



## **Quality Document for Incoming As-Cast and Pre-Machined Castings**

### **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 is a Quality Document to cover the allowable quality levels for as-cast or pre-machined transmission and engine high pressure die castings sent into GM plants for finish machining and testing. This standard will be used by the GM plant Quality organizations in conjunction with GM 1927-17 (GP-5) to determine acceptable scrap levels for finish machined castings. It also covers impregnation, repair and scrap accountability.

**1.2 Applicability.** This document is applicable to transmission and engine high pressure die castings.

**1.3 Remarks.** There are no accurate and reliable non-destructive means for the casting supplier to evaluate visual, or leaker scrap at their facility. Therefore, this document covers the acceptable higher levels of scrap, and repair expected from as-cast product versus other typical purchased components.

### **2 References**

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

#### **2.1 External Standards/Specifications.**

None

#### **2.2 GM Standards/Specifications.**

None

#### **2.3 Additional References.**

- GM 1927-17 Supplier Quality Processes and Measurement Procedure (GP-5)

### **3 Resources**

#### **3.1 Facilities.**

**3.1.1 Calibration.** The test facilities and equipment shall be in good working order and shall have a valid calibration label.

**3.1.2 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.

**3.1.3** Inspection areas must be well-lighted.

#### **3.2 Equipment.**

**3.2.1** Leak testers which must pass a Gage Repeatability and Reproducibility (R&R) study and be capable of detecting the level of leaks defined by the part print and specification drawing.

**3.3 Test Vehicle/Test Piece.** Not applicable.

#### **3.4 Test Time.**

Calendar time: 0 days

Test time: 0.03 h

Coordination time: 0 h

**3.5 Test Required Information.** Not applicable.

**3.6 Personnel/Skills.** Plant personnel must be properly trained in casting specific visual standards, leak tester operation and maintenance.

## 4 Procedure

**4.1 Preparation.** Not applicable.

**4.2 Conditions.**

**4.2.1 Environmental Conditions.** Not applicable.

**4.2.2 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.

**4.3 Instructions.**

**4.3.1 Introduction.**

All High Pressure Die Castings have porosity. Porosity can affect part quality by creating two different defects, visual defects, and leak defects. These defects are typically exposed during final machining operation and not visible or detectable in the raw cast or pre-machined state.

Castings need to be machined with production diamond tooling to expose the visual porosity and open up the majority of the leak issues. The High Pressure Die Cast suppliers have NO direct method of determining whether a casting will pass visual or leak requirements when the casting leaves their facility. Therefore, the need was created for this Quality Document for High Pressure Die Cast parts delivered as-cast or pre-machined to GM for final machining, assembly and testing (which includes: component, sub-assembly and full transmission/engine assembly).

All casting and quality evaluation systems (i.e., visual standards and leak testers) need time to achieve maximum quality performance. That is why there is a staged performance ramp-up to allow for casting and quality measurement systems development.

**4.3.2 Quality Performance Criteria.**

The supplier, GM Product Engineering, GM Manufacturing Engineering, GM receiving plant and GM Supplier Quality will work together to provide a part design and manufacturing process that yields machined castings that meets this quality performance criteria: **Note:** Match the bracket type in (Table 1) for the appropriate casting type and insert numbers into the statements as follows.

- <XXXXX> PPM maximum reject rate at PPV and within the first six (6) months of production.
- [YYYYY] PPM maximum reject rate from six (6) months of production and beyond. PPM is recorded daily but calculated at the end of the month. If the monthly PPM is below [YYYYY] PPM then this is considered within the casting capability, therefore the GM plant will issue no Problem Reporting and Resolutions (PR&R)s. For monthly PPM above the PPM maximum specification, the GM plant may generally issue a 0 point Line Accumulation PR&R. If the reject rate is excessive, the GM plant may issue a Quality PR&R and pursue cost recovery of the rejects above the reject limit as defined in GM GP-5 Section 1.8.
- If there is a one day spike of over {ZZZZZ} PPM based on normal daily volume, the GM plant may issue a Supplier Alert or a Quality PR&R based on the severity and pursue immediate replacement with certified parts from the supplier.

**Note:** Rejects such as cracks, voids or flash which should be caught by standard visual or automated inspection in the supplier manufacturing process will still be subject to reject procedures and not considered acceptable line accumulations.