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| IDM UID<br><b>8PD9A4</b>   |
| VERSION CREATED ON / VERSION / STATUS<br><b>28 Mar 2023 / 1.1 / Approved</b> |
| EXTERNAL REFERENCE / VERSION   |

## Design Report

# Arrangement 5 - PHNB Low Flow Pump (26PHNB-PL-3000) Equipment Summary

This document compiles the main relevant information for the equipment identified in the document title

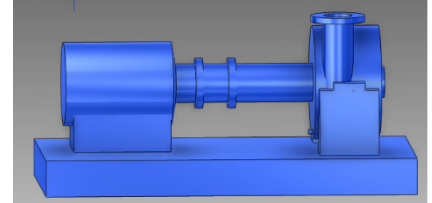
This document support activities for the preparation of Arrangement 5

| Approval Process                                    |   |                         |  |
|---|---|-------------------------|--|
|   | Name  | Action                  | Affiliation                            |
| Author  | Giammei M.  | 28 Mar 2023:signed      | IO/DG/CNST/PLD/MID/TCWS                |
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|   | Gao J.  | 06 Apr 2023:recommended | IO/DG/CORP/FPD/PCD/CAL                 |
|   | Ghirelli N.   | 06 Apr 2023:recommended | IO/DG/CNST/PLD/MID/TCWS                |
|   | Ricou E.  | 28 Mar 2023:recommended | IO/DG/CNST/PLD/MID/TCWS                |
|   | Van hove W.   | 30 Mar 2023:recommended | ORNL - Oak Ridge National Laborator... |
| Approver  | Lioce D.  | 07 Apr 2023:approved    | IO/DG/CNST/PLD/MID/TCWS                |
| Document Security: Internal Use<br>RO: Lioce Donato |   |                         |  |
| Read Access   | LG: Arrangement 5 Cost Estimation, LG: USDA Arrangement 5, LG: Management, GG: IO DDGs (and Senior Advisors), AD: IO_Director-General, AD: External Management Advisory Board, AD: OBS - Project Control Office (PCO), AD: IDM_Controller, AD: OBS - Procurement & Contracts Division (PCD), AD: Auditors, p... |                         |  |

| <i>Change Log</i>   |                             |                          |   |
|---|-----------------------------|--------------------------|---|
| <b>Arrangement 5 - PHNB Low Flow Pump (26PHNB-PL-3000) Equipment Summary (8PD9A4)</b> |                             |                          |   |
| <i><b>Version</b></i>   | <i><b>Latest Status</b></i> | <i><b>Issue Date</b></i> | <i><b>Description of Change</b></i>           |
| v1.0  | Signed                      | 13 Mar 2023              |   |
| v1.1  | Approved                    | 28 Mar 2023              | New version to incorporate reviewers comments |

**OPERATIONAL NARRATIVE**

PHNB Low Flow Pump provides cooling water to the Neutral Beam Injector in order to ensure a minimal flow during maintenance period.



## Disclaimer:

- Contents of this document have been assembled, reviewed and approved as for Information Only,
- May not be used for purchasing, fabrication or construction,
- May not be used as verified input to any document (may be used as unverified assumption).

**PHYSICAL ATTRIBUTES**

|                                |   |
|--------------------------------|---|
| <i>Commodity Type:</i>         | <b>PUMP</b>   |
| <i>Type:</i>                   | Canned motor pump   |
| <i>Approx. Footprint:</i>      | 2.6 m x 1.3 m   |
| <i>Approx. Height:</i>         | Height: 1.2m (skirt/support included)<br>Length: 2.6m<br>Width: 1.3m    |
| <i>Approx. Weight:</i>         | 3 000 kg (wet)  |
| <i>Approx. Tank Volume:</i>    | 0.5 m <sup>3</sup>  |
| <i>Service Fluid:</i>          | Demineralized Water   |
| <i>Material Notes:</i>         | 304L with additional requirement Co < 0.2 w%, Nb < 0.1 w%, Ta < 0.05 w% |
| <i>Anchoring system</i>        | PFM with Bolting  |
| <i>Component configuration</i> | Skid  |
| <i>Design Life Time:</i>       | 20 years  |

WBS: Primary Heat Transfer System

PBS: 26PHNB

GBS: 11-L4-04

**REFERENCE DOCUMENTS**

Sizing calculation: XF9LCC

PID: XH2WUB

**ENVIRONMENTAL CONDITIONS**

|   |                |
|---|----------------|
| <i>Dose Rate:</i>                           | ≤ 2 Gy/h       |
| <i>Integrated Dose Rate 20yrs:</i>          | ≤ 10 000 Gy    |
| <i>Magnetic Field:</i>                      | ≤ 30 mT        |
| <i>Normal temperature</i>                   | 5 – 35 °C      |
| <i>Normal Humidity</i>                      | 20 – 60 %      |
| <i>Normal Pressure relative to atm:</i>     | -0.14 kPa      |
| <i>Accidental Temperature</i>               | 130 °C         |
| <i>Accidental Pressure relative to atm:</i> | -5 to +100 kPa |
| <i>Accidental Humidity</i>                  | 100 %          |

**DESIGN CODES AND SHIPPING**

|  |   |
|--|---|
| <i>French Law Pressure Category / Nuclear Class:</i> | Not Applicable  |
| <i>European Law:</i>                                 | Machine Directive (Directive 2006/42/EC)  |
| <i>Fluid Type / Fluid group</i>                      | Liquid/ Group 2   |
| <i>Conformity Assessment Module:</i>                 | N.A   |
| <i>Related Codes:</i>                                | API 685   |
| <i>Safety Class:</i>                                 | SIC-2   |
| <i>Quality Class:</i>                                | QC-1  |
| <i>Seismic Class:</i>                                | SC1 (S)   |
| <i>Fire:</i>   | Eurocode 2h   |
| <i>Shipping Information:</i>                         | Conventional Load (CTL), Oversea packing per ASME NQA-1 Level C, DAP at ITER site |

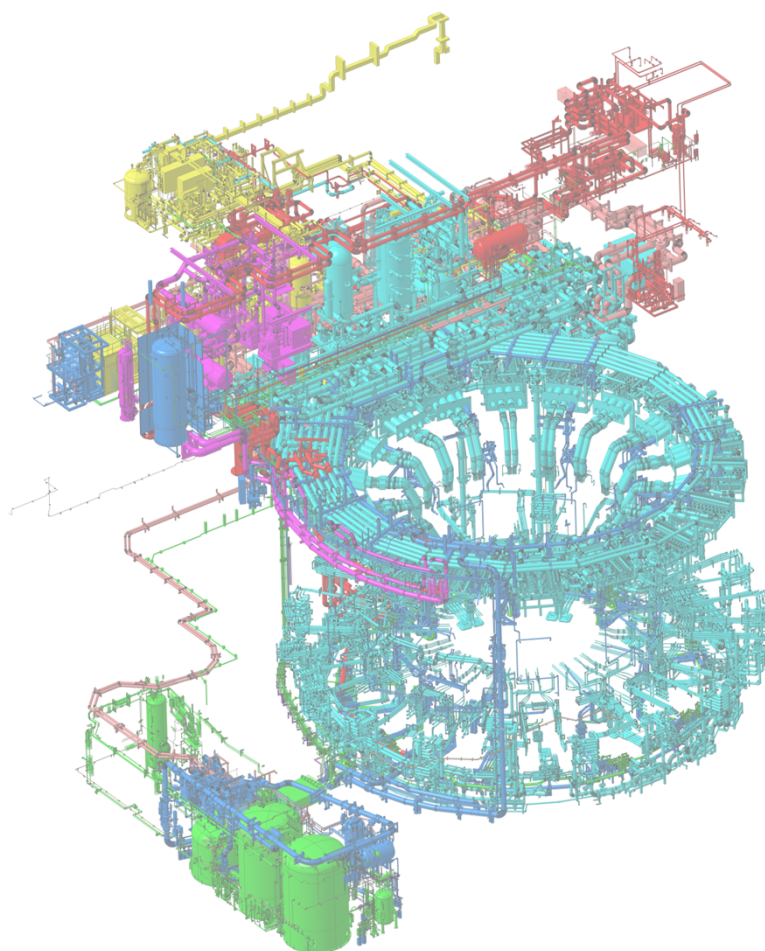
## PHNB – Low Flow Pump (26PHNB-PL-3000)

NOZZLE SCHEDULE

| I.D. | DN / Schedule | Service   |
|------|---------------|-----------|
| N1   | 200 / 20      | Suction   |
| N2   | 200 / 80S     | Discharge |
| N3   | 25 / 40S      | Drain     |

PARAMETERS

| Parameter                                       | Value          |
|---|----------------|
| Nominal inlet Temperature (°C)                  | 31             |
| Design Temperature (°C)                         | 100            |
| Nominal inlet Pressure (MPa)                    | 0.3            |
| Design Pressure (MPa)                           | 5.0            |
| Nominal flow (m <sup>3</sup> /h)                | 375            |
| Nominal Total Delivery Head @Nominal flow (mWC) | 13.5           |
| Nominal Total Delivery Head @No flow (mWC)      | <15.0          |
| Available NPSH @ Nominal flow (mWC)             | 26             |
| Electrical power @ Nominal flow (kW)            | < 43           |
| Nominal electrical voltage (V)                  | 400            |
| Motor control principle                         | Direct On Line |



Notes:

1. Approximate footprint is based on 3d model approved configuration.
2. All nozzles are flanged and a pipe stub of 300mm is requested to be provided.
3. Pump to be provided with dual temperature sensors on each bearing (applicable for both pump and motor), with vibration sensor on each bearing as well as dual temperature sensor for each motor phase.
4. Pump is mounted on a metallic platform (no grouting under the skid, no concrete plinth to attach the pump).
5. Fire: The equipment shall be insulated with fire resistant insulation against a Eurocode 2h fire. The insulation is included in the scope. The insulation thickness shall be sufficient to limit the metal temperature under the insulation to 240 °C. The uninsulated support structures shall be assumed to be at 400 °C. The supplier shall demonstrate resistance to the fire.
6. Nozzle loads: The nozzle loads are expected to be higher than the allowable nozzle loads from API 610. Provision should be taken to resist to high nozzle loads.