

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

- Directive 67/548/EEC "Dangerous substances"
- Directive 99/45/EC "Dangerous preparations"
- Regulation 1935/2004/EC "Food Contact Materials"
- Directive 76/769/EEC "Restrictions on marketing of dangerous substances"

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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, tube, fittings. The products are mainly used for manufacturing of consumer products or applications in process industry, transport, building and construction, power and energy, and food and beverage industry. They are marked with designations according to European standards (e.g. EN 10088).

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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.

3. Hazard classification of product

Many stainless steels contain nickel as an essential alloying element. Nickel 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). Stainless steels do not cause nickel sensitisation by prolonged skin contact in humans. Nevertheless, all stainless steels with 1% or more nickel are classified as skin sensitisers.

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 sensitised to nickel, prolonged skin contact with a few types of stainless steel may result in an allergic dermatological reaction. See section 11 for more information.

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 if 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 products, possibly with sharp edges:

- Straps or bands, used to secure some products, should not be used for lifting. Coil 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 stacking narrow coils.

**8. Exposure controls/Personal protection
Occupations exposure limits**

There are no occupational exposure limits for stainless steels. 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 in Finland, Sweden and UK.

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 kg/dm³

Thermal expansion (RT to 100°C): 10-16 x10⁻⁶ m/m°C

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

Occupational exposure limits (mg/m³) in Finland, Sweden and UK

Table 1

Substance	Finland		Sweden, NGV		UK		
	8h TWA	15 min TWA	TD	RD	Limit	8h TWA	15 min TWA
Chromium, & its Cr(II), Cr(III) compounds as Cr	0.5		0.5		OES	0.5	
Chromium (VI) compounds as CrO ₄	0.05						
Chromium (VI) compounds as Cr			0.005	0.015 *		MEL	0.05
Copper & its compounds as Cu	1		1	0.2			
Copper, fume as Cu	0.1				OES	0.2	
Iron oxide, fume as Fe	5			3.5	OES	5	10
Manganese and its inorganic compounds as Mn	0.5		0.2	0.1	MEL	0.5	
Molybdenum & its soluble compounds as Mo	5				OES	5	10
Molybdenum & its insoluble compounds as Mo			10	5	OES	10	20
Nickel, metal as Ni	1		0.5				
Nickel, compounds as Ni	0.1						
Nickel, soluble compounds as Ni			0.1		MEL	0.1	
Nickel, insoluble compounds as Ni					MEL	0.5	
Nickel, carbonyl as Ni	0.0071	0.021	0.007				
Nickel, subsulfide as Ni			0.01				

NGV= Nivågränsvärde; TWA= Time Weighted Average; RD= Respirable dust; TD= Total dust; OES= Occupational Exp. Standards; MEL= Maximum Exp. Limit; * KTV=Korttidsvärde (15 minTWA)

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 for 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 99/45 EC 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, alloy 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

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 Directive 99/45/EC are that all mixtures, solutions and alloys with 1% or more of nickel must, by default, also be classified as skin sensitisers.

Numerous patch tests have established that most stainless steels do not cause sensitisation. However, studies have shown that, in some individuals already sensitised 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 material are eminently suitable where hygiene is of paramount importance (e.g. food processing and food preparation).

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 inclusion in as a substance capable of causing asthma.

12. Ecological data

No known harmful effects. No special precautions are required.

13. Disposal considerations

Surplus and scrap (waste) stainless steel is valuable and in demand for the production of prime new 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 it is a waste of resources and therefore less desirable than recycling.

14. Transport data

No special precautions required.

15. Regulatory references

Classification and labelling 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.

Classification of nickel

Table 2

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

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Other

The use of products that contain nickel and which come into direct and prolonged contact with the skin are limited by EC Directive 94/27/EC and Directive 2004/96/EC. Posts inserted into pierced ears and other parts of the body during epithelization of the wound must not release more than 0.2 µg/cm²/week of nickel. Other nickel-containing products in direct and prolonged contact with the skin must release no more than 0.5 µg/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 2005:17 Hygieniska gränsvärden och åtgärder mot luftföroreningar. www.av.se
KIFS 2005:7 Klassificering och märkning av kemiska produkter. www.kemi.se
KIFS 1998:8 Kemiska produkter och biotekniska organismer. www.kemi.se

Finland

HTP Haitallisiksi tunnetut pitoisuudet 2005 (www.tyoturva.fi)

EU

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

UK

EH Health & Safety Executive's publications (www.hse.gov.uk)
Health & Safety Executive Information Document ID 668/29: Control of fume arising from electric arc welding of stainless steel

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.

Outokumpu is an international stainless steel company. Our vision is to be the undisputed number one in stainless, with success based on operational excellence. Customers in a wide range of industries use our metal products, technologies and services worldwide. We are dedicated to helping our customers gain competitive advantage.



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