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| High capacity roughing pump system |
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# TECHNICAL DOCUMENTATION

## Roughing pumps

### General Description

High capacity roughing pump system and accessories are required for fast pump down of the very large vacuum chamber dedicated to the plasma physics experiments, located in experimental hall E3 of the ELI Beamlines facility. The vacuum chamber will have an approximate volume of 45 m3 and will weigh in excess of 20 tons. Such high capacity roughing pump system will be used for pumping the chamber from atmospheric pressure to a nominal roughing pressure of 0.09 mbar. It is not required that the pump system be designed to pump reactive or corrosive gases.

### Operational Conditions

REQ-009988/A

The high capacity roughing pump system shall be able to operate under the following conditions:

* temperature of 20 ± 5 ° C,
* humidity of 40-80%,
* Operation of the roughing pump system will be intermittent (0.5 hour operational followed by 0.5 hour shutdown).

### Scope of Delivery

REQ-009989/A

The roughing pump system shall consist of dry single or dry multistage pumps. The following shall be supplied:

* **One** high capacity roughing pump system according to the technical specifications described below.
* The mounting frame and noise reduction systems as per the technical specifications described below.
* The vacuum connectors needed to connect individual pumps within the high capacity roughing pump system.
* A portable control unit for providing basic control (start, stop) of the high capacity roughing pump system (required only if the controller is not included in the pump chassis).
* Any required cabling for the pump and the controller (except for the power cables).
* If a frequency converter is required to operate the pump at the desired speed, then the supplier shall provide this converter.

### International Standards

REQ-009990/A

Delivered high capacity roughing pump system shall conform to the following standards:

ISO 1609: 1986 - Vacuum technology - Flange dimension;

ISO 2861: 2013 - Vacuum technology - Dimensions of Clamped - type quick-release couplings.

### Maintenance

REQ-009991/A

Preventive maintenance procedure shall be described in the manual.

### Product Specific Quality Requirements

REQ-010826/A

The supplier shall provide to the Contracting Authority Product User Manual(s) which describes the following:

* handling,
* storage,
* installation,
* safe operation and maintenance procedures.

REQ-010827/A

The supplier shall supply Declaration of Conformity for each product type.

### Technical specifications

REQ-009992/A

The high capacity roughing pump system shall be new (refurbishment is not allowed).

REQ-009993/A

All the individual pumps of the high capacity roughing pump system shall be dry, i.e., there shall be no possibility of oil or lubricant getting to the vacuum chamber.

REQ-009994/A

The pumping speed of the high capacity roughing pump system shall be greater than 5000 m3/hr at a pressure of 1 mbar, greater than 3000 m3/hr at a pressure of 10 mbar, greater than 1000 m3/hr at a pressure of 100 mbar and greater than 850 m3/hr at 1 bar.

REQ-009995/A

The pump system shall be able to reach an ultimate pressure of at least 10-3 mbar.

REQ-009996/A

The pump system shall use 3 phase, 400 V/50 Hz power supply.

REQ-009997/A

The pump system shall be able to be cooled using water at 16-20 0C.

REQ-009998/A

The pump system shall be able to withstand a loss of power and not be damaged.

REQ-009999/A

The input flange on pump system shall be greater than or equal to DN 160 in diameter. The flange shall have ISO-F or ISO-K standard.

REQ-010000/A

The pump system shall have a purge gas connection.

REQ-010001/A

The maximum size of the pump system including the frame shall be 1.8 m x 2 m x 2.3 m (high). Each individual component in the pump system including the frame shall be able to transport through a corridor less than 1.5 m in width and 2 m in height.

REQ-010002/A

The frame of the pump system shall have castors and/or adjustable feet and housing according to catalog.

REQ-010003/A

The seller shall provide silencer to reduce the noise level.

REQ-010821/A

The pumps shall not be excluded from installation into areas with ionizing radiation and EMP.

### Other required hardware

REQ-010004/A

The following hardware shall be included with the pump system:

* Sieve at the input for preventing coarse dirt from entering the pump. It must not reduce the pumping speed by more than 10% and the size of the gaps must not be greater than 5 mm. Any hardware required to mount the sieve should be included as well.
* Necessary connectors to connect the coolant, including pressure regulator and filter.

### Pump Control

REQ-010005/A

A controller (or multiple controllers) shall be included for the pump system.

REQ-010006/A

The controller interface shall provide at least the following functionalities:

1. The pump system shall be turned off if there is no active signal being sent to the controller.

2. The frequency (and hence the speed) of the pumps shall be controllable by external inputs to the control system.

3. The control system shall be able to relay out the diagnostic status of the pumps.

4. The controllers shall have an ethernet or serial (for e.g., RS 232) interface for remote communication and digital I/O interface.