GM	WORLDWIDE ENGINEERING STANDARDS	Test Procedure	GMW16642

Headlamp Washer Systems/High Pressure Nozzle Jets or Nozzle Jets with Telescopic Drives

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 standard stipulates the requirements, test conditions and test procedures for function, material and durability testing of nozzle jets, as well as nozzle jets with telescopic drives, used in vehicles with high pressure headlamp washer systems (referred to as **nozzles** or **drives**).

1.2 Applicability. In addition to the requirements of this standard, the nozzles, if applicable with drives, shall also fulfill the legal requirements of the countries in which they are operated, in conjunction with a high pressure headlamp washer system.

2 References

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

2.1 External Standards/Specifications.

ECE R 45.01	ISO 845	ISO 1798	ISO 3386
IEC 60068-2-27	ISO 1431-1	ISO 1856	ISO 8067
ISO 37			

2.2 GM Standards/Specifications.

GMW3059	GMW3286	GMW14359	GMW14797
GMW3172	GMW3600	GMW14363	GMW15622
GMW3191	GMW14234	GMW14650	GMW16331
GMW3221			

2.3 Additional References.

- Five (5)-Phase Template
- Program Specific Component Technical Specification (CTS)
- Program Specific Subsystem Technical Specification (SSTS)

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 Pressure System. According to the relevant test methods, test specifications, Deutsches Institut für Normung (DIN) standards, etc.

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3.1.3.1 Temperature Chamber. Recirculating air temperature chamber with air extraction system:

Test Room:	Suitable size
Passages:	Suitable
Temperature Range (-40 °C to +120 °C):	Continuously adjustable
Permissible Temperature Deviation:	± 3 °C
Structural Requirement:	Explosion proof
Humidity:	Controlled

3.1.3.2 Pressure Generation System. Pressure generating system for up to 500 kPa (5 bar) (72.5 psi) (e.g., high pressure pump for headlamp washer system).

3.2 Equipment.

3.2.1 Vibration Test Equipment. Electromagnetic vibration table with control unit for vibration test.

3.2.2 Shock Test Equipment. Shock testing machine with appropriate adjustment options.

3.2.3 Durability Testing Equipment. Suitable durability testing equipment for the performance of the durability test, consisting of counter, time control and pressure generating system.

The durability testing equipment is a device used to operate the nozzles, if applicable with drive, for the total number of durability test cycles according to preset operating and pause times. Upon completion of the specified number of cycles, the durability testing equipment shall automatically shut off.

3.2.4 Testing Instruments. For the performance of the release test, the following devices and equipment are required:

- Pump (to 600 kPa), hoses, pressure gauge (to 600 kPa), stopwatch, test beaker
- Explosion protected temperature cabinet and return air furnace. (-40 °C to +120 °C)
- Serial high pressure pump, power supply, switch clock with numerator
- Agitator for the test of the vibrating strength
- Material testing instrument(s) to ISO 37, GMW14363, ISO 845, ISO 1798, ISO 8067, ISO 1856, GMW3221, GMW14359 and ISO 3386.

All devices and instruments must be so constructed that their accuracy is better than the tolerances allowed for the test.

3.2.4.1 According to the relevant test methods, test specifications, DIN standards, etc.

3.2.4.2 Fixture. Device for mounting and installation of the nozzles, and if applicable, the drives to be tested.

3.2.4.3 Pressure Measuring Instrument. Digital displayed overpressure measuring instrument with analog output (printer and recorder output).

- Indicating range 0 kPa to > 500 kPa, resolution ≥ 2 kPa

3.2.4.4 Voltage Stabilizer. Voltage and current (100 A minimum) adjustable.

3.2.4.5 Voltmeter. With appropriate measurement range, accuracy class 0.5 or higher.

3.2.4.6 Measuring Container. Measuring glasses of appropriate size for volume measurement.

3.2.4.7 Time Switch with Counter. The time switch with counter is a device used to operate the test setup for the total number of test cycles according to preset operating and pause times. Upon completion of the specified number of cycles, the time switch with counter shall automatically shut off.

Intervals: (variable)	Continuously (1 s to 30 s)
Pause intervals: (variable)	Continuously (1 s to 60 s)
Reading accuracy:	0.5 s
Counter Frequency:	0.1 Hz
Counter Range:	≥ 4000 pulses

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3.2.4.8 Test Medium. As described in the individual test points, the following test medium shall be used:

a. Tap water

b. 50% tap water with 50% alcohol (isopropanol)

Note: If no medium is specified in the individual test points, test medium using **Item a**.

3.2.4.9 Water Hardness. Verify that the hardness of the water does not exceed 3.17 grains/L (12 grains/gal). The water hardness certification may be obtained from the local water supplier. Otherwise, contractor shall obtain an equivalent certification or conduct such test within 60 days of beginning of compliance test run. A suitable water softener shall be used if required.

3.2.4.10 Set of Hoses. A set of hoses to connect the individual components filled with the test medium. Released production hoses shall be used for the test, if available. The connection between the individual components shall be as short as possible. Where possible, rigid tube connections with identical flow cross sections are also allowed.

3.3 Test Vehicle/Test Piece.

3.3.1 Test Samples. If not otherwise specified, for the purpose of initial sampling and release testing according to this specification, at least 40 nozzles (20 pair) shall be used. The test samples shall be successively numbered. The factory test certificate shall contain the rated values and the actual values measured by the supplier as required in the specification and the drawings from the material and operational data.

3.3.2 Quality Control. For the control of the quality of production the Division Quality Control and Inspection is responsible. Any change at the jet horn compared to the released test samples requires GM approval.

3.4 Test Time. Time is dependent on test being performed (reference Appendix C, Table C1).

Calendar time:	182 days
Test hours:	5400 hours
Coordination hours:	12 hours

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. A person with previous wiper washer reservoir system test experience who has conducted similar tests for GM.

4 Procedure

4.1 Preparation.

4.1.1 Marking. In accordance with the minimum requirements to ECE R 45.01, an important part of the headlamp washer system shall be clearly and indelibly marked with the following inscription:

- Trade name or trademark.
- The rated voltage, for electrically operated components.
- A sufficiently large area for the authorization codes. The design of the nozzle is normally vehicle dependent. The authorization code should be applied to the nozzle in such a way that it is visible in the installed condition on the vehicle.

If possible, a suitable point on the nozzle and, if applicable, the drive should also be clearly and indelibly marked with the following according to GMW16331:

- GM trademark.
- The manufacturing date.
- The manufacturer's trademark (if not already present).
- The part number.
- If possible for plastic parts, the material identification.

4.1.2 Visual and Dimensional Check. In the as received condition, the test samples shall not show any visible damages or defects which could adversely affect the function or the appearance. The dimensions and their tolerances as specified in the design drawings and/or releases shall be fulfilled from all parts.

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4.2 Conditions. If not otherwise specified in the individual tests, the tests shall be performed in the as received condition at +23 °C ± 3 °C without any preconditioning.

Prior to function testing with the test medium, the system shall be subjected three (3) times to a pressure of 300 kPa (3 bar) (43.5 psi) for 1 s to 2 s.

4.2.1 Environmental Conditions.

4.2.1.1 Emerging Market Environmental Conditions. Emerging Markets are to use the following minimum temperatures (T_{min}), unless stated otherwise in the program specific SSTS.

T_{min} = -20 °C for India

T_{min} = -40 °C for Russia

T_{min} = -15 °C for South America

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.

4.2.3 Materials. All materials used for the nozzles and drives shall meet the drawing specifications and material specifications, as well the requirements of the releases.

4.2.3.1 Ozone Resistance of Elastomer Parts. The ozone resistance of elastomer parts shall meet Ozone per ISO 1431-1 Procedure A, 100 pphm and 40 °C. Zero rating required.

4.2.3.2 Painted Plastic Parts. Painted plastic parts of the nozzles or the drives shall fulfill the requirements according to GMW14797.

4.2.3.3 Plastic Parts. All unpainted plastic parts of the headlamp washer system, which are visible in nonoperational as well as in operational mode, shall be weatherproofed according to GMW14650, Class 2.

4.2.4 Environmental Protection. Must comply with GMW3059, Restricted and Reportable Substances for Parts.

4.2.5 Current Connections. The electrical connections, if available, shall perform according to GMW3191.

4.3 Instructions. The tests shall be performed according to the test sequence (Appendix A, Figure A1). The prescribed sequence of the tests shall be observed to ensure that comparable results are attained.

4.4 General Requirements.

4.4.1 Test Temperature. If not differently specified, the tests are to be performed at 23 °C ± 3 °C.

4.4.2. Water Pressure Test. The jet horn/nozzle is connected to a water pump or approved pressure source by means of hoses. Turn the pump on for 5.0 s ± 0.2 s, a total of ten (10) times with a pressure of 600 kPa ± 30 kPa (87 psi ± 4 psi). The pause time is 10 s for each test. At the end of test, water may not be present at any point on the jet horn, except the jet opening. The individual parts of the jet horn/nozzle must remain in their position and may not be forced out. The settling position of the jet may not be changed. The water quantity issued out of the jet opening is measured. Refer to Figure 1.

4.4.3 Pressure Resistance and Tightness. The drive shall be subjected three (3) times to a pressure of 500 kPa (5 bar) (72 psi) with the nozzle closed. The test time shall be 5 s for each test, the pause time 10 s and the test temperature +60 °C. Refer to Figure 2.

4.4.4 Temperature Storage. The nozzles and, if applicable with the drives (test pieces), shall be stored without test medium (empty) at the following temperatures:

0.5 h at +95 °C then 30 minutes ± 5 minutes at +120 °C ± 3 °C:	Afterwards
168 h at +70 °C then 168 h ± 5 h at +90 °C ± 3 °C:	Afterwards
8 h ± 0.5 h at -40 °C ± 3 °C:	Afterwards
Fill with water:	End of Test
4 h ± 0.5 h at -40 °C ± 3 °C:	(Frozen in)

Note: The times are valid for reaching given temperature.

Note: Afterwards no deficiency is permissible.

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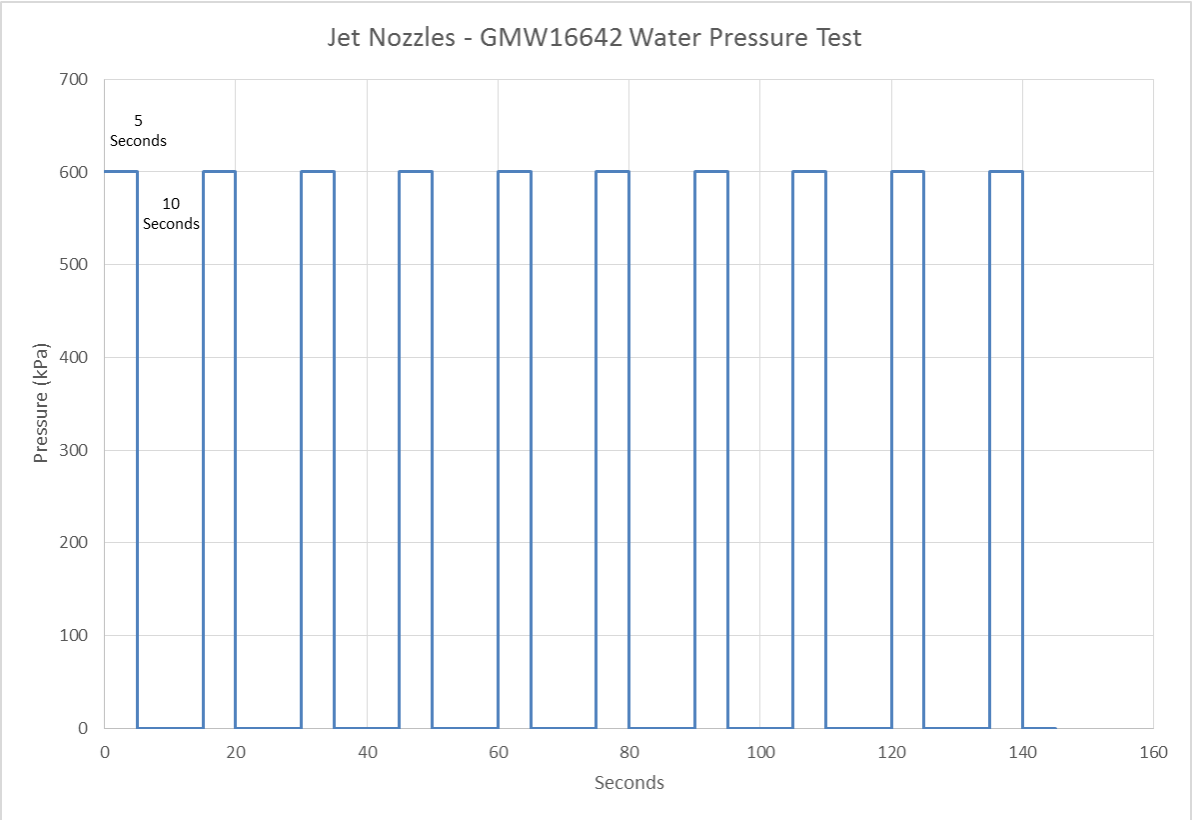

Figure 1: Water Pressure Test

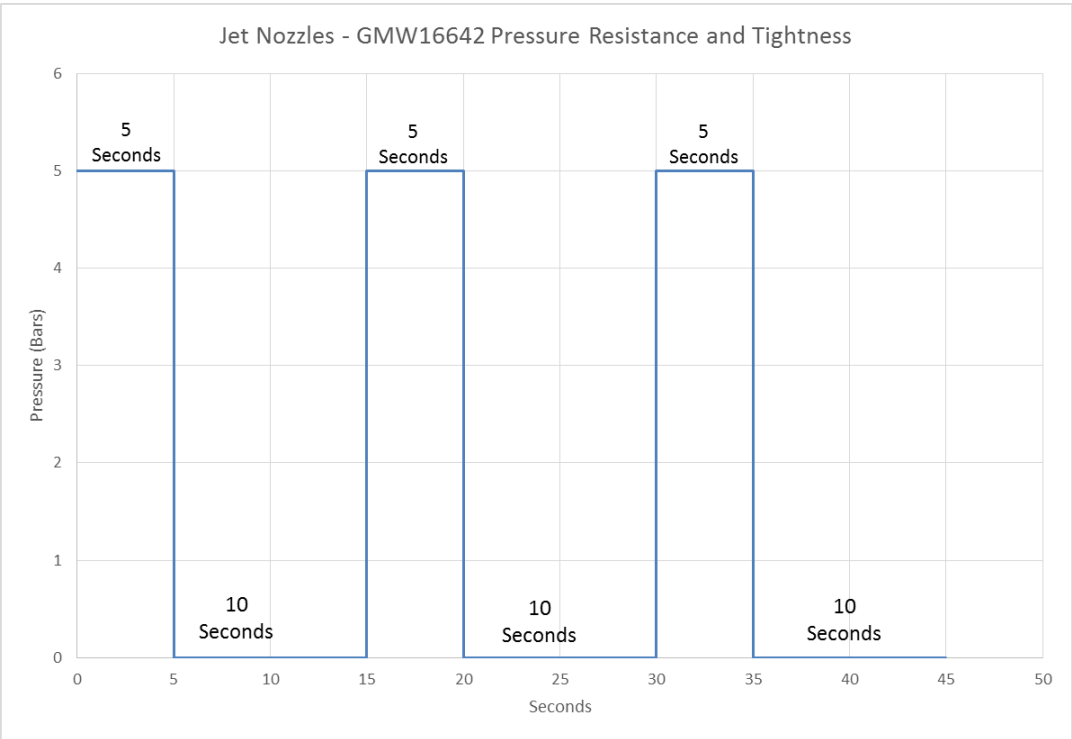

Figure 2: Pressure Resistance and Tightness Test

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