Safe use of Stainless Steel

Consideration of health and safety issues is important when customers are processing or using stainless steel, and when scrap items are returned for re-cycling.

As stainless steel is inert and non-reactive when employed correctly, potential health and safety impacts are extremely limited. This explains why stainless steel is so widely used in medical appliances and for equipment and tools in the food processing industry. In addition to long-term experience with stainless steel in a wide variety of applications, the material has also been tested and reviewed for possible health effects

The Company only stocks and sells stainless steel grades that are standardised and proven to be safe for their recommended use. To ensure that all products sold by the company comply with the specified requirements, only suppliers whose production sites are certified in accordance with the ISO 9001 quality standard are used. In addition, the company's sales and distribution service centres are also certified in accordance with this quality standard.

Attached is a full material safety datasheet from a leading European manufacturer.

SCOPE - ROHS & WEEE

The Waste Electrical and Electronic Equipment directive, commonly referred to as WEEE. This is aimed at electrical and electronic equipment manufacturers and has two main aims:

1. Manufacturers will also have a responsibility for recycling products at the end of their life and there are targets manufacturers must meet.
2. To eliminate the use of environmentally sensitive substances from the manufacturing process of electrical and electronic equipment. To do this, the WEEE directive refers to the Restriction of Hazardous Substances (RoHS) directive.

The main objective of the R0HS directive is to eliminate the use of four metals and 2 flame retardants - For each of these substances a maximum concentration value of 0.1% by weight in electrical and electronic equipment is permissible:

- Lead
- Mercury
- Cadmium
- Hexavalent Chromium
- Polybrominated Diphenyls
- Polybrominated Diphenyl Ethers

In addition, there is an extra clause covering the exceptions which includes Lead, when used as an alloying element where the maximum concentration values are:

- 0.35% by weight in Steels (including Stainless Steel)
- 0.40% by weight in Aluminium
- 4.00% by weight in Copper alloys

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STATEMENT

Our suppliers have confirmed that we do not have a problem in supplying material that fully conforms to the RoHS directive and as a Company we can thus make the following statement:

We can confirm that the levels of:
Lead
Cadmium
Mercury
Hexavalent Chromium
Polybrominated Biphenyl (PBB)
Polybrominated Diphenyl Ether (PBDE)
are all below the maximum permissible levels stipulated in the European Directive 2002/95/EC (Restriction of Hazardous Substances), for all materials supplied by us.
The only exception to this is where a customer orders a grade of material where the British, European or International Standard covering that grade requires the level of one or more of the substances to be in excess of the RoHS Directive. In this case, the material will contain a value of each substance in line with the requirements of the standard.

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REVISION HISTORY

Datasheet Updated	13 November 2018

DISCLAIMER

This Data is indicative only and as such is not to be relied upon in place of the full specification. In particular, mechanical property requirements vary widely with temper, product and product dimensions. All information is based on our present knowledge and is given in good faith. No liability will be accepted by the Company in respect of any action taken by any third party in reliance thereon.

Please note that the 'Datasheet Update' date shown above is no guarantee of accuracy or whether the datasheet is up to date.

The information provided in this datasheet has been drawn from various recognised sources, including EN Standards, recognised industry references (printed & online) and manufacturers' data. No guarantee is given that the information is from the latest issue of those sources or about the accuracy of those sources.

Material supplied by the Company may vary significantly from this data, but will conform to all relevant and applicable standards.

As the products detailed may be used for a wide variety of purposes and as the Company has no control over their use; the Company specifically excludes all conditions or warranties expressed or implied by statute or otherwise as to dimensions, properties and/or fitness for any particular purpose, whether expressed or implied.

Advice given by the Company to any third party is given for that party's assistance only and without liability on the part of the Company. All transactions are subject to the Company's current Conditions of Sale. The extent of the Company's liabilities to any customer is clearly set out in those Conditions; a copy of which is available on request.

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Date of issue: July 2011.

1. INTRODUCTORY INFORMATION

Stainless steel products are considered as articles under Regulation (EC) 1907/2006 concerning Registration, Evaluation, Authorisation, and Restriction of Chemicals (REACH), a position adopted by all European stainless steel producers as presented in the EUROFER position paper determining the borderline between preparation and articles for steel and steel products.

In accordance with REACH and Regulation (EC) 1272/2008 on Classification, Labelling, and Packaging of substances and mixtures (CLP) only substances and preparations require a Safety Data Sheet (SDS). While articles under REACH do not require a classic SDS, REACH Article 32 requires articles to be accompanied by sufficient information to permit safe use and disposal. In order to comply with this requirement, Eurofer members have developed a Safety Information Sheet (SIS) that provides information on the safe use of the stainless steel and its potential impacts on both human health and the environment.

2. ARTICLE DATA

2.1. Article name and description

Outokumpu stainless steel products in massive product forms: semi-finished products, plate, sheet, strip, bar, rod, tube, fittings, wire rod.

Stainless steel as defined in European Standard EN 10088-2:2005 cover corrosion resisting, heat resisting, and creep resisting steels

2.2. Article supplier

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2.3. Article composition:

Iron alloy with 10.5% to 30% chromium
Max. 38% nickel
Max. 11% molybdenum
Max. 1.2% carbon

Other elements such as Manganese, Nitrogen, Niobium, Titanium, Copper and Silicon may be present. For more information on the chemical composition of standard stainless steels: see EN 10088-1:2005

2.4. Article physical and chemical properties:

- Physical state: solid
- Colour: silvergrey
- Odour: odourless
- Density: 7.7 – 8.3 g/cm3
- Melting point: 1,325 to 1,530 ºC
- Water solubility: Insoluble

Stainless steels are stable and non-reactive under normal ambient atmospheric conditions. Only when molten or during welding operations (i.e. heated to very high temperatures), fumes may be produced.

In contact with strong acids, stainless steels may release gaseous acid decomposition products (e.g. hydrogen and oxides of nitrogen) and chromium may be released in the form of chromium III.

In contact with strong oxidizers at high pH (e.g. alkaline cleaners at pH 10-14), Cr (VI) compounds may form at ambient temperatures.

None of these substances are intended to be released under normal or reasonably foreseeable conditions of use. Exposure to humans or the environment during normal or reasonably foreseeable conditions of use including disposal is negligible.

3. GENERAL INFORMATION ON THE SAFE USE OF STAINLESS STEEL PRODUCTS

All stainless steels contain a minimum of 10.5% chromium, which ensures the formation of a protective, adherent nanometric, oxide film covering the entire surface. Thus, the alloying elements in stainless steel are firmly bonded in its chemical matrix. Increasing the chromium content beyond the minimum of 10.5% confers still greater corrosion resistance. Corrosion resistance may be further improved, and a wide range of properties provided, by the addition of other chemical elements (e.g. nickel and molybdenum). Corrosion from stainless steel in aggressive media can be avoided by use of the proper grade in accordance with relevant European or international standards.

Stainless steels are generally considered non-hazardous to human health or the environment (see paragraph 3.2). Stainless steels are used in applications where safety and hygiene is of utmost importance (equipment in contact with drinking water, food contact materials, medical devices, etc).

This Safety Information Sheet (SIS) presents relevant information for downstream users in order to secure a proper use of the stainless steel articles supplied.

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4. SAFETY INFORMATION

4.1. Description of Hazards

Nickel is the only substance of major importance with regard to the hazard classification of stainless steels in the solid form. In accordance with (EC) Regulations 1272/2008 (CLP) and 790/2009 (ATP 1), nickel is classified as a carcinogen category 2, Specific Target Organ Toxicity Repeated Exposure 1 and skin sensitizer 1.

Note: The CPL Regulation has introduced changes in the classification of nickel when compared with the Dangerous Substance and Dangerous Preparations Directives, which it superseded. Table 1 below provides a direct comparison of the hazard classification of nickel provided by these items of legislation.

4.1.1. Sensitization

Tests conducted in accordance with EN 1811 determined that stainless steels release nickel at levels significantly below the criteria set for classification as a skin sensitizer. Thus, stainless steels in general are suitable for use as piercing posts (where the maximum nickel release limit is 0.2 µg/cm^2/week) and for applications involving close and prolonged contact with the skin (where the maximum nickel release limit is 0.5 µg/cm^2/week).

However, tests conducted in accordance with EN 1811 have shown that the resulphurised free-machining stainless steels (containing 0.15 – 0.30% sulphur) release nickel at levels close to, or above, the maximum nickel release limits of 0.5 µg/cm^2/week). Resulphurised free-machining stainless steels are, therefore, not recommended for use as piercing posts or for applications involving prolonged and close contact with the skin (i.e. jewellery, watch backs and watch straps, etc).

Note: Clinical studies did not reveal any risk of allergy among individuals already sensitised to nickel. Thus, frequent intermittent contact with stainless steels of all types should not pose a problem to downstream users or consumers.

4.1.2. Specific Target Organ Toxicity

In accordance with the CLP Regulation, stainless steels containing more than 10% nickel should be classified as Specific Target Organ Toxicity Repeated Exposure 1 (STOT RE1) and stainless steels containing 1 -10% nickel should be classified as STOT RE 2. Stainless steels containing less than 1% Ni are not classified.

However, a 28-day repeated inhalation study with stainless steel clearly indicates a lack of toxicity (i.e. no adverse effects were seen, even at the highest concentration of stainless steel), whereas the lowest nickel dose (0.004 mg/L) resulted in clear signs of toxicity in a 28-day nickel inhalation study.

4.1.3. Carcinogenicity

In accordance with the CLP Regulation, stainless steels containing more than 1% nickel should be classified as Carcinogen Category 2. However, no carcinogenic effects resulting from exposure to stainless steels have been reported, either in epidemiological studies or in tests with animals. In addition, IARC (International Agency for Research on Cancer) has concluded that stainless steel implants are not classifiable as to their carcinogenicity to humans. Stainless steels containing less than 1% Ni are not classified.

4.2. Specific process and exposure controls

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. Dust and fume quantity and composition depend on specific practice. Oxidized forms of the various alloying elements of stainless steel may be found in welding fumes.

Over long periods, inhalation of excessive airborne levels may have long term health effects, primarily affecting the lungs. 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. Chromium in stainless steel is in the metallic state (zero valence) and stainless steel does not contain hexavalent chromium.

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. Guidance on the welding of metals and alloys is provided on the EUROFER website (www.eurofer.org). The guidance document will provide background information on health hazards posed by welding processes and appropriate Risk Management Measures.

Table 1 – Hazard Classifications of Nickel metal (massive form)

CLP Regulation Hazard	Directives 67/548/EEC & 1999/45/EC Hazard	Comments
Carc Cat 2	Carc Cat 3 R40	No change
Skin Sens 1	R43	No change
STOT RE 1[1]	(T; R48/23)	New

[1] Stainless steels in both massive and powder form containing more than 10% nickel is classified as STOT RE 1 (T; R48/23), while stain-

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There are no specific occupational exposure limits for stainless steel. However, specific occupational exposure limits have been established for some constituent elements and compounds (Table 2).

4.3 First Aid Measures

There are no specific First Aid Measures developed for the stainless steel. Medical attention should be provided in case of an excessive inhalation of dust or a physical injury to the skin or to the eyes.

Note: 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.

4.4 Handling and Storage

There are no special measures for handling stainless steels. Normal precautions should be taken to avoid physical injuries produced mainly by sharp edges. Personal protective equipment must be used e.g. special gloves and eye protection.

Notes:
1. Stainless steels should be stored in a manner that prevents iron contamination. Avoid placing or storing stainless steel in uncoated iron or steel racks and protect from iron emissions from cutting/grinding operations.
2. 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.

4.5 Uses

Stainless steels are present in a wide variety of activities. Main uses include industrial processes, architectural and building, catering and transportation.

5. ENVIRONMENTAL INFORMATION

There are no hazards to the environment from stainless steel in the forms supplied.

Stainless steel is part of an integrated life cycle and it is a material capable of being 100% recycled. Thus, 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. While disposal to landfill is not harmful to the environment, it is a waste of resources and therefore less desirable than recycling.

Occupational exposure limits (mg/m³) in Finland, Sweden and UK Table 2

Substance		Finland		Sweden, NGV		UK	
		8h TWA	15 min TWA	TD	RD	8h TWA	15 min STEL
Chromium, & its Cr(II), Cr(III) compounds	as Cr	0.5		0.5		0.5	
Chromium (VI) compounds	as CrO_4	0.05					
Chromium (VI) compounds	as Cr			0.005	0.015 *	0.05	
Copper & its compounds	as Cu	1		1	0.2		
Copper, fume	as Cu	0.1				0.2	
Iron oxide, fume	as Fe	5			3.5	5	10
Manganese and its inorganic compounds	as Mn	0.2 **		0.2	0.1	0.5	
Molybdenum & its soluble compounds	as Mo	0.5				5	10
Molybdenum & its insoluble compounds	as Mo			10	5	10	20
Nickel, metal	as Ni	1		0.5			
Nickel, compounds	as Ni	0.1					
Nickel, soluble compounds	as Ni			0.1		0.1	
Nickel, insoluble compounds	as Ni					0.5	
Nickel, carbonyl	as Ni	0.007	0.021	0.007			
Nickel, subsulfide	as Ni			0.01			

NGV= Nivågränsvärde; TWA= Time Weighted Average; RD= Respirable dust; TD= Total dust; STEL=Short Term Exposure Limit; * KTV=Korttidsvärde (15 minTWA); ** As respirable dust

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REFERENCES

1. Regulation (EC) No 1907/2006 concerning Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)

2. Regulation (EC) No 1272/2008 on Classification, Labelling and Packaging of Substances and Mixtures (CLP)

3. Regulation (EC) No 790/2009 1st Adaptation to Technical Progress (ATP) to the CLP Regulation

4. Historic Classification Regulation – Directive 67/548/EEC Dangerous Substances,
Directive 99/45/EC Dangerous Preparations

5. REACH and the Welding of Metals and Alloys (May 2010)
http://www.eurofer.org/index.php/eng/REACH/Documents-and-useful-web-links/Welding

6. Review on toxicity of stainless steel, Finnish Institute of Occupational Health (FIOH), 2010
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7. Manufacture, processing and use of stainless steel: A review of the health effects, EUROFER, 1999
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