

General

STAINLESS STEEL - MATERIAL SAFETY DATA SHEET

In accordance with European Commission Directive 93/112/EEC "Safety data sheets" with reference to:

Directive 67/548/EEC "Dangerous substances"

Directive 88/379/EEC "Dangerous preparations"

- to be replaced by 99/45/EC on 2002-07-30

Directive 89/109/EEC "Food contact materials"

Directive 94/27/EC "Nickel jewellery"

and national regulations in Finland, Sweden and UK

1. Identification of preparation and company

Stainless: Steel

Corrosion, heat and creep resisting grades with ferritic, martensitic, duplex or austenitic microstructure in massive product

forms: semi-finished products, plate, sheet, strip, bar, rod, wire, tube, fittings. The products are marketed with manufacturer brand.

Steel's trade, names and designations according to various international and national standards such as European standard (e.g. EN 10088)

2. Composition/information on ingredients

Iron alloy with 10,5 - 30% Cr

max. 38% Ni

max. 11% Mn

max. 8% Mo

Other elements may be present, such as Si, Cu, 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 recognized occupational exposure limits.

3. Hazard classification of product

Many stainless steels contain nickel as an essential alloying element. Nickel classified in EC Directive 67/548/EEC as a suspect carcinogen (category 3 - R40) and as a skin sensitizer (R43).

The classification rules of EC Directive 88/379/EEC dictate that any preparations with equal to or more than 1% content of nickel must automatically be classified as suspect carcinogens (R40). Stainless steels do not cause nickel sensitization by prolonged skin contact in humans. Nevertheless, all stainless steel with 1% or more nickel are classified as skin sensitizers.

Description of hazards

There are no hazards of concern for man or the environment from stainless steels in the forms supplied. However, if an individual is already sensitized to nickel, prolonged skin contact with a few types of stainless steel 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. No carcinogenic effects resulting from exposure to stainless steels have been reported, either in epidemiological studies or in tests with animals.

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.

4. First aid measures

Inhalation

Not applicable to stainless steels in the massive form. Inhalation of dust and/or fume from grinding, cutting and welding operations is unlikely to generate the need for specific first aid.

Skin and eye contact

There are no special symptoms or effects associated with stainless steel. In the event of physical injury to the skin seek appropriate medical attention. In the event of physical injury to the eyes, seek immediate medical attention. Austenitic stainless steel particles are non-magnetic or only slightly magnetic and may not respond to a magnet placed over the eye. In

such cases seek hospital treatment.

Ingestion

Does not apply to stainless steel in the massive form.

5. Fire fighting measures

Stainless steels are not combustible. There are no special hazards or precautions associated with stainless steels in the vicinity of a fire.

6. Accidental release measures

Not applicable.

7. Handling and storage

There are no special technical measures involved for handling stainless steels. Normal precautions should be taken to avoid physical injury from coiled or bundled product, 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.

8. Exposure controls/personal protection

Occupational Exposure Limits (OEL)

There are no occupational exposure limits for stainless steel. Occupational exposure limits apply to some constituent elements (Ni, Cr, Mn, Mo) and certain of their compounds. Table 1 shows limits according to current legislation.

Note that the OEL for welding fume is without prejudice to any occupational exposure limits for individual components in the fume.

Table 1. Occupational Exposure Limits (mg/m³)

Element and compounds	Size	NGV
Iron oxide fume	as Fe	RD 3,5
Manganese and its inorganic compounds:	as Mn	
Manganese and compounds	as Mn	TD 0,4
Manganese, fume	as Mn	RD 0,2
Chromium, & its Cr (II) & (III) compounds	as Cr	
Chromium, total	as Cr	TD 0,5
Chromium (VI) compounds	as CrO ₄	
Chromium (VI) compounds	as Cr	TD 0,02
Nickel, metal	as Ni	
Nickel total	as Ni	TD 0,5
Nickel, compounds	as Ni	
Nickel, soluble compounds	as Ni	TD 0,1
Nickel, & its inorganic compounds: soluble	as Ni	
Nickel, & insoluble compounds	as Ni	
Molybdenum & its soluble compounds	as Mo	
Molybdenum, total	as Mo	TD 10
Molybdenum compounds soluble	as Mo	TD 5
Molybdenum compounds: insoluble	as Mo	

NGV :: Nivagransvarde (One working day exposure)

RD = Respirable Dust acc.to EN 481; TD = Total Dust.

Exposure 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.

Personal protection

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, burning or welding radiation or contact with oils during processing.

9. 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: 1370°C - 1520°C

Density: 7,7 - 8,1 g/cm³

Thermal expansion (mean value 20-100°C):

10 - 18 X 10⁻⁶°C⁻¹

Thermal conductivity (RT) 12 - 30 W/m°C

Magnetic: Austenitic stainless steels are non-magnetic in most supply conditions, but may be para-magnetic in some supply conditions (Permeability 1,005 - 1,1)

Duplex, ferritic and martensitic stainless steels are ferro-magnetic.

10. Stability and reactivity

Stainless steels are stable and non-reactive under normal ambient atmospheric conditions. May react in contact with strong acids to release gaseous acid decomposition products, e.g. hydrogen, oxides of nitrogen. When heated to very high temperatures fumes may be produced (e.g. by cutting, welding or melting operations).

11. Toxicological data

Chronic toxicity, oral or inhalation Stainless steels may contain nickel, which has been classified in EC Directive 67/548/EEC as a suspect carcinogenic substance, Category 3 (i.e. causing concern for man... but available information is not adequate (or making a satisfactory assessment))

The exposure route of concern is inhalation. These stainless steel products are in massive form, not capable of being inhaled.

The requirements of EC directive 88/379/EEC are such that all mixtures, solutions and 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 stainless steels 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.

During mechanical working, flame cutting or welding, stainless steel 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.

However, 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.

Dermatological toxicity

Nickels classified as a skin sensitizer. It causes skin sensitization in susceptible individuals through prolonged intimate contact with the skin (e.g. wearing of jewellery). The requirements of EC Directive 88/379/EEC are that all mixtures, solutions and alloys with 1% or more of nickel must, by default, also be classified as skin sensitizers.

Numerous patch tests have established that most stainless steels do not cause sensitization.

However, studies have shown that, in some individuals already sensitized to nickel, close and prolonged skin contact with the re-sulphurised free-machining types of stainless steel with 0,15 - 0,35% S (EN 1 4105, 1 4523, 1 4305, 1 4570)

may cause an allergic reaction

Other observations

Long-term experience of stainless steels in the most varied applications has demonstrated that these very resistant materials are eminently suitable where hygiene is of paramount importance (e.g. food processing and food preparation).

12. Ecological data

No known harmful effects. No special precautions are required

13. Disposal considerations

Surplus and scrap (waste) stainless steel is a valuable commodity that is reused, via well-established disposal/recycling routes, in the production of prime new stainless steel products. Recycling is therefore the preferred disposal route. Landfill is an environmentally sound but less desirable alternative.

14. Transport data

No special precautions required.

15. Regulatory references

Classification and labeling requirements

Stainless steels with a specified nickel content less than 1% are not classified "as dangerous for supply" under EC Directive 67/548/EEC. Stainless steels containing 1% or more of nickel are classified in the same way as nickel (Table 2). However, in recognition of their essentially non-hazardous nature, stainless steels in the massive form are not required to be labelled as hazardous.

Table 2 classification of nickel

CAS No.	Substance	Danger symbol	Risk phrases	Safety phrases
7440-02-0	Nickel	Xn (Harmful)	R40 limited evidence of carcinogenic effect R43 may cause sensitisation by skin contact	S22 do not breathe dust S36 wear protective clothing

Other

The use of products that contain nickel and which come into direct and prolonged contact with the skin are limited by 94/27/EC. Posts inserted into pierced ears and other parts of the body during epithelization of the wound must not contain more than 0,05% nickel. Other nickel-containing products in direct and prolonged contact with the skin must release no more than 0,5 mg/cm²/week of nickel as defined in CEN 1811.

16;. Other Information

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 provisions of Article 2.2 of Directive 89/109/EEC. The document includes a section on stainless steels.

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.

References to national regulations

SWEDEN AFS 2000 3 Hygieniska gränsvärden och åtgärder mot luftföroreningar (Hygienic limit values and measures against air pollutants)

Implemented 2001-01-01 Replacing AFS 1996 2 and six others

AFS 2000 4 Kemiska arbetsmiljörisiker. (Chemical work environment risks)

Implemented 2001-01-01. Replacing: AFS 1994 2 Dangerous substances and

AFS 1990. 14 Organic solvents

KIFS 1994 12 Klassificering och märkning av kemiska produkter (Classification and labelling of chemical products)

KIFS 1998 8 Kemiska produkter och biotekniska organismer (Chemical products and biotechnical organisms)

UK Health e.. Safety executive Guidance Notes

EH26 Occupational Skin Diseases Health and Safety Precautions

EH40. Occupational Exposure Limits 2001

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-arvot 1998

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

Declaration

The information given in this safety data 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

Disclaimer

Recommendations are for guidance only, and the suitability of a material for a specific application can be confirmed only when we know the actual service conditions. Continuous development may necessitate changes in technical data without notice