

**SAFETY DATA SHEET**

Conforms to Regulation (EC) No. 1907/2006 (REACH), Annex II (including amendments) - United Kingdom (UK)

**Pd-166, Palladium dichlorobis(tert-butyldicyclohexylphosphine)**

**Product code** : 179166  
**Version** : 1  
**Date of issue/ Date of revision** : 06/03/2018  
**Date of previous issue** : No previous validation

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifier**

**Product identifier** : Pd-166, Palladium dichlorobis(tert-butyldicyclohexylphosphine)  
**EC number** : Not available.

**CAS number** : 104889-13-6 **Product code** :  
179166 **Product type** : Powder.

**Chemical formula** : C<sub>32</sub>H<sub>62</sub>Cl<sub>2</sub>P<sub>2</sub>Pd

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

**Specific uses** : Catalyst.

**1.3 Details of the supplier of the safety data sheet**

**Supplier** : Johnson Matthey Plc,  
Orchard Road,  
Royston,  
Herts SG8 5HE

**e-mail address of person responsible for this SDS** : EHS\_CCR@matthey.com

**1.4 Emergency telephone number**

**Telephone number** : 01763 253000  
**Hours of operation** : 24 hours

To the best of our knowledge, the toxicological properties of this product have not been thoroughly investigated.

**2.1 Classification of the substance or mixture**

**Product definition** : Mono-constituent substance

**Classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]**

The product is not classified as hazardous according to Regulation (EC) 1272/2008 as amended.  
See Section 11 for more detailed information on health effects and symptoms.

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## 2.2 Label elements

- Signal word** : No signal word.
- Hazard statements** : No known significant effects or critical hazards.
- Precautionary statements**
- Prevention** : Not applicable.
- Response** : Not applicable.
- Storage** : Protect from moisture.
- Disposal** : Not applicable.
- Hazardous ingredients** : Pd-166, Palladium dichlorobis(tert-butyldicyclohexylphosphine)
- Supplemental label elements** : Not applicable.
- Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles** : Not applicable.
- Special packaging requirements**
- Containers to be fitted with child-resistant fastenings** : Not applicable.
- Tactile warning of danger** : Not applicable.

## 2.3 Other hazards

**Substance meets the criteria for PBT according to Regulation (EC) No. 1907/2006, Annex XIII** : No. P: Not available. B: Not available. T: No.

**Substance meets the criteria for vPvB according to Regulation (EC) No. 1907/2006, Annex XIII** : Not available.

**Other hazards which do not result in classification** : May form explosible dust-air mixture if dispersed.

## 3.1 Substances : Mono-constituent substance

Product/ingredient name	Identifiers	%	Regulation (EC) No. 1272/2008 [CLP]	Type
Pd-166, Palladium dichlorobis(tertbutyldicyclohexylphosphine)	CAS: 104889-13-6	100	Not classified.	[A]

There are no additional ingredients present which, within the current knowledge of the supplier, are classified and contribute to the classification of the substance and hence require reporting in this section.

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Type

[A] Constituent

[B] Impurity

[C] Stabilising additive

Occupational exposure limits, if available, are listed in Section 8.

## **SECTION 4: First aid measures**

### **4.1 Description of first aid measures**

- Eye contact** : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Get medical attention if irritation occurs.
- Inhalation** : Remove victim to fresh air and keep at rest in a position comfortable for breathing. Get medical attention if symptoms occur.
- Skin contact** : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur.
- Ingestion** : Wash out mouth with water. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Do not induce vomiting unless directed to do so by medical personnel. Get medical attention if symptoms occur.
- Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training.

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

#### **Potential acute health effects**

- Eye contact** : Exposure to airborne concentrations above statutory or recommended exposure limits may cause irritation of the eyes.
- Inhalation** : Exposure to airborne concentrations above statutory or recommended exposure limits may cause irritation of the nose, throat and lungs.
- Skin contact** : No known significant effects or critical hazards.
- Ingestion** : No known significant effects or critical hazards.

#### **Over-exposure signs/symptoms**

- Eye contact** : Adverse symptoms may include the following: irritation redness
- Inhalation** : Adverse symptoms may include the following: respiratory tract irritation coughing
- Skin contact** : No specific data.
- Ingestion** : No specific data.

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

- Notes to physician** : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.
- Specific treatments** : No specific treatment.

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## SECTION 5: Firefighting measures

### 5.1 Extinguishing media

**Suitable extinguishing media** : Use dry chemical powder. **media**

**Unsuitable extinguishing media** : Avoid high pressure media which could cause the formation of a potentially **media** explosible dust-air mixture.

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

**Hazards from the substance or mixture** : May form explosible dust-air mixture if dispersed.

**Hazardous combustion products** : Decomposition products may include the following materials:  
carbon dioxide carbon  
monoxide phosphorus  
oxides halogenated  
compounds metal  
oxide/oxides

### 5.3 Advice for firefighters

**Special protective actions for fire-fighters** : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

**Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. Clothing for fire-fighters (including helmets, protective boots and gloves) conforming to European standard EN 469 will provide a basic level of protection for chemical incidents.

**Additional information** : None identified.

**Remark** : The residue, ash or char left after a fire may have catalytic properties and may promote the re-ignition of flammable materials and vapours.

## SECTION 6: Accidental release measures

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

**For non-emergency personnel** : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing dust. Put on appropriate personal protective equipment.

**For emergency responders** : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

### 6.2 Environmental precautions

**Environmental precautions** : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

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

- Small spill** : Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Vacuum or sweep up material and place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor.
- Large spill** : Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Vacuum or sweep up material and place in a designated, labelled waste container. Avoid creating dusty conditions and prevent wind dispersal. Dispose of via a licensed waste disposal contractor.

### 6.4 Reference to other sections

See Section 1 for emergency contact information.

See Section 8 for information on appropriate personal protective equipment.

See Section 13 for additional waste treatment information.

## SECTION 7: Handling and storage

### 7.1 Precautions for safe handling

- Protective measures** : Put on appropriate personal protective equipment (see Section 8). Avoid breathing dust. Avoid the creation of dust when handling and avoid all possible sources of ignition (spark or flame). Prevent dust accumulation. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Electrical equipment and lighting should be protected to appropriate standards to prevent dust coming into contact with hot surfaces, sparks or other ignition sources. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by earthing and bonding containers and equipment before transferring material.

**Advice on general occupational hygiene** Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

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

Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

### 7.3 Specific end use(s)

**Recommendations** : Not available.

**Industrial sector specific solutions** : Not available.

## SECTION 8: Exposure controls/personal protection

The information in this section contains generic advice and guidance. Information is provided based on typical anticipated uses of the product. Additional measures might be required for bulk handling or other uses that could significantly increase worker exposure or environmental releases.

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**8.1 Control parameters**

**Occupational exposure limits**

No exposure limit value known.

**Recommended monitoring :  
procedures**

If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment. Reference should be made to monitoring standards, such as the following: European Standard EN 689 (Workplace atmospheres - Guidance for the assessment of exposure by inhalation to chemical agents for comparison with limit values and measurement strategy) European Standard EN 14042 (Workplace atmospheres - Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents) European Standard EN 482 (Workplace atmospheres - General requirements for the performance of procedures for the measurement of chemical agents) Reference to national guidance documents for methods for the determination of hazardous substances will also be required.

**DNELs/DMELs**

No DNELs/DMELs available.

**PNECs**

No PNECs available

**8.2 Exposure controls**

**Appropriate engineering  
controls**

: Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapour or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapour or dust concentrations below any lower explosive limits. Use explosionproof ventilation equipment.

**Individual protection measures**

**Hygiene measures**

: Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

**SECTION 8: Exposure controls/personal protection**

- Eye/face protection** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields. If operating conditions cause high dust concentrations to be produced, use dust goggles.
- Skin protection**
- Hand protection** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
- Body protection** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Other skin protection** : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Respiratory protection** : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.
- Environmental exposure controls** : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

**SECTION 9: Physical and chemical properties****9.1 Information on basic physical and chemical properties****Appearance**

- Physical state** : Solid. [Powder.]
- Colour** : White to yellowish.
- Odour** : Odourless.
- Odour threshold** : Not available.
- pH** : Not applicable.
- Melting point/freezing point** : Decomposes.
- Initial boiling point and boiling range** : Not available.
- Flash point** : Not applicable.
- Evaporation rate** : Not available.
- Flammability (solid, gas)** : The residue, ash or char left after a fire may have catalytic properties and may promote the re-ignition of flammable materials and vapours. Not available.
- Upper/lower flammability or explosive limits** : available.
- Vapour pressure** : Not available.
- Vapour density** : Not available.
- Relative density** : Not available.
- Solubility(ies)** : Insoluble in the following materials: cold water and hot water.

## SECTION 9: Physical and chemical properties

<b>Partition coefficient: n-octanol/ water</b>	: Not available.
<b>Auto-ignition temperature</b>	: Not available.
<b>Decomposition temperature</b>	: Not available.
<b>Viscosity</b>	: Not applicable.
<b>Explosive properties</b>	: None identified.
<b>Oxidising properties</b>	: Not available.

### 9.2 Other information

**Molecular weight** : 686.1 g/mole

No additional information.

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

No specific test data related to reactivity available for this product or its ingredients.

### 10.2 Chemical stability

The material is supplied in a stable condition and other than the previously mentioned catalytic hazards of this material, no specific reactive hazards are known. The catalytic properties of this material may give it a low ignition temperature (except when supplied as a paste). The catalytic properties will also promote the oxidation and possible ignition of flammable liquids and vapours. A used, filtered catalyst should, therefore, be kept wet and out of contact with combustible vapours and liquids.

### 10.3 Possibility of hazardous reactions

Under normal conditions of storage and use, hazardous reactions will not occur.

### 10.4 Conditions to avoid

Avoid the creation of dust when handling and avoid all possible sources of ignition (spark or flame). Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by earthing and bonding containers and equipment before transferring material. Prevent dust accumulation.

### 10.5 Incompatible materials

Reactive or incompatible with the following materials:  
oxidizing materials

### 10.6 Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced.

## SECTION 11: Toxicological information

### 11.1 Information on toxicological effects

#### Acute toxicity

**Conclusion/Summary** : Not available.

**Irritation/Corrosion****Conclusion/Summary**

**Skin** : Causes skin irritation.

**Eyes** : Causes eye irritation.

**Respiratory** : May cause respiratory irritation.

**Sensitisation**

**Conclusion/Summary** : Not available.

**Mutagenicity****Conclusion/Summary****Carcinogenicity**

**Conclusion/Summary** : Not available. :  
Not available.  
: Not available.

**Reproductive toxicity****Conclusion/Summary****Teratogenicity**

**Conclusion/Summary** : Not available.

**Specific target organ toxicity (single exposure)**

Not available.

**Specific target organ toxicity (repeated exposure)**

Not available.

**Aspiration hazard**

Product/ingredient name	Result
Not available.	

**Information on likely routes of exposure** : Not available.

**Potential acute health effects**

**Eye contact** : Exposure to airborne concentrations above statutory or recommended exposure limits may cause irritation of the eyes.

**Inhalation** : Exposure to airborne concentrations above statutory or recommended exposure limits may cause irritation of the nose, throat and lungs.

**Skin contact** : No known significant effects or critical hazards. **Ingestion** : No known significant effects or critical hazards.

**Symptoms related to the physical, chemical and toxicological characteristics**

**Eye contact** : Adverse symptoms may include the following:  
irritation redness

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**Inhalation** : Adverse symptoms may include the following:  
respiratory tract irritation coughing

**Skin contact** : No specific data.

**Ingestion** : No specific data.

#### Delayed and immediate effects as well as chronic effects from short and long-term exposure

##### Short term exposure

**Potential immediate effects** : Not available.

**Potential delayed effects** : Not available.

##### Long term exposure

**Potential immediate effects** : Not available.

**Potential delayed effects** : Not available.

#### Potential chronic health effects

**Conclusion/Summary** : Not available.

**General** : Repeated or prolonged inhalation of dust may lead to chronic respiratory irritation.

**Carcinogenicity** : No known significant effects or critical hazards.

**Mutagenicity** : No known significant effects or critical hazards.

**Teratogenicity** : No known significant effects or critical hazards.

**Developmental effects** : No known significant effects or critical hazards.

**Fertility effects** : No known significant effects or critical hazards.

**Other information** : Not available.

**Other adverse symptoms** : No known significant effects or critical hazards.

## SECTION 12: Ecological information

### 12.1 Toxicity

**Conclusion/Summary** : Not available.

### 12.2 Persistence and degradability

**Conclusion/Summary** : Not available.

### 12.3 Bioaccumulative potential

Not available.

### 12.4 Mobility in soil

**Soil/water partition coefficient ( $K_{oc}$ )** : Not available.

**Mobility** : Not available.

### 12.5 Results of PBT and vPvB assessment

**PBT** : No.

P: Not available. B: Not available. T: No.

**vPvB** : Not available.

vP: Not available. vB: Not available.

**12.6 Other adverse effects**

No known significant effects or critical hazards.

**SECTION 13: Disposal considerations****13.1 Waste treatment methods:****Product****Methods of disposal****Hazardous waste****Packaging****Methods of disposal****Special precautions**

The generation of waste should be avoided or minimised wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and nonrecyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Return accumulated waste material to the refinery for metal recovery, or dispose of in accordance with local and national regulations. Within the present knowledge of the supplier, this product is not regarded as hazardous waste, as defined by EU Directive 2008/98/EC.

The generation of waste should be avoided or minimised wherever possible. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.

This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

**SECTION 14: Transport information**

	ADR/RID	ADN	IMDG	IATA
<b>14.1 UN number</b>	Not regulated.	Not regulated.	Not regulated.	Not regulated.
<b>14.2 UN proper shipping name</b>	-	-	-	-
<b>14.3 Transport hazard class(es)</b>	-	-	-	-
<b>14.4 Packing group</b>	-	-	-	-
<b>14.5 Environmental hazards</b>	No.	No.	No.	No.
<b>Additional information</b>	-	-	-	-

**14.6 Special precautions for transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

**14.7 Transport in bulk according to Annex II of Marpol and the IBC Code** : Not available.

## SECTION 15: Regulatory information

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

#### EU Regulation (EC) No. 1907/2006 (REACH)

##### Annex XIV - List of substances subject to authorisation

###### Annex XIV

None of the components are listed.

###### Substances of very high concern

None of the components are listed.

##### Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles

#### Other EU regulations

##### Ozone depleting substances (1005/2009/EU)

Not listed.

##### Prior Informed Consent (PIC) (649/2012/EU)

Not listed.

##### Seveso Directive

This product is not controlled under the Seveso Directive.

#### International regulations

##### Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

##### Montreal Protocol (Annexes A, B, C, E)

Not listed.

##### Stockholm Convention on Persistent Organic Pollutants

Not listed.

##### Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

##### UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

#### International lists

**National inventory**

<b>Australia</b>	: Not determined.
<b>Canada</b>	: Not determined.
<b>China</b>	: Not determined.
<b>Japan</b>	: <b>Japan inventory (ENCS)</b> : Not determined. <b>Japan inventory (ISHL)</b> : Not determined.
<b>Malaysia</b>	: Not determined.
<b>New Zealand</b>	: Not determined.
<b>Philippines</b>	: Not determined.
<b>Republic of Korea</b>	: Not determined.
<b>Taiwan</b>	: Not determined.
<b>Turkey</b>	: Not determined.
<b>United States</b>	: Not determined.

**15.2 Chemical safety assessment**

Not available.

**SECTION 16: Other information**

✔ Indicates information that has changed from previously issued version.

**Abbreviations and acronyms** : ATE = Acute Toxicity Estimate **acronyms** CLP = Classification, Labelling and Packaging Regulation [Regulation (EC) No.

1272/2008]

DMEL = Derived Minimal Effect Level

DNEL = Derived No Effect Level

EUH statement = CLP-specific Hazard statement

PBT = Persistent, Bioaccumulative and Toxic

PNEC = Predicted No Effect Concentration RRN

= REACH Registration Number vPvB = Very

Persistent and Very Bioaccumulative

**Procedure used to derive the classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]**

Classification	Justification
Not classified.	

**Full text of abbreviated H statements**

Not applicable.

**Full text of classifications [CLP/GHS]**

Not applicable.

**Notice to reader**

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It is the policy of Johnson Matthey to update this information regularly. You are therefore advised to check that this sheet is the most recent issue.