

WROUGHT, CAST AND FABRICATED ALUMINUM AUTOMOTIVE PRODUCTS

WARNING

Non-combustible as supplied. Small chips, fine turnings and dust from processing may be readily ignitable.

Explosion/fire hazards may be present when: Dust or fines are dispersed in air; Chips, fines or dust are in contact with water; Dust and fines are in contact with certain metal oxides (e.g., rust, copper oxide). Molten metal in contact with water/moisture or certain metal oxides (e.g., rust, copper oxide).

Dust and fume from processing: Can cause irritation of the eyes, skin and respiratory tract. Prolonged or repeated skin contact may cause sensitization and allergic contact dermatitis.

Health effects from mechanical processing (e.g., cutting, grinding): Chronic overexposures: Can cause reduction in number of red blood cells, skin abnormalities, respiratory sensitization, central nervous system damage, secondary Parkinson's disease and reproductive harm.

Additional health effects from elevated temperature processing (e.g., welding, melting): Acute overexposures: Can cause metal fume fever, reduced ability of the blood to carry oxygen and the accumulation of fluid in the lungs. Chronic overexposures: Can cause lung cancer.

FIRST AID

Eye contact Dust and fumes from processing: Rinse eyes with plenty of water or saline for at least 15 minutes. Consult a physician.

Skin contact Dust and fume from processing or contact with lubricant/residual oil: Wash with soap and water for at least 15 minutes. Get medical attention if irritation develops or persists.

Inhalation Dust and fumes from processing: Remove to fresh air. Check for clear airway, breathing, and presence of pulse. Provide cardiopulmonary resuscitation for persons without pulse or respirations. Consult a physician.

FIRE FIGHTING

Suitable extinguishing media Use Class D extinguishing agents on fines, dust or molten metal. Use coarse water spray on chips and turnings.

Extinguishing media which must not be used for safety reasons DO NOT USE halogenated extinguishing agents on small chips/fines. DO NOT USE water in fighting fires around molten metal. These fire extinguishing agents will react with the burning material.

SPILL PROCEDURES

Spill or leak procedure Collect scrap for recycling.
If molten: Contain the flow using dry sand or salt flux as a dam. All tooling (e.g., shovels or hand tools) and containers which come in contact with molten metal must be preheated or specially coated, rust free and approved for such use. Allow the spill to cool before remelting as scrap.

HANDLING AND STORAGE

Handling Keep material dry. Avoid generating dust. Avoid contact with sharp edges or heated metal. Hot and cold aluminum are not visually different. Hot aluminum does not necessarily glow red.

See Alcoa Material Safety Data Sheet No. 973 for more information about use and disposal.
Emergency Phone: (412) 553-4001.

Contains:

Aluminum	7429-90-5
Silicon	7440-21-3
Zinc	7440-66-6
Nickel	7440-02-0
Copper	7440-50-8
Manganese	7439-96-5
Magnesium	7439-95-4
Chromium	7440-47-3
Vanadium	7440-62-2
Lead†	7439-92-1

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INTRODUCTION

The purpose of this report is to describe the properties and characteristics of wrought cast iron fabricated aluminum automotive products. The report is intended for use by engineers and designers who are interested in the use of these materials in automotive applications. The report is organized as follows: Section 1.0 describes the materials and their properties. Section 2.0 describes the manufacturing process. Section 3.0 describes the test results. Section 4.0 describes the conclusions.

1.0 MATERIALS

The materials used in this study are wrought cast iron and aluminum. The wrought cast iron is a type of cast iron that has been refined and forged to improve its mechanical properties. The aluminum is a type of aluminum alloy that is commonly used in automotive applications. The properties of these materials are described in Table 1.0.

2.0 MANUFACTURING

The manufacturing process for wrought cast iron fabricated aluminum automotive products involves several steps. The first step is the casting of the wrought cast iron. The second step is the forging of the wrought cast iron. The third step is the casting of the aluminum. The fourth step is the joining of the wrought cast iron and aluminum. The fifth step is the finishing of the product.

3.0 TEST RESULTS

The test results for wrought cast iron fabricated aluminum automotive products are presented in Table 3.0. The tests performed include tensile strength, yield strength, elongation, and impact strength. The results show that the wrought cast iron fabricated aluminum automotive products have high tensile strength, yield strength, elongation, and impact strength. The results also show that the wrought cast iron fabricated aluminum automotive products have good mechanical properties.





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MATERIAL SAFETY DATA SHEET

For U.S. Manufactured or Distributed Welding Consumables and Related Products. May be used to comply with OSHA's Hazard Communication Standard, 29 CFR 1910.1200 and Superfund Amendments and Reauthorization Act (SARA) of 1986 Public Law 99-499. Standard must be consulted for specific requirements.

SECTION 1 - IDENTIFICATION

Manufacturer/Supplier Name: MAXAL, INC. Telephone
No: (231) 933-1234
Address: 1631 International Drive, Traverse City, MI 49686 Emergency
No: (231) 933-1234
Products For: ALUMINUM ALLOYS
Trade Name For: ER 1100, ER 4043, ER 5183, ER 5356, ER 5554, ER 5556

SECTION 2 - HAZARDOUS INGREDIENTS

IMPORTANT - This section covers the hazardous materials from which this product is manufactured. The fumes and gases produced during welding with normal use of this product are also addressed in Section 5. The term "hazardous" in this section should be interpreted as a term required and defined in OSHA Hazard Communication Standard (29 CFR Part 1910.1200).

HAZARDOUS INGREDIENTS	% WEIGHT	CAS NO.	EXPOSURE LIMIT (mg/m ³) OSHA PEL	ACGIH TLV
ALUMINUM###	80 - 99.7	7429-90-5	5 R*	1 R* {A4}
IRON+	0 - 1	7439-89-6	5 R*, 10 (Oxide Fume)	5 R* (Fe ₂ O ₃) {A4}
MANGANESE# Compounds of Mn)	0 - 2	7439-96-5	1, 3 STEL***, 5 CL** (Fume)	0.2 (As inorganic)
SILICON+	0 - 14	7440-21-3	5 R*	3 R*
MAGNESIUM+	0 - 6	7439-95-4	5 R*	3 R*
NICKEL#	0 - .05	7440-02-0	1 (Metal)	1.5 I* (Metal) {A5}
{A4}			1 (Soluble Compounds)	0.1 I* (Soluble Compounds)
{A1}			1 (Insoluble Compounds)	0.2 I* (Insoluble Compounds)
CHROMIUM#	0 - .5	7440-47-3	1 (Metal)	0.5 (Metal) {A4}
Compounds {A1}			0.5 (Cr II & Cr III Compounds)	0.5 (Cr III Compounds) {A4}
			0.005 (Cr VI Compounds)	0.05 (Cr VI Soluble)
Compounds {A1}				0.01 (Cr VI Insoluble)
COPPER#	0 - .5	7440-50-8	0.1 (Fume), 1 (Dust)	0.2 (Fume), 1 (Dust)

R* - Respirable Fraction. I* - Inhalable Fraction ** - Ceiling Limit. *** - Short Term Exposure Limit. + - As a nuisance particulate covered under "Particulates Not Otherwise Regulated" by OSHA or "Particulates Not Otherwise Classified" per ACGIH # - Reportable material under Section 313 of SARA ### - Reportable material under Section 313 of SARA as dust or fume. {A1} - Confirmed Human Carcinogen per ACGIH {A4} - Not Classifiable as a Human Carcinogen per ACGIH {A5} - Not Suspected as a Human Carcinogen per ACGIH

The exposure limit for welding fume has been established at 5 mg/m³ with OSHA's PEL and ACGIH's TLV. The individual complex compounds within the fume may have lower exposure limits than the general welding fume PEL/TLV. An Industrial Hygienist, the OSHA Permissible Exposure Limits for Air Contaminants (29 CFR 1910.1000), and the ACGIH Threshold Limit Values should be consulted to determine the specific fume constituents present and their respective exposure limits.

SECTION 3 - PHYSICAL/CHEMICAL CHARACTERISTICS

Welding consumables applicable to this sheet are solid and nonvolatile as shipped.

SECTION 4 - FIRE AND EXPLOSION HAZARD DATA

Welding consumables applicable to this sheet as shipped are nonreactive, nonflammable, nonexplosive and essentially nonhazardous until welded. Welding arcs and sparks can ignite combustibles and flammable products. See American National Standard Z49.1 referenced in Section 7.

SECTION 5 - REACTIVITY DATA

HAZARDOUS DECOMPOSITION PRODUCTS

Welding fumes and gases cannot be classified simply. The composition and quantity of both are dependent upon the metal being welded, the process, procedures and electrodes used. **Most fume ingredients are present as complex oxides and compounds and not as pure metals.**

Other conditions which also influence the composition and quantity of the fumes and gases to which workers may be exposed include: coatings on the metal being welded (such as paint, plating or galvanizing), the number of welders and the volume of the work area, the quality and amount of ventilation, the position of the welder's head with respect to the fume plume, as well as the presence of contaminants in the atmosphere (such as chlorinated hydrocarbon vapors from cleaning and degreasing activities).

When the electrode is consumed, the fume and gas decomposition products generated are different in percent and form from the ingredients listed in Section 2. Decomposition products of normal operation include those originating from the volatilization, reaction or oxidation of the materials shown in Section 2, plus those from the base metal and coating, etc., as noted above.

Monitor for the materials identified in Section 2. Fumes from the use of this product may contain manganese, aluminum, chromium, nickel and copper compounds whose exposure limits are lower than the 5 mg/m³ PEL/TLV for general welding fume.

Gaseous reaction products may include carbon monoxide and carbon dioxide. Ozone and nitrogen oxides may be formed by the radiation from the arc.

One recommended way to determine the composition and quantity of fumes and gases to which workers are exposed is to take an air sample inside the welder's helmet if worn or in the worker's breathing zone. [See ANSI/AWS F1.1, available from the "American Welding Society", P.O. Box 351040, Miami, FL 33135. Also, from AWS is F1.3 "Evaluating Contaminants in the Welding Environment - A Sampling Strategy Guide", which gives additional advice on sampling.]

SECTION 6 - HEALTH HAZARD DATA

EFFECTS OF OVEREXPOSURE:

Electric arc welding may create one or more of the following health hazards:

ARC RAYS can injure eyes and burn skin.

ELECTRIC SHOCK can kill. See Section 7.

FUMES AND GASES can be dangerous to your health.

PRIMARY ROUTES OF ENTRY are the respiratory system, eyes and/or skin.

SHORT-TERM (ACUTE) OVEREXPOSURE EFFECTS:

Welding Fumes - May result in discomfort such as dizziness, nausea or dryness or irritation of nose, throat or eyes. **Iron, Iron Oxide** - None are known. Treat as nuisance dust or fume. **Manganese** - Metal fume fever characterized by chills, fever, upset stomach, vomiting, irritation of the throat and aching of body. Recovery is generally complete within 48 hours of the overexposure. **Magnesium, Magnesium Oxide** - Overexposure to the oxide may cause metal fume fever characterized by metallic taste, tightness of chest and fever. Symptoms may last 24 to 48 hours following overexposure. **Nickel, Nickel Compounds** - Metallic taste, nausea, tightness in chest, metal fume fever, allergic reaction. **Chromium** - Inhalation of fume with chromium (VI) compounds can cause irritation of the respiratory tract, lung damage and asthma-like symptoms. Swallowing chromium (VI) salts can cause severe injury or death. Dust on skin can form ulcers. Eyes may be burned by chromium (VI) compounds. Allergic reactions may occur in some people. **Copper** - Metal fume fever characterized by metallic taste, tightness of chest and fever. Symptoms may last 24 to 48 hours following overexposure.

LONG TERM (CHRONIC) OVEREXPOSURE EFFECTS:

Welding Fumes - Excess levels may cause bronchial asthma, lung fibrosis, pneumoconiosis or "siderosis." **Iron, Iron Oxide Fumes** - Can cause siderosis (deposits of iron in lungs) which some researchers believe may affect pulmonary function. Lungs will clear in time when exposure to iron and its compounds ceases. Iron and magnetite (Fe₃O₄) are not regarded as fibrogenic materials. **Manganese** - Long-term overexposure to manganese compounds may affect the central nervous system. Symptoms may be similar to Parkinson's disease and can include slowness, changes in handwriting, gait impairment, muscle spasms and cramps and less commonly, tremor and behavioral changes. Employees who are overexposed to manganese compounds should be seen by a physician for early detection of neurologic problems. **Magnesium, Magnesium Oxide** - No adverse long term health effects have been reported in the literature. **Nickel, Nickel Compounds** - Lung fibrosis or pneumoconiosis. Studies of nickel refinery workers indicated a higher incidence of lung and nasal cancers. **Chromium** - Ulceration and perforation of nasal septum. Respiratory irritation may occur with symptoms resembling asthma. Studies have shown that chromate production workers exposed to hexavalent chromium compounds have an excess of lung cancers. Chromium (VI) compounds are more readily absorbed through the skin than chromium (III) compounds. Good practice requires the reduction of employee exposure to chromium (III) and (VI) compounds. **Copper** - Copper poisoning has been reported in the literature from exposure to high levels of copper. Liver damage can occur due to copper accumulating in the liver characterized by cell destruction and cirrhosis. High levels of copper may cause anemia and jaundice. High levels of copper may cause central nervous system damage characterized by nerve fiber separation and cerebral degeneration.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Persons with pre-existing impaired lung functions (asthma-like conditions).

EMERGENCY AND FIRST AID PROCEDURES: Call for medical aid. Employ first aid techniques recommended by the American Red Cross.

Eyes & Skin: If irritation or flash burns develop after exposure, consult a physician.

CARCINOGENICITY: Chromium VI and nickel compounds must be considered as carcinogens under OSHA (29 CFR 1910.1200). Chromium VI compounds are classified as IARC Group 1 and NTP Group 1 carcinogens. Nickel compounds are classified as IARC Group 1 and NTP Group 2 carcinogens. Welding fumes must be considered as possible carcinogens under OSHA (29 CFR 1910.1200).

CALIFORNIA PROPOSITION 65: WARNING: This product contains or produces a chemical known to the State of California to cause cancer and birth defects (or other reproductive harm). (California Health & Safety Code Section 25249.5 et seq.)

WARNING: This product, when used for welding or cutting, produces fumes or gases which contain chemicals known to the State of California to cause birth defects and, in some cases, cancer. (California Health & Safety Code Section 25249.5 et seq.)

SECTION 7 - PRECAUTIONS FOR SAFE HANDLING & USE/APPLICABLE CONTROL MEASURES

Read and understand the manufacturer's instructions and the precautionary label on the product. See American National Standard Z49.1; Safety in Welding and Cutting published by the American Welding Society, P.O. Box 351040, Miami, FL 33135 and OSHA Publication 2206 (29 CFR 1910), U.S. Government Printing Office, Washington, DC 20402 for more detail on any of the following.

VENTILATION: Use enough ventilation, local exhaust at the arc or both to keep the fumes and gases below PEL/TLVs in the worker's breathing zone and the general area. Train the welder to keep his head out of the fumes.

RESPIRATORY PROTECTION: Use NIOSH approved or equivalent fume respirator or air supplied respirator when welding in confined space or where local exhaust or ventilation does not keep exposure below PEL/TLVs.

EYE PROTECTION: Wear helmet or use face shield with filter lens. As a rule of thumb begin with Shade Number 14. Adjust if needed by selecting the next lighter and/or darker shade number. Provide protective screens and flash goggles, if necessary, to shield others.

PROTECTIVE CLOTHING: Wear hand, head and body protection which help to prevent injury from radiation, sparks and electrical shock. See ANSI Z49.1. At a minimum this includes welder's gloves and a protective face shield, and may include arm protectors, aprons, hats, shoulder protection as well as dark nonsynthetic clothing. Train the welder not to touch live electrical parts and to insulate himself from work and ground.

PROCEDURE FOR CLEANUP OF SPILLS OR LEAKS: Not applicable

WASTE DISPOSAL: Prevent waste from contaminating surrounding environment. Discard any product, residue, disposable container or liner in an environmentally acceptable manner, in full compliance with Federal, State and Local regulations.

SPECIAL PRECAUTIONS (IMPORTANT): Maintain exposure below the PEL/TLVs. Use industrial hygiene monitoring to ensure that your use of this material does not create exposures which exceed PEL/TLVs. Always use exhaust ventilation. Refer to the following sources for important additional information: ANSI Z49.1 from the American Welding Society, P.O. Box 351040, Miami, FL 33135 and OSHA (29 CFR 1910) from the U.S. Department of Labor, Washington, DC 20210.

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