required for the sensors.

The field instruments shall be certified at least to the degree of protection IP65 or IP68 (refer to [AD- 2]) and the components installed inside the signal conditioning cubicles shall be certified to the degree of protection IP20 or better according to IEC 60529 [ACS- 25].

8.3.2 Sensors - performance

An uncertainty of ±2% of the sensor range is requested taking into account uncertainty generated by the sensor and by the transmitter.

A time response T90 ≤ 2 s is requested for the measurement loop including sensor and signal transmitter.

8.3.3 Cables

All cables shall be NF C32-070 [ACS- 26] C1 or the equivalent IEC ones:

- Reduced flame propagation (IEC 60332 [ACS- 27]),
- Flame retardant (IEC 60332 [ACS- 27]),
- Low smoke (IEC 61034 [ACS- 28])
- Halogen-free (IEC 60754 [ACS- 29])
- Nontoxicity (IEC 60754 [ACS- 29])

In addition, all SIC cables shall be fire resistant (IEC 60331 [ACS- 30] or NF C32-070 [ACS-26] CR1).

All cables in High Radiation areas (more than 10 kGy) shall be qualified according with IEEE 383 [ACS- 31] or IEC 60544 [ACS- 32] for the dose values indicated in this document.

8.4 Layout and installation

8.4.1 Sensors to process

A tapping will be implemented on the process line in order to allow the measurement of the fluid pressure. From the tapping, a tubing will be routed to the sensor, with the adapted manifold/connector. The connection will allow to make the connection to a tubing 1/2" (OD 12.7

mm, thickness 1.245 mm). Tubing 1/2" has been selected due to the difficulty to locate the sensor close to the tapping (due to very congested space). The tubing and fittings upstream of the Pressure or Pressure Differential Sensors are not in the scope of the Contractor.

Level measurements will be based on the wet leg type in order to guarantee large pressure difference on the differential Pressure Differential Sensor and to be less affected by variation of ambient room temperature.

All sensors connected to liquid lines and radioactive/vacuum lines shall be connected to the tubing through Swagelok VCR fitting (or equivalent if suggested by sensor supplier) in order to guarantee high tightness at the connection. Other sensors can be provided with NPT fitting. The details of the split are given in the datasheet [AD- 2].

8.4.2 Cables

Due to the service conditions in the process area, the cubicles assigned for the signal transmitter might be located several levels above/below the physical location of the sensor.
The current specification is to consider a maximal cable length of 300 m (distance from sensor to signal transmitter).
The cables are expected to be twisted pair shielded cables, and the use of the junction box between the sensor and the signal transmitter is forecast to limit the footprint. There is no imposition from ITER for the connection of the sensor to the electrical cable. Already qualified electrical connectors could be used but the Contractor is free to select the most suitable option as long as it allows to remove the sensor from the field to perform maintenance outside without cutting the cables. A total number of 50 occurrences is assumed for the whole lifetime of the plant.
The Contractor shall provide a specification for signal connection from the sensor to the transmitter, including definition of electrical connection type, definition of junction box type, etc. If the Contractor proposes to use junction boxes for signal connection, the cable length of 20 m between the sensor and the junction box shall be assumed.
Cable types shall be selected from the IO Cable Catalogue [AD- 20] unless a need for specific cable type is identified and justified by the Contractor.
Any components that will be foreseen for installation inside junction boxes or I&C cubicles shall be DIN-rail mountable.

8.4.3 Signal conditioners

SIC signal conditioner shall be DIN rail mounted inside the PLC cabinet. Only passive electronics shall be used for SIC sensors.

9 Documentation

All documentation shall conform to the following requirements:

SUPPLY

9.1 General Requirements

All documents shall be submitted to the ITER Document Management System (IDM). A dedicated project area will be created for the purpose.

The documents produced by the Contractor may be bi-lingual. The primary language is English and the secondary language is that of the Contractor. The English text shall have the same technical meaning as the Contractor text. When bi-lingual text is used, it shall apply to all texts on the drawing.

All documents shall be clean and legible white prints with uniform background density suitable for electronic scanning and subsequent reproduction from an electronic format. In addition, all documents shall be submitted in PDF files and native format, or another electronic format if mutually agreed upon. Hard copies may be submitted in addition to electronic transmission.

Documents not meeting the quality requirements specified herein will be returned to the Contractor without IO review for correction and resubmission. Rejected documents will not be a basis for approving schedule extensions or cost increases.

All documents shall utilize IO's Pressure Sensors and Pressure Differential Sensors Item Number and Contractor's part number for those items and component identification.

All or part of the Contractor's documents, sketches, or instructions (or the Contractor's subcontractor's) may be copied or reproduced as necessary by IO for project use. This shall include documents that are labelled "Copyright".

The Contractor is responsible for the document requirements. This includes documents from subcontractors. This responsibility may not be delegated or passed on to any other subcontractor.

Contractor's as-built record drawings shall be updated to reflect changes made during shop fabrication. All as-built drawings (both physical copies and in native format) shall be provided prior to shipment of the equipment.

The Contractor shall provide all the documentation required to clean, start up, test, operate, and maintain all Contractor-supplied Pressure Sensors and Pressure Differential Sensors and accessories.

Acceptance by IO of any of Contractor's documents neither certifies nor warrants Contractor's conformance to any of its obligations under the Purchase Order.

Shall the Contractor, upon receipt of documents as commented by the IO, for whatever reason, not incorporate every of IO's comments as so marked by IO on the Contractor's documents, the Contractor shall so advise the IO in writing the reason for not incorporating these comments.

Note: Release for material procurement and fabrication shall be in writing and not dependent on document status.

The Contractor shall review and approve under its QA program drawings and/or documents submitted by the Contractor's subcontractors before submitting these documents to the IO for review. Specific cases in which parallel review by the IO and Contractor would be advantageous to the project schedule will be considered on a case basis.

Before the Release for Manufacture, the documentation shall be submitted to the IO for review and acceptance. No material orders or fabrication shall begin until released by the IO.

9.2 Weld Documentation Requirements

The following welding documentation shall be retained in the Contractor's shop and available for IO review:

- Administrative procedures for the control of the welding program, which includes qualification of Welding Procedure Specifications, qualification and assignment of welders, filler metal control, the performance of post-weld heat treatment (PWHT), control of welding work, specification of workmanship requirements, and other information related to the administrative control of welding.
- Records of Welder Performance Qualification and updates/renewal of qualification for the welders who will be assigned to the work, according to EN 9606 [ACS- 23]. Additional requirements of EN 13480 [ACS- 6] section 9 shall be applied as well.
- Drawing(s) depicting examination surface configuration and the surface finish for pressure retaining and integrally attached welds and adjacent base material subject to the volumetric examination shall be provided by the Contractor.

10 Manufacturing Dossier

At the completion of the contract, all the following documents shall be submitted to IO for acceptance.

In addition, when relevant according to the PE/NPE classification defined in [AD- 2], the Contractor shall provide the additional documents listed in Appendix I of [AD- 28], except those free-issued by IO as listed in Paragraph 14.1.

10.1 Contract Documentation

- Final technical specification,
- Quality Plan,
- NDT/Inspection personnel certifications,
- Full supplier list,
- List of documents.

10.2 Design Documentation

- Design/sizing calculation note,
- Hydraulic characteristics,
- Verification and validation of software documents,
- Assembly, 3D models and detail drawings,
- Bill of Materials.

10.3 Manufacturing Readiness Documentation

- Special process procedures,
- Manufacturing Inspection Plan,
- Weld maps and weld repair procedures (if applicable),
- Material test reports (Inspection documents),
- Material supplier’s quality system certificate,
- Consumable list.

10.4 Fabrication Documentation

- Heat treatment report, including temperature measurement data,
- NDT reports,

- Surface roughness measurement report,
- Inspection report with complete dimensional and tolerance evaluation,
- Certificate of cleanliness,
- List of special tools, if any,
- Hanging/lifting lug load test report.

10.5 Qualification and Procedure Documentation

- Permanent marking and labelling procedures,
- Qualifications of the personnel for manufacturing special processes,
- Qualification dossier,
- ESPN dossier, bilingual English and French,
- Deviation requests and non-conformity requests,
- Installation, operation and maintenance manual – Instruction manual, bilingual English and French.

10.6 Delivery Documentation

- Cleaning and packing report,
- Final inspection report,
- Delivery report,
- Packing list,
- Preservation manual,
- Contractor Release Note,
- Photographs of packaged components,
- Any document/drawing/procedure that needs prior approval by the IO as mentioned elsewhere in this specification,
- Manufacturer Declaration of Conformity, bilingual English and French.

11 Quality Assurance

GM3S Section 8 [AD- 1] applies in full. The following is a non-exhaustive reminder and an addition to the GM3S.

11.1 Classification

The detailed safety and quality classification of each component in the scope of supply is defined in [AD- 2].

11.2 General

Quality Requirements shall be by the “ITER Procurement Quality Requirements” [AD- 3].

The Contractor shall have an ISO 9001 [ACS- 9] accredited quality system or an IO approved QA Program.

11.3 Quality Plan and Inspection Plan

11.3.1 Quality Plan

Before the commencement of any work under this Contract, a "Quality Plan" (QP) [AD- 3].shall be produced by the Contractor and Subcontractors and submitted to the IO for approval, describing how they will implement the ITER Procurement Quality Requirements.

The IO has the option to use a third party to evaluate the Contractor's quality assurance program. In such a case, the third party shall be the technical organization that is responsible for the approval and monitoring of the Contractor's quality assurance system and the direct inspection of the product. The Contractor shall provide access and information required by the third party to perform the necessary evaluations and tests to fulfil its responsibilities.

11.3.2 Manufacturing and Inspection Plan

Before the commencement of any manufacturing, a "Manufacturing and Inspection Plan" (MIP), according to [AD- 1], shall be produced by the Contractor and Subcontractors and approved by the IO, who will mark up any intended intervention point.

MIPs are used to monitor Quality Control and acceptance tests during the execution of the Contract. The MIP is a listing of the chronological sequence of manufacturing operations affecting quality encompassing the whole scope of the subcontract and ranging from verification of materials, manufacture, inspection and test to delivery. For PIC elements, the MIP also clearly identifies the PIA, as further explained in Section 12. It is permissible for the Contractor to submit multiple MIPs that are more sufficient and manageable to the particular operation. The level of detail in a MIP shall be sufficient to prevent the inadvertent by-passing of critical operations and to enable adequate planning, monitoring and verification of critical operations.

It should be noted that interventions additional to those required in this Technical Specification may be included on the MIP by the IO. The right of the IO listed above shall apply in relation to any Subcontractor and in this case, the IO will operate through the Contractor. The overseeing of the quality control operation by the IO shall not release the Contractor from his responsibility to meet any aspect of this Technical Specification. Subcontractors not performing Critical Quality Activities (i.e. activities that if not performed correctly may affect safety, functionality or reliability) may be exempted from the requirement to supply Quality Plans and Manufacturing & Inspection Plans, subject to agreement by the IO.

11.3.3 SIC and PIC

In case of Contracts concerning SIC components and/or a Safety Related Activity, or PIC and/or Protection Related Activities, the Quality Assurance Programme of the Contractor shall comply with the requirements of the INB Order and the subsequent ASN decisions linked to this Order. For this purpose, the Contractor and Subcontractors carrying out contracts placed under the Contract shall comply with the QA requirements under the relevant QA classifications as defined in "Quality Classification Determination" and additional requirements of the INB Order and the subsequent ASN decisions linked to this Order.

In particular for SIC, the IO, as the Nuclear Operator, will supervise the whole production cycle of the Contractor and Subcontractors by the document "Overall supervision plan of the chain of Suppliers for Safety Important Components, Structures and Systems and Systems and Safety Related Activities" [AD- 13], which shall be identified in the MIP.

11.4 Quality Records

Records shall be maintained to show objective evidence of quality.

SUPPLY

11.4.1 Document Retention Requirements

Documentation records shall be maintained in accordance with the Contractor's QA program to show objective evidence of quality.

No quality records shall be destroyed or otherwise disposed of prior to completion of the work and the IO shall have an opportunity to acquire possession of such records prior to their disposal.

Documentation developed as the result of this Contract shall be retained by the Contractor for a minimum of five (5) years and then may be discarded at the direction of the IO.

The IO shall have an opportunity to acquire possession of such records prior to disposal.

Documents shall be annotated with the IO supply order number or other numbering system traceable to it for identification.

11.4.2 Test Sample Retention Requirements

Any test coupons and specimens used for acceptance per lot shall be kept by the Contractor for a period of up to five (5) years.

The IO shall have an opportunity to acquire possession of such test samples prior to disposal.

11.4.3 Equipment Calibration

Measuring and Test Equipment shall be calibrated, and calibration records maintained according to a calibration program based on a recognized standard. The measuring and test equipment shall have a current Certificate of Calibration traceable to a national recognized testing laboratory.

Certificates of Calibration shall be submitted to the IO.

All heat treatment equipment shall be calibrated and all personnel performing heat treatment shall be qualified to do so.

11.5 Non-conformities and Deviation Requests

Non-conformities are the product or process which does not fulfil or fails in meeting IO specified requirements. Deviation requests are requests for deviation from a formal agreement between the Contractor and the IO. The Deviation requests shall be issued by the Contractor or by the IO.

All requirements of this Technical Specification and subsequent changes proposed by the Contractor during the execution of this Contract are subject to the Deviation Request process described in "Contractors Deviations and Non-conformities Procedure" [AD- 11].

If the conformity assessment of the NPE/PE is not completed because of NCR from the Contractor and/or its subcontractor(s) and supplier(s), the Contractor shall have the related activities or parts redone at its own cost.

11.6 Software Qualification

The use of computer software to perform a safety-based task activity such as analysis and/or modelling, etc. shall be reviewed and approved by the IO before its use, by "Quality Assurance for ITER Safety Codes Procedure" [AD- 12].

Software based devices (Smart devices) shall be avoided as far as reasonable. If the software-based devices are proposed, the Contractor shall perform the Verification and Validation of all the software applications used within the framework of this contract according to the Software Qualification Policy [AD- 10] and for any SIC related software IEC 61513 [ACS- 7] and/or IEC 62671 [ACS- 8]. The Contractor shall prepare software qualification plans or technical procedures based upon the software requirements. The plans or procedures shall include test

cases encompassing the range of intended use for the new or revised software. Qualification testing shall be taken into consideration to demonstrate that software meets its specifications and is ready for use in its target environment or integration with its containing system.

Where necessary to evaluate technical adequacy for verification, the plan shall indicate how the results are to be evaluated. For example, the results may be compared to results from alternative methods such as:

- Analysis without computer assistance
- Other qualified software
- Experiments and tests
- Standard problems with known solutions
- Confirmed publications or correlations

12 Propagation of Safety Requirements

The scope under this contract covers for PIC and PIA and PE/NPE components, [AD- 1] GM3S section 5.3 applies.

12.1 Classification

The nuclear safety class, the seismic class and the pressure class under this contract are defined per item in [AD- 2].

12.2 General

ITER is a nuclear facility (an “INB”, for Installation nucléaire de base, “Basic nuclear installation” in French regulation) identified in France by the number “INB no. 174” [AOD- 3]

Contractors and Sub-contractors must be informed that:

- The INB Order applies to all protection important components and the protection of important activities.
- Compliance with the INB Order must be demonstrated in the chain of external Contractors.
- In application of article II.2.5.4 of the INB Order, the Nuclear Operator (IO) shall undertake supervision of activities undertaken by external interveners (The Contractor and subcontractors).

The IO shall inform the Contractor that the equipment being procured is considered protection important components (PIC). Under Order 7 February 2012 [AOD- 3], the PICs require control and guarantee of the quality of the PICs during the design, manufacturing and transportation phase to ensure its safety functions can be maintained in all postulated situations.

In the contracts passed down to the subcontractors, it is clearly stated that in addition to technical requirements, and defined requirements on PIC, IO shall ensure the surveillance of the Protection Important Activities (PIA). The contractor shall ensure technical control. The subcontractor must possess a quality system in agreement with the importance of the item being delivered and in particular for the follow-up of the PIA corresponding to the PIC to be provided under the contract. The contractor shall provide documented information on how to perform the technical control (each protection-important activity undergoes technical monitoring), to ensure that the activity is carried out in compliance with the requirements defined for the activity and, if necessary, for the protection-important components concerned and that the appropriate corrective and preventive actions have been defined and implemented. This system shall be included in the MIP or Quality Plan.

SUPPLY

The list of PIA for ITER is described in the "List of ITER-INB Protections Important Activities" [AD- 14]. Additionally, the generic safety requirements to be implemented to satisfy the requirements of the INB Order are identified in "Provisions for implementation of the generic safety requirements by the external interveners" [AD- 15].

This applies to all levels of subcontractors. Additionally, the Contractor shall inform the IO of all subcontractors at all levels involved in the supply.

12.3 Audits

Contractor shall inform its Subcontractors that IO is a nuclear facility identified in France by the number INB-174 [AOD- 3]. Certain items that are subject to this Specification are classified as PIC to which the French Order dated 7th February 2012 applies and are subject to IO and regulatory body inspections. PIA shall be identified for PIC to comply with the requirements of the safety function.

The IO and French regulator (for PIC) reserve the right to conduct announced or unannounced inspections and audits, at the Contractor's facilities to verify conformance of the work being performed to the requirements of the supply order and this Specification. Both the Contractor and its Subcontractors are subject to such inspections and audits. No proprietary processes or information shall inhibit IO, or other official parties from performing its audit or inspection function. The IO and French regulator exercise of, or failure to exercise, this right to inspect or witness shall not relieve the Contractor of its obligation to comply with the terms and conditions of the supply order.

IO reserves the right to verify the validity of the Certificate of Compliance during the performance of audits of the Contractor or by independent inspection or test of the item(s).

12.4 Access to Contractor's Premises

The Contractor shall grant access rights to the IO and French regulator as well as to their selected representatives to its facilities, records, proprietary processes and/or information and those of its Subcontractors for surveillance of defined requirements during the construction/manufacturing of a PIC. This surveillance shall also include the examination of all protective-important actions and the follow-up and verification of all corrective actions which are to be implemented.

The IO and Host regulatory body representatives shall have the authority to refuse release for shipment if the requirements of this Specification have not been fulfilled. Copies of required inspections and certified test reports shall be available for review. Final acceptance of material or components shall be performed on the ITER site.

The Contractor shall inform the IO of all locations where fabrication will be done. Source surveillance activities may be conducted at the Contractor's facility or any sub-tier supplier facility that the IO determines necessary to ensure quality objectives are met.

Such surveillance may include auditing and monitoring of production processes, in-process inspection and controls, chemical or physical certifications, final inspection and tests, preparation for shipment, and review of certification data.

Surveillance visits can be announced on short notice.

Source surveillance by IO and French regulator as well as their selected representatives shall not constitute product acceptance by the IO and shall in no way relieve the Contractor of the responsibility to furnish acceptable items.

To ensure the safety of the IO and French regulator as well as their selected representatives who visit the Contractor's or their supplier's facilities, the Contractor shall provide relevant information about facility safety procedures including, for example, safety glasses, hearing and

respiratory protection, emergency preparedness, rally point, and general safety rules; and shall review typical workplace hazards with the representative(s) upon their arrival.

The IO and French regulator as well as their selected representatives who visit the Contractor's or their supplier's facilities shall be bound by appropriate confidentiality obligations to be agreed upon in advance.

13 Location for Scope of Work Execution

The Contractor will perform the work at their own location. No work is anticipated at the ITER site in the framework of this contract.

14 IO Documents & IO Free issue items

14.1 IO Documents:

Under this scope of work, IO will deliver the documents listed in Section 6.2.1.

IO will provide during the contract execution:

- the complete piping interface loads.

14.2 Free issue items:

N/A.

15 Project Management

The Contractor shall designate a Contract Responsible Officer, within 5 working days after the award of the contract (AOC), who will be responsible for the overall design, manufacture, factory testing, installation, performance testing, schedule, cost control and resolution of disputes and discrepancies. The Contractor shall also identify specific individuals responsible for each aspect of the Work. The Contractor's proposal shall provide an outline of the management structure and resumes of the team members for the project.

15.1 Project Schedule

The Contractor shall prepare their document schedule using the template available in the GM3S Appendix II (click here to download) [AD- 1].

The Contractor shall provide a schedule within 10 working days after receipt of each Supply Order. It shall identify the submittals to and approvals from IO of the Contractor's and Subcontractors' specifications, drawings, procedures, and other types of documents as appropriate.

As a minimum the schedule shall include task descriptions with start and finish dates for each task. Separate detailed task breakdowns shall be provided for design, procurement, fabrication, and factory testing phases and end with a Scheduled Jobsite Delivery Date.

The project schedule must be provided to IO for approval prior to the implementation of any Work. The Contractor shall consider potential schedule conflicts due to previous or pending commitments to supply services or material to other customers. Anticipated deviations from the

schedule must be identified to IO as soon as possible to evaluate the impact of changes on the master project schedule.

15.2 List of deliverables

The Contractor shall provide IO with the documents and data required in the application of this technical specification, the GM3S [AD- 1] and any other requirement derived from the application of the contract.

Deliverable	Description	Estimated due date
D1.1	Kick-off meeting minutes	T0 +3 days
D1.2	Approval of documents related to the "Contract documentation" (Section 0)	T0 + 1 month
D1.3 (T1)	Approval of documents related to the "Design documentation" (Section 10.2)	T0 + 4 months
Completion of Task 1 – Design Phase		
Hold Point (T2)	Approval of the "Manufacturing Readiness Review" (Section 7.10)	**Target date September 2026**
Completion of Task 2 – Manufacturing Readiness		
D3.1	Completion of the FAT (Section 7.12) Approval of the FAT report	T2 + 6 months
D3.2 (T3)	Approval of the Manufacturing Dossier (Section 10)	T2 + 8 months
Completion of Task 3 – Manufacturing and Testing		
D4.1	IO acceptance of the delivered equipment and handover of the complete approved documentation	T3 + 1 month **Target date: June 2027**
Completion of Task 4 – Delivery to IO site		

T0 = Commencement Date of the contract

16 Delivery

The transport of the items in the scope of supply shall be the responsibility of the Contractor. The selection of the transport company shall be at the contractor's discretion and the Contractor shall be responsible for the transport to the delivery location.

Before the shipment, a Release Note shall be prepared by the "Contractor Release Note" [AD-3][AD- 19] and approved by the IO. Additionally, a native file item-level packing list and a

delivery report shall be provided to logistics.data@iter.org by the working instruction for the DRR [AD- 7], at least 15 working days before the planned shipment date for each shipment.

Marking shall be transferred to all pieces when a part is cut to make more than one component. The method of marking and marking procedures shall comply with the document “ITER Numbering System for Components and Parts” [AD- 6]. IO will provide a detailed ‘IO component identification standard’ together with printed label (QR-code) templates.

Shipment and Delivery will be undertaken using the International Commercial Terms (Incoterms) 2010. The Contractor shall deliver the items in the scope of supply “Delivered At Place” (DAP) to the IO Site:

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

After packaging, the Contractor shall prepare and submit a Delivery Report [AD- 17] and Packing List [AD- 18] to the IO for review and approval. The Contractor shall sign the Declaration of Integrity and stamp it before submission to the IO. Declaration of Integrity is included in the Delivery Report.

17 Special Management requirements

Requirement for GM3S section 6 [AD- 1] applies in full.

The Contractor and the IO shall meet to review the progress of the work and discuss technical issues.

The Contractor or IO can request specific meetings or communications to resolve issues. All the meetings shall be held by video conference. The Contractor shall be responsible for producing minutes of each meeting, which shall be circulated for review and approval by all attendees before formal issue.

The Contractor shall provide the Deliverables corresponding to the Task assigned by IO in due time. The content of such Deliverables is described in Section 15.2.

In addition to the contract gates as defined in [AD- 1] Section 6.1.5, the scope of work call for Contract gates as defined in Section 15.2 of this document