



Leakage Test of Sealing Systems in Fuel Line Systems

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. The test standard describes the leakage test for sealing systems (e.g., crimp connections, plug connections, clamp systems, etc.) in fuel line systems and stipulates the leakage requirements (up to system pressure of 1200 kPa).

This standard may be also used for fluid filter, valves and media connections. This standard may be used in whole and in part.

1.2 Applicability. Performance testing for fuel line systems for the complete vehicle range.

1.3 Remarks. Classifications (Reference Table 1) are:

Type A: Fuel line systems except for in-tank systems.

Type B: Fuel line systems for in-tank systems.

Type C: Fuel filler systems.

Table 1: Test Overview

Type	TCT / Ageing Soak Temp. (-30 and above) °C ± 2 °C	Test Pressure in kilopascals	Test Fuel		Test Step					
			Benzine (Gasoline)	Diesel	1	2	3	4	5	6
					Leak Test Delivery Condition	TCT without Fuel	TCT with Fuel	Soak with Fuel	Leak Test at (-30 ± 2) °C	Leak Test at (+23 ± 5) °C
A1	100	1000	X	--	X	X	--	X	X	--
A2	125									
A3	150									
A4	100		--	X						
A5	125									
A6	150	1200	X	--	X	X	--	X	X	--
B1	70	1000								
B2	200	200								
B3	90	1000								
C1	60	10	X	--	X	--	X	--	--	X
C2			--	X						

Note: TCT = Thermal Cycling Test

2 References

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

2.1 External Standards/Specifications.

DIN 50011	EN 837-1	EN 50014	ISO 1817
EN 590	EN 837-2		

2.2 GM Standards/Specifications.

GMW3059	GMW14914
---------	----------

GM Confidential

© Copyright 2015 General Motors Company All Rights Reserved

September 2015

Page 1 of 7

3 Test Preparation and Evaluation

3.1 Resources.

3.1.1 Facilities.

3.1.1.1 Calibration. The test facilities and equipment shall be in good working order and shall have a valid calibration label.

3.1.1.2 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.

3.1.2 Equipment. Test equipment are the test devices and gauges required for dimensional checks as well as the test facilities required under these test specifications:

- Connection equipment
- Water bath
- Polyglycol bath (optional)
- Air pressure supply

3.1.2.1 Climate Chamber. Climatic chamber with forced ventilation for recirculation with the addition of fresh air according to DIN 50011 and for the temperature range of -40 °C to +180 °C with a suitable explosion proof interior structure according to EN 50014.

The climatic chamber shall be capable of the test temperatures within the specified tolerances both with respect to time and space. The temperature change rate during heating and cooling phases shall be at ≥ 2 °C/minute.

3.1.2.2 Explosion Proof Pressure Chamber. For pressure, Class 0.6 according to EN 837-1 and EN 837-2, indicating range 0 MPa to 1.5 MPa, graduation 5 kPa, capable of bearing the final indication value.

3.1.3 Test Vehicle/Test Piece. See Section 4.

3.1.4 Test Time.

Calendar time: 9 days (includes all preparations, tests and coordination times)

3.1.5 Test Required Information. See Section 4.

3.1.6 Personnel/Skills. Technician/Test Engineer trained in the operation of test equipment as listed in 3.1.2.

3.2 Preparation. For initial sample inspections and in arbitrary cases, the test shall not be performed before 7 days, and for routine quality inspections not before 72 h after manufacture. Before the test, the samples shall be soaked at $+23$ °C ± 5 °C for ≥ 8 h under no load.

3.3 Conditions.

3.3.1 Environmental Conditions. See Section 4.

3.3.2 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.

3.4 Instructions. See Section 4.

3.5 Data. See 3.7.1 and Section 4.

3.6 Safety. This standard may involve hazardous materials, operations, and equipment. This standard does not propose to address all the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

3.7 Documentation. Samples of components or material released to this standard shall be tested for conformity with the requirements of this standard and approved by the responsible GM Department prior to the start of delivery of production level components or materials.

Any change to the component or material, e.g., design, function, properties, manufacturing process and/or location of manufacture requires a new release of the product. It is the sole responsibility of the supplier to provide the customer, unsolicited, with documentation of any change or modification to the product/process, and to apply for a new release.

If not otherwise agreed to, in writing in the sourcing documentation or deviation approval work orders, the entire verification test shall be repeated and documented by the supplier prior to start of delivery of the modified or

GM Confidential

© Copyright 2015 General Motors Company All Rights Reserved

September 2015

Page 2 of 7

changed product. In some cases, a shorter test can be agreed to between the responsible GM department and the supplier.

3.7.1 Test Results. The results shall be represented in a test report with reference to this standard. See also Data Sheet A1, Appendix A.

- Complete identification of the specimen
- Conditioning of the test specimen
- Test conditions, including method used
- Any deviations to the test method

4 Requirements and Procedure

4.1 General. The entire test procedure shall be performed under an explosion proof excavation system. For the corresponding test setup refer to the respective sealing system design drawing.

4.1.1 In order to perform leakage tests at the manufacturer, it is necessary to acquire information on single components from the responsible project engineer, or take it from the test layout on the design drawing of the sealing system, or obtain the parts from the project engineer.

4.1.2 The samples are assembled according to the assembly specifications using the specified assembly tools and the design drawing of the sealing system. The assembly is then subjected to the test steps according to Table 1.

4.1.3 Evaluation and Rating. No air leaks shall be detectable for the first 5 minutes. Discontinue the pressure buildup if an air leak is detected on the sealing system. Then the requirements of this specification are not fulfilled.

Air leak out of the pressure loaded inside of the system leads to nonconformity to this standard. In special cases, air leakage can occur from cavities which are not filled with fuel during system operation (e.g., also trapped air in textile layers of reinforced elastomeric hoses).

4.2 Requirements.

4.2.1 Samples.

4.2.1.1 Sample Setup. The assembly as used in vehicles, is used as a sample, however, the corresponding fuel line section is limited to 300 mm maximum.

4.2.1.2 Number of Samples. For initial sample inspections and in arbitrary cases at least six (6) samples shall be tested.

4.2.1.3 Temperature measurements shall be taken directly next to the samples.

4.2.1.4 In case of doubt, the prepared test pieces shall be stored in a suitable glass tank so that the tempering of the test piece is not impaired.

4.2.2. Test Fuel. Test fuel containing methanol according to the following specifications or standards:

- Benzine (Gasoline): ISO 1817 Liquid 2 (see also GMW14914)
- Diesel: EN 590 Artic Fuel Class 4

4.2.3 Fresh air at test temperature shall flow through the climatic chamber in a way that the complete air in the chamber is exchanged at least three (3) times and not more than ten (10) times an hour. Because of its catalytic effect on the ageing process, neither copper nor alloys of copper shall be used for parts of the climatic chamber which contact the samples.

4.3 Test Procedure.

4.3.1 Test at Delivery Condition All Parts. According to Test Step 1 in Table 1.

4.3.1.1 Storage. Twenty-four (24) h $\pm$ 1 h at $+23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$.

4.3.1.2 Leakage Test. With a pressure according to Table 1, the test samples are pressed in a water bath (respectively, polyglycol bath) at $+23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$.

Build up the pressure slowly so that test pressure is reached after 15 minutes $\pm$ 2 minutes. For evaluation and rating, see 4.1.3. If not fulfilled, stop testing.

4.3.1.2.1 Movement. For Type A and B only.

GM Confidential

© Copyright 2015 General Motors Company All Rights Reserved

September 2015

Page 3 of 7