SAFETY INFORMATION DATASHEET* (SIS) FOR CARBON STEELS AND LOW ALLOYED STEELS

Issue of October 2012

1. Identification of substance and company

1.1. Product identifier
Product name Carbon steels and Low alloyed steels.
The steels are in the massive product forms: semi-finished products, strip, bar, rod, wire and tube. The products are marketed under Sandvik's trademarks and grade designations, such as Sandvik Finemac™, Sandvik 20C, Sanbar® 20, Sanbar® 23, Sanbar® 61 and Sanbar® 64, and when applicable, also with designations according to various international and national standards.

1.2. Relevant identified uses of the mixture and uses advised against
The products are used extensively in the most varying applications, especially where there are demands on e.g. high strength, high fatigue resistance, good wear resistance and good machinability. However, these products have limited resistance against wet corrosion and high temperature corrosion in gases. This means that these Sandvik products are used in many different industrial applications, such as in the automotive industry, in articles with small dimensions and high tolerances in electric and electronic instruments and in watches as well as components in rock drilling operations.

1.3. Details of the supplier of the safety information sheet
Manufacturer, supplier
AB Sandvik Materials Technology including any of its producing subsidiaries.
Address main office:
AB Sandvik Materials Technology
Tel. No. +46 26 26 00 00
S-811 81 SANDVIKEN
Sweden
2. Hazards identification

2.1. Classification of the mixture
Some low alloy steels contain nickel as an alloying element. Nickel is 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 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 sensitization by prolonged skin contact in humans. Nevertheless, all stainless steels with 1% or more nickel are classified as skin sensitizers.

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

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Carc. 2</td>
<td>H351</td>
<td>Carc. Cat 3, R40</td>
</tr>
<tr>
<td>STOT RE 1*</td>
<td>H372</td>
<td>T;R48/23</td>
</tr>
<tr>
<td>Skin Sens. 1</td>
<td>H317</td>
<td>R43</td>
</tr>
</tbody>
</table>

* Low alloy steels containing 1-10 % Ni are classified as STOT RE2. Low alloy steels containing less than 1 % Ni are not classified.

2.2. Label elements
Since these products are alloys, labelling is not required

2.3. Other hazards
There are no hazards of concern for man or the environment from carbon steels and low alloyed steels in the forms supplied. However, if an individual is already sensitized to nickel, prolonged skin contact with low alloyed steels containing nickel 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 these carbon steels and low alloyed 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.

3. Composition/information on ingredients

Table 2

<table>
<thead>
<tr>
<th>Element</th>
<th>CAS number</th>
<th>EINECS number</th>
<th>Concentration, wt-%</th>
<th>Classification (EC 1272/2008 Annex VI Table 3.1.)</th>
<th>EC Directive 67/548/EE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nickel</td>
<td>7440-02-0</td>
<td>231-111-4</td>
<td>&lt;4</td>
<td>Carc2; H351, STOT RE; H372, Skin Sens. 1; H317</td>
<td>Carb. Cat 3 T;R48/23 R43</td>
</tr>
<tr>
<td>Chromium</td>
<td>7440-47-3</td>
<td>231-157-5</td>
<td>&lt;4</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>7439-98-7</td>
<td>231-107-2</td>
<td>&lt;1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Manganese</td>
<td>7439-96-5</td>
<td>231-105-1</td>
<td>&lt;2</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Iron</td>
<td>7439-89-6</td>
<td>231-096-4</td>
<td>balance</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

4. First aid measures

4.1. Description of first aid measures
There are no specific first aid measures developed for carbon steels and low alloyed steels. Medical attention should be sought in case of an excessive inhalation of dust, a physical injury to the skin or to the eyes.

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
Carbon steels and low alloyed steels 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.

5.2. Special hazards arising from the mixture
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 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. 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 carbon steels and low alloyed steels. 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.

<table>
<thead>
<tr>
<th>Element and compounds</th>
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</thead>
<tbody>
<tr>
<td>Iron oxide, fume</td>
<td>as Fe</td>
</tr>
<tr>
<td>Manganese &amp; its inorganic compounds</td>
<td>as Mn</td>
</tr>
<tr>
<td>Chromium</td>
<td>as Cr</td>
</tr>
<tr>
<td>Copper and its compounds</td>
<td>as Cu</td>
</tr>
<tr>
<td>Nickel</td>
<td>as Ni</td>
</tr>
<tr>
<td>Molybdenum &amp; its insoluble compounds</td>
<td>as Mo</td>
</tr>
</tbody>
</table>

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<th>TD</th>
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<tbody>
<tr>
<td>0.2</td>
</tr>
<tr>
<td>0.5</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>0.5</td>
</tr>
<tr>
<td>10</td>
</tr>
</tbody>
</table>

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 oxidized, blue/black surfaces.
Odour: Odorless
Water solubility: Insoluble
Melting: 1300°C – 1520°C
Density: 7.6 – 8.0 g/cm³
Thermal expansion (mean value 20-100°C): 11 – 13 x 10⁻⁶ °C⁻¹
Thermal conductivity (RT): 30 – 75 W/m°C
Magnetic: Carbon steels and low alloyed steels are steels are ferromagnetic.

9.2. Other information
Thermal conductivity at 20°C, 30-75 W/(m K), depending on specific grade. Not explosive.

10. Stability and reactivity

10.1. Reactivity
Carbon steels and low alloyed steels are stable and non-reactive under normal ambient atmospheric conditions.

10.2. Chemical stability
Carbon steels and low alloyed steels are relatively stable and non-reactive under normal ambient atmospheric conditions. However, they can corrode (rust) with a rate that increases with increasing humidity and temperature. The consequences of any corrosion must be taken into account and the need for any surface treatment, e.g. painting or galvanizing, should be considered. In sufficiently corrosive environments, e.g. in the presence of chlorides or acids, alternative materials, such as stainless steels should be selected.

10.3. Possibility of hazardous reactions
May react in contact with 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 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
Carbon steels and low alloyed steels are not acute toxic.
**Irritation**
The exposure route of concern is inhalation. These steel products are in massive form and not possible to inhale.

**Corrosivity**
Carbon steels and low alloyed steels are not corrosive to skin.

**Sensitization**
Nickel is classified as a skin sensitizer. It causes skin sensitization in susceptible individuals through prolonged intimate contact with the skin (e.g. wearing of jewelry). 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 sensitizers.

The uses of products that contain Ni and which come into direct and prolonged contact with the skin are limited by 2004/96/EC. Posts inserted into pierced ears and other parts of the body during epithelization of the wound must not contain more than 0,050 % Ni. Other Ni-containing products in direct and prolonged contact with the skin must release no more than 0,5 mg/cm²/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**
Carbon steels and low alloyed steels may contain nickel, which has been classified, see section 2, Hazards identification. The exposure route of concern is inhalation. These steel 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 chromium containing steels, compared with the slightly increased risk when welding steels that do not contain chromium.

\textit{Mutagenicity}
Carbon steels and low alloyed steels are not classified as mutagenic.

\textit{Toxicity for reproduction}
Carbon steels and low alloyed steels are not toxic for reproduction.

\textbf{12. Ecological information}
12.1. Toxicity.
Not ecotoxic.

12.2. Persistence 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) carbon steels and low alloyed steels are valuable commodity and in demand for the production of prime stainless steel.

Recycling routes are well-established, and recycling is therefore the preferred disposal route. Disposal to landfill 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
Steels containing 1% or more of nickel are classified in the same way as nickel, see section 2. Hazards classification, in this document. However, in recognition of their essentially non-hazardous nature, these steels 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>
<thead>
<tr>
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<tbody>
<tr>
<td>Hazard Class and Category Code</td>
<td>Hazard statement Code</td>
</tr>
<tr>
<td>Carc. 2</td>
<td>H351</td>
</tr>
<tr>
<td>STOT RE 1*</td>
<td>H372</td>
</tr>
</tbody>
</table>
Skin Sens. 1 H317 May cause an allergic skin reaction
R43 May cause sensitization by skin contact.

*Steels containing 1-10 % Ni are classified as STOT RE2. Steels containing less than 1 % Ni are not classified.

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. The document includes one sections on iron and one on stainless steel.

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.


References to national regulations
SWEDEN
AFS 2011:18 Hygieniska gränsvärden och åtgärder mot luftföroringar. (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 steel products according to section 1 in this SIS, conform to requirements, regulations or guidance given in:

- Reach regulation EC 1907/2006
- Classification, Labelling and Packaging regulation EC 1272/2008.
- 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.
- EN 1811: Reference test method for release of nickel from products intended to come into direct and prolonged contact with skin.

AB Sandvik Materials Technology is third party certified according to the Environmental Management System, ISO 14 001:2004.
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.

Trademarks
Sandvik Finemac, Sandvik and Sanbar are trademarks owned by Sandvik Intellectual Property AB.

* Previous designation: Material safety datasheet (MSDS)