GM WORLDWIDE ENGINEERING STANDARDS	Test Procedure	GMW15673

Friction Coefficient of Window Regulator Pulley

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. The purpose of this procedure is to determine the friction coefficient of window-regulator pulley, which affects the performance of glass guidance system. The information is used in Computer Aided Engineering (CAE) model to predict the performance of glass guidance system.

1.2 Foreword. Not applicable.

1.3 Applicability. This procedure applies to all cable-drive regulator systems.

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

3 Resources

3.1 Facilities. Not applicable.

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 Fixed rigid fixture with pulley riveted per production process.

3.2.2 Weights.

3.3 Test Vehicle/Test Piece. Pulley and pulley rivet are to be production intent components.

3.4 Test Time. Not applicable.

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. Not applicable.

4 Procedure

4.1 Preparation. Not applicable.

4.2 Conditions.

4.2.1 Environmental Conditions. Conduct tests at ambient conditions 22 °C ± 2 °C.

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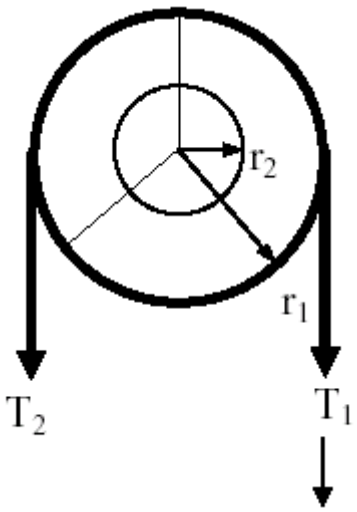
4.2.2 Test Conditions. Deviations from the requirements of this standard shall have been agreed upon. Such requirements shall be specified on component drawings, test certificates, reports, etc.

4.3 Instructions.



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Where:

r_1 = Pulley radius (measured from center to inside of the cable groove)

r_2 = Pulley rivet radius

T_1 = Hanging weight 1

T_2 = Hanging weight 2

Figure 1: Pulley and Rivet Test Setup

4.3.1 Mount the rotating pulley in a fixed rigid fixture. Attach cable with a contact angle of 180 degrees. Remain equal length for both ends.

4.3.2 Measure the inner and outer radius of the rotating pulley (r_1, r_2) as shown in Figure 1.

4.3.3 Hang equal weight of 100 N (T_2) to each end of cable as shown in Figure 1.

4.3.4 Gradually increase weight to one (1) end of cable until the cable begins to move. Record the final weight (T_1).

4.3.5 Substitute T_1, T_2 into 5.1 Equation 1 to calculate the friction coefficient μ_s.

4.3.6 Change the balance weight (T2), and repeat 4.3.2 through 4.3.4 for another four (4) estimates (T_2 = 200 N, 300 N, 400 N and 500 N).

4.3.7 Average the five (5) estimates.

5 Data

5.1 Calculations. The friction coefficient of pulley is estimated per Equation 1.

$$u_s = \frac{\frac{T_1}{T_2} - 1}{\frac{T_1}{T_2}\frac{r_2}{r_1} + \frac{r_2}{r_1}} \quad \text{Equation 1}$$

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