GM	WORLDWIDE ENGINEERING STANDARDS	Test Procedure	SUPERCEDED GMW16861

Test Method to Quantify Cleanliness of Electric Motor and Components

Do Not Use on New Programs; Replaced by GMW16037

1 Introduction

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose. This document outlines a method for:

a. Method to remove and collect foreign debris from electric motor and related electrically insulated components with an intention to introduce cleaned components into service.

b. Determining the weight and nature (if specified) of foreign material retained in or on electric motor components prior to assembly.

c. Verifying the functionality of the component in application after the cleaning process.

1.2 Applicability. This method may be used to quantify foreign material present in components, sub-assemblies and assemblies.

1.3 Remarks. The test method involves washing electric motor and related electrically insulated components with specified method and solvents, collecting the rinse fluid, filtering solid materials from it and determining the weight (and nature, if specified) of solids present; The method also outlines drying requirement and method for the post-washed components to be re-introduced to service.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

ISO 16232-2 ISO 17025

2.2 GM Standards/Specifications.

None

3 Resources

3.1 Facilities. Test shall be performed in well ventilated area required by the safe handling of the solvent.

3.1.1 Calibration. The test facilities and equipment shall be in good working order and shall have a valid calibration label.

3.1.2 Alternatives. Alternative test facilities and equipment may also be used. However, all measuring variables as specified in this standard shall be determined correctly with respect to their physical definition.

3.2 Equipment. A list of equipment and materials which may be necessary and useful in evaluating components for sediment levels is shown in Appendix A.

3.2.1 Nylon or Polytetrafluoroethylene (PTFE) filter membranes, 10 micron pore size (maximum), shall be used. The use of 44 micron (maximum) and 10 micron (maximum) nylon or PTFE filters in series is permissible.

3.2.2 A 5 micron filter (or equivalent) shall be used for filtering wash fluid that is recycled to a reservoir for further use.

3.2.3 Wash fluid shall be chemically non-aggressive to insulation and other materials used on the motor components. It shall provide effective rinse and leave minimum residue. Acceptable wash fluids are listed in Appendix A for motor components that are to be re-introduced to service.

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3.3 Test Vehicle/Test Piece. Components, subassemblies and assemblies shall be from the production process prior to their introduction into the assembly (if washed at the plant) or as shipped from a supplier (if shipped directly to the assembly line). Components may also be obtained from the production line at the final exit in order to monitor and control sediment control effectiveness. During transportation to the test lab, the samples shall be protected from external environmental debris.

3.4 Test Time. Part specific. See Section 4.3.

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. Per ISO 17025 section 5.2.

4 Procedure

4.1 Preparation. Collect test samples per 3.3 prior to sediment evaluation, test samples must not be rinsed, wiped, or cleaned in any way other than what is typical for the production process. Lot numbers or other pertinent shipment information shall be recorded for samples to be tested. Avoid handling samples in a manner that could loosen or remove debris from the samples.

4.2 Conditions.

4.2.1 Environmental Conditions. Ambient laboratory environment.

4.2.1.1 When evaluating traction motor assemblies, rotor and stator shall be checked separately.

4.2.1.2 Test frequency and sample size shall be defined per control plan. Sample size shall be sufficient to allow for statistical control of production processes and establishment of control limits. Reduced sampling is possible based on statistical data showing process capability.

4.2.1.3 Reintroduction of test samples into the production process must occur before the end of line test.

4.2.2 Test Conditions. Deviations from the requirements of this standard shall have been agreed upon. Such requirements shall be specified on component drawings, test certificates, reports, etc.

4.3 Instructions.

4.3.1 Prepare Test Equipment and Materials.

4.3.1.1 Oven dry the required number of filters for 30 minutes to 35 minutes at 50 °C to 55 °C. Allow filters to cool for 15 minutes to 20 minutes in a desiccator prior to use. Times and temperatures may be adjusted to meet current plant practices and production schedules.

4.3.1.2 Ascertain the weight of filters to the nearest 0.1 mg (milligram) by means of an analytical balance and record the value in milligrams.

4.3.1.3 Rinse collection tub/tray before and after each test with a sufficient quantity of wash fluid to purge the system of any foreign material. Collect the fluid in a beaker and visually examine the sediment for unusual particles or amounts. Equipment and materials should be protected from environmental contamination when not in use.

4.3.1.4 For reusable wash fluid, cleanliness shall be checked as follows. Collect at least 1 L of homogeneous rinse fluid in a clean beaker and note the volume used. Filter the fluid with vacuum assist through a pre-dried and pre-weighed 5 micron (maximum) filter. Remove filter from the funnel and expose to drying cycle (4.3.2.5.1). Determine amount of residue collected by subtracting original filter weight from weight of filter plus (+) residue. If amount of residue exceeds 0.50 mg/L, wash fluid must be replaced with new. Wash fluid must be replaced annually regardless of test results.

4.3.2 Cleaning and Measurement of Test Sample. Prepare the required number of filters per 4.3.1.1 and 4.3.1.2.

4.3.2.1 Place the component to be evaluated in the clean collection tub/tray. Thoroughly rinse the component with a maximum pressure of 300 kPa and a minimum of 1 L of solvent. Efforts should be made to ensure that all foreign material and loose debris are removed from the motor component including those in the enclosed areas.

4.3.2.2 Burrs resulting from machining operations, assembly operations, etc., which remain firmly attached after rinsing and air blowout shall be noted but shall not be included in the total sediment weight. Appropriate equipment (mirrors, lights) shall be used to inspect enclosed areas for loose chips not removed by the rinse. In such cases, proper actions shall be taken to improve the cleanliness process.

4.3.2.3 Place dried and weighed filters in the filtration funnel.

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