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Safety Data Sheet
INCONEL - MONEL

Nickel Alloys

Issue of August 2013

1. Identification of the substance and company

1.1. Product identifier

Product name: Nickel alloy

Corrosion, heat and creep resisting grades with austenitic microstructure in massive product forms: semi-finished products, plate, sheet, strip, bar, rod, wire, tube, fittings.

1.2. Relevant identified uses of the mixture and uses adviced against

The products are used e.g. in the chemical, oil and gas, aviation and nuclear industries, in demanding environments including corrosive conditions (e.g. with high chloride contents and/or strong acids) or in high temperatures including corrosive gases.

1.3. Details of the supplier of the safety information sheet

Supplier Information:
Malin Co.
5400 Smith Rd.
Brook Park, Ohio 44142
Telephone: (216) 267-9080
Fax: (216) 267-9077

1.4. Emergency information

In case of emergency, contact your local authority advisor.

2. Hazards identification

2.1. Classification of the mixture

Nickel metal is classified in EC Directive 67/548/EEC as a suspect carcinogen (category 3 – R40) and as a skin sensitiser (R43).

The classification rules of EC Directive 99/45/EC dictate that any preparations with equal to or more than 1% content of nickel must automatically be classified as suspect carcinogens (R40).

Table 1 The corresponding classification according to EC regulations EC 1272/2008 Annex VI Table 3.1 and EC Directive 67/548/EEC:

EC 1272/2008		EC Directive 67/548/EEC
Hazard class and category code	Hazard statement code	
Carc. 2	H351	Carc. Cat 3, R40
STOT RE 1	H372	T;R48/23
Skin Sens. 1	H317	R43
Resp. Sens. 1	H334	R42/43

2.2. Label elements

Since these products are alloys, labelling is not required.

2.3. Other hazards

There are normally no hazards to man or the environment from preparations in the massive form they are supplied.
However, if an individual is already sensitised to nickel, prolonged skin contact with nickel alloys may result in an allergic dermatological reaction. If prolonged skin contact is involved in the processing of this product, please contact the supplier for advice. Dust and fume may be generated during processing e.g. in welding, cutting and grinding. If airborne concentrations of dust and fume are excessive, inhalation over long periods may affect workers' health, primarily of the lungs.

3. Composition/information on ingredients

3.1 Substances

Table 2

Element	CAS number	EINECS	Concentration, wt-%	Classification (EC 1272/2008 Annex VI Table 3.1.)	EC Directive 67/548/EEC
Nickel	7440-02-0	231-111-4	38-75	Carc2; H351, STOT RE; 4H372, Skin Sens. 1; H317	Carc. Cat 3, R40 T;R48/23 R43
Cobalt	7440-48-4	231-158-0	<2	Skin Sens. 1;H317 Resp. Sens. 1;H334 Aquatic Chronic 4;H413	R42/43 R53
Copper	7440-50-8	231-159-6	<34	-	-
Chromium	7440-47-3	231-157-5	<32	-	-
Molyddenum	7439-98-7	231-107-2	<12	-	-
Manganese	7439-96-5	231-105-1	<11	-	-
Iron	7439-89-6	231-096-4	<50	-	-

Other elements may be present, such as Si, Ti. These are not classified as hazardous, or are below the concentration levels for classification of these alloys as hazardous, and are not subject to recognised occupational exposure limits.

4. First aid measures

4.1. Description of first aid measures

There are no specific first aid measures developed for nickel alloys. Medical attention should be sought in case of an excessive inhalation of dust, a physical injury to the skin or to the eyes.
Note that nickel alloy particles are magnetic. However, this effect may be weak and particles may not respond to a magnet placed over the eye.

4.2. Most important symptoms and effects both acute and delayed

No relevant information has been identified.

4.3. Indication of any immediate medical attention and special treatment needed

No relevant information has been identified.

5. Firefighting measures

5.1. Extinguishing media

Nickel alloys in massive form are not combustible.
However, care should be taken to avoid exposing fine process dust (e.g. from grinding and blasting operations) to high temperatures as it may present a potential fire hazard.

None identified.

5.3. Advice for firefighters

None identified.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Not applicable.

6.2. Environmental precautions

Not applicable

6.3. Methods and material for containment and cleaning up

Not applicable

6.4 Reference to other sections

None.

7. Handling and storage

7.1. Precautions for safe handling

There are no special technical measures involved for handling nickel alloys. Normal precautions should be taken to avoid physical injury from coiled or bundled products, possibly with sharp edges:

- Straps or bands, used to secure some products, should not be used for lifting. Coils and bundled products (e.g. sections, rods, bars etc.) may spring apart when the banding is removed and the banding itself could cause eye or other injury when tension is released.
- Certain products may, as a result of processing, be brittle or have residual stress that might cause fracture or significant deformation.
- All products are likely to have sharp edges that could cause lacerations and flying particles may be produced when shearing.
- Suitable protective clothing and equipment, such as hand and eye protection, should be worn and systems of work adopted to take account of any hazards arising from the risk of fracturing or the release of tension when breaking open banding.
- Suitable racks should be used to ensure stability when stocking narrow coils.

7.2. Conditions for safe storage, including any incompatibilities

The product is stable in storage. However, it should be kept in mind that the products may display sharp edges and a sufficiently robust place capable of carrying the significant weight of the products should be used for storage.

7.3. Specific end uses

None identified

8. Exposure controls/personal protection

8.1. Control parameters

There are no occupational exposure limits for nickel alloys. Occupational exposure limits apply to some constituent elements (Ni, Cr, Mn, Mo) and certain of their compounds. Table 3 shows limits according to current legislation in Sweden.

Table 3. Occupational Exposure Limits, NGV, (mg/m3) IN SWEDEN.

Element and compounds		TD	RD
Iron oxide, fume	as Fe		3,5
Manganese & its inorganic compounds	as Mn	0.2	0.1
Chromium	as Cr	0.5	
Copper and its compounds	as Cu	1	0.2
Nickel	as Ni	0.5	
Molybdenum & its insoluble compounds	as Mo	10	5

NGV = Nivågränsvärde (One working day exposure)
RD = Respirable Dust acc. to EN 481; TD = Total Dust.

8.2. Exposure controls

8.2.1. Appropriate engineering controls

In the processing of all metallic materials, exposure to fume and dust must be kept below any legally imposed limits.
Dust and fume may be generated in use, e.g. by cutting, grinding and welding processes, which may contain materials subject to exposure limits. To ensure these limits are not exceeded, adequate general or local ventilation or fume extraction should be provided.

8.2.2. Individual protection measures, such as personal protective equipment

In accordance with European and national health and safety regulations, it is necessary to assess the need for personal protection equipment and appropriate approved respiratory protection should be provided for those workers at risk of inhalation. Suitable hand and eye protection should be worn where

there is a risk of laceration, flying particles, welding heat radiation or contact with oils during processing.
The process of welding should only be performed by trained workers with the personal protective equipment in accordance with the laws of each member state relating to safety.

8.2.3. Environmental exposure controls

Emissions from ventilation or equipment in the work place should be controlled in order to assure that environmental legislation is fulfilled.

9. Physical and chemical properties

9.1. Information on basic physical and chemical properties

Appearance: Solid; metallic grey, ranging from dull to bright polished. Occasionally supplied with oxidised, blue/black surfaces.
Odour: Odourless
Water solubility: Insoluble
Melting: 1300°C – 1520°C
Density: 7.9 – 8.8 g/cm^3
Thermal expansion (mean value 20-100°C): 12 – 15 x 10^{-6} °C^{-1}
Thermal conductivity (RT): 10 – 22 W/m°C
Magnetic: Nickel alloys are ferro-magnetic or non-magnetic depending on the chemical composition of specific grades.

9.2. Other information

Thermal conductivity at 20oC, 10-22 W/(m K), depending on specific grade.
Not explosive.

10. Stability and reactivity

10.1. Reactivity

Nickel alloys are stable and non-reactive under normal ambient atmospheric conditions.

10.2. Chemical stability

Nickel alloys are stable and non-reactive under normal ambient atmospheric conditions.

10.3. Possibility of hazardous reactions

May react in contact with strong acids, releasing gaseous acid decomposition products, e.g. hydrogen, oxides of nitrogen.

10.4. Conditions to avoid

When heated to very high temperatures fumes may be produced (e.g. by cutting, welding or melting operations).

10.5. Incompatible materials

May react in contact with strong acids, releasing gaseous acid decomposition products, e.g. hydrogen, oxides of nitrogen.

10.6. Hazardous decomposition products

See section 10.3. and 10.5.

11. Toxicological information

11.1. Information on toxicological effects

Acute toxicity
Nickel alloys are not acute toxic.

Irritation
The exposure route of concern is inhalation. These nickel alloy products are in massive form, not capable of being inhaled.
Note: The UK Health & Safety Executive´s publication "Control of fume arising from electric arc welding of stainless steel" indicates that there is some risk of developing asthma from compounds of chromium VI and nickel in the fume from stainless steel welding. However, stainless steel welding fume did not meet the European Union classification criteria required for a substance capable of causing asthma. It is assessed that this also applies for nickel alloys.

Corrosivity
Nickel alloys are not corrosive to skin.

Sensitisation
Nickel is classified as a skin sensitiser. It causes skin sensitisation in susceptible individuals through prolonged intimate contact with the skin (e.g. wearing of jewellery). The requirements of EC regulation EC 1272/2008 Annex VI Table 3.1 are such that alloys with 1% or more of nickel must, by default, also be classified as skin sensitisers.
The uses of products that contain Ni and which come into direct and prolonged contact with the skin are limited by 2004/96/EC. Nickel-containing products in direct and prolonged contact with the skin must release no more than 0.5 mg/cm^2/week of Ni as defined in EN 1811.

Repeated dose toxicity
During mechanical working, flame cutting or welding, dust, or fumes containing complex or mixed oxides (spinels) of its constituents, may be formed. Over long periods, inhalation of excessive airborne levels may have long term health effects, primarily affecting the lungs.

Carcinogenicity
Nickel metal has been classified, see section 2, Hazards identification. The exposure route of concern is inhalation. These nickel alloy products are in massive form, not capable of being inhaled.
The requirements of EC regulation EC 1272/2008 Annex VI Table 3.1 are such that all alloys with more than 1% nickel must be classified in the same way as nickel itself, by default.
There is no direct evidence of carcinogenic effects of nickel alloys in man, nor indirect evidence from animals tested by relevant routes, i.e. inhalation or ingestion. In other studies, using non-relevant routes in animals, alloys with up to 40% nickel caused no significant increase in cancer.
Studies of workers exposed to nickel powder and dust and fumes generated in the production of nickel alloys and stainless steels have not indicated a respiratory cancer hazard.
Welding and flame cutting fumes may contain hexavalent chromium compounds. Studies have shown

that some hexavalent chromium compounds can cause cancer. However, epidemiological studies amongst welders indicate no extra increased risk of cancer when welding stainless steels, compared with the slightly increased risk when welding steels that do not contain chromium.

Mutagenicity

Nickel alloys are not classified as mutagenic.

Toxicity for reproduction

Nickel alloys are not toxic for reproduction.

12. Ecological information

12.1. Toxicity.

Not ecotoxic.

12.2. Persistance and degradability

Not relevant.

12.3. Bioaccumulative potential

None.

12.4. Mobility in soil

Not soluble in water. Immobile.

12.5. Results of PBT and vPvB assessment

Not relevant.

12.6. Other adverse effects

No known harmful effects. No special precautions are required.

13. Disposal considerations

13.1 Waste treatment methods

Surplus and scrap (waste) nickel alloys is valuable commodity and in demand for the production of prime nickel alloys and stainless steel.

Recycling routes are well-established, and recycling is therefore the preferred disposal route. Disposal to landfill is not harmful to the environment, but is a waste of resources and therefore less desirable than recycling.

14. Transport information

No special precautions required.

The product is not classified as hazardous for transport.

15. Regulatory information

15.1. Safety, health and environmental regulation/legislation specific for the mixture

Nickel alloys are classified in the same way as nickel metal, see section 2. Hazards classification, in this document. However, in recognition of their essentially non-hazardous nature, nickel alloys in the massive form are not required to be labelled as hazardous.

15.2. Chemical safety assessment

No chemical safety assessment has been published.

16. Other information

Table 4

EC 1272/2008			EC Directive 67/548/EEC	
Hazard Class and Category Code	**Hazard statement Code**	**Hazard statement in full text**	**Code**	**Full text**
Carc. 2	H351	Suspected of causing cancer	Carc. Cat 3, R40	Limited evidence of a carcinogenic effect.
STOT RE 1	H372	Causes damage to organs through prolonged or repeated exposure	T;R48/23	Toxic: danger of serious damage to health by prolonged exposure through inhalation.
Skin Sens. 1	H317	May cause an allergic skin reaction	R43	May cause sensitization by skin contact.

Food contact materials

The Council of Europe published "Guidelines on metals and alloys used as food contact materials" in April 2001 as a reference document to ensure that metallic materials used in contact with food comply with the regulation EC 1935/2004.

References to key data

Note that all of the data on the potential health effects of stainless steel, including those which might occur during manufacture and processing, which were available up to 1998 are reviewed in the reference No. 1 below.

1. H J Cross, J Beach, L S Levy, S Sadhra, T Sorahan, C McRoy:
   Manufacture, processing and use of stainless steel: A Review of the Health Effects.
   Prepared for Eurofer by the Institute of Occupational Health, University of Birmingham, 1999.
2. N Becker:
   Cancer mortality among arc welders exposed to fumes containing chromium and nickel.
   Results of a third follow-up: 1989–1995.

3. Report of the International Committee on Nickel Carcinogenesis in Man: Scand J, Work Environ Health 1990, 16; 1–82
4. International Agency for Research on Cancer.
Chromium, nickel and welding. 'IARC Monograph on the Evaluation of Carcinogenic Risks to Humans'. Lyon: IARC 1990.
5. Santonen, Stockman -Juvala, Zitting:
Review on toxicity of stainless steel, Finnish Institute of Occupational Health, ISBN 978-952-261-039-3, 2010-11-17

References to national regulations

SWEDEN

AFS 2005:17 Hygieniska gränsvärden och åtgärder mot luftföroreningar. (Hygienic limit values and measures against air pollutants)
KIFS 2005:7 Klassificering och märkning av kemiska produkter. (Classification and labelling of chemical products)
KIFS 2008:2 Kemiska produkter och biotekniska organismer. (Chemical products and biotechnical organisms)

UK

Health & Safety Executive Guidance Notes
EH26: Occupational Skin Diseases Health and Safety Precautions
EH40: Occupational Exposure Limits 2002
EH42: Monitoring Strategies for Toxic Substances
EH44: Dust in the Workplace: General Principles of Protection 1990
EH54: Assessment of Exposure to Fume from Welding and Allied Processes
EH55: The Control of Exposure to Fume from Welding, Brazing and Similar Processes.

Finland

HTP Haitallisiki tunnetut pitoisuudet 2000 (www.occuphealth.fi)

EU

The nickel alloy products according to section 1 in this SDS, conform to requirements, regulations or guidance given in:

- Reach regulation EC 1907/2006
- Classification, Labelling and Packaging regulation EC 1272/2008.
- EU Directive 67/548/EEC, Directive on Dangerous Substances
- EU Directive 2006/122/EG, i.e. the 30th amendment of the Directive 76/769/EEG of the 12th of December 2006. The directive 76/769/EEG is used for controlling the risks for human health and the environment caused by hazardous substances.
- EU Directive 2011/65/EU of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment. (RoHS).

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EN 1811: Reference test method for release of nickel from products intended to come into direct and prolonged contact with skin.

This certification requires full compliance with national and EU legislation within our area of business.

Declaration

The information given in this safety information sheet is based on the present level of our knowledge and experience. The data sheet describes the products with respect to safety requirements. The data given is not intended as a confirmation of product properties and does not constitute a legal contractual relationship, nor should it be used as the basis for ordering these products.

* Previous designation: Material safety datasheet (MSDS)

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