European Organization for Nuclear Research
Organisation européenne pour la recherche nucléaire

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The High Luminosity LHC Project

Price Enquiry

Technical Specification

Supply of machined and welded components for the DQM INTERLINK

Abstract

This Technical Specification concerns the supply of five DQM Interlink components, including pressure and vacuum vessels in stainless-steel and thermal shields in aluminium. CERN will use these components for the manufacturing of DQM interlink assembly for the HL-LHC Project.
The delivery schedule anticipates one assembly within five months and four assemblies within eight months from the notification of the Contract.

March 2025

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Table of Acronyms

Acronym	Definition
HL-LHC	High Luminosity LHC
FAT	Factory Acceptance Tests
LHC	Large Hadron Collider
MIP	Manufacturing and Inspection Plan

1. INTRODUCTION

The Contract will be performed in accordance with the General Conditions of CERN Contracts (CERN/FC/6674-II). However, this Technical Specification prevails over the General Conditions of CERN Contracts with regard to the particular provisions specified in this document, and this without prejudice to any other provision in the General Conditions of CERN Contracts.

Capitalised terms in the body text are defined either in the General Conditions of CERN Contracts or in the present document.

1.1 Introduction to CERN

CERN, the European Organization for Nuclear Research, is an intergovernmental organization with over 30 Member States[1]. Its seat is in Geneva but its premises are located on both sides of the French-Swiss border (https://maps.web.cern.ch/). CERN's mission is to enable international collaboration in the field of high-energy particle physics research and to this end it designs, builds and operates particle accelerators and the associated experimental areas. At present, more than 10 000 scientific users from research institutes all over the world are using CERN's installations for their experiments. Further information is available on the CERN website: http://cern.ch.

The accelerator complex at CERN is a succession of machines with increasingly higher energies. Each machine injects the beam into the next one, which takes over to bring the beam to an even higher energy, and so on. The flagship of this complex is the Large Hadron Collider (LHC) (see Figure 1).

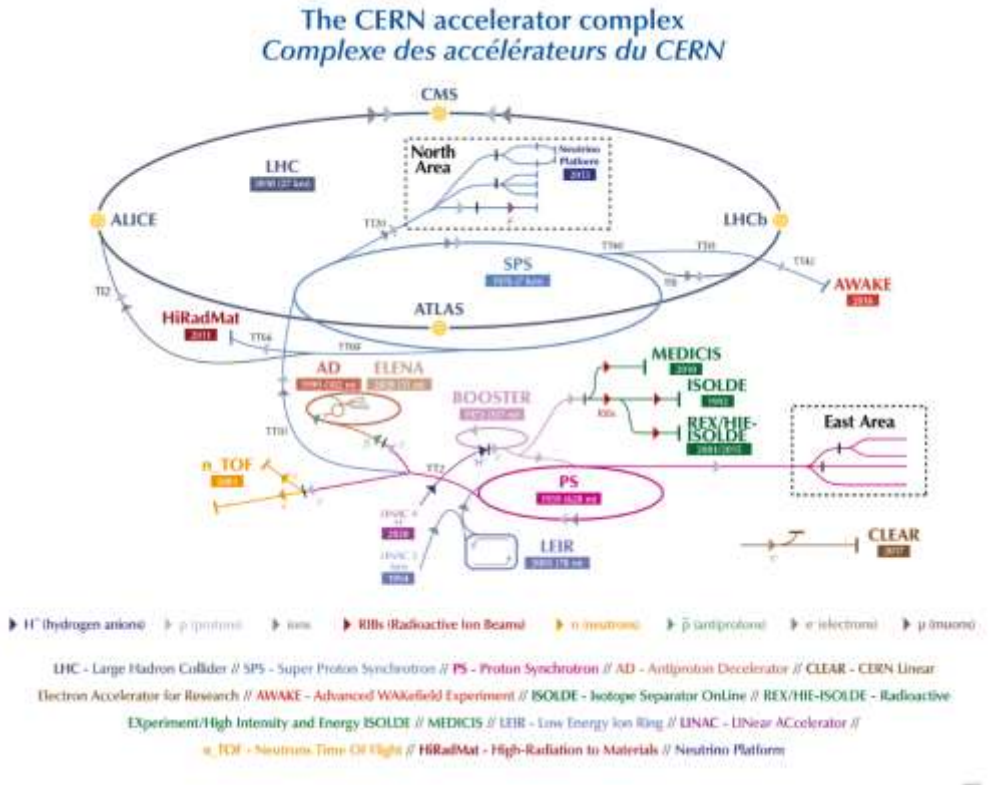

Figure 1: CERN Accelerator Complex

[1] http://home.web.cern.ch/about/member-states

1.2 Introduction to the HL-LHC Project

The Large Hadron Collider (LHC) is the largest scientific instrument ever designed and built for particle physics research. The LHC machine accelerates and collides proton beams but also heavier ion species at unprecedented energies of up to 14 TeV. The accelerator is installed in a 27 km long tunnel, about 100 m underground at CERN, the European Organization for Nuclear Research, on the Franco-Swiss border near Geneva, Switzerland.

The LHC design is based on superconducting twin-aperture magnets, which are cooled with superfluid helium to their nominal operating temperature of 1.9 K, for the guidance of the particle beams.

High Luminosity LHC (HL-LHC) is a project aiming at an upgrade of the LHC machine to maintain scientific progress and exploit its full capacity. By increasing its peak luminosity as of 2029 by a factor of five beyond its initial design value, it will allow collecting a ten times larger set of physics data than during the exploitation period of the nominal LHC. To this aim, HL-LHC is exploring new beam configurations and novel technologies in the domain of superconductivity, radiofrequency, cryogenics, radiation tolerant materials, electronics, and remote handling.

2. SCOPE OF THE SUPPLY

CERN intends to place a contract (the “Contract”) for the supply of machined and welded components (the “Components” and, in whole or in part, the “Supply”) for five DQM Interlink.

The successful bidder (the “Contractor”) shall provide the Supply as defined in this Technical Specification, including its annexes.

2.1 General Description

The Supply includes welded and mechanical components in aluminium and stainless steel from different grades.

The Supply consists of inner pressure vessels, a thermal screen, insulation-blanket layers, an outside vacuum vessel.

The Contractor shall guarantee full compliance of the Supply with the Pressure Equipment Directive (2014/68/EU). In addition, the Supply shall fully conform to the requirements of EN 13458, including related standards to which it refers.

Table 1 - Operating Conditions

Design pressure	20 bara (int)
Test pressure	25 bara (int)
Operating temperature	1.9K / 300K (on the side of Ø206x3) 4.5K / 300K (on the side of Ø156x3)
Fluid	Helium

2.2 Content of the Supply

The Supply shall include:

- *Technical deliverables* as specified in § 3:
  - Batch 1 as described in § 3.1 according to the drawing provided by CERN (see § 9.1);
  - Batch 2 as described in § 3.1 according to the drawing provided by CERN (see § 9.1).

- *Activities* as specified in § 4:
  - Procurement of the material (see § 3.2);
  - Machining according to the drawings provided by CERN (see § 9.1);
  - Welding according to the drawings provided by CERN (see § 9.1);
  - Dimensional control according to the drawings provided by CERN (see § 9.1);
  - Testing according to the Non Destructive Tests (NDTs) requested;
  - Packing and shipping, if so requested (see § 4.4).

- *Documentation* as specified in § 5:
  - Manufacturing and Inspection Plan (see § 5.1);
  - Factory Acceptance Test report (see § 5.2);
  - Progress Reports (see § 5.3).

2.3 Material provided by CERN

CERN will provide the following stainless steel 1.4429 (316LN) in form or bars and sheets as raw material for the purpose of the performance of the Contract, as noted in Table **2**:

- LHCLDQM_0022: 1 bar in Stainless Steel grade 1.4429 dimension: Ø210, Length 275 mm;
- LHCLDQM_0034: 1 bar in Stainless Steel grade 1.4429 dimension: Ø210, Length 250 mm;
- LHCLDQM_0037: 5 Sheets in Stainless Steel grade 1.4429 Thickness=1.5mm, dimension: 1200x500mm;
- LHCLDQM_0042: 1 Sheet in Stainless Steel grade 1.4429 Thickness=3mm, dimension: 1200x500mm.

The Contractor shall procure any other required raw material for the execution of the Contract according to the drawings provided by CERN (see §§ 5 and 9.1).

3. SPECIFICATION OF THE TECHNICAL DELIVERABLES

The Supply shall include the technical deliverables as specified in the present section.

3.1 Types and quantities of Components

The Supply includes the items (references and quantities) indicated in Table 2.

Table 2 - Types and quantities of Components

Item	Drawing reference[2]	Qty Batch 1
1	LHCLDQM_0010	1
2	LHCLDQM_0025	1
3	LHCLDQM_0026	1
4	LHCLDQM_0012	1

[2] The Drawings are available in the Annexes.

5	LHCLDQM_0013	1
6	LHCLDQM_0055	6
7	LHCLDQM_0058	6
8	LHCLDQM_0008	2
9	LHCLDQM_0009	1
10	LHCLDQM_0014	1
11	LHCLDQM_0022	1
12	LHCLDQM_0023	1
13	LHCLDQM_0024	1
14	LHCLDQM_0003	1
15	LHCLDQM_0066	1
Item	**Drawing reference[3]**	**Qty Batch 2**
16	LHCLDQM_0010	**4**
17	LHCLDQM_0025	4
18	LHCLDQM_0026	4
19	LHCLDQM_0012	4
20	LHCLDQM_0013	4
21	LHCLDQM_0055	24
22	LHCLDQM_0058	24
23	LHCLDQM_0008	8
24	LHCLDQM_0009	4
25	LHCLDQM_0014	4
26	LHCLDQM_0022	4
27	LHCLDQM_0023	4
28	LHCLDQM_0024	4
29	LHCLDQM_0003	4
30	LHCLDQM_0066	4

CERN reserves the right to introduce minor modifications of the Drawings during the Contract.

[3] The Drawings are available in the Annexes

3.1.1 Engraving

The Contractor shall permanently identify all parts, as described in Table 3. Default size for marking the identifiers (character height) shall be 8 mm. The engraving shall be done either by laser, by milling or with an electrical pen.

Table 3 - Engraving

Drawing reference	Designation	To be engraved on each part
LHCLDQM_0010	INTERLINK VACUUM VESSEL	**HCLDQM_010-CR000001** **HCLDQM_010-CR000002** **HCLDQM_010-CR000003** **HCLDQM_010-CR000004** **HCLDQM_010-CR000005**
LHCLDQM_0012	D2 / INTERLINK SLEEVE ASSEMBLY	**HCLDQM_012-CR000001** **HCLDQM_012-CR000002** **HCLDQM_012-CR000003** **HCLDQM_012-CR000004** **HCLDQM_012-CR000005**
LHCLDQM_0008	HALF JUMPER SPLICE THERMAL SHIELD	**HCLDQM_008-CR000001** **HCLDQM_008-CR000002** **HCLDQM_008-CR000003** **HCLDQM_008-CR000004** **HCLDQM_008-CR000005**
LHCLDQM_0009	HALF THERMAL SHIELD INTERLINK	**HCLDQM_009-CR000001** **HCLDQM_009-CR000002** **HCLDQM_009-CR000003** **HCLDQM_009-CR000004** **HCLDQM_009-CR000005**
LHCLDQM_0014	HALF THERMAL SHIELD INTERLINK	**HCLDQM_014-CR000001** **HCLDQM_014-CR000002** **HCLDQM_014-CR000003** **HCLDQM_014-CR000004** **HCLDQM_014-CR000005**
LHCLDQM_0003	WELDED CHAMBER FOR VACUUM BARRIER	**HCLDQM_003-CR000001** **HCLDQM_003-CR000002** **HCLDQM_003-CR000003** **HCLDQM_003-CR000004** **HCLDQM_003-CR000005**
LHCLDQM_0066	HELIUM CHAMBER	**HCLDQM_066-CR000001** **HCLDQM_066-CR000002** **HCLDQM_066-CR000003** **HCLDQM_066-CR000004** **HCLDQM_066-CR000005**

3.2 Specific Material Requirements

The Supply shall be made of either stainless steel EN 1.4306, EN 1.4307, EN 1.4404, EN 1.4435, Cu OF, EN AW-1050 at the Contractor’s discretion (see the Drawings listed in § 9.1 for details). The

material shall be conformed to the requirement of standards harmonized with the Pressure Equipment Directive (2014/68/EU). All the piping material shall be delivered with EN 10204 3.1 certificate, which the Contractor shall provide to CERN for written approbation at the time the Contractor receives the piping material at its premises.

The Contractor shall procure the braids, screws, nuts and washers according to the drawings provided by CERN (see § 9.1).

3.3 Welding Requirements

The Contractor shall specify and document all pressure welds according to EN ISO 3834-2 (Comprehensive quality requirements), compliant with the EN 13458 and ensure the welds conform to ISO 5817 quality level B, which specifies the quality level for imperfections. All welds shall be documented with qualified procedures and shall be performed by qualified welders as specified in § 5. The Contractor shall make all butt welds with full through-thickness penetration. Fillet welds of reinforcements shall be interrupted according to the welding indications to avoid crossing with leak tight seams (see § 9.1).

Double side welds shall always be interrupted at least on one side (normally non pressurized side) to prevent closed volumes that may become the cause of virtual leaks and difficulties in leak detection.

The Contractor shall ensure that no discoloration of the steel in the heated areas around welds is present on the finished assemblies. Final weld beads shall not be modified by grinding or machining.

A stainless-steel brush could be used to remove the oxidation. Nevertheless, the Contractor shall document all welding repairs (see § 5).The Contractor shall ensure that its welding procedure and filler material guarantee corrosion resistance of the welds and heat affected areas at minimum equal to 1.4306/1.4307 stainless steel. EN 10204 2.2 certificate shall be provided for the filler material for written approval by CERN prior to execution.

All parts shall be cleaned to prevent any welding defects, and a good backing gas protection shall be used for butt welds and fillet welds to avoid root porosity.

3.4 Leak Tightness Requirements

The global leak tightness of each of the volumes (Helium Chamber's Components, Vacuum Vessel's Components), shall be tested independently and measured with a calibrated UHV leak detector according to ASTM E498/E498M–11. According to the provisions of § 4.3.1, the leak tightness shall be better than 10^{-10} Pa m^3 s^{-1} (10^{-9} mbar L s^{-1}) at room temperature.

4. SPECIFICATION OF THE ACTIVITIES

The Supply shall include the activities listed in the present section. These activities shall comply with the requirements specified below.

During the Contract, CERN shall have free access, during normal working hours, to the Contractor's premises, including manufacturing and assembly sites and Subcontractor's premises. The change of manufacturing place is subject to prior written approval by CERN.

4.1 Manufacturing Activities

The Contractor shall produce the Supply following the schedule provided in § 7.1 and according to the requirements specified in § 3.

The Contractor shall order required raw material for the execution of the entire Contract (see § 3.2) except raw material supply by CERN after award of the contract (see § 2.3).

The manufacturing of the Supply shall be subject to prior written acceptance by CERN of the alternative design proposed by the Contractor, or the confirmation by the Contractor of the compliance of the preliminary design specified in this Technical Specification (see the list of drawings, § 9.1). The Contractor shall not start the procurement of raw materials and manufacture of the Supply before the written approval from CERN of the alternative design proposed by the Contractor (if any).

CERN reserves the right to reject design proposals by the Contractor that may impair the thermal performance or the compatibility of any interfaces with the rest of the system, or that do not ensure the compliance with the requirements described in § 3.

4.2 Machining

The Contractor shall respect the chamfer reported to the cartouche for each edge in the drawings, as it is important for the next welded assembling to be done by CERN.

The surface roughness reported on the drawings (see § 9.1) shall be respected for all the components.

The sealing surfaces shall not present scratches, dents, or any other surface imperfections.

Surface roughness and lay shall ensure leak tightness with clean and dry elastomer or metallic seals and without use of grease.

The Contractor shall perform the deburring according to the specification indicated in the cartouches of the drawings. There shall not be any scratches on these surfaces.

The Supply shall be free of dust or chips; and the Contractor shall blow threads and holes.

4.3 Welding

All the welding coordination documents shall be signed by a welding engineer with comprehensive level from *Competency levels for welding coordination personnel* according to EN ISO 14731.

The Contractor shall send the certificates attesting all qualifications mentioned above to CERN for approval. The Contractor shall not start any welding before CERN has approved the corresponding documents in writing.

4.3.1 Arc Welding

The Contractor shall perform arc welding, which cannot be subcontracted. All welders shall be proving their training or awareness of defects by visual inspection (according to EN ISO 5817 B).

All welders shall be qualified by WPQ according to EN ISO 9606-1 and EN ISO 14732.

4.4 Packing and Shipping

The Contractor shall be responsible for the packing and, if requested by CERN for the transport to CERN. In this case, the Contractor shall take up a dedicated all-risk transport insurance for the Supply

concerned in accordance with the provisions of DAP Incoterms 2020 conditions, CERN Meyrin (CH) or Prévessin (FR) (left to the choice of the Contractor).

In all cases, the Contractor shall comply with the packing and shipping instructions available under: https://procurement.web.cern.ch/system/files/document/packing-and-shipping-instructions_0.pdf and, in particular, ensure that the Supply is packed in a way that guarantees the absence of any contamination and that no damage or any possible deterioration in performance due to transport conditions can occur.

In addition, the Contractor shall comply with the relevant applicable standards in matters of packing, in particular, each group of Drawing reference shall be packed in individual boxes identified with the drawing reference number and the quantity of pieces.

4.5 Tests

The Contractor shall carry out the inspections and tests as specified below.

4.5.1 Tests Carried Outside the CERN site – Factory Acceptance Tests (FAT)

The Contractor shall perform the following tests during the production of the Supply:

- Welded joints Inspection (see § 4.5.1.1);
- Dimensional Inspection (see § 4.5.1.2);
- Leak tests (see § 4.5.1.3);
- Volumetric examination, Radiographic test (see § 4.5.1.4);
- Factory Acceptance Tests (see § 4.5.1.5).

CERN, or a representative of its choice, may attend any tests carried out outside the CERN site. The Contractor shall notify CERN in writing at least ten working days before the proposed date for any such tests.

4.5.1.1 Welded joints Inspection

The testing of the welds and required quality level shall follow EN ISO 17635 “Non-destructive testing of welds — General rules for metallic materials”.

All pressure welds shall conform to quality level B according to ISO 5817.

4.5.1.2 Dimensional Inspection

The whole (100 % of the) Supply shall be inspected by using a 3D scanning method or equivalent. The Contractor shall:

- Guarantee a probing error of less than 100 µm;
- Provide a software to view the collected metrological data or each part;
- The viewer shall allow the evaluation of the minimum and maximum deviation of the scanned surfaces from the theoretical surfaces and the display of a graded colour map of the deviation of the scanned surfaces;
- Provide a metrological report of the roughness Ra 1.6 defined in the drawings, by using a rugosimeter.

4.5.1.3 Leak tests

The Contractor shall leak test all welded volumes of the Supply according to EN 13185 by evacuation of the internal volume (technique A.1) and using helium as tracer gas. These tests shall be documented according to the report template given in § 9.2.

In addition, the Contractor shall leak test the pressure vessel according to EN 13185 (technique B.6) by applying design pressure and evacuating the insulation volume (volume 2). This test shall be documented according to the report template given in § 9.2.

The Contractor shall use an automatic recorder to produce a chart with annotations showing the complete evolution over time of the vacuum leak test. This chart shall be included in the leak test report.

The Contractor shall perform the final tests after degreasing, rinsing and removal of oxides.

Leak tests shall be performed in a clean environment, free of dust and noise.

The Contractor shall submit to CERN for approval the test protocols that the Contractor intends to follow, including the test sequence that prevents detrimental helium background signal originating from surfaces or elastomer seals charged with helium during preceding tests. The Contractor shall not start the testing before such approval by CERN. Prior to the test, the response time shall be measured as per section 9.1.5 of EN 13185.

The Contractor shall propose a suitable pumping and leak detection set-up, to be approved by CERN, ensuring:

- A response time no longer than 3 minutes;
- No contamination of tested volumes with pump-oil or any other substance;
- Leak detection sensitivity compatible with the leak tightness requirements of this technical specification.

Dye penetrant test techniques are not allowed on leak tight joints because they may impair the leak testing of leak tight components.

4.5.1.4 Volumetric examination, Radiographic test

The extent of volumetric examination by the Contractor for welded joints shall correspond to a weld joint factor of 1.0 according to EN 13458 (*EN 13458-2, § 6.3.3 Extent of examination for volumetric imperfections, Table 6*):

- Longitudinal seams: 100 %;
- T junctions: 100 %;
- Circumferential seams: 25 %.

The Contractor shall perform non-destructive testing of joints in accordance with EN ISO 17636.

4.5.1.5 Factory Acceptance Tests

The Contractor shall compile the FAT results in a FAT report (see § 5.2) to be submitted to CERN for written approval prior to shipment of the Supply.

The FAT shall include the following:

- Test of threads and filets with screws and bolts;
- A dimensional control;
- Helium leak tests of 100 % of welds;

- A pressure test that shall be carried out on of each pressure Components.

4.5.2 Tests Carried Out by CERN

CERN reserves the right to perform the same tests specified in the FAT (see § 4.5.1) as part of the Site Acceptance Test (SAT) of the Supply. The Contractor may attend such tests.

5. SPECIFICATION OF THE DOCUMENTATION

The Supply shall include the following documentation. This documentation shall comply with the requirements specified below.

Table 4: Documents to be delivered

	Documents to be delivered
For partial approval of each Batch, Batch 1 & Batch 2:	• Manufacturing and Inspection Plan (MIP) (see § 5.1) • Alternative design to the preliminary in the price enquiry and construction drawings (if needed); • Qualification test certificates of welders and/or welding operators; • Welding procedure specifications and procedure qualification records; • Material certificates; • Content of the manufacturing records; • Leak test protocol; • Qualification certificates of leak testing personnel; • Qualification certificates of non-destructive testing personnel.
Hold point for approval of Batch 1:	• Material certificates and traceability records; • Complete welding book, including records of weld repairs; • FAT report (see § 5.2); • Approved non-conformity reports, if applicable; • Leak test reports and respective leak detector calibration certificates; • Dimensional control reports.
For approval of Batch 2:	• Material certificates and traceability records; • Complete welding book, including records of weld repairs; • FAT report (see § 5.2); • Approved non-conformity reports, if applicable; • Leak test reports and respective leak detector calibration certificates; • Dimensional control reports.

5.1 Manufacturing and Inspection Plan (MIP)

The Contractor shall submit a Manufacturing and Inspection Plan (MIP) detailing the qualifications, manufacturing, inspections and testing schedules. The MIP shall include preliminary dates and hold points requiring approval by CERN and/or a notified body:

- Weld documentation:
- Weld Procedure Specifications (WPS) according to ISO 15609-1 and the Weld Procedure Qualification Record (WPQR) according to ISO 15614-1 issued by notified body for each type of weld approved by notified body;

- Welders' certificates. The Contractor shall provide valid and relevant certificates according to ISO 9606-1 for each manual welder working on the project as well as orbital TIG welding operators' qualification certificates according to ISO 14732 for each orbital welder working on the project;
- Weld inspectors' certificates. The Contractor shall provide valid certificates according to ISO 9712 for weld inspection level 2, tubes and pipes, for each person carrying out the visual inspections and/or radiographic inspections;
- Leak test inspectors' certificates. The Contractor shall provide certificates according to ISO 9712 for the personnel carrying out leak test;
- Inerting plan. The Contractor shall provide a plan for the inerting of the pipes during on-site welding. This plan will contain calculations of the inert gas flows, time required for purging and sketches showing the gas injection points on the piping;
- The Contractor shall submit a Quality Plan in accordance with the schedule defined in § 7.1. The Quality Plan shall be prepared along the guidelines stated in ISO 10005:2018, *Quality management – Guidelines for quality plans*.

5.2 Factory Acceptance Test report

The Contractor shall submit a FAT report in accordance with the schedule defined in § 7.1, including:

- All tests performed;
- All test results;
- All non-conformities;
- All modifications performed;
- Anything else of interest for CERN.

5.3 Progress Reports

The Contractor shall submit progress reports including:

- The actual progress in comparison to the scheduled progress (see § 7.2);
- Updates of documentation.

6. APPLICABLE RULES, NORMS AND STANDARDS

The Supply shall comply with Laws. For the purpose of the Contract, Laws shall include all relevant rules, norms and standards and, and in particular:

6.1 Rules

- CERN Safety rules, available under: http://cern.ch/safety-rules;
- Swiss, European and French rules.

6.2 Norms and Standards

This Technical Specification incorporates provisions from European, international or national standards. They are cited in this document, to be used as a whole or in part, and shall be considered part of this Technical Specification, for application in the scope for which they are referred. For undated references, the latest edition applies, including amendments.

- PED 2014/68/EU: *Pressure Equipment Directive;*
- EN 13458 – *"Cryogenic vessels – Static vacuum insulated vessels";*
- EN ISO 3834 – *"Quality requirements for fusion welding of metallic materials;*
- EN ISO 5817 – *"Welding — Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) — Quality levels for imperfections";*
- EN 10204 – *"Metallic Products: Types of Inspection Documents";*
- EN 12300 – *"Cryogenic vessels: Cleanliness for cryogenic service";*
- EN ISO 14731 – *"Welding coordination - Tasks and responsibilities";*
- EN ISO 9606-1 – *"Qualification testing of welders - Fusion welding - Part 1: Steels";*
- EN ISO 14732 – *"Welding personnel — Qualification testing of welding operators and weld setters for mechanized and automatic welding of metallic materials";*
- EN ISO 17635 – *"Non-destructive testing of welds — General rules for metallic materials";*
- EN ISO 17636 – *"Non-destructive testing of welds — Radiographic testing";*
- ISO 17637 – *"Non-destructive testing of welds — Visual testing of fusion-welded joints";*
- EN 1779 – *"Non-destructive testing – Leak testing";*
- EN 13185 – *"Non-destructive testing - Leak testing: tracer gas method";*
- EN ISO 15609-1 – *"Specification and qualification of welding procedures for metallic materials — Welding procedure specification";*
- EN ISO 15614-1 – *"Specification and qualification of welding procedures for metallic materials — Welding procedure test — Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys";*
- ISO 9712 – *"Non-destructive testing: Qualification and certification of NDT personnel";*
- ISO 10005:2018 – *"Quality management – Guidelines for quality plans";*
- ISO 2553 – *"Welding and allied processes – Symbolic representations on drawings – Welded joints";*
- ASTM E498/E498M–11 – *"Standard Practice for Leaks Using the Mass Spectrometer Leak Detector or Residual Gas Analyzer in the Tracer Probe Mode".*

7. PERFORMANCE OF THE CONTRACT

Unless specifically mentioned otherwise, the Contractor shall apply the most restrictive clause in case of ambiguity between the clauses of the future Contract, including its annexes.

All deliverables and activities that are not explicitly mentioned in the Technical Specification and Annexes but are essential for the execution of the Contract shall be considered as an integral part of the Technical Specification and therefore subject to clause 3.1 of the General Conditions of CERN Contracts.

7.1 Schedule

The Contractor shall deliver the Supply in accordance with the following schedule, starting from the reception of the material provided by CERN at the Contractor's premises:

Table 5: Schedule

	Milestones	Months	Indicative Date
T_0	Notification of the Contract and reception of the material provided by CERN		April 2025
T_1	Delivery of the Manufacturing and inspection Plan (MIP) and their related documentation (see §§ 3 and 5).	$T_0 + 2$	June 2025
T_2	Hold point for Batch 1 approval.	$T_1 + 3$	September 2025
	Delivery of Batch 1 documentation and technical deliverables.		September 2025
T_3	Delivery of Batch 2 documentation and technical deliverables.	$T_2 + 3$	December 2025

7.2 Contract Follow-Up and Progress Monitoring

The Contractor shall assign a person in charge of the technical execution of the Contract and its follow-up, as well as a person in charge of the commercial follow-up, during the whole duration of the Contract. These persons shall be able to communicate (spoken and/or written) in at least one of the official languages of CERN (English and/or French).

The Contractor shall send to CERN a written progress report (as specified in § 5.3) every month until the end of the Contract. All communications and documents shall be in English and/or French.

7.3 Acceptance of the Supply by CERN

7.3.1 Acceptance of the Documentation

The Contractor shall submit to CERN for acceptance the Documentation as specified in § 5 and according to the schedule defined in § 7.1.

CERN will verify the conformity of the Documentation in accordance with Article 22 of the General Conditions of CERN Contracts.

7.3.2 Acceptance of Supply

The Contractor shall deliver to CERN for acceptance the Supply as specified in § 3 and according to the schedule defined in § 7.1.

CERN will verify the conformity of the Supply in accordance with clause 22 of the General Conditions of CERN Contracts.

Acceptance of the Supply shall be given by CERN only after the delivered Supply is deemed to be in conformity with the Contract including documentation referred to in this Technical Specification, all tests specified have been successfully completed and all tests or other certificates have been submitted to CERN.

Acceptance of the Supply shall also be subject to the successful completion of any tests by CERN on its site (Site Acceptance Tests or SAT), deemed necessary to assess conformity of the Supply with this Technical Specification.

8. CERN REPRESENTATIVES

All commercial and technical correspondence concerning the Price Enquiry shall be communicated to the CERN Procurement officer and in copy to the Technical officer. Any communication by or to any other person than the CERN Procurement Service shall not be valid and have no effect.

Table 7: Cern Contact Persons

Procurement officer	**Telephone**	**Email**
Mr Alvaro Lecinana (IPT/PI)	Tel: +41 22 766 7433	alvaro.lecinana.soldevilla@cern.ch
In case of absence:		
Mr Floris Bonthond (IPT/PI)	Tel: +41 22 767 3143	floris.bonthond@cern.ch
Technical officer	**Telephone**	**Email**
Mr Simon Kesel (EN/MME)	Tel: +41 22 766 00 27	simon.kesel@cern.ch
In case of absence:		
Mr Pierre Moyret (EN/MME)	Tel: +41 22 767 20 73	pierre.moyret@cern.ch

9. ANNEXES

9.1 List of drawings and 3d models

Reference	Designation
LHCLDQM_0010	INTERLINK VACUUM VESSEL
LHCLDQM_0025	GUIDE RING
LHCLDQM_0026	GUIDE RING
LHCLDQM_0012	D2 / INTERLINK SLEEVE ASSEMBLY
LHCLDQM_0013	INTERLINK SLEEVE OF JUMPER SIDE
LHCLDQM_0058	CONTACT PLATE
LHCLDQM_0055	CONTACT PLATE
LHCLDQM_0008	HALF JUMPER SPLICE THERMAL SHIELD
LHCLDQM_0063	HALF THERMAL SHIELD JUMPER SPLISE
LHCLDQM_0050	MAIN CRUSHING PLATE
LHCLDQM_0062	MAIN COPPER BLOCK
LHCLDQM_0061	MAIN COUNTERPART
LHCLDQM_0060	HALF THERMAL SHIELD JUMPER SPLISE CYLINDER
LHCLDQM_0059	HALF FLANGE OF THERMAL SHIELD
LHCLDQM_0009	HALF THERMAL SHIELD INTERLINK
LHCLDQM_0046	HALF LONG THERMAL SHIELD
LHCLDQM_0053	THERMAL SHIELD HALF CYLINDER
LHCLDQM_0014	HALF THERMAL SHIELD INTERLINK
LHCLDQM_0047	HALF LONG THERMAL SHIELD
LHCLDQM_0054	THERMAL SHIELD HALF CYLINDER
LHCLDQM_0049	MAIN COPPER BLOCK
LHCLDQM_0048	MAIN COUNTERPART
LHCLDQM_0051	LONG THERMAL SHIELD FLANGE HALF
LHCLDQM_0052	THERMAL SHIELD LATERAL STOP
LHCLDQM_0022	INTERLINK LAMBDA PLATE
LHCLDQM_0024	ROUND TUBE Ø206x3
LHCLDQM_0023	CHAMBER OF THE LAMBDA PLATE
LHCLDQM_0003	WELDED CHAMBER FOR VACUUM BARRIER
LHCLDQM_0037	EXTERNAL VACUUM BARRIER Ø356x1.5
LHCLDQM_0038	REINFORCEMENT RING
LHCLDQM_0039	INTERNAL VACUUM BARRIER Ø203x1.5
LHCLDQM_0040	MIDDLE RING OF VACUUM BARRIER
LHCLDQM_0041	VACUUM VESSEL FLANGE EXTENTION
LHCLDQM_0042	WELDED ROUND TUBE Ø372x3
LHCLDQM_0044	INTERLINK VACUUM VESSEL FLANGE DN400 - ISO-K
LHCLDQM_0066	HELIUM CHAMBER
LHCLDQM_0033	ROUND TUBE Ø156x3
LHCLDQM_0034	WELDING FLANGE Ø198
LHCLDQM_0036	INTERFACE FLANGE OF BARRIER VACUUM

9.2 Leak test report, under vacuum method

Contractor:	HELIUM MASS SPECTROMETER LEAK TEST REPORT UNDER VACUUM METHOD	Job number: N°_____

CERN contract number: _____ **CERN technical spec.:** _____

CERN Part identifier .....: _____

Leak test procedure (Ref. N°, Revision) .....: _____

Volume to be tested.....: _____

Test equipment

Helium Mass Spectrometer type .....: _____

Pressure gauge type .....: _____

Turbo pump type .....: _____

Helium calibrated leak data

Calibrated leak N°.:_____ **Calibration** (Date,Temp.) : _____ °C

Test temperature .:_____ °C **Nominal value**.....: _____ mbar l s^{-1}

q_{FR} (Size of the calibrated leak after correction for ageing and temperature) .....: _____ mbar l s^{-1}

System Calibration

R_{FR} (Residual signal prior S_{FR} measurement) .....: _____ mbar l s^{-1}

S_{FR} (Signal given by the calibrated leak) .....: _____ mbar l s^{-1}

S_m (Smallest readable signal deviation is equivalent to 2 x amplitude of R_{FR} noise) : _____ mbar l s^{-1}

q_{Gm} (Sensitivity of the leak test) $= S_m \frac{q_{FR}}{S_{FR} - R_{FR}} \frac{1}{C}$ .....: _____ mbar l s^{-1}

3t (Time to achieve stabilised leak signal) .....: _____ sec

Leak test conditions

p (System Pressure) .....: _____ mbar

C (Volumetric fraction of tracer gas in the injection envelope).....: _____

R_F (Residual signal prior to S_F measurement) .....: _____ mbar l s^{-1}

S_F (Signal given by the leak after :_____minutes $\geq$ 3t) .....: _____ mbar l s^{-1}

Leak tightness requirements	Leak evaluation
≤_____ Pa.m^3 s^{-1} ≤_____ mbar l s^{-1}	$q_G = \frac{q_{FR}(S_F - R_F)}{S_{FR} - R_{FR}} \frac{1}{C}$ = _____
Conformance.....: YES / NO	**Remarks:**

Operator	Checked by	Approved by
Date..:	Date..:	Date..:
Name:	Name:	Name: