



MSDS NO. 001 Rev. 11
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MATERIAL SAFETY DATA SHEET
 For U.S. Manufactured 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:	TRI-MARK	Telephone No: (513) 773-2010
Address:	8585 INDUSTRY PARK DRIVE, PLOUA, OH 45356	Emergency No: (513) 773-2010
Trade Name For:	*GROUP A*: TM-11, 22, 72, 73, 1HE, 771, 711, 771M, 772, RX7, RX7I, 55, 90, 771A, 773, 55E, TRIPLE 7, METALLOY 70, 71, 70R, 74, 76, 70X	
	TM-75A1, 81A1, 811A1, 91D3, 95D2, 105D2	
	METALLOY 80D2	
	METALLOY EH14S, EM12KS, EM1KS	
	GROUP B: TM-33, 133, 33R, 44, 77, 10, 121, 123, 88	
	GROUP C: TM-770, 81N1, 81NI, 881N1, 81N2, 81N2, 91N2, 91N2, 991N2, 91K2, 911K, 991K2, 101K3, 101K3-C, 1101K3-M, 11K3, 85N1, 85N2, 85N3, 85K1, 95K2, 115, 125K4, 81B2, 81B2L, 91B3, 91B3L, 81B2, 81B2L, 91B3, 101B3, 101B3-C	
	METALLOY 90, 80N1, 80N2, 80N3, 80B2, 80B2L, 90B3, 100, 110, 110B, 114, 100G, 80W, TM-C90M, C120M, 80A1	
	METALLOY NIS, N2S, N5S, N4S, B2S, B3S, A3S, F2S, M2S, WS, 120S	
	GROUP D: METALLOY 409, 409CH, 439, 18G-CB, 430, 430TI, 430CB, 420S, 410	
Product Type For:	*GROUP A* GAS SHIELDED CARBON STEEL FLUX-CORED ARC WELDING ELECTRODE	
	GROUP B SELF SHIELDED CARBON STEEL ARC WELDING ELECTRODES	
	GROUP C GAS SHIELDED LOW ALLOY FLUX CORED ARC WELDING ELECTRODE	
	GAS SHIELDED LOW ALLOY FLUX STEEL COMPOSITE ARC WELDING ELECTRODE	
	LOW ALLOY COMPOSITE SUBMERGED ARC WELDING ELECTRODE	

SECTION 2 - HAZARDOUS MATERIALS

This section covers the hazardous materials from which this product is manufactured, and those by-products which are reasonably expected to be produced during normal use of this product. 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 COMPONENTS	Group A	Group B	Group C	Group D	CAS NO.	OSHA PEL	ACGIH TLV
	85-98	85-95	80-95	78-87		% WEIGHT	(mg/m ³)
#MANGANESE	<4.5	<2	<4	<1	7439-96-5	5 R*	10
TITANIUM DIOXIDE	<10	<3	<10	—	13463-67-7	10 (Oxide Fume)	5 (Oxide Fume)
SILICON	<4	<2	<3	<1	7440-21-3	5 Cl-*** (Dust)	0.2
FLUORSPAR	<5	1-10	<5	—	14542-23-5	1, 3 STEL*** (Fume)	(Dust & Fume)
MOLYBDENUM	<1	—	<2	—	7439-98-7	5 R*	10
CALCIUM CARBONATE	<2	—	—	—	1317-65-3	5 R*	5 (Soluble Compounds)
#ALUMINUM	—	<5	—	—	7429-90-5	5 (as CaO)	2 (as CaO)
MAGNESIUM	—	<2	—	—	7439-95-4	5 R* (Dust)	10 (Dust)
BARIUM FLOURIDE ⁽¹⁾	—	<5	—	—	7787-32-8	5 R*	5 (Fume)
#NICKEL	—	<4	—	—	7440-02-0	5 R* (Oxide Fume)	10 (Oxide Fume)
#CHROMIUM	—	<3	—	11-20	7440-47-3	0.5 (as Ba)	0.5 (as Ba)
COPPER ⁽²⁾	—	<1	—	—	7440-50-8	1 (Metal & Insoluble Compounds)	1 (Metal & Insoluble Compounds)
TITANIUM	—	<2	—	7440-32-6	—	0.1 (Soluble Compounds)	0.5 (Metal) ♦ B

⁽¹⁾ Present only in TM-77, TM-21, TM-23 and TM-78K6. ⁽²⁾ Present only in TM-81W, TW-811W, METALLOY WS and METALLOY 80W.
 * - Respirable Fraction. ** - Ceiling Limit. *** - Short Term Exposure Limit. (A1) - Confirmed Human Carcinogen.
 + - As a nuisance particulate covered under "Particulates Not Otherwise Regulated" by OSHA, or "Particulates Not Otherwise Classified" by ACGIH.
 ♦ A - 1993-1994 ACGIH listed under Notice of Intended Changes. Limits of 0.2 mg/m³ are proposed and should be considered as trial limits. # - Reportable material under Section 313 of SARA as dust or fume.
 ♦ B - 1993-1994 ACGIH listed under Notice of Intended Changes. A4 - "Not Classifiable as a Human Carcinogen" for Chromium metal and Cr-III compounds. Limits of 0.01 mg/m³ for insoluble Cr VI compounds are proposed and should be considered as trial limits.

SECTION 3 - PHYSICAL/CHEMICAL CHARACTERISTICS

Not Applicable

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 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.

Reasonably expected constituents of the fume would include: Complex oxides of iron, manganese, silicon and titanium. Groups A, B and C may have fluorides present. Group C may also contain chromium and nickel. Group D contains chromium.

Monitor for the materials identified in Section 2. Fumes from the use of this product may contain fluorides, manganese, calcium oxide, chromium and nickel compounds, mica and silica fume 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/SAWS Fl. 1, available from the "American Welding Society," P.O. Box 351040, Miami, FL 33135. Also, from AWS is Fl. 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.
- TITANIUM DIOXIDE** - Irritation of respiratory system.
- SILICA (AMORPHOUS)** - Dust and fumes may cause irritation of the respiratory system, skin and eyes.
- FLUORIDES** - Fluoride compounds evolved may cause skin and eye burns, pulmonary edema and bronchitis.
- MOLYBDENUM** - Irritation of the eyes, nose and throat.
- CALCIUM OXIDE** - Dust or fumes may cause irritation of the respiratory system, skin and eyes.
- ALUMINUM OXIDE** - Irritation of the respiratory system.
- 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.
- BARIUM** - Aching eyes, rhinitis, frontal headache, wheezing, laryngeal spasms, salivation or anorexia.
- 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** - Central nervous system effects referred to as "Manganism." Symptoms include muscular weakness, tremors similar to Parkinson's Disease. Behavioral changes and changes in handwriting may also appear. Employees exposed to manganese compounds should receive quarterly medical examinations for early detection of manganism.
- TITANIUM DIOXIDE** - Pulmonary irritation and slight fibrosis.
- SILICA (AMORPHOUS)** - Research indicates that silica is present in welding fume in the amorphous form. Long term overexposure may cause pneumoconiosis. Nonerythrocyte forms of silica (amorphous silica) are considered to have little fibrotic potential.
- FLUORIDES** - Serious bone erosion (osteoporosis) and molting of teeth.
- MOLYBDENUM** - Prolonged overexposure may result in loss of appetite, weight loss, loss of muscle coordination, difficulty in breathing and anemia.
- CALCIUM OXIDE** - Prolonged overexposure may cause ulceration of the skin and perforation of the nasal septum, dermatitis and pneumonia.
- ALUMINUM OXIDE** - Pulmonary fibrosis and emphysema.
- MAGNESIUM, MAGNESIUM OXIDE** - No adverse long term health effects have been reported in the literature.
- BARIUM** - Long term overexposure to soluble barium compounds may cause nervous disorders and may have deleterious effects on the heart, circulatory system and musculature.
- 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

Nickel, chromium (with the exception of metallic chromium and chromium (III)) must be considered as carcinogens under OSHA (29CFR 1910.1200).
Welding fumes must be considered as possible carcinogens under OSHA (29 CFR 1910.1200).

CALIFORNIA PROPOSITION 65: This product contains chemicals which are known to the State of California to cause cancer. Nickel, certain nickel compounds and hexavalent chromium (Cr VI) are listed under Proposition 65. Hexavalent chromium (Cr VI) may be generated during welding.

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 (29CFR1910), 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/TLV's 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/TLV.

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/TLV. Use industrial hygiene monitoring to ensure that your use of this material does not create exposures which exceed PEL/TLV. Always use exhaust ventilation. Refer to the following sources for important additional information: ANSI Z49.1 The American Welding Society, P.O. Box 351040, Miami, FL 33135 - OSHA(29CFR1910) U.S. Department of Labor, Washington, DC 20210.

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