

Technical Specifications (In-Cash Procurement)

Technical Specifications for installation and commissioning of 14 Bar CA Units in B33

Specify the scope and requirement for engineering work of:14 bar compressor unit installation and integration:auxiliary connecting pipes supply and whole unit installation;Compressor unit I&C integration and commissioning.The 14 bar compressor unit is part of the ITER plant system:14 bar compressor unit (with necessary auxiliaries) in B33-L2-12 is to provide compressed air at 14 bar to the PBS41 DC switches (through CA pipe network of PBS 65) located in B32 and 33. The concerned work scope is ...

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1 Purpose

This technical specification specifies the scope and requirement in three parts:

- 1) Engineering services for installation design of 14 bar(g) compressed air production units.
- 2) Installation with supply of missing items (mechanical, I&C & electrical) for system completion.
- 3) Testing & commissioning of the 14 bar(g) compressed air production units.

This specification defines the design, material, fabrication, inspection, installation, safety, examination and testing requirements for the three work scopes.

In this document, the term Contractor is assigned to the company that has been hired by the Employer to procure, fabricate and install the components.

The Contractor shall bring to the attention of the Employer any discrepancy between the approved drawings, procedures or specifications and the referenced codes and standards. Any possible differences of opinion concerning the interpretation of the requirements shall be considered by the Employer and his interpretation shall be final.

None of the requirements of this specification shall exempt the Contractor from his responsibility to carry out, in addition to that stipulated herein, other analyses, tests, inspections or other activities that he considers necessary to ensure that the materials, design and workmanship are suitable for the intended service.

“**The IO**” means the operator owner of the Site and acts as the Employer under the Contract.

“**The CMA**” shall mean the Construction Manager as Advisor. They are responsible for site coordination.

“**The Contractor**” means the person(s) named as contractor in the Letter of Tender accepted by the Employer and the legal successors in title to this person(s).

“**The Contract**” means the Contract Agreement, the Letter of Acceptance, the Letter of Tender, these Conditions, the Specification, the Drawings, the Schedules, and the further documents (if any) which are listed in the Contract Agreement or in the Letter of Acceptance.

“**The Works**” mean the Permanent Works and the Temporary Works, or either of them as appropriate.

“**The Permanent Works**” means the permanent works to be executed by the Contractor under the Contract.

“**The Temporary Works**” means all temporary works of every kind (other than Contractor’s Equipment) required on Site for the execution and completion of the Permanent Works and the remedying of any defects.

“**Site**” means the places where the Permanent Works are to be executed and to which Plant and Materials are to be delivered, and any other places as may be specified in the Contract as forming part of the Site.

2 Scope

The CAS (Compressed Air System) production unit located in B33-L2-12 is intended to operate to support the PBS41 DC switches (through CA pipe network of PBS 65) located in B32 and 33.

The CAS network design target is to meet the following:

Deliver air pressure at 14 bar(g) & at correct flow rate for final consumers.

Provide CAS during entire project life cycle at correct quality as per ISO-8573-1 ISO 2.2.1.

- Particulate: (Per ISO 8573-1 Table 1)
 - $0.1 \mu\text{m} < d \leq 0.5 \mu\text{m} : \leq 400\,000$
 - $0.5 \mu\text{m} < d \leq 1.5 \mu\text{m} : \leq 6000$
 - $1.0 \mu\text{m} < d \leq 5.0 \mu\text{m} : \leq 100$
- Humidity and Liquid water: (Per ISO 8573-1 Table 2)
 - Less than or equal to -40°C
- Oil: (Per ISO 8573-1 Table 3)
 - Less than or equal to 0.01 mg/m^3

Table 1: System Classification

| Components | Seismic Class | Safety Class | Quality Class |
|------------|---------------|--------------|---------------|
| All | NSC | NSR | QC3 |

The concerned work scope is not safety important.

All the components in the scope of this technical specification are of quality class 3.

All the components in the scope of this technical specification should be meeting relevant standards and with declaration of conformity.

3 Definitions

For a complete list of ITER abbreviations see: [ITER Abbreviations \(ITER_D_2MU6W5\)](#).

| Abbreviation | Definition |
|--------------|---|
| ANB | Authorized Notified Body |
| BOM | Bill Of Materials |
| BOQ | Bill of Quantities |
| CAS | Compressed Air System |
| CBD | Cabling Diagram |
| CMA | Construction Management-as-Agent |
| CRO | Contact Responsible Officer |
| CRR | Construction Readiness Review |
| CWP | Construction Work Package |
| CotS | Commercial off the Shelf |
| DA | Domestic Agency |
| DN | Nominal Diameter |
| E&IC | Electrical, Instrumentation and Control |

| Abbreviation | Definition |
|---------------------|---|
| EP | Embedded Plate |
| EWP | Engineering Work Package |
| FIDIC | Fédération Internationale des Ingénieurs-Conseils (International Federation of Consulting Engineers) |
| GMS | General and Management Specification |
| HOP | Hand Over Package |
| HP | Hold Point |
| I&C | Instrumentation and Control |
| ITP | Inspection and Test Plan |
| ITR | Inspection and Test Record |
| ITER | ITER Project |
| ITT | Instruction to Tenderers |
| IO | ITER Organization |
| IWP | Installation Work Package |
| LAD | List of Applicable Documents (incl. Documents applicability, for Tender, for Construction, for Information) |
| MCS | Material Certificate Summary |
| MIP | Manufacturing Inspection Plan |
| NB | Notified Body |
| NDE | Non Destructive Examination |
| NDT | Non Destructive Test |
| NP | Notification Point |
| PBS | Plant Breakdown Structure |
| PDS | Post Drilled Structure |
| PE / PED | Pressure Equipment / European Directive for Pressure Equipment |
| PFD | Process Flow Diagram |
| P&ID | Process & Instrumentation Diagram |
| PMI | Positive Material Identification |
| QAP | Quality Assurance Plan |
| QA | Quality Assurance |
| QC | Quality Control |
| QCR | Quality Compliance Record |
| SIC | Safety Important Class |
| SoW | Start of Work |
| SSC | Structures, Systems and Components |
| TS | Technical Specification |
| WPQR | Welding Procedure Qualification Record |
| WPS | Welding Procedure Specification |

| Abbreviation | Definition |
|--------------------|---|
| Primary Supports | Piping support in direct contact with the pipe (e.g. U-bolt, pipe clamp base, insulated Pipe Clamp Base, Pipe Shoe and Pipe Strap) and related accessories (e.g. lift-off restraints, lug, axial Stoppers). |
| Secondary Supports | Steel structures (e.g. beam, plates) supporting the pipe or the primary support up to the interface (e.g. PDS, another steel structure). |

4 References

4.1 Applicable Codes & Standards

- [1] EN 13480: Metallic Industrial Piping
- [2] Eurocode 0 NF EN 1990: Eurocode - Basis of structural design
- [3] Eurocode 3 Part 1-1 NF EN 1993-1-1: Design of steel structures Part 1-1: General rules and rules for buildings
- [4] Eurocode 3 Part 1-2 NF EN 1993-1-2: Design of steel structures Part 1-2: General rules – Structural fire design
- [5] Eurocode 3 Part 1-8 NF EN 1993-1-8: Design of steel structures Part 1-8: Design of Joints
- [6] NF EN 10162: Cold rolled steel sections. Technical delivery conditions. Dimensional and cross-sectional tolerances
- [7] NF EN 10088 Part 1, 2, 3 Stainless steels.: Part 1 - List of stainless steel/ Part 2: Technical delivery conditions for sheet/plate and strip of corrosion resisting steels for general purposes/ Part 3: Technical delivery conditions for semi-finished products, bars, rods, wire sections and bright products of corrosion resisting steels for general purposes
- [8] EN ISO 7089: Plain washers – Normal series – Product grade A
- [9] NF EN 1090 Parts 1,2: Execution of steel structures and aluminium structures. Part 1 - Requirements for conformity assessment of structural components. Part 2 - Technical requirements for steel structures.
- [10] NF EN 10160: Ultrasonic testing of steel flat product of thickness equal or greater than 6 mm
- [11] NF EN 10306: Iron and steel. Ultrasonic testing of H beams with parallel flanges and IPE beams
- [12] NF EN 10308: Non-destructive testing. Ultrasonic testing of steel bars
- [13] NF EN ISO 1461: Hot dip galvanized coatings on fabricated iron and steel articles. Specifications and test methods
- [14] NF EN ISO 8503-2: Preparation of steel substrates before application of paints and related products. Surface roughness characteristics of blast-cleaned steel substrates. Part 2 - Method for the grading of surface profile of abrasive blast-cleaned steel. Comparator procedure
- [15] NF EN ISO 12944: Paints and varnishes. Corrosion protection of steel structures by protective paint systems
- [16] NF EN ISO 2808: Paints and varnishes. Determination of film thickness

4.2 Applicable Documents

- [17] [ITER_D_YPPKW3 - Technical Specification for procurement of Compressors Units](#)
- [18] [ITER_D_22F53X - Procedure for Management of Nonconformities](#)
- [19] [ITER_D_2EFMKB - System Requirements Document SRD 65-00-CA Compressed Air \(from DOORS\)](#)

- [20] [ITER_D_V5N9RF - Construction Design - PBS 62, 63 and 65 - 04TSME - Specification for Design - Mechanical - Piping Material Classes Detail - OME_DH_SP_000004_ME](#)
- [21] [ITER_D_V5NHKE - Final Design - PBS 62.11-14-74 and 63.61 - 04TSME - Specification for Design - Mechanical - Fluids Design - Buildings 11-14-61-74-External - OME_DH_SP_0D0007_ME](#)
- [22] [ITER_D_VQ69HA - Technical Specification for the Pre-fabrication & Installation of Stainless Steel Pipework \(non-ESP, ESP,ESPN,PIC etc.\)](#)
- [23] [ITER_D_8XJ5JN - General Arrangement drawing of 14 bar compressed air unit components](#)
- [24] [ITER_D_8XHUU2 - Data sheet for 14 bar compressed air unit components](#)
- [25] [ITER_D_7VEC8R - ITER_6533CA_PFD_001 - Compressed Air Production Units 14bar\(g\) - Building 33](#)
- [26] [ITER_D_86SLG5 - ITER_6533CA_CBD_001 - Compressed Air Production Units 14bar\(g\) - Building 33](#)

4.3 Reference Documents

- [27] [ITER_D_YPPKW3 - Technical Specification for procurement of Compressors Units](#)
- [28] [ITER_D_33WL3N - CAD Manual 12-2 Piping Design](#)
- [29] [ITER_D_2NCULZ - Procedure for ITER CAD Data Exchanges](#)
- [30] [ITER_D_2F6FTX - Procedure for the Usage of the ITER CAD Manual](#)
- [31] [ITER_D_2DWU2M - Procedure for the CAD management plan](#)
- [32] [ITER_D_KFMK2B - Diagrams and Drawings Management System Working Instruction](#)
- [33] [ITER_D_JKT5KN - How to use the SMDD Application \(System for the Management of Diagrams and Drawings\)](#)
- [34] [ITER_D_35CY6V - CAD Manual 14 - Diagram Guidelines](#)
- [35] [ITER_D_P7Q3J7 - Specification for CAD data Production in ITER direct contracts](#)
- [36] [ITER_D_SLA7CJ - Technical Specification for Erection of Structural Steel](#)
- [37] [ITER_D_347SF3 - Safety Important Functions and Components Classification Criteria and Methodology](#)
- [38] [ITER_D_24VQES - Quality Classification Determination](#)
- [39] [ITER_D_S9YVVG - Technical specification for Coating and Tagging](#)
- [40] [ITER_D_vyj7u2 - Procedure for Labelling on Physical Items](#)
- [41] [ITER_D_TL25DK - System Component labelling procedure ITER Project](#)
- [42] [VNTEQX_FER_EH_DW_332096_ME - Construction Design - PBS 65.33/PW/DW/CA/NG - Construction Design. Building 33. Mechanical PW, DW, CA & NG details](#)

5 Work Description

The following table briefly provides the number, description, input/pre-requisite and expected deliverable(s) of each task.

Table 2 List of tasks

| Task number | Task | Description | Input/pre-requisite | Deliverable* |
|-------------|--------------------------------------|-------------|----------------------|---|
| T1.1 | Survey of the site, Detailed design. | 5.1 | This TS+ Site Survey | P&ID, CBD, Single line Diagrams, Piping Layout (3D), GA Drawings, Installation drawings, BOM, Line list and |

| | | | | |
|------|-------------------------------|-----|---|---|
| | | | | Installation procedures. Inspection and testing procedures. |
| T1.2 | Installation works & Testing | 5.2 | T1.1+ CA compressors (already procured by IO)** + support from IO (interfacing I/O) | Procurement and supply of missing parts, Installation of the Units with auxiliary parts. Testing of the system in accordance with the relevant codes & standards. |
| T1.3 | Integration and commissioning | 5.3 | Support from IO (interfacing I/O) | Successful integration and commissioning of the CA unit report, Operation and maintenance manual. |

* Requirements of each deliverable are specified in the task description (6.1-6.2).

** The compressor unit (with filters + tank) is already procured by IO through [17].

5.1 T1.1: Survey of Site, Execution design of the system

5.1.1 Description of T1.1

The contractor is responsible for the survey of the site in order to start the detailed design of the system. The image below shows the site where existing installed 7 bar(g) compressors are located and the 14 bar(g) components procured by IO will be available to the contractor.

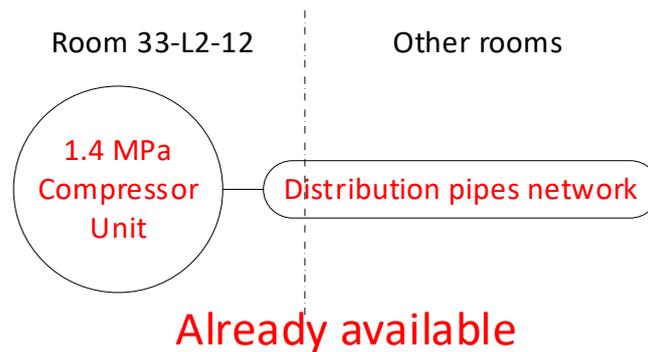
Figure 1 Room 33-L2-12 Compressor unit room



The items supplied by IO are in the document[24]. The contractor is responsible to identify the missing items that has to be procured by the contractor to integrate the system for it to operate at

the desired output & quality of air as mentioned in the SRD [19]. The contractor is responsible to develop the P&ID according in line with the PFD [25] and suggest changes to IO if required. The contractor shall follow codes and standards as mentioned in section 4.1 for the design of piping systems in accordance with pipe specification [20] & fluid design [21]. The supports shall be designed in order to comply with the system classification [Table 1: System Classification]. The task is to request the contractor to make necessary installation design, identifying and supply missing material and install the 14 bar(g) compressor units.

Figure 2 scope of existing components



5.1.2 Inputs for T1.1

- General arrangement drawings of procured items by IO [23]
- Data Sheets of procured items by IO [24]
- **Installation Manuals and notes of items procured by IO**
- Preliminary 2D diagrams prepared by IO [25][26]
- 2D mechanical drawings of existing 7 bar(g) compressor unit and the room 33-L2-12 [42]

5.1.3 Existing CODAC service and infrastructure for 7/14 bar compressor units [appendix 1] Deliverables for T1.1:

- Detailed P&ID.
- Detailed Cabling Diagrams, Single Line Diagrams.
- General arrangement drawings/3D of mechanical, I&C and electrical systems.
- Data Sheets of components.
- Piping Isometrics.
- Support design documents and drawings.
- Stress analysis report if required.
- Shop fabrication drawings for piping and supports.
- Detailed BOMs, Line Lists, Valve Lists and Equipment Lists.
- Installation procedures.
- Required controls and test reports.
- Manufacturing documentation.

IO shall approve all the documents required for manufacturing the components prior to manufacturing.

5.2 T1.2: Supply of materials, Installation of the Units & Testing

5.2.1 Description and Requirement for T1.2

The contractor is responsible for the installation of the compressor units in the room B33-L2-12 along with prefabrication of pipe spools, including the supply of raw bulk material (pipes, fittings, flanges, tapping, in line components, instrumentation etc.) which are required for the completion of the system for operation. Piping shall be manufactured as per the isometric drawings generated by the contractor during T1.1. Please refer to [22] for the main requirements for prefabrication of piping. This shall be read in conjunction with the piping classes as well as the applicable isometrics/drawings/bill of materials. The Contractor shall respect all codes and standards listed. The Contractor shall describe the manufacturing steps through a dedicated Manufacturing Inspection Plan submitted by the Contractor for approval by IO.

The contractor shall provide RIO cubicle to be connected to the existing cubicle 6533CA-CU-0007. Refer cabling diagram [26] for more information. The contractor is also responsible to select the proper cables for the power and I&C for the compressor units (I&C cables connecting to 6533CA-CU-0007 in room 33-L1-02; power cables connecting to 33-R1 roof: 6333ES-BD-0003).

A Construction Readiness Review shall be arranged by the contractor with the IO. Then, the contractor shall arrange the installation activities following ITER site construction rules, in particular the safety regulations. The required administrative and safety documentation for the installation activities shall be issued by the Contractor and approved by corresponding authorities in IO or its delegation. These types of documentation are not considered as deliverables of this TS. The installation activities shall be executed not to cause any damage to any existing components (the 7 bar compressor units).

IO TRO reserve the authority to inspect any of the installation activities. A construction completion inspection shall be arranged for the installation of the compressor unit. The contractor shall issue the corresponding inspection report with signatures from relevant authorities. The supplier shall arrange a third party initial legal inspection after the completion of the installation, and the identified non-conformity issues regarding installation shall be resolved by the contractor before integration. All the tests shall be according to the applicable codes & standards mentioned in this document.

5.2.2 Input/pre-requisite for T1.2

All in T1.1 & supply of missing items.

5.2.3 Deliverable for T1.2

After the installation, an installation completion report(s) shall be issued in IDM by the contractor as key indicator of the completion of this task. The completion report shall include:

- Construction completion inspection records;
- Successful test reports (including test procedure agreed by IO) & conformity certificates;
- Certificate and warranty of the installation.

Tagging of all the installed components, which are under this contract, is contractor's responsibility.

5.3 T1.3: 14 bar compressor unit integration

5.3.1 Input/pre-requisite for T1.3

The following pre-requisite has to be ready for task 1.2:

- The successful installation and tests of the 14 bar(g) compressor units (completion of task T1.2);
- The successful third party legal inspection performed on the installed compressor units (arranged in the task T1.2);
- The CODAC and building service team is ready to provide integration support.

5.3.2 Description and Requirement for T1.3

The task requires the contractor to perform the commissioning (with CODAC and building service team) of the installed compressor units, including:

- Power-on the units and verify the performance.
- Switch and operate locally and remotely through CODAC service.

The contractor shall perform the integration and commissioning of the compressor units with inspection and witness of the IO-TRO and his delegation.

5.3.3 Deliverable for T1.3

The contractor shall deliver the test report (test procedure agreed by IO before the commissioning) to IO indicating the successful commissioning and integration of the compressor units (an example is provided for information in Appendix 2).

6 Responsibilities

6.1 IO Responsibilities

IO is responsible to appoint a technical responsible officer (TRO) for this contract.

IO is responsible to provide IDM access to the Contractor for issuing the deliverables.

6.2 Contractor's Responsibilities

The Contractor is responsible to appoint a project manager/technical responsible officer (TRO) for this contract.

The contractor is responsible for removal of unwanted material from site, damage repair etc.

The contractor is responsible to follow the export control requirements of anything developed within this contract for IO. IO remains in any cases, the owner of the results of the execution of this contract.

7 Acceptance Criteria

The approval of a deliverable in IDM indicates the acceptance of the work by IO. The deliverable should include the minimum contents listed in Chapter 11 deliverable table.

The approver of the deliverable is the IO-TRO and the approver may select a list of reviewers to review the deliverables.

8 Specific requirements and conditions

N/A

9 Estimated Duration

Shall not exceed 12 months. The duration requirement on each task is given in section 11.

10 Work Monitoring / Meeting Schedule

A kick-off meeting will be organized to initiate the activities when the contract is signed.

Biweekly or monthly progress meetings will be organized with mutual agreement of the both TROs.

11 Delivery Time Breakdown

The delivery schedule is proposed in the following table, taking into account the construction schedule of the concerned components. The Contractor may propose new durations needed for the work under this contract for the IO approval. The Contractor shall submit a detailed implementation schedule to the IO.

Table 3 Delivery Schedule

| Task | Due date | Comment |
|------|----------------|---|
| T1.1 | T0*+ 3 months | Survey of Site, Execution design of the system |
| T1.2 | T0*+ 6 months | Supply of materials, Installation of the Units & Testing |
| T1.3 | T0*+ 12 months | Commissioning and integration of 14 bar compressor unit system in B33 |

T0*: contract signature date

12 Quality Assurance (QA) requirements

All the components in the scope of this technical specification are of quality class 3.

The organisation conducting these activities should have an ITER approved QA Program or an ISO 9001 accredited quality system.

The general requirements are detailed in [ITER Procurement Quality Requirements \(ITER_D_22MFG4\)](#).

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

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

13 CAD Design Requirements

The Exchange of CAD data shall comply with “Procedure for the design office activities related to CAD Data Exchange Task” [2NCULZ]

For the contracts where CAD design tasks are involved, the following shall apply:

The Contractor shall provide a Design Plan to be approved by the IO. Such plan shall identify all design activities and design deliverables to be provided by the Contractor as part of the contract.

The Contractor shall ensure that all designs, CAD data and drawings delivered to IO comply with the Procedure for the Usage of the ITER CAD Manual ([2F6FTX](#)).

The reference scheme is for the Contractor to work in a fully synchronous manner on the ITER CAD platform. This implies the usage of the CAD software versions as indicated in CAD Manual 07 - CAD Fact Sheet ([249WUL](#)) and the connection to one of the ITER project CAD data-bases. Any deviation against this requirement shall be defined in a Design Collaboration Implementation Form (DCIF) prepared and approved by DO and included in the call-for-tender package. Any cost or labour resulting from a deviation or non-conformance of the Contractor with regards to the CAD collaboration requirement shall be incurred by the Contractor.

Procedures of producing diagrams (Process Flow Diagrams, Piping & Instrumentation Diagrams, One Line Diagrams, Instrumentation and Control Diagrams, Cabling Diagrams, and Cable Routing Diagrams etc.) are included in the ITER CAD Manual. The software tool to produce the diagrams is SEE System Design.

14 Safety requirements

Not Applicable.

The concerned work scope is not safety important.

(Appendix files are also included in the attachment in IDM)

(Appendix files are also included in the attachment in IDM)

Appendix 1: Additional input for Task 1.1

1. Existing CODAC service and infrastructure for 7/14 bar compressor units



FER_EH_DR_333006_C
Lv04.1.pdf

CBD of the I&c for 7 bar system (for information)



FER_EH_DR_334191_C
Lv08.1.pdf

SLD of the power distribution



ITER_6333ES_SLD_001
.pdf

Appendix 2: Additional input for Task 1.3

1. Example of the commissioning report



FER_EJ_TE_0X0021_CA
_v02.0_commissioning