Enhanced Machinability Steels

Safety Data Sheet July 2018

1. Identification of the Substance and company

1.1 Product identifier

Other names:	Free cutting steels, high machinability steels, leaded steels
Description:	Any steel grade to which small quantities of added elements are added in conjunction with sulphur to enhance the machinability of the steel.

1.2 Relevant identified uses

Used in many applications such as construction, automotive, energy/power, transport, defence and security, engineering.

1.3 Details of supplier

Company:	Liberty Speciality Steels Fox valley Way,, Stocksbridge, Sheffield, S36 2JA
Telephone:	+44 (0) 114 2882361
Normal Hours:	Commercial / Technical support
Email:	contactus@specialityuk.com

1.4 Emergency contact

Emergency:	Contact Security Department

2. Hazards Identification

2.1 Classification

Enhanced machinable steel is defined as an article under REACH. However, some of the components meet the requirements for classification as hazardous under the Classification, Labelling and Packaging of substances and mixtures (CLP) Regulations (EC 1272/2008). Please see the table in Section 3 for more information on the classification of these components. It should be noted that the different enhanced machinable steels manufactured by Liberty Steel do not contain all of the elements listed in Section 3. There is a wide range of specifications and more often than not only one, or perhaps two, of the elements are present together at any one time in a given enhanced machinable steel.

Activities such as mechanical working, such as dry grinding/sanding, or hot working, such as welding or flame cutting, may give rise to irritant dust/fumes. (From the constituents of the steel and consumables).

Certain grades of stainless steels may be referred to as 'enhanced machinable steels'. These are covered in a separate SDS.

2.2 Label elements according to CLP regulations (EC) 1272/2008 No label required, no signal word required.

2.3 Other hazards

Pre-finished steel can have sharp edges and corners, and relevant precautions should be taken when handling and storing. Under normal conditions of use and storage these materials are stable and non-toxic. Some steels may be coated with a non-hazardous oil, prolonged exposure to which may give rise to skin irritation.

3. Composition / information on ingredients

Enhanced machinable steels can be broadly defined as any plain carbon, high carbon, low alloy, high alloy or stainless steel to which extra small quantities of added elements are added to improve the machinability of the steel. The elements may included one or more of the following elements, but not necessarily together: sulphur, lead, tellurium, selenium or bismuth. Dependent upon the basic steel grade there may also be elevated levels of nickel, for example with alloy or stainless steels. The concentrations of the added elements will vary according to customer requirements. For more details reference should be made to British or other national/international standards or customer specification. There may be a protective or residual coating of oil applied to the steel product. The table below gives a basic overview of typical steels and their additives together with their classifications, where appropriate. Please note that it is likely that not all the elements will be present in a given steel grade and clarification should be given with your account contact

Table showing typical composition of enhanced machinable steels

Product area	Substance	EINECS No.	CAS No.	Range (%) by weight	Classification (CLP Regs)
Steel substrate	Iron	231-096-4	7439-89-6	Balance	Not classified
	Carbon	231-153-3	7440-44-0	0.1 – 1.1	Not classified
	Manganese	231-105-1	7439-96-5	0.2 – 2.0	Not classified
	Chromium	231-157-3	7440-47-3	0.1 – 3.4	Not classified
	Molybdenum	231-107-2	7439-98-7	0.01 – 1.0	Not classified
	Nickel (massive*)	231-111-4	7440-02-0	0.04 – 0.9	H350, H372, H317
	Copper	231-159-6	7440-50-8	0.03 – 0.3	Not classified
	Sulphur**	231-722-6	7704-34-9	0.1 - 0.5	Not classified
	Lead	231-100-4	7439-92-1	0.00 – 0.35	H360df, H372, H410
	Selenium	231-957-4	7782-49-2	0.03 – 0.05	H301, H331, H373, H413
	Tellurium	236-813-4	13494-80-9	0.002 – 0.010	H319, H332, H335
	Bismuth	231-177-4	7440-69-9	0.05 – 0.10	Not classified
* Massive form covers all sizes/forms above granular					

4. First aid measures

4.1 Description of first aid measures

Skin contact: Cuts (lacerations) to the skin from sharp steel edges should be treated as normal cuts and, if required, seek medical attention. Wash if contaminated with oil coating.

Eye contact: If particles enter the eye, wash the eye with running water for at least ten minutes. Seek medical advice if irritation persists.

Inhalation: If hot work such as welding / burning causes exposure to significant concentrations of fume, remove exposed personnel to fresh air. Seek medical attention if symptoms such as coughing persist.

Ingestion: None required.

4.2 Most important symptoms and effects

The most important symptoms and effects for eye exposure are soreness and irritation.

4.3 Indication of any immediate medical attention or treatment Immediate medical attention is required if lacerations are deep.

5. Fire fighting measures

Enhanced machinable steels are non-flammable and have a melting point of >1 000°C.

6. Accidental release measures

Enhanced machinable steels are sold in solid massive form and an accidental spill could not occur.

7. Handling and Storage

7.1 Handling

Enhanced machinable steels are sold in many forms, sheet, coils, sections, tube, pipe, plate or as semi-finished products. Care should be taken when handling, as there may be sharp edges present. Where required the use of hard wearing (protective) gloves and overalls should be used to prevent cuts and abrasions. Care should be taken when lifting heavy loads and, where necessary, use appropriate lifting equipment to do so. Coil bundles may be secured by banding straps, which may have been fitted under tension so care should be taken when removing them. Steel products should never be lifted by retaining straps or bands since these may snap and release the load during lifting.

7.2 Storage

Some products may be secured by using straps or bands, which could cause injury to eyes or other injuries when tension is released. There may be sharp edges present, which could cause lacerations. Store in an appropriate facility to prevent damage, use suitable racks or storage pallets. Lifting should always be carried out in a way that prevents injury to operators or damage to the lifting equipment.

8. Exposure controls and personal protection

8.1 Control parameters [occupational exposure limits (OELs)]

Please note these exposure limits are not always directly associated with the product but with possible exposures that may occur when performing certain operations on the steel.

OELs (GESTIS International Limit Values Institut fuer Arbeitsschutz der Deutschen Gesetzlichen Unfallversicherung (IFA) & EH40)

Country in EU with OEL for the relevant substance	**Substance**					
	Iron oxide (Fe_2O_3 & FeO) as Iron		**Nickel, water soluble compounds (as Ni)**		**Nickel, water insoluble compounds (as Ni)**	
	8-h TWA (mg/m³)	**STEL** (mg/m³)	**8-h TWA** (mg/m³)	**STEL** (mg/m³)	**8-h TWA** (mg/m³)	**STEL** (mg/m³)
Austria	5.0 (resp)	10.0 (resp)	0.1	---	0.05	0.1
Belgium	5.0	---	0.1	---	0.1	---
Denmark	3.5	7.0	0.01	0.02	0.01	0.02
France	---	---	---	---	---	---
Germany (AGS)	---	---	---	---	---	---
Germany (DFG)	---	---	---	---	---	---
Hungary	6.0 (resp)	---	0.1	0.1	0.1	0.1
Poland	5.0	10.0	---	---	---	---
Spain	5.0	---	0.1	---	0.1	---
The Netherlands	---	---	---	---	---	---
United Kingdom	5.0	---	0.1	---	0.5	---
TWA – Time-weighted average exposure measured over an 8-hour period						
STEL – Short-term exposure limit value – 15-minute duration						
Resp - Respirable fraction of dust						
Nickel DNEL (derived no-effect level) Long-term (systematic) = 0.05 mg/m³, Acute (local) = 1.6 mg/m³						

Country in EU with OEL for the relevant substance	Substance					
	Manganese and inorganic compounds (as Mn)		Cobalt and compounds (as Co)		Chromium (VI) compounds (as Cr)	
	8-h TWA (mg/m^3)	STEL (mg/m^3)	8-h TWA (mg/m^3)	STEL (mg/m^3)	8-h TWA (mg/m^3)	STEL (mg/m^3)
Austria	0.5	2.0	0.1	0.4	0.05	0.2
Belgium	0.2	---	0.02	---	0.05	---
Denmark	0.2	0.4	0.01	0.02	0.005	0.01
France	---	---	---	---	0.001	0.005
Germany (AGS)	0.5	---	---	---	---	---
Germany (DFG)	0.2	---	---	---	---	---
Hungary	5.0	20.0	0.1	0.4	---	0.05
Poland	0.3	---	---	---	---	---
Spain	0.2	---	0.02	---	0.01	---
The Netherlands	---	---	0.02	---	0.025	0.05
United Kingdom	0.5	---	0.1	---	0.05	---
TWA – Time-weighted average exposure measured over an 8-hour period						
STEL – Short-term exposure limit value – 15-minute duration						

Country in EU with OEL for the relevant substance	Substance					
	Lead and inorganic compounds (as Pb)		Selenium and compounds (as Se)		Tellurium and compounds (as Te)	
	8-h TWA (mg/m^3)	STEL (mg/m^3)	8-h TWA (mg/m^3)	STEL (mg/m^3)	8-h TWA (mg/m^3)	STEL (mg/m^3)
Austria	0.1	0.4	0.1	0.3	0.1	0.5
Belgium	0.15	---	0.2	---	0.1	---
Denmark	0.05	0.1	0.1	0.2	0.1	0.2
France	0.1	---	---	---	0.1	---
Germany (AGS)	0.15	---	0.05	0.05	---	---
Germany (DFG)	---	---	0.02	0.16	---	---
Hungary	0.15	0.60	0.1	0.4	---	---
Poland	0.05	---	0.1	0.3	0.01	0.03
Spain	0.15	---	0.1	---	0.1	---
The Netherlands	---	---	---	---	---	---
United Kingdom	0.15	---	0.1	---	0.1	---
TWA – Time-weighted average exposure measured over an 8-hour period						
STEL – Short-term exposure limit value – 15-minute duration						

8.2 Control Measures

A detailed risk assessment should be made of the need for and the design of any control measures required based upon the nature and extent of work carried out using enhanced machinable steels. The following control measures can be applied to all components of enhanced machinable steels. However, the text primarily focuses on lead as the most toxic component of enhanced machinable steels, when present.

Engineering and ventilation controls

Basic aspects of equipment and facility design should be such that occupational exposures to lead (or other components) are minimised. Such measures may include enclosure of process equipment so that sources of dust or fume emissions are prevented or minimised: such as provision of negative draught exhaust systems to extract emissions from enclosures, and/or installation of local exhaust ventilation where unavoidable sources of process emissions occur. The design characteristics of any local exhaust ventilation (e.g. extraction hoods) will be specific to the emission source to be controlled. The design of the capture hood and extraction system should ensure that the in-duct velocity of extracted air is sufficient to prevent fallout within the extraction system. Area ventilation should also be balanced such that air flow within a work area moves from areas of low to high exposure potential. Air captured by exhaust systems may require cleaning, e.g. by filtration or electrostatic precipitation, to prevent or minimise the release of toxic substances either to external air or in air recirculated to the workplace.

Organisational measures to prevent /limit releases, dispersion and exposure

Cleaning: Ensure general shop cleanliness is maintained by frequent washing/vacuuming. Clean spillages in the workplace at the end of every shift.

Personal protective equipment: Assess the need to wear respiratory protective equipment in production areas if adequate control cannot be achieved by the use of engineering controls. Consider the use of effective ori-nasal masks, for example according to EN149 : FFP3S accompanied by a wearer compliance policy (ensure wearers are clean shaven; ensure workers do not remove respiratory protective equipment (RPE) in production areas in order to communicate. Where ori-nasal masks are used, employ formal mask cleaning and filter changing strategies. For workers in areas of significant exposure, provide sufficient working clothes to enable daily changes into clean clothes. In such cases all work clothing should be cleaned by the employer on a daily basis and should not be permitted to leave the work site. Recommended minimum RPE should be worn except in cases where adequate ventilation/emission control in place. Any RPE as defined above shall only be worn if the following principles are implemented in parallel: The duration of work and hence duration of exposure should take into consideration the additional physiological stress for the worker owing to the increased breathing resistance and mass of the RPE itself, and increased thermal stress caused by enclosing the head. In addition, it should be considered that the workers' capability for using tools and of communicating are reduced during the wearing of RPE. For reasons given above, the worker should therefore be: (i) healthy (especially in view of physical/medical limitations that may affect the use of RPE); (ii) have no facial characteristics that would reduce the seal between face and mask (e.g.scars and facial hair). The recommended RPE specified above rely on a tight face seal and will not provide the required protection unless they fit the contours of the face properly and securely. Face-fit testing is recommended to form part of the RPE compliance policy Both employers and self-employed persons have legal responsibilities for the maintenance and issue of respiratory protective devices and for the management of their correct use in the workplace. Therefore, they should define and document a suitable policy for a respiratory protective device programme including training of the workers.

Personal hygiene: Ensure workers follow simple hygiene rules (e.g. do not bite nails and keep them cut short, avoid touching or scratching face with dirty hands or gloves); Ensure workers do not wipe away sweat with hands or arms, e.g. by providing disposable perspiration towels; ensure workers use disposable tissues rather than a handkerchief; prohibit drinking, eating and smoking in production areas. Prevent access to eating in non-production areas in working clothes; ensure workers as a minimum wash hands, arms, faces and mouths (but preferably shower) and change into personal clothing (or clean coveralls provided by the company) before entering eating areas. For high exposure workplaces, at the end of a shift, workers may need to pass through a room containing washhand basins for the cleaning of hands, followed by a 'dirty' room for the removal of working clothes, then through showers into a 'clean' room for changing into personal clothing. Ensure workers handle dirty working clothes with care and consider making showering obligatory at the end of a shift, with towels and soap provided. Recommend that no personal belongings are taken into production areas, and recommend that items that have been used in production areas should not be taken home.

Blood lead monitoring: Set in place a monitoring regime which covers all site activities (for women and for men); Use accredited laboratories to measure blood lead concentration. Consider benchmarking with other companies/sectors. Define a policy for submitting workers to blood lead monitoring, including increased frequency for workers undertaking high-risk jobs and workers with elevated blood lead levels. Ensure all workers have a blood test prior to working on site. The blood lead levels of workers should be monitored on a regular basis, often in reference to an "action level" that is typically 5 µg/dl of blood. Blood lead concentrations below the exposure limit are deemed to be safe, but if the action level is exceeded, appropriate measures need to be taken to control exposures, (e.g. ban overtime, provide counselling on proper work practice and hygiene, instigate an individual blood lead management plan, increase blood lead sampling frequency) in an effort to prevent further increases in blood lead. If the safe threshold (40 µg/dl for men; 10 µg/dl for women) is exceeded, continue ban on overtime, ensure strict hygiene procedures are followed, undertake detailed inspections to ensure correct use of personal protective equipment, undertake detailed inspections to ensure recommended workplace procedures are followed, move any affected employees to work in an area where exposure is expected to be lower or remove from lead environment altogether, further increase blood lead sampling frequency, and continue frequent sampling until results are below the first action level.

Creating a culture of safety: Define and communicate a clear policy for controlling occupational exposure to lead and ensure that managers set the example in terms of personal protection and hygiene. Where possible, involve occupational physicians in making workers take control of their own blood lead levels. Consider making low blood lead concentrations a condition of employment, with disciplinary action taken where protective

equipment and hygiene procedures are not followed. Involve managers when workers' blood lead levels exceed action levels. Consider publicising company blood lead performance (anonymously) to workers via notices and briefings to ensure the topic remains a key priority. Provide detailed training for new personnel on the risks of lead exposure and the procedures for protection and provide regular refresher courses for all employees on the risks of lead exposure and the procedures for protection. Provide instruction on specific lead exposure risks for workers undertaking new tasks. Involve worker representatives in all actions and initiatives.

Environmental Controls

One or more of the following measures (as set out in in the BAT Reference Document on Non-Ferrous Metal Processes) should be taken to reduce emissions to water:

- Chemical precipitation: used primarily to remove the metal ions - Sedimentation
- Filtration: used as final clarification step
- Electrolysis: for low metal concentration
- Reverse osmosis: extensively used for the removal of dissolved metals
- Ion exchange: final cleaning step in the removal of heavy metal from process wastewater

One or more of the following measures (as set out in in the BAT Reference Document on Non-Ferrous Metal Processes) should be taken to reduce emissions to air:

- Electrostatic precipitators using wide electrode spacing: Wet electrostatic precipitators: - Cyclones, but as primary collector
- Fabric or bag filters: high efficiency in controlling fine particulate (melting): achieve emission values Membrane filtration techniques can achieve
- Ceramic and metal mesh filters. PM_{10} particles are removed
- Wet scrubbers

9. Physical and chemical properties

Property	Value used
Physical State at 20°C/ 1 013 hPa	Solid
Form	Enhanced machinable steels are hard, dense silver/grey coloured metallic solids
Melting point	1 450-1 520°C at 1 013 hPa (steel)
Boiling point	Not applicable
Relative density	7.85 kg/dm^3 at 20°C
Vapour pressure	Not applicable to steels owing to their high melting point >1 000°C
Surface tension	Not applicable, steels are an inorganic solids with very low aqueous solubility
Flash point	Not applicable, steels are an inorganic solids with high melting points >1 000°C
Flammability	Non-flammable
Explosive properties	Non-explosive
Oxidising properties	No
Viscosity	Solid

10. Stability and reactivity

The product is stable under normal conditions. When heated to high temperatures (>1 000°C) it may give rise to fumes. In contact with strong acids, steels may release gaseous acid decomposition products (e.g. hydrogen, oxides of nitrogen) and metals will be dissolved in the acid. For chromium-containing steels, contact with strong oxidising agents at high pH (e.g. alkaline cleaners at pH 10-14) may result in the formation of Cr (IV) compounds at ambient temperatures.

11. Toxicological information

Under the normal applications of this product, health effects should not occur owing to the low risk of exposure to minimal hazard material. If activities mechanical activities, such as dry grinding or machining, or hot work, such as welding and burning, are carried out dust / fume will be produced which may irritate the respiratory system at high airborne concentrations. The principal route of entry into the body is via inhalation of fume/dust.

Acute toxicity
Exposure to high fume/dust concentrations in air may cause respiratory irritation and can be potentially harmful if inhaled into the body in large amounts over long time periods. This is not expected under normal conditions of use of the product. Although lead can exert toxic effects upon multiple organ systems and body functions, this toxicity manifests under conditions of sub-chronic to chronic exposure that can range from months to years in duration.

Skin corrosion / irritation
Fumes/dust released during mechanical working or hot work are not known to be irritant.

Eye damage / irritation
Fumes/dust released during mechanical working or hot work are not known to be irritant. Tellurium is known as an eye and respiratory irritant but not at the concentrations contained in tellurium-containing steels.

Respiratory / Skin sensitisation
Fumes/dust released during mechanical working or hot work may potentially cause sensitisation owing to the presence of nickel above 0.1%. Skin Sens. 1 H317: May cause an allergic skin reaction (nickel). 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 sensitiser. Thus, stainless steels in general are suitable for use as piercing posts (where the maximum nickel release limits is 0.2 µg/cm²/week) and for applications involving close and prolonged contact with the skin (where the maximum nickel release limits is 0.5 µg/cm²/week). Clinical studies did not reveal any risk of allergy among individual already sensitised to nickel. Thus, frequent intermittent contact with stainless steels of all types should not pose a problem to downstream users or consumers.

Germ cell mutagenicity No effect.

Carcinogenicity
Nickel is classified as Carc.2 suspected of causing cancer if present above 0.1%. IARC (International Agency for Research on Cancer) has concluded that stainless steel implants are not classifiable as to their carcinogenicity to humans.

Reproductive toxicity
Exposure to lead can cause damage to an unborn child and damage fertility hence its classification as Reproductive Toxic (Repr. 1A). 5. Note that from bioavailability considerations, blood lead levels capable of impacting reproductive function will be most easily achieved via exposure to lead metal powder. Exposures to metallic lead in the massive form in amounts required to produce effects at occupational exposure levels would represent highly unusual exposure scenarios. Elevated blood lead levels in lead producing and using industry sectors would also largely be the result of inorganic lead compounds present in the workplace and not metallic lead. Developmental effects associated with lower level lead exposures would similarly be more likely to be associated with lead metal powders.

Repeated dose toxicity - Inhalation
Exposure to iron oxide fume, in excessive concentrations and over long periods of time, may cause a benign condition called siderosis.
Repeated inhalation could lead to cumulative effects. This condition is not expected under normal conditions of use of these products.
Repeated exposure to dusts and or fumes containing nickel above 0.1% increases the risk of damage to the respiratory system. 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. Long-term exposure to lead can cause significant damage to the central nervous system.

12. Ecological information

There are no known harmful effects from the product to the environment. Under normal conditions of use exposure to the environment should not occur.

12.1 Toxicity
No data.

12.2 Persistence and Degradability
In general, (abiotic) degradation is an irrelevant process for inorganic substances that are assessed on an elemental basis.

For inorganic substances like lead salts on which the chemical assessment is based on the elemental concentration (i.e., pooling all inorganic speciation forms together), biotic degradation is an irrelevant process, regardless of the environmental compartment that is under consideration: biotic processes may alter the speciation form of an element, but will not eliminate the element from the aquatic compartment by degradation of transformation. This

elemental-based assessment (pooling all speciation forms together) can be considered as a worst-case assumption for the chemical assessment. Biodegradation in water is not an applicable end point for lead.

12.3 Bioaccumulative potential

From the literature overview, the following bioaccumulation/bio-concentration factors have been derived for Pb: Aquatic compartment = Bioaccumulation/bio-concentration factors in freshwater: 1 553 l/kg (wet weight) Soil compartment = Bioaccumulation/bio-concentration factors in soil: 0.39 kg/kg (dry weight).

12.4 Mobility in soil No data.

12.5 Results of PBT and vPvB assessment Enhanced Machinable Steels is not PBT or vPvB.

13. Disposal considerations

Steel products are 100% recyclable and should be recycled at the ”end of life” in all situations.

14. Transport information

Enhanced machinable steels are not classified as hazardous under CLP Regulations (EC)1272/2008 and there is no requirement for transport information. None of the sub-headings in this section is applicable for these products.

15. Regulatory information

15.1

Enhanced machinable steel specifications are covered by numerous ISO standards. All steels covered by this safety data sheet comply with the packaging and packaging waste EC Directive 94/62/EEC on heavy metal content, the Restriction of Hazardous substances directive 2002/95/EC and the End of Life Vehicle directive 2000/53/EC. The iron manufactured and used to produce this steel product has been registered under REACH along with any other component where a registration was required.

15.2

A chemical safety assessment has not been carried out as enhanced machinable steels are defined as an article under REACH and do not require an assessment, plus they are not classified as hazardous under the CLP Regulations (EC)1272/2008.

16. Other Information

Revision

This safety data sheet (SDS) has been produced/revised in line with Annex II of the REACH Regulations (2006) as guidance only, as articles do not require a SDS. Information in this safety data sheet is supplied to inform the customer and should be used where necessary.

This revision is the current version dated **July 2018** Changes: replaced the word ‘dangerous’ with ‘hazardous’ to comply with CLP

Previous Versions: May 2017 *Changes:* Re-brand to Liberty Speciality steels, reference to coated products, other Tata Steel references, minor formatting edits, Changed website link to GESTIS.
May 2015 - *Changes: deleted references to Dangerous Substances Directive to comply with June 2015 requirements CLP. Also minor edits.*

Hazard and Precautionary Statements according to CLP Regulations (EC)1272/2008):

H301. Toxic if swallowed
H317. May cause an allergic skin reaction
H319. Causes serious eye irritation
H331. Toxic if inhaled
H332. Harmful if inhaled
H335. May cause respiratory irritation
H351. Suspected of causing cancer, inhalation
H360df. May damage fertility and may damage unborn child
H372. Causes damage to organs through prolonged or repeated exposure (Target organs: Respiratory tract, CNS and Reproduction)
H373. May cause damage to organs through prolonged or repeated exposure
H410. Very toxic to aquatic life with long lasting effects
H413. May cause long lasting harmful effects to aquatic life

References

GESTIS International Limit Values Institut fur Arbeitsschutz der Deutschen Gesetzlichen Unfallversicherung (IFA) – website:

http://www.dguv.de/ifa/gestis/gestis-internationale-grenzwerte-fuer-chemische-substanzen-limit-values-for-chemical-agents/index-2.jsp

EH40 Workplace Exposure Limits, 2005 as amended (2012) – HSE UK
ECHA Website
Leaded Steel CSR and Exposure Scenario (Lead REACH Registration Dossier 2010)

Disclaimer