



Engine Accessory Drive Cast Mounting Bracket

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 Component Technical Specification covers supplier requirements for general purpose engine accessory drive aluminum and iron sand and die cast mounting brackets.

1.2 Applicability. This specification covers only accessory drive castings, but can be applied to other castings as well.

1.3 Remarks. This specification contains all information necessary to design, analyze, develop, validate, and manufacture accessory drive cast mounting brackets.

2 References

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

2.1 External Standards/Specifications.

AIAG CQI-9	ISO 9001	JIS H5302 ADC12	MPIF Standard 35
ASTM E505	JIS H5302 ADC10		

2.2 GM Standards/Specifications.

GMW5	GMW3059	GMW14671	GMW16291
GMW10			

2.3 Additional References.

- AnyCasting Company, Limited, Seoul, South Korea (www.anycastsoftware.com)
- Global Engine Durability (GED) Test
- MAGMA Foundry Technologies, Incorporated, Schaumburg, Illinois (www.magmasoft.com)
- Statement of Requirements (SOR)
- Trubiquity (Managed File Transfer), Rocket Software Incorporated, Troy, Michigan (www.trubiquity.com)

3 Requirements

3.1 System/Subsystem/Component/Part Definition.

3.1.1 Appearance. Not applicable.

3.1.2 Content.

3.1.2.1 Physical Content. These brackets are used to mount engine driven accessories to the engine structure. There are also idler pulley or belt tensioner mounting bracket applications.

3.1.2.2 Functional Content. Not applicable.

3.1.3 Ambient Environment. Varies by application, but assumed to be -40 °C to 121 °C. Generally this is not an issue with these parts.

3.1.4 Interfaces. Not applicable.

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3.1.5 Usage Definition. These castings are used to attach engine mounted accessories to the engine structure. Their design focus is stiffness, not stress reduction or mass savings, although those parameters are also considered.

3.2 Product Characteristics.

3.2.1 Performance Requirements.

3.2.1.1 Design. This paragraph deals with the responsibilities for design related tasks required to be completed by GM in the course of a normal design cycle. All designs will be executed with the intent to provide constant wall sections to minimize shrink porosity; however packaging underhood will preclude this goal on some features. Wall thicknesses will vary from 4.0 mm to 10.0 mm depending upon structural requirements to meet acceptable stiffness and stress levels. Wall thickness around sliding sleeves should start at 4.5 mm. The tops of ribs, including draft, should be no less than 3.0 mm. Round features with local close conditions to adjacent components should use local flats for clearance, rather than reduced diameter.

3.2.1.2 Finite Element Analysis (FEA). The FEA task is done by General Motors Powertrain (GMPT), while the involvement of the supplier is to comment on the manufacturability and cost associated with changes generated as a result of the FEA modeling.

3.2.1.3 Noise and Vibration. The Noise & Vibration (N&V) work is done by GMPT in conjunction with both FEA and N&V Laboratory testing. The interface of the supplier is limited to commenting on the feasibility of manufacturing and cost related to proposals by these disciplines.

3.2.2 Physical Characteristics.

3.2.2.1 Dimensions and Capacity. Dimensional requirements are on the engineering drawings.

3.2.2.2 Mass Properties. Not applicable.

3.2.3 Reliability.

3.2.3.1 Reliability Evaluation Point. Reliability in the design is the responsibility of GM, and in manufacturing by the supplier.

3.2.3.2 Reliability Requirements. The production manufacturing process must be approved by the global technical specialist.

3.2.4 Serviceability. A system issue not covered in this specification.

3.2.5 User System/Subsystem/Component/Part Interface. Not applicable. The interface is not the responsibility of the supplier.

3.3 Design and Construction.

3.3.1 Materials, Processes and Parts Selection Guidelines. Acceptable materials for aluminum are A380 and A383 as well as ADC10 and ADC12, which are listed in GMW5 with the GM equivalents. Cast iron materials are in GMW10.

3.3.1.1 Material Guidelines. Aluminum is the only recommended material for virtually all bracket applications. Specific requirements are in the various materials section.

3.3.1.1.1 Restricted and Reportable Substances. All component parts must meet GMW3059. This includes, but is not limited to, hexavalent chrome free finishes. All drawings must include the note: "Restricted and Reportable Substances for Parts per GMW3059".

3.3.1.1.2 Part Cleanliness. Every detail drawing must call out, "Parts as delivered to assembly plant shall be clean and free of debris, residual abrasive material and corrosion products adversely affecting function or appearance".

3.3.1.1.3 Coatings/Platings/Finishes. Aluminum castings are not finished.

3.3.1.1.4 Metals. Callouts are required on the detail drawing as follows:

Die Cast Aluminum: Shall employ GMW5 specification. A380 is equivalent to GMW5M-Al-C-D-Si8Cu3Fe, and A383 is equivalent to GMW5M-Al-C-Si10C2Fe1. Note that the GMW5 callouts follow ISO 9001, based on chemical symbols applicable to all the light metals and their alloys. International symbols are used in GMW5 to cover the major alloying elements and significant residual elements. Alloying elements, defined as those with an upper and lower limit (other than zero) in the chemical composition are listed left to right in order of decreasing content, or in alphabetical order in the case of equal percentages. Each chemical symbol is followed by whole numbers denoting the nominal percent present in the alloy.

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3.3.1.1.4.1 Aluminum Die Castings. For the sake of commonality, the material shall be:

Aluminum alloy per GMW5M-AL-C-D-Si8Cu3Fe (A380) or GMW 5M-AL-C-D-Si10Cu2Fe1 (A383) for die castings.

Acceptable alternatives include JIS H5302 ADC10 or JIS H5302 ADC12 for Far Eastern suppliers.

3.3.1.1.4.2 Sand Cast Aluminum. This specification shall be either:

Aluminum alloy per GMW5M-AL-C-S-Si6Cu3 (A319) or GMW5M-AL-C-S-Si7Mg T5 or T6 (A356) for sand cast applications.

3.3.1.1.4.3 Heat Treatment. Approved suppliers shall demonstrate compliance to AIAG CQI-9, Special Process: Heat Treat System Assessment (HTSA).

3.3.1.1.4.4 Nodular Cast Iron. The cast iron material shall be:

Nodular iron GMW10M-IR-C-N550-3.

3.3.1.1.4.4.1 Finish. The finish for cast iron shall be as follows:

- Clean, zinc phosphate and paint black by cathodic electrodeposition per GMW14671, Type A-U/H, except scribed 168 h salt spray is the only required test.
- Clean, zinc phosphate and paint black with powder epoxy per GMW14671, Type D-U/H, except scribed 168 h salt spray is the only required test.

Runs and sags and other surface imperfections are unacceptable. Paint prior to machining.

3.3.1.1.4.5 Powdered Metal (for sliding sleeves). Grade and finish require Technical Specialist approval. In general, iron and carbon steel, (i.e., MPIF Standard 35, F-0008-25) or iron/copper, (i.e., MPIF Standard 35, FC0205 or better grades) are acceptable, either with or without heat treat, as application dictates. Questions on other grades should be addressed to the Technical Specialist and Materials Engineers.

For heat treated parts: Applicability and effectiveness of heat treating processes shall be determined using AIAG CQI-9 special process: HTSA, published by AIAG, and records maintained.

3.3.1.2 Processes Guidelines. See 7.3, Manufacturing Requirements.

3.3.1.3 Parts Guidelines. Not applicable.

3.3.2 Design Guidelines and Constraints.

3.3.2.1 Detail Drawing Issues. In order to facilitate commonality in dealing with detail drawing issues, the following requirements provide a framework for disciplining this process.

3.3.2.1.1 Parting Line. Generally speaking, the parting line is initially determined by the GMPT designer, however, there are always areas which can be changed without affecting the function or shape of the part, but which would enhance its manufacturability and tool life. It is these which the supplier is expected to bring up to the release engineer for discussion and mutual agreement, preferably at the Technical Review. Early sourcing is necessary to get the supplier's input.

3.3.2.1.2 Draft. In general, the draft angles on castings vary from 1 degree to 15 degrees depending on the length of the drafted surface. The print specification applies to the longest surfaces. Because of practical issues in the tooling, it is normal for the supplier to seek exceptions on most parts, and these are to be resolved with the release engineer and covered by a general note on the drawing. In the case of design requirements in a localized area for draft **less** than industry standards, e.g., 1.0 degree for aluminum die castings and 3.0 degrees for sand castings, agreement must again be reached between the release engineer and the supplier, but the specification must appear on the drawing. Draft in bolt boss holes must not reduce bearing area under bolt heads so as to result in yield under maximum clamp load.

3.3.2.1.3 Ejector Pins. In the case of die cast aluminum parts, ejector pin bosses which extend beyond the shape of the part submitted to the supplier must be shown on the detail drawing after agreement has been reached with the release engineer. Since stress distribution and clearance to adjacent parts is important, only drawing control can assure compliance.

3.3.2.1.4 Cast Locators. Cast locators are the most critical features for quality control. These will determine the design of the machining fixture. They must be identified and dimensioned on the detail drawing, unless they are just part of the shape of the part, to provide for a flatness/no draft note in these areas, as well as to facilitate tooling maintenance. Locators must be discussed for adequacy to meet the intent of the drawing for variation control. In general, locators must be large enough to permit an adequate clamp size and visually identifiable

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