5.2 Performance Requirements Test Procedures

The following performance test procedures are used to qualify the LV MLOI test apparatus (aka Tester) for ATP qualification and production testing of the Elevate Oil Level Sensor (OLS). There are two parts to this evaluation:

A. **Capabilities**. The Tester shall be deemed capable and fit for purpose by passing the following five tests:

1. Set the Level Process Variable (PV_{LEVEL}) to desired level and measure PV_{LEVEL} to +/- 0.TBD" compared to Depth Gauge.
2. Measure the precision resistor within +/- 0.1% FS compared to Fluke Ohmmeter.
3. Maintain Resistance calibration between scheduled annual Calibrations.
4. Automatically execute the prescribed test protocol. (go to SP, measure, repeat)*
5. Generate the test report in prescribed ATP Format.*

* These tests are evaluated by the previous Functional Testing.

B. **Suitability** The Tester implemented protocol, and procedure shall be deemed suitable and fit for purpose by passing the following test:

1. Accuracy of determining the accept/reject criteria of <Sample Size> OLS DUTs.

All instruments used as part of the apparatus and those used as Calibration reference in these tests along with their calibration dates should be listed as part of the test report in the table below.

Table in Instruments

Instrument	Asset ID	Type	Calibration Date	Note
Keyence LK-G3000		Laser Level Sensor		Apparatus
DataQ DI-2801		Voltage Data Acquisition		Apparatus
Production Fluke		V, A, Ω Meter		Ω Cal Reference
Depth Gauge		Depth Gauge		PV_{LEVEL} Cal Reference
Precision Resistor		100Ω & 1K +/- 0.01% 15ppm		Ω Cal Reference

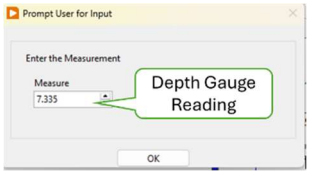
5.2.1 Capability A1 - Level Calibration Repeatability & Accuracy

Step 1. Connect the hardware USB hub to the PC then load run the calibration program. (This can be call from the Main MLOI application menu or run as the standalone $OLS_LevelZeroVerification.vi)

- Verify that the Pump, and Laser Online status are GREEN. (DataQ is Don't Care.)

Step 2. Enter the Tester name as it will be recorded in the ATP Report.

Step 3. The program will set 5-level set points (SP) the first at EMPTY level then three at random levels approximately every 20% +/- 0.100" of full scale and the fifth at FULL Level. When prompted enter the Raw Laser reading.



Step 4. After the fifth run, the operator is prompted to select the csv file where the calibration is saved. Save the Slope and Offset in the Gage R&R form. (see form for instructions.)

- ☐ Verify that the calibration saved in the Cal File is the same as displayed in the Calibrate utility.

Step 5. This test should be repeated at least 5 times by 3 different operators.

Step 6. Record the Precision/Tolerance Ration (%Tolerance) from the Gage R&R Form.

- ☐ Verify the % Tolerance is < 10%.

Tester _____ Date _____ PASS FAIL

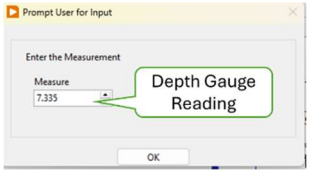
5.2.2 Capability A2 - Resistance, Calibration, Repeatability & Accuracy

Step 1. Connect the hardware USB hub to the PC then load run the calibration program. (This can be called from the Main MLOI application menu or run as the standalone $OLS_LevelZeroVerification.vi)

- ☐ Verify that the Pump, and Laser Online status are GREEN. (DataQ is Don't Care.)

Step 2. Enter the Tester name as it will be recorded in the ATP Report.

Step 3. The program will set 5-level set points (SP) the first at EMPTY level then three at random levels approximately every 20% +/- 0.100" of full scale and the fifth at FULL Level. When prompted enter the Raw Laser reading.



Step 4. After the fifth run, the operator is prompted to select the csv file where the calibration is saved. Save the Slope and Offset in the Gage R&R form. (see form for instructions.)

- ☐ Verify that the calibration saved in the Cal File is the same as displayed in the Calibrate utility.

Step 5. This test should be repeated at least 5 times by 3 different operators.

Step 6. Record the Precision/Tolerance Ration (%Tolerance) from the Gage R&R Form.

- ☐ Verify the % Tolerance is < 10%.

Tester _____ Date _____ PASS FAIL

5.2.3 Capability A3 - Resistance Stability and Drift

To determine the Tester resistance Stability and Drift, the precision resistance should be measured in accord with the Stability test procedure (TBD) at least every use to begin, then may decrease to monthly measurement then be placed into the annual calibration schedule as appropriate.

5.2.4 Suitability B1 - Measurement Gage R & R

5.2.5 Tank Response and Fill Rate

The Tank oil level response can be evaluated using $TEST_TankControl18V7.vi and the TBD procedure.