



Connector and Terminal Design Specification

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 document defines requirements for the design of electrical connectors and terminals.

1.2 Applicability. These requirements apply to all connectors designed for use in GM vehicles.

1.3 Remarks. The requirements specified in this standard, the Connector Component Technical Specification (CTS) Appendix C1 supplement to the electronic Statement of Requirements (eSOR), and if provided, USCAR-12, USCAR-21, and USCAR-2, shall be met for connectors and terminals. Additional requirements and/or any deviations to these requirements require prior written approval by the responsible GM Connection System Design Release Engineer (DRE) and Connector Bill of Materials (BOM) BOM Family Owner (BFO). Requirements and exceptions stated in the Connector CTS Appendix C1 supplement to the eSOR, if provided, shall take precedence over this standard.

2 References

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

2.1 External Standards/Specifications.

AIAG FMEA-4	EWCAP-005	SAE/USCAR-2	USCAR-21
EWCAP-001	IEC 60529	USCAR-12	USCAR-25

2.2 GM Standards/Specifications.

GMW3059	GMW3116	GMW16323
GMW3089	GMW3191	

2.3 Additional References.

- Automotive Industry Action Group (AIAG) Potential Failure Mode and Effects Analysis (FMEA) FMEA-4, available at Uniform Resource Locator (URL): <https://www.aiag.org/>
- Connector CTS Appendix C1 supplement to the eSOR, if provided
- Drawing Release Process and Releasing Files in TeamCenter Unified Architecture (TcUA) available at GM Supply Power, Uniform Resource Locator (URL) <https://gmsupplypower.covisint.com/web/portal/home> under Collaborate, Document Library, Engineering, Global, GEES Operations, Customer Support, FAQs - Self Help, How to
- GM drawing 13246040 available through GM Purchasing contacts
- Mechanical Interface Control Document (ICDm), provided by the GM Connector BFO, based on PNTTOP-7 Manufacturing Requirement for Paint Build-Up (ID) for body direct mounted connectors
- Plastic Manufacturer Specification for Regrind and Raw Material Combinations
- SAE/USCAR-2, USCAR-12, USCAR-21, and USCAR-25 are available at URL: <http://www.sae.org/>
- USCAR Electrical Wiring Component Applications Partnership (EWCAP), EWCAP-001 terminal blade drawing and EWCAP-005 clip slot bases are available at <http://www.uscar.org/guest/teams/10/Electrical-Wiring-Component-Applications-Partnership-EWCAP->

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April 2018

Page 1 of 9

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3 Requirements

3.1 Terminals.

3.1.1 The terminal system shall be a robust design that withstands normal handling in manufacturing, wiring-harness plants, assembly and service (test pins). Overstress protection shall be included.

3.1.2 Design the female terminals to avoid snagging or injury to assembler at the harness manufacturing plant.

3.1.3 Design for robust terminal retention, clean body or lanced (protected tangs).

3.1.4 Upon initial release of a new terminal family, a Dimensional (2D) cavity drawing shall be provided to GM for unrestricted usage by GM. The drawing shall be released under a GM part number.

3.1.5 Any outside surface or blade contacting surface must be free of burrs to promote good contact surfaces between male and female mating terminals.

3.1.6 New female terminal families to be compatible with male terminals specified on either GM drawing 13246040, available through GM Purchasing contacts, or, USCAR Electrical Wiring Component Applications Partnership (EWCAP) EWCAP-001 terminal blade drawing available at <http://www.uscar.org/guest/teams/10/Electrical-Wiring-Component-Applications-Partnership-EWCAP->.

3.1.7 Male terminals/blades/pins shall be according to either GM drawing 13246040 or EWCAP-001.

3.1.8 Terminals used on serial communication bus systems shall fulfill the requirements specified in GMW3089.

3.1.9 The nominal insertion force of the design to be quantified for each type of plating and shown on the drawing for the female terminal.

3.1.10 Terminals for individual cable seals must prevent the seal from moving along the wire and away from the terminal during assembly and handling and meet the retention force shown in USCAR-21.

3.1.11 Female terminals shall be designed with hoods, shrouds, sleeves, or steel springs to protect the electrical contact(s).

3.1.12 Terminal system shall use only rear carrier strips. Terminals must be reeled left to right, front to back and feed into the crimp die with the crimp wings up (Figure 1).

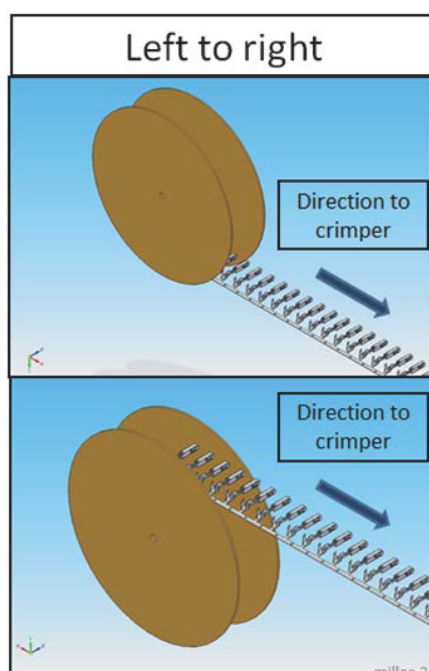


Figure 1: Terminal Reeling

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April 2018

Page 2 of 9

3.1.13 All terminals must be plated. Thickness, method of plating, type of material, etc., must be defined for each application and listed on the terminal drawing. Plating must be compatible with mating device plating per EWCAP-001

3.1.14 Precious metal plating shall have a visible indicator.

3.1.15 Silver-plated terminals must have anti-tarnish protection.

3.1.16 Design the terminal to prevent miss-orientation into the connector housing. **Note:** Not all terminals require a polarization feature. For designs that require polarization, design the terminal with a visually obvious external terminal orientation feature.

3.2 Connector Housing Design Characteristics.

3.2.1 Connectors shall be designed around Connector CTS Appendix C1 supplement to the eSOR, if provided. It is the Connector Supplier responsibility to fulfill the requirements specified in GMW3191 and this standard, e.g., extraction forces are established by choosing materials accordingly. The Connector Supplier is also responsible to be sure to have the latest terminal cavity drawing.

3.2.2 Connections shall be designed such that when mating at any angle or orientation, contact with the male blades by the female housing is not possible.

3.2.3 Design connectors to be protected against solid objects > 12.5 mm per IEC 60529, IP2 Compliance. Male Blade Stabilizers (MBS) may be used to meet this requirement.

3.2.4 The design should allow for a minimum of four codings (keys). The mechanical codings shall not allow miss-mating between any combinations. Tooling design must support the potential of additional coding. Coding variants shall be both color and mechanically coded.

3.2.5 Provide at least 0.25 mm clearance between the terminal lock surface and the respective terminal cavity locking finger retention surface. Clearance to be measured with the terminal against its forward stop and with the locking finger swung to a position where its retention surface most closely approaches the terminal lock surface.

3.2.6 All exposed connector edges must have a radius as large as possible to prevent injury and/or discomfort during handling and assembly. All connectors shall comply with the requirements specified in USCAR-25.

3.2.7 Calculated connector mating effort must comply with applicable USCAR-25 criteria with a 10% design margin. Requirements for actual testing results will be to the USCAR requirements without the 10% margin.

3.2.8 Push surface areas must comply with USCAR-25 for contact surface characteristics.

3.2.9 The distance between the rear of the connector cavity and the rear edge of the terminal, when it is in its rear-most locked position, must be a minimum of 1 mm.

3.2.10 Design the connector with a terminal forward stop feature or alternate means to prevent terminals from pushing through during assembly and handling.

3.2.11 The functional features of the connector assemblies must be robustly designed and/or protected by connector design feature(s) to withstand the normal packaging, shipping, and handling of the product.

3.2.12 Connectors should have chamfers or radii in the mating area. Chamfers and/or radii are not allowed in coding areas.

3.2.13 Connectors must be marked with the material designation per GMW3116, the part number, the revision level and the mold cavity identification. Connectors with GM paid tooling shall include the GM logo.

3.2.14 Housings shall be designed to guarantee a minimum terminal engagement length of 1.0 mm in the fully closed condition for all terminals > 0.5 mm and a minimum terminal engagement length of 0.7 mm in the fully closed condition for all terminals = 0.5 mm.

3.2.15 Connectors designed for airbag deployment loop use shall contain sufficient amount of yellow color in order to meet requirements identified in GMW16323 for service.

3.2.16 Connectors shall have a clearly defined, permanent cavity identification scheme on both the connector, the drawing and the interface/header drawing.

3.2.17 Clip and bracket attachments shall be designed according to EWCAP-005 clip slot bases available at <http://www.uscar.org/guest/teams/10/Electrical-Wiring-Component-Applications-Partnership-EWCAP->.

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April 2018

Page 3 of 9