SDS
SAFETY DATA SHEET

VALE

Nickel Powder 200 Series

Section 1. Identification of the Substance and Company

1.1 Product Identification:

Product Name: Nickel Powder – 200 Series
Synonyms: T-255

EC No: 231-111-4
CAS No: 7440-02-0
REACH Registration number: **see Section 15**

1.2 Uses

Identified Uses:
Formulation or re-packing; Use of nickel metal in the production of stainless, special steels and special alloys
Formulation or re-packing; Base metals and alloys; Use of nickel metal in the production of integrated steel and iron
Formulation or re-packing; Use of nickel metal in electric arc furnace carbon steel manufacturing
Formulation or re-packing; Use of nickel metal in the production of brazing alloys
Formulation or re-packing; Use of nickel metal for the production of silver-nickel contact materials
Formulation or re-packing; Use of nickel metal and nickel containing alloys for the production of steel and other alloy powders by atomisation
Use at industrial sites; Use of nickel metal containing powders in additive manufacturing (3D-printing)
Use at industrial sites; Use of nickel-containing stainless, special steels and special alloys
Use at industrial sites; Use of nickel-containing integrated steel and iron
Use at industrial sites; Use of nickel-containing carbon steel
Use at industrial sites; Use of nickel powder or nickel alloy powder in powder metallurgy
Use at industrial sites; Use of nickel-containing brazing alloys in industrial settings
Widespread use by professional workers; Use of nickel-containing consumables for welding/brazing by professionals
Use at industrial sites; Use of silver-nickel contact materials
Use at industrial sites; Use of nickel-containing steel and other alloy powders
Use at industrial sites; Use of nickel-containing alloys for sand blasting in industrial settings
Formulation or re-packing; Use of nickel metal in formulating and repackaging of surface treatment products
Use at industrial sites; Use of nickel metal in metal surface treatment (nickel electroplating and nickel electroforming technologies)
Use at industrial sites; Use of nickel metal in sputter deposition techniques
Use at industrial sites; Use of nickel metal in thin film deposition by evaporation technique
Use at industrial sites; Use of nickel metal for thermal spraying
Formulation or re-packing; Use of nickel metal powder in the formulation of micronutrient additives for biogas production
Use at industrial sites; Use of nickel metal-derived micronutrient powder in biogas production
Widespread use by professional workers; Use of nickel metal-derived micronutrient in compostable bags in biogas production

Use at industrial sites; Use of pre-reduced nickel-containing catalyst
Use at industrial sites; Intermediate use of nickel metal for the manufacture of other substances in catalyst or catalyst precursor manufacture
Use at industrial sites; Use of nickel metal in the production of abrasive tools
Use at industrial sites; Production of batteries using nickel electrodes
Use at industrial sites; Use of nickel metal in the production of nickel-containing electronics
Use at industrial sites; Intermediate use of nickel metal for the manufacture of nickel-containing inorganic pigments
Use at industrial sites; Use of nickel metal powder in the production of magnets
Use at industrial sites; Intermediate use of nickel metal for the manufacture of nickel salts
Use at industrial sites; Use of nickel containing anti-seize lubricant
Service life (worker at industrial site); Service life of nickel alloys and nickel-coated metal objects (machining and handling) in industrial settings
Service life (professional worker); Service life of nickel alloys and nickel-coated metal objects (machining and handling) in professional settings
Service life (worker at industrial site); Service life of nickel-containing electronic parts and batteries in industrial settings
Service life (professional worker); Service life of nickel-containing electronic parts and batteries in professional settings
Service life (worker at industrial site); Service life of abrasive tools containing nickel in industrial settings
Service life (professional worker); Service life of abrasive tools containing nickel in professional settings
Consumer use: Use of nickel-containing alloys for welding/brazing by consumers

Uses Advised Against:
Use of nickel-containing High Sulphur stainless steel for surgical implants (AISI grade 303 or ISO 7153-1 reference grade N)
Use of nickel and nickel compounds in tattoo inks or permanent makeup products.
Use of nickel containing food contact materials for which release into foodstuff would exceed more than 0.14mg/kg food of nickel

1.3 Company Identification

Manufactured by:

In Canada:
Vale Canada Limited
Ontario Operations
Sudbury, ON
Canada PoM 1No

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In Asia (Except India, & Pakistan):
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For Fire, Spill, or chemical emergency call CHEMTREC: +1 703 527-3887
for Europe call CHEMTREC: +(44) 870 8200418

Section 2. Hazards Identification

2.1 Classification of the Substance:

Skin Sensitization – Category 1
Carcinogenicity – Category 2
Specific Target Organ Toxicity, Repeated exposure – Category 1
Aquatic Chronic – Category 3

Hazard Pictograms:	GHS07 - Exclamation mark, GHS08 - Health Hazard
Signal Word:	Danger
Hazard Statements:	H317 - May cause an allergic skin reaction. H351 - Suspected of causing cancer by inhalation H372 - Causes damage to lungs through prolonged or repeated inhalation exposure H412 - Harmful to aquatic life with long lasting effects

Precautionary Statements: P201, P202, P260, P261, P264, P270, P272, P273, P280, P302+P352, P308+P313, P333+P313, P314, P321, P363, P405, P501

2.2: Label elements

Product identifier: Nickel
CAS #: 7440-02-0
Symbols:

GHS07 - Exclamation mark

GHS08 - Health Hazard

Signal Word: Danger

Hazard Statements:
H317 - May cause an allergic skin reaction.
H351 - Suspected of causing cancer by inhalation
H372 - Causes damage to lungs through prolonged or repeated inhalation exposure
H412 - Harmful to aquatic life with long lasting effects

Precautionary Statements:
P202 - Do not handle until all safety precautions have been read and understood
P261 - Avoid breathing dust or fume. Wear respiratory protective equipment if fine dusts are generated.
P273 – Avoid release to the environment
P280 - Wear protective gloves and protective clothing
P302+352 - If on skin: Wash with plenty of soap and water.
P501 - Dispose of contents/container in accordance to local; regional; national and international regulations

(NOTE: P-statements have been reduced)
For full text of Precautionary Statements see section 15.

Section 3. Composition

☒ **Substance** ☐ **Mixture**

Hazardous Ingredients	Typical Composition	C.A.S. Number	EINECS/EC Label No.
Nickel Metal (Ni)	>99%	7440-02-0	231-111-4

Section 4. First Aid Measures

Ingestion: No specific first aid required.

Inhalation: No specific first aid required.

Skin: Remove contaminated clothing, and wash affected areas thoroughly with water. If skin irritation or rash occurs: Get medical advice/attention. Show label if possible.

Eyes: Irrigate eyeball thoroughly with water for at least 10 minutes. If discomfort persists, seek medical attention.

Most important symptoms & affects, both acute/ delayed Skin contact: Rash
Eye contact: Redness

Indication of immediate medical attention and special treatment needed No special requirements

Section 5. Fire Fighting Measures

Suitable extinguishing media: Any, type to be selected according to materials stored in the immediate neighbourhood.

Special risks: Non-flammable. May oxidize to Nickel Oxide if exposed to high temperatures within a fire. Keep containers cool with water spray.

Special protective equipment for fire fighting: None needed. Wear protective equipment if required for other materials within the immediate vicinity.

Section 6. Accidental Release Measures

Person related precautionary measures: Avoid generation of dusty atmospheres. Do not inhale dusts. Contaminated work clothing should not be allowed out of the workplace. Use personal protective equipment as required. Wash hands, and face thoroughly after handling.

Environmental No specific measures needed.

Protection measures:

Procedures for cleaning/absorption: Pick up and replace in original container. Nickel-containing material is normally collected to recover nickel values.

Section 7. Handling and Storage

Precautions for Safe Handling: Prevent the generation of inhalable dusts e.g. by the use of suitable ventilation. Do not inhale dust. Wear appropriate nationally approved respirators if handling is likely to cause the concentration limits of airborne nickel to exceed the locally prescribed exposure limits. Wear suitable protective clothing and gloves. Contaminated work clothing should not be allowed out of the workplace

Conditions for Safe Storage: Keep in the container supplied, and keep container closed when not in use. Local regulations should be followed regarding the storage of this product.

Section 8. Exposure Controls / Personal Protection

8.1.1 Exposure Limits:

Nickel Metal (Ni) – CAS 7440-02-0		
	Exposure Limit	Year
ACGIH TLV-TWA [1]	1.5 *	2008
UK WEL [2]	0.5	2006
Japan	1	1968
Korea	1	2006
China	1	2007

* - as Ni in inhalable fraction

DNEL's

	Unit	DNEL
Dermal		
Long-term local	mgNi/cm²/day	0.035
Inhalation		
Acute local	mgNi/m³	11.9
Long-term systemic	mgNi/m³	0.05
Long-term local	mgNi/m³	0.05

8.1.2 Environmental Limits:

PNEC's

Compartment	Unit	PNEC
Freshwater	µg Ni/L	7.1
Sediment	mg Ni/kg	109
Marine water	µg Ni/L	8.6
Sediment (marine)	mg Ni/kg	109
Agricultural soil	mg Ni/kg	29.9

8.2.1 Occupational exposure controls:

Mechanical extraction ventilation may be required if user operations change it to other physical or chemical forms, whether as end products, intermediates or fugitive emissions, which are inhalable. Maintain airborne nickel levels as low as possible. Avoid repeated skin contact.

PPE

Respiratory protection: If required, use an approved respirator with particulate filters.

Eye protection: None

Hand & Skin Protection: Wear suitable protective clothing and gloves, which should be selected specifically for the working place, depending on concentration and quantity of the hazardous material (overalls and leather/rubber gloves). Wash skin thoroughly after handling and before eating, drinking or smoking. Change contaminated clothing frequently. Launder clothing and gloves as needed. Use of skin-protective barrier cream advised.

Section 9. Physical and Chemical Properties

Silver-grey odourless metal powder.

Physical state at 20°C and 101.3 kPa	solid
Melting / freezing point	1455°C
Boiling point	2730°C
Decomposition temperature	Not applicable
Relative density	8.9 g/cm^3 at 25°C
Vapour pressure	1 mm Hg at 1810°C.
Vapour density	Not applicable
Surface tension	Not applicable
Water solubility	Not applicable

pH	Not applicable
Evaporation rate	Not applicable
Partition coefficient n-octanol/water (log value)	Not applicable
Flash point	Not applicable
Flammability	Non-flammable
Explosive properties	Non-explosive
Self-ignition temperature	Very finely divided metal in the fully reduced state can smolder in the presence of oxygen or air.
Oxidising properties	Non-oxidising
Granulometry	Particle size: 2-3.5 micron
Stability in organic solvents and identity of relevant degradation products	Not applicable
Dissociation constant	Not applicable
Viscosity	Not applicable
Magnetic properties	Ferromagnetic

Section 10. Stability and Reactivity

Reactivity: Stable under normal conditions.

Chemical stability: Stable under normal conditions.

Possibility of hazardous Reactions: Stable under normal conditions.

Conditions to avoid: This product can react vigorously with acids to liberate hydrogen, which can form explosive mixtures with air. Under special conditions nickel can react with carbon monoxide in reducing atmospheres to form nickel carbonyl, $Ni(CO)_4$, a toxic gas. Metal powders when heated in reducing atmospheres may become pyrophoric.

Incompatible materials: Acids, Strong oxidising agents.

Hazardous Decomposition Product(s): Nickel carbonyl gas

Section 11. Toxicological Information [3]

Nickel

Acute Toxicity:

a) Oral: Non-toxic - LD_{50} ORAL RAT >9000 mg/kg

b) Inhalation: Not classified

c) Dermal: Not classified

Corrosivity/Irritation:

a) Respiratory Tract: None

b) Skin: See sensitization section.

c) Eyes: Mechanical irritation may be expected.

Sensitization:

a) Respiratory tract: Nickel metal induced asthma is very rare. 3 case reports are available; the data is not sufficient to conclude that nickel metal is classified as a respiratory sensitizer.

b) Skin: Nickel metal is a well-known skin sensitizer. Direct and prolonged skin contact with metallic nickel may induce nickel allergy and elicit nickel allergic skin reactions in those people already sensitized to nickel, so called nickel allergic contact dermatitis.

c) Pre-existing conditions: Individuals known to be allergic to nickel should avoid contact with nickel whenever possible to reduce the likelihood of nickel allergic contact dermatitis reactions (skin rashes). Repeated contact may result in persistent chronic palmar/hand dermatitis in a smaller number of individuals, despite efforts to reduce or avoid nickel exposure.

Chronic toxicity:

a) Oral: No information available

b) Inhalation: Animal studies (rats) show that repeated dose inhalation of micron-sized metallic nickel powder damages the lung. Chronic inflammation, lung fibrosis and accumulation of nickel particles were observed.

c) Dermal: Direct and prolonged skin contact with nickel metal may cause nickel sensitization resulting in nickel allergic contact dermatitis /skin rash.

Mutagenicity / Reproductive toxicity: Not classified

Carcinogenicity:

a) Ingestion: The U.S. National Institute for Occupational Safety and Health (NIOSH) concluded that there is no evidence that nickel metal is carcinogenic when ingested.

b) Inhalation: To date, there is no evidence that nickel metal causes cancer in humans based on epidemiology data from workers in the nickel producing and nickel consuming industries. A recent animal (rat) inhalation study showed no increased respiratory cancer risk for nickel metal powder indicating that no carcinogen classification is warranted for nickel metal The U.S. National Toxicology Program has listed metallic nickel as reasonably anticipated to be a human carcinogen.

The International Agency for Research on Cancer (IARC)(Vol 49) found there was inadequate evidence that metallic nickel is carcinogenic to humans but since there was sufficient evidence that it is carcinogenic to animals, IARC concluded that metallic nickel is possibly carcinogenic to humans (Group 2B). In 1997, the ACGIH categorized elemental nickel as: A5 "Not Suspected as a Human Carcinogen". Epidemiological studies of workers exposed to nickel powder and to dust and fume generated in the production of nickel alloys and of stainless steel have not indicated the presence of a significant respiratory cancer hazard.

Section 12. Ecological Information

Toxicity:	Aquatic Chronic 3. May cause long lasting harmful effects to aquatic lif
Persistence and Degradability:	The PBT and vPvB criteria of Annex XIII to the Regulation do not apply to inorganic substances, such as nickel metal. The methods for determining the biological degradability are not applicable to inorganic substances
Bio accumulative Potential:	Nickel does not tend to bioaccumulate or biomagnify in aquatic or terrestrial systems.
Mobility in soil:	The substance is essentially insoluble in water and therefore poorly mobile in soil.
Results of PBT and vPvB assessment:	Not classified as PBT or vPvB.
Other adverse Effects:	None anticipated.

Section 13. Disposal Considerations

Waste treatment Methods:	Recover or recycle if possible. Dispose of contents in accordance with local, state or national legislation.
Additional Information:	No information available.

Section 14. Transport Information

International Maritime Dangerous Goods Code	Not regulated.
International Civil Aviation Organization Technical Instructions for the Carriage of Dangerous Goods by Air	Not regulated.
U.S. Dept. of Transportation Regulations	UN3077 Environmentally Hazardous Substance, Solid, N.O.S. (Nickel Powder), 9 pg III RQ *Applies to nickel powders if they are less than 100 micron in particle size and if they are packaged in quantities greater than 100 pounds.*
Canadian Transportation of Dangerous Goods Act	Not regulated.
European Agreement Concerning the International Carriage of Dangerous Goods by Road	Not regulated.

MARPOL Annex V

Under the 7 Criteria contained within the MARPOL Annex V, this material is classified as:

	Harmful to the Marine Environment (HME)
X	Not Harmful to the Marine Environment (non-HME)

Section 15. Regulatory Information

Europe:

REACH Registration #'s:

01-2119438727-29-XXXX – Vale Europe Limited

01-2119438727-29-XXXX – Vale Canada Limited (H2 Compliance acting as Only Representative)

Exposure Scenarios: See Annex 1

Classification according to Part 3 of Annex VI of EU Regulation No. 1272/2008
Skin Sensitization – Category 1
Carcinogenicity – Category 2
Specific Target Organ Toxicity, Repeated exposure – Category 1
Aquatic Chronic – Category 3

Symbols:
GHS07 - Exclamation mark

GHS08 - Health Hazard

Signal Word: Danger

Hazard Statements:
H317 - May cause an allergic skin reaction
H351 – Suspected of causing cancer by inhalation
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H412 - Harmful to aquatic life with long lasting effects

Precautionary Statements:

Prevention:
P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P260 - Do not breathe dust or fume
P261 - Avoid breathing dust or fume. Wear respiratory protective equipment if fine dusts are generated.
P272 - Contaminated work clothing should not be allowed out of the workplace.
P273 - Avoid release to the environment
P280 - Wear protective gloves and protective clothing
P264 - Wash hands, and face thoroughly after handling.
P270 - Do not eat, drink or smoke when using this product.

Response:
P302+P352 - If on skin: Wash with plenty of soap and water.
P308+P313 - If exposed or concerned: Get medical advice/attention
P333+P313 - If skin irritation or rash occurs: Get medical advice/attention.
P314 - Get medical advice/attention if you feel unwell.
P321 - See Safety Data Sheet for specific treatment

P363 - Wash contaminated clothes before reuse

Storage:
P405 - store locked up

Disposal:
P501 - Dispose of contents/container in accordance to local, regional, national, and international regulations

Canada:
WHMIS 2015 Classification: Skin Sensitization – Category 1
Carcinogenicity – Category 2
Specific Target Organ Toxicity, Repeated exposure – Category 1

All components are listed on the Canadian Domestic Substances List (DSL)

United States of America:
Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200)
This product contains *NICKEL* which is subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 and of 40 CFR 372. Refer to the Hazardous Ingredients section of this MSDS for the appropriate CAS numbers and percent by weight.
All components are listed on the US Toxic Substances Control Act (TSCA) inventory

California Proposition 65: This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

Australia:
Classified as Hazardous according to ASCC criteria
All components are listed on the Australian Inventory of Chemical Substances (AICS)

P.R. Korea:
All components are listed in the Korean Toxic Substances Control Act inventory; KE-25818

Philippines:
All components are listed in the Philippine Inventory of Chemicals and Chemical Substances (PICCS)

Japan:
All components are listed in the Japanese Handbook of Existing and New Chemical Substances.

P.R. China:
All components are listed in the Inventory of Existing Substances in China (IECSC).

Section 16. Other Information

Indications of Change:

1.0 – Original document
2.0 - Updated uses and uses advised against, updated exposure scenarios and update for WHMIS 2015
2.1 – Updated exposure scenarios
2.2 – Update of identified uses and Appendix 1-Exposure Scenarios
2.3 - Updated Only Representative for Vale Canada
2.4 - Update of identified uses and Appendix 1-Exposure Scenarios, and update of H phrases
2.5 - Update of identified uses and Appendix 1-Exposure Scenarios

The following acronyms may be found in this document:

ACGIH	American Conference of Governmental Industrial Hygienists
DNEL	Derived No Effect Level
LTEL	Long Term Exposure Limit
LR	Lead Registrant
MMAD	Mass Median Aerodynamic Diameter
NIOSH	National Institute of Occupational Safety and Health
OEL	Occupational Exposure Limits
OR	Only Representative
OSHA	Occupational Safety and Health Administration
PBT	PBT: Persistent, Bioaccumulative and Toxic
PNEC	Predicted No Effect Concentration
STEL	Short Term Exposure Limit
STOT	Specific Target Organ Toxicity
TLV-TWA	Threshold Limit Value – Time Weighted Average
vPvB	very Persistent and very Bioaccumulative
WEL	Workplace Exposure Limit (UK HSE EH40)

Safety Data Sheet prepared by:

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SDS available online at http://www.vale.com/canada/en/business/mining/nickel/pages/default.aspx

Note:
Vale Canada believes that the information in this Material Safety Data Sheet is accurate. However, Vale Canada makes no express or implied warranty as to the accuracy of such information and expressly disclaims any liability resulting from reliance on such information.

1. Threshold Limit Values of the American Conference of Governmental Industrial Hygienists. 2016
2. Maximum Exposure Limit of the Health and Safety Executive in the U.K. in EH40/00.
3. Describes possible health hazards of the product supplied. If user operations change it to other chemical forms, whether as end products, intermediates or fugitive emissions, the possible health hazards of such forms must be determined by the user.

ANNEX 1 – Exposure Scenarios

Exposure Scenarios can be obtained by clicking on the following link:

http://www.vale.com/canada/EN/business/mining/product-safety-information/reach-scenarios-metals-powder/Pages/default.aspx

If you are unable to retrieve the document or have difficulties, please use the following email address for assistance: msds@vale.com

ES1 - Formulation or re-packing; Use of nickel metal in the production of stainless, special steels and special alloys
ES2 - Formulation or re-packing; Base metals and alloys; Use of nickel metal in the production of integrated steel and iron
ES3 - Formulation or re-packing; Use of nickel metal in electric arc furnace carbon steel manufacturing
ES4 - Formulation or re-packing; Use of nickel metal in the production of brazing alloys
ES5 - Formulation or re-packing; Use of nickel metal for the production of silver-nickel contact materials
ES6 - Formulation or re-packing; Use of nickel metal and nickel containing alloys for the production of steel and other alloy powders by atomisation
ES7 - Use at industrial sites; Use of nickel metal containing powders in additive manufacturing (3D-printing)
ES8 - Use at industrial sites; Use of nickel-containing stainless, special steels and special alloys
ES9 - Use at industrial sites; Use of nickel-containing integrated steel and iron
ES10 - Use at industrial sites; Use of nickel-containing carbon steel
ES11 - Use at industrial sites; Use of nickel powder or nickel alloy powder in powder metallurgy
ES12 - Use at industrial sites; Use of nickel-containing brazing alloys in industrial settings
ES13 - Widespread use by professional workers; Use of nickel-containing consumables for welding/brazing by professionals
ES14 - Use at industrial sites; Use of silver-nickel contact materials
ES15 - Use at industrial sites; Use of nickel-containing steel and other alloy powders
ES16 - Use at industrial sites; Use of nickel-containing alloys for sand blasting in industrial settings
ES17 - Formulation or re-packing; Use of nickel metal in formulating and repackaging of surface treatment products
ES18 - Use at industrial sites; Use of nickel metal in metal surface treatment (nickel electroplating and nickel electroforming technologies)
ES19 - Use at industrial sites; Use of nickel metal in sputter deposition techniques
ES20 - Use at industrial sites; Use of nickel metal in thin film deposition by evaporation technique
ES21 - Use at industrial sites; Use of nickel metal for thermal spraying
ES22 - Formulation or re-packing; Use of nickel metal powder in the formulation of micronutrient additives for biogas production
ES23 - Use at industrial sites; Use of nickel metal-derived micronutrient powder in biogas production
ES24 - Widespread use by professional workers; Use of nickel metal-derived micronutrient in compostable bags in biogas production

ES25 - Use at industrial sites; Use of pre-reduced nickel-containing catalyst
ES26 - Use at industrial sites; Intermediate use of nickel metal for the manufacture of other substances in catalyst or catalyst precursor manufacture
ES27 - Use at industrial sites; Use of nickel metal in the production of abrasive tools
ES28 - Use at industrial sites; Production of batteries using nickel electrodes
ES29 - Use at industrial sites; Use of nickel metal in the production of nickel-containing electronics
ES30 - Use at industrial sites; Intermediate use of nickel metal for the manufacture of nickel-containing inorganic pigments
ES31 - Use at industrial sites; Use of nickel metal powder in the production of magnets
ES32 - Use at industrial sites; Intermediate use of nickel metal for the manufacture of nickel salts
ES 33- Use at industrial sites; Use of nickel containing anti-seize lubricant
ES34 - Service life (worker at industrial site); Service life of nickel alloys and nickel-coated metal objects (machining and handling) in industrial settings
ES35 - Service life (professional worker); Service life of nickel alloys and nickel-coated metal objects (machining and handling) in professional settings
ES36 - Service life (worker at industrial site); Service life of nickel-containing electronic parts and batteries in industrial settings
ES37 - Service life (professional worker); Service life of nickel-containing electronic parts and batteries in professional settings
ES38 - Service life (worker at industrial site); Service life of abrasive tools containing nickel in industrial settings
ES39 - Service life (professional worker); Service life of abrasive tools containing nickel in professional settings
ES40 – Consumer use: Use of nickel-containing alloys for welding/brazing by consumers