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Technical specifications for turbine vacuum pumps and their equipment of the CNAO O3 line

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Riassunto / Abstract

Technical specifications for the supply of nr. 4 (four) turbine vacuum pumps and their equipment, to be used for synchrotron of the CNAO Foundation of Pavia, as part of the INSPIRIT project

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1 CONTEXT AND INTRODUCTION

The CNAO (National Center for Oncological Hadrontherapy, www.fondazionecnao.it), based in Pavia, is an innovative and technologically advanced structure, established by the Ministry of Health with the aim of treating patients suffering from solid radioresistant tumors through the use of protons and carbon ions, particles called hadrons (hence "hadrontherapy"). For this reason, a "synchrotron" was created at CNAO to accelerate both particles. The generated beams are used for both therapeutic and clinical and physical research purposes.

CNAO is the Lombard research organization leader of the INSPIRIT project, conducted in partnership with INFN and the SME Hifuture, (PROJECT ID 1161908 CUP E18I19000180007) funded by the Lombardy Region under the POR FESR 2014-2020 Call Hub Research and Innovation. The project has among its objectives the realization of an innovative source capable of producing new ionic species that will be accelerated by the synchrotron and directed to the experimental room to be made available for research and industrial activities. The project includes a series of machine upgrades necessary for the operation of the new source, including the supply in question, consisting of 4 (four) turbine vacuum pumps and their equipment for the synchrotron.

2 OBJECT OF THE SUPPLY

The object of this request for tender is the supply, including packaging, shipment and delivery at CNAO Foundation, of the following items:

- Nr. 4 (four) turbine vacuum pumps for the synchrotron
- Nr. 4 (four) control unit for turbine vacuum pumps
- Nr. 4 (four) power cable 230 V for turbine vacuum pumps
- Nr. 4 (four) connection cable 10 mt for turbine vacuum pumps
- Nr. 4 (four) air cooling kit for turbine vacuum pumps

Together with the supply of the above-mentioned 4 (four) turbine vacuum pumps and their equipment, the contracting authority asks the following documents as mandatory:

- User manual of turbine vacuum pumps and their equipment in Italian or English

3. TECHNICAL SPECIFICATIONS OF TURBINE VACUUM PUMPS FOR THE O3 LINE

Turbine pumps for the O3 line must have the following technical characteristics:

- Bearing Hybrid
- Compression ratio for Ar $\geq 1 \cdot 10^{13}$
- Compression ratio for H₂ $\geq 2 \cdot 10^7$
- Compression ratio for He $\geq 3 \cdot 10^9$
- Compression ratio for N₂ $\geq 1 \cdot 10^{13}$
- Connection flange (in) DN 160 CF-F
- Connection flange (out) DN 25 ISO-KF/G ¼"
- Cooling method, optional Air
- Cooling method, standard Water
- Water cooling system with quick coupling for flexible hose 8mm external diameter
- Max cooling water flow 100 l/h
- Cooling water temperature >15, <35 °C
- Current max. 8,75 A
- Final pressure without gas ballast <1·10⁻¹⁰ hPa | 7.5·10⁻¹¹ Torr | 1·10⁻¹⁰ mbar
- Fore-vacuum max. for N₂ 22 hPa | 16.5 Torr | 22 mbar
- Gas throughput at full rotational speed for Ar ≥ 2 hPa·l/s

- Gas throughput at full rotational speed for H₂ ≥ 14 hPa·l/s
- Gas throughput at full rotational speed for He ≥ 18 hPa·l/s
- Gas throughput at full rotational speed for N₂ ≥ 3.5 hPa·l/s
- Mounting orientation Any
- Permissible radial magnetic field max. 6 mT
- Power consumption max. 420 W
- Protection category IP54
- Pumping speed for Ar ≥ 665 l/s
- Pumping speed for H₂ ≥ 555 l/s
- Pumping speed for He ≥ 655 l/s
- Pumping speed for N₂ ≥ 685 l/s
- Rotation speed variable 60 – 100 %
- Run-up time 2 min
- Remote control through separated electronic drive unit equipped with dedicated 26-pin d-sub connector.
- Ultimate pressure <1·10⁻¹⁰ hPa | <7.5·10⁻¹⁰ Torr | <1·10⁻¹⁰ mbar
- Disassembly of the pump from the process chamber must not be required to replace the ball bearing
- Venting connection G 1/8"
- Max weight of the pump 17 kg
- Communication protocol RS-485
- Delivery time for the supply of four pumps 10 week

4 WARRANTY

Warranty is required for a minimum of 12 months