



ALUMINUM ALLOY, EXTRUSION, HEAT TREATABLE, STRUCTURAL, HIGH STRENGTH, 7000 SERIES

WSS-M2A180-A1

1. SCOPE

The material defined by these specifications is for 7000 series, heat treatable extruded aluminum profiles.

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, pretreatment, and/or surface texture, for a specific grade and/or part. The defined requirements shall be mandatory and no characteristics shall conflict with these engineering specifications.

2. APPLICATION

This specification was released originally for extruded aluminum profiles for bumper applications. The manufacturing processes used to form these profiles includes but are not limited to rotary bending, push roll bending, stretch bending, stamping, piercing, laser trimming, and machine trimming.

2.1 LIMITATIONS

The alloy defined in this specification may be susceptible to intergranular corrosion or stress corrosion cracking. The yield strength of the material in the part after the artificial aging heat treatment and/or paint baking process is a function of the thermo-mechanical history. The mechanical property values shown in Table 2 apply only to the listed condition; individual parts will have different properties, depending on specific processing in the vehicle manufacturing plants.

2.2 DEFINITIONS

Variant A1 is a 7000 series structural alloy with gage thicknesses 1.8mm to 5.0mm, typically applied to non-visible structural parts (Class 3) where high strength and good ductility are required. This alloy will be used for high volume extrusions, which will then be subjected to a prescribed artificial aging heat treatment such that the material achieves desired minimum mechanical properties.

3. REQUIREMENTS

3.1 APPROVED SOURCES

This specification requires the use of approved sources. Only the sources identified on the Ford Approved Source List (ASL) can be used when this specification is listed on the drawing, CAD file, or other documents. The list of approved sources is located within Ford at www.mats.ford.com or available externally through a Ford Materials Engineer.

3.2 CHEMICAL COMPOSITION AND MICROSTRUCTURE

(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.

Date	Action	Revisions	Rev. 00
2017 02 16	Released		



Documents

K. Morgan, NA
Document Sharing Hub



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.

Check analyses of cast billets 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: Chemical Composition (weight percent maximum, unless shown as a range or a minimum; balance Al)

	A1
Si	0.20
Fe	0.30
Cu	0.05
Mn	0.05
Mg	0.7 – 1.5
Cr	0.04
Zn	4.8 – 5.8
Ti	0.03
Zr	0.10 – 0.25
Other Elements	0.05
Others (total)	0.15

3.3 MECHANICAL PROPERTIES

(ASTM B557M, 50 mm gauge length; ISO 6892-1)

Mechanical properties are valid in the longitudinal direction parallel to extrusion direction, except as noted. Certification of ongoing production material shall be in accordance with regional and/or local requirements.

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 is to be established locally to certify ongoing production material.

Yield Strength is defined as 0.2% proof stress.

Yield Strength (T81 & T6), Long Term Thermal Stability are defined and measured per FLTM AB 108-01. Uniform elongation shall be measured per ASTM E8M, Sec. 7.9.3 or 7.9.3.2. In cases of dispute, section 7.9.3 shall be the umpire method.

Bendability (T6 + T81) is defined as the minimum bend angle the material can accomplish without cracking and measured as defined and agreed upon during initial source approval process.



Table 2: Mechanical Properties (minimum, unless shown as a range or maximum)

	A1
Yield Strength (T6), MPa	320
Ultimate Tensile Strength(T6), MPa	360
Elongation at Fracture (T6), %	10
Yield Strength (T6+T81), MPa	280
Ultimate Tensile Strength(T6+T81), MPa	300
Elongation at Fracture (T6+T81), %	10
Bendability after T6+T81 (L-Direction)	Report Only
Long Term Thermal Stability after T6+T81, Δ YS, MPa	Report Only

3.3.1 Lot Release Limits

The supplier shall propose initial lot release values that will be used prior to addition to the ASL. The final lot release requirements shall be agreed upon between the supplier and Ford Materials Engineering during initial mechanical property testing and included into the source approval.

3.3.2 Ongoing Mechanical Property Testing

For ongoing production, the testing frequency shall be agreed upon annually between the supplier, Ford Product Development and Ford STA. It will include all of the properties listed in Table 2 and be available upon request.

3.4 DIMENSIONS AND DIMENSIONAL TOLERANCES

Tolerances for the material as delivered by the aluminum alloy supplier are defined by the relevant local manufacturing activity. Unless otherwise specified by Ford Motor Company on the Engineering Drawing or Purchase Order, tolerances shall comply with EN755-9.

3.5 FORMABILITY

In conjunction with the material supplier and Ford Materials Engineering, the affected local manufacturing activity shall, as part of the initial material source approval process, approve the formability of this material by means of laboratory test(s), manufacturing trial(s), and/or another mutually acceptable alternative, using the equipment and methods that are proposed for production.

If needed to enable the fabrication of a specific component, restricted tolerances and/or additional material property requirements (i.e., the "quality level" of the aluminum alloy) shall be developed by the affected manufacturing activity and the aluminum alloy supplier. Examples include, but are not limited to: restricted yield strength range, restricted gauge tolerance, and grain size control.

The "quality level" of the aluminum alloy for a specific component:

- shall not conflict with specified requirements in Section 3 of this Engineering Material Specification
- shall be described in detail by the local manufacturing activity
- shall be a mandatory extension of these Engineering Material Specifications

Acceptance of subsequent orders by the aluminum alloy supplier for a given component at the agreed upon quality level implies that all aluminum alloy supplied will be of a comparable quality level and will form that part satisfactorily as defined and recorded by the manufacturing activity.