

QUALIFICATION ENVIRONMENTAL TEST

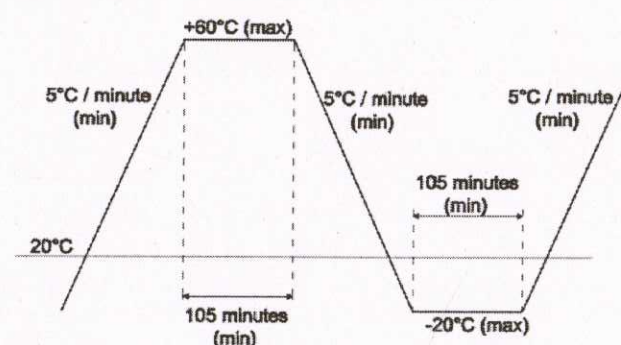
| TEST NAME | SPECIFICATION | REMARKS |
|---|--|--|
| 1 ENVIRONMENTAL STRESS SCREENING TEST (ESS) | 12 NUMBER OF CYCLES (8 DEFECT FREE CYCLES) SHALL BE DONE SO THAT TOTAL DURATION AT HIGH TEMPERATURE AND AT LOW TEMPERATURE WILL BE AT LEAST 1260 MINUTES RESPECTIVELY. EACH THERMAL CYCLE SHOULD BE DONE AS PER FIGURE ENCLOSED IN APPENDIX - 'L'. AFTER COMPLETION THERMAL CYCLING RANDOM VIBRATION TO BE CARRIED OUT. | 1. SYSTEM ON DURING POSITIVE CYCLE AND SYSTEM OFF DURING THE NEGATIVE CYCLE.(CYCLE 5SEC ON/ 300 SEC OFF) 2. LIMITED PERFORMANCE CHECK DURING EACH POSITIVE CYCLE OF THE TEST WHEN THE UNIT IS INSIDE THE CHAMBER. 3. PERFORMANCE CHECK AFTER RECOVERY. |
| 2 VIBRATION TEST | RANDOM VIBRATION IN 3 AXIS $10(M/S^2)/HZ$ DURING 20 TO 500 HZ FALLING TO $1 (M/S^2)/HZ$ AT 2000 HZ FOR 2 HOURS IN EACH AXIS. | 1. SYSTEM OFF DURING THE TEST 2. LIMITED PERFORMANCE CHECK DURING THE TEST 3. PERFORMANCE CHECK AFTER RECOVERY |
| 3 HIGH TEMPERATURE (OPERATIONAL)(*) | 100°C +/- 3°C FOR 24 HOURS | 1. SYSTEM OFF DURING THE TEST 2. LIMITED PERFORMANCE CHECK DURING LAST HALF AN HOUR |
| 4 HIGH TEMPERATURE (STORAGE)(*) | 85°C +/- 3°C FOR 24 HOURS | 1. SYSTEM OFF DURING THE TEST 2. PERFORMANCE CHECK AFTER RECOVERY |
| 5 LOW TEMPERATURE | -30°C +/- 3°C FOR 24 HOURS | 1. SYSTEM OFF DURING THE TEST 2. SYSTEM ON DURING LAST HALF AN HOUR 3. LIMITED PERFORMANCE CHECK DURING LAST HALF AN HOUR 4. PERFORMANCE CHECK AFTER RECOVERY |
| 6 DAMP HEAT | 40°C +/- 2°C FOR 16 HOURS. RH>95% | 1. SYSTEM OFF DURING THE TEST 2. PERFORMANCE CHECK DURING LAST HALF AN HOUR |
| 7 DROP TEST | HEIGHT OF DROP = 100MM; NO OF DROPS/FACE=1 ON ALL FACES EXCEPT CONNECTOR SIDE. | PERFORMANCE CHECK AFTER TEST |
| 8 DUST TEST | CHEMICAL COMPOSITION: SiO ₂ :97-99% Fe ₂ O ₃ :0-2%:Al ₂ O ₃ : 0 to1%: TiO: 0 TO 2% : MgO : 0 TO 1% : IGNITION LOSSES : 0 to 1% ONE HOUR. TEMP 40°C+/-3 RH<50% | PERFORMANCE CHECK AFTER RECOVERY |
| 9 BUMP TEST | 4000 BUMPS AT 25g; PULSE DURATION: 6ms, HALF SINE WAVE. | 1. SYSTEM OFF DURING THE TEST 2. PERFORMANCE CHECK AFTER RECOVERY |
| 10 SHOCK TEST | 40g, 2 SHOCKS PER DIRECTION, PULSE DURATION : 18 ms. | 1. SYSTEM OFF DURING THE TEST 2. PERFORMANCE CHECK AFTER RECOVERY |
| 11 WATER IMMERSION TEST | 6 METER WATER COLUMN DEPTH (PR - 58.7 KPA), DURATION 2 HOURS | 1. SYSTEM OFF DURING THE TEST 2.PERFORMANCE CHECK AFTER RECOVERY |
| 12 MOULD GROWTH TEST | 30°C +/- 1°C AND RH > 90 %, DURATION: 28 DAYS (TEST NO.21). | 1. SYSTEM OFF DURING THE TEST 2. PERFORMANCE CHECK AFTER RECOVERY |

| REVN. | NO. OF PLACES | CHANGE/ECN NO. | SIGNATURE & DATE | |
|-------|---------------|----------------|------------------|----------|
| | | | REVISED | APPROVED |

| TEST NAME | SPECIFICATION | REMARKS |
|-----------------------|---|--|
| 13 SALT SPRAY TEST | 35°C +/- 2°C, RH 90-95%, DURATION 3 DAYS (TEST NO.: 9, PROCEDURE 2). | 1. SYSTEM OFF DURING THE TEST 2. PERFORMANCE CHECK AFTER RECOVERY |
| 14 CONTAMINATION TEST | ONE OR MORE OF THE FOLLOWING CONTAMINATING FLUIDS TO BE SPRAYED-PARAFFIN,PETROL,LUBRICATION OIL, HYDRAULIC FLUIDS AND ESTER BASED LUBRICATING OILS. AFTER SPRAYING, MAINTAIN TEMPERATURE 50°C FOR 48 HRS. | 1. SYSTEM OFF DURING THE TEST 2. PERFORMANCE CHECK AFTER RECOVERY |

ENVIRONMENT STRESS SCREENING (ESS)

BURN-IN-TEST



THERMAL CYCLE SHALL BE AS FOLLOWS, (MIL STD 2164)

- 12 NUMBER OF CYCLES SHALL BE DONE SO THAT TOTAL DURATION AT HIGH TEMPERATURE AND AT LOW TEMPERATURE WILL BE AT LEAST 1260 MINUTES EACH
- AFTER COMPLETION OF THERMAL CYCLING RANDOM VIBRATION TEST TO BE CARRIED OUT AS FOLLOWS:
 - RANDOM VIBRATION ON 3 PERPENDICULAR AXIS.
 - 10 (M/S²)/HZ DURING 20 TO 500 HZ FALLING TO 1 (M/S²)/HZ AT 2000 HZ FOR 2 HOURS IN EACH AXIS

NOTE:

- (*) APPLICABLE FOR SYSTEMS FITTED IN ENGINE COMPARTMENT. FOR SYSTEMS FITTED OUTSIDE ENGINE COMPARTMENT, HIGH TEMPERATURE (OPERATIONAL) IS 550°C AND HIGH TEMPERATURE (STORAGE) IS 850°C
- TESTS 2 TO 14 ARE TO BE CONDUCTED AS PER JSS 55555: 2012 REV3, L2J AND L3 CLASS.
- DURING TESTING , THE SYSTEM'S POWER ON/OFF PERIODS MAY BE ADJUSTED/DECIDED BASED ON THE SYSTEM/UNIT DESIGN CRITERIA.
- BEML WILL SUPPLY UUT, RELATED CABLES, AND REQUIRED ACCESSORIES TO POWER 'ON/OFF' THE UNIT. THE SUPPLIER IS RESPONSIBLE FOR PROVIDING THE MOUNTING ARRANGEMENT/TEST SETUP FOR TESTING THE UNIT.
- TEST REPORTS ARE TO BE SUBMITTED FOR EACH TEST ALONG WITH COC (CERTIFICATE OF CONFORMANCE).

| | | | | | | | | |
|---|----------|--------------|---|----------|---------------------------|-------------|------|--|
| | | | | | BE1500 | | - | |
| SL. NO. | PART NO. | NAME OF PART | QTY./ ASSLY. | MATERIAL | REMARKS | APPLICATION | QTY. | |
| General Tolerance To ISO 2768 | | | Remove all burrs and break sharp edges. | | Unspecified finish Ra12.5 | | | |
| All dimensions are in mm, Unless specified. Do not scale the drawing. If in doubt, ask. | | | MATERIAL | | HEAT TREATMENT | | | |
| | | | SEE DWG | | --- | | | |
| DESIGN REF. | | | Wt. of part (Kgs.) | | CASE DEPTH | | | |
| | | | --- | | --- | | | |
| TITLE | | | QUALIFICTION TEST (COOLANT PUMP) | | SIZE A3 SCALE NTS | | | |
| NAME | | | SIGNATURE | | DATE | | | |
| APPROVED | | | JAYAKUMAR HC | | 30/1/24 | | | |
| CHECKED | | | JAYALAXMI KUMARI | | 30/1/2024 | | | |
| DRAWN | | | SANSKRITI | | 30/1/2024 | | | |
| BEML LIMITED, Engine Division, Mysore. | | | SHEET 1/2 | | DRG.NO. 550 849 0781 | | | |

| REVN. | NO. OF PLACES | CHANGE/ECN NO. | SIGNATURE & DATE | |
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| | | | REVISED | APPROVED |
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EMI AND EMC TESTS AS PER MIL 461G

| TEST DETAILS | TEST DESCRIPTION | TEST DETAILS |
|--------------|--|--|
| CE102 | CONDUCTED EMISSIONS, RADIO FREQUENCY POTENTIALS, POWER LEADS | THIS REQUIREMENT IS APPLICABLE FROM 10 KHZ TO 10 MHZ FOR ALL POWER LEADS, INCLUDING RETURNS, WHICH OBTAIN POWER FROM OTHER SOURCES NOT PART OF THE EUT. |
| CS101 | CONDUCTED SUSCEPTIBILITY, POWER LEADS | THIS REQUIREMENT IS APPLICABLE FROM 30 HZ TO 150 KHZ FOR EQUIPMENT AND SUBSYSTEM AC, LIMITED TO CURRENT DRAWS ≤ 30 AMPERES PER PHASE, AND DC INPUT POWER LEADS, NOT INCLUDING RETURNS. THIS IS ALSO APPLICABLE TO SYSTEMS THAT DRAW MORE THAN 30 AMPS IF THE SYSTEM HAS AN OPERATING FREQUENCY 150 KHZ OR LESS AND AN OPERATING SENSITIVITY OF 1 MV OR BETTER (SUCH AS 0.5 MV). IF THE EUT IS DC OPERATED, THIS REQUIREMENT IS APPLICABLE OVER THE FREQUENCY RANGE OF 30 HZ TO 150 KHZ. IF THE EUT IS AC OPERATED, THIS REQUIREMENT IS APPLICABLE STARTING FROM THE SECOND HARMONIC OF THE EUT POWER FREQUENCY AND EXTENDING TO 150 KHZ. |
| CS114 | CONDUCTED SUSCEPTIBILITY, BULK CABLE INJECTION | THIS REQUIREMENT IS APPLICABLE FROM 10 KHZ TO 200 MHZ FOR ALL INTERCONNECTING CABLES, INCLUDING POWER CABLES. FOR EUTS INTENDED TO BE INSTALLED ON SHIPS OR SUBMARINES, AN ADDITIONAL COMMON MODE LIMIT OF 77 DBMA IS APPLICABLE FROM 4 KHZ TO 1 MHZ ON COMPLETE POWER CABLES (HIGHS AND RETURNS – COMMON MODE TEST). |
| CS115 | CONDUCTED SUSCEPTIBILITY, BULK CABLE INJECTION, IMPULSE EXCITATION | THIS REQUIREMENT IS APPLICABLE TO ALL AIRCRAFT, SPACE, AND GROUND SYSTEM INTERCONNECTING CABLES, INCLUDING POWER CABLES. THE REQUIREMENT IS ALSO APPLICABLE FOR SURFACE SHIP AND SUBMARINE SUBSYSTEMS AND EQUIPMENT WHEN SPECIFIED BY THE PROCURING ACTIVITY. |
| CS116 | CONDUCTED SUSCEPTIBILITY, DAMPED SINUSOIDAL TRANSIENTS, CABLES AND POWER LEADS | THIS REQUIREMENT IS APPLICABLE FROM 10 KHZ TO 100 MHZ FOR ALL INTERCONNECTING CABLES, INCLUDING POWER CABLES, AND INDIVIDUAL HIGH SIDE POWER LEADS. POWER RETURNS AND NEUTRALS NEED NOT BE TESTED INDIVIDUALLY. FOR SUBMARINE APPLICATIONS, THIS REQUIREMENT IS APPLICABLE ONLY TO CABLES AND LEADS EXTERNAL TO OR THAT EXIT THE PRESSURE HULL. |
| RE102 | RADIATED EMISSIONS, ELECTRIC FIELD | THIS REQUIREMENT IS APPLICABLE FOR RADIATED EMISSIONS FROM EQUIPMENT AND SUBSYSTEM ENCLOSURES, AND ALL INTERCONNECTING CABLES. FOR EQUIPMENT WITH PERMANENTLY MOUNTED ANTENNAS THIS REQUIREMENT DOES NOT APPLY AT THE TRANSMITTER FUNDAMENTAL FREQUENCY AND THE NECESSARY OCCUPIED BANDWIDTH OF THE SIGNAL. THE REQUIREMENT IS APPLICABLE AS FOLLOWS: A. GROUND 2 MHZ TO 18 GHZ |
| RS103 | RADIATED SUSCEPTIBILITY, ELECTRIC FIELD | THIS REQUIREMENT IS APPLICABLE FOR EQUIPMENT AND SUBSYSTEM ENCLOSURES AND ALL INTERCONNECTING CABLES. THE REQUIREMENT IS APPLICABLE AS FOLLOWS: A. 2 MHZ TO 30 MHZ ARMY, NAVY AND OPTIONAL* FOR ALL OTHERS |

NOTE:

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3. TEST REPORTS ARE TO BE SUBMITTED FOR EACH TEST ALONG WITH COC (CERTIFICATE OF CONFORMANCE).

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| SL. NO. | PART NO. | NAME OF PART | QTY./ ASSLY. | MATERIAL | REMARKS | APPLICATION | QTY. | |
| General Tolerance To ISO 2768 | | | Remove all burrs and break sharp edges. Unspecified finish Ra12.5 | | | | | |
| All dimensions are in mm, Unless specified. Do not scale the drawing. If in doubt, ask. | | | MATERIAL | | HEAT TREATMENT | | | |
| | | | SEE DWG | | --- | | | |
| DESIGN REF. | | | Wt. of part (Kgs.) | | CASE DEPTH | | SIZE A3 | |
| | | | --- | | --- | | | |
| TITLE | | | QUALIFICTION TEST (COOLANT PUMP) | | | | SCALE NTS | |
| | | | | | | | | |
| NAME | | | SIGNATURE | DATE | SURF. TREATMENT SEE DWG | | | |
| APPROVED | JAYAKUMAR HC | | 30/11/24 | | | | | |
| CHECKED | JAYALAXMI KUMARI | | 30/11/2024 | | | | | |
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