



Damper Teardown 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.

1.1 Purpose. This procedure outlines the method required to assure a consistent process for data collection relative to benchmarking, post-test analysis and root causing.

1.2 Applicability. This procedure applies specifically to the teardown of vehicle suspension dampers (e.g., shock absorbers and MacPherson struts).

1.3 Remarks. Not applicable.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW14243

GMW14804

GMW16811

GMW17193

GMW14540

2.3 Additional References. None.

3 Resources

3.1 Facilities.

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.

3.2.1 Shock Dynamometer with Capability to Measure Damping, Friction and Gas Reaction Forces

3.2.2 Scale (0.1g resolution)

3.2.3 V-Blocks

3.2.4 Bench Vise with Soft Jaws

3.2.5 Personal Protective Equipment (PPE)

3.2.6 Drill Press

3.2.7 Graduated Cylinders

3.2.8 Solvent for Parts and Equipment Cleaning

3.2.9 Fluid Storage Plastic Bottles

3.2.10 Lathe

3.2.11 Pipe Cutter

3.2.12 Beakers**3.2.13 Lint Free Toweling****3.2.14 Mallet****3.2.15 Dial/Digital Torque Wrench (100N-m capacity)****3.2.16 Band Saw****3.2.17 Cut-off Saw****3.2.18 Deburring Tool****3.2.19 Digital Vernier Caliper****3.2.20 Digital Micrometer****3.2.21 Digital Height Gage****3.2.22 Coordinate Measuring Machine (CMM)****3.2.23 Optical Comparator****3.2.24 Digital Camera**

3.3 Test Vehicle/Test Piece. On-vehicle testing may be required in advance of teardown procedure completion to gather additional product performance information critical to the evaluation process. This will be determined by GM personnel.

3.4 Test Time. Test time will vary for each part group. GM personnel shall have flexibility to assess the priority communicated to the Supplier to conduct this procedure in a manner that provides a complete evaluation based on objectives set prior to work start-up.

3.5 Test Required Information. See Table 1.

3.6 Personnel/Skills. Performance of this procedure shall be conducted by persons skilled in the function, performance and assembly of these products. These persons shall be skilled in the use of all tools and equipment identified in 3.2. These persons shall also be trained in the safe handling of these products in addition to the tools and equipment required to execute this procedure identified in 3.2.

4 Procedure

4.1 Preparation. GM personnel shall define the metrics for the affected test pieces in advance. The tear down procedure will be conducted after all non-destructive performance is complete. Many non-destructive performance requirements will be captured by performing GMW14243, GMW14540, GMW14804, GMW16811, and GMW17193. Any deviation from this procedure will require permission from GM personnel. Additional non-destructive requirements may be required. On-vehicle damper or module data may be required to complete the evaluation. Non-destructive findings shall be reviewed with GM personnel prior to destructive process start.

4.2 Conditions.

4.2.1 Environmental Conditions. All work shall be conducted at room temperature (21 °C) in a clean enclosed room to minimize exposure to contaminants.

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. All measurements shall be documented and compared to part nominal and control requirements. This includes all characteristics and attributes that should be controlled and are on the approved GM Engineering drawing. All aspects should be evaluated relative to process controls looking at both distribution and average. See Table 1 and Appendix A, Figure A1 for specific procedure requirements.

Table 1: Specific Procedure Requirements

Step	Description	Note/Observation	Equipment Needed
1	Mark and photograph all components in position	Mark all components to indicate alignment and relative position of components for post teardown reference. Note contact of interfacing components. Photograph.	Paint pen and camera
2	Measure performance criteria as possible	Damping, gas force, friction, lag, Noise and Vibration (N&V), etc. Utilize GMW specifications as applicable.	Shock dynamometer
3	Measure mass	Note content (e.g., mounts, bushings, etc.)	Scale
4	Remove Dust Tube from Damper Assembly	If plastic - push or cut-off at cap. If metal – cut-off near interface with cap.	Utility knife or pipe cutter
5	Measure external interface and other significant dimensions	Measure basic position of interfacing components (spring seats, brackets, etc.) and basic dimensions (lengths, travels, diameters, etc.) per Geometric Dimensioning and Tolerancing (GD&T) as needed.	Calipers, micrometers, height gage, CMM, optical comparator
6	Secure damper in a horizontal position to drain oil away from drilling area	Note: Do not deform or crush reservoir tube to prevent binding or damaging internal parts.	V-blocks or bench vise with soft jaws
7	Drill small hole in bottom of reservoir tube	Drill slowly to release gas pressure (use plastic bag to protect from oil spray). Allow gas to release slowly when tube is initially perforated (keep reservoir tube horizontal to prevent oil loss). Hole should be approximately 10 mm to 15 mm above end cap. WARNING: Monotube dampers may have exchanged gas and oil across the separator piston. Use caution when drilling to release gas pressure as oil may be present.	Drill press, PPE (safety glasses, gloves and plastic bag)
8	Pump the oil from the damper into a container	Collect fluid in a clean graduated cylinder to determine contents volume (typically 200cc to 400cc). Turn damper over with drilled hole downward and pump the fluid out by repeatedly pushing the piston rod in and out. Transfer fluid to a storage bottle and keep with sample (filtration and further analysis may be required of fluid). WARNING: Monotube dampers may have exchanged gas and oil across the separator piston. Use caution when drilling to release oil as gas pressure may be present.	Graduated cylinder, solvent and fluid storage bottle
9	Collect and measure fluid volume		