

## Frequently Asked Questions about Ultra Capacitor

1. What is the intended objective of proposed Ultra Capacitor?  
Cranking of Engine when Main Battle Tank is exploited in extreme cold condition.
2. In which platform the proposed Ultra Capacitor to be integrated?  
Presently, proposed for Bhishma Tank
3. Whether jumpstart or onboard solution?  
Onboard solution
4. What is the operating voltage of Bhishma Tank?  
 $27.5^{+1.5}$  V
5. What is the cranking voltage of Bhishma Tank?  
48 V
6. What is the specification of the existing Lead Acid Battery in Bhishma Tank?  
12 V, 120 AH lead acid battery, Qty: 4 Nos.
7. Whether proposed Ultra Capacitor will replace existing Lead Acid Batteries?  
No, presently, proposed Ultra Capacitor is intended for cranking of engine at extreme cold temperature only.
8. What is the current requirement during cranking of Engine?  
650 ± 20 Amperes  
Curation duration: Duration: Up to 7 Sec with not more than three times in sequence with interval between switching on 10-15 Sec or Duration up to 15 sec not more than two time in sequence with interval between switching on 10-15 Sec
9. What is the desirable dimension and weight of the proposed Ultra Capacitor?  
Desirable: very Compact and light weight.  
Approximately dimension: 640 mm (L) x 200 mm (W) x 175 mm (H).  
Approximate weight: 15-20 Kgs  
The above quantitative details are tentative and are subject to change.

10. What is the operating conditions of the system?  
Ambient Temperature: below -40°C to 55 °C.  
Altitude: Ranges from 9000 to 18000 feet
  
11. What is the required standards to be followed?  
MIL grade components.  
All electrical and electronic system shall comply with JSS:55555, L2J class  
(latest version) as applicable  
EMI/EMC Test: As applicable

## Frequently asked questions (FAQs) about Anti-Drone system for AFV:

### **What is the purpose of developing an anti-drone system for AFV?**

The purpose of developing an anti-drone system for battle tanks is to enhance their defensive capabilities by providing protection against unmanned aerial threats that could pose a risk to the tank and its crew.

### **What technologies can be considered for the development of the anti-drone system?**

Various technologies such as radar, electro-optical sensors, electronic warfare techniques, any other latest techniques and countermeasure systems can be considered for the development of the anti-drone system.

### **How should be the anti-drone system to be integrated into existing battle tank platforms?**

The integration of the anti-drone system into existing battle tank platforms involve designing compatible hardware and software solutions that can seamlessly integrate with the tank's on-board systems and architecture without significantly affecting the mobility or performance and tank silhouette.

### **What countermeasures can be employed to neutralize drone threats?**

The anti-drone system can employ a combination of countermeasures such as jamming, spoofing, kinetic methods, directed energy weapons, and electronic warfare techniques or any other latest techniques to neutralize drone threats effectively.

### **How to ensure the reliability and effectiveness of the anti-drone system?**

Rigorous testing and validation processes will be conducted to ensure the reliability and effectiveness of the anti-drone system under various operational scenarios, including adverse weather conditions and electronic warfare environments. Test certification from the approved GOI/NABL Labs

### **Will the anti-drone system be adaptable to evolving drone threats?**

Yes, the anti-drone system has to adopt and flexible to counter evolving drone threats by incorporating modular components and upgradeable software.

### **What training is to be provided to tank crews for operating the anti-drone system?**

Comprehensive training programs should be provided to tank crews to ensure they are proficient in operating and maintaining the anti-drone system effectively during missions.

### **What logistical support should be available for deploying and sustaining the anti-drone system in the field?**

Adequate logistical support should be provided to ensure the timely deployment, maintenance, and sustainment of the anti-drone system across the battle tank fleet.

### **In which platform the proposed anti-drone to be integrated?**

Presently, proposed for T-90 and T-72 Tank

**What are the operating conditions of the system?**

Ambient Temperature: below -40°C to 55 °C.

Altitude: Ranges from 9000 to 18000 feet

**What are the required standards to be followed?**

MIL grade components,

All electrical and electronic system shall comply with JSS:55555, L2J class for "A" vehicles (latest version)

EMI/EMC Test: 461E/F as applicable

**DISC 11**  
**CHALLENGE 19**

**Frequently asked question for Design & Development of  
Synchro Resolver/Rotary Transformer 2.5 BT/0.1/ ЛШ3.010.399**

**1. What is Synchro resolver/Rotary Transformer?**

The Synchro resolvers/ Rotary transformers are designed for operation in electromechanical calculating devices, servo systems, and also as a primary sensor in digital converters. The Synchro resolver/ Rotary transformer is designed to convert mechanical values into an electrical signal in accordance with the given functional dependency.

**2. How does Synchro resolver/Rotary Transformer work?**

Synchro resolver/Rotary Transformer devices are divided into sine - cosine (SCR), the output voltage of which varies in proportion to the sine (cosine) of the rotor rotation angle, and linear (LVT), the output voltage of which changes linearly proportional to the angle within  $\pm 60^\circ$ .

**3. What is the Technical Characteristic of Synchro resolver/Rotary Transformer?**

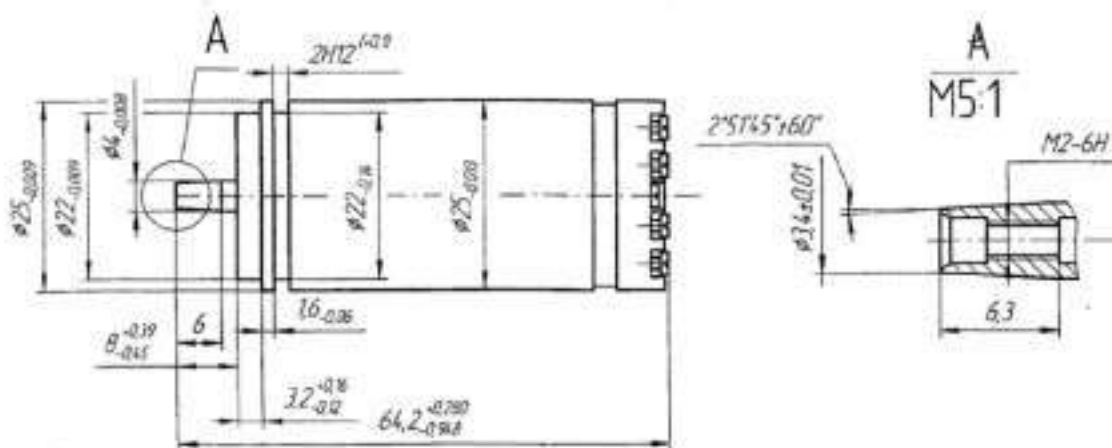
The excitation voltage is supplied to the stator windings. The current collector from the rotor windings of the device is a Synchro resolver/Rotary Transformer rotating by contact rings (reverse windings can be switched on for power and output).

**4. What are the parameters of Minimum operation life of Synchro resolver/Rotary Transformer?**

Minimum operation life at a speed of up to 5 rpm is 6,000 hours, of which 1,000 hours at a temperature of up to 373K (100°C), the remaining 5,000 hours under normal conditions, or at a speed of up to 20 rpm - 1,000 hours at an ambient temperature of 323K (50°C)

**5. What are the Design Constraints?**

Firm has to design Synchro resolver/Rotary Transformer by maintaining outline dimensions as shown in figure below.



**6. What is the norm as per accuracy class 0.1 of Synchro resolver/Rotary Transformer?**

<b>Description</b>	<b>Norm for Accuracy class 0.1</b>
Electromotive force of square winding, % max	1.2
Residual Electromotive force, % max	0.1
Asymmetry of Zero positions of rotor, max	$\pm 3' 20''$
Sine characteristic representation / transformation error, % max	$\pm 0.1$

**7. Which type of precious materials & nonferrous materials used in Synchro resolver/Rotary Transformer?**

Silver, Palladium, Copper & copper-based alloys, Titanium & Titanium based alloys.

**8. What is the guaranteed shelf life of Synchro resolver/Rotary Transformer?**

12 Years from the date of acceptance by Customer representative.

**9. What is the guaranteed service life of Synchro resolver/Rotary Transformer?**

12 Years within the limits of guaranteed shelf life.

**10. What is the Guaranteed operation life of Synchro resolver/Rotary Transformer?**

6000 hours within the limits of Service life.

**11. What is the Annual Requirement of Synchro resolver/Rotary Transformer?**

Annual requirement of Synchro resolver will be 75 nos. for next 5 years.

**12. What is the Operation & Mechanical Condition of Synchro resolver/Rotary Transformer?**

- a) Nominal Excitation Voltage 27V
- b) Operating Voltage Range above 0 to 27V
- c) Nominal Frequency of excitation Voltage 400 Hz
- d) Input impedance at no-load 1600 Ohms
- e) Nominal ratio of conversion  $1.00 \pm 0.05$
- f) Transformation sine dependence error % should not exceed  $\pm 0.1$
- g) Axial Clearance of Rotor at alternate load 0.75-0.80 Kgf, applicable to shaft end 0.002 -0.012 mm.
- h) Radial run out of shaft taper end should not exceed 0.012 mm (during rotation in combination with Bearings)
- i) Torque of tightening screws M1.6 should not exceed 0.0245 N.M (0.25 Kgf cm).
- j) Misalignment of transformer shaft coupling with drive should not exceed 0.01 mm.
- k) Mass 0.105 Kg. (Synchro Resolver) & with coupling Assembly 0.127 Kg.

## **Frequently Asked Questions about (Ampoule) Reserve Batteries**

### **1) What is an ampoule reserve battery?**

An ampoule reserve battery is a type of battery that stores its electrolyte in a sealed glass/plastic ampoule until activation. This design prolongs the battery's shelf life and prevents electrolyte leakage until needed.

### **2) How does an ampoule reserve battery work?**

Ampoule reserve batteries work by keeping the electrolyte separated from the battery's electrodes in a sealed glass/plastic ampoule. When activated, the ampoule is broken, releasing the electrolyte to initiate the battery's chemical reactions and produce electrical energy.

### **3) What are the advantages of ampoule reserve batteries?**

Advantages include extended shelf life, reduced risk of electrolyte leakage, and suitability for long-term storage or infrequent use. They are also compact and lightweight, making them ideal for portable applications.

### **4) How long can an ampoule reserve battery be stored before activation?**

The shelf life of an ampoule reserve battery depends on factors such as the type of battery, storage conditions, and the specific electrolyte used. Generally, they can be stored for several years.

### **5) Can ampoule reserve batteries be recycled or reused after activation?**

No, once activated and the electrolyte is released, ampoule reserve batteries cannot be recycled or reused. They must be disposed of properly according to local regulations for hazardous waste.

### **6) Are ampoule reserve batteries safe to use?**

When handled and used according to safety norms, ampoule reserve batteries are generally safe. However, users should avoid damaging the glass /plastic ampoule before activation to prevent premature electrolyte release.

### **7) What are some common applications of ampoule reserve batteries?**

Ampoule Reserve battery are mainly used in spin based different variants of Electronic Fuzes for various ammunitions.

**8) What is the activation mechanism of Ampoule Reserve Batteries?**

Ampoule Reserve battery will be activated by setback and centrifugal forces acting on ammunition at the time of launch.

**9) What is the Electrochemistry of Ampoule Reserve Batteries (36 Volt)?**

Li/SOCl<sub>2</sub>

**10) What is the Electrochemistry of Ampoule Reserve Batteries (18 Volt)?**

Pb/ PbO

**11) What is the Shelf life of Ampoule Reserve Batteries (18 Volt)?**

15 Years

**12) What is the Shelf life of Ampoule Reserve Batteries (36 Volt)?**

20 Years

**13) How to determine shelf-life of ampoule reserve batteries?**

For determining of shelf-life of batteries accelerated test as per MIL-STD -331, will be carried out. Details of these test can be shared with the developer.

**14) What will be size of ampoule reserve batteries?**

As per the drawing and dimension details provided by MTPF.

**15) Who will bear all the expenses for development, testing and proofing of ampoule reserve battery?**

Developer will bear all the expense for development, testing and proofing of ampoule reserve batteries. MTPF shall provide Fuzes (without batteries) required for field trial of batteries at proof ranges. The developing agency will have to bear the Charges for proof ranges for conducting field trials of batteries as well.