ALUMINUM ALLOY, SHEET, NON-HEAT TREATABLE, REDUCED LÜDERING **WSS-M2A176-A1**

ALUMINUM ALLOY, SHEET, NON-HEAT TREATABLE, STRUCTURAL **WSS-M2A176-A2**

1. SCOPE

The materials defined by these specifications are for direct cast, 5000 series, non-heat treatable aluminum sheet.

Ford Motor Company may, at its option and in agreement with the local or regional supplier, define additional and/or restricted technical delivery requirements such as mechanical properties, forming characteristics, and/or pretreatment for a specific grade and/or part. The defined requirements shall be mandatory and no characteristics shall conflict with these engineering specifications.

2. APPLICATION

These Global specifications were released originally for stamped automotive body parts.

2.1 LIMITATIONS

Variant A1 defined by this specification is intended for sheet metal gage thicknesses of less than or equal to 2.0 mm.

Variant A2 is intended for sheet metal gage thicknesses of 1.0 to 4.0 mm.

2.2 DEFINITIONS

Both variants of this specification are suitable for Class 2 and Class 3 applications only.

Variant A1 is a high formability alloy with controlled Lüders lines. It is suitable for applications that do not experience exposure to temperatures above 150C due to susceptibility to intergranular corrosion (e.g. door inner panels).

Variant A2 is a general structural alloy suitable for all non-visible applications.

3. REQUIREMENTS

3.1 STANDARD REQUIREMENTS FOR PRODUCTION MATERIALS

Material suppliers and part producers must conform to the Company's Standard Requirements for Production Materials (WSS-M99P1111-A).

Material suppliers and part producers must conform to the Company's Quality System Requirements. In order for materials to comply with the requirements of the material specification they shall be sourced from suppliers listed in the Ford Motor Company Approved Source List, ASL (See also paragraph 4.2).

Date	Action	Revisions	Rev 02
2014 10 27	Editorial	See Summary of Revisions	C. Mracna, NA
2014 06 27	Revised	See Summary of Revisions	C. Mracna, NA
2013 11 06	Released		C. Mracna, NA

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3.2 CHEMICAL COMPOSITION

(ASTM E34, ASTM E716, ASTM E1251)

3.2.1 Chemical Composition

The upper and lower limits of chemical composition of the controlled elements shall be established by the supplier by any of the listed methods and included in the Supplier's Control Plan. In case of dispute, the referee method shall be ASTM E34.

The tabulated upper and lower limits of chemical composition for each variant may not agree with those listed in the Aluminum Association "Teal Sheets." The values in Table 1 take precedence.

Ladle analyses shall be provided as part of the initial material source approval process in a format suitable for upload into the Ford Material Database.

Table 1: Ladle Chemical Composition (weight percent maximum, unless shown as a range or a minimum, balance Al)

	A1	A2
Si	0.20	0.25
Fe	0.35	0.35
Cu	0.10	0.10
Mn	0.20 – 0.50	0.50
Mg	4.20 – 5.00	2.90 – 3.50
Cr	0.10	0.10
Zn	0.10	0.10
Ti	0.10	0.10
Others (each)	0.05	0.05
Others (total)	0.10	0.10

3.3 MECHANICAL PROPERTIES

(ASTM E6, ASTM E8M, ASTM B557M, 50 mm gauge length; ASTM E517)

Mechanical properties are valid in the longitudinal, transverse, and diagonal directions, except as noted. Certification of ongoing production material shall be in accordance with regional and/or local requirements. In cases of dispute, test data obtained from supplier retained samples that have been stored under environmentally controlled conditions will serve as the arbitrator. The samples shall be tested at a third party laboratory.

For the determination of mechanical properties, the material cross sectional area shall be defined as that of the aluminium alloy; contribution of any surface treatments to the calculated cross-sectional area used for stress calculations is neglected.

The test specimen geometry and orientation relative to the rolling direction are to be established locally to certify ongoing production material.

Yield Strength is defined as 0.2% proof stress. Yield strength and ultimate tensile strength shall be measured per ASTM B557M.

Uniform elongation shall be measured per ASTM E8, Sec. 7.9.3 or 7.9.3.2. Alternatively, the tensile specimen design may comply with ASTM E517, Section 7.2.1. In cases of dispute, ASTM E8, Sec. 7.9.3 shall be the umpire method unless alternative methods of uniform elongation calculation, filtering, or data smoothing algorithms have been approved by Ford Materials Engineering. Any approved alternative methods or tensile specimen design shall be identified in the supplier's Control Plan.

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