



Alloying Material Specification

Applies To: Aluminum Hardener
Type: Magnesium - Grade 9300A

Specification No. MS 4Mg02-N
Revision No. E
Effective Date 1/31/2018

Form: Notch Bar, Ingot, T-bar (sow)

Page 1 of 18

TABLE OF CONTENTS

Section	Page
1. Scope and Classification	2
2. Applicable Reference Documents	2
2.1 The Aluminum Association	2
2.2 European Standard	2
2.3 American Society for Testing and Materials	2
2.4 American National Standards Institute	3
2.5 Government and Industry Standards	3
3. Product Requirements	3
3.1 Material Condition	3
3.2 Chemical Composition	4
3.3 Metallurgical Requirements	5
3.4 Microstructure Requirements	5
3.5 Performance Requirements	5
3.6 Dimensional Requirements	5
4. Quality Assurance Requirements	6
4.1 Identification	6
4.2 Quality Control / Statistical Process Control	6
4.3 Record Retention	7
4.4 Supplier Audits	8
4.5 Product Testing	8
4.7 Certification Documentation	9
4.8 Shipping	11
4.9 Basis of Acceptance	12
5. Ordering Information	13
6. Informational Notes	13
6.1 Product Approval / Qualification	13
6.2 Process Change Evaluations / Approvals	14
6.3 Specification Change History / Approvals	14
Acknowledgement	16
Appendix	17



Alloying Material Specification

Applies To: Aluminum Hardener
Type: Magnesium - Grade 9300A

Specification No. MS 4Mg02-N
Revision No. E
Effective Date 1/31/2018

Form: Notch Bar, Ingot, T-bar (sow)

Page 2 of 18

SUPPLIER / CUSTOMER INFORMATION

This document may contain sensitive technical information that has been reviewed in confidence between Arconic, Inc. and the manufacturer (“vendor”) of alloying materials. Therefore, the contents of this specification should be divulged only to persons who by nature of their duties require access to such information.

1. Scope and Classification

This purchase specification defines metallurgical, chemical, dimensional, quality and general requirements of materials used to produce aluminum alloys for remelting and/or fabrication. Additional material requirements may be specified by individual locations and communicated directly to the supplier.

2. Applicable Reference Documents

Current revisions of the following documents in effect on the date of purchase order, unless a specific issue is referenced, form a part of this specification to the extent specified herein. In the event of conflict between the requirements of this specification and the requirements of any other applicable document, the requirements of this specification shall prevail.

2.1 The Aluminum Association

Registration Record of Aluminum Association Designations and Chemical Composition Limits for Aluminum Hardeners

2.2 European Standard

EN 575:1995 Aluminium and aluminium alloys – Master alloys produced by melting - Specifications

2.3 American Society for Testing and Materials

ASTM E3 Preparation of Metallographic Specimens
ASTM E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications
ASTM E88 Practice for Sampling Nonferrous Metals and Alloys in Cast Form for Determination of Chemical Composition



Alloying Material Specification

Applies To:	Aluminum Hardener	Specification No.	MS 4Mg02-N
Type:	Magnesium - Grade 9300A	Revision No.	E
		Effective Date	1/31/2018

Form: Notch Bar, Ingot, T-bar (sow)

Page 3 of 18

ASTM B93 Standard Specification for Magnesium Alloys in Ingot Form for Sand Castings, Permanent Mold Castings, and Die Castings

2.4 American National Standards Institute

ANSI/ASQC Q-1 Generic Guidelines for Auditing of Quality Systems
ANSI H35.3 Designation for Aluminum Hardeners
ANSI Z34.2 Self Certification by Producer or Supplier
ANSI Z540.1 Calibration Laboratories and Measuring and Test Equipment – General Requirements

2.5 Government and Industry Standards

ISO 10012 Quality Assurance Requirements for Measuring Equipment
ToSCA Toxic Substance Control Act
CONEG Coalition of Northeastern Governors Requirements
CFR 29, CFR 49 Code of Federal Regulations – Hazardous Materials
CFR 40 Part 82 Protection of Stratospheric Ozone, Subpart E: Labeling of Products Using Ozone Depleting Substance.

3. Product Requirements

Each shipment shall be subject to inspection by the receiving location. All material received is expected to be of quality that, at a minimum, meets industry norms and adheres to the specific requirements in this section. If, in the buyer's opinion, the product does not meet expected normal industry standards, the material may be subject to rejection.

3.1 Material Condition

3.1.1 External: Product shall be cast using submerged metal-feed pouring technology or adequately skimmed to produce surfaces free of entrained oxides, salts, and reaction products. Product shall be poured continuously and show no evidence of laps, crevices, folds, or other surface defects associated with multiple pours or disrupted metal distribution. Edges and surfaces shall be free of sharp protrusions, spurs and/or flash that might present hazards in handling. Surfaces shall be free of visible oxidation including full coverage, spotting, and areal corrosion caused by contact with water or chemicals.



Alloying Material Specification

Applies To: Aluminum Hardener	Specification No. MS 4Mg02-N
Type: Magnesium - Grade 9300A	Revision No. E
	Effective Date 1/31/2018

Form: Notch Bar, Ingot, T-bar (sow)	Page 4 of 18
-------------------------------------	--------------

- 3.1.2 Product surfaces shall not be cleaned through use of acid washing. Failure to completely remove residue from the washing process can result in corrosion and/or contamination during shipping and storage. Mechanical cleaning via brushing is acceptable. Any exclusions from this requirement must be made directly by the receiving location and clearly documented.
- 3.1.3 Internal: There shall be no internal voids that are interconnected to, and distinguishable on, the material surface as shrinkage porosity.
Non-metallic inclusions - Non-metallic inclusions should be less than 500 microns in size, and the density for all particles 20 microns and larger should be less than 5 counts per cm² based on samples taken from areas where maximum shrinkage occurs.
- 3.1.4 Contamination: Materials shall be free of contamination and products of corrosion. The presence of foreign substances, on the surface or imbedded, such as discrete non-metallic fragments, iron, oxide flakes, rust, fertilizers, nitrates, oxidizers, and hygroscopic salts shall be cause for rejection. Surfaces shall be free of abrasive materials, ferrous materials, etc. used for cleaning ingot.
- 3.1.5 Purity: Product composition shall meet limits specified in paragraph 3.2.

3.2 Chemical Composition

Element(s)	Min (wt%)	Max (wt%)
Si (silicon)		0.05
Fe		0.004
Cu		0.008
Mn		0.5
Mg	93.0	
Ni		0.001
Zn		0.2
Be		0.0005
Ca		0.005
Na		0.002
Al		Remainder
Pb+Cd		<0.010
Rare Earth Elements (ea)		0.010
Rare Earth Elements (tot)		0.020
Others Each Max.		0.01

NOTES Rare earth element content shall be determined via analytical techniques and instruments capable of achieving accurate results at 20ppm (0.0020%). Total elements to include Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, and Lu.



Alloying Material Specification

Applies To: Aluminum Hardener
Type: Magnesium - Grade 9300A

Specification No. MS 4Mg02-N
Revision No. E
Effective Date 1/31/2018

Form: Notch Bar, Ingot, T-bar (sow)

Page 5 of 18

Mg determined by Difference. Vendors unable to analyze and report concentration for Pb, Cd and Be for every lot must request a variance. An acceptable alternative is to report Cpk and maximum values for Pb, Cd, and Be based on sampling 30 random-selected lots each quarter. Each Certificate of Analysis shall report a Cpk and maximum value for each element and indicate the applicable time frame.

3.3 Metallurgical Requirements

Structures shall display cleanliness and uniformity characteristic of consistent metallurgical practices and acceptable solidification processing. Materials shall be free of salts, oxides, and foreign inclusions.

3.4 Microstructure Requirements

Microstructure is not a specified requirement for this material.

3.5 Performance Requirements

Since magnesium has high solubility in liquid aluminum, minimum rate of dissolution is not specified. However, a 99% minimum recovery should be achieved. Performance is routinely monitored under plant-scale conditions. Internal and external cleanliness can affect safety in handling and charging, overall recovery, dross generation and final product quality.

3.6 Dimensional Requirements

The following represents typical ordered dimensions and weights. Specific requirements and alternate dimensions shall be specified on the order:

<u>Form</u>	<u>Dimension</u>	<u>Weight</u>
Notch Bar / Ingot	Weight Dependent	All individual weights +/- 8%, Bundle weights: +/- 5%: 17.6 lb. (8 kg.), 25 lb. (11.3 kg.), 33 lb. (15 kg.), 40 lb. (18 kg.), 47 lb. (21.3 kg.), 50 lb. (22.7 kg.), 55 lb. (25 kg.)
T-Bar (Sow)	Weight Dependent	All Weights +/-5%: T-Bar: 250 lb. (113 kg.), 440 lb. (200 kg.), 500 lb. (227 kg.), 1500 lb. (680 kg.), 2000 lb. (907 kg.) Sow: 250 lb. (113 kg.), 500 lb. (227 kg.)



Alloying Material Specification

Applies To: Aluminum Hardener	Specification No. MS 4Mg02-N
Type: Magnesium - Grade 9300A	Revision No. E
	Effective Date 1/31/2018

Form: Notch Bar, Ingot, T-bar (sow)	Page 6 of 18
-------------------------------------	--------------

4. Quality Assurance Requirements

The vendor's Quality System shall conform to requirements of ISO 9002 (current revision). The Quality System shall be available at all times for review and approval by Arconic personnel.

4.1 Identification

4.2.1 Alphanumeric Marking: Each pallet or packaged unit shall display easily referenced and legible identification that includes the name of the vendor, product identification (product type), heat identification traceable to the manufacturing process, lot identification if separate, and producing location. Bar coding, supported by written information, is desirable.

4.1.2 Color Coding: Each package of material shall be color coded in accordance with the following table. In most cases, these color codes are the same as those registered and published in the Aluminum Association (AA) – Designation and Chemical Composition Limits for Aluminum Hardeners based on ANSI H35.3 or in the European Committee for Standardization (CEN) - EN 575:1995. NOTE: Some colors listed in the AA and CEN standards present a risk in product identification due to 1) same color codes for different material specifications or 2) different color codes for the same material specifications. Under these conditions, the color codes listed in this Alloying Material Specification shall prevail.

<u>Form</u>	<u>Color Coding</u>	<u>Special Marking</u>
Notch Bar / Ingot	Each stack shall be marked with one (1) purple stripe and three (3) white stripes using ink or paint.	Material shall be labeled with producer's name and clearly marked as "Mg-Grade 9300A"
T-Bar (Sow)	See above.	When required by the receiving plant, the weight of each T-Bar or Sow shall be prominently marked on each piece and marked as "Mg-Grade 9300A"

4.2 Quality Control / Statistical Process Control

4.2.1 Quality Systems & Procedures: Manufacturing facilities (vendors) shall maintain consistent operations and demonstrate adherence to their formal Quality Systems. Quality Systems shall consist of written or electronic controls including Standard Operating Procedures, inspection and testing



Alloying Material Specification

Applies To:	Aluminum Hardener	Specification No.	MS 4Mg02-N
Type:	Magnesium - Grade 9300A	Revision No.	E
		Effective Date	1/31/2018

Form: Notch Bar, Ingot, T-bar (sow)

Page 7 of 18

procedures (methods, frequency, acceptance limits) and records retention. Procedures shall ensure timely delivery and product performance consistent with terms of this specification.

4.2.2 Calibration Requirements: The vendor's calibration system shall conform to ISO 10012 and be compliant with the requirements of ANSI Z540.1, or an approved equivalent standard.

4.2.3 Statistical Process Control: Vendors should use Statistical Process Control (SPC) techniques relevant to their processes to evaluate state of control, to determine process capability, to verify product acceptability, to evaluate measurement/testing process repeatability and reproducibility, and to aid in improvement of process and product performance.

- The vendor must demonstrate minimum expected process capability and/or develop action plans to achieve the expected capability for the following Critical Product Characteristics:

%Si, %Mn, %Zn, %Mg, Piece Weight

For Initial Qualification: The Process Performance Index (Ppk) shall be at least 1.67. Initial samples or results from preliminary statistical capability studies shall be provided to Casting Technology, Arconic Technical Center, per paragraph 6.1.

For Qualified Standard Production: The Process Capability Index (Cpk) shall be at least 1.33.

- Gauge R&R Studies should be performed on devices used to measure the Critical Product Characteristics. Measurement processes shall be documented and proven to be stable over time.
- Real-Time SPC Control Charts should be used as basis for making process adjustments. Copies of capability indices (Ppk or Cpk) and/or SPC charts shall be provided to the buyer (receiving plant) on a quarterly basis or as specified in the purchase order.
- Corrective Action Plans should describe how to respond to an out-of-control condition and the process for determining root cause.
- Containment Plans shall ensure that no out-of-spec materials are inadvertently shipped. The Containment Plan must define inspection and release procedures and the disposition process for non-conforming.
- Continuous Improvement Plans shall be implemented to address process control and capability issues. Tools such as Failure Modes Effects Analysis (FMEA) are recommended to identify weaknesses and to guide appropriate action.

4.3 Record Retention



Alloying Material Specification

Applies To: Aluminum Hardener
Type: Magnesium - Grade 9300A

Specification No. MS 4Mg02-N
Revision No. E
Effective Date 1/31/2018

Form: Notch Bar, Ingot, T-bar (sow)

Page 8 of 18

Quality Records related to production and processing of this order shall be maintained for minimum of 7 years after the material has been shipped.

4.4 Supplier Audits

4.4.1 Arconic selects and approves suppliers based on evaluations of their quality systems and on demonstrated performance of the product(s) and service(s) being purchased. Periodic formal on-site audits may be performed to assess supplier's practices, procedures, operations and safety for conformance to Arconic's standards.

4.4.2 For quality audit purposes, Arconic, Arconic's customer and regulatory agencies will have access to approved supplier's facilities including subcontractor facilities with approved notifications for the purpose of verifying the quality of the product or service. This includes access to all facilities involved in this order and all applicable quality records including those of the calibration system.

4.5 Product Testing

The vendor shall make sure that product is properly tested to ensure consistency in manufacturing, material characteristics and product performance.

4.5.1 Chemical Composition: In addition to all elements specified, the manufacturing facility (vendor) shall perform additional testing as required to define and control impurity content and identify and correct trends detrimental to product performance.

4.5.2 Metallographic Examination: As required for process control and validating product acceptance and performance, or as dictated by other agreement.

4.5.3 Mechanical Properties and Material Characteristics: When applicable, vendor(s) shall determine mechanical properties or characteristics considered critical for control of process and product performance that may affect fines generation, conveyance, payoff of coiled materials, etc.

4.5.4 Qualification Testing: Initial qualification or re-qualification of product and/or process shall be established using the procedure described in Paragraph 6: Informational Notes.

4.5.5 Performance Testing: Vendor(s) shall perform routine testing to qualify manufacturing procedures and to determine acceptability of process



Alloying Material Specification

Applies To: Aluminum Hardener	Specification No. MS 4Mg02-N
Type: Magnesium - Grade 9300A	Revision No. E
	Effective Date 1/31/2018

Form: Notch Bar, Ingot, T-bar (sow)	Page 9 of 18
-------------------------------------	--------------

adjustments. Arconic shall perform evaluations to establish qualified vendors and for periodic surveillance.

4.6 Packaging

4.6.1 Pallet: Product shall be self-palletizing or stacked to form a pack suitable for safe unloading and handling by forklift. Magnesium footers/runners that match product requirements outlined in Section 3 may be used. Packs shall be free of non-magnesium dunnage. Steel strapping, free of oxidation, shall be used in quantities sufficient to prevent sows/T-bars or ingots from shifting during transportation and handling. Bundles must be capable of being heated for drying prior to use. All exceptions, including the usage of wooden or other pallets, must be specified and approved by the receiving location. When specified, materials shall be covered with polyethylene wrap (shrink or stretch) or wrapped with loose removable plastic covers. All plastic must be external to the main steel banding used to constrict the pack. If more than one heat is packed together, materials from the individual heats shall be clearly identified by heat number. Package information shall include chemical composition by heat number. Desiccants or other non-magnesium residues shall be removed from packs prior to delivery.

4.6.2 Package Standard: Packages shall be designed so as to ensure acceptance by common or other carriers for safe transportation at the lowest rate to the point of delivery.

4.6.3 Size and Weight: Pallet dimensions and weight shall be as follows unless specified different on the order.

<u>Form</u>	<u>Package Size and Weight</u>
Notch Bar / Ingot	The type of packing and gross weight of individual containers or bundles shall be specified on the order.
T-Bar (Sow)	T-bar and sows shall be stacked and banded to a specified weight or number of pieces as specified on the order. When specified, each T-bar and sow shall be weighed and marked, individually.

4.7 Certification Documentation

4.7.1 Chemical Composition:

4.7.1.1. Certification Report: The manufacturing facility (vendor) shall furnish a certified chemical composition report and a statement of compliance referencing this specification with each shipment.



Alloying Material Specification

Applies To: Aluminum Hardener
Type: Magnesium - Grade 9300A

Specification No. MS 4Mg02-N
Revision No. E
Effective Date 1/31/2018

Form: Notch Bar, Ingot, T-bar (sow)

Page 10 of
18

The chemical composition certificate shall contain:

- Arconic purchase order / release number and order item number
- Supplier's product batch number
- Quantity
- Test results for each element specified in paragraph 3.2
- A statement of test method(s) used to determine composition
- The name of person responsible for the certification
- Production date(s) of material
- Certification date

4.7.1.2. Statistics: The supplier may be asked to furnish statistical-based information regarding specification compliance.

4.7.2. Environmental Requirements:

4.7.2.1. Toxic Substances: By accepting this specification, the vendor is indicating compliance with regulations described by Title 40, Part 710, of the Toxic Substance Control Act (ToSCA), or equivalent international standard. The vendor also represents that none of the purchased materials contain polychlorinated biphenyls (PCBs).

4.7.2.2. Hazardous Materials: For any material furnished to this specification which is or contains hazardous materials as defined by Code of Federal Regulations 29CFR 1910.1200 and/or CFR 49 (or equivalent international standard), the vendor shall furnish 2 copies of a Material Safety Data Sheet (MSDS), or equivalent, to the buyer's facility and 1 copy to the Manager, Health & Safety – Compliance & Service, 201 Isabella Street, Pittsburgh, PA (USA) 15212-5858. The MSDS must be in the buyer's possession at least 48 hours before the material arrives at the buyer's plant site. The MSDS shall include the buyer's purchase order number or release number. Any change to the MSDS shall be promptly provided to the buyer, not to exceed 3 months following the revision.

4.7.2.3. Non-Hazardous: For any material(s) furnished to this specification not considered hazardous as defined by 29CFR 1910.1200 and/or CFR 49 (or equivalent international standard), the vendor shall certify in writing to the buyer. Such certification shall be in the buyer's possession at least 48 hours before the material arrives at the buyer's plant site.



Alloying Material Specification

Applies To:	Aluminum Hardener	Specification No.	MS 4Mg02-N
Type:	Magnesium - Grade 9300A	Revision No.	E
		Effective Date	1/31/2018

Form: Notch Bar, Ingot, T-bar (sow)

Page 11 of
18

4.7.2.4. CONEG Requirements: The vendor shall certify that no lead, cadmium, mercury, or hexavalent chrome has been added to materials supplied and that lead and cadmium are reported as impurities in accordance with Chemical Composition, Paragraph 3.2 This requirement applies only to materials with the sum concentration Pb+Cd specified at less than 0.010%.

4.7.2.5. Clean Air Act Product Labeling: The vendor shall not supply any materials that contain or have been manufactured using an Ozone Depleting Substance unless the supplier has received prior written approval from Arconic, Inc. Upon receiving written approval, the vendor shall label materials in accordance with Clean Air Act Product Labeling; Code of Federal Regulations, Title 40 Part 82 "Protection of Stratospheric Ozone," Subpart E "Labeling of Products Using Ozone Depleting Substance" (or equivalent international standard).

4.8 Shipping

- 4.8.1. General: Prior to order entry, the receiving plant shall establish specific requirements for overland and overseas shipments (e.g. containers, trucks, and/or rail, etc.). Material must be stored and transported under cover at all times. Local storage facilities shall be open to inspection by authorized Arconic (or subsidiary) personnel.
- 4.8.2. Manifest: A shipping manifest and documentation shall accompany all shipments. They shall contain the purchase order, product identification, manufacturing source (name), chemistry certification, weights (e.g. package, pallets, etc.) and reference to this specification. An additional copy shall be mailed to the procurement department of the receiving plant.
- 4.8.3. Weights: The receiving plant may weigh trucks before and after unloading using certified scales. Deviations that exceed 2% of the stated weight shall be resolved between Arconic, Inc. and the vendor. Piece count may be employed at Arconic's option.
- 4.8.4. Truck Shipments: The receiving facility shall specify type of trailer or special carrier. Equipment shall be clean and in safe operating condition. Material shall be shipped in covered van or trailer.



Alloying Material Specification

Applies To:	Aluminum Hardener	Specification No.	MS 4Mg02-N
Type:	Magnesium - Grade 9300A	Revision No.	E
		Effective Date	1/31/2018

Form: Notch Bar, Ingot, T-bar (sow)

Page 12 of
18

- 4.8.5. Rail Shipments: Rail cars shall be clean and in safe operating condition. Loading shall be conducted to facilitate safe rapid unloading by industrial trucks at the receiving facility.
- 4.8.6. Boat Shipments: The receiving facility shall specify loading that facilitates safe and rapid handling upon receipt. Storage areas and/or containers should be clean, and the vessel should be in safe operating condition. Material must be packaged in a manner to avoid exposure to moisture. Desiccant shall be securely added to the container in appropriate volumes to control moisture. Other shipping requirements, such as closing/opening container vents, may be specified by the purchasing location.
- 4.8.7. Shipping Order:
Reference Paragraph 4.8.2
- 4.8.8. Driver's Documents: The Truck Driver shall be presented with the following documents and paraphernalia:
- Bill of Lading
 - Packing List
 - Carrier's Information Packet*
 - Placards (hazardous material labels)*
 - Certificate of Analysis
- *For specific hazardous materials, the driver shall initial the appropriate space on the Bill of Lading to indicate receipt of Carrier's Information Packet and Placards.

4.9 Basis of Acceptance

- 4.9.1. Inspection and Test: Unloading does not imply acceptance. Failure to meet the requirements of this specification may result in product rejection. Physical testing and/or other inspections including chemical analysis may establish cause(s) for rejection of shipments in part or total. The receiving location shall notify vendor of any refusal to receive shipment. Extra handling charges may be assessed with vendor's approval.
- 4.9.2. Radioactive Material: By accepting this specification, the vendor shall warrant that all supplied materials are free of radioactive components and materials regulated under Federal, Provincial and State laws. Supplier agrees to indemnify and hold Arconic harmless from any and all claims,



Alloying Material Specification

Applies To:	Aluminum Hardener	Specification No.	MS 4Mg02-N
Type:	Magnesium - Grade 9300A	Revision No.	E
		Effective Date	1/31/2018

Form: Notch Bar, Ingot, T-bar (sow)

Page 13 of
18

demand costs, and expenses (including attorney's fees), resulting from or arising under, in whole or in part from a breach of this warranty. The supplier shall be responsible for proper removal and disposal of any such materials, of which they supplied, brought to any Arconic location (including subsidiaries and partnerships) and shall pay the costs of any necessary clean up.

5. Ordering Information

Orders must specify any desired options offered in this specification as well as the following:

- Number and date or revision of this specification
- Product or material name or description
- Quantity
- Special packaging requirements
- Modes of shipping transportation and special loading.

6. Informational Notes

6.1 Product Approval / Qualification

Characteristics and performance of materials and products shall be evaluated under laboratory conditions and approved by the location listed below or by a regional equivalent.

Casting Technology
Arconic Technical Center (ATC)
100 Technical Drive
New Kensington, PA 15069

Performance of materials under plant trial and full scale applications shall be coordinated and approved by the location listed below or by a regional equivalent.

Arconic, Inc. – Cast House Center of Excellence
2300 N. Wright Rd.
Alcoa, TN 37701-3141

Commercial approval of vendor shall be obtained through

Arconic, Inc. - Metal Purchasing Dept.
201 Isabella St.
Pittsburgh, PA 15212



Alloying Material Specification

Applies To: Aluminum Hardener	Specification No. MS 4Mg02-N
Type: Magnesium - Grade 9300A	Revision No. E
	Effective Date 1/31/2018

Form: Notch Bar, Ingot, T-bar (sow)	Page 14 of 18
-------------------------------------	---------------

or the appropriate regional purchasing department.

6.2 Process Change Evaluations / Approvals

The manufacturing facility (vendor) shall not make any changes in approved product formulation, raw materials, basic methods of manufacture or plant site without notification and prior approval in writing from ATC, Ingot Technology, and Metal Purchasing per Paragraph 6.1.

6.2.1. Disqualification: In the event that investigations of reported nonconformance reveal that materials purchased under this specification are inadequate for intended use, and if a mutually agreeable solution cannot be established with the vendor, Arconic, Inc. may consider disqualification of the producing facility.

6.2.2. Re-qualification: Steps for re-qualification due to an approved process change or due to a disqualification shall be accomplished in accordance with Paragraph 6.1.

6.3 Specification Change History / Approvals

Unless designated otherwise, the same functions and organizations that reviewed and approved this specification shall approve changes and modifications. Reviewers have access to pertinent background information upon which to base their review and approval.

Revision Date	No.	Description of Change
4/17/2002		Original Issue
2/5/2003	A	Draft specification (dated 4/17/2002) for 93% minimum purity magnesium master alloy. Paragraphs 2.3, 3.2, 4.1, and 4.2 describe requirements different from pure magnesium. Note new stock numbers applied. 02/05/2003: Revised Basis of Acceptance (Para. 4.9.2) specifying supplier warranty of shipping all materials free of radioactivity. Supplier agrees to indemnify Arconic harmless for all associated claims, costs and expenses. Supplier shall be responsible for proper removal, disposal and clean up costs due to such materials for which they supplied and/or shipped.



Alloying Material Specification

Applies To: Aluminum Hardener
Type: Magnesium - Grade 9300A

Specification No. MS 4Mg02-N
Revision No. E
Effective Date 1/31/2018

Form: Notch Bar, Ingot, T-bar (sow)

Page 15 of
18

- | | | |
|------------|---|---|
| 12/01/2006 | B | Revised Section 4.4 Supplier Audits to include quality audit statement (Paragraph 4.4.2) |
| 3/17/2016 | C | Section 3 wording revised. Reference to multiple pours added to paragraph 3.1.1. Added paragraph 3.1.2 to exclude acid washing as a process option. Paragraph 4.6.1 edited to better reflect current Mg bundling requirements. Paragraph 4.8.6 added for shipments by boat. |
| 1/31/2017 | | Document modified to reflect changes in company name and contacts. No change to revision number. |
| 8/04/2017 | D | Section 3.1, "Material Condition", modified to provide more detail. Appendix added to provide examples of unacceptable material conditions. |
| 1/31/2018 | E | Section 3.2 modified to reflect an increase in maximum allowable Be content to 0.0005%. In addition, compositional limits and detection criteria were added for rare earth elements. |



Alloying Material Specification

Applies To: Aluminum Hardener
Type: Magnesium - Grade 9300A

Specification No. MS 4Mg02-N
Revision No. E
Effective Date 1/31/2018

Form: Notch Bar, Ingot, T-bar (sow)

Page 16 of
18

Acknowledgement

The vendor shall indicate agreement to the subject specification as described below.

Director of Metal Purchases
Arconic, Inc.
Pittsburgh, PA

Process Consultant – Cast House CoE
Arconic, Inc.
Knoxville, TN

Technical Consultant - Casting
Technology
Arconic, Inc.
New Kensington, PA

Vendor: _____

Plant _____

Address: _____

Check (✓) one of the following:

____ We certify that we are in agreement with the subject specification and shall comply with all the requirements as written.

____ We certify that we are in agreement with the subject specification provided that the attached exceptions are incorporated.

Signature

Signature (2nd Optional)

Title

Title



Alloying Material Specification

Applies To: Aluminum Hardener
Type: Magnesium - Grade 9300A

Specification No. MS 4Mg02-N
Revision No. E
Effective Date 1/31/2018

Form: Notch Bar, Ingot, T-bar (sow)

Page 17 of
18

Appendix

Examples of unacceptable material conditions per Section 3.1



Excessive surface corrosion



High concentration of corrosion spots



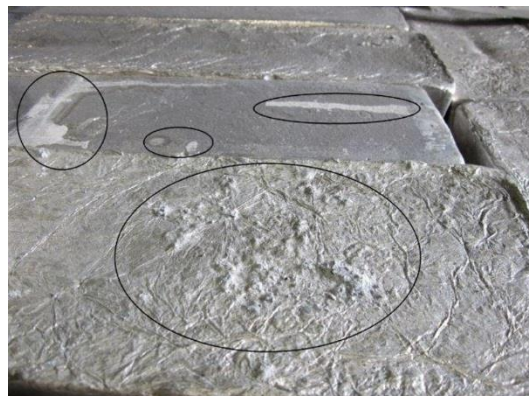
Corrosion resulting from water contact



Footer corrosion



Corrosion due to trapped moisture



Excessive level of entrained surface oxides



Alloying Material Specification

Applies To: Aluminum Hardener
Type: Magnesium - Grade 9300A

Specification No. MS 4Mg02-N
Revision No. E
Effective Date 1/31/2018

Form: Notch Bar, Ingot, T-bar (sow)

Page 18 of
18

Examples of unacceptable material conditions per Section 3.1



Heavy spots of localized corrosion



Excessive level of entrained surface oxides



Excessive salt retention



Embedded salts or other materials



High concentration of sub-surface oxides



Surface porosity connected to large voids