



Hose to Spigot Connection: System of Spring Band Clamp, Hose, and Spigot

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 includes definitions of coolant spigot/socket end-form dimensions for 6.4 mm through 50.8 mm in diameter.

1.2 Applicability. Coolant spigot/socket include end-forms made from steel or aluminum tubing, cast/machined, and plastic molded ends-forms typically found on radiators, heater cores, coolant hose tees, powertrain tubing, and other miscellaneous coolant plumbing.

1.3 Remarks. The connections to coolant hoses are used in a temperature range from (-40 to 150) °C. Coolant circuits to an overpressure of 400 KPa. See GMW14329, GMW14785, GMW17010 and SAE J1610.

2 References

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

2.1 External Standards/Specifications.

ASME Y14.5	DIN 3021-3	SAE J1697
DIN 3021-1	SAE J1508	SAE J2024
DIN 3021-2	SAE J1610	SAE J2387

2.2 GM Standards/Specifications.

9986467	GMW14785	GMW15184	GMW16812
GMW3059	GMW14872	GMW15272	GMW17010
GMW14329	GMW15024	GMW16295	

2.3 Additional References.

- Design record and control plan.
- GM assembly plan.
- GM Drawing 13261358: Hose Data.
- GM Three Dimensional (3D) Models.
- Production Part Approval Process (PPAP) per Automotive Industry Action Group (AIAG). (<http://www.aiag.org>)
- Validation Plan.

3 Test Preparation and Evaluation

3.1 Resources.

3.1.1 Facilities. Consistent with a climate controlled engineering facility. See 3.3.1.

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. For more details about equipment and testing parameters see 3.1.5.

3.1.3 Test Vehicle/Test Piece. Twelve (12) pieces shall be checked for dimensional compliance.

3.1.4 Test Time.

Dependent on number of spring band clamps, hoses, and spigots, and complexity of them, to be measured.

3.1.5 Test Required Information. GM Three Dimensional (3D) models. See 4.3.3. See also GMW14872, GMW15184, GMW15272, DIN 3021-1, DIN 3021-2, DIN 3021-3, and SAE J1508.

3.1.6 Personnel/Skills. Person familiar with hose and fitting measuring equipment.

3.2 Preparation. Confirm the equipment complies with relevant calibration standards.

3.3 Conditions.

3.3.1 Environmental Conditions. Measurements must be completed at (20 +5/-2) °C.

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. Dimensional requirements, see ASME Y14.5 and GMW16812 for GM Global Geometric Dimensioning and Tolerancing (GD&T), will follow the Production Part Approval Process (PPAP) per Automotive Industry Action Group (AIAG) available at Uniform Resource Locator (URL) <http://www.aiag.org>. The organization shall provide evidence that required dimensional verifications have been completed by providing the GM Design Release Engineer (DRE) the PPAP design record and control plan. Results must indicate compliance with specified requirements. The organization shall have dimensional results for each unique manufacturing process, e.g., cells or production lines and all cavities, molds, patterns or dies. The organization shall record, with the actual results, all dimensions (except reference dimensions), characteristics, and specifications as noted on the design record and control plan. Joint sealing properties are evaluated under SAE J1697.

3.5 Data. Dimensional data shall be reported as defined in the PPAP. Design Failure Mode and Effects Analysis (DFMEA) will be documented as defined in the PPAP.

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. Dimensional data shall be reported as defined in the PPAP.

4 Requirements and Procedure

4.1 General. See Figure 1 for an example of a spigot, hose and clamp assembly and Figure 2 for an example of a spigot, hose and clamp assembly cross section. See GMW16295 for coolant hose coupled assembly and quick connectors.

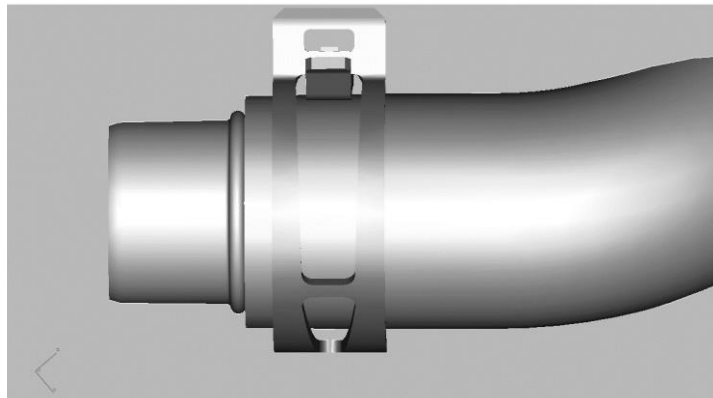


Figure 1: Example of Spigot/Hose/Clamp Assembly

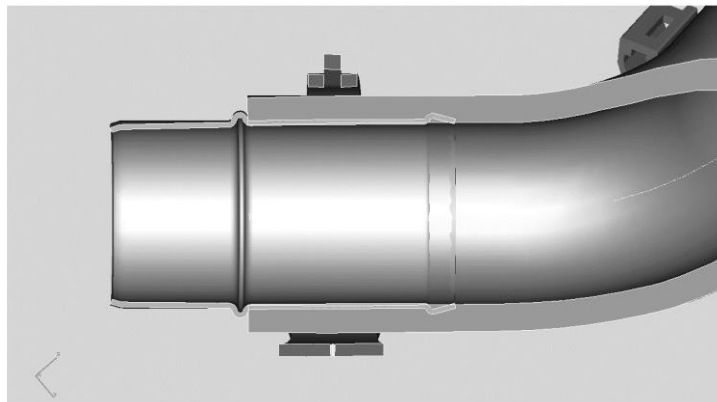


Figure 2: Example of Spigot/Hose/Clamp Assembly: Cross Section View

4.2 Clamp Positioning. Clamp shall be positioned 5.0 mm (nominal) with a tolerance of ± 2.0 mm from the hose edge for joints which have the requested landing area (parameter L1 from Figure 12 and Appendices A and B, Figures A1 and B4 respectively). For joints with shorter L1 (clamp landing area), the clamp should be positioned at 3.0 mm (nominal) from the hose edge, with a tolerance of $+2.0/-1.0$ mm, to ensure a proper clamp position on the L1 length, e.g., 17 W auxiliary (AUX) heater pump connections. The GM DRE should notify the supplier about the part(s) number(s) with this condition. See Figure 3.

Note: Nominal position and tolerance are not negotiable, supplier is responsible to implement controls to ensure the compliance of the requirement based on feedback from GM DRE about joints with insufficient clamp landing area.

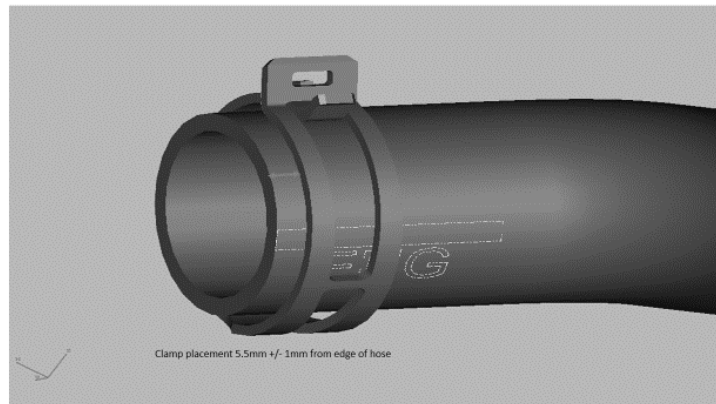


Figure 3: Example of Coolant Hose and Clamp Position

4.3 Coolant Hose.

4.3.1 Material Requirements. See GMW15024.

4.3.2 Basic Dimensions. From the cut length of the hose, the angularity of the hose end cut must be within the GD&T specified on the print. See Figure 4. Edge flatness cut tolerance GD&T reference shall be included on the print. See Figure 5. See also SAE J2024, SAE J2387 and GM Drawing 13261358.

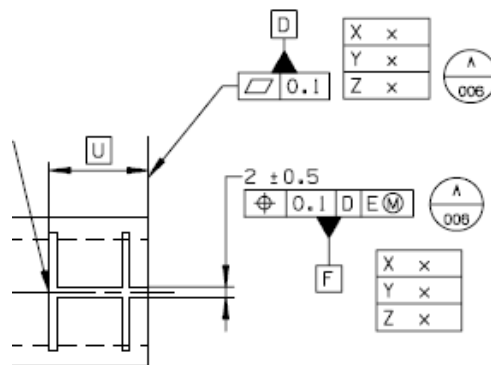


Figure 4: Example of Hose Angularity GD&T

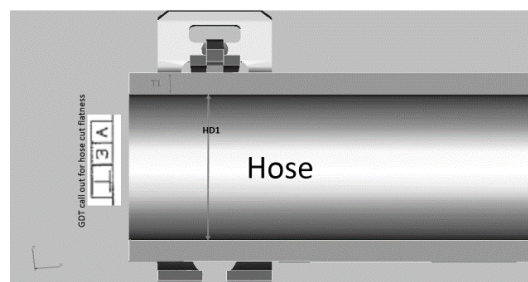


Figure 5: Example of Hose Edge Flatness Cut Tolerance GD&T

4.3.3 Hose Alignment Marks. All coolant connections to engine, pumps, surge tank, Condenser Radiator Fan Module (CRFM) or any module, shall have alignment marks on the hoses and the orientation should be according with the 3D model provided by the GM engineering department(s). See Figure 6 and Figure 7 (for alignment marks definition on Legacy joints check Appendix B, Figure B5 and Figure B6).

Note: Any deviation or changes in the dimensions should be checked and approved by The GM DRE and Coolant Systems Bill of Material Family Owner (BFO). The hose alignment mark should include the part number (PN) and labels/legends such as radiator (RAD), engine (ENG), surge tank (SRG TNK), heater (HTR), AUX HTR, or defroster (DEF) outlet (OTLT) or inlet (INL) to provide robust error proofing for the GM assembly plan. The name convention must be checked and approved by GM DRE.

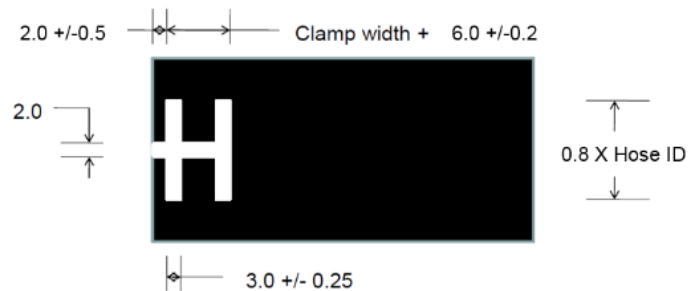


Figure 6: Example Alignment Marks for Hoses for Inside Diameter (ID) ≤ 10 mm

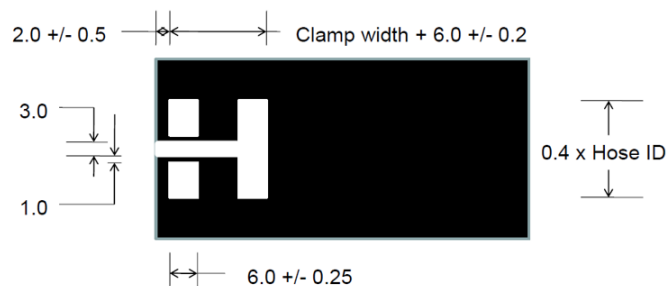


Figure 7: Example Alignment Marks for Hoses for ID > 10 mm

Note: Usage of paint marks or tube marks such as engravings or depressions can be accepted as alignment features for metallic tubular spigots. For paint marks, the supplier shall guarantee the permanence of the mark during material shipping and handling conditions. In the case of depressions or tube engravings, the supplier shall demonstrate no damage caused to the structural integrity of the metallic tube during the creation of this feature which can compromise tube performance.

4.3.4 Clamps Position for Shipping and Installed Conditions. See Figure 8.

Note: The acceptance criteria showed in the Figure 8 is applicable to all the joints released by the GM assembly or middle connections made by the hose supplier.

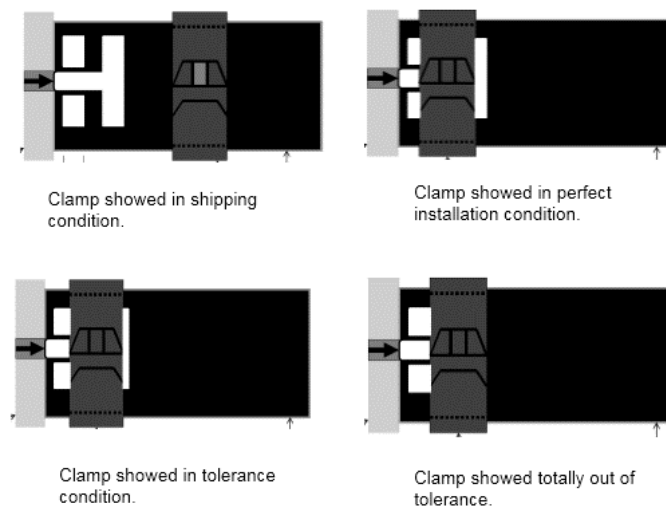


Figure 8: Clamp Position Acceptance Criteria

4.4 Spigot/Socket Requirements. The Figures 9 through 16 describe the spigot/socket geometric requirements (and their allowable tolerances) applicable for interfaces used for Powertrain Cooling Applications, Electrical Modules Cooling Systems and any of the Auxiliary Cooling Systems used on GM vehicles, all these parameters shall be applied to configurations 2019 Model Year and beyond and/or applications part of the Conventional Short Straight (CSS) strategy. The Appendix B includes the details for the legacy fittings already available on some GM platforms previous to 2019 Model Year.

Some important remarks about the content:

- Spigot roundness for MOLDED end-form is define by Geometric Dimensioning and Tolerancing (GD&T).
- The initial requirement is to avoid burrs or Net lines (no seam lines). Figure 12 describes the maximum residual flash allowed for every joint, any deviation from this requirement requires the approval of the GM BFO or Global Subsystem Leadership Team (GSSLT) Lead for Thermal Fluid Management Systems, prior joint performance analysis completion.
- No additional activities to remove material are allowed to meet surface finish requirements as defined by Ra, RZ1, and Residual Flash on Figure 12.
- Preferred tube wall thickness for coolant purposes is 1.24 mm (aluminum pipes) and 0.89 mm (steel pipes).
- To improve the hose insertion force, the usage of any of the globally approved water based lubricants is required. Lubricant material properties are included in the latest version of 9986467, the usage of any lubricant different to these parts numbers needs to be signed off by Coolant Systems BFO or Global Subsystem Leadership Team (GSSLT) Lead for Thermal Fluid Management Systems and GM Materials Engineer. The team can determine additional battery testing besides the tests included in the coolant hose Validation Plan.