

RESTRICTED

**GOVERNMENT OF INDIA
MINISTRY OF DEFENCE**



DIRECTOR GENERAL OF QUALITY ASSURANCE

**QUALITY ASSURANCE INSTRUCTIONS
NO. CQA(ICV)/QAI/519/A (REVISED)**

FOR

**AUDIO VISUAL WARNING DEVICE (AVWD)
FOR HIGH TEMPERATURE OF ENGINE COOLANT
AND LOW PRESSURE OF ENGINE OIL (BMP-II & IIK)**

**CONTROLLERATE OF QUALITY ASSURANCE (ICV)
YEDDUMAILARAM - 502 205**

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ADDITIONS AND AMENDMENTS

Sl. No.	Page & Para	Brief Description of Additions / Amendments	Date of Amendment	Authority

PROVISIONAL
QUALITY ASSURANCE INSTRUCTIONS
FOR
AUDIO VISUAL WARNING DEVICE (AVWD) FOR HIGH TEMPERATURE
OF ENGINE COOLANT (H TEC) AND LOW PRESSURE OF ENGINE OIL
(LPEO) (BMP-II & IIK)

1. **Introduction.** The device is intended for Audio as well as visual warning to driver when temperature of engine coolant become high and or pressure of engine oil become low, In order to save engine from premature failure due to over heating and starvation / low oil pressure and overheating. This QAI deals with Quality Assurance of this device. This covers the inspection requirements for all the assemblies, components and complete kit items used AVW Device.
2. **General Instructions:**
 - (a) Each procurement is guided by its contract modifications hereto and connected specifications and drawings.
 - (b) Notwithstanding the inspection procedures indicated in this Quality Assurance instructions, the inspecting officer can carry out any test to check the store for conformance to the paper particulars quoted in the supply order before acceptance. As a result of experience gained in the inspection, the inspector is at liberty to suggest the improvements to this QAI direct to the Controller, CQA(ICV), Yeddumailaram.
 - (c) This Quality Assurance Instructions Is the property of the Govt of India. It is liable for amendment at any time and the latest issue will always be applicable. Copies of this QAI may be obtained from the Controller, CQA(ICV), Yeddumailaram.
3. **Aim.** These instructions are issued to guide the authorized inspector in his routine inspection and to set out main points to which his attention must be drawn to ensure that the accepted stores are thoroughly fit for intended purpose.
4. **Description and Operation.** Audio Visual Warning Devices in engine cooling system and engine lubrication system is intended to draw the attention of the driver as and when the threshold limits are exceeds specified limit. The location of the control panel with audio visual warning devices is in the driver's compartment.
 - (a) **Engine Coolant high temperature warning device:** This device in engine cooling system comprises of a PT-100 type temperature sending unit fitted on pipe 765-08-Sb484 connected through wiring to control panel. When the system is filled with water the selector switch on control panel is to be kept in 'Water' mode. The warning will be operative when the system temperature reaches 115°C. Water temperature window will start blinking along with audio alarm. In case,

the audio alarm is not required the stop sound facility is provided on control panel with a preset timer function of 60 ± 5 sec.

When the system is filled with low freezing liquid, the selector switch on control panel is to be kept in 'Anti-freeze' mode. The warning will be operative when the system temperature reaches 105° C. Anti-freeze temperature window will start blinking along with audio alarm. In case the audio alarm is not required the stop sound facility is provided on control panel with a preset timer function of 60 ± 5 sec.

- (b) Engine Oil Low pressure warning device: This device in engine lubrication system comprises oil pressure sending unit. The oil pressure sending unit is fitted on the cross member in the engine compartment and connected through wiring to control panel. When system pressure falls to 4.5 Kg/Cm^2 the oil pressure warning will be operative. Low oil pressure window will start blinking with audio alarm. In case the audio alarm is not required the stop sound facility is provided on control panel with a preset timer function of 60 ± 5 sec.

5. Quality Assurance Provisions. The Quality Assurance requirements and procedures for the device along with kit are as given below:-

Srl. No.	Tests to be Carried out	Sample Size	
		Pilot	Bulk
✓ 1	Visual Examination	100%	100%
✓ 2	Completeness of AVWD and kit	100%	100%
✓ 3	Fitment connectors on control panel and cable harness assy	100%	100%
✓ 4	Dimensions	100%	Level II, AQL 2.5% IS:2500-92
5	Material	01 No each of item of kit	01 No each of item of kit per lot
6	Functional Tests on the test rig	100%	100%
7.	Performance and acceptance criteria when integrated in the vehicle	100%	100% by the user
✓ 8	High temperature	01 No.	01 No from each lot
9	Low Temperature Test	01 No	01 No from each lot
10	Moisture Resistance test	01 No.	01 No
11	Vibration Test	01 No.	01 No.
12	Weighment	100%	100%

TEST PROCEDURE

6. Visual Examination. Visual examination shall be carried out for complete kit and checked for visual defects like sharp corners, burrs, damage / crack of electrical wires and plastic material. The device along with kit shall be free from the visual defects.
7. Completeness of AVWD and Kit. 100% devices offered for QA shall be checked for completeness of Kit and connected assys. Ensure that colours of bulbs / LED mentioned in the drawing have been fitted.
8. Dimensions. The firm will be advised to submit the applicable manufacturing drawing for approval of AHSP before commencement of production / Inspection. Dimensional check shall be carried out as per the approved drawings and the AVW Device along with Kit shall conform to drawing dimensions.
9. Material Test. Materials used in the manufacture of each component shall conform to the specifications mentioned in the drawing. The same shall be checked for correctness for each lot offered.
10. Functional Tests. The firm will set the following parameter before offering the device for QA.
- | | |
|----------------------------|--|
| a) Water temp. Alarming | - 115° C - 03° C |
| b) Anti/freeze temperature | - 105° C - 03° C |
| c) Oil pressure | - 4.5 + 0.25 kg/cm ² with oil temp. 100 to 105° C |
| d) Audio Alarm buzzer | - 120 db |
| e) Sound stop time | - 60 ± 5 Sec. |
- AVWD system shall be subjected to functional test at an input voltage 24V DC and confirm the same parameter on test rig.
- i) "Power ON" LED (Red colour) should turn "ON" after providing supply to device.
 - ii) Check coolant high temperature warning audio alarm and blinking "Water" indication turn on, at temperature 115-3° C. Ensure that "Master" warning LED (Red colour) should also blink.
 - iii) Check coolant high temperature warning audio alarm and blinking "Anti-freeze" indication turn on at temperature 105 -3° C when device is put in "Anti-freeze" mode using switch provided on control panel. Ensure that "Master" warning LED (Red colour) should also blink.
 - iv) Check low pressure warning audio alarm and blinking 'Low Oil pressure' "Window" at pressure 4,5 + 0.25 kg/cm² after delay of 30 ± 5 sec.
 - v) Check sound level of buzzer from distance of 300 mm radius around the device and level should 120 ± 15 db.

- vi) Check whether audio alarm gets switched 'OFF' when 'Stop sound' switch operated and remains off for 60 ± 5 sec and buzzer gets on again.
- vii) Repeat the entire above tests (i) to (vi) at supply voltage **18V, DC** and **32V**.

11. Environmental Test. The Audio Visual Warning Device shall be subjected to the following Environmental tests:-

(a) High Temperature Test. This test shall be carried out in the following sequence. AVWD system should function properly as per specification after this test.

- i) Check functional tests mentioned at para 10 (i) to (vii) above on AVWD subjected to High temperature test and values to be recorded.
- ii) Keep the AVWD in test chamber at $60 \pm 1^\circ\text{C}$ temp. For duration 48 hrs.
- iii) Repeat all functional tests (para 10 (i) to (vii) and values to be recorded.
- iv) Check all kit items are free from cracks, damages etc.

(b) Low Temperature Test. The test procedure mentioned in para 11 (a) above shall be followed except AVWD system shall be kept in test chamber at (-) minus 10°C temperature for duration of 48 hours. AVWD system should function properly as per specification after this test.

(c) Moisture Resistance. AVWD system shall be placed into humidity chamber, having relative air humidity 98% and temp $+35^\circ\text{C}$ and kept for 48 hours. After AVWD shall be subjected to functional tests mentioned at para 10 (i) to (vii) and should function properly, as per specification.

12. Vibration Test. AVWD system shall be subjected to vibration test by fastening to the test stand platform, the way they are secured during operation, in switched on condition as per norms given below: Test duration for each frequency is 2 hours.

Frequency Range Hz	Amplitude		Test Duration
	Acceleration $\text{m/sec}^2(\text{g})$	Displacement in mm	
10 to 20	9.8 to 19.6 (1 to 2)	2.0	02 hrs
20 to 30	19.6 to 39.2 (2 to 4)	1.2	02 hrs
30 to 40	39.2 (4)	0.6	02 hrs
40 to 50	39.2 to 58.8 (6)	0.6	02 hrs

After completion of test AVWD should be subjected to functional tests as mentioned in para 10 (i) to (vii) and system should function properly as per specification.

13. Acceptance criteria for Audio Visual Warning Device when integrated with vehicle system: It is mandatory that temperature and oil pressure at which the AVWD gets activated shall match with the temperature and oil pressure indicated by the respective gauges fitted on the vehicle instrument panel. The function of audio visual warning device for engine coolant high temperature and engine oil low pressure when integrated in the vehicle shall be checked in the following sequence.

(a) Coolant Temperature Warning Device. The performance of engine coolant temperature warning device shall be checked during vehicle running in the following sequence.

- i) Switch 'ON' the power supply to the vehicle. The AVWD warning should appear after 30 + 5 sec.
- ii) Start the engine and warm up engine coolant and engine oil upto 50°C.
- iii) Switch on warning device into anti freeze mode.
- iv) March of the vehicle to test track and run the vehicle till the audio visual warning device is activated. In anti-freeze mode the audio visual warning to operator shall be at 105° - 3° C.
- v) After the warning device in anti-freeze mode activated switch on the device into coolant water mode.
- vi) Continue the running of the vehicle till the coolant temperature reaches 115°C and record the temperature at which warning device is activated. The warning device in water mode shall give the audio-visual warning as and when the coolant temperature is reached 115 - 3°C.

(b) Low Oil Pressure Warning. Check the performance of Audio Visual Warning device for engine oil low pressure immediately after completion of performance checking of engine coolant temperature. This device has been incorporated to give warning to the operator as and when the engine lubricating oil pressure goes down to 4.5 +0.25 Kg/Cm² during actual exploitation. Therefore, the performance of the same need to be checked in the following sequence:-

- i) After completion of performance checking of coolant temperature warning device stop the vehicle and allow static running of the engine.

- ii) Reduce the engine speed so that the oil pressure fall below 4 Kg/Cm² and check the low oil pressure warning (Audio visual) which shall be after 30 + 5 sec.
- iii) With the above condition start raising the engine speed so that the pressure rises and watch the pressure indicator gauge and note down the reading at which audio visual warning stops. This reading indicates the low oil pressure set point.
- iv) The engine oil low pressure setting shall be at 4.5 Kg/Cm² to 4.75 Kg/Cm². However, at times reading engine oil pressure between 4.5 to 5 Kg/Cm² may be subjective and may vary from person to person due to the limitation of reading precisely for these values on the pressure gauge fitted on the vehicle instrument panel. Therefore, when AVWD gets activated at engine oil pressure between 4.5 Kg/Cm² and 5 Kg/Cm² shall be considered acceptable.

14. Weightment. Firm should declare the weight of AVW Device along with Kit and should be mentioned in the drawing. The weight of all the AVWD to be supplied shall be maintained. Ensure the weight of AVWD during QA.

15. Supply of Literature. The firm will supply an operation manual along with each device. The following information will be included in the manual:

- a) Detailed Manufacturing Drawings
- b) Block diagram
- c) Brief description of sub-assy.
- d) List of item/Sub-assy along with firm's part No./Defect part No.
- e) System operation
- f) Salient features
- g) Wiring diagram
- h) Trouble shooting & Remedies.

16. Preservation / Packing & Marking. AVWD along with complete kit shall be preserved and packed properly in order to avoid any transit / handling damage. Each box shall mark the following:-

- a) Manufacturer's name / trade mark
- b) Part No. for AVWD assys, sub-assys & components.
- c) Manufacturing date and SI.No.
- d) Inspection mark.

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