

Numero

Data

Rev.

Pagina

**SPEME- SBVCH-00065**

02/07/2020

2

1

Documento tipo c4

**SPECIFICA TECNICA (SPE)**

Titolo

**Specific for the construction of vacuum chambers and diagnostics of the Cnao O3 line**

Autori (CNAO se non diversamente indicato)

Lanzavecchia Lorenzo,

Referente

Lanzavecchia Lorenzo.

Parole chiave

Linea O3

Riassunto

Cnao, the National Center for Oncological Hadrontherapy, is a center for the treatment of oncological diseases, consisting mainly of a particle accelerator. This document illustrates the specifications for the construction of a new line, composed of a set of motorized vacuum chambers and pass-throughs for beam diagnostics, called "Line O3"

Emesso

Verificato

Verificato

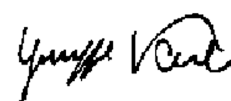
Approvato

**Lorenzo Lanzavecchia**

**L. Falbo**

**G. Venchi**





Informazioni strettamente riservate di proprietà della Fondazione CNAO – Da non utilizzare per scopi diversi da quelli per cui sono state fornite – Tutti i diritti riservati. Nessuna parte di questa pubblicazione può essere riprodotta, immagazzinata o trasmessa in nessuna forma o con qualsiasi mezzo elettronico, meccanico, registrato, fotocopiato o in qualsiasi altro modo senza il permesso della Fondazione CNAO.

Confidential information property of CNAO Foundation – Not to be used for any purpose other than that for which is supplied – All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior permission of the CNAO Foundation.

## INDICE

**1. Generality**1.1. Object of the supply

- 1.1.1. The Supplier must provide for the realization of the vacuum components in the quantities and according to the indications contained in the drawings attached to this specification.
- 1.1.2. The Supplier must make available what is necessary in terms of work, technical resources, materials, tools and equipment for the manufacture, assembly, control, testing and shipment of the components relating to the drawings attached to this specification.
- 1.1.3. The Supplier must produce a copy of the reports relating to the quality and dimensional checks carried out.
- 1.1.4. This specification applies for the realization of the following assembly drawings:

| Disegno numero                          | Quantità | Descrizione      |
|---|----------|------------------|
| 300-CNA-O3-SUPP-BILANCIERE              | 1        | Assieme generale |
| 400-CNA-O3-TANK-A                       | 2        | Assieme generale |
| 500-CNA-O3-SUPP-MONTAGGIO PRELIMINARE-A | 2        | Assieme generale |
| 600-CNA-O3-TANK-B                       | 2        | Assieme generale |

This specification also applies to all sub-assemblies and individual components described in the remaining drawings attached to this document.

1.2. Reference documents

- 1.2.1. The construction drawings shown in the request for quotation are an integral part of this specification and fully and in detail define the quantities, characteristics of the components to be built and the related tolerances.
- 1.2.2. Any conflict noted by the Supplier between the documents provided must be reported for necessary corrections before proceeding with the work.
- 1.2.3. The drawings specify the details of the commercial parts, the status of their supply and the materials to be used. Also specified are the serial numbers to be engraved on the parts, the cleaning treatments or the dimensions for which a certification is required at dimensional testing.

1.3. Modification

- 1.3.1. It is appropriate that any technical changes to this specification, which the companies participating in the tender deem useful, be proposed together with the offer itself.

1.4. Inspections and controls

- 1.4.1. Representatives of the CNAO foundation can visit the facilities of the Supplier and its possible sub-suppliers at the appropriate times to check the progress of the work and participate in the tests.
- 1.4.2. The Supplier must notify the Cnao Foundation in advance of its intention to carry out the tests and checks required by this specification.

**2. Technical specifications**

2.1. Permitted materials

- 2.1.1. The materials to be used will be indicated on each construction drawing, the steel parts must be in AISI stainless steel 316L, copper parts must be in OFHC copper, the aluminum parts must be in 6082 T6 alloy.

2.1.2. All nuts and bolts required for vacuum assemblies must be of the A4 80 type.

## 2.2. Realization

2.2.1. All dimensions given in the drawings correspond to measurements at room temperature of  $23 \pm 0.5$  ° C and therefore quality checks of all dimensions must be done at this temperature.

2.2.2. The use of sulfur and silicon-based lubricants is prohibited.

2.2.3. All the threads made on the vacuum chambers in En AW 6082 must be fitted with a Helicoil insert in AISI 304

## 2.3. Cleaning

2.3.1. Immediately after mechanical processing, the components must undergo a cleaning treatment in an ultrasonic tank using a 3% solution of Almeco 19 at a temperature of about 50 ° C. The rinsing must be carried out with demineralized water.

2.3.2. After the cleaning treatment, the components must be dried carefully and stored in clean plastic bags pending assembly.

2.3.3. For copper parts, the cleaning procedures already listed and before drying, must be followed by a deoxidizing treatment with a 5% solution of citric acid in distilled water at a temperature of about 50 ° C, followed by a thorough rinsing in water distilled. Then proceed with the usual drying operations.

2.3.4. For Peek parts, drying must be carried out in a vacuum oven at a temperature of 120 ° C with a pressure not exceeding  $1 \cdot 10^{-4}$  mbar.

2.3.5. All assembly operations must be carried out in a dedicated, clean and dust-free environment.

2.3.6. During all assembly phases, any possible contamination of the clean parts must be avoided, the staff must use clean disposable gloves.

## 2.4. Welding

2.4.1. Must be TIG, All welding operations must be done in a clean and dust-free environment

2.4.2. During all the welding phases, any possible contamination of the cleaned parts must in any case be avoided.

2.4.3. The supplier must use only qualified personnel with suitable protective clothing for welding operations.

## 2.5. Tests and inspections at the supplier

- 2.5.1. The vacuum electrical connections of the 00-CNA-O3-DIAG-FC, 00-CNA-O3-DIAG-SL and 00-CNA-O3-DIAG-WS elements will be made by Cnao personnel directly at the supplier. The electrical feedthroughs will therefore be mounted on that occasion and subsequently it will be possible to carry out vacuum tightness tests of the detectors.
- 2.5.2. Before shipment, the Supplier must carry out acceptance tests as described on the drawings.
- 2.5.3. The Supplier must carry out all the necessary dimensional checks as required and described on the drawings. CNAO staff will be present to check all or part of the checks at its discretion. At the end of this procedure a dimensional inspection certificate must be provided.
- 2.5.4. The vacuum chambers and through-pipes subject to these specifications must be subjected to a rigorous vacuum seal test at the Supplier's premises after all construction, cleaning and assembly operations have been completed. The Supplier must have at its disposal a leak detector based on a mass spectrometer for helium with a measurement sensitivity of  $5e-11$  mbar l / s He or better. Chambers and passers-by will be accepted from a vacuum seal point of view if the measured leak rate is less than  $5e-10$  mbar l / s. At the end of this operation, a test certificate for vacuum tightness must be issued.
- 2.5.5. Upon request, Cnao can supply the vacuum testing equipment for drawings 00-CNA-O3-DIAG-SL and 00-CNA-O3-DIAG-WS
- 2.5.6. After the tests, the vacuum chambers must be brought back to atmospheric pressure by filling with nitrogen and sealed with hermetically sealed caps.
- 2.5.7. Vacuum loops should be wrapped with aluminum foil and stored in sealed plastic bags filled with nitrogen.

## 3. **Imballaggio e trasporto**

### 3.1. Shipping authorization

- 3.1.1. Following the positive outcome of all tests at the Supplier and after receiving an official acceptance from CNAO, the Supplier can pack each vacuum chamber and each vacuum tube individually. The packaging must be such as to protect the vacuum chambers and passers-by from bad weather and shocks during transport.

- 3.1.2. The vacuum chambers must be delivered with only the logs connected as shown in the drawing: 00-CNA-O3-TANK-A, motorized supports and axes will be packed separately. The rectangular gaskets necessary for this assembly will be supplied by Cnao.
- 3.1.3. The final acceptance tests will take place at the CNAO Laboratories which reserves the right to refuse any component that does not conform to these specifications.
- 3.1.4. Priority delivery of a fully assembled and tested 400-CNA-O3-TANK-A assembly is required within three months of the order, the rest of the supply must be strictly delivered within 6 months of the order.