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

1.1. Product identifier

Product Description: Solders for stainless steel.

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

Identified Use Professional use: Material for the soldering of orthodontic devices with melting range: 680-705°C.

1.3. Details of the supplier of the safety data sheet

Leone s.p.a.
I – 50019 Sesto Fiorentino – Firenze - Via P. a Quaracchi, 48/50
e-mail: research@leone.it – http://www.leone.it
Tel. +39 055.30.44.1 – Fax +39 055 374808.

1.4. Emergency telephone number

+39 055.30.44.1. An answering machine is on during closing time.
www.leone.it/emergency (EU and international telephone numbers).

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

This product is classified as dangerous in accordance with Regulation (EC) no.1272/2008 (CLP) on classification, labelling and packaging of substances and mixtures. The product thus requires a safety data sheet according to Regulation (EU) no. 2020/878, as amended.
Further information on health and / or the environment are given in Sections 11 and Sections 12 of this sheet.

Carcinogenicity, cat. 2	H351
Specific target organ toxicity (STOT) – Repeated exposure, cat. 2	H373
Skin sensitizing, cat. 1	H317

2.2. Label elements

Exempt from labelling according to Regulation (EC) no. 1272/2008 – Annex I – 1.3.4

2.3. Other hazards

Avoid inhaling the fumes that develop during brazing operations by using fume hoods and/or protective masks.
Workers must use and carefully store the individual means of protection made available to them or in any case provided by the employer and comply with the safety regulations. Before the start of welding and brazing operations, workers must in any case be aware of the safety regulations to be observed and are obliged to scrupulously observe these regulations. The workers' bodies must be protected with suitable clothing. Welding and brazing operations can present a danger of developing dangerous metal oxides and metal fumes (fine particles in the millimetre range). Avoid excessive heating of the products and/or workpieces to be brazed. Do not eat and/or drink at the workplace. According to available data, the product does not contain any PBT or vPvB substances above 0.1%. The product does not contain SVHC substances. The product does not contain endocrine disrupting substances in concentrations >=0.1%.

SECTION 3: Composition/information on ingredients

3.2. Mixtures

Ingredients	Product identifier	%W/W	Classification according to Regulation (EC) No. 1272/2008 [CLP]
Silver	EC-No.: 231-131-3 CAS-No.: 7440-22-4	49	/
Copper	EC-No.: 231-159-6 CAS-No.: 7440-50-8	16	/
Zinc	EC-No.: 231-175-3 CAS-No.: 7440-66-6	23	/
Manganese	EC-No.: 231-105-1 CAS-No.: 7439-96-5	7,50	/
Nickel	EC-No.: 231-111-4 CAS-No.: 7440-02-0	4,50	Carcinogenicity cat.2, H351 STOT RE. 1, H372 Skin Sens 1, H317

The full text of the hazard statements (H) is given in section 16 of the sheet.

SECTION 4: First aid measures

There are no known hazardous effects on human health for the product as supplied, in solid form. However, compliance with good hygiene and safety regulations is recommended.

4.1. Description of first aid measures

Inhalation Welding fumes: remove the person from the hazardous area and let them breathe fresh air. If symptoms persist, consult a doctor.

Skin contact	In case of contact with hot product: use appropriate first aid methods.
Eye contact	Not likely due to the solid form of the product. Welding fumes: rinse eyes for a few minutes with running water, holding the eyelids wide open.
Ingestion	Not likely, given the solid form of the product.

4.2. Most important symptoms and effects, both acute and delayed
Welding fumes: irritation of the nose, throat, eyes, and mucous membrane. Inhalation of excessive amounts of copper and/or zinc oxide fumes can cause metal fume fever. Symptoms are similar to those of flu and appear after a latency period of up to ten hours. Symptoms normally disappear within the next 24 hours.

4.3. Indication of any immediate medical attention and special treatment needed
Information not available.

SECTION 5: Firefighting measures
The product is not flammable.

5.1. Extinguishing media
Suitable extinguishing Media	General media: water, chemical powder, CO2, etc..
Unsuitable extinguishing Media	None.

5.2. Special hazards arising from the substance or mixture
Avoid breathing combustion products.

5.3. Advice for firefighters
General information:
Cool the product with water jets to avoid decomposition and the development of substances potentially hazardous to health. Collect extinguishing water which must not be discharged into drains. Dispose of contaminated extinguishing water and fire residue in accordance with current regulations.
Equipment:
Complete fire protection equipment.

SECTION 6: Accidental release measures
The product in its solid state presents no particular danger of accidental spillage.

6.1. Personal precautions, protective equipment, and emergency procedures
Avoid the formation of dust spraying the product with water if there are no contraindications.
Wear appropriate personal protective equipment.

6.2. Environmental precautions
Do not allow product to reach sewage system, ground water levels or any water course.

6.3. Methods and material for containment and cleaning up
Collect the material manually.
The disposal of contaminated material must be made in accordance with the provisions of Section 13.

6.4. Reference to other sections
For information on safe handling, refer to Section 7.
For information on personal protective equipment, refer to Section 8.
For information on disposal, refer to Section 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling
Handling the product as supplied, in its solid state, does not require any special precautions. However, it is recommended to handle the product after consulting all other sections of this MSDS.
Do not eat, drink, or smoke during use.
During use (brazing) avoid breathing the fumes that develop, ensuring adequate ventilation.

7.2. Conditions for safe storage, including any incompatibilities
Store in original packaging, in a dry, well-ventilated place.

7.3. Specific end use(s)
During brazing, keep the workplace well-ventilated or use appropriate mechanical air extraction methods. If necessary, wear a suitable respiratory mask.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters
Silver
Cas: 7440-22-4
Type threshold value: ACGIH-TWA.
TWA/8h: 0.1 mg/m^3

Copper
Cas: 7440-50-8
Type threshold value: ACGIH-TWA.

TWA/8h: 0.2 mg/m^3 Fume, as Cu
VME-TWA = TWA/8h: 1.0 mg/m3

Predicted no-effect concentration for environment - PNEC
Reference value in fresh water: 7.8 mg/l.
Reference value in sea water: 5.2 µg/l.
Reference value for fresh water sediments: 87 mg/kg.
Reference value for sea water sediments: 676 mg/kg.
Reference value for STP Microorganisms: 230 µg/1.
Reference value for Terrestrial compartment: 65 mg/kg.

Health- derived no effect level- DNEL

	Effects for the consumers		Effects for workers	
Exposition way	Short Systemic	Long systemic	Short Systemic	Long systemic
Oral		41 µg/kg bw/d		
Dermic	273 mg/kg bw/d	137 mg/kg bw/d	273 mg/kg bw/d	137 mg/kg bw/d

Zinc
Cas: 7440-66-6
Type threshold value: MAK-TWA(DE)
TWA/8h: 0,1 mg/m3 Breathable
MAK-STEL(DE) = STEL/15 min: 0.4 mg/m3

Manganese
Cas: 7439-96-5
Type threshold value: TLV-TWA(DK)
TWA/8h: 0.1 mg/m3 Breathable
TLV-STEL(DK) = STEL 15 min: 0.2 mg/m3
VLEP-TWA(FR)= TWA/8h: 1 mg/m3 Breathable
TLV-TWA = TWA/8h: 0.5 mg/m3 Breathable
TLV-STEL = STEL/15 min: 3 mg/m3
NGV/KGV-TWA = TWA/8h: 0.2 mg/m3 Breathable

Predicted no-effect concentration for environment - PNEC
Reference value in fresh water: 0.034 mg/1.
Reference value in sea water: 0.003 mg/l.
Reference value for fresh water sediments: 3.3 mg/kg/d.
Reference value for sea water sediments: 0.34 mg/kg/d.
Reference value for fresh water, intermittent release: 0.028 mg/1.
Reference value for STP Microorganisms: 100 mg/1.
Reference value for Terrestrial compartment: 3.4 mg/kg/d.

Health- derived no effect level- DNEL

	Effects for the consumers		Effects for workers		
Exposition way	Long Local	Long systemic	Long Local	Short Local	Long Systemic
Inhalation	0.041 mg/m3	0.041 mg/m3	0.2 mg/m3	0.2 mg/m3	0.2 mg/m^3.
Dermic					0.004 mg/kg bw/d

Nickel
Cas:7440-02-0
Type threshold value: ACGIH-TWA
TWA/8h: 1,5 mg/m^3 Inhalable
VLEP-TWA(B)= TWA/8h: 0,2 mg/m^3 Inhalable
TLV-TWA(BG)= TWA/8h: 0,05 mg/m^3
MAK-TWA(CH)= TWA/8h: 0,05 mg/m^3 Breathable
VME/VLE-TWA(CH)= TWA/8h: 0,05 mg/m^3
TLV-TWA(CZ)= TWA/8h: 0,5 mg/m^3
TLV-STEL(CZ)= STEL 15 min: 1 mg/m^3
AGW-TWA(D)= TWA/8h: 0,006 mg/m^3
AGW-STEL(D)= STEL 15 min: 0,048 mg/m^3
TLV-TWA(DK)= TWA/8h: 0,05 mg/m^3

VLA-TWA(E)= TWA/8h: 1 mg/m^3
TLV-TWA(EST)= TWA/8h: 0,5 mg/m^3
VLEP-TWA(FR)= TWA/8h: 1 mg/m^3
HTP-TWA(FIN)= TWA/8h: 1 mg/m^3
AK-TWA(H)= TWA/8h: 0,1 mg/m^3
AK-STEL(H) =STEL 15 min: 0,1 mg/m^3
GVI/KGVI-TWA(HR) = TWA/8h: 0,5 mg/m^3
OELV-TWA(IRL) = TWA/8h: 0,5 mg/m^3
RD-TWA(LT) = TWA/8h: 0,5 mg/m^3
RV-TWA(LV) = TWA/8h: 0,05 mg/m^3
TLV-TWA(N) = TWA/8h: 0,05 mg/m^3
TGG-TWA(NL) = TWA/8h: 0,1 mg/m^3
NDS/NDSCh-TWA(PL) = TWA/8h: 0,25 mg/m^3
TLV-TWA(RO)= TWA/8h: 0,1 mg/m^3
TLV-STEL(RO) =STEL 15 min: 0,5 mg/m^3
NGV/KGV-TWA(S)= TWA/8h: 0,5 mg/m^3
NPEL-TWA(SK)= TWA/8h: 0,5 mg/m^3
MW-TWA(SLO)= TWA/8h: 0,5 mg/m^{3}Inhalable
MW-STEL(SLO) =STEL 15 min: 2 mg/m^3
WEL-TWA(UK)= TWA/8h: 0,5 mg/m^3

Predicted no-effect concentration for environment - PNEC
Reference value in fresh water: 0.0071 mg/1.
Reference value in sea water: 0.0086 mg/1.
Reference value for fresh water sediments: 109 mg/kg/d.
Reference value for sea water sediments: 109 mg/kg/d.
Reference value for STP Microorganisms: 0.3 mg/1.
Reference value in food chain: 0.12 mg/kg.
Reference value for Terrestrial compartment: 29.9 mg/kg/d.

Health- derived no effect level- DNEL

	Effects for the consumers		Effects for workers		
Exposition way	Long Local	Long systemic	Long Local	Short Local	Long Systemic
Inhalation	0.06 mg/m3	0.06 mg/m3	0.05 mg/m3	11.9 mg/m3	0.05 mg/m3
Dermic	0.035 mg/cm2		0.035 mg/cm2		
Oral		0.011 mg/kg bw/d			

8.2. Exposure controls

8.2.2. Individual protection measures, such as personal protective equipment

Eye/face protection	It is advisable to wear sealed safety glasses with side protectors (ref. Standard EN 166).
Hand protection	It is advisable to protect hands with work gloves.
Respiratory protection	Ensure a well-ventilated workplace by means of mechanical air extraction and/or exhaust air systems. If these measures are not sufficient to keep the product concentration below the exposure limit values, wear a suitable respirator.
Body protection	Waterproof safety footwear and professional, long-sleeved, waterproof work clothes are recommended (ref. EN 344).
General hygiene measures	Information not available.

8.2.3. Environmental exposure controls

Information not available.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	Solid
Colour	Yellowish
Odour	Odourless
Odour threshold	Not available
pH:	Not applicable
Melting point/freezing point	>680°C
Boiling point or initial boiling point and boiling range	Not applicable
Flammability	Not applicable
Lower and upper explosion limit	Not applicable
Flash point	Not applicable

Auto-ignition temperature	Not applicable
Decomposition temperature	Not applicable
pH	Not applicable
Kinematic viscosity	Not applicable
Solubility	Not applicable
Partition coefficient n-octanol/water (log value)	Not applicable
Vapour pressure	Not applicable
Density and/or relative density	Not applicable
Relative vapour density	Not applicable
Particle characteristics	Not applicable

9.2. Other information
There is no additional information.

9.2.2. Other safety characteristics

Explosive properties	Not applicable
Oxidizing properties	Not applicable

SECTION 10: Stability and reactivity
10.1. Reactivity
There are no risks of reaction with other substances in normal conditions of use.
10.2. Chemical stability
The product is stable in normal conditions of use and storage.
10.3. Possibility of hazardous reactions
In normal conditions of use and storage are not predictable hazardous reactions.
10.4. Conditions to avoid
None.
10.5. Incompatible materials
Information not available.
10.6. Hazardous decomposition products
At high temperatures it can develop dangerous fumes.

11. SECTION 11: Toxicological information
In the absence of experimental toxicological data on the product itself any product health hazards were evaluated based on the properties of the substances contained, according to the criteria laid down by the relevant regulations for the classification. Consider, therefore, the concentrations for the individual dangerous substances listed in Section 3, to assess toxicological effects resulting from exposure to the product.
Acute effects: exposure to fumes id harmful to the health of the operator, causing rapid poisoning by exposure to metal oxides; may be harmful by dermal absorption and ingestion.
By inhalation of the product, poisoning may manifest itself, depending on the case, with different symptoms, which may include burning and irritation of the eyes, mouth, nose, and throat, coughing, difficulty breathing, dizziness, headache, nausea, and vomiting.
In severe cases, inhalation of the product may cause inflammation and oedema of the larynx and bronchi, chemical pneumonia, and pulmonary oedema, increased or decreased heart rate, excessive salivation or sputum of blood, loss of consciousness, behavioural disturbances (depression or euphoria).
Fumes from the welding process may cause irritation of the eyes and skin.
11.1. Information on hazard classes as defined in Regulation (EC) No 1272/2008
Metabolism, kinetics, mechanism of action and other information
Information not available.
Information on likely routes of exposure
The product is supplied in a solid state and is intended for use as a brazing filler material: the most likely route of exposure is inhalation during product use (melting of the brazing alloy).
Immediate, delayed, and chronic effects from short- and long-term exposure
See section 4.2.
Interactive effects
Information not available.
Acute toxicity

Substance	CAS	Method	Value	Unit of measures / notes
Ag-Cu-Zn-Mn-Ni		LD50- oral LC50- inhalation LD50-dermic	Not classified Not classified Not classified	

Silver	7440-22-4	LD50-oral LC50-inhalation LD50-dermic	>2000	Mg/kg - Rat
Copper	7440-50-8	LD50- oral LC50- inhalation LD50-dermic	>2000	Mg/kg - Rat
Zinc	7440-66-6	LD50- oral LC50- inhalation LD50-dermic		
Manganese	7439-96-5	LD50- oral LC50- inhalation LD50-dermic	>2000 >5,14	Mg/kg – Rat Mg/1/4h
Nickel	7440-02-0	LD50- oral LC50- inhalation LD50-dermic	>9000	Mg/kg - Rat

Skin corrosion / skin irritation
Does not meet the classification criteria for this hazard class.
Serious eye damage / eye irritation
Does not meet the classification criteria for this hazard class.
Respiratory or skin sensitization
Skin sensitization
Germ cell mutagenicity
Does not meet the classification criteria for this hazard class.
Carcinogenicity
Suspected of causing cancer.
Reproductive toxicity
Does not meet the classification criteria for this hazard class.
Specific Target Organ Toxicity (STOT) - Single Exposure
Does not meet the classification criteria for this hazard class.
Specific target organ toxicity (STOT) - Repeated Exposure
Causes damage to organs.
Aspiration hazard
Does not meet the classification criteria for this hazard class.

11.2. Information on other hazards

11.2.1. Endocrine disrupting properties

Based on available data, the product does not contain any substances on the main European lists of potential or suspected endocrine disrupters with effects on human health under evaluation.

SECTION 12: Ecological information

12.1. Toxicity

SUBSTANCE	CAS	METHOD	VALUE	UNIT OF MEASURES	NOTES
Silver	7440-22-4	LC10-Fish LC50- Fish EC10-Crustaceans EC50-Crustaceans EC10-Algae/Aquatic Plants EC50- Algae/Aquatic Plants NOEC-Fish NOEC- Crustaceans NOEC- Algae/Aquatic Plants			
Copper	7440-50-8	LC10- Fish LC50- Fish EC10- Crustaceans EC50- Crustaceans EC10- Algae/Aquatic Plants EC50- Algae/Aquatic Plants NOEC-Fish NOEC- Crustaceans NOEC Algae/Aquatic Plants	193	µg/1	Pimephales promelas

Zinc		LC10- Fish LC50- Fish EC10- Crustaceans EC50- Crustaceans EC10- Algae/Aquatic Plants EC50- Algae/Aquatic Plants NOEC- Fish NOEC- Crustaceans NOEC- Algae/Aquatic Plants	7,1 2,8 0,015	Mg/1/96h Mg/1/48h Mg/1/72h	Nothobranchius guentheri Daphina magna Pseudokirchneriella subcapitata
Manganese		LC10- Fish LC50- Fish EC10- Crustaceans EC50- Crustaceans EC10- Algae/Aquatic Plants EC50- Algae/Aquatic Plants NOEC- Fish NOEC- Crustaceans NOEC- Algae/Aquatic Plants	>3,6 >1,6 4,5	Mg/1/96h Mg/1/48h Mg/1/72h	Oncorhynchus mykiss Daphina magna Desmodesmus subspicatus
Nickel		LC10- Fish LC50- Fish EC10- Crustaceans EC50- Crustaceans EC10- Algae/Aquatic Plants EC50- Algae/Aquatic Plants NOEC- Fish NOEC- Crustaceans NOEC- Algae/Aquatic Plants			

12.2. Persistence and degradability
Information not available.
12.3. Bioaccumulative potential
Information not available.
12.4. Mobility in soil
Not available.
12.5. Results of PBT and vPvB assessment
According to the available data, the product does not contain any PBT or vPvB substances in percentages above 0.1%.
12.6. Endocrine disrupting properties
Based on available data, the substance is not listed in the main European lists of potential or suspected endocrine disrupters with effects on the environment under evaluation.
12.7. Other adverse effects
No other information.

SECTION 13: Disposal considerations
Dispose of in accordance with local and national regulations. In Italy dispose of according to Legislative Decree of April 3 2006 no. 152 “Regulations on environmental subject”, application of European Directives on environmental protection, and subsequent modifications and integrations including those of Decree-Law No. 153 of 17 October 2024.
13.1. Waste treatment methods
Reuse if possible.
The hazardousness of waste containing some of this product must be assessed in accordance with current legislation. Disposal must be entrusted to a company authorized to handle waste, in accordance with national and possibly local regulations.
Contaminated packaging.
Not relevant information.

SECTION 14: Transport information
The product is not to be regarded as dangerous in the sense of the regulations in force for the transport of dangerous goods by road (A.D.R.), by rail (RID), by sea (IMDG Code) and by air (IATA).
14.1. UN number or ID number
Not applicable.
14.2. UN proper shipping name
Not applicable.
14.3. Transport hazard class(es)
Not applicable.
14.4. Packing group
Not applicable.

14.5. Environmental hazards
Not applicable.
14.6. Special precautions for user
Not applicable.
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
Regulation (EC) no. 1272/2008 (Classification, labelling and packaging of substances and mixtures) and subsequent amendments, amending and repealing Directive 67/548/EEC and 1999/45/EC, and amending Regulation (EC) no. 1907/2006.
Directive 2009/161/EU (third list of indicative occupational exposure limit values in implementation of Council Directive 98/24/EC and amending Commission Directive 2000/39/EC).
This product is CE marked in accordance with the essential safety and performance requirements of Annex I of the European regulation on medical devices.

Restrictions related to the product or contained substances according to Annex XVII EC Regulation 1907/2006
Points 75 27 Nickel
15.2. Chemical safety assessment
A chemical safety assessment was not prepared for the mixture and the substances it contains.

SECTION 16: Other information
This safety data sheet has been prepared in accordance with REACH Regulation (EC) 1907/2006 as amended by Regulation (EU) 2020/878.
The safety data sheet has been written according to relevant European provisions, on the basis of information received by the supplier of the mixture.
The product is intended for orthodontic and odontological use only. The use of the product has to be restricted to skilled and licensed professionals. The information relates only to specific product designated and is not intended as a warranty of quality.
Leone disclaims any responsibility arising out of the use of the information here furnished, or of the handling, the application or the manufacture of the product here described. The final user is called to verify the application and completeness of the information herein in relationship to the specific use and reliability of the rules and local applicable dispositions.
The present information does not imply any liberty to break patent rights.

Previous safety data sheet no. R10-10E dated 16/10/2023 is to be considered obsolete. In comparison to the preceding revision, meaningful changes have not been effected but only adjustments to the European provisions which regulate the compilation of safety data sheets.
Certain subsections of some sections are omitted because, as permitted by Annex II, Part B of Regulation (EU) 2020/878, they are not applicable.
This safety data sheet is subject to revision. Visit our web site www.leone.it for an updated version of the present sheet.

Hazard statements
Text of the hazard statements (H) mentioned in sections 2 and 3 of the sheets:
H351: Suspected of causing cancer.
H372: Causes damage to organs through prolonged or repeated exposure.
H317: May cause allergic skin reaction.

Legend
ACGIH: American Conference of Governmental Industrial Hygienists.
CAS No.: numerical identifier that uniquely identifies a chemical substance, assigned by the Chemical Abstract Service.
CLP: Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008.
EC-Number: EINECS and ELINCS Number (see also EINECS and ELINCS).
EN 166: Personal eye-protection – Specifications.
LC50: Lethal Concentration 50: lethal concentration of substance for 50% of organisms of a certain population during a certain exposure period.
LD50 Lethal Dose 50: the dose required to kill half the members of a tested population after a specified test duration.
PBT: Persistent, Bioaccumulative And Toxic Substances.
STEL: Short-Term Exposure Limit.
STOT RE 1: Specific target organ toxicity — Repeated exposure, Category 1.
TLV: threshold limit value.

TWA: Time-weighted average concentration of a chemical agent in the air within the breathing zone of a worker for an 8-hour working day.
vPvB: Very Persistent And Very Bioaccumulative Substances.
SVHC: Sostanze suscettibili di avere effetti gravi sulla salute umana e sull'ambiente.
EN 344: Safety, protective and occupational footwear for professional use - Additional requirements and test methods.
EC10: Effect concentration for 10% of the sample.
EC50: 50 % effective concentration. Corresponds to the concentration of a tested substance capable of causing 50 % changes (e.g. on growth) during a specified time interval.
LC10: Lethal concentration for 10% of the sample.
IMO: International Maritime Organization.
VLEP: Occupational Exposure Limit Value for Chemicals in France.
OELV: occupational exposure limit value
MAK: Maximum concentration in the workplace.
WEL: Occupational Exposure Limit Value.
IMDG: International Maritime Dangerous Goods Code.
NOEC: Concentration with no observed (adverse) effects.
REACH: Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation (EC) No 1907/2006.
NGV/KGV: Exposure limit values
VME/VLE: Average exposure value/exposure limit value
AGW: Workplace limit value
HTP: Limit values for known hazardous substances
AK: Permissible average concentration
RD: Limit value at work
RV: Reference value
TGG: Time-weighted average
NDS/NDSCh: Maximum permissible (and short-lived) concentration
NPEL: Maximum Occupational Exposure Limits
MW: Limit value
IATA : International Air Transport Association.
RID: Regulations concerning the International Carriage of Dangerous Goods by Rail.
ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road.
GVI/ KGVI: Exposure limit values.