Safety Data Sheet

according to Regulation No. 1907/2006

Created on: **Template**
Replaces SDS: -
Version: 1

Metal Powder 316L

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Trade name: **Metal Powder 316L**
Formulation number: 4404

UFI: K46D-60JV-K00E-1SVC

1.2 Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses:

Particle size	**Identified use**
0µm - 15µm	Metal Injection Moulding (MIM), Binder Jetting (BJ)
15µm – 60µm	Powder Bed Fusion (3D-PBF), Selective Laser Melting (3D-SLM)
60µm – 500µm	Hot Isostatic Pressing (HIP), Laser Melting Deposition (LMD)

Uses advised against:
All other uses are strongly discouraged.

1.3 Details of the supplier of the safety data sheet

Supplier

Company name:	Outokumpu Nirosta GmbH
Street:	Oberschlesienstraße 16
City:	47807 Krefeld
Responsible department:	Powder Business
Email:	metalpowder@outokumpu.com

1.4 Emergency telephone number

For medical advice:

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture
Classification according to Regulation No 1272/2008.

GHS – Classification
Skin sensitation, hazard category 1
Carcinogenicity, hazard category 2
Specific target organ toxicity — repeated exposure, hazard category 1

Hazardous Statement:
H317 May cause an allergic skin reaction
H351 Suspected of causing cancer
H372 Causes damage to organs through prolonged or repeated exposure

2.2 Label elements
Signal word: **Danger**
Pictogram: **GHS07, GHS08**

Hazardous Statement:
H317 May cause an allergic skin reaction
H351 Suspected of causing cancer
H372 Causes damage to organs through prolonged or repeated exposure

Precautionary Statement:
P201 Obtain special instructions before use.
P260 Do not breathe dust/fume/gas.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P308+P313 IF exposed or concerned: Get medical advice/attention.
P362+P364 Take off contaminated clothing and wash it before reuse.
P501 Dispose of contents/container to waste disposal in accordance with local/regional/national regulations.
Hazard-determining components: Nickel

2.3 Other hazards
Formation of explosive dust/air mixture possible. The ingredients of this product do not meet the criteria for classification as PBT or vPvB.

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Silicon, sulphur and iron are known to have nanoforms. Nickel is a CMR substance, a skin sensitizer, and a REACH Annex XVII listed substance. The product has no endocrine-disrupting properties.

SECTION 3: Composition/information on ingredients

3.2 Mixture

Component	Max. amount [%]	CAS-No. EG-No. Index-No.	H-codes	Hazard Classes
Iron	62,11-68,16	7439-89-6	-	Nanoform
Chromium	16,5-18,5	7440-47-3 231-157-5	-	-
Nickel	10-13	7440-02-0 231-111-4 028-002-01-4	H317 H351 H372 H412	Skin Sens. 1 Carc. 2 STOT RE 1 Aquatic Chronic 3 Suspected Carcinogen Skin Sensitising REACH Annex XVII
Molybdenum	2,0-2,5	7439-98-7 231-107-2	-	-
Manganese	2	7439-96-5 231-105-1	-	-
Silicon	1	7440-21-3 231-130-8	-	Nanoform
Carbon	0,03	7440-44-0 231-153-3	H319 H335	Eye Irrit. 2 STOT SE 3
Phosphorus	0,045	7723-14-0 918-594-3	H228 H412	Flam. Sol. 1 Aquatic Chronic 3
Sulphur	0,015	7704-34-9 231-722-6 016-094-00-1	H315	Skin Irrit. 2 Nanoform
Nitrogen	0,1	7727-37-9 231-783-9	-	-
Titanium	0,15-0,7	7440-32-6 231-142-3	-	-

Full text of H-phrases: see Section 16.

Further information
Silicon, sulphur and iron are known to have nanoforms. Nickel is a CMR substance, a skin sensitizer and a REACH Annex XVII listed substance. The product has no endocrine-disrupting properties.

SECTION 4: First aid measures

4.1 Description of first aid measures

General notes
First aiders: Ensure self-protection. IF exposed or if affected: Seek medical advice/attention. Remove affected person from danger zone and lie them down.

After inhalation
IF INHALED: Remove the person to fresh air and ensure unobstructed breathing. Consult a doctor if symptoms occur.

After skin contact
IF ON SKIN: Wash immediately with plenty of water and mild soap. If skin irritation occurs: Seek medical advice/attention.

After eye contact
IF IN EYES: Rinse cautiously with water for several minutes. Remove any contact lenses if possible. Continue to rinse. In case of persistent symptoms consult a doctor.

After ingestion
Do NOT induce vomiting. Rinse out the mouth. Never give anything by mouth to an unconscious person. Seek medical advice/attention.

4.2 Most important symptoms and effects, both acute and delayed
Dust may irritate the eyes and the respiratory tract. It also has skin sensitizing properties.

4.3 Indication of any immediate medical attention and special treatment needed
Symptomatic treatment.

SECTION 5: Firefighting measures

5.1 Extinguishing media
The mixture itself is not flammable. Adapt fire-fighting measures to the surroundings.

Suitable extinguishing media

Metal fire extinguishing powder, dry sand, sodium chloride
Extinguishing media which must not be used for safety reasons
Water, CO2

5.2 Special hazards arising from the substance or mixture
In case of fire, formation of toxic gases, sulphur oxides and metal oxides possible.

5.3 Advice for firefighters
Adapt fire-fighting measures to the environment. Do not take any measures that involve personal risk or have not been adequately trained. If safe to do so: recover the container from the danger zone. Wear self-contained breathing apparatus (SCBA) with full face shield operating in positive pressure mode. Wear appropriate protective clothing/apparel that covers the entire body.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Wear protective gloves/protective clothing/eye protection/face protection. Remove contaminated clothing and wash before reuse. Ensure good ventilation. Avoid dust formation. Evacuate non-involved personnel from the area.

6.2 Environmental precautions
Avoid release into the environment. Do not allow to enter water or drains. In case of uncontrolled release of larger quantities of the material into the environment, inform competent authorities and initiate appropriate environmental protection measures.

6.3 Methods and material for containment and cleaning up
Contain the spillage. Collect spilled material mechanically and place in a suitable waste container.

6.4 Reference to other sections
For information on safe handling see section 7.
For information on personal protection see section 8.
For information on disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Do not eat, drink, smoke or blow your nose when handling the product. Prevent contact with skin, eyes and clothing. Observe general workplace hygiene. Wash hands with soap and water before

breaks, at the end of work and immediately after handling. Remove contaminated clothing and shoes immediately. Check gloves regularly for wear, tear and contamination and replace accordingly. Keep away from food, animal feed and drinks. Never store in containers that are used for food or beverages or can be mistaken for such. Clean work areas thoroughly on a regular basis. Wear protective gloves/protective clothing/eye protection/face protection (see section 8.2). Remove contaminated clothing and wash before reuse.

Advice on fire and explosion protection
Avoid accumulation and swirling up of dust. Collect dust mechanically (e.g. by industrial hoover).

7.2 Conditions for safe storage, including any incompatibilities

Requirements for storage rooms and containers
Store only in the original container.
Store container in a well-ventilated and dark place. Keep containers tightly closed. Store in places without fire hazard, away from spark sources, as well as ignition and heat sources. Protect from direct sunlight. Store locked away. Keep away from flammable materials. Electrical equipment in storage areas should be adapted to the risk of formation of hazardous explosive atmospheres. Keep away from food, drinks and animal feed. Observe and comply with all relevant local and national regulations on storage of containers.

Advice on combined storage
Store separately from oxidising agents.

Further information on storage conditions
Store in a dry place.

7.3 Specific end use(s)
See section 1.2.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

According to EH40/2005 Workplace exposure limits

Substance	CAS no.	Workplace exposure limit				Comments
		Long-term exposure limit (8-hr TWA reference period)		Short-term exposure limit (15-minute reference period)		The Carc, Sen and Sk notations are not exhaustive
		ppm	mg/m³	ppm	mg/m³	
Iron salts (as		-	1	-	2	

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Substance	CAS no.	Workplace exposure limit				Comments
		Long-term exposure limit (8-hr TWA reference period)		Short-term exposure limit (15-minute reference period)		The Carc, Sen and Sk notations are not exhaustive
		ppm	mg/m³	ppm	mg/m³	
Fe)						
Chromium	7440-47-3	-	0.5	-	-	
Nickel and its inorganic compounds (except nickel tetracarbonyl): water-soluble nickel comp. (as Ni) nickel and water-insoluble nickel comp. (as Ni)		- -	0.1 0.5	- -	- -	Sk, Carc (nickel oxides and sulphides) Sen (nickel sulphate)
Molybdenum compounds (as Mo) soluble comp. insoluble comp.		- -	5 10	- -	10 20	
Manganese and its inorganic compounds (as Mn) Inhalable fract. Respirable fract.		- -	0.2 0.05	- -	- -	
Silicon Inhalable dust Respirable dust	7440-21-3	- -	10 4	- -	- -	
Carbon (Graphite) Inhalable dust Respirable dust	7440-44-0	- -	10 4	- -	- -	

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Substance	CAS no.	Workplace exposure limit				Comments
		Long-term exposure limit (8-hr TWA reference period)		Short-term exposure limit (15-minute reference period)		The Carc, Sen and Sk notations are not exhaustive
		ppm	mg/m³	ppm	mg/m³	
Phosphorus, yellow	7723-14-0	-	0.1	-	0.3	

8.2 Exposure controls

Protective and hygiene measures
General precautions to be observed when handling the product. Avoid contact with eyes. Avoid contact with skin. Wash hands before breaks and at the end of work. Avoid dust formation. Technical protective measures always take precedence over all other personal protective measures. The use of mechanical equipment such as mechanical extraction methods always take precedence over manual work.

Respiratory protection
In case of dust formation: Wear respiratory protection against dust particles. Observe maximum wearing times and manufacturer's instructions for use.

Hand protection
Use gloves made of nitrile rubber, butyl rubber or PVC. The glove material must be impermeable and resistant to the substance. The choice of a suitable glove depends not only on the material but also on other quality features and varies from manufacturer to manufacturer. When selecting gloves, mechanical risks and cut hazards must also be taken into account.

Eye protection
Select safety goggles with side shield or full safety goggles. In case of high risk additionally wear face shield.

Further skin protection
Wear suitable long-sleeved protective clothing when working. Full protective suit, if necessary. Protective equipment must be selected in its design depending on the concentration and quantity of hazardous substances specific to the workplace.

Environmental exposure controls
Observe national emission regulations. Prevent product from entering drains, water courses and soil.

SECTION 9: Physical and chemical properties

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9.1 Information on basic physical and chemical properties

Appearance:	Powder
Colour	Grey
Aggregate state	Solid
Partikeleigenschaften:	No data available.
Odour:	Odourless
odour threshold:	Not applicable.
pH:	Not applicable.
Melting point/freezing point:	1300-1600 °C
Initial boiling point and boiling range:	>2800 °C
Flashpoint:	No data available.
Evaporation rate:	
Flammability (solid, gaseous):	No data available.
Upper/Lower flammability and explosion limits:	No data available.
Vapor pressure:	Not applicable.
Vapor density:	Not applicable.
density:	7.7-8.1 g/cm³
Solubility (in water):	Insoluble
Partition coefficient: n-octanol / water:	No data available.
Auto ignition temperature:	No data available.
Solid:	
Decomposition temperature:	No data available.
Viscosity:	Not applicable.

9.2 Other information

9.2.1. Information with regard to physical hazard classes

Explosive properties:	No data available.
Oxidizing properties:	No data available.
Self-heating properties:	No data available.
Bulk density:	No data available.
Ignition temperature:	No data available.
Lower explosion limit:	No data available.
Flammable solid	No data available.

9.2.2. Other safety characteristics

Mechanical sensitivity:	No data available.
Self-accelerating polymerisation temperature:	Not applicable.

Formation of explosible dust/air mixtures:	No data available.
Acid/alkaline reserve:	Not applicable.
Evaporation rate:	Not applicable.
Miscibility:	No data available.
Conductivity:	No data available.
Corrosiveness:	No data available.
Gas group:	Not applicable.
Redox potential:	No data available.
Radical formation potential:	No data available.
Photocatalytic properties:	No data available.

SECTION 10: Stability and reactivity

10.1 Reactivity
Not reactive under normal and foreseeable conditions.

10.2 Chemical stability
Stable under normal and foreseeable conditions.

10.3 Possibility of hazardous reactions
No hazardous reactions are expected under normal and foreseeable conditions.

10.4 Conditions to avoid
Ignition sources, open light.

10.5 Incompatible materials
Strong oxidising agents, acids, bases, halogens.

10.6 Hazardous decomposition products
In case of fire, formation of toxic gases, sulphur oxides and metal oxides possible.

SECTION 11: Toxicological information

11.1 Information on hazard classes as defined in Regulation No 1272/2008

Toxicological testing

Acute toxicity

Acute toxicity Oral:

Iron	LD50 oral rat Value: 30000 mg/kg
Silicon	LD50 oral rat Value: 3160 mg/kg
Manganese	LD50 oral rat Value: 9000 mg/kg
Phosphorus	LD50 oral rat Value: > 15000 mg/kg
Sulphur	LD50 oral rat Value: > 2 000 mg/kg
Chrome	LD50 oral rat Value: > 5000mg/kg

Skin corrosion / irritation
Based on available data, the classification criteria are not met.

Serious eye damage / irritation
Based on available data, the classification criteria are not met.

Sensitization of respiratory tract / skin
Nickel is skin sensitising.

Germ cell mutagenicity
Based on available data, the classification criteria are not met.

Carcinogenicity
Nickel is suspected of being carcinogenic.

Reproductive toxicity
Based on available data, the classification criteria are not met.

Specific target organ toxicity single exposure´
May irritate the eyes and respiratory tract.

Specific target organ toxicity repeated exposure
Causes damage to organs through prolonged or repeated exposure.

Aspiration risk
Based on available data, the classification criteria are not met.

11.2 Information on other hazards

11.2.1. Endocrine disrupting properties
This product does not contain substances with endocrine disruptive properties.

11.2.2. Other information
No data available.

SECTION 12: Ecological information

12.1 Toxicity

Acute toxicity fish

Phosphorus	LC50 fish (96 hours) Minimum value: 0.002 mg/l Maximum value: 0.154 mg/l Median value: 0.006 mg/l
Chrome	LC50 fish (96 hours) Minimum value: 13.9 mg/l Maximum value: 210 mg/l Median value: 40.5 mg/l
Molybdenum	LC50 fish (96 hours) Minimum value: 800 mg/l Maximum value: 1320 mg/l Median value: 1060 mg/l
Nickel	LC50 fish (96 hours) Minimum value: 0.0000475 mg/l Maximum value: 350 mg/l Median value: 40 mg/l
Titanium	LC50 fish (48 h): 10 mg/L

Acute toxicity algae

Chrome	EC50 algae (72 h) Minimum value: 0.1 mg/l Maximum value: 17.8 mg/l Median value: 8.75 mg/l
Titanium	EC50 for freshwater algae: 36.6 mg/L

Acute toxicity crustaceans

Manganese	EC50 Crustaceans (48 hours) Minimum value: 40 mg/l Maximum value: 40 mg/l Median value: 40 mg/l

Phosphorus	EC50 Crustaceans (48 hours) Minimum value: 0.03 mg/l Maximum value: 0.25 mg/l Median value: 0.14 mg/l LC50 Crustaceans (48 hours) Minimum value 0.022 mg/l Maximum value 100 mg/l Median value: 0.53 mg/l
Chrome	EC50 Crustaceans (48 hours) Minimum value 0.07 mg/l Maximum value: 0.07 mg/l Median value: 0.07 mg/l LC50 Crustaceans (48 hours) Minimum value: 1.28 mg/l Maximum value: 9.28 mg/l Median value: 8.85 mg/l
Nickel	EC50 Crustaceans (48 hours) Minimum value: 1 mg/l Maximum value: 1 mg/l Median value: 1 mg/l

12.2 Persistence and degradability
No data available.

12.3 Bioaccumulative potential
No data available.

12.4 Mobility in soil
No data available.

12.5 Results of PBT and vPvB assessment
The ingredients of the product do not meet the criteria for classification as PBT or vPvB.

12.6. Endocrine disrupting properties
The product has no endocrine-disrupting properties.

12.7 Other adverse effects
None known.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

General information
Waste disposal must be carried out in accordance with national and local regulations. Avoid release into the environment.

Contaminated packaging
Contaminated packaging must be treated in the same way as the product itself. Do not incinerate empty containers or treat them with cutting torches.

Waste code
The assignment of a waste code depends on the intended use. The concrete determination must therefore be made by the waste producer in consultation with the regional waste management company.

SECTION 14: Transport information

14.1 UN number

Non dangerous goods according to ADR requirements.

14.2 UN proper shipping name

Not applicable.

14.3 Transport hazard class(es)

Not applicable.

14.4 Packaging group

Not restricted.

14.5 Environmental hazards
None.

14.6 Special precautions for user
For information on safe handling see section 7.
For information on personal protection see section 8.
For information on disposal see section 13.

14.7 Maritime transport in bulk according to IMO instruments
Not applicable.

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

International information
European Agreement concerning the International Carriage of Dangerous Goods by Road (Accord européen relatif au transport international des marchandises Dangereuses par Route), ADR.

National legislation

UK-REACH Regulation
GB-CLP Regulation
EH40/2005 Workplace exposure limits, 2020.

REACH ANNEX XVII:

Chemical name	CAS no.
Nickel	7440-02-0

All national and local legislation and regulations must be complied with.

15.2 Chemical safety assessment
No chemical safety assessment has been carried out.

SECTION 16: Other information

Changes to the previous version
Version 1 – creation –

References to key literature and data sources
GESTIS – International limit values for chemical agents (database).
http://prevent.se (database).

Phrase meaning

Aquatic Chronic 2	Hazardous to the aquatic environment — Chronic hazard category 2
Aquatic Chronic 3	Hazardous to the aquatic environment — Chronic hazard category 3
Carc. 2	Carcinogenicity, hazard category 2
Eye Irrit. 2	Eye irritation, hazard category 2
Flam. Sol. 1	Flammable solids, hazard category 1
Skin Irrit. 2	Skin irritation, hazard category 2
Skin Sens. 1	Skin sensitation, hazard category 1

STOT RE 1	Specific target organ toxicity — repeated exposure, hazard category 1
STOT SE 3	Specific target organ toxicity — single exposure, hazard category 3

H228	Flammable solid
H315	Causes skin irritation
H317	May cause an allergic skin reaction
H319	Causes serious eye irritation
H335	May cause respiratory irritation
H351	Suspected of causing cancer
H372	Causes damage to organs through prolonged or repeated exposure
H412	Harmful to aquatic life with long lasting effects

Acronyms

ADR	Accord européen relatif au transport international des marchandises Dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
CAS	Chemical Abstracts Service
CLP	Classification, Labelling and Packaging
EC	European Communites
EWC	European Waste Catalogue
IATA	International Air Transport Association
IBC	Intermediate Bulk Container
IMDG	International Maritime Code for Dangerous Goods
IMO	International Maritime Organization
LC50	Lethal Concentration 50 %
LD50	Lethal Dose 50 %
PBT	persistent, bioaccumulative and toxic
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
UN	United Nations
vPvB	very persistent and very bioaccumulative

Further information

The information provided in this safety data sheet is intended to describe the product with regard to the required safety precautions. They are not intended to assure any particular properties and are based on our present knowledge.