



## Linde Bangladesh Limited

# MATERIAL SAFETY DATA SHEET

## For Welding Consumables and Related Products

Complies with OSHA's Hazard Communication Standard (29CFR 1910.1200)

MSDS NO.: <b>CE003 Cast Iron Covered Electrodes</b>
Date: <b>18/01/10</b>
Revision No.: <b>03</b>
Sizes: <b>All</b>

### SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

<b>Product Name:</b>	CAST IRON COVERED WELDING ELECTRODES
<b>Product Brands:</b>	Ferroid - 1
<b>Product Specification:</b>	AWS SFA 5.15 or other
<b>Product Classification:</b>	ENiCu-B
<b>Recommended Use:</b>	Shielded Metal Arc Welding of cast irons
<b>Supplier:</b>	Linde Bangladesh Limited
<b>Address:</b>	285 Tejgaon I/A, Dhaka - 1208
<b>Telephone Number:</b>	+ (8802) 8870322 - 27 (akm.tareq@linde.com)
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### SECTION 2: HAZARD IDENTIFICATION

Classified as Dangerous to EC 1272/2008

This product contains Nickel in the unused state which is a recognised hazard in its inhalable form.

- Suspected of causing cancer (Carc2, H351/EC 1272/2008, Carc. Cat3, R40/Directive 67/548 EC)
- May cause an allergic skin reaction (Skin sens 1, H317/EC1272/2008, R43/ Directive 67/548 EC)

Packaged consumables may be heavy, and should be handled and stored with care. FOLLOW MANUAL HANDLING REGULATIONS.

Some low levels of dust may be produced during handling. DO NOT BREATHE THE DUST.



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When using these electrodes as part of the welding process additional potential hazards are likely. These are:

- Electric shock from the welding equipment or electrode. This can be fatal.
- Hot metal spatter and heat, which can cause burns to the hand and body, and may cause fire if in contact with combustible materials.
- UV, IR and light radiation from the arc, which can produce 'arc eye' and possible eye damage to unprotected eyes. WEAR SUITABLE PROTECTIVE EQUIPMENT.
- Fumes produced from the welding consumable, material being welded, and the arc radiation. These consist of:
  - Particulate fume such as complex metal oxides, fluorides, and silicates from the weld materials. (Details of the fume constituents are given in section 8 of this document).
  - Gaseous fume such as ozone and nitrogen oxides from the action of arc radiation on the atmosphere, and carbon monoxide and dioxide from the dissociation of some flux constituents during welding.
    - Harmful if inhaled (H332/EC 1272/2008)/ R20/Directive 67/548 EC)
    - May cause cancer (H350/Carc1A/ EC 1272/2008)) (Carc.Cat1;R45/Directive 67/548 EC)
    - Harmful if swallowed (H302/EC1272/2008, R22/Directive 67/548EEC)
    - May cause an allergic skin reaction (H317)/ /EC1272/2008 (T:R23/ R43/ Xi;R36/Directive 67/548/EC)

SHORT TERM INHALATION OF THESE FUMES AND GASES MAY LEAD TO IRRITATION OF THE NOSE, THROAT AND EYES.

LONG TERM OVEREXPOSURE OR INHALATION OF HIGH LEVELS OF FUME MAY RESULT IN HARMFUL EFFECTS TO THE RESPIRATORY SYSTEM, CENTRAL NERVOUS SYSTEM AND LUNGS.

LOCAL EXTRACTION AND /OR VENTILATION SHOULD BE USED TO ENSURE THAT ALL HAZARDOUS INGREDIENTS IN THE FUME ARE KEPT BELOW THEIR INDIVIDUAL OCCUPATIONAL EXPOSURE STANDARDS IN THE WELDER'S AND OTHER WORKERS' BREATHING ZONES

Fume collected in extraction systems may consist of heavy metal compound and should be disposed of (or recycled) in line with local regulations. if applicable)

- May cause long lasting harmful effects to aquatic life (H413/EC1272/2008) (R53/Directive 67/548/EC)

NOTE; If welding is performed on plated or coated materials such as galvanised steel, excessive fume may be produced which contains additional hazardous components, and may result in metal fume fever and other health effects.



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### SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

These electrodes consist of a solid, nickel or iron alloy core covered with a flux coating. The alloy inner core is an uncoated solid rod. The flux coatings vary depending on the type of electrode, and contain varying amounts of metal powders, ferro-alloy powders, graphite, mineral ores, inorganic oxides, carbonates and fluorides, cellulosic compounds and other siliceous materials mixed together with liquid silicate binders.

Specific details of the contents of the core wire and flux coating for the electrode types covered by this data sheet are given below.

TABLE 1: CORE WIRE COMPOSITION DATA (WT %)

Alloy core wires	%C	%Si	%Mn	%Ni	%Cu	%Fe
	CAS Number 7440-44-0	CAS Number 7440-21-3	CAS Number 7439-96-5	CAS Number 7440-02-0	CAS Number 7440-50-8	CAS Number 7439-89-6
Ranges	0 to 0.25	0 to 0.25	0 to 1.0	0 to 99	0 to 35	balance
Hazard Classification 67/548/EC				Carc.Cat3, R40-R43 S:((2-) 22-36		
Hazard Classification 1272/2008				Carc2,H351 Skin sens 1 H317		

TABLE 2: COATING COMPOSITION DATA (WT %)

Flux coating	%	CAS No.	Hazard Classification 67/548/EC	Hazard Classification 1272/2008
Aluminium powder			F; R15,R10 stabilised	H261 water- react.2
Pyr	1-3	7429-90-5	F;R15-17 pyrophoric	H250 pyr.sol1 H228 Flam.Sol.1
Stab.				
Limestone and/or Calcium Carbonate	0 to 25	1317-65-3		
Graphite				
(total inhalable dust)	0 to 15	7440-44-0		
(respirable dust)				
Strontium Carbonate	0 to 35	1633-05-2		
Cellulose				
(total inhalable dust)	0 to 10	9004-34-6		
(respirable dust)				
Starch				
(total inhalable dust)	0 to 15	9005-25-8		
(respirable dust)				
Inorganic Fluorides (as F)	0 to 25	16984-48-8		



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Nickel and its inorganic compounds (soluble, as Ni) (insoluble, as Ni)	0-15	7440-02-0	Carc.Cat3, R40- R43 S:((2-) 22-36	Carc2,H351 Skin sens 1 H317
Iron powder	0 to 15	7439-89-6		
Rutile/Titanium Dioxide (total inhalable dust) (respirable dust)	0 to 5	13463-67-7		
Silicate Binders	0 to 35	1344-09-8		
Others				

### SECTION 4: FIRST AID MEASURES

No first aid measures should be required for the unused electrode consumables.

#### During welding

##### Inhalation

If inhaled remove patient to fresh air and keep at rest in a position comfortable for breathing.. If exposed or concerned call a doctor.

##### For skin contact / burns

Submerge affected area in cold water until burning sensation ceases and refer for immediate medical attention.

##### For eye effects such as arc eye and dusts

Irrigate eye with sterile water, cover with damp dressing and refer for immediate medical attention if irritation persists. If on skin immediately wash with water, Get medical attention for skin irritation..

##### Ingestion

Ingestion is considered unlikely due to product form. However, if detached flux coating is swallowed do not induce vomiting. Seek medical attention. Advice to doctor: treat symptomatically. Rinse mouth.

##### Electric shock

If necessary resuscitate and seek immediate medical attention.



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### SECTION 5: FIRE FIGHTING MEASURES

No specific measures required for these welding consumable prior to welding.

#### **During welding**

Welding should not be carried out in the presence of flammable materials, vapours, tanks, cisterns and pipes and other containers which have held flammable substances unless these have been checked and certified safe.

### SECTION 6: ACCIDENTAL RELEASE MEASURES

No specific actions for these welding consumable prior to use. See sections 12 and 13 for ecological considerations.

Welding in proximity to stored or used halogenated solvents may produce toxic and irritant gases. Prohibit welding in areas where these solvents are used.

### SECTION 7: HANDLING AND STORAGE (FOR SAFETY)

Welding electrodes are dense materials and can give rise to a handling hazard when multiple packages of the electrodes are lifted or handled incorrectly or with poor lifting posture. Gloves should be worn. Wash thoroughly after handling.

Good practice for handling and storage should be adopted to prevent physical injuries.

### SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

#### **Exposure Prevention**

Welders should not touch live electrical parts, and should insulate themselves from the work and the ground. Manufacturer's guidelines for the use of electrical welding machines should be observed at all times.

Welders and co-workers should be educated about the health hazards associated with welding fume, and trained to keep their heads out of the fume plume. Do not breathe the dust or fume.

During welding, fumes and gases will be produced and emitted from the welding process. The content of the fume is dependent on the electrode type, shielding gas, base materials being welded and surface coatings. The amount and concentration of fume generated also depends on factors such as current, voltage, welding practices and number of welders in a given area. Follow recommended welding practices to minimise fume production. Do not eat, drink or smoke when using this product.

For cast iron electrodes, the main constituents of the fume will be iron, copper, nickel, manganese, sodium, potassium and calcium oxides, fluorides and silicates, mainly in the form of complex oxides and other compounds. There will also be smaller amounts of other complex metal oxides and silicates.

Gaseous ozone and nitrous oxides are also formed by arc radiation, and carbon monoxide and carbon dioxide can also be present due to dissociation and reaction with the atmosphere of some of the flux constituents.

Fume composition data for AWS A5.15-90: ENiCuB type electrode and typical fume for other cast iron covered electrodes is given below in table 3. and the individual exposure limits for the constituents (when specified) are also given.



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Fume exposure should be controlled to below the recognised exposure limit for each of the individual constituents.

Table 3: Fume composition data (WT %)

	%Fe	%Mn	%Si	%Mg	%Ti	%Ni	%Cu	%Na	%K	%Ca	%Al	%F
AWS A5.15-90:ENiCuB	3.09	0.77	5.61	0.85	0.78	3.85	12.69	13.44	0.31	29.58	1.74	3.70
Typical range for other cast iron electrodes covered by this data sheet	1 to 13	<3	<2	<3	<1	0 to 10	0 to 10	2 to 3	1 to 2	0 to 12	<1	4 to 15

Table 4: Hazardous fume components<sup>1</sup>

Welding fume component	CAS No.	WEL <sup>2</sup> 8hr TWA	STEL <sup>2</sup> 15min TWA	Hazard Classification 67/548/EC	Hazard Classification (GHS) 1272/2008
Iron oxide fume (as Fe)	1309-37-1	5	10		
Manganese and its inorganic compounds (as Mn)	7439-96-5	0.5		R20/R22	H332/H302 Acute Tox.4
Copper (fume) (dust and mist)	7440-50-8	0.2 1			
Nickel and its inorganic compounds (water soluble) (water insoluble)		0.1 0.5		R40/R43/ R49/R53	H350i/H351 Carc 2 /H317 Skin sens 1 /H413 Aquatic Ch.4
Silica, amorphous (total inhalable dust) (respirable dust)	-	6 2.4			
Titanium dioxide (total inhalable dust) (respirable dust)	13463-67-7	10 4			
Calcium Oxide	1305-78-8	2			
Calcium Silicate (total inhalable dust) (respirable dust)	1344-95-2	10 4			
Fluoride, inorganic (as F)	16984-48-8	2.5			
Carbon Monoxide	630-08-0	30ppm	200ppm		
Carbon Dioxide	124-38-9	5000ppm	15000ppm		
Nitrogen dioxide (NO <sub>2</sub> )	10102-44-0	0.5 ppm <sup>3</sup>	0.95 ppm <sup>3</sup>		
Ozone (O <sub>3</sub> )	10028-15-6		0.2 ppm		
Nitrogen monoxide (NO)	10102-43-9	0.5 ppm <sup>3</sup>	0.63 ppm <sup>3</sup>		



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<sup>1</sup>Units are in mgm/m<sup>3</sup>, except when stated otherwise

<sup>2</sup>WEL Workplace Exposure Limits

<sup>3</sup>As recommended by MAK Commission based on scientific experience and is not established law

<sup>4</sup>As recommended by EH 40 (2007) in the UK

The fume analyses for the cast iron electrodes covered by this data sheet, when used for welding clean, uncoated unalloyed cast irons, indicate that as long as the total fume exposure limits are met, the fume levels of the other constituents will generally be below their respective exposure limits.

The exceptions are manganese, copper and nickel, as these have low exposure limits, and additional controls to their individual limits may be required. Obtain special instructions before use. Do not handle or weld until all safety precautions have been read and understood.

THE FUME LEVELS GIVEN ABOVE WERE GENERATED UNDER LABORATORY CONDITIONS WHEN WELDING CLEAN, UNALLOYED CAST IRONS UNDER THE MANUFACTURERS RECOMMENDED WELDING PARAMETERS, AND ARE INDICATIVE OF REASONABLY EXPECTED FUME LEVELS. ACTUAL FUME LEVELS WILL VARY IN PRACTICE, DEPENDING ON THE WELDING PARAMETERS AND OTHER CONDITIONS, AND MAY BE HIGHER OR LOWER THAN THOSE LISTED ABOVE.

Additional fume may arise when these electrodes are used to weld contaminated base materials, coated or plated steels, other metals and alloys, OR WHEN INCORRECT WELDING CONDITIONS ARE USED.

THE ONLY ACCURATE WAY TO DETERMINE THE COMPOSITION AND QUANTITY OF FUMES AND GASES TO WHICH WORKERS ARE EXPOSED IS TO TAKE AIR SAMPLES FROM INSIDE THE WELDERS HELMET, IF WORN, OR IN THE WORKER'S BREATHING ZONES.

Individual fume measurements should be made in these cases using recognised sampling and analysis standards. Based on the results of these measurements, additional fume controls may be required to ensure that all the fume constituents are controlled below their exposure limits.

### Controls

Good general ventilation, and/or local fume extraction at the arc should be used to control the fumes and gases produced during welding to below their individual recognised exposure limits when measured in the welder's and co-workers' breathing zone. In addition the ventilation and extraction should also be sufficient to ensure that the total particulate fume levels are reduced when measured in the breathing zone. Avoid breathing dust, fume, and gas. Get medical attention if you feel unwell.

In confined spaces where ventilation is not adequate, an air fed breathing system should be used. All precautions for working in confined space should be observed. Refer to AS/NZS 2865 'Safe Working in a Confined Space'. Contaminated work clothing should not be allowed outside the area.

Where fume levels exceed the recognised exposure limits, respiratory protection may be required in the form of a Class P2 (metal fume) respirator.

### Personal Protection

Welders and co-workers in the vicinity should wear protective gloves, protective clothing, eye protection and face protection appropriate to arc welding as specified by local standards.



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### Protection of Body and Skin

Suitable clothes for welding should be worn such as non light reflective fire resistant clothing, overalls, leather apron, welding helmet, leather boots spats and gloves. Remove all contaminated clothing after the welding operation, and wash contaminated clothing before reuse

### Protection of Hands

Welders should wear suitable hand protection such a welding gloves or gauntlets of a suitable standard. Co-worker should also wear suitable hand protection against hot metal, sparks and spatter.

### Eye Protection

Welders should wear a welding helmet fitted with the appropriate optical welding filter for the operation. Suitable protective welding screens and goggles should be provided, (e.g. ANSI Z87.1/AWS F2.2) and used by others working in the same area.

## SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

**Physical state:** Solid

**Colour:** Generally greyish, but other colours can be present

**Form:** Metal wire with flux coating

**Odour:** Odourless

**PH:** Not available

**Vapour pressure:** Not relevant

**Vapour Density:** Not relevant

**Boiling point / range:** Not relevant

**Melting Point:** ~1500°C

**Solubility in water:** Insoluble

**Density:** Not available

**Explosive / ignition point:** Non flammable. No fire or explosion hazard exists

## SECTION 10: STABILITY AND REACTIVITY

There is no stability or reactivity hazards from electrodes as supplied.

Hazardous decomposition products such as metal oxide fumes and gases (see Section 8) are produced during welding.





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### SECTION 11: TOXICOLOGICAL INFORMATION

Inhaling welding fumes can be dangerous to your health. Welding fumes contain various particles and gases produced by the welding process. The International Agency for Research on Cancer has classified welding fumes as possibly carcinogenic to humans.

Welding fumes may irritate the nose, throat and eyes and may aggravate pre-existing respiratory problems such as asthma, emphysema or chronic bronchitis. Exposure to excessive concentrations of welding fumes may also lead to metal fume fever, dizziness, nausea, skin irritation, or impairment of pulmonary function, and possibly neurological injury. The potential health effects from welding fumes depends on the consumable, base material, surface coatings, air contamination, welding process, ventilation, and use, if necessary, of respirators and exhaust equipment. Consult with the specific toxicity data below to assess the health risk when using any particular welding process. See also the additional information below regarding the potential health effects of specific fume components.

Unprotected skin exposed to UV and IR radiation from the welding arc may burn or redden, and UV radiation is potentially a carcinogen. UV radiation can affect the unprotected eye by producing an acute condition known as 'arc eye'.

Specific effects relevant to major particulate and gaseous fume constituents produced when welding with these electrodes include:

#### **Iron**

The chief component of fume generated by welding carbon steels is iron oxide. Iron oxide is generally considered only a nuisance material, but the fume particles can accumulate in the lungs and lead to a benign pneumoconiosis called siderosis.

#### **Manganese**

Manganese compounds are also found in welding fumes. Sustained exposure to manganese or manganese compounds above applicable limits can cause manganism, a form of irreversible brain damage. The symptoms of manganism may include tremors, slurred speech, impaired movement, spastic gait, lethargy, muscular weakness and psychological disturbances. Persons who believe they may have been overexposed to manganese compounds should consult a physician.

Chronic exposure to manganese at levels below that required to produce manganism may lead to impaired reproductive function in men. It has been reported that chronic exposure to manganese at levels below that required to produce manganism may lead to cognitive and neurobehavioral deficits. Respiratory symptoms may result from acute exposure to high concentrations or chronic low level exposure.

#### **Fluorides**

The main source of fluorides is the flux coatings on some welding electrodes, such as basic types (E7016, 7018, 7028), and this produces mainly fluoride particulate fume. Fluorides at high concentrations are respiratory tract irritants and if absorbed through chronic inhalation may damage the lungs and lead to a bone disease known as fluorosis.



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### **Silica**

Silica is found in welding fumes produced by copper alloy wires and rods, and is produced mainly as amorphous silica. Inhalation of this form of silica at high concentrations may lead to lung inflammation but has not been associated to any significant degree with lung pneumoconiosis which is associated with crystalline forms of silica.

### **Rutile Sand**

Mainly present as titanium dioxide, which is a respiratory tract irritant and classified as possibly carcinogenic to humans.

### **Nickel**

Nickel compounds are classified as human carcinogens and occupational exposure is associated with lung and nasal cancer. The other main health effect of nickel is allergic contact dermatitis (nickel 'itch'), and this can be elicited by extremely low exposures in pre-sensitised individuals. Respiratory symptoms, such as lung irritation, pneumonia and asthma, may be induced. Similar to chromium, nickel exists in the fume produced from stainless steel welding.

### **Copper**

Copper may be implicated as a cause of metal fume fever observed during welding. Metal fume fever is a delayed respiratory effect produced by inhalation of fume. Symptoms include sweating, chills, fever, muscle aches and high temperature. These acute symptoms normally alleviate within 24-48 hours.

### **Ozone and Nitrogen oxides**

These gases are formed due to interactions of the arc with the surrounding air. Ozone, nitrogen dioxide and nitric oxide can irritate the eyes, and respiratory tract including the lungs. They can also produce longer term lung effects such as decreased lung function, possibly chronic bronchitis, and (for nitrogen dioxide) emphysema. Of particular concern with these gases is that acute exposure to high levels (e.g. due to build up in confined spaces) can result in severe lung effects such as delayed pulmonary oedema. Ozone may be genotoxic and/or carcinogenic. Nitrous oxide is used as an anaesthetic, so clearly it affects the central nervous system, and it can also affect the peripheral nervous system. Nitrous and nitric oxide can have adverse effects on the blood.

### **Carbon monoxide and Carbon dioxide**

These gases are mainly formed through decomposition of some electrodes' components, or from oxidation of any carbon in the wires and rods, or from the shielding gas.

Carbon monoxide (CO) is a chemical asphyxiant that binds to blood haemoglobin, reducing the blood's oxygen-transport capacity. High exposures can cause fatigue, weakness, dizziness, loss of consciousness and, eventually, even death. At lower levels, exposure to carbon monoxide may lead to toxicity in the respiratory, cardiovascular and central nervous systems.

Carbon dioxide (CO<sub>2</sub>) is mainly a simple asphyxiant. At low levels of exposure, pulse and heart rate may increase, followed by respiratory and heart effects at higher concentrations, and ultimately unconsciousness and death.



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### SECTION 12: ECOLOGICAL INFORMATION

The welding process produces particulate fumes and gases which may cause long term adverse effects in the environment if released directly into the atmosphere. Welding fumes from electrodes covered by this data sheet can produce carbon dioxide gas, which is dangerous to the ozone layer.

Fume collected from the welding operation and extraction units should not be allowed to leach into groundwater or collect in soil.

### SECTION 13: DISPOSAL CONSIDERATIONS

Packaging, stub ends and slag residue should be disposed of as general waste or recycled. Fume collected from extraction units and from cleaning operations will contain chromium and nickel compounds which can be harmful to aquatic life. The residue should be disposed of in accordance with local regulations. Collect all spillage.

### SECTION 14: TRANSPORT INFORMATION

No special requirements are necessary in transporting these products.

### SECTION 15: REGULATORY INFORMATION

Label Information: DANGER. Do not remove or cover this label. Protect yourself and others. Read and understand this information. Electric shock can kill. Keep your head out of the fume. Arc rays and fume can affect others in your workplace. Comply with your employer's safety practices and procedures: protect others.

Hazards related to electrodes in their delivered form:

Hazards to EC 1272/2008: H351, H317

Hazards related to fume:

H302, H332, H350i, H340, H351, H317, H413.

Hazards to 1999/45/EC: R20, R22, R40, R43, R49, R53

Safety data sheets available on request from [www.linde-gas.com.bd](http://www.linde-gas.com.bd)

### SECTION 16: OTHER INFORMATION

The customer should provide this Safety Data Sheet to any person involved in the materials use or further distribution. The Linde Group requests the users (or distributors) of this product to read this Safety Data Sheet carefully before usage.

References to other relevant publications

E.g. British Standard BS EN 169:1992 'Filter Requirements for Personal Eye Protection for Arc Welding'

H phrase to EC 1272/2008;

H302: Harmful if swallowed/acute toxicity 4

H350: May cause cancer/Carc 1A



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H351: Suspected of causing cancer

H332: Harmful if inhaled

H317: May cause an allergic skin reaction

H413: May cause long lasting harmful effects to aquatic life

P phrases to EC1272/2008:

P202,P260,P264,P270,P272,P273,P280,P281,P301+P310,P302+P352,P304+P340,P308+P311,P312,  
P330,,P313, P314,P361,P363,P391,P501

The information contained in this Safety Data Sheet relates only to the specific materials designated and may not be valid for such material used in combination with any other material or in any process.

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