

SAFETY DATA SHEET

# Titanium Ti6Al4V

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

### 1.1. Product identifier

**Trade name**

Titanium Ti6Al4V

**Other names / Synonyms**

Document No. : H-5800-0923-02-B\_EN

**Product no.**

A-5771-0406

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

**Relevant identified uses of the substance or mixture**

Metal powder for additive layer manufacture

**Uses advised against**

None known.

### 1.3. Details of the supplier of the safety data sheet

**Company and address**

**Renishaw plc**

New Mills

Wotton-under-Edge,

GL12 8JR, Gloucestershire,

United Kingdom

+44 (0) 1453 524524

www.renishaw.com

**E-mail**

msds@renishaw.com

**Revision**

09/02/2023

**SDS Version**

1.0

### 1.4. Emergency telephone number

The National Poisons Information Centre (NPIC)

Public: +353 (0) 1 809 2166 (7 days a week, 8am- 10pm)

Healthcare professionals: +353 (0) 1 809 2566 (24 h service)

See also section 4 "First aid measures"

Emergency contact from supplier: +44 (0) 1453 524524 (UK office hours 08:00 to 17:00 UTC Monday to Thursday, 08:00 to 16:00 Friday)

## SECTION 2: Hazards identification

### 2.1. Classification of the substance or mixture

Flam. Sol. 1; H228, Flammable solid.

### 2.2. Label elements

**Hazard pictogram(s)**



**Signal word**

Danger

**Hazard statement(s)**

Flammable solid. (H228)

**Safety statement(s)**

General

According to EC-Regulation 1907/2006 (REACH), annex II, including changes implemented by EC-Regulation 2020/878

-  
**Prevention**

Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. (P210)

**Response**

In case of fire: Use water mist/carbon dioxide/alcohol-resistant foam to extinguish. (P370+P378)

**Storage**

-

**Disposal**

-

**Hazardous substances**

Aluminium

**Additional labelling**

Not applicable.

**2.3. Other hazards**

**Additional warnings**

Dust from flammable solids can be explosive, even if they are not hazardous substances.

May form combustible dust concentrations in air.

This mixture/product does not contain any substances considered to meet the criteria classifying them as PBT and/or vPvB.

This product does not contain any substances considered to be endocrine disruptors in accordance with the criteria set out in Commission Delegated Regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605.

**SECTION 3: Composition/information on ingredients**

**3.1. Substances**

Not applicable. This product is a mixture.

**3.2. Mixtures**

Product/substance	Identifiers	% w/w	Classification	Note
Titanium	CAS No.: 7440-32-6 EC No.: 231-142-3 REACH: 01-2119484878-14-XXXX Index No.:	80-90%		
Aluminium	CAS No.: 7429-90-5 EC No.: 231-072-3 REACH: 01-2119529243-45-XXXX Index No.:	6-6.5%	Flam. Sol. 1, H228 Water-react. 2, H261	
Vanadium	CAS No.: 7440-62-2 EC No.: 231-171-1 REACH: 01-2119537418-34-XXXX Index No.:	3.8-4.5%		

See full text of H-phrases in section 16. Occupational exposure limits are listed in section 8, if these are available.

**Other information**

-

**SECTION 4: First aid measures**

**4.1. Description of first aid measures**

**General information**

In the case of accident: Contact a doctor or casualty department – take the label or this safety data sheet.

Contact a doctor if in doubt about the injured person's condition or if the symptoms persist. Never give an unconscious person water or other drink.

**Inhalation**

Upon breathing difficulties or irritation of the respiratory tract: Bring the person into fresh air and stay with him/her.

**Skin contact**

Remove contaminated clothing and shoes immediately. Ensure to wash exposed skin thoroughly with water and soap. Skin cleanser can be used. DO NOT use solvents or thinners.

#### Eye contact

Upon irritation of the eye: Remove contact lenses and open eyes widely. Flush eyes with water or saline water (20-30 °C) for at least 5 minutes. Seek medical assistance and continue flushing during transport.

#### Ingestion

If the person is conscious, rinse the mouth with water and stay with the person. Never give the person anything to drink.

In case of malaise, seek medical advice immediately and bring the safety data sheet or label from the product. Do not induce vomiting, unless recommended by the doctor. Have the person lean forward with head down to avoid inhalation of or choking on vomited material.

#### Burns

Rinse with water until pain stops then continue to rinse for 30 minutes.

#### 4.2. Most important symptoms and effects, both acute and delayed

None known.

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

None known.

#### Information to medics

Bring this safety data sheet or the label from this product.

### SECTION 5: Firefighting measures

#### 5.1. Extinguishing media

Suitable extinguishing media: Dry powder (Class D), sodium chloride (granulate) or dry sand.

Unsuitable extinguishing media: DO NOT USE WATER!

#### 5.2. Special hazards arising from the substance or mixture

Fire will result in dense smoke. Exposure to combustion products may harm your health. Closed containers, which are exposed to fire, should be cooled with water. Do not allow fire-extinguishing water to enter the sewage system and nearby surface waters.

#### 5.3. Advice for firefighters

Wear self-contained breathing apparatus and protective clothing to prevent contact. Upon direct exposure contact the National Poisons Information Centre (NPIC) on +353 (0) 1 809 256 (24 h service) in order to obtain further advice.

### SECTION 6: Accidental release measures

#### 6.1. Personal precautions, protective equipment and emergency procedures

Storages not yet ignited must be cooled by water mist. Remove flammable materials if conditions allow it. Ensure sufficient ventilation.

Dust deposits should not be allowed to accumulate on surfaces, as these may form an explosive mixture if they are released into the atmosphere in sufficient concentration.

Evacuate surrounding areas.

Eliminate all ignition sources.

Ventilate the area.

Wear appropriate personal protective equipment (see section 8).

#### 6.2. Environmental precautions

Avoid discharge to lakes, streams, sewers, etc.

#### 6.3. Methods and material for containment and cleaning up

Cleaning up the material must be done only with squeegees or soft natural bristle brushes. Scoops used to pick up the material must be conductive and non-sparking. Synthetic bristle brushes and plastic or other non-conductive scoops must not be used, since they tend to accumulate strong static charges.

Collect spills carefully. Moist the material with water in order to prevent the formation and propagation of dust.

Wherever possible cleaning should be performed with normal cleaning agents. Avoid use of solvents.

Use spark-proof tools and explosion-proof equipment.

Avoid dust generation.

Ensure that waste and contaminated materials are collected and removed from the work area as soon as possible in a suitably labelled container.

#### 6.4. Reference to other sections

See section 13 "Disposal considerations" on handling of waste.

See section 8 "Exposure controls/personal protection" for protective measures.

### SECTION 7: Handling and storage

#### 7.1. Precautions for safe handling

According to EC-Regulation 1907/2006 (REACH), annex II, including changes implemented by EC-Regulation 2020/878

Keep all containers sealed except when opened for removal of material. Reseal containers immediately after each use to prevent contamination or, in the case of pastes, loss of solvent.

Take precautionary measures against static discharges.

Smoking, drinking and consumption of food is not allowed in the work area.

Because of the danger of self-ignition, any waste from the product, spray mist and soiled rags etc. are to be kept in a fire-proof place in air-tight containers.

Routine housekeeping should be instituted to ensure that dusts do not accumulate on surfaces.

See section 8 "Exposure controls/personal protection" for protective measures.

#### 7.2. Conditions for safe storage, including any incompatibilities

Containers that have been opened must be carefully resealed and kept upright to prevent leakage.

Keep all containers sealed except when opened for removal of material. Reseal containers immediately after each use to prevent contamination or, in the case of pastes, loss of solvent.

The use of an inert gas to replace air can greatly increase the safety of many operations, particularly where it may be impossible to ensure that all sources of ignition are eliminated.

Powder trickling out onto the floor or onto other containers must be prevented.

Must be stored in a cool and well-ventilated area, away from possible sources of ignition.

Avoid the suspension of dust in the air.

Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

Use non-sparking tools.

##### Recommended storage material

Always store in containers of the same material as the original container.

##### Storage temperature

Store in tightly closed original container in a dry, cool and well-ventilated place.

Store in accordance with local regulations.

##### Incompatible materials

Strong acids, strong bases, strong oxidizing agents, and strong reducing agents.

#### 7.3. Specific end use(s)

This product should only be used for applications quoted in section 1.2.

## SECTION 8: Exposure controls/personal protection

### 8.1. Control parameters

Aluminium

Long term exposure limit (8 hours) (mg/m<sup>3</sup>): 1 (Respirable Fraction)

2021 Code of Practice for the Safety, Health and Welfare at Work (Chemical Agents) Regulations (2001-2015) and the Safety, Health and Welfare at Work (Carcinogens) Regulations (2001-2019).

### DNEL

No data available.

### PNEC

No data available.

### 8.2. Exposure controls

Compliance with the given occupational exposure limits values should be controlled on a regular basis.

Where necessary use lighting and electrical equipment designed for use in atmospheres where flammable vapours or dusts are present, and which can direct static electricity by grounding equipment.

#### General recommendations

When transferring the materials, dust clouds should be kept at an absolute minimum. Handling should be slow and deliberate. The materials should be transferred from one container to another using a non-sparking, conductive metal scoop.

When mixing the material with other dry ingredients, frictional heat should be avoided. The best type of mixer for a dry mixing operation is one that contains no moving parts, but rather affects a tumbling action, such as a conical blender. Introduction of an inert atmosphere in the blender is highly recommended since dust clouds are generated. All equipment must be well grounded.

Smoking, drinking and consumption of food is not allowed in the work area.

#### Exposure scenarios

There are no exposure scenarios implemented for this product.

#### Exposure limits

Professional users are subjected to the legally set maximum concentrations for occupational exposure. See occupational hygiene limit values above.

#### Appropriate technical measures

All electrical wiring, -lights and -equipment must meet minimum safety requirements of the workplace and

According to EC-Regulation 1907/2006 (REACH), annex II, including changes implemented by EC-Regulation 2020/878

equipment used in explosive atmosphere as described by national regulations and/or standards.

#### Hygiene measures

In between use of the product and at the end of the working day all exposed areas of the body must be washed thoroughly. Always wash hands, forearms and face.

#### Measures to avoid environmental exposure

No specific requirements.

### 8.3. Individual protection measures, such as personal protective equipment

#### Generally



Work clothing should be made of smooth, closely woven fire resistant/fire retardant fabrics which tend not to accumulate static electric charges. Trousers should have no cuffs where the material might accumulate. Pockets, if present, should be designed in such a way as to eliminate the accumulation of dust.

Use only CE marked protective equipment.


#### Respiratory Equipment

Type	Class	Colour	Standards	
SL	P3	White	EN149	


#### Skin protection

Recommended	Type/Category	Standards	
Dedicated work clothing should be worn. Wear a protective suit in the event of prolonged periods of work with the product.	-	-	
Safety shoes		EN ISO 20345	

#### Hand protection

Material	Glove thickness (mm)	Breakthrough time (min.)	Standards	
Butyl	0,3	> 480	EN374-2, EN374-3, EN388	

#### Eye protection

Type	Standards	
Safety glasses with side shields.	EN166	

## SECTION 9: Physical and chemical properties

### 9.1. Information on basic physical and chemical properties

#### Physical state

Powder

#### Colour

Gray

#### Odour / Odour threshold

None

#### pH

Not applicable - product is a solid

#### Density (g/cm<sup>3</sup>)

≈ 4.43

#### Relative density

No information available as testing has not been completed.

**Kinematic viscosity**

Not applicable - product is a solid

**Particle characteristics**

Particle size: 15-45 µm

Size distribution: Ti-6Al-4V 15-45 microns: (D10 - 21 µm / D50 - 32 µm / D90 - 49 µm).

**Phase changes****Melting point/Freezing point (°C)**

1605 - 1660

**Softening point/range (waxes and pastes) (°C)**

Does not apply to solids.

**Boiling point (°C)**

No information available as testing has not been completed.

**Vapour pressure**

Testing not relevant or not possible due to the nature of the product.

**Relative vapour density**

Does not apply to solids.

**Decomposition temperature (°C)**

No information available as testing has not been completed.

**Data on fire and explosion hazards****Flash point (°C)**

Not applicable - product is a solid

**Auto-Ignition (°C)**

≈ 493

**Flammability (°C)**

≈ 325

**Lower and upper explosion limit (% v/v)**

No information available as testing has not been completed.

**Solubility****Solubility in water**

Insoluble

**n-octanol/water coefficient**

No information available as testing has not been completed.

**Solubility in fat (g/L)**

No information available as testing has not been completed.

**9.2. Other information****Formation of explosible dust/air mixtures**

Yes

**Dust explosion class**

St1 (Weak explosion)

**Dust deflagration index (Kst) (bar.m/s)**

60

**Evaporation rate (n-butylacetate = 100)**

Not applicable - product is a solid

**Other physical and chemical parameters**

No data available.

**SECTION 10: Stability and reactivity****10.1. Reactivity**

No data available.

**10.2. Chemical stability**

The product is stable under the conditions, noted in section 7 "Handling and storage".

**10.3. Possibility of hazardous reactions**

None known.

**10.4. Conditions to avoid**

Avoid static electricity.

Avoid the suspension of dust in the air.

**10.5. Incompatible materials**

Strong acids, strong bases, strong oxidizing agents, and strong reducing agents.

**10.6. Hazardous decomposition products**

According to EC-Regulation 1907/2006 (REACH), annex II, including changes implemented by EC-Regulation 2020/878

The product is not degraded when used as specified in section 1.

## SECTION 11: Toxicological information

### 11.1. Information on hazard classes as defined in Regulation (EC) No 1272/2008

#### Acute toxicity

Product/substance	Titanium
Test method:	OECD 425
Species:	Rat
Route of exposure:	Oral
Test:	LD50
Result:	>5000 mg/kg bw/day
Other information:	

Product/substance	Vanadium
Test method:	OECD 423
Species:	Rat
Route of exposure:	Oral
Test:	LD50
Result:	>2000 mg/kg bw/day
Other information:	

Product/substance	Vanadium
Test method:	OECD 436
Species:	Rat
Route of exposure:	Inhalation
Test:	LC50 (4 hours)
Result:	>5.05 mg/L
Other information:	

#### 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.

#### Respiratory sensitisation

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

#### Skin sensitisation

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

#### Germ cell mutagenicity

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

#### Carcinogenicity

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

#### Reproductive toxicity

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

#### STOT-single exposure

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

#### STOT-repeated exposure

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

#### Aspiration hazard

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

### 11.2. Information on other hazards

#### Long term effects

None known.

#### Endocrine disrupting properties

None known.

#### Other information

None known.

Exposure to metal dusts and oxides may cause metal fume fever. Metal fume fever is a temporary flu-like condition characterized by chills, fever, muscle aches and pains, nausea, and vomiting. Typically, the symptoms appear within a few hours after exposure and subside within 2-3 days with no permanent effects.

## SECTION 12: Ecological information

According to EC-Regulation 1907/2006 (REACH), annex II, including changes implemented by EC-Regulation 2020/878

### 12.1. Toxicity

Product/substance: Titanium  
 Test method:  
 Species: Algae, Skeletonema costatum  
 Compartment:  
 Duration: 72 hours  
 Test: EC50  
 Result: >10000 mg/L  
 Other information:

Product/substance: Vanadium  
 Test method: OECD 203  
 Species: Fish, Leuciscus idus  
 Compartment:  
 Duration: 96 hours  
 Test: LC50  
 Result: 693 µg/L  
 Other information:

Product/substance: Vanadium  
 Test method: OECD 201  
 Species: Algae, Desmodesmus subspicatus  
 Compartment:  
 Duration: 72 hours  
 Test: ErC50  
 Result: 2907 µg/L  
 Other information:

### 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

This mixture/product does not contain any substances considered to meet the criteria classifying them as PBT and/or vPvB.

### 12.6. Endocrine disrupting properties

None known.

### 12.7. Other adverse effects

None known.

## SECTION 13: Disposal considerations

### Waste treatment methods

Product is covered by the regulations on hazardous waste.  
 HP 3 - Flammable  
 Commission Regulation (EU) No 1357/2014 of 18 December 2014 on waste.

### EWC code

Not applicable.

### Specific labelling

Not applicable.

### Contaminated packing

Packaging containing residues of the product must be disposed of similarly to the product.

## SECTION 14: Transport information

	<b>14.1 UN / ID</b>	<b>14.2 UN proper shipping name</b>	<b>14.3 Hazard class(es) Labels: 4.1 Classification code:</b>	<b>14.4 PG*</b>	<b>14.5 Env**</b>	<b>Other information:</b>
ADR	UN3089	METAL POWDER, FLAMMABLE, N.O.S.	Class: 4.1 Labels: 4.1 Classification code:	II	No	Limited quantities: 1 kg Tunnel restriction



According to EC-Regulation 1907/2006 (REACH), annex II, including changes implemented by EC-Regulation 2020/878

14.1 UN / ID	14.2 UN proper shipping name	14.3 Hazard class(es)	14.4 PG*	14.5 Env**	Other information:	
		F3 			code: (E) See below for additional information.	
IMDG	UN3089	METAL POWDER, FLAMMABLE, N.O.S.	Class: 4.1 Labels: 4.1 Classification code: F3 	II	No	Limited quantities: 1 kg EmS: F-G S-G See below for additional information.
IATA	UN3089	METAL POWDER, FLAMMABLE, N.O.S.	Class: 4.1 Labels: 4.1 Classification code: F3 	II	No	See below for additional information.

\* Packing group

\*\* Environmental hazards

#### Additional information

ADR / See Table A, Section 3.2.1 for any information on special provisions, requirements, or warnings in connection with transport. See section 5.4.3, for instructions in writing regarding mitigation of damages in relation to incidents or accidents during transport.

IMDG / See section 3.2.1, for any information on special provisions, requirements, or warnings in connection with transport.

IATA / See Table 4.2 for any information on special provisions, requirements, or warnings in connection with transport.

This product is within scope of the regulations of transport of dangerous goods.

#### 14.6. Special precautions for user

Not applicable.

#### 14.7. Maritime transport in bulk according to IMO instruments

No data available.

## SECTION 15: Regulatory information

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

#### Restrictions for application

Restricted to professional users.

#### Demands for specific education

No specific requirements.

#### SEVESO - Categories / dangerous substances

Not applicable.

#### Regulation on explosives precursors

Aluminium (Annex II)

#### Additional information

Not applicable.

#### Sources

Commission Regulation (EU) No 1357/2014 of 18 December 2014 on waste.

Council Regulation (EC) No 2019/1148 on explosives precursors.

Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures (CLP).

Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

### 15.2. Chemical safety assessment

No

**SECTION 16: Other information****Full text of H-phrases as mentioned in section 3**

H228, Flammable solid.

H261, In contact with water releases flammable gases.

**Abbreviations and acronyms**

ADN = European Provisions concerning the International Carriage of Dangerous Goods by Inland Waterway

ADR = The European Agreement concerning the International Carriage of Dangerous Goods by Road

ATE = Acute Toxicity Estimate

BCF = Bioconcentration Factor

CAS = Chemical Abstracts Service

CE = Conformité Européenne

CLP = Classification, Labelling and Packaging Regulation [Regulation (EC) No. 1272/2008]

CSA = Chemical Safety Assessment

CSR = Chemical Safety Report

DMEL = Derived Minimal Effect Level

DNEL = Derived No Effect Level

EINECS = European Inventory of Existing Commercial chemical Substances

ES = Exposure Scenario

EUH statement = CLP-specific Hazard statement

EWC = European Waste Catalogue

GHS = Globally Harmonized System of Classification and Labelling of Chemicals

IARC = International Agency for Research on Cancer (IARC)

IATA = International Air Transport Association

IBC = Intermediate Bulk Container

IMDG = International Maritime Dangerous Goods

LogPow = logarithm of the octanol/water partition coefficient

MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)

OECD = Organisation for Economic Co-operation and Development

PBT = Persistent, Bioaccumulative and Toxic

PNEC = Predicted No Effect Concentration

RID = The Regulations concerning the International Carriage of Dangerous Goods by Rail

RRN = REACH Registration Number

SCL = A specific concentration limit

SVHC = Substances of Very High Concern

STOT-RE = Specific Target Organ Toxicity - Repeated Exposure

STOT-SE = Specific Target Organ Toxicity - Single Exposure

TWA = Time weighted average

UN = United Nations

UVBC = Unknown or variable composition, complex reaction products or of biological materials

VOC = Volatile Organic Compound

vPvB = Very Persistent and Very Bioaccumulative

**Additional information**

The classification of the mixture in regard to physical hazards has been based on experimental data.

**The safety data sheet is validated by**

EcoOnline

**Other**

A change (in proportion to the last essential change (first cipher in SDS version, see section 1)) is marked with a blue triangle.

The information in this safety data sheet applies only to this specific product (mentioned in section 1) and is not necessarily correct for use with other chemicals/products.

It is recommended to hand over this safety data sheet to the actual user of the product. Information in this safety data sheet cannot be used as a product specification.

Country-language: IE-en