Bharat Heavy Electricals Limited
Heavy Plates & Vessels Plant
Visakhapatnam – 530 012,
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INVITATION TO TENDER

Ref: OPS/OS/SC/2021-22/68/62 **Date: 13.11.2021**

Sub: Contract for carrying out Limited Qualification Tests (LQT) for ACM Modules and PCM Modules of 2 KW Liquid Cooling System of M/s. BHEL-HPVP, Visakhapatnam – Reg.

Sealed tenders are invited under **two bid system**, Techno-Commercial Bid (Part-I) and Price Bid (Part-II) from the reputed and experienced contractors with sound technical and financial capability for the subject work.

SL. NO.	NAME OF THE WORK	CONTRACT PERIOD
01	Contract for carrying out Limited Qualification Tests (LQT) for ACM Modules and PCM Modules of 2 KW Liquid Cooling System of M/s. BHEL-HPVP, Visakhapatnam	3 Months

1. ELIGIBILITY CRITERIA

I) Average annual turnover of the contractor duly certified by a practitioner chartered accountant during the last 3 years ending 31st March 2021 should be at least 30% of the estimated value. (i.e**. ₹ 3.60 Lakhs**). In case annual turnover for FY 2020-21 is not finalized or ITR is not submitted by the contractor, Avg. annual turnover during the last 3 years ending 31st March 2020 shall be considered.

Tenderer should enclose EPF, ESI, PAN, GSTIN New registration no., Income tax returns for last three years (AY, 2019-20, 2020-21, 2021-22/ 2018-19) and Profit & Loss account and Balance Sheet certified by the Practicing Chartered Accountant for the last 3 years.

II) The Contractor should have experience of completing similar works during last 7 years ending 31st Oct 2021 as given below:

(a) Three similar completed works costing not less than the amount equal to 40% of the estimated value (i.e. **₹ 4.80 Lakhs** each)

OR

(b) Two similar completed works costing not less than the amount equal to 50% of the estimated value. (i.e. **₹ 6.00 Lakhs** each)

OR

(c) One similar completed work costing not less than the amount equal to 80% of the estimated value. (i.e. **₹ 9.60** Lakhs)

Job Completion Certificates from the customer shall be enclosed in support of successful and satisfactory completion of the orders.

Note: Similar work means carrying out Qualification Tests for Liquid Cooling Systems or Similar Systems in State/ Central Govt. / undertakings or private firms.

III) The works executed in the own name of the tenderer will only be considered for eligibility criteria.

2. SCOPE OF THE WORK

Work is to be carried out as per Scope of Work (Annexure– I), GTC and as per Schedule of Quantities & Rates.

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3. LOCATION OF WORK

3.1The subject work is to be carried out at Vendor's work.

3.2 Sending of Items/ Equipments for testing to vendor's work are in the scope of BHEL-HPVP, Visakhapatnam and Return of the same from vendor's work will be of Vendor's scope.

4. CONTRACT PERIOD:

Contract is valid for a period of **3 (Three) months** from date of work order or intimation by R & D department, whichever is later.

5. EARNEST MONEY DEPOSIT

Not Applicable as per OM No. F.9/4/2020-PPD, Dated: 12.11.2020. Bidders to Submit Bid Securing declaration form as enclosed in **Annexure-VII.**

6. SECURITY DEPOSIT:

Security Deposit shall be collected from the successful tenderer @**3%** Contract Value as per OM No: No. F.9/4/2020-PPD, Dated:12.11.2020

A. Security deposit means the security provided by the contractor towards fulfillment of any obligations in terms of the provisions of the contract.

B. The total amount of the security deposit will be **3% of the contract value**. EMD of the successful tenderer shall be converted and adjusted towards the required amount of Security deposit.

C. **Modes of Deposit:**

The balance amount to make up the required Security Deposit of **3%** of the contract value may be accepted in the following forms:

a) Cash (as permissible under the extant Income Tax Act)
b) Local Cheques of Scheduled Banks (subject to realization)/ Pay Order/ Demand Draft/ Electronic Fund Transfer in favour of BHEL.
c) Bank Guarantee from Scheduled Banks/ Public Financial Institutions as defined in the company's act. The bank guarantee format should have the approval of BHEL.
d) Fixed Deposit Receipt issued by Scheduled Banks/ Public Financial Institutions as defined in the company's act (FDR should be in the name of the contractor, a/c BHEL.
e) Securities available from Indian Post offices such as National Savings Certificates, Kisan Vikas Patras etc. (held in the name of Contractor furnishing the security and duly endorsed/ hypothecated/ pledged, as applicable, in favour of BHEL)

(**Note:** BHEL will not be liable or responsible in any manner for the collection of interest or renewal of the documents or in any other matter connected therewith)

D. **Collection of Security deposit**:

At least 50% of the required security deposit, should be submitted before start of the work. Balance security deposit can be collected by deducting 10% of the gross amount progressively from each of the running bills of the contractor till the total amount of the required security deposit is collected.

Security deposit shall be released to the contractor upon fulfillment of contractual obligations as per the terms of the contract.

E. **Refund of Security Deposit:**

i. The security deposit shall be refunded after successful completion of the Contract as per agreement and subject to deduction of any amount due to BHEL.

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ii. Security deposit shall not be refunded to the Contractor except in accordance with the terms of the Contract.

iii. The successful tenderers shall furnish Security Deposit within 15 days from the date of Work Order / Letter of Intent. The Security Deposit shall be furnished by the successful tenderers before commencement of work by them.

iv. The security deposit shall not carry any interest.

Note: Acceptance of Security Deposit against Sl. No. (d) and (e) above will be subject to hypothecation or endorsement on the documents in favour of BHEL. However, BHEL will not be liable or responsible in any manner for the collection of interest or renewal of the documents or in any other matter connected therewith).

F. Security Deposit / Bank Guarantee will be released after the maintenance **period of 2 months** or **on closure of contract whichever is later.**

G. **Bidder agrees to submit performance security required for execution of the contract within the time period mentioned. In case of delay in submission of performance security, enhanced performance security which would include interest (SBI rate +6%) for the delayed period, shall be submitted by the bidder. Further if performance security is not submitted till such time the first bill becomes due, the amount of performance security due shall be recovered as per terms defined in NIT/ contract, from the bills along with due interest.**

7. INCOME TAX:

Income tax as per statutory requirement will be deducted on each payment made to the contractor and TDS certificate will be issued to this effect.

8. TDS ON GST:

TDS on GST amount as per statutory requirement as applicable will be deducted on each payment made to the contractor. Present TDS on GST is 2%.

9. PENALITY:

Contractor has to start the work within one day from the date of intimation otherwise penalty of **₹ 300/-** will be deducted per day for the delayed period from their bills.

10. PAYMENT TERMS:

Bills shall be raised by the contractors once in a month and submitted in triplicate in the format given by BHEL. Duly verifying the trip register and date, 100% payment will be made within **45** days or as per BHEL norms from time to time. No advance in any form is payable by BHEL.

Bills (RA/Final Bill) to be submitted to engineer-in-charge along with following documents:

A. R.A Bill

a) Invoice
b) Job completion certificate issued by the Engineer-in-charge.
c) Proof of GST payment as per annexure - GST.
d) RTGS form
e) WAM 06 duly filled & signed
f) For any reduction in the Invoice value, Credit Note (under GST Act) to be issued by vendor and vice versa.

B. Final Bill

a) Invoice
b) Job completion certificate issued by the engineer-in-Incharge / Attendance certified by indenting dept.

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c) RTGS form
d) WAM 07 duly filled & signed
e) For any reduction in the Invoice value, Credit Note (under GST Act) to be issued by vendor and vice versa.
f) No claim certificate and No dues certificate
g) In case of release of security deposit, WAM-10 to be filled and submitted.

Note: Final bill means last month bill for service contracts. In case of works, final bill means bill for finally executed quantity. All payments will be released only through RTGS / NEFT only.

11. PRICE SCHEDULE, TAXES & DUTIES:

a. Prices shall be quoted in the price schedule attached to the tender for the complete scope of work.

b. **The quoted prices shall be inclusive of all applicable taxes, duties and GST as applicable as on due date of tender submission**. However, GST as applicable shall be payable by vendor & the same will be reimbursed as per Annexure - GST.

c. In addition to existing taxes, any new taxes imposed by Central/ State Govt. shall be payable by the contractor and same shall be reimbursed on submission of relevant documents/proof of payment.

d. In case, any new tax is imposed instead of existing tax, difference of the amount shall be reimbursed/ recovered on submission of documentary evidence.

e. Any new tax is imposed by Central/ State Govt. or there is any variation in taxes after expiry of delivery / contract period, the same shall be borne by contractor only.

f. All terms & conditions of the contract in respect of taxes & duties are subject to new taxation laws introduced time to time by Govt. and terms & conditions will deemed to be modified in accordance with the provisions of New Laws (i.e., GST).

g. The quoted prices shall be fixed & firm without any escalation during the entire period of contract and till completion of the work.

12. REVERSE AUCTION:

Reverse Action will be conducted in GeM Portal

13. VALIDITY OF THE OFFER:

The offer shall be valid for a period of **3 months** from the last date for tender submission.

14. RISK PURCHASE:

In case the contractor fails to execute the work due to any reason, BHEL reserves the right to get the same completed through some other party at the risk & cost of the contractor and any additional expenditure incurred due to the same shall be charged to the contractor.

15. GENERAL:

15.1 **Bidders shall confirm their acceptance to all the terms & conditions of the tender enquiry.**

Any deviation to the tender terms & conditions is not acceptable and BHEL-HPVP reserves the right to reject such offers which do not meet Technical / Commercial requirements without any / further correspondence**.**

Bids not accompanied with requisite Documents, late / delayed bids, incomplete / conditional offers, bids not conforming to the terms & conditions specified in the tender documents are liable for rejection.

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15.2 **BHEL reserves the right to modify or cancel or short close the tender at any stage at its discretion without assigning any reason thereof.**

15.3 The bidders shall study the tender document and all other relevant documents in detail for understanding the scope of supply and the processes involved before submission of their offer.

For any clarifications required on this tender document, scope of supply, mode of operation etc., the bidders shall depute their authorized representatives to BHEL-HPVP, Visakhapatnam with prior intimation to get clarifications from concerned authorities between 09:00 AM to 04:00 PM.

15.4 **Manager (R & D)** shall be the Engineer-in-Charge for herein after referred to as such in the tender.

15.5 Lowest offer need not be the rate acceptable to BHEL-HPVP. BHEL-HPVP reserves the right for negotiation with the L1 bidders.

15.6 The following documents (enclosed) shall form part of the contract including this Notice Inviting Tender: -

PART - I: TECHNO COMMERCIAL BID

a)	Technical Specification	: Annexure – I
b)	Scope of work	: Annexure – II
c)	Acceptance to the Tender Terms & Conditions	: Annexure – III
d)	Contractor Information	: Annexure – IV
e)	Check List	: Annexure – V
f)	Bid Security Declaration Form	: Annexure – VI
g)	GTC of GeM	

PART - II: PRICE BID

i) Price Bid (Schedule of Quantities & Rates) : Annexure – VII

16. Submission of offer by a tenderer implies that all the tender documents were read by the tenderer and the tenderer is aware of the scope and specifications of the work, site condition, local conditions and rates at which stores, tools and plant, free / chargeable materials etc., will be issued to him by BHEL - HPVP and other factors having bearing on the execution of the work.

17. The Bidder declares that they will not enter into any illegal or undisclosed agreement or understanding, whether formal or informal with other Bidder(s). This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process.
In case, the Bidder is found having indulged in above activities, suitable action shall be taken by BHEL as per extant policies/ guidelines.

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ANNEXURE I

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TECHNICAL SPECIFICATIONS

::1::

SPECIFICATION FOR LIMITED QUALIFICATION TEST (LQT) OF ACM MODULE AND PCM MODULE OF 2 KW LIQUID COOLING SYSTEM (LCS)

DOCUMENT NO: LQT-2KW LCS-001 Rev No. 00, DATE: 25-09-2021

1. INTRODUCTION: LIQUID COOLING SYSTEM

The 2 KW Air Cycle Machine (ACM) based Liquid Cooling System (LCS) is used for circulating the coolant through the heat load and maintaining the coolant temperature less than 45^0C using the cold air generated by the ACM, over the operational envelope of the aircraft. The heat absorbed from the heat load will be dissipated to the heat exchangers, which are part of the cooling system. The ACM present in the cooling system is driven by the ram air and generates the cold air, which is used for cooling the hot coolant by passing through an Air to Liquid Heat Exchanger (ALHE).

The ACM Module consists of multiple components and multiple modes of operation to satisfy the heat load requirements.

Liquid Cooling System which is shown in Figure-1 comprises:

a. **ACM MODULE (Figure-2):** Comprises ACM Structure, Air to Liquid Heat Exchanger (ALHE) shown in Figure-4, Air Cycle Machine (ACM), Control Valves, Ground Cooling Fan, Non-Return Valves, Temperature Sensors, Hoses, Power Loom & Signal, Fasteners and Gasket. Approximate weight 25 Kgs.

   Power Requirement:
   i) 400 Hz Frequency converter
   ii) 28 VDC power source

b. **PCM HEAT EXCHANGER MODULE (Figure-3):** Comprises Brazed Core gasket, cover and fasteners. Approximate weight with Phase Change material 6.7 Kgs.

c. **LIQUID CIRCULATION UNIT (LCU) MODULE:**

d. **ELECTRONIC CONTROL UNIT (ECU) MODULE:**

2. SCOPE OF WORK:

The scope of work is:

i) To perform Limited Qualification Test (LQT) separately as indicated in Table-1 & Table-4 for
   a) ACM Module and
   b) PCM Heat Exchanger Module

ii) **ESS Testing of ACM & PCM Module: Random vibration test: 5 minutes per axis**

iii) To fabricate required fixture to conduct the LQT.

iv) To prepare and consolidate the test reports.

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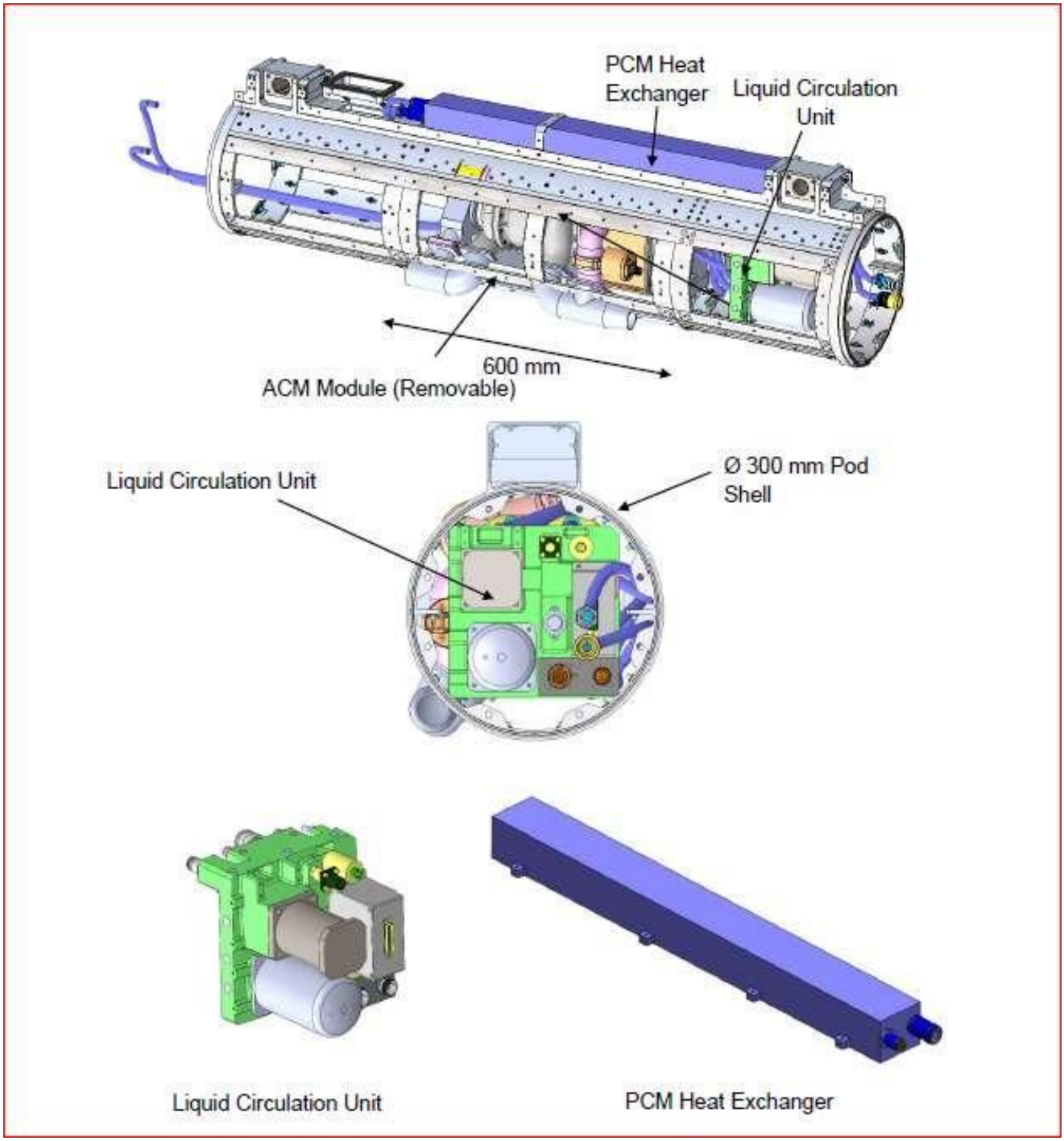

Figure-1: 2 KW LCS

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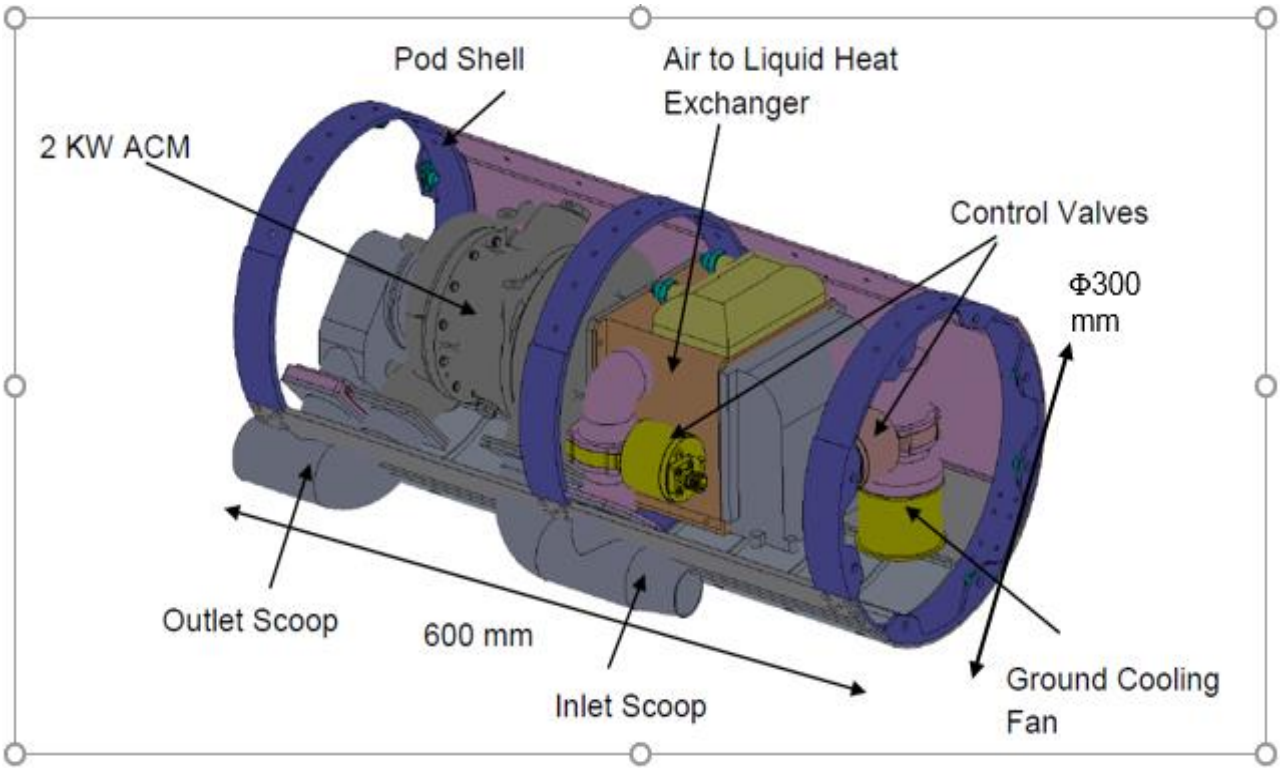

Figure-2: ACM Module

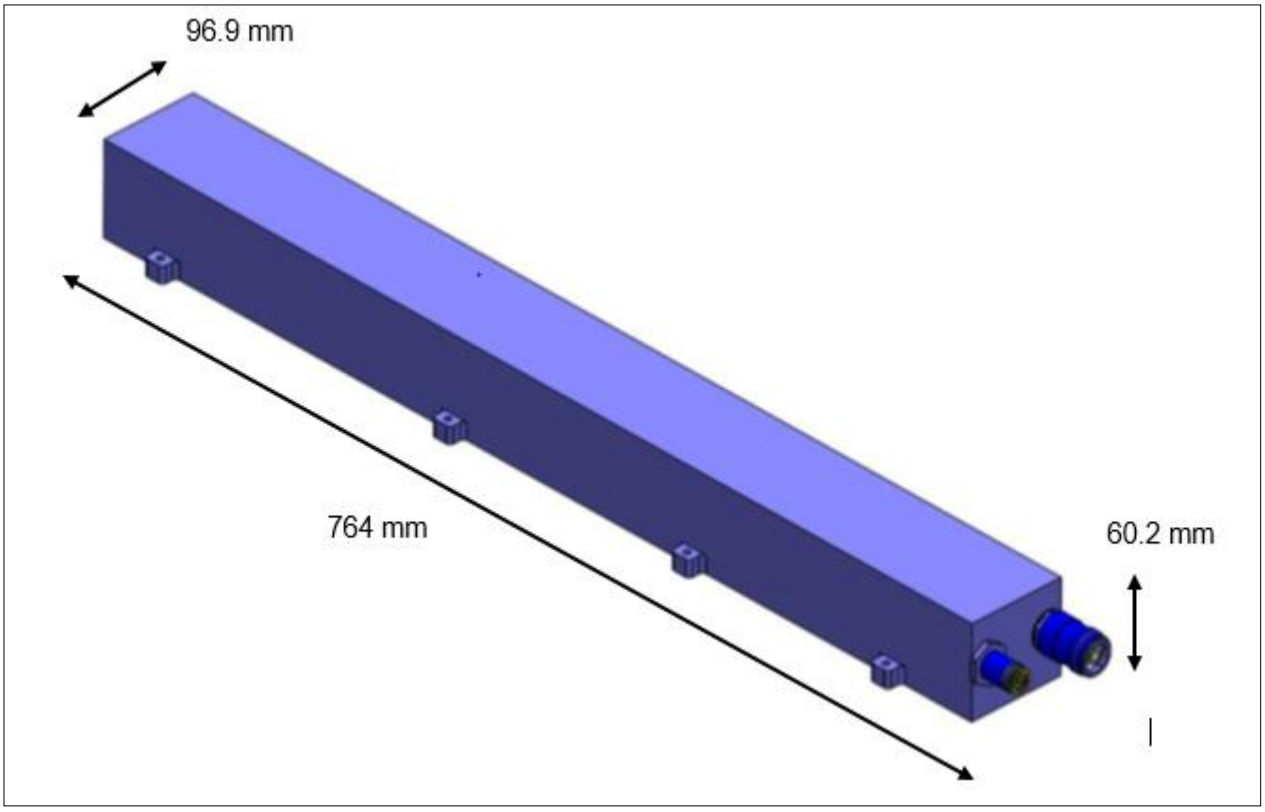

Figure-3: PCM HE Module

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3. LIMITED QUALIFICATION TEST (LQT) FOR ACM MODULE.

The Liquid Cooling System (LCS) should be subjected to the following Limited Qualification Tests (LQTs) for ACM Module shown in **Table-1**.

Table-1: Limited Qualification Tests

Sl. No.	Name of the Test	MIL Spec.	DURATION	REMARKS
1	Random Vibration Test	Method 514.5 (Proc-I) of MIL-STD-810F *Procedure-I .*	1 hour/axis in all three axes	ATP pre and post test
2	High Temperature Storage cum Operation Test	Method 501.4 (Proc-I & II) of MIL-STD-810F.	7 cycles Carryout operation check at max temperature of +65 Deg.C	ATP pre and post-test. Integrity Check as per section 7.3 of ATP during test
3	Low Temperature Storage cum Operation Test	Method 502.2 (Proc-I & II) of MIL-STD-810F.	1 Cycle Cold Start should be checked at -40 Deg.C	ATP pre and post-test. Integrity Check as per section 7.3 of ATP during test
4	Mechanical Shock	Method 516.5 (Proc IV & VI) of MIL-STD-F.	20 g saw tooth pulse 3 shocks per axis	ATP pre and post test
5	Acceleration Test	Method 513.5 (Proc-II) of MIL-STD-810F.	13.5 g All 3 axis Duration 1 minute	ATP pre and post test
6	Altitude (Low pressure) Test	Method 510.4 (Proc-II) of MIL-STD-810F.	One hour soak (non-operating) Rate of change of altitude=150m/sec	ATP pre and post-test. Integrity Check as per section 7.3 of ATP during test

3.1 PROCEDURE AND REQUIREMENTS FOR QUALIFICATION TESTS:

Following are the procedures for conducting different Limited Qualification Tests on the ACM Module of 2 KW ACM based Liquid Cooling System (LCS) QT unit, and the requirements to be satisfied by the **same in order** to pass the tests.

3.1.1 VIBRATION TEST:

Test Purpose:

The ACM Module shall be subjected to a Vibration Test in accordance with MIL-STD-810F, Method 514.5, Procedure-I. The General Model 2511 Vibration Control System Computer or similar system may be used to control vibration levels and measure ACM Module response. Procedure for the test and requirements to be met by the equipment to pass the test are described below.

The vibration test consists of following:

(a) Pre Resonance Search
(b) Random Vibration
(c) Post Resonance Search

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TEST PROCEDURE:

3.1.1.1 Resonance Search:

Carryout Resonance search at 0.5g from 5Hz to 2000Hz with logarithmic sweep rate not exceeding 1 octave/min pre and post the vibration test. First carry out resonance search on fixture only. Then carry out resonance search on the unit mounted with a rigid fixture, which is fixed to the vibration table. (Refer Fig. 5 for axis X, Y & Z)

After completion of this test on each axis, remove the unit from the vibration table and check the physical condition of the unit.

Note: Identify the critical frequencies (frequencies where resonance peak amplitudes are greater than twice the input acceleration amplitude).

3.1.1.2 Procedure - Random Vibration Test

The ACM Module shall be hard mounted, utilizing all mounting points, onto a suitable vibration test fixture (having resonance frequency preferably above 2000 Hz), which shall then be mounted on the vibration test setup. The test shall be repeated for each of the three principal axes (refer **Figure-8**) by orienting the exchanger along each axis in turn. One control accelerometer shall be placed near the mounting location and at least one response accelerometer shall be placed on the ACM Module, parallel to the test axis. A broad band Vibration test shall be conducted according to the random vibration envelope in **Figure-4**, for duration of one (1) hour for each axis.

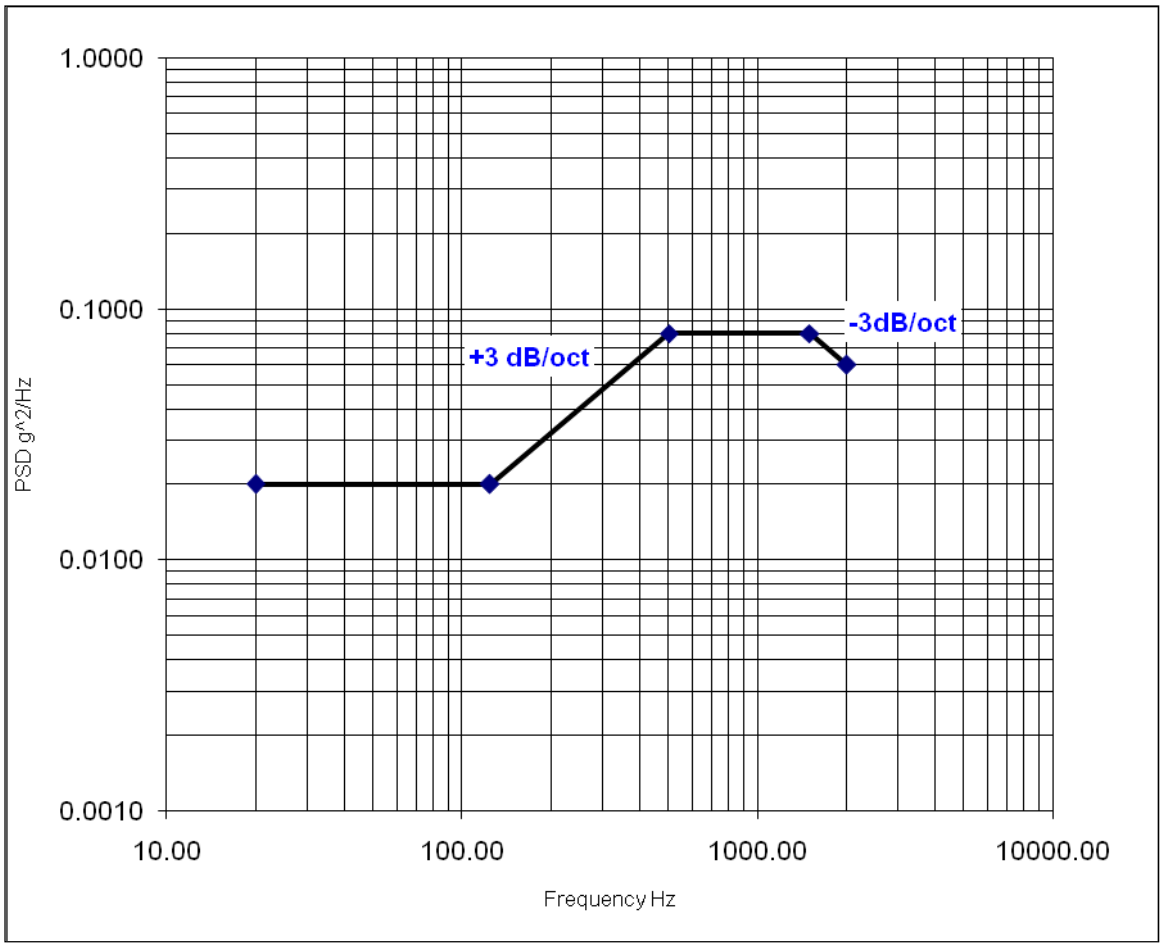

Figure-4 - Vibration Test Profile for Random Vibration Testing

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Table-2

Frequency Hz	P.S.D g^2/H_z	Slope	Grms
20	0.02	----	11.64
124	0.02	+3 dB/Octave	
500	0.08		
1500	0.08	-3 dB/Octave	
2000	0.08		

3.1.1.3 Acceptance Criteria:

a) ACM Module should satisfy pre and post Vibration Test as per ATP of ACM Module in Annexure-1

b) Resonance frequencies of the ACM module with the fixture post vibration shall be within ±10% of the initial resonance frequencies.

3.1.2 HIGH TEMPERATURE STORAGE CUM OPERATION TEST

The purpose of this test is to determine that unit can withstand Storage in the temperature of the surrounding atmosphere without experiencing physical damage or deteriorate in performance as per MIL-STD-810F Method 501.4 Procedure 1 & II.

3.1.2.1 Test Procedure:

The High Temperature test shall be performed on the ACM Module by placing the ACM Module in a chamber and increasing the temperature of the entire chamber. Maintain the temperature profile of the chamber as shown in the Figure-5. An integrity check to be conducted at 65^{O}C as indicated in **Figure-5**. Examine the ACM Module for deformation.

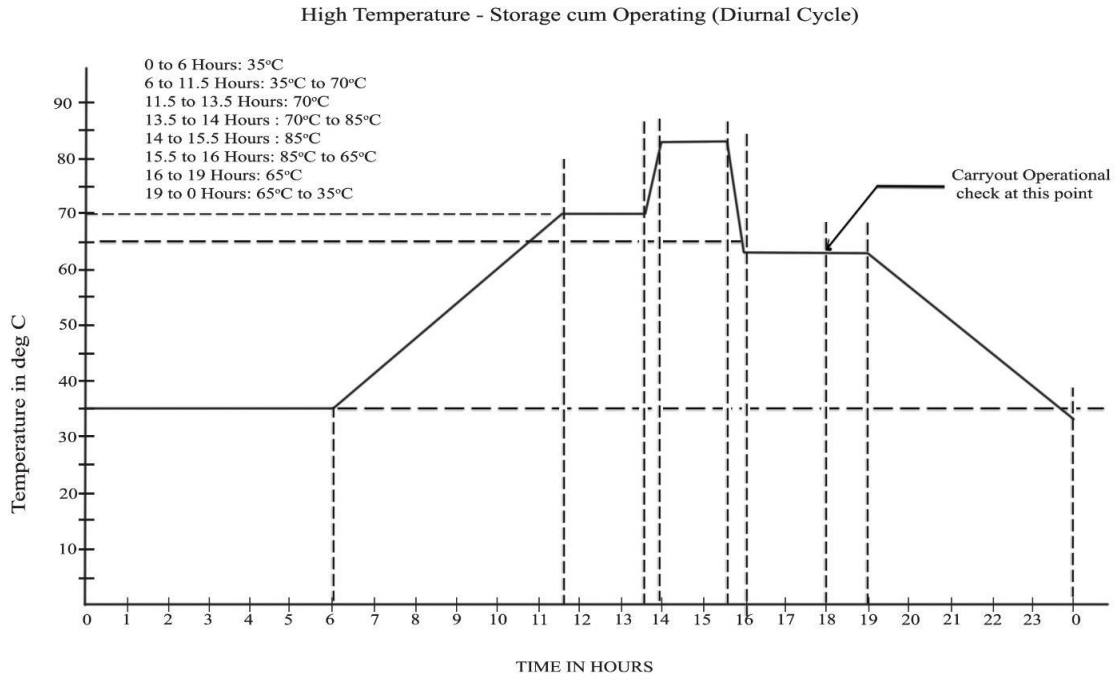

Figure. 5– High Temperature storage cum Operation Test Profile

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3.1.2.2 Acceptance Criteria:

a) ACM Module shall pass pre and post High Temperature Storage cum operation test as per ATP of ACM Module in Annexure-I-A.

b) Integrity checks as per section 7.3 of the ATP of ACM Module in Annexure-I-A shall be satisfactory during the test. Integrity tests except 7.3.7 (ACM Rotation) shall be carried out during the High temperature storage test.

3.1.3 LOW TEMPERATURE TEST

The purpose of this test is to determine that unit can withstand Storage in the temperature of the surrounding atmosphere without experiencing physical damage or deteriorate in performance as per MIL-STD-810F Method 502.2 Procedure I & II.

3.1.3.1 Test Procedure:

The Low Temperature test shall be performed on the ACM Module by placing the ACM Module in a chamber and lowering the temperature of the entire chamber. Bring the entire chamber to -54 °C as indicated in the **Figure-6**, stabilize and soak for two hours. Examine the ACM module for deformation. Integrity Check to be conducted at '-40^{O}C'.

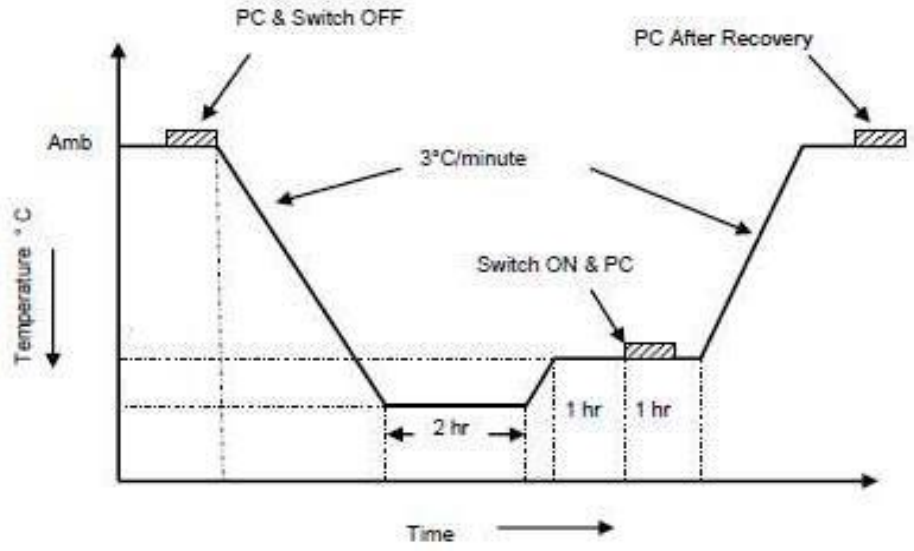

Figure 6- Low Temperature Storage cum operation Test Profile

3.1.3.2 Acceptance Criteria:

a) The ACM Module shall pass pre and post Low Temperature Test as per ATP of ACM Module in Annexure-1

b) Integrity checks as per section 7.3 of the ATP of ACM Module in Annexure-1 shall be satisfactory during the test. Integrity tests except 7.3.7 (ACM Rotation) shall be carried out during the Low temperature storage test.

3.1.4 MECHANICAL SHOCK TEST

The ACM Module shall be subjected to Mechanical Shock Test in accordance with MIL-STD-810F, Method 516.5. The purpose of this test is to check the structural and functional integrity of the unit to shock. Procedure for the test and requirements to be met by the equipment to pass the test are described below.

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3.1.4.1 Test Procedure:

The ACM Module shall be mounted onto a suitable fixture, which shall then be mounted on the shock test setup. Three positive and three negative shocks shall be applied along each of three principal axes (**refer Figure-8**) by orienting the Equipment along each axis in turn. Shocks shall be of Saw-Tooth form with a magnitude of 20 g's over a duration of 11 ± 1 ms.

3.1.4.2 Acceptance Criteria:

The ACM Module should satisfy pre and post Mechanical Shock Test as per ATP of ACM Module in Annexure-1

3.1.5 ACCELERATION TEST

The ACM Module shall be subjected to Acceleration Test in accordance with MIL-STD-810F, Method 513.5. Procedure for the test and requirements to be met by the module to pass the test are described below.

3.1.5.1 Procedure - Acceleration Test

Mount the ACM Module on the Acceleration Test setup oriented along the first test axis on centrifuge. Induce the appropriate acceleration (g) indicated in Table-3 for the orientation being tested. Stabilize system and continue test for a period of one (1) minute. Mount the ACM Module along next test axis and repeat same procedure for each of the other axis orientations in Table-3. Record all test data.

Table 3: Maximum g- Levels for Acceleration Test - Structural

Direction	Acceleration (g)
Forward (+X)	13.5
Backward (-X)	13.5
Left (+Y)	13.5
Right (-Y)	13.5
Up (+Z)	13.5
Down (-Z)	13.5

3.1.5.2 Requirements - Acceleration Test

The ACM Module should satisfy pre and post Acceleration Test as per ATP of ACM Module in Annexure-1

3.1.6 ALTITUDE TEST

The ACM Module shall be subjected to Altitude Test in accordance with MIL-STD-810F, Method 500.4, Procedure II. This test is performed to determine if module can withstand and/or operate in a low pressure environment and/or withstand rapid pressure changes. Procedure for the test and requirements to be met by the module to pass the test are described below.

3.1.6.1 Procedure - Altitude Test

The ACM Module shall be placed inside a chamber after closing all its inlet/outlet ports. The module shall be exposed to corresponding Pressure and temperature for an Altitude of 60000 ft (18000 m) altitude (i.e. 7.172 kPa/71.72mbar/54mm of hg). The rate of change of altitude 150m/s. Once the pressure and temperature is achieved, stabilize for ten minutes and hold for two hours. Equipment is to be brought back to atmospheric pressure and shall pass the requirements specified in 3.1.6.2.

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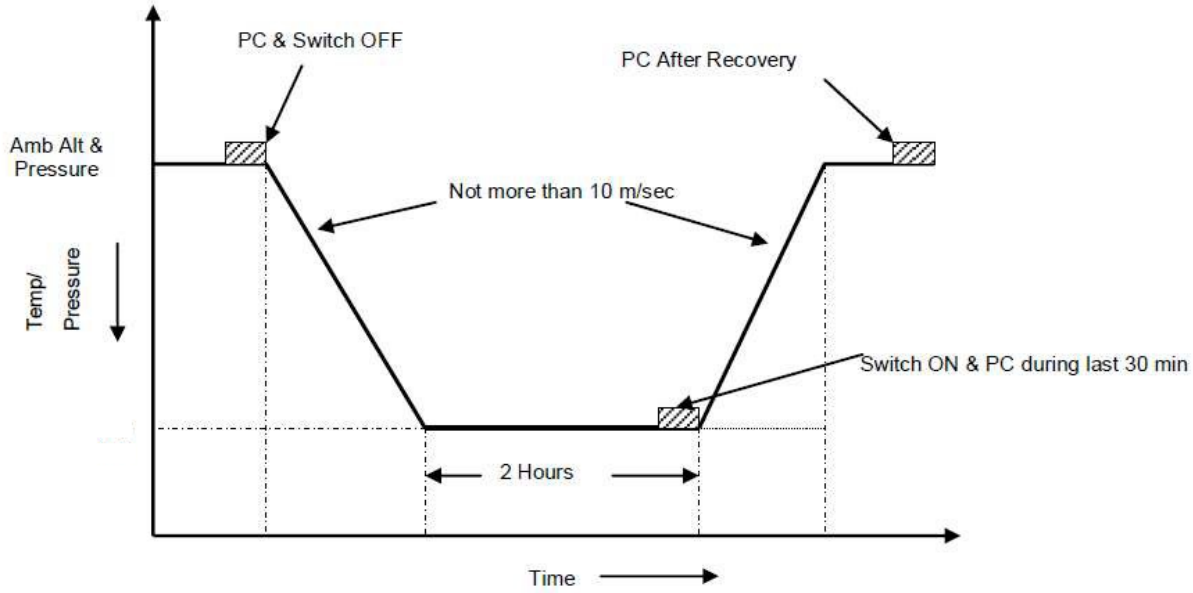
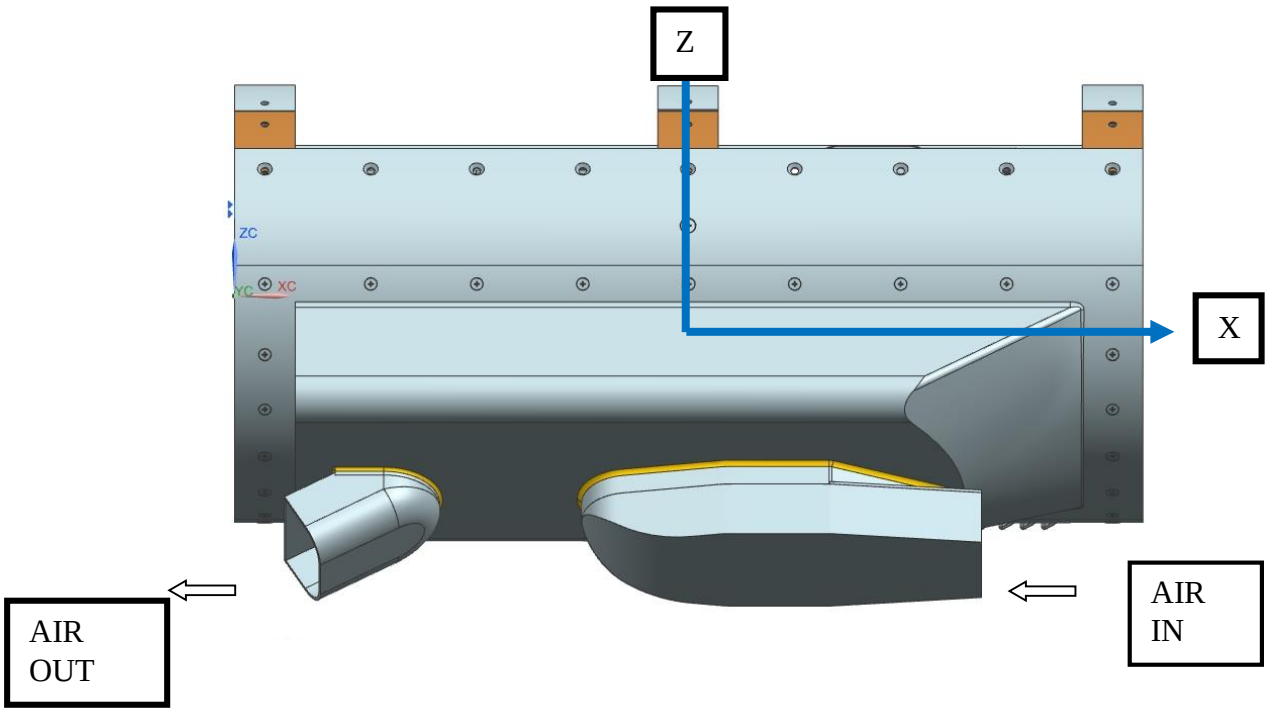


Figure-7-Altitude Test Profile

3.1.6.2 Requirement – Altitude Test

a) The ACM Module shall pass pre and post Altitude Test as per ATP of ACM Module in Annexure-1

b) Integrity checks as per section 7.3 of the ATP of ACM Module in Annexure-1 shall be satisfactory during the test. Integrity tests except 7.3.7 (ACM Rotation) shall be carried out during the High temperature storage test.



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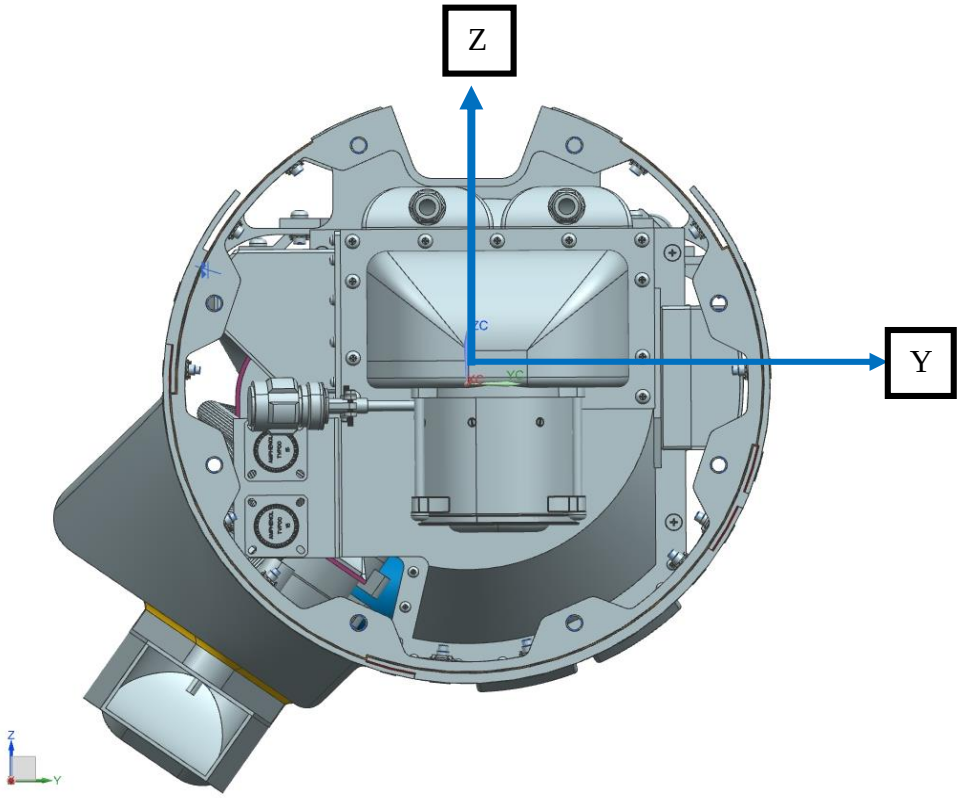

Figure-8: Vibration & Acceleration Axes for ACM Module

4. LIMITED QUALIFICATION TEST (LQT) FOR PCM MODULE.

Table-4: Lists the Limited Qualification Tests (LQT) that need to be conducted on the PCM Module of 2 KW ACM based Liquid Cooling System (LCS) unit identified for undergoing the same. The QT Unit shall undergo the following tests:

Table 4: Qualification Tests:

Sl. No.	Para	Name of Test	MIL Specification	DURATION	REMARKS
1	3.1	Acceptance Test as per ATP of Annexure-2	---		
2	3.2	Random Vibration Test	Method 514.5 (Proc-I) of MIL-STD-810F.	1 Hr / axis on all three axis	ATP pre and post test
3	3.3	High Temperature Storage cum Operation Test	Method 501.4 (Proc-I & II) of MIL- STD-810F.	7 Cycles Carryout operation check at max temp of +65 Deg.C	ATP pre and post test
4	3.4	Low Temperature Storage cum Operation Test	Method 502.2 (Proc-I & II) of MIL- STD-810F.	1 Cycle Cold Start should be checked at -40 Deg.C	ATP pre and post test
5	3.5	Mechanical Shock	Method 516.5 (Proc IV & VI) of MIL- STD-F.	20 g saw tooth pulse 3 shocks per axis	ATP pre and post test

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ANNEXURE I

Ref: OPS/OS/SC/2021-22/68/62 **Date: 13.11.2021**

Sl. No.	Para	Name of Test	MIL Specification	DURATION	REMARKS
6	3.6	Acceleration Test	Method 513.5 (Proc-II) of MIL-STD-810F.	13.5 g All 3 axis Duration 1 minute	ATP pre and post test
7	3.7	Altitude (Low Pressure) Test	Method 510.4 (Proc-II) of MIL-STD-810F.	One Hour soak (non-operating) Rate of change of altitude =150m/sec	ATP pre and post test

4.1 PROCEDURE AND REQUIREMENTS FOR QUALIFICATION TESTS:

Following are the procedures for conducting different Limited Qualification Tests on the PCM Module of 2 KW ACM based Liquid Cooling System (LCS) QT unit, and the requirements to be satisfied by the same in order to pass the tests.

4.1.1 ACCEPTANCE TESTS:

Leakage Test to be conducted as per ATP in Annexure-2

4.1.2 VIBRATION TEST:

Test Purpose:

The PCM Module shall be subjected to a Vibration Test in accordance with MIL-STD-810F, Method 514.5, Procedure-I. The General Model 2511 Vibration Control System Computer or similar system may be used to control vibration levels and measure PCM Module response. Procedure for the test and requirements to be met by the equipment to pass the test are described below.

The vibration test consists of following:

(a) Pre Resonance Search

(b) Random Vibration

(c) Post Resonance Search

Test Procedure:

4.1.2.1 Resonance Search:

Carryout Resonance search at 0.5g from 5Hz to 2000Hz with logarithmic sweep rate not exceeding 1 octave/min pre and post the vibration test. First carry out resonance search on fixture only. Then carry out resonance search on the unit mounted with a rigid fixture, which is fixed to the vibration table. (Refer Fig. 13 for axis X, Y & Z)

After completion of this test on each axis, remove the unit from the vibration table and check the physical condition of the unit.

Note: Identify the critical frequencies (frequencies where resonance peak amplitudes are greater than twice the input acceleration amplitude).

4.1.2.2 Procedure - Random Vibration Test

The PCM Module shall be hard mounted, utilizing all mounting points, onto a suitable vibration test fixture (having resonance frequency preferably above 2000 Hz), which shall then be mounted on the vibration test setup. The test shall be repeated for each of the three principal axes (refer Figure-13) by orienting the exchanger along each axis in turn. One control accelerometer shall be placed near the mounting location and at least one response accelerometer shall be placed on the PCM Module, parallel to the test axis. A broad band Vibration test shall be conducted according to the random vibration envelope in Figure-9, for duration of one (1) hour for each axis.

Contd…12

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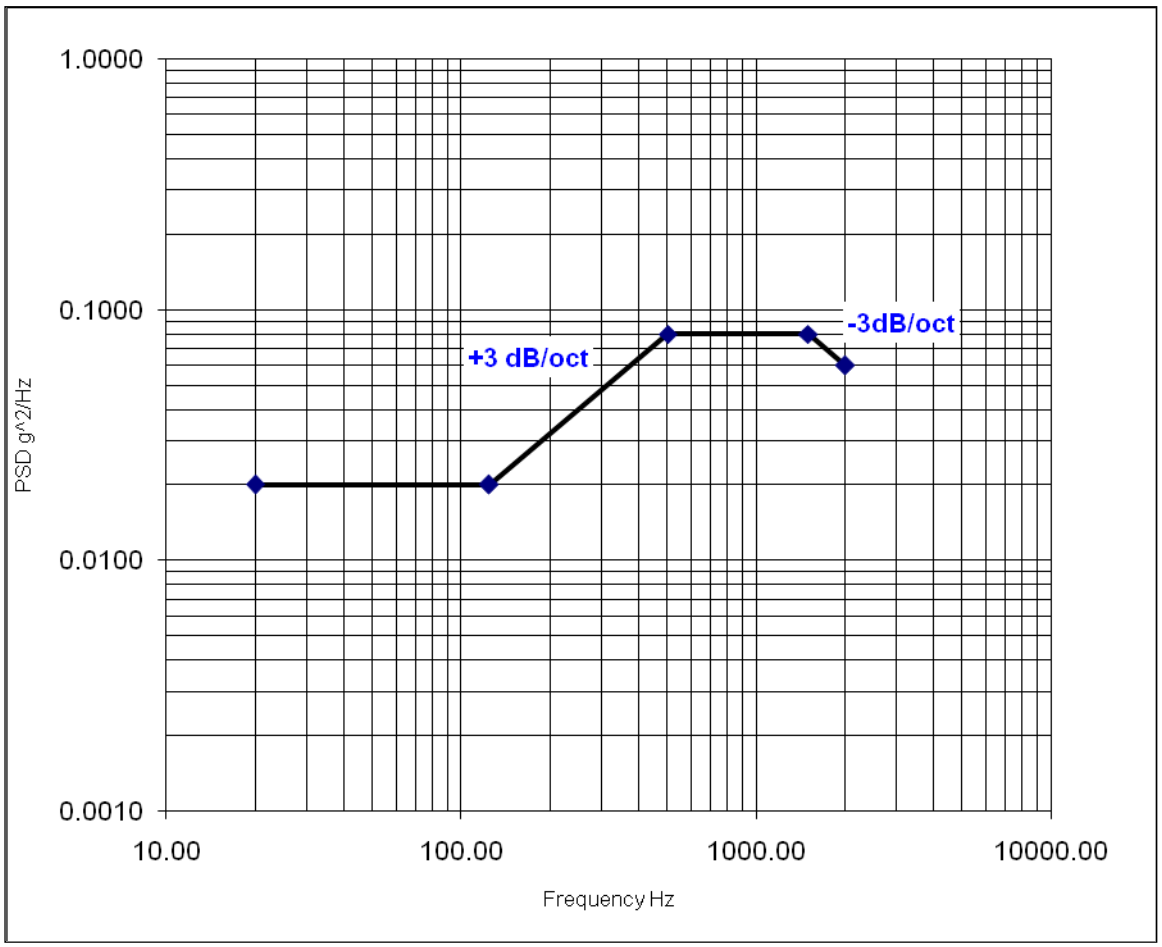

Figure-9 - Vibration Test Profile for Random Vibration Testing

Table-5

Frequency Hz	**P.S.D g^2/H_z**	**Slope**	**Grms**
20	0.02	----	11.64
124	0.02	+3 dB/Octave	
500	0.08		
1500	0.08	-3 dB/Octave	
2000	0.08		

4.1.2.3 Acceptance Criteria:

a) PCM Module should satisfy pre and post vibration test as per ATP of PCM Module in Annexure-2

b) Resonance frequencies of the PCM module with the fixture post vibration shall be within ±10% of the initial resonance frequencies.

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ANNEXURE I

Ref: OPS/OS/SC/2021-22/68/62 **Date: 13.11.2021**

4.1.3 HIGH TEMPERATURE STORAGE CUM OPERATION TEST

The purpose of this test is to determine that unit can withstand Storage in the temperature of the surrounding atmosphere without experiencing physical damage or deteriorate in performance as per MIL-STD-810F Method 501.4 Procedure 1 & II.

4.1.3.1 Test Procedure:

The High Temperature test shall be performed on the PCM Module by placing the PCM Module in a chamber and increasing the temperature of the entire chamber. Maintain the temperature profile of the chamber as shown in Figure-10. An integrity check to be conducted at 65^{O}C as indicated in the Figure. Examine the PCM Module for deformation.

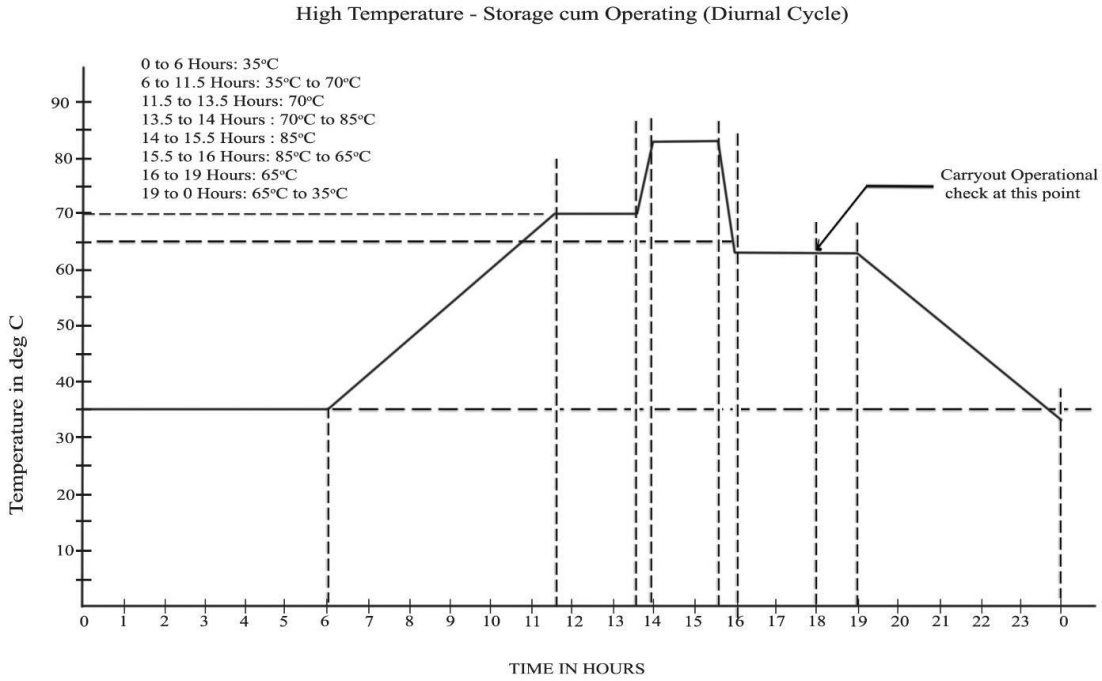

Figure. 10– High Temperature storage cum Operation Test Profile

4.1.3.2 Acceptance Criteria:

PCM Module shall pass Leakage Test pre and post High Temperature Test as per ATP of PCM Module in Annexure-2

4.1.4 LOW TEMPERATURE TEST

The purpose of this test is to determine that unit can withstand Storage in the temperature of the surrounding atmosphere without experiencing physical damage or deteriorate in performance as per MIL-STD-810F Method 502.2 Procedure 1 & II.

4.1.4.1 Test Procedure:

The Low Temperature test shall be performed on the PCM Module by placing the PCM Module in a chamber and lowering the temperature of the entire chamber. Bring the entire chamber to -54 °C as indicated in the Figure, stabilize and soak for two hours. Examine the PCM Module for deformation. Integrity Check to be conducted at '-40^{O}C'.

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ANNEXURE I

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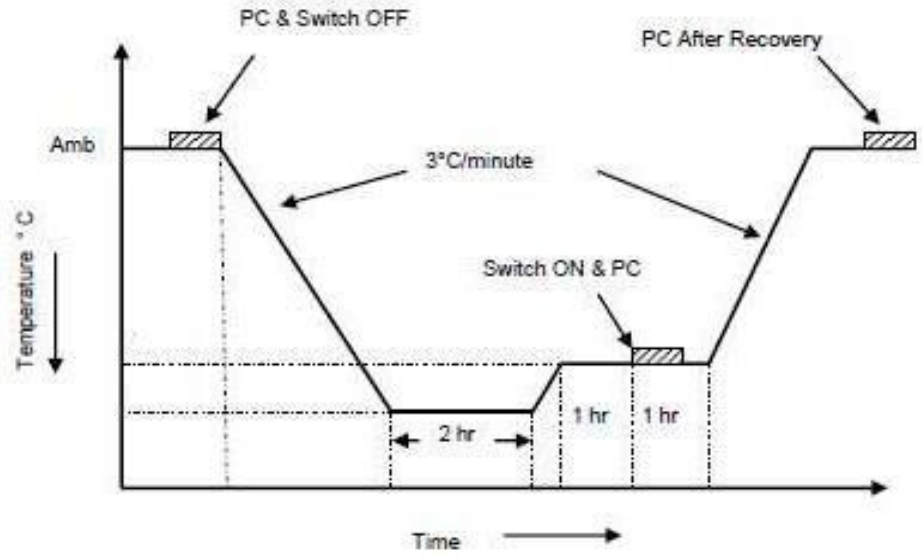

Figure 11- Low Temperature Storage cum operation Test Profile

4.1.4.2 Acceptance Criteria:

The PCM Module shall pass Leakage Test pre and post Low Temperature Test as per ATP of PCM Module in Annexure-2

4.1.5 MECHANICAL SHOCK TEST

The PCM Module shall be subjected to Mechanical Shock Test in accordance with MIL-STD-810F, Method 516.5. The purpose of this test is to check the structural and functional integrity of the unit to shock. Procedure for the test and requirements to be met by the equipment to pass the test are described below.

4.1.5.1 Test Procedure:

The PCM Module shall be mounted onto a suitable fixture, which shall then be mounted on the shock test setup. Three positive and three negative shocks shall be applied along each of three principal axes (refer Figure-13) by orienting the Equipment along each axis in turn. Shocks shall be of Saw-Tooth form with a magnitude of 20 g's over a duration of 11 ± 1 ms.

4.1.5.2 Acceptance Criteria:

The PCM Module should satisfy Leakage Test pre and post shock Test as per ATP of PCM Module in Annexure-2

4.1.6 ACCELERATION TEST

The PCM Module shall be subjected to Acceleration Test in accordance with MIL-STD-810F, Method 513.5. Procedure for the test and requirements to be met by the module to pass the test are described below.

4.1.6.1 Procedure - Acceleration Test

Mount the PCM Module on the Acceleration Test setup oriented along the first test axis on centrifuge. Induce the appropriate acceleration (g) indicated in Table-6 for the orientation being tested. Stabilize system and continue test for a period of one (1) minute. Mount the PCM Module along next test axis and repeat same procedure for each of the other axis orientations in Table-6. Record all test data.

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Table 6: Maximum g- Levels for Acceleration Test - Structural

Direction	Acceleration (g)
Forward (+X)	13.5
Backward (-X)	13.5
Left (+Y)	13.5
Right (-Y)	13.5
Up (+Z)	13.5
Down (-Z)	13.5

4.1.6.2 Requirements - Acceleration Test

The PCM Module should satisfy the Leakage Test pre and post Acceleration Test as per ATP of PCM Module in Annexure-2

4.1.7 ALTITUDE TEST

The PCM Module shall be subjected to Altitude Test in accordance with MIL-STD-810F, Method 500.4, Procedure II. This test is performed to determine if module can withstand and/or operate in a low pressure environment and/or withstand rapid pressure changes. Procedure for the test and requirements to be met by the module to pass the test are described below.

4.1.7.1 Procedure - Altitude Test

The PCM Module shall be placed inside a chamber after closing all its inlet/outlet ports. The module shall be exposed to corresponding Pressure and temperature for an Altitude of 60000 ft (18000 m) altitude (i.e. 7.172 kPa/71.72mbar/54mm of hg). The rate of change of altitude 150m/s. Once the pressure and temperature is achieved, stabilize for ten minutes and hold for two hours. Equipment is to be brought back to atmospheric pressure and shall pass the requirements specified in **4.1.7.2.**

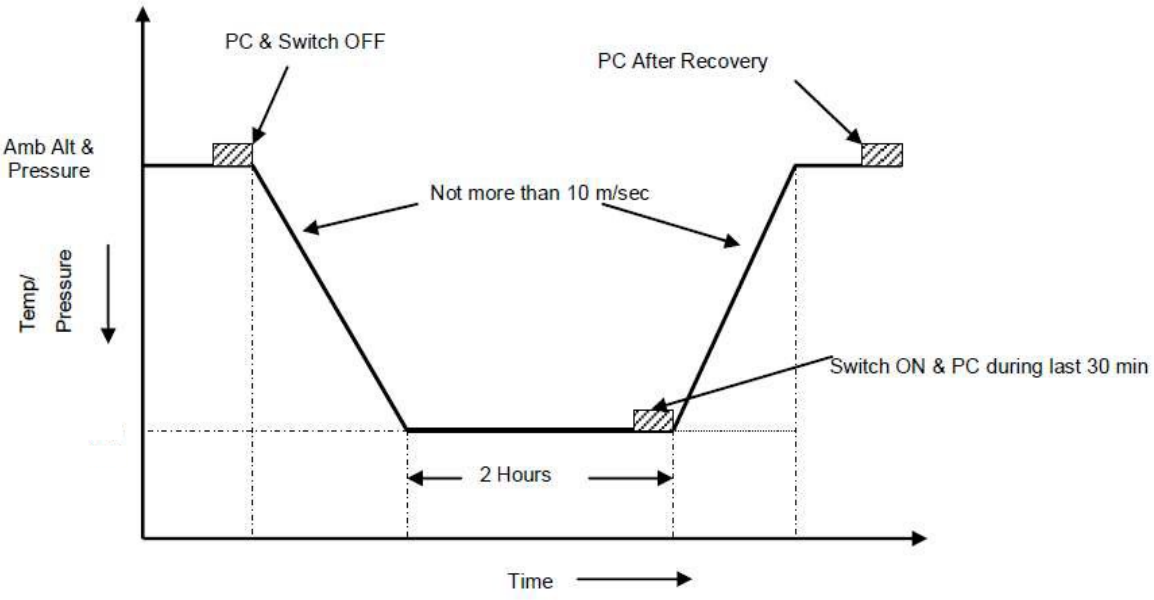

Figure-12-Altitude Test Profile

4.1.7.2 Requirement – Altitude Test

The PCM Module shall pass Leakage Test pre and post Altitude Test as per ATP of PCM Module in Annexure-2

Contd…16

ANNEXURE I

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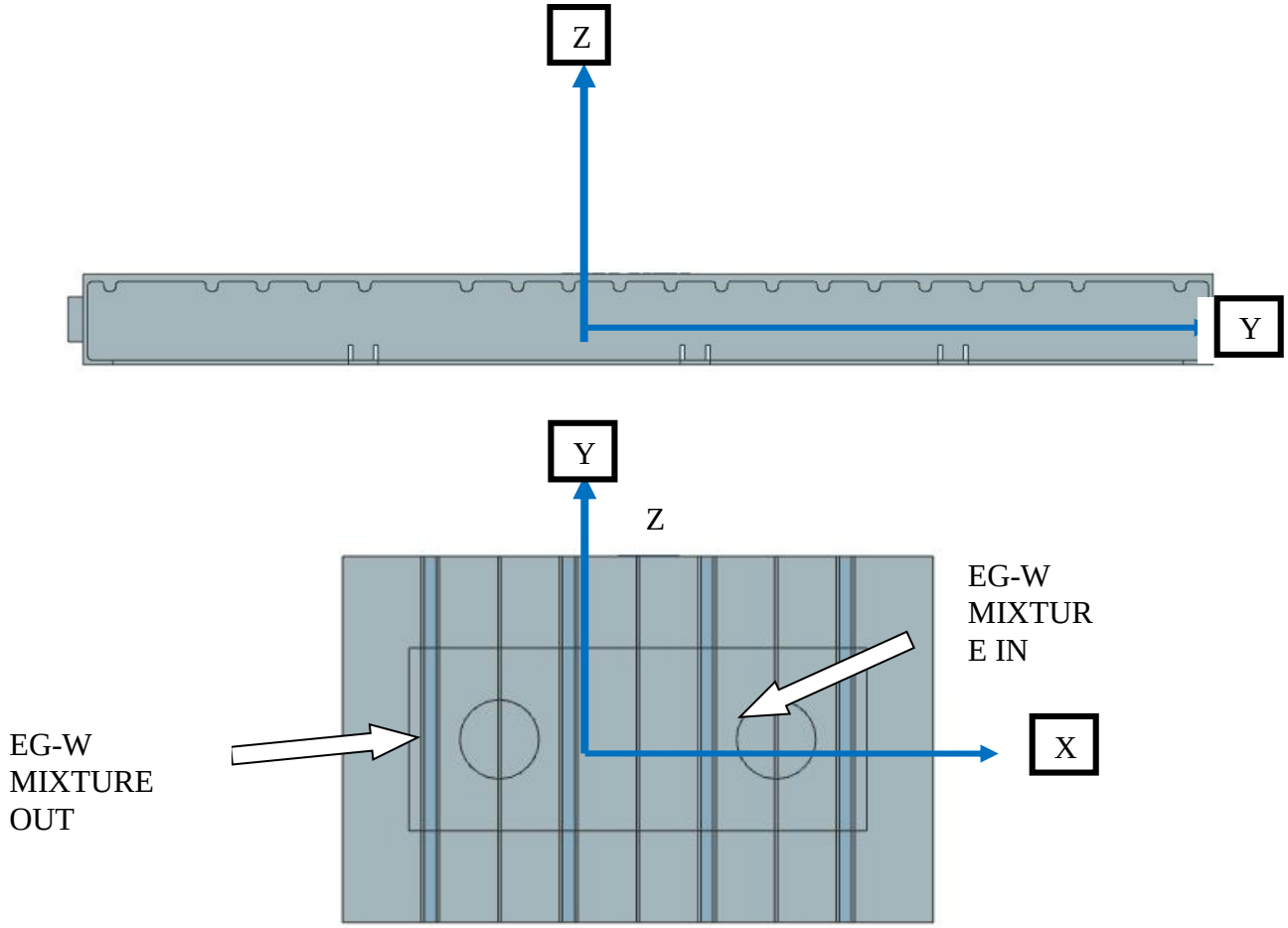

Figure-13: VIBRATION & ACCELERATION AXES FOR ACM MODULE

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ANNEXURE I-A

Ref: OPS/OS/SC/2021-22/68/62 **Date: 13.11.2021**

ATP (ACCEPTANCE TEST PROCEDURE) FOR ACM MODULE

1. SCOPE & OBJECTIVE

This Acceptance Test procedure (ATP) describes the test procedures to be followed for acceptance of the ACM Module Part No. 2041 101 000 developed by M/s BHEL-HPVP, Visakhapatnam meeting the requirement of Design Specification No. DARE/MED/041/REP/1-R3 dt. 15-02-2019.

2. APPPLICABILITY

a) The acceptance test shall be carried out on each ACM Module after fabrication and assembly. Other activities with the ACM module shall be taken up only after successful completion of the ATP
b) Tests listed under section shall be carried out Pre and Post individual qualification tests to verify integrity
c) Tests listed under section shall be carried out in the event of disassembly and subsequent assembly of the ACM Module for any requirement.

3. INSPECTION AUTHORITY

All Acceptance Tests shall be witnessed and inspected by BHEL-HPVP's Quality Control inspector, representatives from DGAQA and CASDIC IQA in accordance with the requirements and procedures specified in this document for each ACM Module. The test report shall be submitted to CASDIC, Bangalore along with each ACM Module

4. INSTRUMENTATION

All instruments used for Acceptance Tests shall be calibrated and certified in accordance with applicable MIL document or BHEL-HPVP's standard calibration system or at NABL accredited Laboratories.

5. TEST ENVIRONMENT

All tests described throughout this document shall be performed on the ACM Module while it is kept at ambient (room) temperature, ambient pressure and humidity, unless otherwise specified in this document.

6. TOLERANCES ON TEST PARAMETERS

The maximum allowable tolerances on various test parameters (exclusive of equipment accuracy) for various tests described throughout this document shall be as follows, unless otherwise specified in this document.

Flow	:	± 5 %
Pressure	:	± 5 %
Temperature	:	± 5 °C

7. ACCEPTANCE TEST SEQUENCE

The Acceptance tests as per sequence below shall be performed on ACM Module upon during Limited Qualification Test to verify the integrity of ACM Module.

Table 1 Acceptance tests sequence

Sequence	Name of Test
1	Visual Examination
2	Leakage Test
3	Integrity Check

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ANNEXURE I-A

Ref: OPS/OS/SC/2021-22/68/62 **Date: 13.11.2021**

7.1 VISUAL EXAMINATION & BUILD STANDARD

Visually examine all the components/sub-assy. for corrosion, dents and visual external damage.

7.2 LEAKAGE TEST

The entire air path of the ACM Module shall be tested for absence of any leaks using air at 0.5 bar pressure (gauge). Procedure for the test and requirements to be met by the ACM Module to pass the test are described below.

7.2.1 PROCEDURE

A schematic of the ACM Module is shown in figure 1-2. The scoop and cover assembly shall be removed from the ACM Module since the inlet and outlet scoops are of non- standard shapes, hence ensuring a leak proof clamping for the same would not be possible.

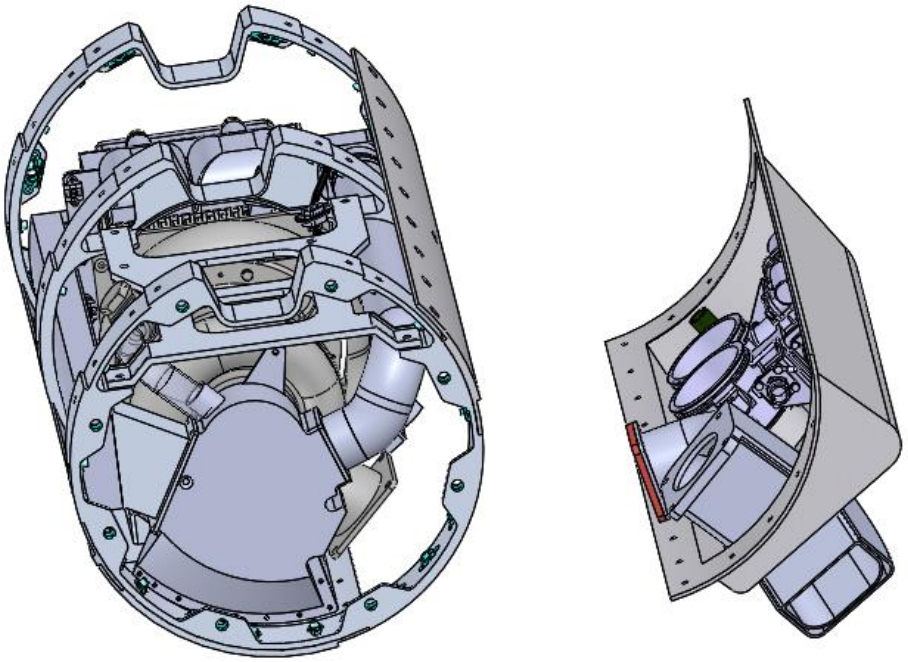

Figure 1 Scoop cover assembly

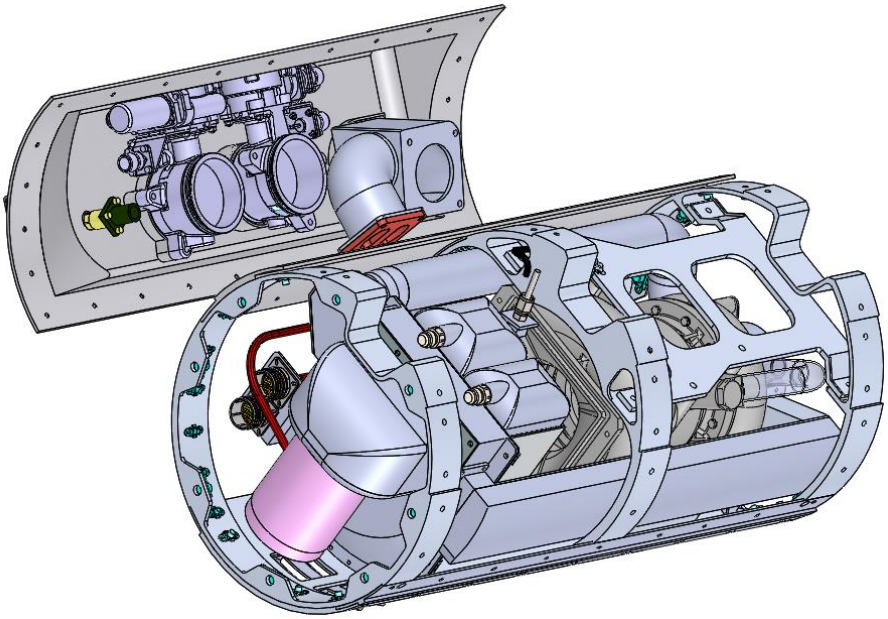

Figure 2 Scoop cover assembly view2

Contd…19

Further all the openings as shown in figure 2 shall be plugged by using appropriate gasket and metal blanks.

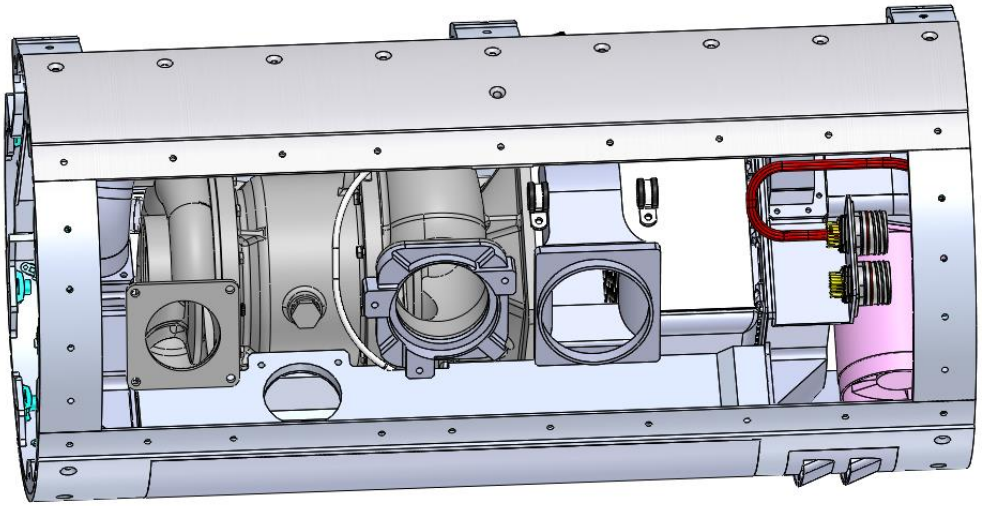

Figure 3 ACM Module openings

Pressured air supply to the turbine inlet shall be provided to the ACM Module, the compressor exit shall be blocked by using a suitable blind. It shall be ensured that no air bubbles remain in either the Heat Exchanger or hydraulic line. Pneumatic pressure shall then be raised gradually to 0.5± 0.25 kg/cm2(g) by checking the reading on the pressure gauge. This pressure shall be maintained for a period of 5 (two) minutes.

7.2.2 ACCEPTANCE CRITERIA

The ACM Module, when tested, shall not show any evidence of leakage. If leakages are found, they are to be addressed by utilizing suitable sealants/gaskets. And the test may be repeated to satisfy the above requirement.

7.3 INTEGRITY CHECK

7.3.1 PREPARATION FOR TEST

The following instrumentation shall be sourced for the checks

a) Variable DC power supply (0-28V)
b) AC 115 V 400 Hz Power supply
c) Electrical looms with suitable mating connectors shall be connected with the power and signal connectors in the ACM Module (D38999 20WD35PN and 20WD18PN)
d) Multimeter to measure current output from the temperature sensor in micro amps.

7.3.2 PROCEDURE FOR AIR VALVE TEST

a) Energize the Air valve 1 and 2 which are positioned at the turbine inlet and ram air bypass locations by connecting the electrical loom to the DC power supply.
b) A supply voltage of 28-30 Volts may be provided to actuate the valves.
c) Once the valve rotation is complete from full open to full close condition, the valve automatically stops and does not draw any additional current from the supply.
d) The opening and closing of the valve may be carried out 10 times to notice any anomalies.

ACCEPTANCE CRITERIA

e) The valve should successfully open and close during the test which can be seen visually if the scoop cover is opened else it is to be inferred by the sound of the valve operation.

Contd…20

7.3.3 PROCEDURE FOR TURBINE SCROLL HEATER

a) Energize the turbine scroll heater by connecting the electrical loom to the AC power supply for duration of 30 seconds.

ACCEPTANCE CRITERIA

b) Measure the current drawn by the heater, the total power is drawn by the heater is less than 150 Watts.

7.3.4 PROCEDURE FOR GROUND FAN

a) Energize the ground fan by connecting the electrical loom to the AC power supply for duration of 1 minute.

ACCEPTANCE CRITERIA

b) No abnormal sound /rubbing during the fan operation is acceptable

c) Measure the current drawn by the fan, the total power is drawn by the fan is less than 300 Watts.

7.3.5 PROCEDURE FOR RAM AIR TEMPERATURE SENSOR

a) The Ram air temperature sensor is of RTD type. Connect the same to a multi meter through the electrical loom and measure the resistance output from the sensor.

ACCEPTANCE CRITERIA

b) Verify the measured value of resistance against the RTD calibration chart.

c) The measured value should correspond to the ambient temperature.

7.3.6 PROCEDURE FOR TURBINE OUTLET TEMPERATURE SENSOR

a) The turbine outlet temperature sensor is of thermister type. The sensor shall be connected to DC power supply with the multi meter in series.

b) A DC power supply of 5-10 V shall be provided to the sensor and the current consumed shall be measured in micro amps.

c) The sensor provides an output of 1µamp /Kelvin.

ACCEPTANCE CRITERIA

d) The measured value should correspond to the ambient temperature around the turbine outlet.

7.3.7 PROCEDURE FOR ACM ROTATION

a) Air supply from an external fan or blower may be directed towards the turbine inlet of the air cycle machine.

ACCEPTANCE CRITERIA

b) Examine the rotation of the ACM.

c) No irregular noises, unexpected behaviour of the ACM should be seen.

8. REPORTS

Table 2 ACM Module tests

NO	TEST Description	PASS/FAIL	Name	Signature
1	Visual			
2	Assembly and Dimension check			
3	Leakage test			

Contd…21

ANNEXURE I-A

Ref: OPS/OS/SC/2021-22/68/62 **Date: 13.11.2021**

Table 3 Integrity Check

NO	TEST Description	PASS/FAIL	Name	Signature
1	Air valve operation			
2	Turbine scroll heater operation			
3	Ground fan operation			
4	Ram air temperature sensor operation			
5	Turbine outlet temperature sensor operation			
6	ACM Rotation			

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ANNEXURE I-B

Ref: OPS/OS/SC/2021-22/68/62 **Date: 13.11.2021**

ATP (ACCEPTANCE TEST PROCEDURE) FOR PCM MODULE

1. SCOPE & OBJECTIVE

This Acceptance Test procedure (ATP) describes the test procedures to be followed for acceptance of the PCM Module Part No. 2041 103 000 developed by M/s BHEL-HPVP, Visakhapatnam meeting the requirement of Design Specification No. DARE/MED/041/REP/1-R3 dt. 15-02-2019.

2. APPPLICABILITY

a) Tests listed under section shall be carried out Pre and Post individual qualification tests to verify integrity
b) Tests listed under section shall be carried out in the event of disassembly and subsequent assembly of the PCM Module for any requirement.

3. INSPECTION AUTHORITY

All Acceptance Tests shall be witnessed and inspected by BHEL-HPVP's Quality Control inspector, representatives from DGAQA and CASDIC IQA in accordance with the requirements and procedures specified in this document for each PCM Module. The test report shall be submitted to CASDIC, Bangalore along with each PCM Module

4. INSTRUMENTATION

All instruments used for Acceptance Tests shall be calibrated and certified in accordance with applicable MIL document or BHEL-HPVP's standard calibration system or at NABL accredited Laboratories.

5. TEST ENVIRONMENT

All tests described throughout this document shall be performed on the PCM Module while it is kept at ambient (room) temperature, ambient pressure and humidity, unless otherwise specified in this document.

6. TOLERANCES ON TEST PARAMETERS

The maximum allowable tolerances on various test parameters (exclusive of equipment accuracy) for various tests described throughout this document shall be as follows, unless otherwise specified in this document.

Flow	± 5 %
Pressure	± 5 %
Temperature	± 5 °C

7. ACCEPTANCE TEST SEQUENCE

The Acceptance tests as per sequence below shall be performed on PCM Module during the LQT tests, to verify the integrity of the PCM Module.

Table 4 Acceptance tests sequence

Sequence	Name of Test
1	Visual Examination & Build Standard
2	Leakage Test

Contd…23

ANNEXURE I-B

Ref: OPS/OS/SC/2021-22/68/62 **Date: 13.11.2021**

7.1 VISUAL EXAMINATION & BUILD STANDARD

Visually examine all the components/sub-assy. for corrosion, dents and visual external damage.

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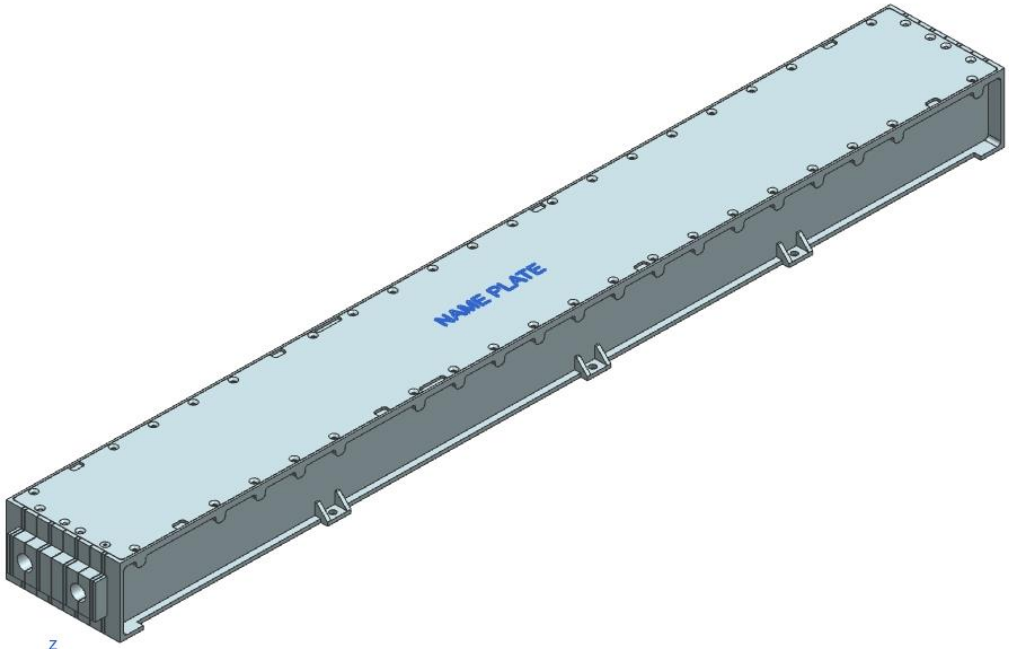

Figure 1 PCM Heat exchanger

7.2 LEAK TEST

The EG-W circuit of the PCMHE shall be tested for absence of any leaks using air / inert gas at 4.0 Kg/cm2(g), to ensure that all joints in it are sound after all other tests. This test Procedure for the test and requirements to be met by the heat exchanger to pass the test are described below.

7.2.1 PROCEDURE – PNEUMATIC LEAK TEST

The EG-W circuit of the PCMHE shall be capped using a suitable blank and shall be connected to a compressed air / inert gas source, through a suitable isolation valve. A pressure gauge of adequate range shall be connected to the line between the isolation valve and air inlet port. The exchanger shall then be kept submerged inside a tank filled with water. Air / inert gas supply into the exchanger shall then be turned on by gradually opening the isolation valve. The exchanger shall be kept submerged under water throughout the test duration. A supply pressure of 4.0 $\pm$ 0.5 kg/cm2 (g) shall be maintained, by checking the reading on the pressure gauge, for a period of 2 (two) minutes.

7.2.1.1 ACCEPTANCE CRITERION – PNEUMATIC LEAK TEST

The PCM Heat Exchanger, when tested as specified above, shall not show any evidence of leakage in the form of air bubbles emerging from the water in which the exchanger is kept submerged.

8. REPORTS

Table 5 Heat exchanger test

NO	TEST Description	PASS/FAIL	Name	Signature
1	Visual			
5	Leakage Test			

***

ANNEXURE II

Ref: OPS/OS/SC/2021-22/68/62 **Date: 13.11.2021**

SCOPE OF WORK

LIMITED QUALIFICATION TESTs (LQT) OF ACM MODULE AND PCM MODULE OF 2 KW LIQUID COOLING SYSTEM (LCS)

1. To perform Limited Qualification Test (LQT) separately as indicated in Table-1 & Table-4 of Technical Specification of Limited Qualification Test Document No. **LQT-2KW LCS-001** *Rev No. 00* dated 25-09-2021 for

    a) ACM Module and
    b) PCM Heat Exchanger Module

2. ESS Testing of ACM & PCM Module: Random vibration test: 5 minutes per axis

3. To fabricate required fixture to conduct the LQT (Limited Qualification Test).

4. To prepare and consolidate the test reports.

5. Tests will be witnessed by reps of BHEL, Visakhapatnam/ CASDIC, Bangalore/ DGAQA, Bangalore.

6. Test Plan to be submitted before conducting the tests

7. Prior intimation (at least one week) to be given to BHEL-HPVP before conducting the Tests. This is required for coordinating with other concerned agencies to witness the tests.

8. The supplier to submit their offer with break-up cost of individual tests. The fixture cost also to be submitted as break-up cost.

9. The total duration of limited qualification tests will be 3 months from placement of PO.

10. The supplier has to comply with the requirements specified in the LQT specification. The supplier to submit the signed copy of the LQT specification along with the offer.

11. **Sending of Items/ Equipments for testing to vendor's work is in the scope of BHEL-HPVP, Visakhapatnam and Return of the same from vendor's work will be of Vendor's scope.**

***

ANNEXURE – III

Ref: OPS/OS/SC/2021-22/68/62 **Date: 13.11.2021**

Sub: Contract for carrying out Limited Qualification Tests (LQT) for ACM Modules and PCM Modules of 2 KW Liquid Cooling System of M/s. BHEL-HPVP, Visakhapatnam – Reg.

ACCEPTANCE TO TENDER TERMS & CONDITIONS

I / We hereby confirm that the Tender documents, all annexures etc. have been studied in detail and we have fully understood the scope of work.

I / We accept to all the **Terms and Conditions** of the Tender Enquiry and the prices quoted are in accordance with the same.

I / We accept to offer valid for a period of **3 months** from the last date for tender submission.

I / We give our acceptance to participate in **Reverse Auction** in case BHEL decides to go for reverse auction for this tender.

Tender documents duly signed on all the pages by the Owner / authorized representative of the bidder are attached herewith.

***

ANNEXURE- IV

Ref: OPS/OS/SC/2021-22/68/62 **Date: 13.11.2021**

CONTRACTOR INFORMATION

Sl. No.	Particulars	To be Filled by Bidder
01.	Name of the Contractor	
02.	Nature of Firm / Concern (Proprietor/Partnership/Pvt. Limited/Public Ltd.) Note: In case of partnership concern, please enclose photo copies of the partnership deed	
03.	Full address	
04.	Name of the Proprietor/Partner	
05.	Name of the Person(s) and designation authorized for signing the contract/dealing with BHEL	
06.	Telephone No. of the firm	
07.	Fax No.	
08.	Mobile No.	
09.	E-mail ID	
10.	HSN Code./ SAC Code	
11.	Organizational structure with name and designation	

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ANNEXURE- V

Ref: OPS/OS/SC/2021-22/68/62 **Date: 13.11.2021**

CHECK LIST

Sl. No.	Particulars	Document Enclosed (Yes / No)	Document No
01.	Name of the Contractor		
02.	Tender Document Signed & Stamped		
03.	GSTIN Registration Certificate		
04.	HSN / SAC Code		
05.	PAN Number		
06.	Income Tax Returns for last 3 years		
07.	Profit & Loss account and Balance Sheet certified by the Practicing Chartered Accountant for the last 3 years		
08.	Work orders & Job Completion Certificates in similar works as mentioned in eligibility criteria.		
09.	MSE Registration Documents for relevant works as per Tender (if applicable) Valid NSIC certificate **or** Valid MSME registration/ Udyog Aadhaar Certificate **Or** Valid Udyam Registration Certificate		
10.	Startup India – Certificate of Recognition (if Applicable)		

***

ANNEXURE-VI

Ref: OPS/OS/SC/2021-22/68/62 **Date: 13.11.2021**

BID-SECURING DECLARATION FORM

To,
Dy. Manager
Outsourcing Department,
BHEL- HPVP, Visakhapatnam

I/We, the undersigned, declare that:
I/We understand that, according to your conditions, bids must be supported by a Bid-Securing Declaration.

I/We accept that I/we will automatically be suspended from being eligible for bidding in any contract with BHEL for a period of **10 months** from the date of notification, if I am /we are in breach of any obligation(s) under the bid conditions, because I/we:

a) have withdrawn/modified/amended, impairs or derogates from the tender, my/our Bid during the period of bid validity specified in the form of Bid; or
b) having been notified of the acceptance of our Bid by the purchaser during the period of bid validity,

   (i) fail or refuse to execute the Contract, if required,
   or
   (ii) fail or refuse to furnish the Performance Security, in accordance with the Instructions to Bidders.

I/We understand this Bid-Securing Declaration shall expire if I am/we are not the successful Bidder, upon the earlier of (i) our receipt of your notification of the name of the successful Bidder; or (ii) **thirty days** after the expiration of my/ our Bid.

Signature of Tenderer with Company Seal

Date:

Place:

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ANNEXURE – NEFT

ACCEPTANCE FOR ELECTRONIC FUND TRANSFER / RTGS / NEFT TRANSFER

01	NAME & ADDRESS OF THE SUPPLIER / SUBCONTRACTOR	
02	VENDOR CODE ASSIGNED BY BHEL,HPVP LTD	

DETAILS OF BANK ACCOUNT

03	NAME & ADDRESS OF THE BANK	
04	NAME OF THE BRANCH	
05	BRANCH CODE	
06	MICR CODE	
07	ACCOUNT NUMBER	
08	TYPE OF ACCOUNT	
09	BENEFICIARY'S NAME	
10	IFSC CODE OF THE BRANCH	
11	EMAIL ID	
12	TELEPHONE / MOBILE NUMBER	

CERTIFICATE

I / We here by agree to receive the payments due from M/s Bharat Heavy Electricals Ltd., by the National Electronic Fund Transfer / or RTGS Transfer mode by credit to my / our above mentioned Bank account. I / We also agree that payments made to the above mentioned account are a valid discharge of the liability of M/s Bharat Heavy Electricals Ltd. I / We also agree to bear the applicable Bank charges for the above mode of transfer. A copy of the Cheque leaf/ cancelled Cheque leaf of the above account is sent herewith.

(Authorized Signatories with Name & Seal)

BANKER'S CERTIFICATION

We confirm that we are enabled for receiving RTGS and NEFT credits and we further confirm that the account number of _____ _____ (name of account holder), the signature of authorized signatory and the MICR and IFSC codes of our branch mentioned above are correct.

Place: Bank Manager / Officer

Date: Signature with Bank stamp and Name seal

FORWARDED TO ACCOUNTS DEPARTMENT / CASH SECTION

We confirm the above details are verified with the records available with us

Signature of BHEL Official with Name & Seal

Operating the contract / Services

ANNEXURE- GST

GST COMPLIANCE FOR INDIGENOUS SUPPLIERS / CONTRACTORS

1. In Response to Tenders for Indigenous supplier will be entertained only if the vendor has a valid GSTIN which should be clearly mentioned in the offer. If any specific exemption is available, a declaration with due supporting documents need to be furnished for considering the offer.
2. Supplier shall mention their GSTIN in all their invoices and invoices shall be in the format as specified/prescribed under GST laws. Invoices shall necessarily contain Invoice number (in case of multiple numbering system is being followed for billing like SAP invoice no, commercial invoice no etc., then the Invoice No which is linked/uploaded in GSTN network shall be clearly indicated), item description as per P0, Quantity, Rate, Value, applicable taxes with nomenclature (like IGST, SGST, CGST & UTGST) separately, HSN/ SAC Code, etc.
3. All invoices shall bear the HSN Code for each item separately (Harmonized System of Nomenclature)/ SAC code (Services Accounting Code).
4. A declaration to the effect that all invoice particulars are/were uploaded in the GSTN network/ portal & all tax liability as per GST rules and regulations have been and will be discharged, shall be mentioned in the invoice. If not mentioned in the invoice, a separate declaration shall be submitted as per the requirement of BHEL.
5. All documents like Test Certificate, LR copy, Guarantee/Warrantee certificate, work completion certificate, any other document mentioned in PO, shall be sent along with the vehicle/consignment where ever applicable. For all consignments received within the calendar month, input credit will be availed within that month in line with monthly returns filing cycle. In case of any discrepancy in the document or non-submission of documents mentioned in the PO, then BHEL will not be able to accept or account the material, in such case availing of tax credit will be deferred to next month or so.
6. In case of discrepancy in the data uploaded by supplier in the GSTN portal or in case of any shortages or rejection in the supply, then BHEL will not be able to avail the tax credit and will notify the supplier of the same. Supplier has to rectify the data discrepancy in the GSTN portal or issue credit note (details to be uploaded in GSTN portal) for the shortages or rejections in the suppliers, within the calendar month notified by BHEL.
7. For any such delay in availing of tax credit for reasons attributable to supplier (as mentioned above), interest (calculated @ SBI Base Rate + 6%) along with penalty if any will be deducted for the delayed period i.e. from the month of receipt till the month tax credit is availed, from the running bills.
8. Under GST regime, BHEL has to discharge GST liability on LD recovered from suppliers/ contractors. Hence applicable GST shall also be recoverable from suppliers/contractors on LD amount. For this Debit note will be issued by BHEL indicating the respective supply invoice number.
9. This is to inform that GST portion of invoice, shall be released only upon Vendor declaring such invoice in his GSTR-1 and receipt of goods and Tax invoice by BHEL and Confirmation of payment of GST thereon by vendor on GSTN portal. Alternatively, BG of appropriate value may be obtained from vendor which shall be valid At least one month after the confirmation of date of payment of GST by vendor on GSTN portal and receipt of Tax invoice and receipt of goods, whichever is later. Above is subject to receipt of goods/service and tax invoice thereof along with vendor declaring invoice in his return and paying GST within timeline prescribed for availing ITC by BHEL.
10. That in case vendor delays Declaring such invoice in his return and GST credit availed by BHEL is denied or reversed subsequently as per GST law, GST amount paid by BHEL towards such ITC reversal as per GST law shall be recoverable from vendor/contractor along with interest levied/ leviable on BHEL.

Note: The above will be followed strictly for Processing vendor payments to ensure GST Compliance.

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ANNEXURE- VII

BHARAT HEAVY ELECTRICALS LIMITED
HEAVY PLATES & VESSELS PLANT
VISAKHAPATNAM – 530 012

PRICEBID
PART-II

NAME OF WORK:

Contract for carrying out Limited Qualification Tests (LQT) for ACM Modules and PCM Modules of 2 KW Liquid Cooling System of M/s. BHEL-HPVP, Visakhapatnam – Reg.

Tender Enquiry No.: OPS/OS/SC/2021-22/68/62, Date: 13.11.2021

NOTE:

1) **Tenderers are requested to visit the site before submitting their tenders and go through the site conditions, nature and quantum of the job to be done and in general shall themselves obtain all necessary information as to risks, safety precautions, contingencies and other circumstances. A tenderer shall be deemed to have full knowledge of the site, whether he inspects it or not, no claim shall be allowed.**

2) **The quoted prices shall be fixed & firm without any escalation during the entire period of contract and till completion of the work.**

3) **The quoted prices shall be inclusive of all applicable taxes, duties and GST as applicable as on date of tender submission.** However, GST as applicable shall be payable by the contractor and same will be reimbursed by BHEL as per Annexure - GST.

4) **L1 shall be evaluated based on quoted total price.** However, BHEL reserves the right to negotiate with L1 vendor.

5) **Sending of Items/ Equipments for testing to vendor's work are in the scope of BHEL-HPVP, Visakhapatnam and Return of the same from vendor's work will be of Vendor's scope.**

ANNEXURE- VII

BHARAT HEAVY ELECTRICALS LIMITED
HEAVY PLATES & VESSELS PLANT
VISAKHAPATNAM – 530 012

Sub: Contract for carrying out Limited Qualification Tests (LQT) for ACM Modules and PCM Modules of 2 KW Liquid Cooling System of M/s. BHEL-HPVP, Visakhapatnam – Reg.

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Tender Enquiry No.: OPS/OS/SC/2021-22/68/62, Date: 13.11.2021

SCHEDULE OF QUANTITIES & RATES

SL No	Description of work	Unit	Total Amount including GST in ₹
1	Contract for carrying out Limited Qualification Tests (LQT) for ACM Modules and PCM Modules of 2 KW Liquid Cooling System of M/s. BHEL-HPVP, Visakhapatnam	Lump sum.	

Total Amount in Words: