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EXTERNAL REFERENCE / VERSION

Design Report

Arrangement 5 - PHNB Main Pumps (26PHNB-PL-3010/3020) 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

<i>Approval Process</i>			
	<i>Name</i>	<i>Action</i>	<i>Affiliation</i>
<i>Author</i>	Giammei M.	07 Apr 2023:signed	IO/DG/CNST/PLD/MID/TCWS
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<i>Reviewers</i>	Berruyer F. Van hove W.	07 Apr 2023:recommended (Short Cycle)	IO/DG/CNST/PLD/MID/TCWS ORNL - Oak Ridge National Laborator...
<i>Previous Versions</i>	Ciampichetti A. Ghirelli N.	07 Apr 2023:recommended v1.1 06 Apr 2023:recommended v1.1	IO/DG/CNST/PLD/MID/TCWS IO/DG/CNST/PLD/MID/TCWS
<i>Reviews</i>	Gao J. Ricou E.	04 Apr 2023:recommended v1.1 28 Mar 2023:recommended v1.1	IO/DG/CORP/FPD/PCD/CAL IO/DG/CNST/PLD/MID/TCWS
<i>Approver</i>	Lioce D.	10 Apr 2023:approved	IO/DG/CNST/PLD/MID/TCWS
<i>Document Security: Internal Use RO: Lioce Donato</i>			
<i>Read Access</i>	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...		

Change Log

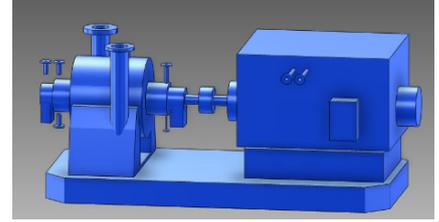
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<i>Version</i>	<i>Latest Status</i>	<i>Issue Date</i>	<i>Description of Change</i>
v1.0	Signed	13 Mar 2023	
v1.1	Revision Required	28 Mar 2023	Update to incorporate reviewers comments
v1.2	Approved	07 Apr 2023	Update following Walter comments

PHNB – Main Flow Pump (26PHNB-PL-3010/3020)

OPERATIONAL NARRATIVE

PHNB Main Flow Pump provides cooling water to the main heat exchanger.



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- 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>	PUMP
<i>Type:</i>	Centrifugal pump with dual sealing system (API Plan 53) and water cooled motor
<i>Number of equipment</i>	2 (installed in parallel)
<i>Approx. Footprint:</i>	5.2 m x 2.4 m
<i>Approx. Height:</i>	Height: 2.2m (skirt/support included) Length: 1.9m Width: 2.4m
<i>Approx. Weight:</i>	21 500 kg (wet)
<i>Approx. Tank Volume:</i>	1 m ³
<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 Welding or Bolting
<i>Component configuration</i>	Skid
<i>Design Life Time:</i>	20 years

ENVIRONMENTAL CONDITIONS

<i>Integrated Dose Rate 20yrs:</i>	≤ 10 000 Gy
<i>Magnetic Field:</i>	≤ 60 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 %

WBS: Primary Heat Transfer System

PBS: 26PHNB

GBS: 11-L4-04

REFERENCE DOCUMENTS

Sizing calculation: XF9LCC

PID: XH2WUB

DESIGN CODES AND SHIPPING

<i>French Law Pressure Category / Nuclear Class:</i>	ESPN N3 (for piping item only)
<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 610
<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

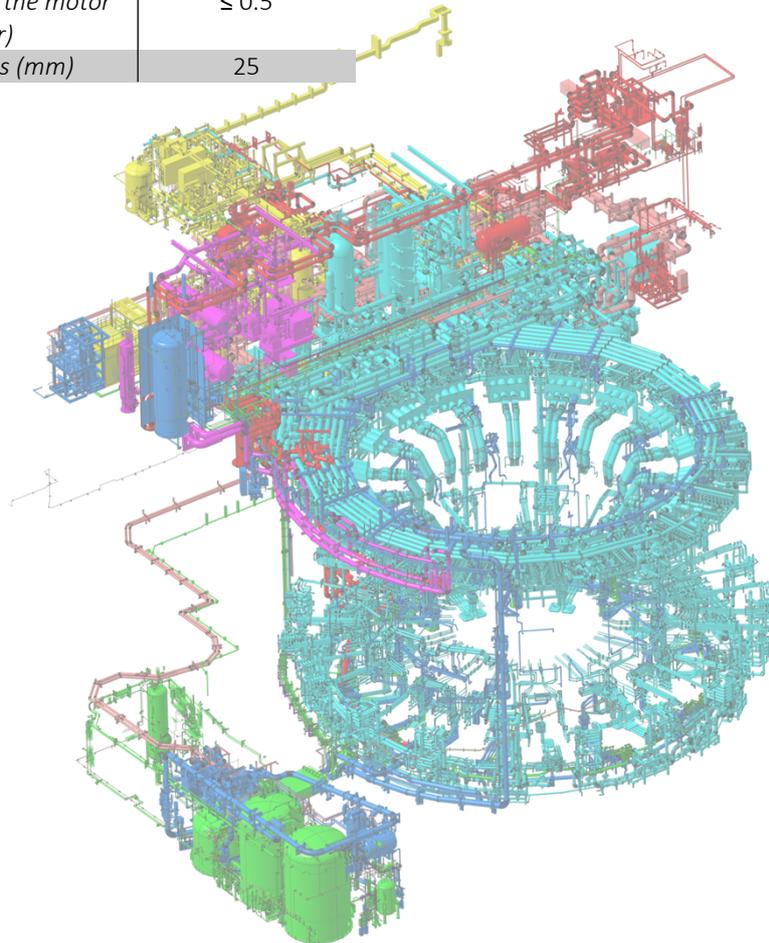
PHNB – Main Flow Pump (26PHNB-PL-3010)

PARAMETERS

Parameter	Value
Nominal Inlet Temperature (°C)	67
Design Temperature (°C)	100
Nominal Inlet Pressure (MPa)	3.0
Design Pressure (MPa)	5.0
Nominal flow (m ³ /h)	1366
Nominal Total Delivery Head @Nominal flow (mWC)	335
Nominal Total Delivery Head @No flow (mWC)	<380
Available NPSH @ Nominal flow (mWC)	11.5
Electrical power @ Nominal flow (MW)	< 1.8
Nominal motor voltage (kV)	6.6
Motor control principle	Direct On Line
Cooling water flow (kg/s)	≤ 6.5
Cooling water inlet temperature (C)	31
Cooling water design pressure (MPa)	1.72
Cooling water design temperature (MPa)	190
Differential pressure across the motor cooling heat exchanger (bar)	≤ 0.5
Thermal insulation thickness (mm)	25

NOZZLE SCHEDULE

I.D.	DN / Schedule	Service
N1	250 / 40S	Suction
N2	250 / 80S	Discharge
N3	25 / 40S	Drain
N4	15 / 40S	Seal Injection



Notes:

1. The cobalt, tantalium and Niobium concentration is limited as follow: $Co \leq 0.2\%$, $Ta \leq 0.05\%$, $Nb \leq 0.1\%$
2. Approximate footprint is based on 3d model approved configuration.
3. All nozzles are flanged.
4. 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.
5. Pump is mounted on a metallic platform (no grouting on the skid, no concrete plinth to attach the pump).
6. Double pressurized mechanical seals with seal injection are required. API Seal Plan 53B or 53C. Mechanical seal injection skid system to be provided by the pump vendor and mounted on the pump skid.
7. Fire Protection: 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.
8. 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.