



MINISTRY OF MICRO, SMALL & MEDIUM ENTERPRISES  
GOVERNMENT OF INDIA

# सेन्ट्रल टूलरूम एन्ड ट्रेनिंग सेन्टर, भुवनेश्वर CENTRAL TOOL ROOM & TRAINING CENTRE, BHUBANESWAR

भारत सरकार की सोसाइटी, सूक्ष्म, लघु एवं मध्यम उद्यम मंत्रालय  
Government of India Society, Ministry of Micro, Small & Medium Enterprises



ISO 9001, 14001, 50001 & 29990  
OHSAS 18001 & AS 9100

## Notice for Expression of Interest (EOI)

CTTC Bhubaneswar invites detail technical proposals along with budgetary price offer from interested reputed Test Rigs Manufacturers for Manufacturing, Supply and Installation of Individual Test Rigs for 3 Different Pumps . **The brief details of the scope of work and deliverables with terms & conditions are available on CTTC website : [www.cttc.gov.in](http://www.cttc.gov.in).**

Interested parties need to submit their detail techno-commercial proposals along with requisite documents by post or by hand to General Manager, Central Tool Room & Training Centre, B-36, Chandaka Industrial Area, Bhubaneswar – 751024. **The last date and time for submission of response to this EOI is Dt. 12.12.2024.** Final Bidding shall be done through GeM portal [gem.gov.in](http://gem.gov.in)

Central Tool Room & Training Centre, Bhubaneswar reserves the right to accept or reject any EOI, and to annul the process and reject all EOIs at any time prior to evaluation without assigning any reason whatsoever.



**General Manager.**

**Central Tool Room & Training Centre**

**B-36, Chandaka Industrial Area, Bhubaneswar-751024**

**Phone: (0674) 2654710**

**Email: [cttc@cttc.gov.in](mailto:cttc@cttc.gov.in)**



## Central Tool Room & Training Centre

(Min. of MSME, Govt. of India)

B/36, Chandaka Industrial Area,

Bhubaneswar-751024, Odisha, India

Scope of work for the design, development, assembly, installation, acceptance testing, and commissioning of the test rig for carrying out the acceptance and endurance tests of:

- 1.AC Double Ended Fuel Booster Pump (BP1)
- 2.DC Starting Pump (DCP)
- 3.Hydraulically Driven Emergency Fuel Pump (BP2)

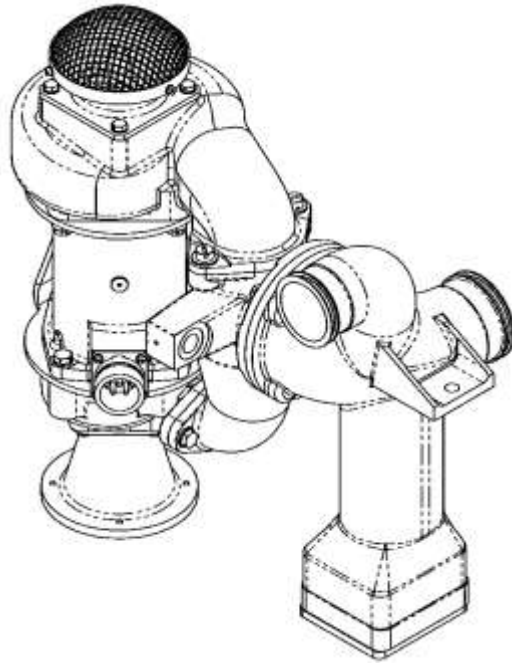
## **1 INTRODUCTION**

This document provides the technical requirements to the design and development of a dedicated fuel test rig to carry out the acceptance and endurance testing of pumps for aircraft application. This fuel pump test rig will be used to evaluate the performance of the pumps as a part of acceptance testing and endurance testing as a part of qualification. The test rig shall have in-built features for recording the parameters, such as pressure, temperature, and flow, and appropriate valves shall be included for achieving cycling and directional control of fluid flow. The rig shall be designed with a primary tank for fitting the test unit and a secondary tank as a buffer tank for fuel storage, accommodating the pumped-out fuel.

The fuel tanks shall be provisioned with features such as pressurisation, draining, fuel level measuring, venting, an appropriate stand for structural support, the required pipe line system, the transfer of fuel between the tanks, etc. The test rig shall have the provision to rotate by 180 degrees to perform an inverted flight test. The developed rig shall be commissioned at the premises of M/s Central Tool Room & Training Centre (CTTC), Bhubaneswar.

## **2 Description of AC Double Ended Booster Pump (BP1)**

This AC Double Ended Fuel Booster Pump (test unit) is designed to provide pressurized fuel flow to the aircraft engine including positive and negative g condition and environment condition severity and in case of motor failure or AC supply failure provide sufficient flow to the engine through a bypass port.

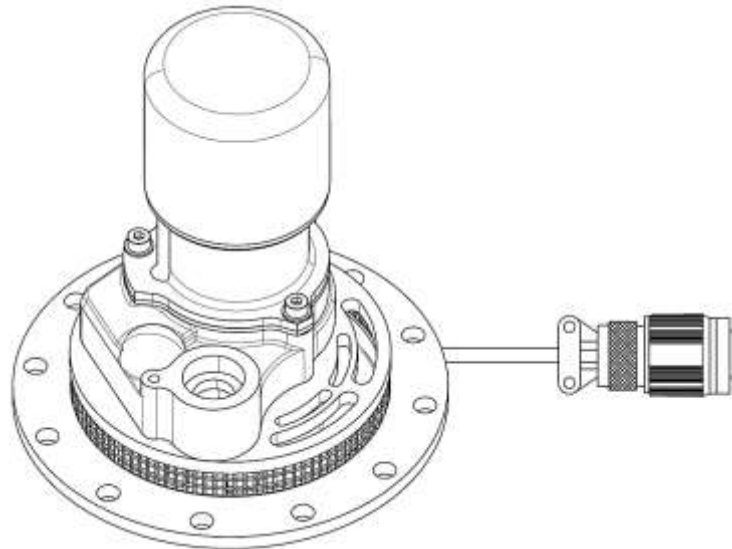


## 2.1 General Specification of Test Unit

- Design point : 7.5 kg/s at 146 kPa at Sea level
- Operating temperature : -40°C to +80°C
- Operating altitude : Sea Level to 18 km
- Max. operating pressure : 345 kPa
- Proof Pressure : 690 kPa
- Over All Dimension : 350mm x 345mm x 180mm (max)
- Outlet connection : Interflex male boss straight connector 22609-02-50A.
- Weight : 6 kg (max.)
- Electrical requirement : 3 phase, 115/200 V AC, 400 Hz
- Power rating : 4.5 kVA/ 3.5 kW

## 3 Description of DC Starting Pump (DCP)

This DC Starting Pump (test unit) is designed to supply fuel in adequate quantity at the required pressure for the Jet Fuel Starter (JFS) for starting on ground and in-flight. And also it shall be used to supply fuel to aircraft engine during in-flight starts up to an altitude of 10 km.

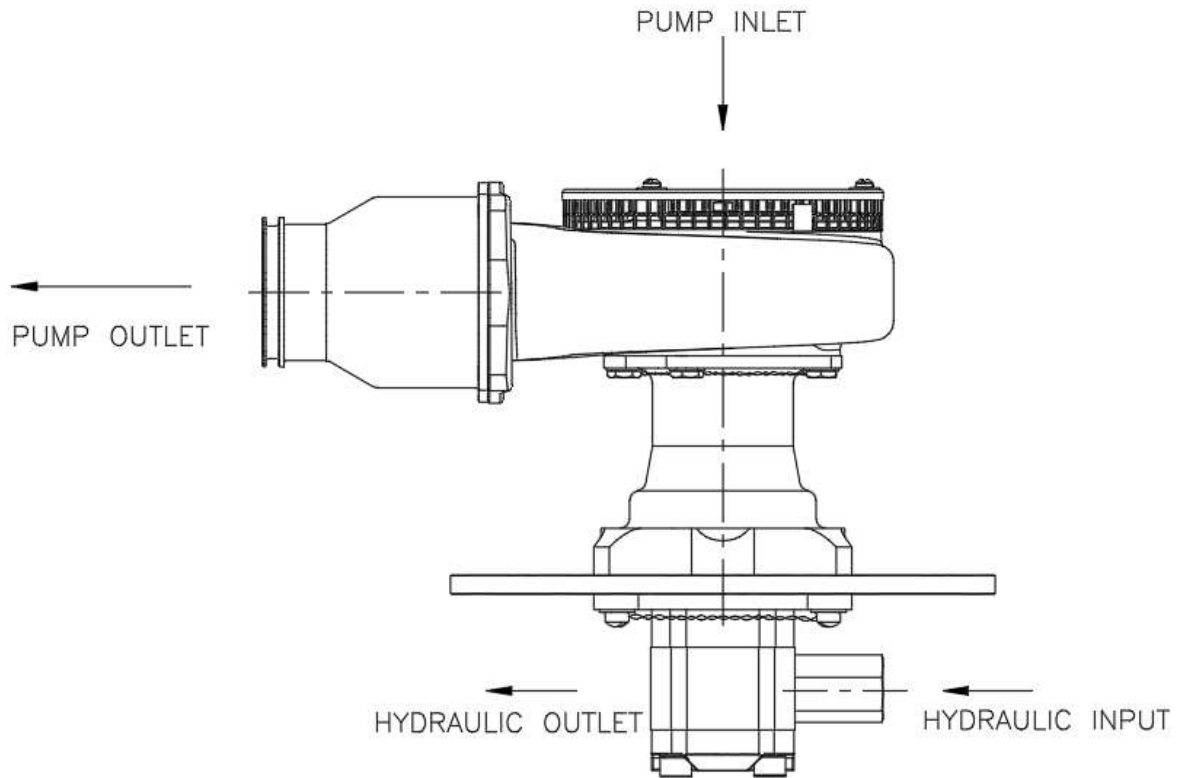


### 3.1 General specification of Test Unit

- Design point : 9 kg/min at 23 psig at Sea level
- Operating temperature : -40°C to +80°C
- Operating altitude : Sea Level to 10 km
- Max. operating pressure : 35 psig
- Proof Pressure : 70 psig
- Over All Dimension : Ø133.5mm x 150mm (max)
- Outlet connection : Interflex male boss straight connector MS33555-1.
- Weight : 1.6 kg (max.)
- Electrical requirement : Operating voltage range 12 to 29V DC
- Power rating : 400 W

## 4 Description of Hydraulically Driven Emergency Pump (BP2)

LCA fuel feed system is incorporated with Hydraulic Motor Driven Emergency Fuel Pump as a standby pump to meet the Engine inlet requirements. This pump is a standby pump to the electrically driven fuel booster pump and is equally capable to meet the full engine requirement. It is driven by a gear motor powered by hydraulic pressure and flow.



## 4.1 General specification of Test Unit

### Pump Specification

- Design point : 4.5 kg/s at 100 kPa at Sea level
- Max. operating Pressure : 200 kPa
- Over All Dimension : 175 × 175 × 200 mm (max)
- Outlet connection : Interflex 22609-02-40A male boss.
- Weight : 2 kg (max.)
- Operating Temperature : - 40° C to +80° C

### Hydraulic Gear Motor Specification

- Hydraulic Power Input : 280 bar at 4.8 lpm
- Operating Temperature : - 54° C to +135° C
- Hydraulic Motor Port Details : Inlet: MJ12 x 1.25 to suit 6 mm OD pipe  
Outlet: M14 x 1.25 to suit 8 mm OD pipe

## 5 Purpose of the Test Rig

The Test rig is designed to carry out as well as the Acceptance test, Qualification Test & Endurance tests for the Fuel Pumps as part of LRU development activities. During testing, working fluid i.e. JET A1 is transferred to the Collector tank by the Test Unit from Test Tank. Depending on the test procedure the fuel will be collected in Collector tank and recycled back.

The following test is to be carried out on the test rig:

<b>Sl. No.</b>	<b>Test Description</b>	<b>Reference Procedure</b>	<b>Applicable Test unit (BP1/ DCP/ BP2)</b>
1.	Calibration of Pump	MIL-P-5238 C Section 4.5.5	BP1, DCP. BP2
2.	Break In Run Test	MIL-P-5238C Section 4.5.3	BP1, DCP. BP2
3.	Endurance test	MIL-P-5238C Section 4.5.16	BP1, DCP. BP2
4.	Dry Endurance test	MIL-P-5238C Section 4.5.17	BP1, DCP. BP2
5.	Contaminated Fuel Endurance	MIL-P-5238C Section 4.5.18	BP1, DCP. BP2
6.	Pump Down test	MIL-P-5238C Section 4.5.7	BP1, DCP. BP2
7.	Blocked inlet screen test	MIL-P-5238C Section 4.5.6	BP1, DCP. BP2
8.	Re-prime	MIL-P-5238C Section 4.5.8	BP1, DCP. BP2
9.	Water in Fuel	MIL-P-5238C Section 4.5.24	BP1, DCP. BP2
10.	Inverted Operation	MIL-P-5238C Section 4.5.9	BP1
11.	Engine Suction mode test	MIL-P-5238C Section 4.5.10	BP1
12.	Leakage Tests (Proof pressure & Burst Pressure Test)	MIL-P-5238C Section 4.5.4.1	BP1, DCP. BP2

### **Provisions of the Test Rigs:**

- Three dedicated test rigs for each pump is to be supplied with independent operating of individual test rig. And one set of Fuel Temperature Control Module, Altitude Control Module and Pressurization Module will be supplied along with three test rigs.
- All test rigs should have provision to integrate with the heating, cooling, Altitude control and Pressurization module as per requirement.
- All the three test rigs should be equipped with Pressure sensor, Temperature sensor and Flow Transducer, or any other measuring devices as per test requirement of suitable ranges for measuring the performance of the Pumps during testing and should be recorded w.r.t time in a text files for future references through Data Acquisition System (DAS). One DAS has to be supplied to integrate with all the three test rigs to record the test data through three dedicated computer station for each test rig.
- Also a station with Hand Pump Module to conduct Leakage tests on the Pump is to be supplied with suitable attachments for individual Pump and also should have provision to measure the leakage.
- The AC Double Ended Duel Booster Pump test rig to be supplied with Variable Frequency Drive (VFD) with adjustable Frequency and Voltage settings of suitable range to conduct electrical power variation tests as per MIL-STD-704.
- The DC Starting Pump test rig to be supplied with Regulated Power Supply (RPS) with adjustable Voltage settings of suitable range to conduct electrical power variation tests as per MIL-STD-704.
- The Hydraulically Driven Emergency Fuel Pump test rig to be supplied with Hydraulic Power Pack with adjustable Flow and Pressure settings of suitable range to conduct Hydraulic power variation tests.
- All electrical measurements like current, voltage, frequency, etc. are to be properly measured with a Power Analyser of suitable quality and precision.

## **6 Objectives of Acceptance and Endurance Test Rig**

The main objectives of the test rig are to perform the following functions:

- Evaluating the performance of an AC double-ended booster pump, DC Starting Pump & Hydraulically Driven Emergency Fuel Pump at various test conditions such as attitude, pressure, temperature, and variations in the electrical power, voltage, etc.
- Carry out endurance testing on the pump at various test conditions as per MIL-P-5238C



- Carrying the performance of the pump in the inverted condition (up/down inlet variations)
- To perform pre-installation checks.
- Conduct dedicated tests to identify the snags and faults.
- Test the pump after the overhaul and maintenance activities.
- Carry out the intended tests with automation and record all the test parameters using a dedicated data acquisition system (DAS).

## **7 SCOPE OF WORK FOR THE VENDOR**

- Generation of technical specification and obtaining the approval from competent authority with due co-ordination of M/s CTTC Bhubaneswar.
- Design of test rig with appropriate material selection, sizing, analysis and optimisation and has to be cleared by Design Review Committee made by the Co-ordinating agency.
- Selection of suitable sensors such as temperature transducer, pressure transducer, flow meter, relay switches, electrical switches and connectors, transfer pumps, fuel level indicators, breather valves, etc.,
- Selection and implementation of suitable resources for the automatic functioning of test rig and resources for fault identification.
- Design of actuation mechanisms, drives or mechanism for achieving the test conditions,
- Generation of design report, which will be reviewed by Design review committee.
- Develop the test rig as per the approved design.
- Generation of detailed fabrication drawings.
- Develop suitable pipe lines systems with standard interfaces.
- Design and development of Data Acquisition System with required interfaces and provision of additional resources as spares for future requirement.
- Vendor has to carry out the complete testing at their end as per approved test schedule and then to offer for the inspection authority of M/s CTTC.
- Generation of Kit of Parts documents with traceability with the help of M/s CTTC and Clearance by the competent authority before despatch to CTTC.
- Packing and Transportation to CTTC Bhubaneswar.
- Commissioning of Test Rig at M/s CTTC, Bhubaneswar.
- Conduct of Rig acceptance Test and final approval.

## **8 INSPECTION AND TESTING:**

- All the inspection shall be carried out by the vendor and generate inspection records for verification by M/s CTTC's Inspection Team.
- The vendor shall carry out the acceptance testing under the supervision of M/s CTTC Bhubaneswar's Inspection Team.

## **9 INSTALLATION, COMMISSIONING AND TRAINING.**

- Installation of Test Rig shall be carried out the identified facilities of M/s CTTC Bhubaneswar.
- Vendor shall impart appropriate training to the identified personals of M/s CTTC.

## **10 RESPONSIBILITIES OF CTTC, BHUBANESWAR**

- CTTC will provide required technical details to the vendor to facilitate the design and development of Test Rig for testing the AC double-ended booster Pump, DC Starting pump and Hydraulically Driven Fuel Emergency Pump.
- CTTC will provide all the Mechanical and Electrical interface details of AC double-ended Booster Pump, DC Starting pump and Hydraulically Driven Emergency Pump to the Vendor.
- 3D model features for the test rig integration study.

## **11 DELIVERABLES**

### **11.1 Documents**

- Detailed design report of Test Rig
- 2D drawings.
- Raw material documents
- Certified Welder document
- Documents in support of accessories/instruments used on test rig like pump, sensors, valves, NRVs etc.
- Dimensional Inspection reports of each components.
- Installation and interface drawings
- Rig Maintenance Manual and Operating Manual
- Any special tools and testers required to carry out maintenance activities on test rig.
- Warranty certificate

## 11.2 Equipments

- Three Test Rigs for three individual Pumps
- Heating Module
- Cooling Module
- Altitude Control Module
- Pressurisation System
- Leakage Testing System
- Three Computer station with one DAS
- Variable Frequency Drive(VFD)
- Regulated DC Power Supply
- Hydraulic Power pack
- Power Analyser
- Other miscellaneous tools, fixtures, attachments, etc. as per requirement for testing of three pumps

## 12 DESCRIPTION OF PROPOSED TEST RIG

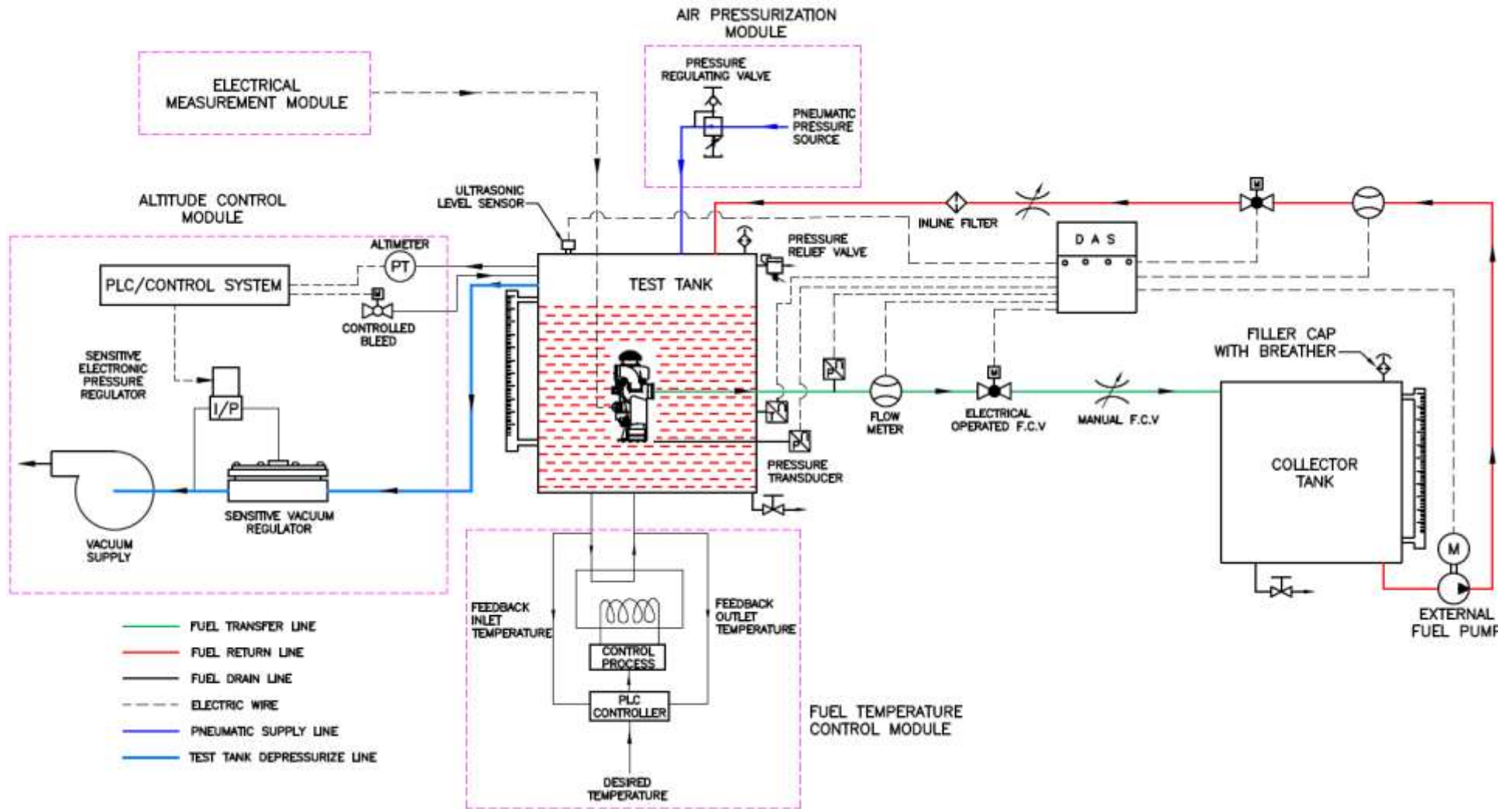
The Test Rig is designed to perform independent ATP and Endurance test so Fuel System using fuel media. Following are the features of Test Rig:

- Simple, Modulating and Ergonomic Design.
- Simplified operation.
- Automatic Generation of test reports.
- Data Acquisition system to store and record/ data of Fuel System Pumps.
- During Acceptance Test Procedure (ATP), the tests will be performed manually but the test data will be acquired and processed automatically, while the endurance tests will be performed automatically and the test data will also be acquired and processed automatically.
- Robust box structure architecture for stability and enhanced service life.
- Backup for uninterrupted power supply (UPS) for at least 6 hours.

## 13 TOP LEVEL REQUIREMENTS OF TEST RIG

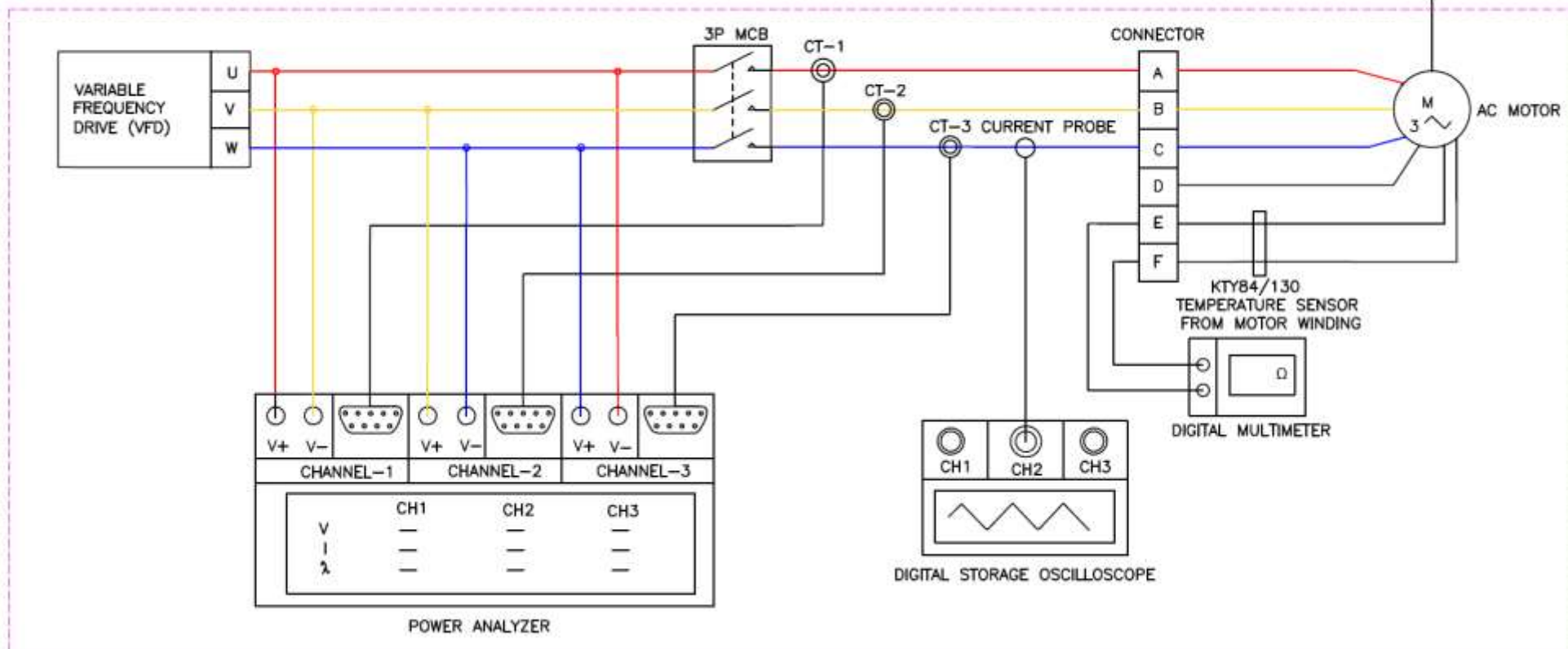
- The Design shall be confirm, to the requirement laid down by ASME section VIII division I/ ANSI and API/ Fire Safety Board Standards.
- The test rig is designed to work with the Jet A1 Fuel and Air.

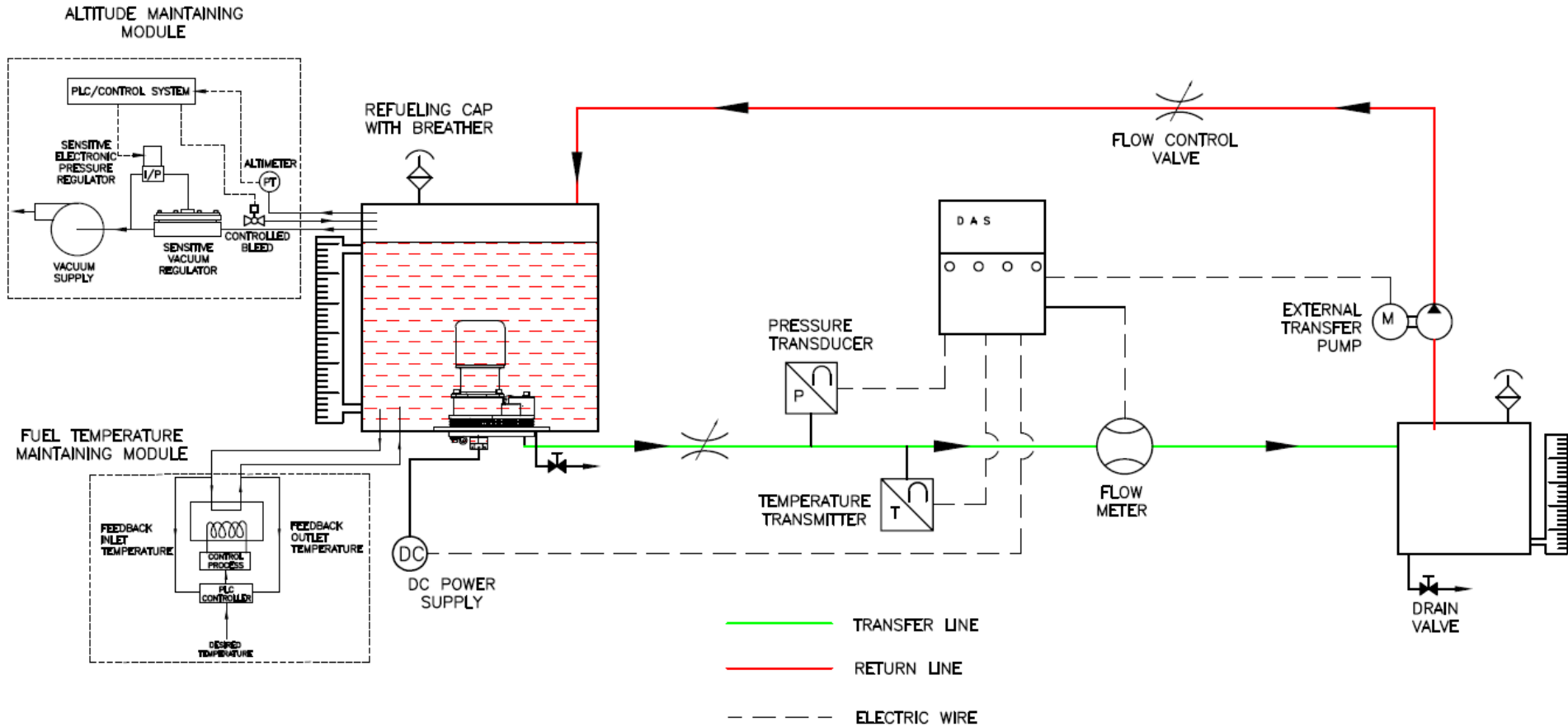
- Additionally the Test rigs shall be provisioned with fuel storage and filtration trolley.
- Pressure drop across the system shall be minimum for this purpose, the components are sized for adequate flow capacity, and the pipe bend are kept to a minimum.
- The test rig shall be designed and fabricated in order to work ergonomically by operator. All the equipment should be installed properly ensuring ease of accessibility.
- Over all dimension of the rig should be compatible enough to install inside a closed room of height 2.5 m. Length and width of the rig shall be optimised in coordination with the Design team of CTTC before fabrication.
- All electronic transducers, measuring equipment, pumps, compressor, fuel-refuelling/ defueling facilities and the test rig shall have common grounding. The electrically operated infrastructure facilities shall be properly earthed. Short circuit protection shall be provided, by way of fuse and circuit breakers (MCB/ ECB).
- Test rigs shall have built in electrical safety system as MCB/ ECB/ Emergency Break up.
- Test rigs shall have fire proof for lighting / illuminating system.
- Sufficient space shall be there between different tanks and lines for working persons to freely stand and work comfortably.
- Protection shall be provided in the testing station appropriately, so that the operator will be shielded from any pressurized component.



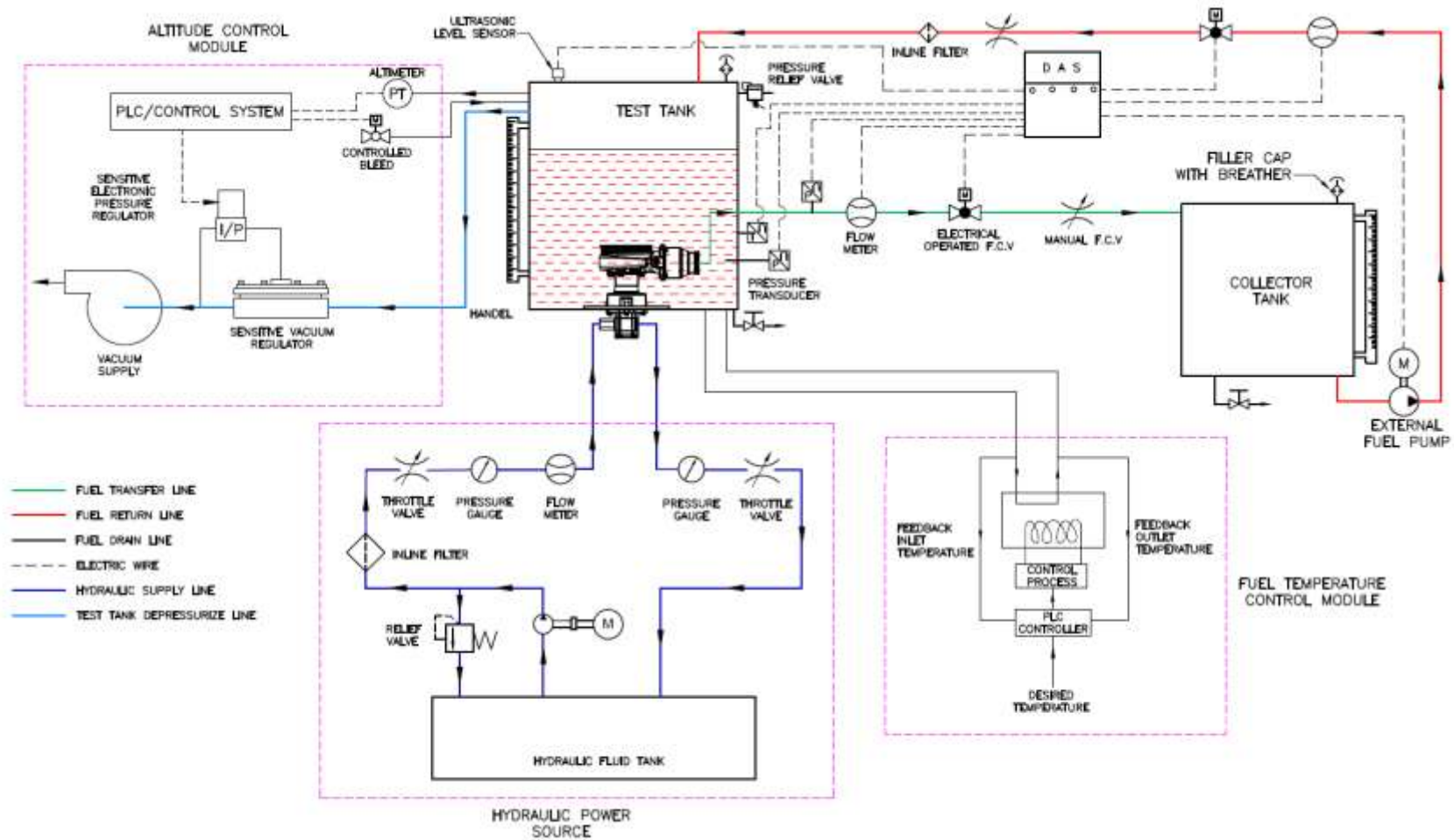
Proposed design concept of Test Rig – Ac Double Ended Fuel Booster Pump

## ELECTRICAL MEASUREMENT MODULE





Proposed design concept of Test Rig – DC Starting Pump



Proposed design concept of Test Rig – Hydraulically Driven Emergency Fuel Pump



## 14 TERMS AND CONDITIONS

### Milestone Details:

Sl. No.	Milestone No.	Activity Description	Duration (Months)
01	Milestone – 1	<ul style="list-style-type: none"> <li>• Study the design requirements</li> <li>• Conceptual Design</li> <li>• Preparation of Technical Specification</li> <li>• Approval of Technical specification</li> <li>• Preparation of design document as per approved technical specification</li> <li>• Preparation of Detailed drawings</li> <li>• Conduct Design review</li> <li>• Approval of Design by Review Committee</li> <li>• Approval of ATP of the test rig</li> </ul>	T0+1 <sup>1</sup> / <sub>2</sub>
02	Milestone – 2	<ul style="list-style-type: none"> <li>• Manufacturing of Rig Elements</li> <li>• Procurements of BOIs and Equipment</li> <li>• DAS system elements</li> <li>• Assembly of Test Rig, DAS and other equipment</li> <li>• KOP preparation and submission for approval with help of CTTC</li> <li>• Conduct ATP to demonstrate the capability of the test rig as per technical specification at vendor premises with CTTC QA</li> </ul>	BP1: T0+4 DCP: T0+4 BP2: T0+5 (Progressively)
03	Milestone – 3	<ul style="list-style-type: none"> <li>• Despatch of Test Rig with all equipment after clearance of CTTC-QA</li> <li>• Installation and Commissioning of the test rigs at CTTC, Bhubaneswar</li> <li>• Conduct ATP and other tests as per requirement</li> </ul>	BP1: T0+4 DCP: T0+5 BP2: T0+6 (Progressively)

		<ul style="list-style-type: none"><li>• Submission of Maintenance Manual</li><li>• Submission of Operating Manual</li><li>• Conduct ATP and other tests as per requirement in presence of Co-ordinating agency for clearance of Test Rig</li><li>• Certification and approval</li><li>• Warranty Certificate</li></ul>	
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