**Project: Laser Width Gauge 2.0 System**

**Build #: 1.0.0.1**

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| **APPROVALS** |

|  |  |  |  |
| --- | --- | --- | --- |
| NAME | FUNCTION | DATE | APPROVAL |
| **Software Engineering** |  |  |  |
|  |  |  |  |
| **Project Management** |  |  |  |
|  |  |  |  |
|  |  |  |  |
| **Quality Assurance** |  |  |  |
| Boris Lipnitsky |  |  |  |

|  |
| --- |
| **DOCUMENT HISTORY** |

|  |  |  |
| --- | --- | --- |
| **Version** | **Date** | **Reason** |
| 1.0 | 05.16.2017 | Initial Draft |
|  |  |  |

# INTRODUCTION

* 1. **OVERVIEW**

This document is intended to serve as a functional testing plan a Laser Width Gauge system (LWG 2.0) is being developed for the **Arcelor-Mittal** hot strip mill in Burns Harbor, Indiana.

* 1. PURPOSE

The purpose of this document is to define the Test plan for the Laser Width Gauge system product. The objective of the Verification and Validation Activity is to check the completeness and correctness of the enhancements of the system. This V&V ensures the product is designed to deliver all functionality to the customer; it typically involves reviews and meetings to evaluate documents, plans, code, requirements and specifications; this can be done with checklists, issues lists, and walkthroughs and inspection meetings.

* + 1. The scope of this test plan includes:
       1. The V&V strategy
       2. The Traceability of verification protocols to the Requirements
       3. Testing result requirements

The approvals those are necessary to proceed.

* 1. REFERENCE DOCUMENTS

|  |  |  |
| --- | --- | --- |
|  | Number | Title |
| 1 | LWG2.0 PRS  Ver. 050417 | Product Requirements Specification |
| 2 |  |  |

* 1. DEFINITION, ABBREVIATIONS, AND ACRONYMS

*This sub-section should:*

* *list all that terms that are need to properly interpret the document (referencing a project or other dictionary as appropriate).*

|  |  |
| --- | --- |
| **Name** | **Definition** |
| LWG | Laser Width Gauge system |
| MPC | Mill Process Computer |
| V&V | Verification and Validation design activity |
| UUT | Unit Under Testing |
| ECR | Engineering Change Request |
| CIA | Change Impact Analysis |

The term “**shall**” means that compliance with this requirement is mandatory for compliance to this specification. The term “**shall**” shall be boldedand *italicized* to facilitate the identification of requirements throughout this specification.

The term “**should**” means that compliance with a requirement is recommended but is not mandatory for compliance with this specification. The term “**should**” should be boldedto facilitate the identification of requirements throughout this specification.

The term “may” is used to describe a permissible way to achieve compliance with a requirement.

The term “NA” indicates Not Applicable.

# COPYRIGHT POLICY

#### 2.1 The statements ©Copyright 2017 by Vizimation Cor. and “All Rights Reserved” **shall** be:

#### 2.2 On the cover page of all user manuals/guides issued to the field

2.3 The current year date is the date when the material is made available to the public.

# TESTING STRATEGY

The verification testing for the software requirements identified in the scope **shall** covered with the test objective to:

* 1. Use the hierarchical verification methodology at the module and multiple module level, as well as the full system level
  2. Verify each specific LWG module/s is functional complete and correct by operational experts. These V&V activities **shall** conducted on the resource files and require documents
  3. Verification is developing base of test solutions:
     1. Hardware description
     2. Software description
     3. Documentation package
     4. Specification of tester verification criteria
     5. Specification of support requirements of the proposed test solution
     6. Specification of required customer deliverable
  4. Use functional testing using the product application to verify that the worst case scenarios are not truncated or extend beyond their field
  5. Assumptions, Constraints and Dependencies
     1. Test readiness review **shall** done before the formal execution
     2. Testers are trained and qualified
     3. Defects logging tool is available to the test coordinator

# TRACEABILITY

The traceability matrix identifies the following:

* Document Name-It’s a requirement document name corresponding to

PRS ID

* Paragraph -it is a requirement number for each requirement of IP Software Requirement

Specifications.

* Specification Detail-It is a requirement description for each requirement of Requirement Specifications.
* Verification Number- It’s a document number corresponding to Verification protocols.
  1. **Test Responsibility**
     1. Vizimation Cor. is responsible for the execution of all test protocols as per this plan and reporting of defects. The reporting of results will be the responsibility of Vizimation in the form of Verification Test Summary report
     2. All CIA and ECR **shall** performed by Vizimation Engineering Department

# Testing Requirements

**5.1** Every test protocol **should** include the following test configuration information:

**5.1.1.** Configuration Index of Software under test

**5.1.2.** System Setup

**5.1.3.** Test Equipment Used

**5.2.** Every test phase using the protocol include fields to record the following information:

**5.2.1.** Identification of Configuration under test

**5.2.2.** Verification Procedure

**5.2.3.** Expected Results

**5.2.4.** Pass/Fail/Not executed Conclusion

**5.2.5.** Tester Signature and Date

Instruction is included to ensure the tester understands the workflow, documents actual results if they differ from expected results and will provide the data required to support defect disposition.

# Protocol Requirements

* 1. All testing performed **shall** be covered under a reviewed and approved protocol that identifies
     1. Purpose
     2. Test Conditions Planned
     3. Configuration requirements for units to be evaluated
     4. Test Equipment required/hardware/testing tools/data files
     5. Set up requirements
     6. Specific procedures to be followed/defect management
     7. Acceptance criteria
     8. Protocol Approvals

## Testing Approach / Quantity to be Tested / Number of Executions

All verification protocols are planned for a single execution, with regression testing as required by the change impact analysis in the defect report

## Test Locations

6050 Lowell Str. Suite 206 Oakland, CA 94608

## Test Conditions Planned

Temperature – laboratory conditions.

Humidity - laboratory conditions.

Altitude - laboratory conditions

Voltage - 120VAC, 60 Hz.

These conditions have been selected as an equivalent environment to the end user environment.

## Set-Up Requirements (if applicable)/Prerequisites

A prerequisite for effectively executing all protocols is the successful completion of a Test readiness review. Specific requirements are there in the individual protocols. Please refer to the Test Protocols document.

## Test Responsibility / Training / Skills Requirements

* + 1. Vizimation **shall** responsible for the execution of all the tests protocols provided in the Appendix A
    2. Vizimation **shall** provide the necessary hardware and software setup for the formal execution of all tests in this document.

## Test Documentation

The results for each test shall be recorded in the body of the copy of the protocol .The copy of the protocol with the results of the execution of the protocol **shall** include in the test report. Recording of testing results: Objective evidence **shall** attach to Test Report.

The reviewed and approved test plan, protocols, and reports should be archived:

* + 1. Approved Test Protocols **shall** archived
    2. Approved Test Reports **shall** archived

## Acceptance Criteria /Defect management

### Acceptance Criteria

* + - 1. The test objectives for all tests cases pass the criteria defined within each Test Case
      2. The software must pass all tests in this protocol to complete this validation. Any

anomalies recorded against the software that specifically fail a test step contained in the protocols must be addressed, either by correction of the software, revision of the applicable specification, by revision of the test step, or by acceptance of a cross functional design review for deferred closure. If the software is revised to close an anomaly, an impact analysis of the change shall be conducted and the test steps required for validation and regression test of the change shall be recorded in the defect/anomaly record. A CIA **shall** perform to determine amount of regression that is required for any changes to system.

### Defect management

The test report **should** include printed copies of all defects associated with the protocol execution. For protocol errors, protocol revision history shall identify all anomaly IDs fixed with the protocol revision. If release has been made with closed anomaly, impact analysis of the change shall be conducted and test steps for the verification and regression test of the change shall be recorded in the Defect report.

## Test Article Documentation

All test article documentation is covered under the Configuration index, **Attachment 1** as a part of the test readiness review.

## Required Equipment

The following equipment is required for the execution of the protocols:

**6.10.1.** Standard configuration computer with following parameters:

**6.10.1.1. ?**

# Results Requirements

All test results shall include:

* 1. Identification of protocol number and revision used
  2. Test date and time
  3. Tester and Approver signature and date
  4. Configuration of the unit(s) tested
  5. Listing of any open defects on the unit(s) tested and reporting in Test Track Pro tool
  6. Acceptance Criteria as a Pass or Fail
  7. Test results (in measurable terms, if possible)

# Test Protocol Approval Requirements

Test Protocols shall be approved by the following representatives:

CEO

Systems Engineering

Quality Assurance

**Attachment 1**

*Configuration index*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Installation Qualification** | | | | |
| **#** | **Procedure** | **Protocol**  **Name** | **Protocol Number** | **Case # and explanation (optional)** |
| 1 | Verification of computer parameters, setup, supporting software and internet |  |  |  |
| 2 | Installation software for LWG |  |  |  |
| 3 | Verification of connection and system start up |  |  |  |
| 4 | Verification of communication with simulator |  |  |  |
| 5 | Verification of the version of software and the user manual |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Operational Qualification** | | | | |
| **#** | **Procedure** | **Protocol**  **Name** | **Protocol Number** | **Case # and explanation (optional)** |
| 1 | Verification of the communication with mill server (simulator) |  |  |  |
| 2 | Verification of the On/Off line module |  |  |  |
| 3 | Verification of measurement includes:  Less Min Width  Over Max Width  Less Min Slab Length  Over Max Slab Length  Deviation of target Width and average Width  Deviation of target Length and average Length  Center line deviation  History file verification and analysis |  |  |  |
| 4 | Verification list of system messages |  |  |  |
| 5 | Verification of maintenance utility  Gauge Status  Accuracy Check  Calibration  System Setting  I/O Devices Setting  Alarms Setting  Gauge Properties Setting  Log File (Back-up)  Save Configuration  Restore Configuration  Log In/Out |  |  |  |
| 6 | Operator errors and recovery |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Performance Qualification** | | | | |
| **#** | **Procedure** | **Protocol**  **Name** | **Protocol Number** | **Case # and explanation (optional)** |
| 11 | System startup |  |  |  |
| 12 | System controls |  |  |  |
| 13 | Safety features |  |  |  |
| 14 | User manual |  |  |  |
| 15 | Software interface |  |  |  |
| 16 | System Back-up |  |  |  |
| 17 | Power failures |  |  |  |
| 18 | Alarms Messaging System |  |  |  |
| 19 | Maintenance procedures |  |  |  |
| 20 | Labeling |  |  |  |

**Attachment 2**

*List of potential errors and LWG expected response*

(for testing purpose)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **#** | **Contents**  **Alarm (Warning )** | **Potential Situation** | **LWG response** | **Protocol**  **#** | **Comment** |
| **1** |  |  |  |  |  |