

SECTION - C

TECHNICAL SPECIFICATIONS OF STORES AND DRAWINGS.

Technical Specifications of Cryo-Cooler based Two Stage Cryopumping System



INSTITUTE FOR PLASMA RESEARCH
GANDHINAGAR, GUJARAT
382428

Technical specification of Cryocooler Based two-stage Cryopump

A. Cryopump

| Sr. No. | Required technical specification of Cryopump | |
|---------|--|--|
| 1 | Quantity required | 02 Nos. |
| 2 | Pumping speed for Hydrogen | ≥ 14000 l/s |
| 3 | Base vacuum at inlet flange | $\leq 1.0 \times 10^{-7}$ mbar |
| 4 | Capacity for hydrogen | ≥ 30 standard litres |
| 5 | Crossover | ≥ 300 mbar litres |
| 6 | Cool down time to 20 K | ≤ 200 minutes |
| 7 | Cold head temperature | 50 to 75 K for first stage 10 to 20 K for second stage |
| 8 | Temperature measurement of 1 st and 2 nd stage of Cryopump | Should be provide |
| 9 | Inlet connection flange | DN ISO-F 500 |
| 10 | Fore vacuum flange | DN25 KF |
| 11 | Cryopump mounting direction | Any |
| 12 | Built-in dual stage cold head | Should be provided |
| 13 | Cryopump heating | Heating jacket for Cryopump should be provided for regeneration. |
| 14 | Regeneration of cryopump | Cryopump should have single command facility for regeneration purpose. |
| 15 | Cryopump body helium leak rate | $\leq 1.0 \times 10^{-9}$ mbar l/s |
| 16 | Cryopump ports requirements | Roughing port with automated valve, purging port with automated valve, relief port along with pressure set valve, auxiliary port should be provided. |
| 17 | Two set of ISO 500 centring along with Viton O-ring | Should be provided |

B. Cryo-compressor

| Sr. No. | Technical specification for Cryo-compressor | |
|---------|---|--|
| 1 | Quantity required | 02 Nos. |
| 2 | Cryo-compressor type | Should be compatible for above mentioned Cryopump. |
| 3 | Cooling type | Should be water cooled |
| 4 | Helium flexible lines (connected to Cryopump) | 5 meter (Minimum) |
| 5 | Electrical connection | Suitable end connectors should be provided (power cable not in the scope). |
| 6 | Electrical requirement | 415 VAC, 3 phase, 50 Hz |
| 7 | Power consumption | 7 KW max |
| 8 | Control Interface | Compressor should have RS-232 interface or any other advance interface for remote operation. |

C. Cryopump controller

| Sr. No. | Technical specification of Cryopump controller | |
|----------------|---|--|
| 1 | Quantity required | 02 Nos. |
| 2 | Cryopump controller | Should be compatible for cryopump operation through PC or Laptop (PC and Laptop are not in the scope of vendor). |
| 3 | Communication interface | RS 232 connecting cable |
| 4 | Network cable | Communication cable with end connectors for connect system controller to pump and compressor to the controller should be provided. |
| 5 | Controller operation | There should be provision to operate and control the cryopump unit with PLC (PLC software is not in the scope of vendor) |
| 6 | Power requirements | 230 VAC, 1 phase, 50 Hz |
| 7 | Controller functions | The controller should supply the power to cryopump and heater. Cryopump ON/OFF status should be read by RS232. |
| 8 | Software for operation | Appropriate windows based (windows 7 and above) software should be provided for operation and control of cryopump. |
| 9 | Power supply cable | Power supply end connector should be provided (cable is not in the scope). |

Essential Requirements:

- Vendor must provide the compliance statement for technical specifications along with offer as per attached **Annexure-A**.
- Cryopump should be provided ready to use condition. Kindly quote for the required accessories for the pump operation.
- Vendor should provide operation manual, regeneration procedure and safety guide for each unit of cryopump in English language.
- Vendor should provide tool kits for Cryopump.
- At least one (01) year of warranty shall be provided by vendor from the acceptance of the pump.
- Minimum 5 years of service and spares support for the Cryopump, Cryo-compressor and Cryo controller including spares shall be provided by the vendor.

Factory Acceptance test of Cryopump:

- Cryopump should be tested at manufacturer's site for the specifications like Pumping speed for N₂, Leak rate, cold head temperature T₁(stage-1), T₂(stage-2) and cool down time for stage-1 and stage-2 prior to dispatch.
- Certificate of compliance should be sent to IPR with pump.

Acceptance of Cryopump at IPR:

Acceptance of Cryopump will be followed by below mentioned successful tests carried out by vendor's representative at IPR site.

- Vendor's representative shall demonstrate the following tests on Cryopump

1. Ultimate pressure at inlet flange: $\leq 1.0 \times 10^{-7}$ mbar,
 2. Body helium leak rate: $\leq 1.0 \times 10^{-8}$ mbar,
 3. Cool down time to 20 K: ≤ 200 minutes.
- Vendor's representative shall demonstrate full functionality of Cryopump pumping operation and regeneration operation.

COMPLIANCE STATEMENT

Annexure-A

Vendor must filled and submit the compliance statement with official seal and signature with offer.

Vendor shall confirm the specification by filling the values of all specification mentioned as below

A. Cryopump

| Sr. No. | Required technical specification of Cryopump | | Vendor's confirmation |
|----------------|--|--|------------------------------|
| 1 | Quantity required | 02 Nos. | |
| 2 | Pumping speed for Hydrogen | ≥ 14000 l/s | |
| 3 | Base vacuum at inlet flange | $\leq 1.0 \times 10^{-7}$ mbar | |
| 4 | Capacity for hydrogen | ≥ 30 standard litres | |
| 5 | Crossover | ≥ 300 mbar litres | |
| 6 | Cool down time to 20 K | ≤ 200 minutes | |
| 7 | Cold head temperature | 50 to 75 K for first stage 10 to 20 K for second stage | |
| 8 | Temperature measurement of 1 st and 2 nd stage of Cryopump | Should be provide | |
| 9 | Inlet connection flange | DN ISO-F 500 | |
| 10 | Fore vacuum flange | DN25 KF | |
| 11 | Cryopump mounting direction | Any | |
| 12 | Built-in dual stage cold head | Should be provided | |
| 13 | Cryopump heating | Heating jacket for Cryopump should be provided for regeneration. | |
| 14 | Regeneration of cryopump | Cryopump should have single command facility for regeneration purpose. | |
| 15 | Cryopump body helium leak rate | $\leq 1.0 \times 10^{-9}$ mbar l/s | |
| 16 | Cryopump ports requirements | Roughing port with automated valve, purging port with automated valve, relief port along with pressure set valve, auxiliary port should be provided. | |
| 17 | Two set of ISO 500 centring along with Viton O-ring | Should be provided | |

B. Cryo Compressor

| Sr. No. | Technical specification for Cryo compressor | | Vendor's confirmation |
|----------------|--|--|------------------------------|
| 1 | Quantity required | 02 Nos. | |
| 2 | Cryo-compressor type | Should be compatible for above mentioned Cryopump. | |
| 3 | Cooling type | Should be water cooled | |

| | | | |
|---|---|--|--|
| 4 | Helium flexible lines (connected to Cryopump) | 5 meter (Minimum) | |
| 5 | Electrical connection | Suitable end connectors should be provided (power cable not in the scope). | |
| 6 | Electrical requirement | 415 VAC, 3 phase, 50 Hz | |
| 7 | Power consumption | 7 KW max | |
| 8 | Control Interface | Compressor should have RS-232 interface or any other advance interface for remote operation. | |

C. Cryopump Controller

| Sr. No. | Technical specification of Cryopump controller | | Vendor's confirmation |
|----------------|---|--|------------------------------|
| 1 | Quantity required | 02 Nos. | |
| 2 | Cryopump controller | Should be compatible for cryopump operation through PC or Laptop (PC and Laptop are not in the scope of vendor). | |
| 3 | Communication interface | RS 232 connecting cable | |
| 4 | Network cable | Communication cable with end connectors for connect system controller to pump and compressor to the controller should be provided. | |
| 5 | Controller operation | There should be provision to operate and control the cryopump unit with PLC (PLC software is not in the scope of vendor) | |
| 6 | Power requirements | 230 VAC, 1 phase, 50 Hz | |
| 7 | Controller functions | The controller should supply the power to cryopump and heater. Cryopump ON/OFF status should be read by RS232. | |
| 8 | Software for operation | Appropriate windows based (windows 7 and above) software should be provided for operation and control of cryopump. | |
| 9 | Power supply cable | Power supply end connector should be provided (cable is not in the scope). | |

AUTHORIZED SIGNATORY

OFFICIAL SEAL

DATE :-