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| Note :  1. If any of the below sections are not applicable for the project, mention as “Not applicable” with justification notes.  2. If any information pertaining to the below sections are documented externally, embed the external document in the corresponding section below.  3. If any information pertaining to the below sections are stored in standard tools such as EPM-Gate, Teamcenter etc., mention the file path/link in the corresponding section below. |

# Introduction

## Purpose

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| The purpose of this document is to outline a detailed test plan and to describe the hardware test cases for verifying CobaltKE17 UI module to ensure it meets its HW requirements specification. |

## Scope

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| In Scope This section shall include all the activities that are in scope pertaining to the HW testing. Following are the list of testing that will be performed during the test execution phase of this project.   * ET-01 Functional bench test * ET-15 Low temperature limit test, powered/non-powered * ET-18 Dry heat test, powered/non-powered * ET-16 Damp heat/steady state * ET-17 Change of temperature test * ET-20 Ionic migration |
| Out of Scope This section shall include out-of-scope activities pertaining to the HW testing. Following are the list of testing that will not be performed during the test execution phase of this project.   * Any ET test not listed above |

## Documents Referenced

### Codes (Norms) Agency Standards

|  |  |  |
| --- | --- | --- |
| **Standard** | **Revision and Date** | **Description** |
|  |  |  |

### Electrolux Standards

|  |  |  |
| --- | --- | --- |
| **Standard** | **Revision** | **Description** |
| SP000011978 |  | ET-Electronics Lab Testing Specifications |
| SP000000134 | A | Electronic Supply Specification CD09 for Test Purpose and Test Pass/Fail Criteria |

### Third Party Standards

|  |  |  |
| --- | --- | --- |
| **Standard** | **Revision and Date** | **Description** |
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### Other Documents

|  |  |  |
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| **Standard** | **Revision and Date** | **Description** |
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# Hardware Test Plan

## System Overview

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| Following is the brief overview of the project/system under development and its functionalities:  -Cobalt is an I&W user interface mounted on the door of the refrigerator and is used on higher end products like SXS, FDBM and MD applications.  The UI is a micro change and component refresh project under the ERAP projects. |

## Testing Requirements

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| Following are the list of HW requirements for which the testing is planned to be performed:   * Number of boards required: 35 * Level of board build: DVT/MVT/PPAP 25/50/300 |

## Test Execution Strategy

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| The test strategy that is planned is to perform the CD-09 environmental testing package for the module. When the module is implemented into the application, EMC testing will be conducted on the system. Shock & vibration and RoHS testing will be completed by the supplier in parallel. |

### Testing Types

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| Following are the various types of testing that is planned to be performed for the HW under development:   * ET-01 Functional bench test * ET-15 Low temperature limit test, powered/non-powered * ET-18 Dry heat test, powered/non-powered * ET-16 Damp heat/steady state * ET-17 Change of temperature test * ET-20 Ionic migration |

### Testing Tasks

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| Listed below are the various tasks that are planned to be performed pertaining to the testing:   * Test design document prep – preparing the HW test design document (this document) * Test design document review & approval – Reviewing, approving and baselining HW test design document * Checking the availability of the test environment with latest version of the application * Test design (test cases) execution – executing the test cases as per the HW test design document * Test report – evaluation and recording the test results * Defect log – logging defects reported during all levels of testing * Defect fix & verification – fixing the defects and subjecting to re-test, as applicable |

### Testing Tools

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| Following are the list of HW tools that are planned to be used for the testing:   * **AC power supply** * **Digital DMM** * **Oscilloscope** * **Function generator** * **Serial relay bank** * **Electronic test interface** * **Programmable temperature and humidity chamber** |

### Test Environment and Items

| Resources | Configuration |
| --- | --- |
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### Staffing and Training Needs

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| No training required |

### Test Responsibilities

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| |  |  |  |  | | --- | --- | --- | --- | | Task/Owner | HW Lead | HW Engineer | Lab Engineer | | Test design document prep | X | X |  | | Test design document review and approval | X | X |  | | Test design execution |  |  | X | | Test report review | X | X |  | | Defect log |  | X | X | | Defect fix |  | X |  | | Defect fix verification | X |  |  | | Test report delivery | X |  |  | |

### Testing Schedule

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| Following are the detailed schedule planned to perform the testing activities:   |  |  | | --- | --- | | Milestone | Date | | Test design document creation | 4-20-2023 | | Test design document review and approval | 4-28-2023 | | Test design execution | TBD | | Test report preparation and review | TBD | | Defect log | TBD | | Defect fix and verification | TBD | | Test report delivery | TBD | |

## Test Coverage

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## Entry and Exit Criteria

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| This section provides the entry and exit criteria for performing the testing.  Entry criteria:   * Hardware available * Reviewed and approved test design document * Test data and test environment is ready * Necessary scripts/SW available for carrying out tests   Exit criteria:   * All tests are executed * Test results updated for each of the test cases * Defects discovered due to failed tests are fixed, re-tested and passed * Fixed defects with tested results documented * Test summary report prepared/generated |

## Acceptance Criteria

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| This section provides the acceptance criteria for testing:   * All test data result is passed results * Any adhoc test results are reviewed and approved by appropriate team |

## Defects Analysis and Closure

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| Following are the defect tracking activities planned during the testing till its closure:   * Logging of defects – indicates the defect discovered during the testing phase that was recorded in defect log * Analysis of defects – indicates the new defect has been triggered and found that it is a valid defect and severity is assigned. Defect is assigned to a developer to fix. * Fixing of defects – indicates a defect fixed by development team and ready for retest * Re-testing of fixes – indicates defect fixed by development team and ready for retest * Regression testing to ensure that fixes have not impacted the original functionality |

## Suspension and Resumption Requirements

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| This section describes the suspension & resumption criteria during the testing:  Suspension criteria:   * Any fatal error that does not allow further testing of the application * Database has been corrupted * Test environment has become unstable * A series of faults has been exposed which indicate that the build has been unsuccessful or contains incorrect version of items or that development phase has failed * Loss of support of the testing environment or significant features of the environment itself   Resumption criteria:   * Testing will be resumed only after rectification of an error in that respective module |

## Deliverables

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| This section details all the deliverables that are planned for the various testing tasks:   * HW test design document * Requirements traceability matrix * HW defect log * HW test execution report |

# Hardware Test Protocol

## Test Setup Requirements

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| Test setup requirements will adhere to the test setup procedures describes in the CD09 testing documents. |

## Instructions to the Tester

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## Test Cases

| Test Case ID | Test Procedure | Equipments / Tools / Test Jigs Required | Expected Result |
| --- | --- | --- | --- |
| <Mention the test objective along with requirement reference> | | | |
| **TC\_01** | **Create functional circuit test software to verify if loads are being activated as needed** | **JIG** | **All loads must be activated** |
| **TC\_02** | **ET-1 functional bench test – document procedure for testing various electronic controls** | **N/A** | **Documented procedure** |
| **TC\_03** | **ET-15 low temperature limit test, powered – determine the ability of the components, equipment or articles to be used, transported of stored at low temperature** | * **AC power supply** * **Digital DMM** * **Oscilloscope** * **Function generator** * **Serial relay bank** * **Electronic test interface** * **Programmable temperature and humidity chamber** | All components remain functional |
| **TC\_04** | **ET-18 dry heat test, powered – determine the ability of components, equipment or other articles to be used, transported or stored at high temperature** | All components remain functional |
| **TC\_05** | **ET-15 low temperature limit test, powered – determine the ability of the components, equipment or articles to be used, transported of stored at low temperature** | All components remain functional |
| **TC\_06** | **ET-18 dry heat test, un-powered - determine the ability of components, equipment or other articles to be used, transported or stored at high temperature** | All components remain functional |
| **TC\_07** | **ET-16 damp heat, steady state test – observation of the effect of high humidity at constant temperature without concertation on the specimen over a prescribe period** | PCB functions with no variation of humidity levels |
| **TC\_08** | **ET-17 change of temperature test – determines the ability of components, equipment or other articles to withstand and/or function during changes of ambient temperature** | All components remain functional |
| **TC\_09** | **ET-20 ionic migration – determines if ionic migration is present on the pcb after a powered, high humidity condition occurs** | No ionic migration is present |
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# Notes

## Terms, Definitions, Abbreviations and Acronyms

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| --- | --- |
| **Terms** | **Defintions** |
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**Appendix**

**Template Revision History:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Authors** | **Date** | **Description** | **Version** |
| B.Gopalakrishnan | 2020-10-08 | Draft Release | Draft v0.1 |
| B.Gopalakrishnan | 2021-07-05 | Updated for GEO name change | Draft v0.2 |
| B.Gopalakrishnan | 2022-04-13 | Initial Baseline | v1.0 |
| P.Kumaravelu  K.Damodaran | 2022-11-10 | Single row text box added to all the sections  Note added  Document ID has been updated from GDxxxxxxxxx/A format to GEO-XXX-XXX-X-XXXXX/A  Combined Hardware Test Plan and Test Protocol template & renamed as Hardware Test Design Template  File name, header, footer modified from E. to E- | V2.0 |

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| **Reviewed by:** | Luigi Conenna | GEO Process & Cost CL |  | 2022-11-18 |
| **Approved by:** | Luigi Conenna | GEO Process & Cost CL |  | 2022-11-18 |