



Durability Test Bellows Propeller Shaft

1 Scope

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. Not applicable.

1.2 Foreword. The suitability of bellows for homokinetic joints on the drive shaft of rear wheel drive (RWD) or four wheel drive (4WD) vehicles shall be determined on the test bench.

1.3 Applicability. Determination of the fatigue strength or the ability of the bellows to maintain shape and envelope at various ambient temperatures, joint angles and number of revolutions

1.4 Definitions. The temperatures (T) are ambient temperatures in the test room. The joint angles (α) and rotational speed (n) on the test piece shall be set in accordance with specification.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

None

2.3 Additional References.

Master Process Documents (MPD)

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.

3.1.3 Climatic chamber, e.g., Weiss Technik, type 500 AB/60 – 120, or equivalent.

- Temperature range: -40 °C to +160 °C
- Volume of test room: 500 L

3.1.4 Control of rotational speed and temperature.

3.2 Equipment. Mechanical test device and connection parts as per MPD.

3.3 Test Vehicle/Test Piece. Not applicable.

3.4 Test Time. Reference 4.3.1 and 4.3.2.

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. Not applicable.

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4 Procedure

4.1 Preparation.

4.1.1 The test bench-specific connection parts shall be fitted to ensure the assembly, cap (with bellow) is held in accordance with the MPD.

4.1.2 The test pieces shall be fitted as specified in the MPD. Particular attention shall be paid to the correct grease filling, the specification of the clamps, the tensioning forces and tensioning tools.

4.1.3 The test pieces shall be stored for 3 days (72 h) at $+23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ and shall then be installed in the test bench.

4.1.4 Test. The test parameters shall be programmed into the climatic chamber or adjusted there (see Sections 4.2.1.1 and 4.2.1.2).

4.2 Conditions.

4.2.1 Environmental Conditions. Reference Table 1.

Table 1: Test Environment Conditions

Condition	Parameter
Lowest Outside Ambient Temperature Without Damage	$-40\text{ }^{\circ}\text{C}$ ^{Note}
Lowest Outside Ambient Temperature Without Performance Degradation	$-10\text{ }^{\circ}\text{C}$
Maximum Outside Ambient Temperature Without Damage or performance degradation	$+55\text{ }^{\circ}\text{C}$
Non-Operating Free Air Temperature Range	$-40\text{ }^{\circ}\text{C}$ to $100\text{ }^{\circ}\text{C}$
Maximum Component Temperature (Shaft assembly – front/axle prop (Front/Auxiliary))	$+135\text{ }^{\circ}\text{C}$ continuous, $+163\text{ }^{\circ}\text{C}$ for 15 minute duration
Maximum Component Temperature (Shaft assembly – prop, or front and rear prop (one (1) piece or two (2) piece))	$+94\text{ }^{\circ}\text{C}$ continuous, $+121\text{ }^{\circ}\text{C}$ for 15 minute duration ^{Note}
Paint Booth Temperature during Vehicle Repair	$+100\text{ }^{\circ}\text{C}$
Altitude for Operation	-150 m to 4600 m
Altitude Maximum for Transport	$13\text{ }700\text{ m}$
Humidity	100%

Note: Check vehicle "Regions of Sale" for possible temperature requirement adjustments.

4.2.1.1 Heat test ambient temperature: $+94\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ (shall have been present for 2 h when revolutions start).

Note: Check vehicle "Regions of Sale" for possible temperature requirement adjustments.

4.2.1.2 Cold test ambient temperature $-40\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ (shall have been present for 2 h when revolutions start).

Note: Check vehicle "Regions of Sale" for possible temperature requirement adjustments.

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 Heat Test.

- Rotational speed: 6000 rpm
- Joint angle: 8 degrees
- Test duration: 100 h

4.3.2 Cold Test.

- Rotational speed: 2000 rpm

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