GM	WORLDWIDE ENGINEERING STANDARDS	Test Procedure	GMW15468

Hydrolytic Resistance of Polyamide to Coolants

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. This standard shall be used to determine the hydrolytic resistance of glass fiber reinforced polyamide 66 to the influence of water/coolant mixtures at elevated temperatures.

1.2 Foreword. Not applicable.

1.3 Applicability. This standard is particularly suitable for assessing materials intended for use in the engine cooling circuit.

2 References

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

2.1 External Standards/Specifications.

ISO 179-1	ISO 527-1	ISO 527-2

2.2 GM Standards/Specifications.

GMW3059	GMW3420	GMW16270

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 Autoclave With electronically-controlled electrical heating system or pressure vessels, preferably stainless steel, suitable for use in drying ovens. The dimensions and volume of the vessels shall be in accordance with the shape and number of the test pieces to be stored simultaneously in the test fluid.

3.2.2 Testing Machines. Testing machines which are equipped in such a manner as to determine the specified properties according to paragraph 4.3.4.

3.2.3 Test Fluid. Mixtures of radiator anti-freeze agents according to GMW3420 and distilled water shall be used. Unless agreed otherwise, the mixture ratio shall be 1:1 vol. concentrated anti-freeze agents must not be used. Any one of the approved products may be used as a test fluid. The test fluid shall not be changed during storage.

3.2.4 Desiccator.

3.2.5 Cotton Cloth.

3.3 Test Vehicle/Test Piece. Polyamide 66 reinforced with glass fibers, with stable hydrolytic heat stabilizer according to e.g., GMW16270P PA66-GF30.

3.4 Test Time. See Table 1, Table 2 and Table 3.

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3.5 Test Required Information. The testing of 1:1 water/antifreeze mixtures at temperatures > +108 °C (boiling point of the mixture) shall be performed in pressure vessels under increased pressure. Loss of pressure would lead to a severe delay in the mixtures reaching boiling point. The vessels shall therefore be designed for pressure loads and the relevant safety regulations observed. The pressure vessel shall only be opened once it has cooled down / at room temperature.

3.6 Personnel/Skills. Not applicable.

4 Procedure

4.1 Preparation. For initial sample approval and arbitration purposes, the minimum time period between manufacturing and testing shall be 7 days, for routine quality control purposes the time period shall be minimum 72 h.

Before testing, the test pieces shall be stored at a temperature of (+23 ± 5) °C for at least 8 h and shall be free from strain during this period.

4.2 Conditions.

4.2.1 Environmental Conditions. The tests shall be performed on dry as molded test specimen according to ISO 527-1 and ISO 527-2, where possible Type A.

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 Check-in Test. The test according to the properties in paragraph 4.3.4.1 shall be performed without any further pre-treatment.

4.3.2 Storage. The test specimen shall be stored in the test medium in the autoclav for the test time and test temperature according to paragraph 4.3.4.2 and 4.3.4.3 respectively.

After test time the test specimens shall be cooled down in the test medium to (+23 ± 5) °C.

Then the test specimens shall be removed from the test medium, rinsed with water and wiped dry with a cotton cloth.

After cleaning the test specimen shall be stored in a desiccator.

4.3.3 Test after Storage. Within 7 days (maximum) after the storage in the autoclav (paragraph 4.3.2) the properties according to paragraph 4.3.4.2 and 4.3.4.3 respectively shall be tested.

4.3.4 Determination of Properties.

Note: The properties are only applied for test specimen (see paragraph 4.2.1) and not for out-of-tool parts.

4.3.4.1 Determination of property values of the material in the as-received condition according to Table 1.

Table 1: Properties in the as-received condition, dry as molded.

Properties	Standard	Unit
Stress at Break	ISO 527-1	N/mm^2
Strain at Break	ISO 527-1	%
Charpy Impact Strength at +23 °C	ISO 179-1/ 1eU	kJ/m^2

4.3.4.2 Determination of property values after (504 /-2) h storage according to Table 2.

Table 2: Properties after storage (504 /-2) h at (+130 ± 3) °C.

Properties	Standard	Unit
Stress at Break	ISO 527-1	N/mm^2
Strain at Break	ISO 527-1	%
Charpy Impact Strength at +23 °C	ISO 179-1/ 1eU	kJ/m^2

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