# Calibration Certificate

## Fine dust

## Fidas®

Suitability Tested
Complying with
2008/50/EC
EN 15267
Regular
Surveillance
www.tuv.com
ID 0000040212

Palas GmbH
Partikel- und Lasermesstechnik
Greschbachstraße 3b
76229 Karlsruhe, Germany
www.palas.de

Geschäftsführer/
General Manager:
Dipl.-Ing. (FH)
Leander Mölter
Dr.-Ing. Maximilian Weiß

Handelsregister/
Commercial Register:
Mannheim HRB 103813
Sitz des Unternehmens/
Place of Business: Karlsruhe

**Responsible for calibration certificate:** F.Farr

## Tested device

| | |
|---|---|
| Model: | Fidas® 200 E |
| Serial number: | 9380 |

## Reference fine dust monitor

| | |
|---|---|
| Model: | Fidas® 200 |
| Serial number: | 7117 |

## Test conditions/test equipment

| | |
|---|---|
| Humidity: | 10 % |
| Air pressure: | 1006 mbar |
| Ambient air temperature: | 25 °C |

**Particle generator**

| | |
|---|---|
| Used particle material: | DEHS |
| Aerosol generator: | PLG 1000 |
| Volume flow generator: | 1.4 – 2.2 l/min |

**Test channel**

| | |
|---|---|
| Volume flow: | 3400 l/min |

1.) Flow calibration

| | |
|---|---|
| Used flow meter: | Alicat M-20SLPM-D |
| Serial number: | 70080 |

**Result:**

Measured flow: 4.80 l/min (nominal: 4.8 l/min ± 0.05 l/min)

4.) MonoDust calibration with IADS at 50 °C

**Result**

IADS temperature: 50 °C
Peak setpoint: 141.10

Peak position: 141.18(nominal: peak setpoint according MonoDust certificate ± 0.1)
PMT voltage: 1.290 V

5.) Velocity calibration with IADS at 50 °C and MonoDust1500

**Result:**

Measured particle velocity at cursor with IADS at 50 °C: 8.64 m/s

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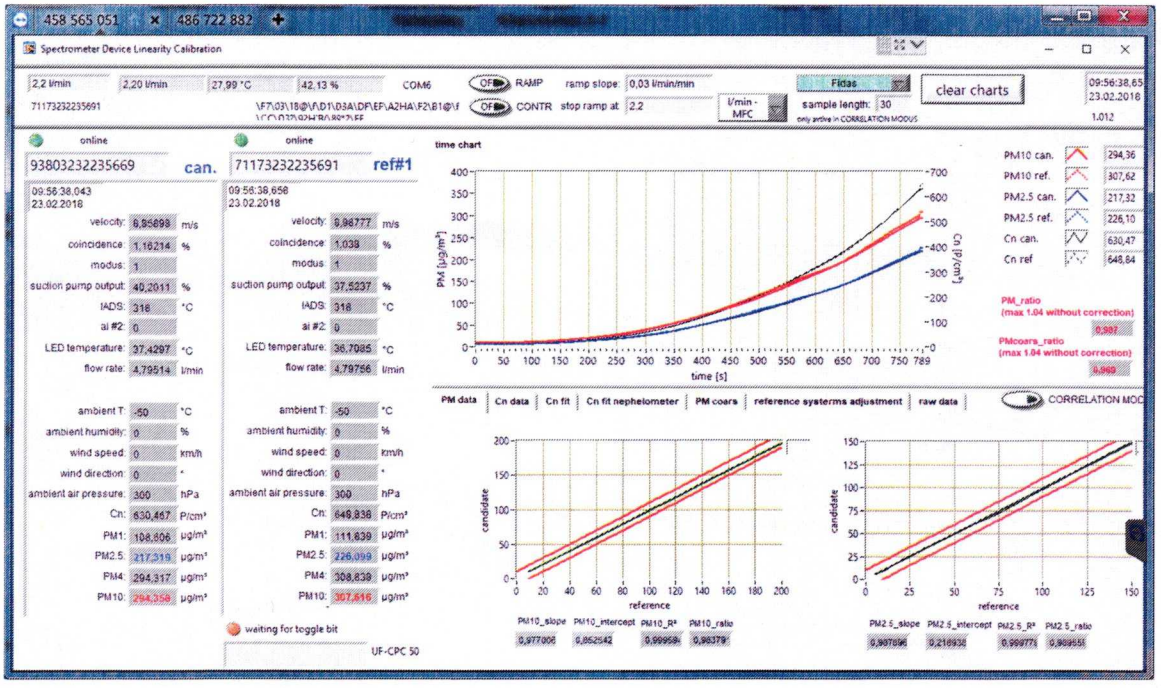
Karlsruhe, 23.02.2018

2.) Fine dust calibration procedure without correction factor (increasing PM-value)

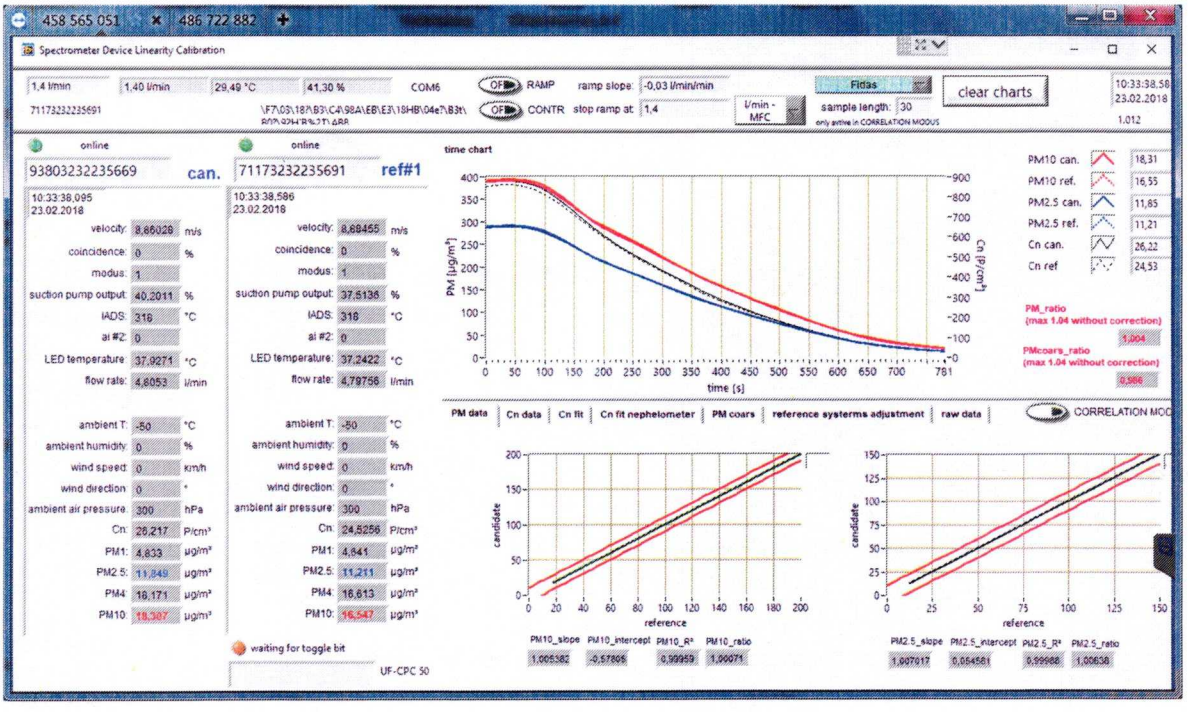
**Result (average of PM2.5 and PM10 slope):** (nominal: 1.00 ± 0.04)




Adopted PM10 calibration factor: 1.02
Adopted PM2,5 calibration factor: 1.02

3.) Fine dust calibration procedure with correction factor (decreasing PM-value)

**Result (average of PM2.5 and PM10 slope):** (nominal: 1.00 ± 0.01)



# Calibration Certificate

## Aerosol spectrometer measurement range

## Fidas®

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Quality Management ISO 9001:2008


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Sitz des Unternehmens/
Place of Business: Karlsruhe

**Responsible for calibration certificate:** F.Farr

## Tested device

Control unit
Model/serial number: Fidas® 200 E/ SN.: 9380
Firmware version: 100434

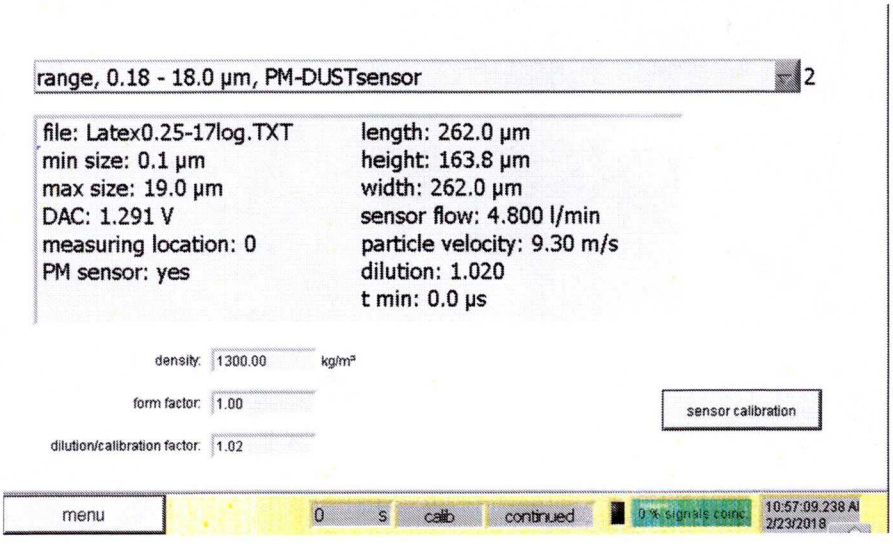
Optical sensor
Model/serial number: PM-Dustsensor / SN.: 9380
Size range: 0.18 – 18 µm

## Test conditions

Humidity: 10 %
Air pressure: 1006 mbar
Ambient air temperature: 25 °C

## Test results

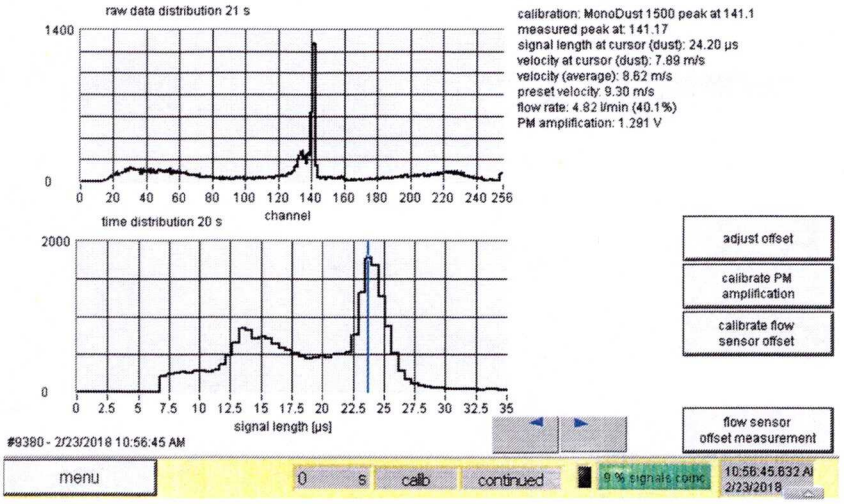
Settings



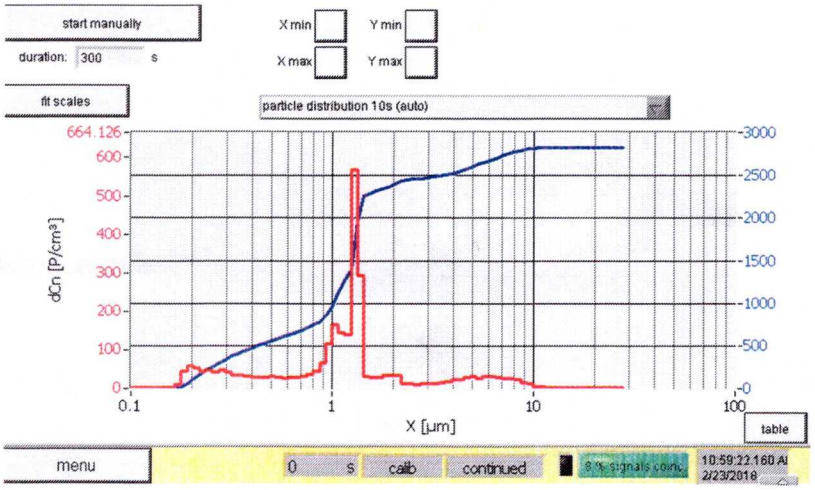
1.) MonoDust 1500 calibration for particle size and velocity

**Result**

Raw data distribution, signal length distribution



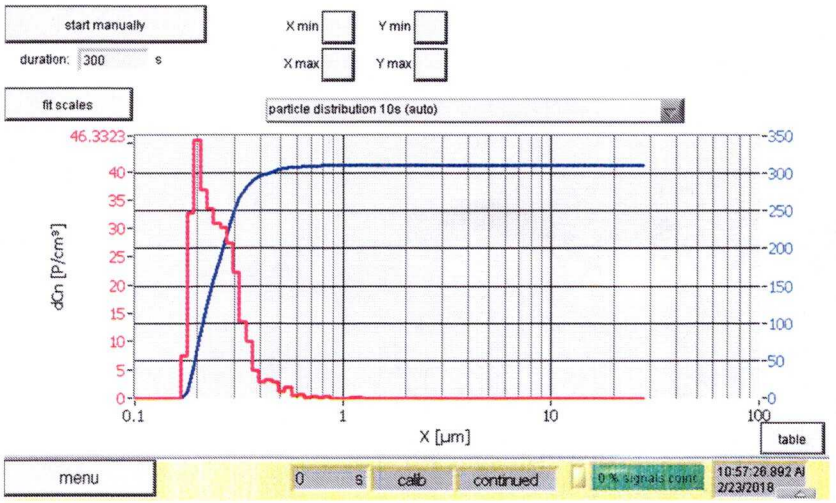

Size distribution with 64 channels/decade



2.) Ambient air particle size distribution

**Result**

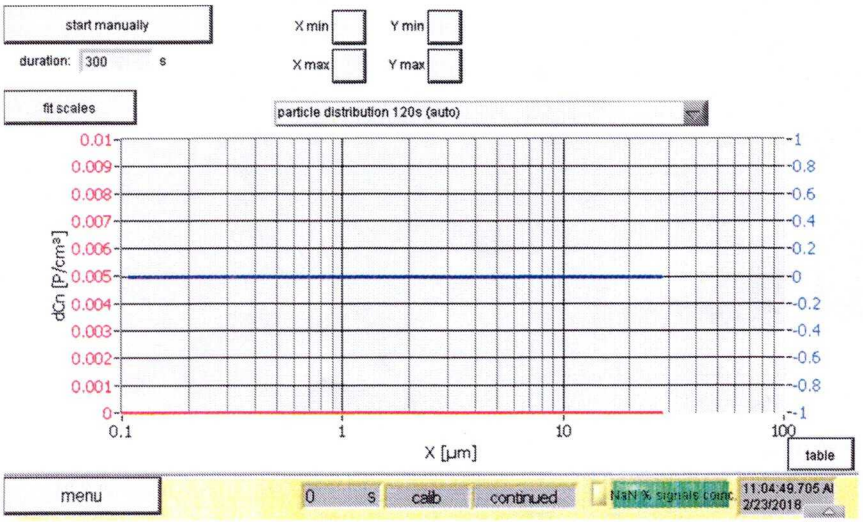
Size distribution with 64 channels/decade:




3.) Zero filter measurement

**Result**

Size distribution with 64 channels/decade for 120 seconds



4.) Signal noise measurement

**Result**

Signal noise with total filter and signal amplification by a factor of 10



Karlsruhe, 23.02.2018

# Calibration Certificate

## Aerosol spectrometer control unit

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Place of Business: Karlsruhe

**Responsible for calibration certificate:** F.Farr

## Tested device

Control unit
Model/serial number: Fidas® 200 E/ SN.: 9380
Firmware version: 100434

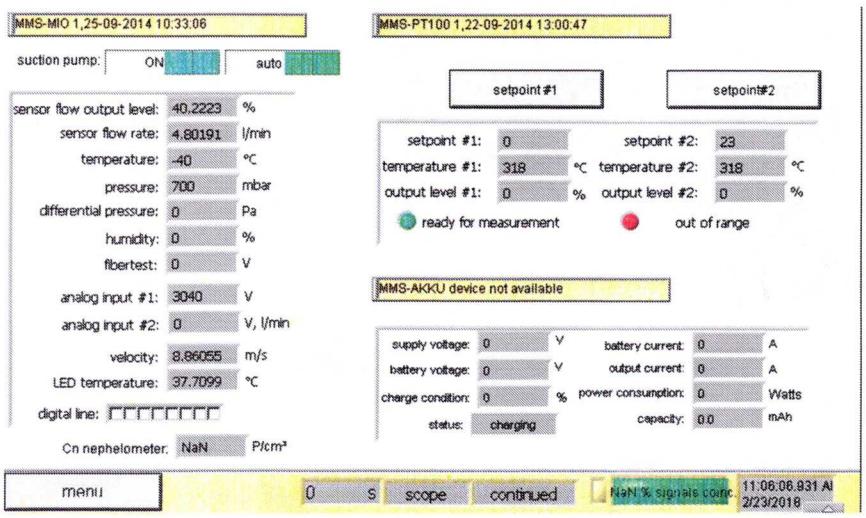
## Test conditions

Humidity: 10 %
Air pressure: 1006 mbar
Ambient air temperature: 25 °C

## Test results

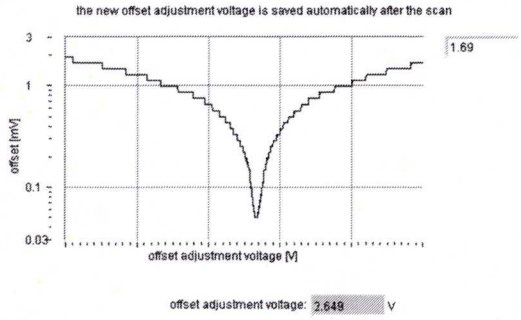
1.) General IO/Suction pump/Fiber test

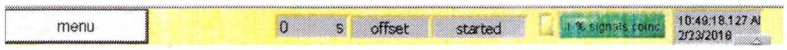
## Result



2.) Offset measurement

**Result**




3.) Flow measurement

| | |
|---|---|
| Measured flow: | 4.80 l/min |
| Reference flow sensor model/serial number: | Alicat M-20SLPM-D / SN.: 70080 |
| Flow reference temperature: | 25 °C |
| Flow reference pressure: | 1013 mbar |

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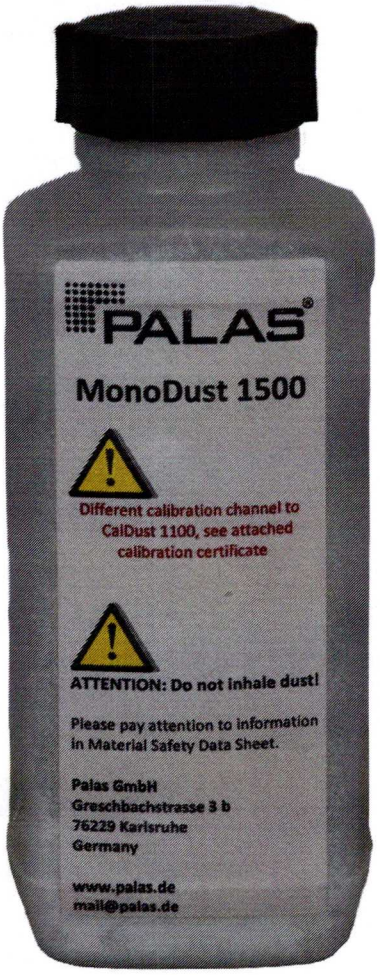
Karlsruhe, 23.02.2018

# Calibration Certificate

## MonoDust 1500

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Sitz des Unternehmens/
Place of Business:
Karlsruhe

**Responsible for calibration certificate:** R. Joachim

## Test conditions

| | |
|---|---|
| Humidity: | 29 % |
| Air pressure: | 1008 hPa |
| Ambient air temperature: | 23 ° C |

## MonoDust 1500

| | |
|---|---|
| Lot. Number: | 130809-048-016 |
| Valid until: | 11.2019 |

## Sizing Calibration (monodisperse)

| | |
|---|---|
| Reference PSL size: | 0.994 µm +- 0.015 µm |
| manufacturer: | Thermo Scientific |
| lot number: | 44659 |

## Test results

| **calibration range** | **setpoint raw chan.** | **permissible tolerance** |
|---|---|---|
| 0.2 - 10 µm | 164.7 | 0,5 raw channel |
| 0.3 - 17 µm | 141.3 | 0,5 raw channel |
| 0.6 - 40 µm | 96.3 | 0,5 raw channel |

Measured size (modal value): 1.287 µm

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Karlsruhe, 24.11.2017

# Safety Datasheet MonoDust 1500
# (according to 1907/2006/EG, article 31)

revised on: 30.04.2015

## 1) Identification of the substance/mixture and of the company/undertaking

**Product details**

- **Trade name**: MonoDust 1500
- **Application of the substance / the preparation: Chemicals for various applications**
- **Manufacturer / Supplier**:

  Palas GmbH — Phone: +49 (0)721 96 21 30
  Greschbachstraße 3b — Fax: +49 (0)721 96 213 33
  76229 Karlsruhe (Germany)
- **E-mail address of the competent person responsible for the Safety Data Sheet:**:
  mail@palas.de
- **Informing department**: Sales
- **Emergency information:** As above or next toxicological information centre

## 2) Hazards identification

**2.1 Classification of the substance or mixture**

- Classification according to Regulation (EC) No 1272/2008
  The product is not classified as hazardous according to the CLP regulation.
- Classification according to Directive 67/548/EEC or Directive 1999/45/EC Void

**2.2 Label elements**

- Labelling according to Regulation (EC) No 1272/2008: Void
- Hazard pictograms: Void
- Signal word: Void
- Hazard statements: Void

**2.3 Other hazards**

- Results of PBT and vPvB assessment
  PBT: Not applicable.
  vPvB: Not applicable.

## 3) Composition/information on ingredients

- **Chemical characterization: Substances**
- **CAS No. Designation:** 7631-86-9 Silicon dioxide
- **Identification number(s):**
  **EC number:** 231-545-4

## 4) First aid measures

**4.1 Description of first aid measures**

- General information: Remove contaminated clothing.
- After inhalation: Supply fresh air; consult doctor in case of symptoms.
  Remove person to fresh air and keep comfortable for breathing.
- After skin contact:
  Wash with soap and water. If skin irritation continues, consult a doctor.
- After eye contact:
  Rinse opened eye for several minutes under running water. If symptoms persist, consult doctor.
  Remove contact lenses, if present and easy to do.
- After swallowing:
  Rinse out mouth and then drink plenty of water. In case of persistent symptoms consult doctor.

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

No further relevant information available.

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

symptomatic treatment

## 5) Firefighting measures

**5.1 Extinguishing media**

- Suitable extinguishing agents
- Use fire fighting measures that suit the environment.
- For safety reasons unsuitable extinguishing agents
  None.

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

- Silica fumes

**5.3 Advice for firefighters**

- Protective equipment: Put on breathing apparatus.
- Additional information:
  Dispose of fire debris and contaminated fire fighting water in accordance with official regulations.

## 6) Accidental release measures

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

- Avoid causing dust.
- Do not breathe dust.
- Avoid contact with eyes.

**6.2 Environmental precautions:** Do not allow large quantities of product to reach sewage system or water bodies.

**6.3 Methods and material for containment and cleaning up:**

- Collect mechanically.
- Send for recovery or disposal in suitable containers.
- Dispose of the material collected according to regulations.

**6.4 Reference to other sections**

- See Section 8 for information on personal protection equipment.

## 7) Handling and storage

**7.1 Precautions for safe handling**

- Ensure good ventilation/exhaustion at the workplace.
- Do not breathe dust.
- Avoid contact with eyes.
- Make sure that all applicable workplace limits are observed.
- Information about protection against explosions and fires:
  Protect against electrostatic charges.

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

- Storage
- Requirements to be met by storerooms and containers:
  Observe all local and national regulations for storage of water polluting products.
- Information about storage in one common storage facility: Store away from foodstuffs.
- Further information about storage conditions:
  Keep container tightly sealed.
  Store under dry conditions.

**7.3 Specific end use(s):** No further relevant information available.

**8) Exposure controls and personal protection**

- **Additional information about design of technical systems:** No further data; see item 7.

**8.1 Control parameters**

| **Components with critical values that require monitoring at the workplace:** | |
|---|---|
| **DNELs** | |
| Inhalative DNEL long-term exposure - systemic effects | 4 mg/m³ (worker) |

- **Additional information:** The lists that were valid during the compilation were used as basis.

**8.2 Exposure controls**

- Personal protective equipment
- General protective and hygienic measures
  Keep away from foodstuffs, beverages and food.
  Do not eat, drink or smoke while working.
  Do not breathe dust.
  Avoid close or long term contact with the skin.
  Avoid contact with the eyes.
  Wash hands during breaks and at the end of the work.
- Breathing equipment:
  If all workplace limits are observed and good ventilation is ensured, no special precautions necessary.
- Protection of hands:
  Antistatic gloves
  Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation.
  The glove material has to be impermeable and resistant to the product/ the substance/ the preparation.
  Check the permeability prior to each renewed use of the glove.
  To avoid skin problems reduce the wearing of gloves to the required minimum.
  Sensibilisation by the components in the glove materials is possible.
- Material of gloves
  Nitrile rubber – NBR
  Recommended thickness of the material: ≥ 0.11 mm
  The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer.
- Penetration time of glove material
  Penetration time: ≥ 8 hours
  Protective gloves should be replaced at first signs of wear.
  The exact break through time has to be found out by the manufacturer of the protective gloves and has to be observed.
- Eye protection: Safety glasses

## 9) Physical and chemical properties:

### 9.1 Information on basic physical and chemical properties

| | |
|---|---|
| **General Information:** | |
| **Form:** | powder |
| **Colour:** | white |
| **Smell:** | odourless |
| **Odour threshold:** | not determined |
| **pH-value (100 g/l) at 20 °C:** | 7 (susp.) |
| **Change in condition:** | |
| **Melting point/Melting range:** | not determined |
| **Boiling point/Boiling range:** | not determined |
| **Flash point:** | not applicable |
| **Inflammability (solid, gaseous)** | Product is not inflammable. |
| **Ignition temperature:** | not applicable |
| **Decomposition temperature:** | not determined |
| **Self-inflammability:** | not determined |
| **Danger of explosion:** | Product is not explosive |
| **Critical values for explosion:** | |
| **Lower:** | not determined |
| **Upper:** | not determined |
| **Oxidising properties:** | not classified as oxidising |
| **Vapor pressure:** | not determined |
| **Density at 20°C:** | 2.2 - 2.5 g/cm³ |
| **Relative density at 20 °C** | 2.2 - 2.5 ($H_2O$ = 1) |
| **Vapour density (AIR = 1):** | not determined |
| **Evaporation rate** | not determined |
| **Solubility in / Miscibility with Water:** | insoluble |
| **Partition coefficient (n-octanol/water):** | not determined |
| **Viscosity:** | |
| **dynamic:** | not determined |
| **kinematic:** | not determined |

**9.2 Other information:** No further relevant information available.

## 10) Stability and reactivity

**10.1 Reactivity:** see 10.3

**10.2 Chemical stability**

- Thermal decomposition / conditions to be avoided:
  No decomposition if used according to specifications.
  Avoid impact, friction, heat, sparks, electrostatic charges.

**10.3 Possibility of hazardous reactions:** No dangerous reactions known.

**10.4 Conditions to avoid:** No further relevant information available.

**10.5 Incompatible materials:** Hydrofluoric acid

**10.6 Hazardous decomposition products:**

- Silica fumes

## 11) Toxicological information

- **Acute toxicity:**

| LD/LC50 values that are relevant for classification: | | |
|---|---|---|
| Oral | LD50 | > 2500 mg/kg (rat) |
| Inhalative | LC50/4 h | > 5.15 mg/l (rat)<br>no mortalities |

- Primary irritant effect:
- on the skin: Long or repeated contact can defat skin and may cause dermatitis..
- on the eye: Dust particles may mechanically irritate the eye.
- Subacute to chronic toxicity:
  Repeated or prolonged exposure to dusts may result in deposition of dust particles in the lungs.
- Sensitisation No sensitizing effect known.
- Repeated dose toxicity not classified
- CMR effects (carcinogenity, mutagenicity and toxicity for reproduction)
  According to present knowledge no CMR-effects known.

## 12) Ecological information

**12.1 Toxicity**

| Aquatic toxicity: | |
|---|---|
| LC50/96 h | > 100 mg/l (carp (cyprinus carpio)) |

**12.2 Persistence and degradability** No further relevant information available.

**Other information:**

Methods for the determination of biodegradability are not applicable to inorganic substances.

**12.3 Bioaccumulative potential** Not bioaccumulative

**12.4 Mobility in soil** No further relevant information available.

- Additional ecological information:
- General notes: Not hazardous for water.

**12.5 Results of PBT and vPvB assessment**

- PBT: Not applicable.
- PvB: Not applicable.

**12.6 Other adverse effects** No further relevant information available.

## 13) Disposal considerations

**13.1 Waste treatment methods**

- Recommendation:
  Must not be disposed of together with household garbage. Do not allow product to reach sewage system.
- European waste catalogue:
  Waste disposal key numbers from EWC have to be assigned depending on origin and processing.
  Uncleaned packagings:
  Recommendation: Disposal must be made according to official regulations.

## 14) Transport information

| |
|---|
| **14.1 UN-Number**<br>▪ **ADR, IMDG, IATA: Void** |
| **14.2 UN proper shipping name**<br>▪ **ADR, IMDG, IATA: Void** |
| **14.3 Transport hazard class(es)**<br>▪ **ADR, IMDG, IATA**<br>▪ **Class: Void** |
| **14.4 Packing group**<br>▪ **ADR, IMDG, IATA Void** |
| **14.5 Environmental hazards:**<br>▪ **Marine pollutant: NO** |
| **14.6 Special precautions for user** Not applicable. |
| **14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code** Not applicable. |
| **Transport/Additional information:** Not dangerous according to the above specifications. |
| **UN "Model Regulation": -** |

## 15) Regulatory information

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

- National regulations
- Decree to be applied in case of technical fault: Directive 96/82/EC does not apply.
- Water hazard class:
  Generally not hazardous for water.
  ID-Number: 849

**15.2 Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

## 16) Other information:

These data are based on our present knowledge. However, they shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

- **Department issuing MSDS:**

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Greschbachstraße 3b
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Fax: +49 (0)721 96 213 33

- **Abbreviations and acronyms:**
  RID: Règlement international concernant le transport des marchandises dangereuses par chemin de fer (Regulations Concerning the
  International Transport of Dangerous Goods by Rail)
  IATA-DGR: Dangerous Goods Regulations by the "International Air Transport Association" (IATA)
  ICAO: International Civil Aviation Organisation
  ICAO-TI: Technical Instructions by the "International Civil Aviation Organisation" (ICAO)
  ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International
  Carriage of Dangerous Goods by Road)
  IMDG: International Maritime Code for Dangerous Goods
  IATA: International Air Transport Association
  GHS: Globally Harmonised System of Classification and Labelling of Chemicals
  EINECS: European Inventory of Existing Commercial Chemical Substances
  CAS: Chemical Abstracts Service (division of the American Chemical Society)
  DNEL: Derived No-Effect Level (REACH)
  LC50: Lethal concentration, 50 percent
  LD50: Lethal dose, 50 percent
  vPvB: very Persistent and very Bioaccumulative

  **Sources: These data are based on information submitted by pre-suppliers.**
  **ECHA, European Chemicals Agency**
  **External MSDS**