



Qualification Procedure for Magnesium Alloy Ingot Producers

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 procedure defines the process and requirements a magnesium producer must satisfy to qualify their ingot production process. Technical approval is required to supply GM magnesium ingots. GM Materials Engineering, Non-ferrous and Casting Global Subsystem Leadership Team (GSSLT) shall define approval requirements.

The intent of this procedure is to define the process used to qualify producers of magnesium ingot meeting GM requirements. Certain material characteristics and attribute data are requested for qualification purposes.

1.2 Applicability. This is not a general specification. This standard provides the qualification procedures for magnesium ingot being supplied to GM per GMW3035 requirements.

2 References

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

2.1 External Standards/Specifications.

ASTM B93	ISO 16220	ISO/TS 16949
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2.2 GM Standards/Specifications.

GMW3035	GMW3286	GMW14729
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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.

3.2 Equipment. Not applicable.

3.3 Test Vehicle/Test Piece. Test specimens excised from magnesium ingot per GMW3035.

3.4 Test Time.

Calendar time: 2 weeks to 8 weeks

Test time: 100 h

Coordination time: 4 h to 8 h

3.5 Test Required Information.

3.5.1 Requirements. Magnesium producer will furnish documentation for each grade and ingot casting process combination submitted for approval. GM requires that all suppliers adhere to the fundamental quality systems requirements of ISO/TS 16949. Suppliers choosing other approaches must be able to show that their quality systems meet the intent of ISO/TS 16949.

3.5.1.1 Qualification of magnesium ingot to GMW3035 is based on three requirements:

- Chemical composition

- Corrosion properties
- Cleanliness (internal oxide content)

A need for qualification is triggered whenever the following occurs:

- New alloy
- Currently approved alloy with new process
- New supplier or change in supplier location

Re-qualification of approved alloys and ingot processes will not be required when new cast component designs and/or design changes are submitted for production.

3.5.1.1.1 The testing and reporting required under this procedure shall establish that the supplier's ingot production process is robust and capable of producing ingots that meet the requirements cited in GMW3035. The magnesium ingot producer is responsible for providing all test data and process documentation. Submissions will be compiled in a complete package both in booklet and electronic format, to the Non-ferrous and Casting Materials GSSLT designated representative(s). All ingot material test data submitted to GM must be generated by an accredited laboratory that has been approved by GM. A separate package must be submitted for each alloy, process change or ingot producer location. The test report is to be written in English and data reported in metric units. Reported data shall include mean, range, standard deviation, as well as limits used to control the production process. Sampling plans and test locations are defined in GMW3035. The Non-ferrous and Casting Materials GSSLT will review the data and decide on technical approval.

3.5.1.1.2 The completed qualification package shall include, at a minimum, the following:

3.5.1.1.2.1 Documentation of meetings between GM and the producer to review the approval requirements. GMW3035 refers to batch, lot or run. These terms will have to be defined individually for each producer, per agreement between the Non-ferrous and Casting Materials GSSLT and the producer.

3.5.1.1.2.2 Process description, flow diagram, process Failure Mode and Effects Analysis (FMEA) and control plan shall be provided to the Non-ferrous and Casting Materials GSSLT. Ingot sampling shall be conducted when the production system has reached a steady state condition and is in process control. All test coupons which include; chemical, chlorine, corrosion and Fast Neutron Activation Analysis (FNAA) will be excised from ingots sampled at the start, middle and end of the agreed upon batch, lot or run. The following four evaluation tests will be conducted by supplier and results reported to the Non-ferrous and Casting Materials GSSLT.

3.5.1.1.2.3 Chemical Analysis. Evaluate chemical composition of coupons excised from ingots sampled at the start, middle and end of the agreed upon batch to determine producers capability to conform to the ASTM B93 and ISO 16220 specification.

3.5.1.1.2.4 Chlorine Tests. Both flux and non-flux based processes require one sampling from ingots produced during the agreed upon batch or run which is in process control. Chlorine test coupons shall be excised from the ingots sampled at the start, middle and end of the agreed upon batch or run.

3.5.1.1.2.5 Corrosion Tests. Corrosion test coupons shall be excised from the same ingots produced for chemical composition analysis and chlorine tests. Coupons shall be tested per GMW3286 (Neutral Salt Spray) and GMW14729, option A (High Humidity).

3.5.1.1.2.6 Fast Neutron Activation Analysis (FNAA). Ingot sampling shall be conducted when the producer system has reached a steady state condition and is in process control. Three ingots shall be sampled, one each from the beginning, middle and end of production lot. FNAA and the other test specimen coupon locations within an ingot are identified in GMW3035, Appendix A. If the ingot size or geometry does not permit excising test specimen from it for FNAA testing in the locations identified in GMW3035, an alternate sampling plan has to be approved by the Non-ferrous and Casting Materials GSSLT designated representative(s).

3.5.1.1.3 An on-site facility assessment may be performed by Non-ferrous and Casting Materials GSSLT designated representatives.

3.6 Personnel/Skills. Test technician familiar with test facilities and equipment.

4 Procedure

4.1 Preparation. Not applicable.

4.2 Conditions.

4.2.1 Environmental Conditions. Not applicable.