

## Report

# Arrangement 5 - CVBD Charging Pump 1(26CVBD-PL-5701) Equipment Summary

This document provides a summary of CVBD Charging Pump 1(26CVBD-PL-5701)

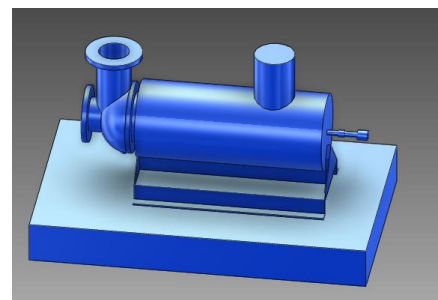
Approval Process			
	Name	Action	Affiliation
Author	Kanda K.	07 Apr 2023:signed	IO/DG/CNST/PLD/MID/TCWS
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Previous Versions	Gao J. Ricou E.	04 Apr 2023:recommended v2.1 05 Apr 2023:recommended v2.1	IO/DG/CORP/FPD/PCD/CAL IO/DG/CNST/PLD/MID/TCWS
Reviews	Van hove W.	04 Apr 2023:recommended v2.1	ORNL - Oak Ridge National Laborator...
Approver	Lioce D.	07 Apr 2023:approved	IO/DG/CNST/PLD/MID/TCWS
Document Security: Internal Use 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 - CVBD Charging Pump 1(26CVBD-PL-5701) Equipment Summary (8SD73A)</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	12 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	Signed	06 Apr 2023	Since the estimated power consumption of 200 kW is with margin, this pump should be LV load instead of MV load. The interface sheets IS-43-26 need to be updated.
v2.3	Approved	07 Apr 2023	The pump is changed to the original MV (6.6 kV) load, considering the fact that pump efficiency of canned pump is 10~20% lower than standard centrifugal pump, and to avoid impact for PBS43 design.

## CVBD – Charging pump #1 (26CVBD-PL-5701)

## OPERATIONAL NARRATIVE

CVBD Charging pump recirculates primary water in Volume control tank to the circuit 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>	<b>Canned motor pump</b>
<i>Number of equipment:</i>	1
<i>Driver:</i>	Electric motor, fixed speed
<i>Approx. Footprint:</i>	1.5 m x 2.5 m
<i>Approx. Height:</i>	1.0 m
<i>Approx. Weight:</i>	15 000 kg (wet)
<i>Service Fluid:</i>	Demineralized Water
<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>	Mounted on baseplate
<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-PL-5701

## REFERENCE DOCUMENTS

Sizing calculation: ITER\_D\_WEP5KL\_v2.2

PID: ITER\_D\_XGXS95\_v2.4

## DESIGN CODES AND SHIPPING

<i>French Law Pressure Category / Nuclear Class (piping system):</i>	ESPN / N3
<i>Fluid Type / Fluid group</i>	Liquid/ Group 2
<i>Construction Codes:</i>	API 685
<i>Safety Class:</i>	SIC-1
<i>Quality Class:</i>	QC-1
<i>Seismic Class:</i>	SC1 (SF)
<i>Fire:</i>	Eurocode 2h
<i>Shipping Information:</i>	Oversea packing per ASME NQA-1 Level C, DAP at ITER site

## CVBD – Charging pump #1 (26CVBD-PL-5701)

PARAMETERS

Parameter	Value
Nominal Temperature (°C)	50
Nominal inlet pressure (MPa)	0.51
Type of Operation	Continuous
Design Temperature (°C)	100
Design Pressure (MPa,abs)	6.0
Nominal head (m-WC)	167.1
Nominal mass flowrate (kg/s)	45
Maximal shut-off head (m-WC)	205
Available NPSHa (m-WC)	51
Shaft power (kW)	200
Motor Voltage (V)/Phase(-)/Cycle (Hz)	6600 / 3 / 50
Thermal insulation thickness (mm)	50

SENSOR

I&C Tag	Type of sensor
26CVBD-MV-5705	Inboard Pump Vibration
26CVBD-MV-5707	Outboard Pump Vibration
26CVBD-MV-5703	Inboard Motor Vibration
26CVBD-MV-5701	Outboard Motor Vibration
26CVBD-MT-5700	Motor Winding Temperature #1
26CVBD-MT-5701	Motor Winding Temperature #2
26CVBD-MT-5702	Motor Winding Temperature #3
26CVBD-MT-5703	Outboard Motor Bearing Temperature
26CVBD-MT-5704	Inboard Motor Bearing Temperature
26CVBD-MT-5705	Inboard Pump Bearing Temperature
26CVBD-MT-5706	Outboard Pump Bearing Temperature

PERFORMANCE TEST

Type of Test	
Performance tests according to the Codes	Required
Six-point testing (shut-off, MCF, 95-9% of rated flow, 100–105% of rated flow, the best efficiency flow, and maximum allowable flow).	Required
Mechanical run test at rated for 4 hours	Required
NPSH test	Required
Record of vibration at each test	Required

NOZZLE SCHEDULE

I.D.	DN / Schedule	Service
N1	150 / 80S	Inlet
N2	150 / 80S	Outlet
N3	25/40S	Casing drain

## Notes:

- Motor shall be selected to cover end-of-curve of the pump.
- The connected piping is subject to French ESPN/PED Order, but the pump is excluded from French ESPN/PED Order. Supplier to refer to Article 1, section 2.(j) of DIRECTIVE 2014/68/EU. Pump will be subject to Directive 2006/42/EC known as the Machinery Directive.
- Approximate footprint is based on 3d model approved configuration.
- Nozzles are flanged. Counter flanges with a pipe stub that will be butt-welded to inlet/outlet piping shall be provided.
- Motor shall have fully encapsulated winding system as described in IEC 60034-1 and IEC 60072. Minimum insulation class shall be in accordance with the API 685.
- 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.
- Pump PL-5701 operates during plasma/standby/baking mode and PL-5703 operates during baking mode when the head requirements are higher. Utilizing two separate pumps for the main operating modes of CVBD reduces the demand on either pump and allows a smaller pump to be used for plasma operation.