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| ***Windsor Machine & Stamping (2009) LTD*** | Document Type: **PROCEDURE** Department: **QUALITY ASSURANCE**  |
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| Revision Date: June 18, 2012 | Revision No: 002 | Page 1 of 3 |
| Subject: INSPECTION, MEASUREMENT AND TEST EQUIPMENT CALIBRATION  |

 PURPOSE

 The purpose of this procedure is to provide for instructions, for calibration of measuring and test equipment.

 This procedure applies to measuring and test equipment, to comparative reference hardware (such as templates), and to test software used for verification of product and environmental conformance and for control of production processes. This procedure directly concerns the Quality Assurance department, and is indirectly relevant to Production and Design departments. The Plant Quality Manager is responsible for this activity. The Corporate Quality Manager is responsible for ensuring that measurement analysis software is validated annually.

 PROCEDURE

 Calibration of Digital Read Out Calipers and Micrometers

1. Clean the gage.
2. Insure the gauge travel from minimum to maximum position is present without difficulties or binding.
3. Inspect the part contact surfaces of the gauge for wear and/or damage.
4. Calibrate the gage by comparing measurements with gage blocks of 10 to 20%, 50%, and 70 to 80% of the gauge total travel.
5. If the results are within .0005” of the standard, (gage blocks), record the readings, accept the gage and identify the gauge as calibrated.
6. If the results are outside of the calibration allowance, reject the gauge, remove it from service and place “OUT OF SERVICE” tag on the gauge. Initiate corrective action to resolve the impact to the customer of measurement nonconformance.
7. Document the calibration results in gage software from the identification number of the gauge.
8. Insure that the gauge is identified as calibrated.

**Calibration of Pin/Slot/Cone Gages/Go-No-Go Set Pins, Snap Gages**

1. Clean the gage.
2. Inspect the part contact surfaces of the gauge for wear and/or damage.
3. Using certified Micrometers / Gage Blocks compare the Gauge dimension reading with the stated dimension.
4. If the results are not exact to the specification, remove the gage(s) from service and place “OUT OF SERVICE” tag on the gage. Initiate corrective action to resolve the impact to the customer of measurement nonconformance
5. If the gage is acceptable, record the calibration results in the gage software from the gage identification number.
6. Insure that the gauge is identified as calibrated.

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**Calibration of Hardness Tester, Surface Plate, Torque Wrench, Gage Blocks, Force Gages, Shipping Scales, Optical Comparators, CMM and MTS Tension Tester.**

1. Certification by qualified contractor or agent of the Equipment Manufacturer is required for calibration of Hardness testers, surface plates, torque wrenches, force gages, shipping scales, optical comparators, CMM and MTS tension test apparatus using reference standards that are traceable to N.I.S.T.
2. If the re-calibration results are not to the specification and tolerance, remove the gage(s) from service and place “OUT OF SERVICE” tag on the gage. Initiate corrective action to resolve the impact to the customer of measurement nonconformance.
3. When the test apparatus is acceptable, place Certificate of Calibration in gauge calibration record book and update gauge software.
4. Insure that the gauge is identified as calibrated.

**Calibration of Form / Final Form, Gauges with Digital / Dial Indicator Gages.**

1. All form and final form gages will be re-certified to current design record and the current design level change using reference standards that are traceable to the N.I.S.T.
2. If the re-calibration results are not to the specification and tolerance, remove the gage(s) from service and place “OUT OF SERVICE” tag on the gage. Initiate corrective action to resolve the impact to the customer of measurement nonconformance
3. When the gauge is acceptable, place gauge re-certification certificate and calibration certification in gage calibration record book and update gage software.
4. Insure that the gauge is identified as calibrated.

 **Measurement System Analysis**

 **A. Variable Gauge Analysis**

1. Measurement System Analysis of Variable Gauges, ie. Calipers, Micrometers, and Height gauges will be documented annually. Measurement System Analysis of Variable Data Form Gauges will be documented at PPAP- Initial Process Study and when production part design changes occur.
2. Where Critical Characteristics ‘CC’ or Special Characteristics ‘SC’ as per the design record/drawing are measured, the measurement system analysis of the gage will be re-evaluated and documented annually.
3. Clean gage and ensure the gage functions as designed though the operating range.
4. Using 10 numbered production parts and 3 evaluators, complete and document 3 measurements of the characteristic on each of the 10 production parts which are spread in the tolerance of the dimension.
5. Complete and record the resulting measurement system analysis in the gage software.
6. Insure that the gauge is identified as calibrated.
7. Where resulting Gauge Repeatability and Reproducibility (GR&R) values are above 10%, the gauge shall be improved and re-evaluated until GR&R values are below 10%.

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**B. Attribute Gauge Analysis**

1. Measurement System Analysis of Attribute Gauges, i.e. form gauges, will be documented at certification. Measurement System Analysis of Attribute Form Gauges will be documented as well, at PPAP (Initial Process Study) and when production part design changes occur requiring gauge certification.
2. Where Critical Characteristics ‘CC’ or Special Characteristics ‘SC’ as per the design record/drawing are measured, the measurement system analysis of the gage will be re-evaluated and documented annually using 50 parts, 3 operators and 3 trials.
3. Clean gage and ensure the gage functions as designed though the operating range.
4. Using 30 numbered production parts and 3 evaluators, complete and document 3 trials/decisions of the non CC or SC characteristic on each of the 30 production parts that do not have a designated CC or SC characteristics.
5. Complete and record the resulting measurement system analysis in the gage software.
6. Insure that the gauge is identified as calibrated.
7. Where the resulting ‘KAPPA’ values are below 80%, the gauge and operator training shall be improved and re-evaluated until KAPPA values are above 80%.

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**Nonconforming Equipment**

 When measuring or test equipment is found to be out of calibration or appears to have a % G&R value of greater than 20% ( % Process Variation or % Tolerance), Quality Assurance will investigate and assess the validity of measurements for which the equipment was previously used. Identification of such equipment and the impact of its uses on acceptance of products are reported in a nonconformance report, in accordance with Procedure PR-QA-007 Control of Nonconforming Product. If suspect material has been shipped, the customer shall be notified; PR-QA-005 Corrective and Preventative Action.

 ASSOCIATED DOCUMENTS

 AIAG: Measurement System Analysis (MSA) Manual

 Control of Non Conforming Product PR-QA-007

 Corrective and Preventative Action PR-QA-005