



Fuel Immersion Resistant, Single-Core Stranded ISO Cable

1 Introduction

Note: Nothing in this standard supersedes 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 defines test and validation requirements for fuel immersion resistant automotive single-core ISO cable for General Motors. The cable shall meet all requirements of GMW15626, in addition to the requirements defined in this standard.

1.2 Applicability. This standard defines test and validation for single-core cables used in fuel tank immersion applications.

1.3 Remarks.

1.3.1 Nominal System Voltage. The cables used for fuel resistant applications shall be rated for 60 V, where the nominal system voltage is $< 60 V_{DC}$ or $25 V_{AC}$.

1.3.2 Temperature Classes. For fuel resistant cables, there are three classes defined in Table 1.

Table 1: Temperature Class Rating

Temperature Class	Alternative Temperature Class	Operating Temperature
A	T1	-40 °C to 85 °C
B	T2	-40 °C to 100 °C
C	T3	-40 °C to 125 °C

2 References

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

2.1 External Standards/Specifications.

ASTM B3 ASTM B33 ASTM B298 ISO 6722-1

2.2 GM Standards/Specifications.

GMW3059 GMW15626

2.3 Additional References.

- GMPT-4-002
- GMPT-4-008
- GMPT-5-020
- GMPT-5-029
- GMPT-6-019
- GMPT-6-030
- www.asg-analytik.de
- www.gageproducts.com
- www.haltermannsolutions.com

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. Refer to individual test in 4.5 of this standard.

3.1.3 Test Vehicle/Test Piece. Refer to individual test in 4.5 of this standard.

3.1.4 Test Time. Refer to individual test in 4.5 of this standard.

3.1.5 Test Required Information. Not applicable.

3.1.6 Personnel/Skills. Laboratory technicians skilled in safe fuel handling and data acquisition.

3.2 Preparation. Refer to individual test in 4.5 of this standard.

3.3 Conditions.

3.3.1 Environmental Conditions. Refer to individual test in 4.5 of this standard.

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. Refer to individual test in 4.5 of this standard.

3.5 Data. See 3.7.1.

3.6 Safety. This Engineering Standard may involve safety requirements for hazardous materials, the method of operations and equipment. This standard does not propose to address all the safety issues associated with its use. It is the responsibility of the user of this standard to ensure compliance with all appropriate safety and health practices. This would include any specific training that may be required. The safety and health standards include site specific rules and procedures, company rules and procedures, and Government Standards. Contact shall be made with the appropriate site Safety and Health personnel for further direction and guidance in these matters.

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, the entire verification test shall be repeated and documented by the supplier prior to start of delivery of the modified or 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 reported in the test report summary. The standard tests to GMW15626 shall be reported as shown in Appendix C of that document. The required tests to this standard shall be reported with the following (refer to Appendix B, Data Sheet B1):

- Name of the supplier.
- Date.
- Supplier Product Designation.
- GM Wire Code Designation.
- Production Location.
- Designation of Compound.
- International Material Data System (IMDS) Identification (ID) and information, if the IMDS datasheet has been approved by the customer.

- Test result and interpretation of test result.

4 Requirements and Procedure

4.1 General.

4.1.1 Cable Types. See Appendix A, Figure A1 and Tables A1 through A8 for definitions of cable types, based on construction, conductor, temperature class, wall thickness, and insulation materials.

4.2 Material.

4.2.1 Conductors. The conductor shall consist of plain or coated copper strands (see Table 2).

Table 2: Conductor Specification

ASTM B3	Soft or annealed copper wire
ASTM B33	Tin coated soft or annealed copper wire
ASTM B298	Silver coated soft or annealed copper wire

4.2.2 Conductor Stranding. The strand diameter and number of strands shall be according to Table 3.

Table 3: Conductor Stranding and Dimensions ^{Note 1}

Conductor Size (mm ²)	Structure A (Symmetrical)		Structure B (Asymmetrical)		Structure C (Flexible)	
	Number of Strands (minimum)	Strand Diameter maximum (mm)	Number of Strands (minimum)	Strand Diameter maximum (mm)	Number of Strands (minimum)	Strand Diameter maximum (mm)
0.22	7	0.21	N/A	N/A	N/A	N/A
0.35	7	0.27			19	0.16
0.5	19	0.19			37	0.14
0.75	19	0.24			38	0.16
1	19	0.27			54	0.16
1.5	19	0.33			76	0.16
2	19	0.38			105	0.16
2.5	37	0.28	50	0.26	140	0.16
3	37	0.34	44	0.31	160	0.16
4	37	0.38	56	0.31	224	0.16
5	37	0.43	65	0.33	250	0.16
6	37	0.45	84	0.31	320	0.16
8	98	0.33	62	0.41	240	0.21

Note: N/A = Not applicable

Note 1: Other stranding configurations may be used, if approved by GM Engineering.

4.3 Conductor and Cable Dimensions. The measurement is carried out according to ISO 6722-1. All measurements shall be within the limits of the appropriate values in Table 4.

Table 4: Dimensions

ISO Conductor		Thin Wall				Thick Wall			
		Outside Diameter		Insulation Thickness		Outside Diameter		Insulation Thickness	
Size mm ²	mm max	min	max	nom	min	min	max	nom	min
0.22	0.70	1.10	1.20	0.25	0.20	NA			
0.35	0.90	1.20	1.40	0.25	0.20				
0.5	1.10	1.40	1.60	0.28	0.22	2.00	2.30	0.60	0.48
0.75	1.30	1.70	1.90	0.30	0.24	2.20	2.50	0.60	0.48
1	1.50	1.90	2.10	0.30	0.24	2.40	2.70	0.60	0.48
1.5	1.80	2.20	2.40	0.30	0.24	2.70	3.00	0.60	0.48
2	2.00	2.50	2.80	0.35	0.28	3.00	3.30	0.60	0.48
2.5	2.20	2.70	3.00	0.35	0.28	3.30	3.60	0.70	0.56
3	2.40	3.10	3.40	0.40	0.32	3.80	4.10	0.70	0.56
4	2.80	3.40	3.70	0.40	0.32	4.00	4.40	0.80	0.64
5	3.10	3.90	4.20	0.40	0.32	4.50	4.90	0.80	0.64
6	3.40	4.00	4.30	0.40	0.32	4.60	5.00	0.80	0.64
8	4.30	4.60	5.00	0.40	0.32	5.00	5.90	0.80	0.64

Note: max = Maximum; min: Minimum; nom = Nominal