

**KISWEL**

MSDS NO : 001K Rev.07

November 30,2007

# Material Safety Data Sheet

**For Welding Consumables and Related Products**

Conforms to OSHA's Hazard Communication Standard 29CFR 1910.1200

**SECTION I - IDENTIFICATION**

Manufacturer's Name : KISWEL.Ltd.

Telephone No : +82-55-269-7255

Address : #58-2, Sungjoo-Dong, ChangWon-City, Kyung Nam, Korea

FAX NO : +82-55-285-1655

TYPE	Trade Name	Specification	Products Type
I	KI-101LF,KCL-10,KCL-11,K-6012, KR-3000,KR-3000V,KH-500LF, KH-500VLF,KH-500W,KH-500T, K-6022,KF-300LF,K-7014,K-7024, KK-50LF,K-7018,K-7028LF,KT-303 Cutting-Rod, Gouging -Rod	AWS A5.1	Carbon steel electrodes for shielded metal arc welding
II	KST-307-15,KST-309Mo-15, KST-308,KST-308-15,KST-308L, KST-308L-15,KST-309,KST-309-15 KST-309L,KST-309L-15,KST-309Mo KST-309MoL,KST-310,KST-312, TENSILE WELD,KST-316,KST-308H KST-316-15,KST-316L,KST-316L-15 KST-317,KST-317L,KST-318, KST-347,KST-347L,KST-410, KST-430,K-502,KST-308Mo K-502-15,K-505,K-505-15	AWS A5.4	Stainless steel electrodes for shielded metal arc welding
III	KK-55,KK-60,KK-70,KK-80, K-8018,K-9018M,K-10018M, K-11018M,K-12018M,KW-50G, KW-50V,KW-60G,KK-50N,KW-50WH KK-50NN,K-8016C1,K-8016C2, K-7018N,K-8018C1,K-8018C2 K-8018C3,K-7010A1,K-7016A1 K-8016B1,K-8016B2,K-9016B3, K-7018A1,K-8018B2,K-9018B3, K-8015B6,K-8015B8,K-8016B6, K-8016B8,K-7010G,K-8010G,KK-50B	AWS A5.5	Low alloy steel electrodes for shielded metal arc welding



<b>TYPE</b>	<b>Trade Name</b>	<b>Specification</b>	<b>Products Type</b>
XII	K-308T,K-308LT,K-309T, K-309LT,K-309MoLT,K-312T, K-316T,K-316LT,K-317LT, K-347T,K-329T,K-410NiMoT, K-410T,K-308LF,K-309LF, K-316LF,K-430T	AWS A5.22	Stainless steel electrode for flux cored arc welding and stainless steel flux cored rods for gas tungsten arc welding
XIII	KD-60,KD-B2,KD-B3  KC-80D2,ZO-60,KC-80SB2, KC-90SB3,TGS-80D2,TGS-80SB2, TGS-90SB3	AWS A5.23  AWS A5.28	Low alloy steel electrodes for submerged arc welding  Low alloy steel electrodes and rods for gas shielded arc welding
XIV	K-81T,K-110TK3,K-71TW,K-81TW K-80TK2,K-81TK2,K-82T,KX-300 K-81TB2,K-91TB3,K-81TA1,K-71TB K-115TK5,K-91TB9,K-81TSR	AWS A5.29	Low alloy steel electrodes for flux cored arc welding with external gas shielding
XV	K-250HT,K-300HT,K-350HT, K-450HT,K-500HT,K-600HT, K-700HT,K-800HT,K-CXA-40HT, K-CXA-41HT KM-100,KM-100C,KM-300R, KM-250,KM-300,KM-350,KM-500 KM-700,KM-800,KM-900,KBH-2, KM-11Cr,KOSPEL-600H,KSB-2, KM-13CrM,KQD-600,KM-1000 KOSPEL-800R	No Requirement	Composite surfacing welding rods and electrodes

## SECTION II - HAZARDOUS MATERIAL(\*)

### IMPORTANT

This section covers the materials from which this product is manufactured. The fumes and gases produced during welding with the normal use of this product are covered by Section V ; see it for industrial hygiene information.

CAS number shown is representative for the ingredients listed

\* The term "hazardous" in "hazardous materials" should be interpreted as a term required and defined in the OSHA's hazards communication standard and does not necessarily imply the existence of any hazard.

All materials are listed on the TSCA inventory.

TYPE	Ingredient	% Weight	CAS No	OSHA PEL(mg/m <sup>3</sup> )	ACGIH TLV(mg/m <sup>3</sup> )
I	Iron	1-35	7439-89-6	5 (Respirable Fraction)	10
	Manganese	1-3	7439-96-5	5 (Ceiling Limit)	0.2
	Titanium	0-5	13463-67-7	5 (Respirable Fraction)	10
	Silicon	0-5	7440-21-3	5 (Respirable Fraction)	10
	Sodium Silicates	1-3	1344-09-8	Nothing Found	Nothing Found
	Magnesite	0-5	546-93-0	15	10
	Aluminum	0-1	7429-90-5	Nothing Found	10
	Calcium Carbonate	0-5	1317-65-3	Nothing Found	10
	Mineral Silicates	0.5-2.5	1332-58-7	10	10
	Quartz	0-2	14808-60-7	0.1 (Respirable Fraction)	0.1
	Graphite	0-8	7782-42-5	Nothing Found	5
	Potassium Silicate	0-3	1312-76-1	Nothing Found	Nothing Found
	Alkali and Metallic Carbonate	0-2	584-08-7	Nothing Found	10
	Magnesium	0-5	1309-48-4	15	10
	Carbon steel core wire	50-85			
II	Iron	0-2	7439-89-6	5	Nothing Found
	Nickel	0-8	7440-02-0	1	1
	Molybdenum	0-5	7439-98-7	15 (Mo)	10(Mo)
	Manganese	1-3	7439-96-5	5 (Ceiling Limit)	1(Fume)
	Chromium	0-10	7440-47-3	1	0.5
	Columbium	0-2	7440-03-01	5	5
	Titanium	1-3	13463-67-7	15	10
	Calcium Carbonate	0.5-2	1317-65-3	Nothing Found	10
	Calcium Fluoride	0.5-1.5	7789-75-5	2.5(as F)	2.5(as F)
	Sodium Silicates	1-2	1344-09-8	Nothing Found	Nothing Found
	Potassium Silicate	1-2	1312-76-1	Nothing Found	Nothing Found
	Quartz	0.5-2	14808-60-7	1 (Respirable)	0.1
	Stainless steel core wire	60-75			
III	Iron	1-35	7439-89-6	5	Nothing Reported
	Manganese	1-3	7439-96-5	5	1(Fume)
	Titanium	0-3	13463-67-7	15	10
	Fluorspar	0-10	7789-75-5	2.5(as F)	2.5(as F)
	Potassium Silicate	0-3	1312-76-1	Nothing Found	Nothing Found
	Sodium Silicates	1-3	1344-09-8	Nothing Found	Nothing Found
	Calcium Carbonate	2-10	1317-65-3	5(as CaO)	10
	Bauxite and Aluminum	0-1	1344-28-1	5	10
	Silicon	1-2	7440-21-3	5(as SiO <sub>2</sub> )	3(as SiO <sub>2</sub> )
	Molybdenum	0-3	7439-98-7	15	10

TYPE	Ingredient	% Weight	CAS No	OSHA PEL(mg/m <sup>3</sup> )	ACGIH TLV(mg/m <sup>3</sup> )
III	Chromium	0-10	7440-47-3	0.05(as Cr)	0.05(as Cr)
	Nickel	0-5	7440-02-0	1	1
	Calcium Fluoride	0-10	7789-75-5	2.5(as F)	2.5(as F)
	Potassium Titanate	0-1	12030-97-6	Nothing Found	10
	Feldspar	0-3	68476-25-5	Nothing Found	10
	Copper	0-1	7440-50-8	1(Dust)	2
	Magnesite	0-2	546-93-0	5(as MgO)	10
	Carbon steel core wire	55-70			
IV	Iron	<1.5	7439-89-6	5 (Respirable Fraction)	10
	Manganese	<1.5	7439-96-5	5 (Ceiling Limit)	0.2
	Copper	<64-98	7440-50-8	1 (Dust)	1 (Dust)
	Silicon	<4	7440-21-3	5 (Respirable Fraction)	10
	Aluminum	<12	7429-90-5	5 (Respirable Fraction)	10
	Nickel	0-32	7440-02-0	1	1.5 (Metal)
	Titanium	<0.5	7440-32-6	5 (Respirable Fraction)	10
V	Iron	65-80	7439-89-6	5 (Respirable Fraction)	10
	Manganese	<8	7439-96-5	5 (Ceiling Limit)	0.2
	Silicon	<1	7440-21-3	5 (Respirable Fraction)	10
	Chromium	10-28	7440-47-3	1	0.5
	Nickel	0-22.5	7440-02-0	1	1.5(Mrtal)
	Molybdenum	<3.5	7439-98-7	5(Respirable Fraction)	10
	Titanium	<1.5	7440-32-6	5(Respirable Fraction)	10
VI	Iron	5-40	7439-89-6	5 (Respirable Fraction)	10
	Manganese	0-4	7439-96-5	5 (Ceiling Limit)	1(Fume)
	Silicon	<1.5	7440-21-3	5 (Respirable Fraction)	10
	Chromium	18-31.5	7440-47-3	1	0.5
	Nickel	50-85	7440-02-0	1	1.5 (Metal)
	Molybdenum	<17	7439-98-7	5 (Respirable Fraction)	10
	Titanium	<3.5	7440-32-6	5 (Respirable Fraction)	10
	Aluminum	0-1	7429-90-5	Nothing Found	10
	Calcium Fluoride	0-2	7789-75-5	2.5(as F)	2.5(as F)
	Sodium Silicates	1-2	1344-09-8	Nothing Found	Nothing Found
	Calcium Carbonate	0-1	1317-65-3	Nothing Found	10
	Graphite	1-2	7782-42-5	Nothing Found	5
	Barium Carbonate	1-2	513-77-9	0.5	0.5
Potassium Silicate	1-2	1312-76-1	Nothing Found	Nothing Found	

TYPE	Ingredient	% Weight	CAS No	OSHA PEL(mg/m <sup>3</sup> )	ACGIH TLV(mg/m <sup>3</sup> )
VII	Iron	1-5	7439-89-6	5	Nothing Reported
	Manganese	1-3	7439-96-5	5	1(Fume)
	Titanium	0-5	13463-67-7	15	10
	Silicon	0-5	7440-21-3	Nothing Found	10
	Sodium Silicates	1-3	1344-09-8	Nothing Found	Nothing Found
	Magnesite	0-5	546-93-0	15(MgO)	10
	Aluminum	0-1	7429-90-5	Nothing Found	10
	Calcium Carbonate	0-5	1317-65-3	Nothing Found	10
	Mineral Silicates	0.5-2.5	1332-58-7	10	10
	Quartz	0-2	14808-60-7	0.1 (Respirable Fraction)	0.1
	Graphite	0-8	7782-42-5	Nothing Found	5
	Potassium Silicate	0-3	1312-76-1	Nothing Found	Nothing Found
	Alkali and Metallic Carbonate	0-2	584-08-7	Nothing Found	10
	Magnesium	0-5	1309-48-4	15	10
Carbon steel&nickel alloy core wire	50-85				
VIII	Iron	<5	7439-89-6	5 (Respirable Fraction)	10
	Manganese	<5	7439-96-5	5 (Ceiling Limit)	0.2
	Copper	<0.5	7440-50-8	1 (Dust)	1 (Dust)
	Silicon	<5	7440-21-3	5 (Respirable Fraction)	10
	Aluminum	25-45	7429-90-5	5 (Respirable Fraction)	10
	Fluorides	<5		2.5 (as F)	2.5 (as F)
	Titanium	5-30	7440-32-6	5 (Respirable Fraction)	10
	Mineral Silicates	10-25			
IX	Iron	80-98	7439-89-6	5 (Respirable Fraction)	10
	Manganese	1.1-1.95	7439-96-5	5 (Ceiling Limit)	0.2
	Copper	0.01-0.04	7440-50-8	1 (Dust)	1 (Dust)
	Silicon	0.45-0.92	7440-21-3	5 (Respirable Fraction)	10
	Chromium	0.01-0.19	7440-47-3	1	0.5
	Nickel	0.01-0.03	7440-02-0	1	1.5 (Metal)
	Molybdenum	0.01-0.33	7439-98-7	5 (Respirable Fraction)	10
	Titanium	0.05-0.22	7440-32-6	5 (Respirable Fraction)	10
X	Iron	80-95	7439-89-6	5 (Respirable Fraction)	10
	Manganese	0.5-2	7439-96-5	5 (Ceiling Limit)	0.2
	Titanium	0-3	13463-67-7	5 (Respirable Fraction)	10
	Silicon	0-2	7440-21-3	5 (Respirable Fraction)	10
	Aluminum	1-5	7429-90-5	5 (Respirable Fraction)	10
	Magnesium	1-3	7439-95-4	5 (Respirable Fraction)	10
	Barium Carbonate	1-5	7787-32-8	0.5 (as Ba)	0.5 (as Ba)

TYPE	Ingredient	% Weight	CAS No	OSHA PEL(mg/m <sup>3</sup> )	ACGIH TLV(mg/m <sup>3</sup> )
XI	<u>Iron</u>	75-95	7439-89-6	5 (Respirable Fraction)	10
	<u>Manganese</u>	1-4	7439-96-5	5 (Ceiling Limit)	0.2
	<u>Titanium Dioxide</u>	4-10	13463-67-7	5 (Respirable Fraction)	10
	<u>Silicon</u>	0.5-3	7440-21-3	5 (Respirable Fraction)	10
	<u>Nickel</u>	0-4	7440-02-0	1	1.5 (Metal)
XII	Iron	65-85	7439-89-6	5 (Respirable Fraction)	10
	Manganese	<2	7439-96-5	5 (Ceiling Limit)	0.2
	Titanium Dioxide	<10	7440-32-6	5 (Respirable Fraction)	10
	Silicon	<1	7440-21-3	5 (Respirable Fraction)	10
	Chromium	10-25	7440-47-3	1	0.5
	Nickel	0-15	7440-02-0	1	1.5 (Metal)
	Molybdenum	<3	7439-98-7	5 (Respirable Fraction)	10
XIII	Iron	85-97	7439-89-6	5 (Respirable Fraction)	10
	Manganese	0.5-2	7439-96-5	5 (Ceiling Limit)	0.2
	Copper	<0.5	7440-50-8	1 (Dust)	1 (Dust)
	Chromium	1.5-2.5	7440-47-3	1	0.5
	Molybdenum	0.5-1	7439-98-7	5 (Respirable Fraction)	10
XIV	Iron	75-95	7439-89-6	5 (Respirable Fraction)	10
	Manganese	1-4	7439-96-5	5 (Ceiling Limit)	0.2
	Titanium Dioxide	4-10	13463-67-7	5 (Respirable Fraction)	10
	Silicon	0.5-3	7440-21-3	5 (Respirable Fraction)	10
	Nickel	0-6	7440-02-0	1	1.5 (Metal)
	Chromium	0-8	7440-47-3	1	0.5
	Molybdenum	0-2	7439-98-7	5 (Respirable Fraction)	10
	Copper	0-1	7440-50-8	1 (Dust)	1 (Dust)
XV	Iron	75-95	7439-89-6	5 (Respirable Fraction)	10
	Manganese	1-4	7439-96-5	5 (Ceiling Limit)	0.2
	Titanium Dioxide	4-10	13463-67-7	5 (Respirable Fraction)	10
	Silicon	0.5-3	7440-21-3	5 (Respirable Fraction)	10
	Chromium	0-10	7440-47-3	1	0.5
	Molybdenum	0-2	7439-98-7	5 (Respirable Fraction)	10

### SECTION III - FIRE AND EXPLOSION HAZARD DATA

Non flammable : Welding arc and sparks can ignite combustibles products. See Z49.1 referenced in Section VI.  
Product is inert, no special handling or spill procedures required. NOT regulated by DOT.

## SECTION IV - HEALTH HAZARD DATA

**Threshold Limit Value:** The ACGIH recommended general limit for Welding Fume NOC - (Not Otherwise Classified) is 5mg/m<sup>3</sup>. ACGIH-1999 preface states that the TLV-TWA should be used as guides in the control of health hazards and should not be used as fine lines between safe and dangerous concentrations. See Section V for specific fume constituents which may modify this TLV. Threshold Limit Values are figures published by the American Conference of Government Industrial Hygienists. Units are milligrams per cubic meter of air.

**Effects of Overexposure:** Electric arc welding may create one or more of the following health hazards: Fumes and Gases can be dangerous to your health. Common entry is by inhalation. Other possible routes are skin contact and ingestion.

Short-term (acute) overexposure to welding fumes may result in discomfort such as metal fume fever, dizziness, nausea, or dryness or irritation of nose, throat, or eyes. May aggravate pre-existing respiratory problems (e.g. asthma, emphysema).

Long-term (chronic) overexposure to welding fumes can lead to siderosis (iron deposits in lung) and may affect pulmonary function. Manganese overexposure can affect the central nervous system, resulting in impaired speech and movement. Bronchitis and some lung fibrosis have been reported.

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

Arc Rays can injure eyes and burn skin. *Skin cancer has been reported.*

Electric Shock can kill. If welding must be performed in damp locations or with wet clothing, on metal structures or when in cramped positions such as sitting, kneeling or lying, or if there is a high risk of unavoidable or accidental contact with workpiece, use the following equipment: Semiautomatic DC Welder, DC Manual (Stick) Welder, or AC Welder with Reduced Voltage Control.

**Emergency and First Aid Procedures:** Call for medical aid. Employ first aid techniques recommended by the American Red Cross.

IF BREATHING IS DIFFICULT give oxygen. IF NOT BREATHING employ CPR (Cardiopulmonary Resuscitation) techniques. IN CASE OF ELECTRICAL SHOCK, turn off power and follow recommended treatment. In all cases call a physician.

TYPE	Ingredient	CAS NO	OSHA PEL(mg/m <sup>3</sup> )	ACGIH TLV(mg/m <sup>3</sup> )
I	Iron oxide	1309-38-2	5 (as Fe)	10 (as Fe <sub>2</sub> O <sub>3</sub> )
	Manganese	7439-96-5	5 (Ceiling Limit, as Fume)	1(Fume)
	Silicon Oxide	7631-86-9	5	3
	Titanium Oxide	13463-67-7	15	10
	Magnesium Oxide	1309-48-4	15	10
	Calcium Oxide	1305-78-8	5 (as CaO)	2 (as CaO)
	Aluminum Oxide	1344-28-1	Nothing Found	10



TYPE	Ingredient	CAS NO	OSHA PEL(mg/m³)	ACGIH TLV(mg/m³)
II	Iron oxide	1309-38-2	5 (as Fe)	10 (as Fe <sub>2</sub> O <sub>3</sub> )
	Nickel Oxide	1313-99-1	Nothing Found	1(as Ni)
	Molybdenum (as Mo)	7439-98-7	15 (Mo)	10
	Manganese	7439-96-5	5	1(Fume)
	Chromium Oxide	1308-38-9	0.5 (as Cr)	0.5
	Silicon Oxide	7631-86-9	5	3
	Titanium Oxide	13463-67-7	15	10
	Calcium Oxide	1305-78-8	5 (as CaO)	2 (as CaO)
	Columbium	7440-03-01	5	5
	Fluorides	-	2.5(as F)	2.5(as F)
III	Iron oxide	1309-38-2	5 (as Fe)	10 (as Fe <sub>2</sub> O <sub>3</sub> )
	Manganese	7439-96-5	5	1(Fume)
	Silicon Oxide	7631-86-9	5	3
	Titanium Oxide	13463-67-7	15	10
	Fluorides	-	2.5(as F)	2.5(as F)
	Chromium Oxide	1308-38-9	0.5 (as Cr)	0.5
	Chromic Acid	1333-82-0	0.1	0.05
	Nickel Oxide	1313-99-1	Nothing Found	1(as Ni)
	Calcium Oxide	1305-78-8	5 (as CaO)	2 (as CaO)
	Aluminum Oxide	1344-28-1	Nothing Found	10
	Magnesium Oxide	1309-48-4	15	10
	Molybdenum (as Mo)	7439-98-7	15 (Mo)	10
IV	Iron oxide	1309-38-2	10 (as Fe)	5 (as Fe)
	Manganese Compounds (as Mn)	7439-96-5	5 (Ceiling Limit, as Fume)	0.2
	Copper Compounds (as Cu)	7440-50-8	0.1 (Fume)	0.2 (Fume)
	Silica	60676-67-7	0.1	2 (Respirable, Fume)
	Aluminum Oxide	1344-28-1	5 (Respirable Fraction)	5 (Fume)
	Nickel Compounds (Soluble)		1 (as Ni)	0.1 (as Ni)
	Nickel Compounds (Insoluble)		1 (as Ni)	0.2 (as Ni)
	Titanium Dioxide	13463-67-7	5 (Respirable Fraction)	10
V	Iron oxide	1309-38-2	10 (as Fe)	5 (as Fe)
	Manganese Compounds (as Mn)	7439-96-5	5 (Ceiling Limit, as Fume)	0.2
	Titanium Dioxide	13463-67-7	5 (Respirable Fraction)	10
	Silica	60676-67-7	0.1	2 (Respirable, Fume)
	Nickel Compounds (Soluble)		1 (as Ni)	0.1 (as Ni)
	Nickel Compounds (Insoluble)		1 (as Ni)	0.2 (as Ni)

TYPE	Ingredient	CAS NO	OSHA PEL(mg/m³)	ACGIH TLV(mg/m³)
V	Chromium Oxide (as Cr II ,Cr III)		0.5 (as Cr II , Cr III)	0.5 (as Cr II , Cr III)
	Chromium (Insoluble CrVI)		0.1 (Ceiling Limit, as CrVI)	0.01
	Molybdenum Compounds (as Mo)	7439-98-7	5 (Respirable Fraction)	10
	Copper Compounds (as Cu)	7440-50-8	0.1 (Fume)	0.2 (Fume)
VI	Iron oxide	1309-38-2	10 (as Fe)	10 (as Fe)
	Manganese (as Mn)	7439-96-5	5 (Ceiling Limit, as Fume)	1
	Silicon Oxide	7631-86-9	5	3
	Nickel Compounds (Soluble)		1 (as Ni)	0.1 (as Ni)
	Nickel Oxide	1313-99-1	Nothing Found	1 (as Ni)
	Chromium Oxide (as Cr II ,Cr III)		0.5 (as Cr II , Cr III)	0.5 (as Cr II , Cr III)
	Chromium (Insoluble CrVI)		0.1 (Ceiling Limit, as CrVI)	0.01
	Molybdenum Compounds (as Mo)	7439-98-7	5 (Respirable Fraction)	10
	Titanium Dioxide	13463-67-7	5 (Respirable Fraction)	10
	Fluorides		2.5(as F)	2.5(as F)
	Calcium Oxide	1305-78-8	5(as CaO)	2(as CaO)
Aluminum Oxide	1344-28-1	Nothing Found	10	
VII	Iron oxide	1309-38-2	5 (as Fe)	10 (as Fe <sub>2</sub> O <sub>3</sub> )
	Manganese	7439-96-5	5 (Ceiling Limit, as Fume)	1(Fume)
	Silicon Oxide	7631-86-9	5	3
	Titanium Oxide	13463-67-7	15	10
	Magnesium Oxide	1309-48-4	15	10
	Calcium Oxide	1305-78-8	5 (as CaO)	2 (as CaO)
	Aluminum Oxide	1344-28-1	Nothing Found	10
VIII	Iron oxide	1309-37-1	10 (as Fe)	5 (as Fe)
	Manganese Compounds (as Mn)	7439-96-5	5 (Ceiling Limit, as Fume)	0.2
	Copper Compounds (as Cu)	7440-50-8	0.1 (Fume)	0.2 (Fume)
	Silica	60676-67-7	0.1	2 (Respirable, Fume)
	Aluminum Oxide	1344-28-1	5 (Respirable Fraction)	5 (Fume)
	Fluorides		2.5 (as F)	2.5 (as F)
	Titanium Dioxide	13463-67-7	5 (Respirable Fraction)	10
IX	Iron oxide	1309-37-1	10 (as Fe)	5 (as Fe)
	Manganese Compounds (as Mn)	7439-96-5	5 (Ceiling Limit, as Fume)	0.2
	Copper Compounds (as Cu)	7440-50-8	0.1 (Fume)	0.2 (Fume)
	Silica	60676-67-7	0.1	2 (Respirable, Fume)
	Nickel Compounds (Soluble)		1 (as Ni)	0.1 (as Ni)
	Nickel Compounds (Insoluble)		1 (as Ni)	0.2 (as Ni)

TYPE	Ingredient	CAS NO	OSHA PEL(mg/m <sup>3</sup> )	ACGIH TLV(mg/m <sup>3</sup> )
IX	Chromium Oxide (as Cr II ,Cr III)		0.5 (as Cr II , Cr III)	0.5 (as Cr II , Cr III)
	Chromium (Insoluble CrVI)		0.1 (Ceiling Limit, as CrVI)	0.01
	Molybdenum Compounds (as Mo)	7439-98-7	5 (Respirable Fraction)	10
	Titanium Dioxide	13463-67-7	5 (Respirable Fraction)	10
X	Iron oxide	1309-37-1	10 (as Fe)	5 (as Fe)
	Manganese Compounds (as Mn)	7439-96-5	5 (Ceiling Limit, as Fume)	0.2
	Titanium Dioxide	13463-67-7	5 (Respirable Fraction)	10
	Silica	60676-67-7	0.1	2 (Respirable, Fume)
	Fluorides		2.5 (as F)	2.5 (as F)
	Magnesium Oxide	1309-48-4	5 (Respirable Fraction)	10
	Aluminum Oxide	1344-28-1	5 (Respirable Fraction)	5 (Fume)
	Barium Compounds	7440-39-3	0.5 (soluble, as Ba)	0.5 (as Ba)
XI	Iron oxide	1309-37-1	10 (as Fe)	5 (as Fe)
	Manganese Compounds (as Mn)	7439-96-5	5 (Ceiling Limit, as Fume)	0.2
	Titanium Dioxide	13463-67-7	5 (Respirable Fraction)	10
	Silica	60676-67-7	0.1	2 (Respirable, Fume)
	Nickel Compounds (Soluble)		1 (as Ni)	0.1 (as Ni)
	Nickel Compounds (Insoluble)		1 (as Ni)	0.2 (as Ni)
XII	Iron oxide	1309-37-1	10 (as Fe)	5 (as Fe)
	Manganese Compounds (as Mn)	7439-96-5	5 (Ceiling Limit, as Fume)	0.2
	Titanium Dioxide	13463-67-7	5 (Respirable Fraction)	10
	Silica	60676-67-7	0.1	2 (Respirable, Fume)
	Nickel Compounds (Soluble)		1 (as Ni)	0.1 (as Ni)
	Nickel Compounds (Insoluble)		1 (as Ni)	0.2 (as Ni)
	Chromium Oxide (as Cr II ,Cr III)		0.5 (as Cr II , Cr III)	0.5 (as Cr II , Cr III)
	Chromium (Insoluble CrVI)		0.1 (Ceiling Limit, as CrVI)	0.01
	Molybdenum Compounds (as Mo)	7439-98-7	5 (Respirable Fraction)	10
XIII	Iron oxide	1309-37-1	10 (as Fe)	5 (as Fe)
	Manganese Compounds (as Mn)	7439-96-5	5 (Ceiling Limit, as Fume)	0.2
	Copper Compounds (as Cu)	7440-50-8	0.1 (Fume)	0.2 (Fume)
	Chromium Oxide (as Cr II ,Cr III)		0.5 (as Cr II , Cr III)	0.5 (as Cr II , Cr III)
	Chromium (Insoluble CrVI)		0.1 (Ceiling Limit, as CrVI)	0.01
	Molybdenum Compounds (as Mo)	7439-98-7	5 (Respirable Fraction)	10
XIV	Iron oxide	1309-37-1	10 (as Fe)	5 (as Fe)
	Manganese Compounds (as Mn)	7439-96-5	5 (Ceiling Limit, as Fume)	0.2
	Titanium Dioxide	13463-67-7	5 (Respirable Fraction)	10

TYPE	Ingredient	CAS NO	OSHA PEL(mg/m <sup>3</sup> )	ACGIH TLV(mg/m <sup>3</sup> )	
XIV	Silica	60676-67-7	0.1	2 (Respirable, Fume)	
	Nickel Compounds (Soluble)		1 (as Ni)	0.1 (as Ni)	
	Nickel Compounds (Insoluble)		1 (as Ni)	0.2 (as Ni)	
	Chromium Oxide (as Cr II ,Cr III)		0.5 (as Cr II , Cr III)	0.5 (as Cr II , Cr III)	
	Chromium (Insoluble CrVI)		0.1 (Ceiling Limit, as CrVI)	0.01	
	Molybdenum Compounds (as Mo)		7439-98-7	5 (Respirable Fraction)	10
	Copper Compounds (as Cu)		7440-50-8	0.1 (Fume)	0.2 (Fume)
XV	Iron oxide	1309-37-1	10 (as Fe)	5 (as Fe)	
	Manganese Compounds (as Mn)	7439-96-5	5 (Ceiling Limit, as Fume)	0.2	
	Titanium Dioxide	13463-67-7	5 (Respirable Fraction)	10	
	Silica	60676-67-7	0.1	2 (Respirable, Fume)	
	Chromium Oxide (as Cr II ,Cr III)		0.5 (as Cr II , Cr III)	0.5 (as Cr II , Cr III)	
	Chromium (Insoluble CrVI)		0.1 (Ceiling Limit, as CrVI)	0.01	
	Molybdenum Compounds (as Mo)	7439-98-7	5 (Respirable Fraction)	10	

A1-Confirmed Human Carcinogen

Gaseous reaction products may include carbon monoxide and carbon dioxide. Ozone and nitrogen oxides may be formed by 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, PO Box 351040, Miami, FL 33135. Also available from AWS is F1.3, "Evaluating Contaminants in the Welding Environment- A Sampling Strategy Guide", which gives additional advice on sampling. At a minimum materials listed in this section should be analyzed.

## SECTION V - REACTIVITY DATA

Welding fumes and gases cannot be classified simply. The composition and quantity of both are dependent upon the metal being welded the process and electrodes used.

keep exposure as low as possible. Indoors, use local exhaust; outdoors, a respirator may be required.

### Short-term(acute) overexposure effects

**Welding Fumes;** May result in discomfort such as dizziness, nausea or dryness or irritation of the nose, throat or eyes.

**Iron, Iron Oxide;** None are known. Treat as a nuisance dust or fume.

**Manganese;** Metal fume fever characterized by chills, fever, upset stomach, vomiting, irritation of throat and aching of body.

**Nickel, Nickel Compounds;** Metallic taste, nausea, tightness in chest, fever, allergic reactions.

**Chromium;** Inhalation of fume with chromiumVI compounds can cause irritation of the respiratory system, lung damage and asthma-like symptoms. Swallowing chromiumVI salts can cause severe injury or death. Dust on the skin can form ulcers.

Eyes may be burned by chromium VI compounds. Allergic reactions are likely in some people from chromium compounds.

**Copper;** Metal fume fever can be caused by fresh copper oxide.

**Barium;** Aching eyes, rhinitis, frontal headache, wheezing, laryngeal spasms, salivation or anorexia.

**Silica;** None are known. Treat as a nuisances dust or fume.

**Molybdenum;** None are known. Treat as a nuisances dust or fume.

**Titanium Dioxide;** None are known. Treat as a nuisances dust or fume.

**Aluminum, Aluminum Oxide;** None are known. Treat as a nuisances dust or fume.

**Magnesium, Magnesium Oxide;** None are known. Treat as a nuisances dust or fume.

### **Long term(chronic) overexposure effects**

**Welding Fume;** Excess levels may cause bronchial asthma, lung fibrosis, pneumoconiosis, or siderosis.

**Iron, Iron Oxide;** Siderosis or deposits of iron in lungs which is believed to affect pulmonary function. Lungs will clear in time when exposure to iron fumes and its compounds ceases. Iron and magnetite( $\text{Fe}_3\text{O}_4$ ) are not regarded as fibrogenic materials.

**Manganese;** Central nervous system effects referred to as manganism. Symptoms include muscular weakness and tremors. Behavioral changes in handwriting may also appear. Employees overexposed to manganese should receive quarterly medical examinations for early detection of manganism.

**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 the nasal septum. Respiratory irritation may occur with symptoms resembling asthma. Studies have shown that chromate production workers exposed to chromium VI compound 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;** No adverse long-term health effects have been reported in the literature.

**Barium;** Exposure to soluble barium compounds may cause nervous disorders and may have deleterious effects on the heart, circulatory and muscular system.

**Silica;** Treat as nuisance dust. Little adverse effect on lungs. Does not produce significant organic disease or toxic effect when exposures are kept under reasonable control.

**Molybdenum;** Treat as a nuisance dust. Little adverse effect on lungs. Does not produce significant organic disease or toxic effect when exposures are kept under reasonable control.

**Aluminum, Aluminum Oxide;** Treat as a nuisance dust. Little adverse effect on lungs. Does not produce significant organic disease or toxic effect when exposures are kept under reasonable control.

**Magnesium, Magnesium Oxide;** Treat as a nuisance dust. Little adverse effect on lungs. Does not produce significant organic disease or toxic effect when exposures are kept under reasonable control.

## SECTION VI

### PRECAUTIONS FOR SAFE HANDLING AND USE / APPLICABLE CONTROL MEASURES

Read and understand the manufacturer's instructions and 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, D.C. 20402, for more detail on many of the following:

**Ventilation;** Use enough ventilation, local exhaust at the arc, or both, to keep the fumes and gases below 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 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 protect 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, non-synthetic clothing. Train the welder not to touch live electrical parts and to insulate himself from the work and ground.

**Disposal Information;** Discard any product, residue, disposable container, or liner as ordinary waste in an environmentally acceptable manner according to federal, State and local regulations unless otherwise noted.