

ARC SPOT, PLUG AND SLOT WELDING SPECIFICATION

GM4491M

1 SCOPE. This specification covers the acceptance criteria and geometric requirements for gas metal arc spot, plug and slot welds encountered in automotive arc welding for which GM is responsible for establishing or approving product design.

1.1 The application of the requirement of this specification is mandatory, unless a specific note on the weld drawing establishes different weld criteria. Any exceptions from these requirements must be in accordance with good engineering practice.

1.2 Welds are considered satisfactory when they carry the intended or expected service loads for a required period. Service loads on weldments in a vehicle are varied in both type and magnitude and can not be addressed by this specification. Therefore, while weld quality criteria of this specification are consistent with weld service loading requirements, they have been established based on the process and product monitoring. Any attempted application of this document to other uses, such as post-crash weld quality assessment, may lead to an erroneous result or conclusion.

1.3 Welds are considered discrepant when they do not meet the criteria of this specification. Discrepant welds often retain some of their engineering properties and may still contribute to the integrity of the assembly.

1.4 The welding source is responsible for establishing practices and test methods to assure that the criteria for this specification are met.

2 REFERENCED STANDARDS.

GM1000M GM6122M

3 REQUIREMENTS. This specification is applicable to welding related to passenger cars, trucks and their components when specified on the engineering drawing. This document is intended to be used as a supplement to engineering drawings and other documents for arc welding. When no arc welding specification is designated on the engineering drawing for arc spot, plug or slot welding, this document shall apply.

3.1 REPORTABLE AND RESTRICTED CHEMICALS (GM1000M). All materials supplied to this specification must comply with the requirements listed in GM1000M, "Restricted and Reportable Chemicals."

3.2 Any requirements exceeding the limits of this specification shall be designated on the engineering drawing.

3.3 Should any conflict occur between the limits specified herein and those on the drawing, the drawing has precedence.

3.4 This specification applies to all steels approved by GM for automotive products joined by arc welding in the thickness range up to 4.50 mm.

3.5 This specification defines the geometric quality for welds made with and without the use of filler materials for the following welding processes:

Gas Metal Arc Welding (GMAW)
Gas Tungsten Arc Welding (GTAW)
Flux Cored Arc Welding (FCAW)
Shielded Metal Arc Welding (SMAW)
Plasma Arc Welding (PAW)

4 GENERAL PROVISIONS.

4.1 Filler metals, when required, shall be designated on the welding symbol or by note on the engineering drawing or other appropriate documents. The designated filler metal must conform to the latest requirements of the appropriate AWS filler metal classification (AWS A5.1, A5.5, A5.8, etc.). Any change in specification or classification of filler metal requires requalification of the welding procedure prior to its implementation.

4.2 Responsible technical personnel shall determine that welding equipment and procedures are capable of consistently producing good welds.

4.3 Welding symbols on product drawings shall be those in the latest edition of AWS/A5.1, Standard Symbols for Welding and Nondestructive Examination. The use of symbols to clarify locations is acceptable. Special conditions should be fully explained by added notes or details.

5 WELD PATTERN CLASSIFICATION.

5.1 STANDARD PATTERN. A weld pattern for which reasonably anticipated variation is unlikely to affect a product's safety. Compliance with government regulations, or fit and function. All arc spot, plug or slot weld patterns are standard patterns unless specifically identified by the following pattern symbols.

5.2 FIT/FUNCTION PATTERN. A weld pattern for which reasonably anticipated variation is likely to significantly affect customer satisfaction with the product (other than Safety/Compliance), such as fits, function, performance, durability, mounting or appearance. Fit/Function weld patterns will be identified with a $\diamond$ symbol.

5.3 SAFETY/COMPLIANCE PATTERN. A weld pattern for which reasonably anticipated variation could significantly affect the product safety or its compliance with government regulations such as flammability, occupant protection, steering control and braking. Safety/Compliance weld patterns will be identified with a ∇ symbol.

6 GAS METAL ARC SPOT WELDS.

6.1 For the purposes of this specification, gas metal arc spot welding shall mean a system which uses a timed GMAW process to melt a spot on the surface of a sheet which will

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penetrate through the sheet, into adjoining sheets, fusing them together.

6.2 Unless otherwise specified on the engineering drawing, all gas metal arc spot welds will penetrate through all adjoining sheets forming a weld nugget at each interface (See Figure 1).

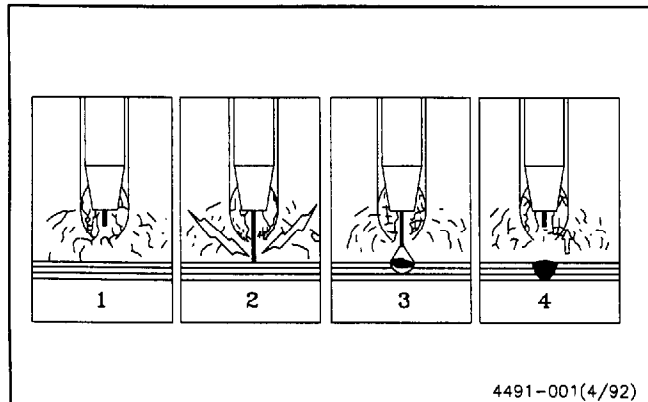


FIGURE 1

6.3 A gas metal arc spot weld which is placed on the assembly greater than 10 mm from the indicated location when a locating dimension to an identifiable feature is specified, or 20 mm from the indicated position when no locating dimension is specified, is a discrepant weld.

6.4 There will be no convexity limitations provided that all other requirements of this specification are complied with and the part configuration remains functional and meets performance specifications.

6.5 Unless otherwise specified on the engineering drawing, all arc spot welds shall be filled to the surface of the top sheet.

6.6 A weld whose measured nugget size or average button diameter at the interface of two adjoining sheets which is equal to or larger than the appropriate value given in Table 1 is an acceptable weld. Undersize welds are discrepant.

TABLE 1 - MINIMUM WELD SIZE FOR ARC SPOT WELDS

GMT (mm)	Button Diameter (mm)
0.40 - 0.59	3.0
0.60 - 0.79	3.5
0.80 - 1.39	4.0
1.40 - 1.99	4.5
2.00 - 2.49	5.0
2.50 - 2.99	5.5
3.00 - 3.49	6.0
3.50 - 3.99	6.5
4.00 - 4.50	7.0

NOTE 1: For use with this specification only, the governing metal thickness (GMT) specified in Table 1 is the thinner of any of the sheets adjacent to the interface in which a fused area is to be produced.

6.7 For metal stackups containing more than two sheets, the fused area at the interface of the lowest sheet (furthest from the torch) shall be:

1. 2.5 times the thickness of the lower sheet if the lower sheet is thicker than or equal to 2.0 mm.
2. Conforming to 5.6 of this specification if the lower sheet is thinner than 2.0 mm.

In all cases the interface diameter shall not be required to exceed 11.0 mm.

7 PLUG WELDS.

7.1 For use with this specification, plug welds shall mean a weld made inside a predrilled hole in one member of a lap or T joint which fuses that member to the other (See Figure 2).

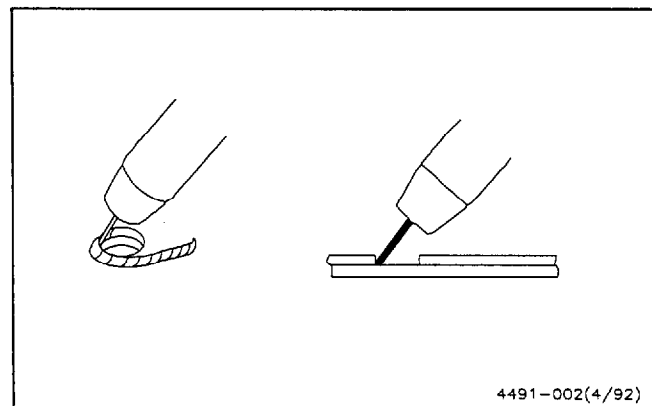


FIGURE 2

7.2 The nominal hole diameters for plug welds are given in Table 2.