

IDM UID <b>8T5VK6</b>
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EXTERNAL REFERENCE / VERSION

## Report

# Arrangement 5 - CVBD Vacuum pump skid(26CVBD-SFU-5532) Equipment Summary

This document provides a summary of CVBD Vacuum pump skid(26CVBD-SFU-5532)

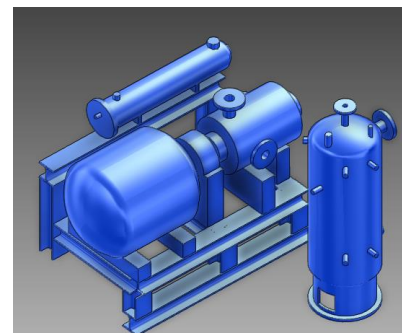
Approval Process			
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Document Security: Internal Use RO: Lioce Donato			
<i>Read Access</i>	<b>LG: Arrangement 5 Cost Estimation, LG: USDA Arrangement 5, LG: Management, GG: IO DDGs (and Senior Advisors), AD: IO_Director-General, AD: External Management Advisory Board, AD: OBS - Project Control Office (PCO), AD: IDM_Controller, AD: OBS - Procurement &amp; Contracts Division (PCD), AD: Auditors, p...</b>		

<i>Change Log</i>			
<b>Arrangement 5 - CVBD Vacuum pump skid(26CVBD-SFU-5532) Equipment Summary (8T5VK6)</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>
v0.0	In Work	10 Mar 2023	
v1.0	Signed	13 Mar 2023	The first version for review.
v2.0	Signed	27 Mar 2023	Updated based on the reviewer's comment.
v2.1	Signed	29 Mar 2023	Updated based on the reviewer's comment. The native word file with revision track with respect to the first version is attached.
v2.2	Approved	03 Apr 2023	Unit of pump capacity was corrected. (Nm <sup>3</sup> /h to m <sup>3</sup> /h).

## CVBD – Vacuum pump skid (26CVBD-SFU-5532)

## OPERATIONAL NARRATIVE

CVBD vacuum pump maintains back pressure of membrane degasifier under vacuum, which enhances removal efficiency of dissolved oxygen in the primary water of IBED (Integrated loop of Blanket, ELM-VS, and Divertor) PHTS (Primary Heat Transfer System) during operation.



## 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>	Liquid ring vacuum pump with recirculation
<i>Number of equipment:</i>	1 unit
<i>Approx. Footprint:</i>	1.5 m x 1.5 m (entire skid)
<i>Approx. Height:</i>	1.4 m (entire skid)
<i>Approx. Weight:</i>	1 000 kg (wet)
<i>Service Fluid:</i>	Wet nitrogen gas
<i>Material Notes:</i>	304L / 316L with composition requirement: cobalt <0.20 wt%, Niobium < 0.1 wt% and Tantalum < 0.05 wt%.
<i>Anchoring system</i>	Platform / Bolting
<i>Component configuration</i>	Assembly mounted on skid
<i>Design Life Time:</i>	20 years

## ENVIRONMENTAL CONDITIONS

<i>Integrated Dose Rate 20yrs:</i>	≤ 10 Gy
<i>Magnetic Field:</i>	≤ 35 mT
<i>Normal temperature</i>	5 – 35 °C
<i>Normal Humidity</i>	40 – 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: Chemical &amp; Volume Control System

PBS: 26CVBD / GBS: 14-L4-21

Functional Reference: 26CVBD-SFU-5532

## REFERENCE DOCUMENTS

Sizing calculation: ITER\_D\_WVXWFF\_v5.1

PID: ITER\_D\_XGXS95\_v2.4

## DESIGN CODES AND SHIPPING

<i>French Law Pressure Category / Nuclear Class:</i>	Non-ESPN (NC) / IV
<i>European Law:</i>	PED, Machinery Directive
<i>Fluid Type / Fluid group</i>	Gas / Group 2
<i>Conformity Assessment Module:</i>	IV, module G
<i>Construction Codes:</i>	ASME VIII Div2, API 681
<i>Safety Class:</i>	SIC-1
<i>Quality Class:</i>	QC-1
<i>Seismic Class:</i>	SC1 (S)
<i>Fire:</i>	Eurocode 2h
<i>Shipping Information:</i>	Oversea packing per ASME NQA-1 Level C, DAP at ITER site

## CVBD – Vacuum pump skid (26CVBD-SFU-5532)

**PARAMETERS**

Parameter	Value
Nominal Temperature (°C)	50
Type of Operation	Continuous
Design Temperature, gas side (°C)	100
Achievable Vacuum Pressure (kPa,abs)	15
Permissible Pressure Difference (MPa)	0.11
Type of seal liquid	Demin. Water
Design Pressure, gas side (MPa,abs)	1.80 / 0.0
Rated pump capacity (m <sup>3</sup> /h) at 15 kPa inlet pressure*	511
Gas composition	Refer to Notes below
Cooling water flowrate per unit (kg/s)	0.5
Allowable Pressure Drop, cooling water side(MPa)	0.10
Power Consumption (kW)	10.3
Motor Voltage (V)/Phase(-)/Cycle (Hz)	400 / 3 / 50
Thermal insulation thickness (mm)	50

**PROCESS CONNECTION**

I.D.	DN / Schedule	Service
1	50 / 40S	Gas Inlet
2	25 / 40S	Gas Outlet
3	25 / 40S	Drain
4	15 / 40S	Cooling water supply
5	15 / 40S	Cooling water return
6	25/40S	DM water make-up
7	20/40S	Connection to online hydrogen monitor

\* Estimated value. Shall be matched to the need of the selected degasifier.

**Notes:**

1. Approximate footprint is based on 3d model approved configuration.
2. All nozzles are butt-welded.
3. Support shall be accounted in the vendor estimate.
4. Pump is subject to Machinery Directive. Tank, heat exchanger, piping, valves are subject to PED.
5. Total volume of seal water tank and cooler is assumed as 200 L. Supplier to confirm the volume is not exceeding 200 L.
6. Minimum documentation shall include: Quality plans, Manufacturing & inspection plans, Procedures, Calculation note (where design is involved), Working instructions, Special process qualifications (if applicable), Operator qualifications, As-built drawings, Contractor release note, Certificate of conformity, Material certification and inspection documents according to EN 10204 Type 3.1 (or equivalent) traceable to the component part and equipment.
7. Gas composition at vacuum pump suction is as below (water as vapor):

Exhaust gas molar composition	
Oxygen	0.01 %
Hydrogen	0.95 %
Nitrogen	16.71 %
Water	82.33 %

8. P&ID for vacuum pump skid to be provided by supplier is as below:

