



Battery Disconnect Unit Tray, Contactor and Relay - Free Acceleration and Sound Pressure Evaluation Procedure

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.

- The Operating Data Acquisition Master Test Procedure. GMW14227, shall be referenced for more detailed information corresponding to this test procedure.
- Test Properties Definitions, GMW8702, shall be referenced to provide a standardized set of definitions of test properties for noise and vibration testing, analysis, benchmarking and development.

1.1 Purpose. Define the process for quantifying the component assembly free acceleration levels and sound pressure levels at the vehicle and subsystem attachment locations for Battery Disconnect Unit (BDU) trays and contactors/relays.

1.2 Applicability. This test procedure is appropriate to use for high voltage battery disconnect unit trays and individual contactors/relays.

1.3 Remarks. The free acceleration of an electrically powered component is one of the factors affecting structure-borne noise. This quantity, with others, can be used to calculate forces into the body or be combined to predict noise levels in the vehicle passenger compartment.

2 References

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

2.1 External Standards/Specifications.

DIN 45631/A1

2.2 GM Standards/Specifications.

GMW8702

GMW14172

GMW14227

2.3 Additional References.

- ArtemiS suite available from www.head-acoustics.de/eng/nvh_artemis_suite.htm
- Component Technical Specification (CTS)
- Subsystem Technical Specification (STS)

3 Resources

3.1 Facilities. A test room with a background noise level 10 dB below the level of the component being measured (see GMW14227).

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.

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3.2 Equipment.

- Data acquisition system
- External voltage supply
- Small accelerometers (weight less than 0.006 kg)
- Free field measurement microphone (12.7 mm diameter)
- Microphone stand and signal conditioning
- Elastomeric cords

3.3 Test Vehicle/Test Piece. A representative component with bracket assembly and cabling including appropriate electrical connection is required.

3.4 Test Time.

Calendar time: 1 day

Test time: 6 hours

Coordination time: 2 hours

3.5 Test Required Information. Appropriate component operating voltage range.

3.6 Personnel/Skills. To complete this test, at least one (1) technician and/or one (1) engineer skilled in noise and vibration data acquisition, analysis, equipment usage and test setup is required.

4 Procedure

4.1 Preparation. Using elastomeric cords, suspend the test piece as oriented in the vehicle to approximate free-free boundary conditions. Manipulate the elastic compliance to less than a 1 Hz rigid bounce mode.

4.2 Conditions.

4.2.1 Environmental Conditions. The ambient temperature shall be between 18 °C and 29 °C and temperatures shall not vary more than 6 °C during a given test unless otherwise specified.

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 Calibration Verification. Check equipment for valid calibration date. Replace out of date equipment. Perform equipment calibration verification (see GMW14172).

4.3.2 Data Acquisition. Capture the time data with a minimum sampling rate of 44.1 kHz.

4.3.2.1 Operate the component with an external voltage supply. Increment the applied voltages between 9 V and 15 V, or other appropriate voltage range as experienced in vehicle. Using lightweight accelerometers, monitor the tri-axial acceleration responses at each of the vehicle attachment locations. Locate the microphone 500 mm above, and centered on the top face of, the BDU tray. Identify the applied voltage that results in the highest acceleration levels. Repeat while monitoring the microphone voltage, record the voltage that results in the highest sound pressure levels.

4.3.2.2 Operate the component at the voltages identified in 4.3.2.1. Measure the tri-axial acceleration responses at each of the vehicle attachment locations.

5 Data

5.1 Calculations. Calculate the maximum free acceleration vector magnitude for each attachment point. The acceleration vector magnitude is equal to the square root of the sum of the squares of the individual tri-axial responses as follows:

$$A_i = \sqrt{(A_x^2 + A_y^2 + A_z^2)}$$

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