### 1: Identification

- **1.1 Product identifier**
  - Trade name: **CALORIVAC® C**
  - Article number: CALORIVAC® C Parts / granulated material (> 100 μm)
  - © registered trademark of VACUUMSCHMELZE GmbH & Co. KG
  - Material Safety Data Sheet - no.: IB131

- **1.2 Relevant identified uses of the substance or mixture and uses advised against** Not applicable

- **Application of the substance / the mixture**
  - Magnetocaloric material, e.g. Refrigerators, Freezers, Air conditioning equipment, heat pumps, energy conversion

- **1.3 Details of the supplier of the safety data sheet**
  - Manufacturer/Supplier: VACUUMSCHMELZE GmbH & Co.KG
  - Grüner Weg 37
  - D-63450 Hanau
  - datasheet@vacuumschmelze.com
  - Information department: Environmental Protection Department

- **1.4 Emergency telephone number:**
  - Tel. no.: (**49) 6181/38-0
  - Emergency tel. no.: via (**49) 6181/38-0

### 2: Hazard(s) identification

- **2.2 Classification (substance or mixture)**
  - Classification according to Regulation (EC) No 1272/2008 (CLP-Regulation):
    - Not applicable
    - Our semi-finished and finished products constitute manufactured articles under the terms of the REACH Regulation (EC) No. 1907/2006.
    - For articles there is no obligation to classify acc. to CLP -Regulation.

- **2.2 Labelling according to Regulation (EC) No 1272/2008**
  - Labelling according to Regulation (EC) No 1272/2008 (CLP-Regulation):
    - Not applicable

- **Additional VAC information:**
  - In the case of dust-producing processing, we recommend observance of the following warnings:
    - **Hazard statements**
      - May cause allergy or asthma symptoms or breathing difficulties if inhaled.
      - May cause an allergic skin reaction.
      - May cause cancer. Route of exposure: Inhalative.
      - Suspected of damaging fertility or the unborn child.
    - **Precautionary statements**
      - Do not breathe dust.
      - Use personal protective equipment as required.
      - If experiencing respiratory symptoms: Call a poison center/doctor.
      - Wash contaminated clothing before reuse.
      - If inhaled: If breathing is difficult, remove person to fresh air and keep comfortable for breathing.
      - IF exposed or concerned: Get medical advice/attention.
      - If skin irritation or rash occurs: Get medical advice/attention.
      - If on skin: Wash with plenty of water.

- **2.3 Other hazards**
  - Results of PBT and vPvB assessment
  - PBT: Not applicable.
**3: Composition/information on ingredients**

- **3.2 Chemical characterization:**
  - **Description:** La-Fe- Alloy (Parts / granulated material)
  - **Dangerous components:**
    The classifications given below reflect the classification of each pure substance respectively and are intended for information only

<table>
<thead>
<tr>
<th>CAS: 7439-89-6</th>
<th>iron</th>
<th>rest%</th>
</tr>
</thead>
<tbody>
<tr>
<td>EINECS: 231-096-4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CAS: 7439-91-0</th>
<th>lanthanum</th>
<th>&lt; 20%</th>
</tr>
</thead>
<tbody>
<tr>
<td>EINECS: 231-099-0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CAS: 7440-48-4</th>
<th>cobalt</th>
<th>max. 10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>EINECS: 231-158-0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Index number: 027-001-00-9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Additional information:** For the wording of the listed risk phrases refer to section 16.

**4: First-aid measures**

- **4.1 Description of first aid measures**
  - **After inhalation:**
    If metal vapours or solid dusts have been inhaled:
    Get the affected person out in the fresh air and call a doctor.
  - **After skin contact:**
    Foreign bodies which have penetrated the skin must be removed and the wound cleaned thoroughly.
  - **After eye contact:**
    Rinse opened eye for several minutes under running water. If symptoms persist, consult a doctor.
  - **After swallowing:** Consult a doctor if the symptoms persist.
  - **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**
    No further relevant information available.

**5: Fire-fighting measures**

- **5.1 Extinguishing media**
- **Suitable extinguishing agents:**
  - Non-combustible.
  - Extinguishing agents must be adapted to the environment.
- **5.2 Special hazards arising from the substance or mixture**
  - Formation of toxic smoke / fumes (metal / metal oxides) is possible during heating or in case of fire.
- **5.3 Advice for firefighters**
  - **Protective equipment:** Do not inhale fumes.

**6: Accidental release measures**

Accidental release of dusts and vapours which are damaging to health can be ruled out.
7: Handling and storage

7.1 Precautions for safe handling
No safety precautions are necessary in the delivered form.
The appropriate industrial and environmental safety measures
must be taken for processing steps which cause dust
(see also section 8):
Prevent formation of dust.
Ensure good ventilation/exhaustion at the workplace.
Take note of emission threshold.

• Information about protection against explosions and fires: No special measures required.

7.2 Conditions for safe storage, including any incompatibilities

• Storage:

• Requirements to be met by storerooms and receptacles: No special requirements.

• Information about storage in one common storage facility: Not required.

• Further information about storage conditions: None.

• Storage class: Not applicable

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

8: Exposure controls/personal protection

• Additional information about design of technical systems:
Provide suction with filtering for good airing and ventilation of the work area during processing steps which
cause dust.
If industrial vacuum cleaners are used, these must have dust class H (DIN EN 60335-2-69).
Suitable breathing apparatus must be used during repair and maintenance work to suction systems,
especially when changing filters (see personal safety equipment).

8.1 Control parameters

• Components with limit values that require monitoring at the workplace:

<table>
<thead>
<tr>
<th>7439-89-6 iron</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>EV (Canada)</td>
<td>Long-term value: 1* 5** mg/m³ as iron; salts, water-soluble; welding fume</td>
</tr>
<tr>
<td>74440-48-4 cobalt</td>
<td></td>
</tr>
<tr>
<td>EL (Canada)</td>
<td>Long-term value: 0.02 mg/m³ as Co; ACGIH 2B</td>
</tr>
<tr>
<td>EV (Canada)</td>
<td>Long-term value: 0.1 mg/m³</td>
</tr>
<tr>
<td>PEL (USA)</td>
<td>Long-term value: 0.1* mg/m³ as Co; *for metal dust and fume</td>
</tr>
<tr>
<td>REL (USA)</td>
<td>Long-term value: 0.05 mg/m³ as Co; metal dust &amp; fume</td>
</tr>
<tr>
<td>TLV (USA)</td>
<td>Long-term value: 0.02; NIC - 0.02* mg/m³ BEI; *hard metals: thoracic; NIC-A2, RSEN; as W</td>
</tr>
</tbody>
</table>

(Contd. on page 4)
Material Safety Data Sheet
(MSDS)

Printing date 01/29/2015 Reviewed on 01/29/2015
Version - No. 1

Trade name: CALORIVAC® C

7440-21-3 silicon

<table>
<thead>
<tr>
<th>Source</th>
<th>Limit Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>EL (Canada)</td>
<td>Long-term value: $10^*\times 3^{**}\text{mg/m}^3$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>*total dust;**respirable fraction</td>
<td></td>
</tr>
<tr>
<td>EV (Canada)</td>
<td>Long-term value: $10\text{mg/m}^3$</td>
<td></td>
</tr>
<tr>
<td>PEL (USA)</td>
<td>Long-term value: $15*\times 5^{**}\text{mg/m}^3$</td>
<td></td>
</tr>
<tr>
<td>REL (USA)</td>
<td>Long-term value: $10*\times 5^{**}\text{mg/m}^3$</td>
<td></td>
</tr>
<tr>
<td>TLV (USA)</td>
<td>TLV withdrawn</td>
<td></td>
</tr>
</tbody>
</table>

• Ingredients with biological limit values:

7440-48-4 cobalt

<table>
<thead>
<tr>
<th>Source</th>
<th>Limit Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEI (USA)</td>
<td>$15 \mu g/L$</td>
<td></td>
</tr>
<tr>
<td>Medium: urine</td>
<td>Time: end of shift at end of workweek</td>
<td></td>
</tr>
<tr>
<td>Parameter: Cobalt (background)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$1 \mu g/L$</td>
<td>Medium: blood</td>
<td></td>
</tr>
<tr>
<td>Time: end of shift at end of workweek</td>
<td>Parameter: Cobalt (background, semi-quantitative)</td>
<td></td>
</tr>
</tbody>
</table>

• Additional information:
The lists that were valid during the creation were used as basis.
GESTIS International Limit Values:

• 8.2 Exposure controls
• Personal protective equipment:
• General protective and hygienic measures:
Keep away from foodstuffs, beverages and feed.
Wash hands before breaks and at the end of work.
Store protective clothing separately.
Do not eat, drink, smoke or sniff while working.

• Breathing equipment:
In the case of dust formation (limit value exceeded), breathing apparatus must be worn.
Time limits for wearing must be observed.
Breathing mask, apparatus with particle filter P2 or P3, for example:
- Full face mask (EN 136)
- Breathing mask (EN 149) FFP2 or FFP3
10 times the limit value (FFP2)
30 times the limit value (FFP3)
Recommendation: P3

• Protection of hands:
Preventive skin protection by use of skin-protecting agents is recommended.

• Material of gloves:
Experience has shown glove materials polychloroprene, nitrile caoutchouc, butyl caoutchouc, fluoride caoutchouc and polyvinylchloride to offer sufficient protection.

• Penetration time of glove material:

• Eye protection:
In the event of larger quantities of dust:
Wear protective glasses / EN 166, poss. with side protection.
9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

- **Form:** Parts / granulated material
- **Color:** Metallic
- **Odor:** Metallic
- **pH-value:** Not applicable.
- **Melting point/Melting range (approx):** 1180 °C
- **Auto igniting:** Not applicable
- **Danger of explosion:** Not applicable
- **Vapor pressure:** Not determined.
- **Density (approx) at 20 °C:** 7.2 g/cm³
- **Relative density:** Not determined.
- **Solubility in / Miscibility with Water:** Insoluble.

9.2 Other information

No further relevant information available.

10: Stability and reactivity

10.1 Reactivity

10.2 Chemical stability

10.3 Possibility of hazardous reactions

Hydrogen is released in contact with acid which can cause explosive gas mixtures.

10.4 Conditions to avoid

No further relevant information available.

10.5 Incompatible materials

No further relevant information available.

10.6 Hazardous decomposition products

No dangerous decomposition products known.

11: Toxicological information

11.1 Information on toxicological effects

11.2 Acute toxicity:

- **LD/LC50 values:**
  - 7440-48-4 cobalt
  - Oral LD50 550 mg/kg (rat)
  - Inhalative LC50/4 h --- mg/l (rat)

siehe zusätzlicher toxikologischer Hinweis / see additional toxicological information

11.3 Primary irritant effect:

- **on the skin:** No irritant effect.
- **on the eye:** Iritiation of the eyes in the case of massive direct contact will be mainly due to mechanical effects depending on the grain size.

(Contd. on page 6)
• Sensitization:
  Cobalt in the form of inhalable dust can lead to hypersensitisation when inhaled.
  In the case of repeated and prolonged contact with the skin with metallic cobalt there is a possibility of
  sensitization.

• Subacute to chronic toxicity:
  Additional Information for Cobalt:

Currently in the EU cobalt metal is not classified as carcinogenic according to Annex VI of the CLP regulation
(EC No. 1272/2008). German law classified cobalt metal in the form of respirable dusts/aerosols within
Category 3 (DSD; RL 67/548/EWG). At the time of EU regulations becoming effective the positive results of
the cobalt metal study carried out by the NTP 1* were not available.
A new classification within EU regulations based on the results of that study is deemed necessary by German
authorities. Since this will be a time consuming process cobalt metal in the form of respirable dusts/aerosols
has been classified within German national regulations (TRGS 905) as category 2 (DSD) and category 1B
(CLП) in the meanwhile.


• Additional toxicological information:

Subsequent users should be aware of the fact that Co-metal fine powder are classified as “acute toxic if
inhaled, Category 1” (no legal classification); LC50 4hr ≤0,05 mg/l.
In case the subsequent use of product generates fine Co-metal particles (e.g. dust), protection measures
such as described in Chapter 7 and 8 of this information sheet must be applied.
When used and handled according to specifications, the product does not have any harmful effects according
to our experience and the information provided to us.

• Carcinogenic categories

| IARC (International Agency for Research on Cancer) | 2B |
| 7440-48-4 cobalt                                                   |
| NTP (National Toxicology Program)                                |
None of the ingredients is listed.

• OSHA-Ca (Occupational Safety & Health Administration)
None of the ingredients is listed.

12: Ecological information

• 12.1 Toxicity
  Aquatic toxicity: No further relevant information available.
• 12.2 Persistence and degradability No further relevant information available.
• 12.3 Bioaccumulative potential No further relevant information available.
• 12.4 Mobility in soil No further relevant information available.
• Additional ecological information:
  General notes: Not known to be hazardous to water.
• 12.5 Results of PBT and vPvB assessment
  PBT: Not applicable.
  vPvB: Not applicable.
• 12.6 Other adverse effects No further relevant information available.

13: Disposal considerations

• 13.1 Waste treatment methods
  Recommendation: Observe official regulations.
• Uncleaned packagings: Not applicable
14: Transport information

- Transport/Additional information:
  - Land transport DOT / TDG
    - Remarks: Non-hazardous goods from the standpoint of the specified regulations
  - Maritime transport IMDG:
    - Remarks: Non-hazardous goods from the standpoint of the specified regulations
  - Air transport ICAO-TI and IATA-DGR
    - Remarks: Non-hazardous goods from the standpoint of the specified regulations

15: Regulatory information

- 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture
  - Sara
    - Section 355 (extremely hazardous substances):
      None of the ingredient is listed.
    - Section 313 (Specific toxic chemical listings):
      7440-48-4 cobalt
    - TSCA (Toxic Substances Control Act):
      All ingredients are listed.
    - Proposition 65
      - Chemicals known to cause cancer:
        7440-48-4 cobalt
      - Chemicals known to cause reproductive toxicity for females:
        None of the ingredients is listed.
      - Chemicals known to cause reproductive toxicity for males:
        None of the ingredients is listed.
      - Chemicals known to cause developmental toxicity:
        None of the ingredients is listed.
    - Cancerogenity categories
      - EPA (Environmental Protection Agency)
        None of the ingredients is listed.
      - TLV (Threshold Limit Value established by ACGIH)
        7440-48-4 cobalt A3
      - MAK (German Maximum Workplace Concentration)
        7440-48-4 cobalt 2
      - NIOSH-Ca (National Institute for Occupational Safety and Health)
        None of the ingredients is listed.
  - National regulations:
    - Other regulations, limitations and prohibitive regulations
      e.g.
      - guidelines 67/548/ECC, 1999/45/EC
      - 1272/2008/EG (CLP)
      - 1907/2006/EG (REACH)
      - German Hazardous Substances
  - 15.2 Chemical safety assessment: Void (for articles)
16: Other information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

- Relevant phrases
  Wording of the hazard warnings mentioned (Chapter 3) for pure substances:
  H302 Harmful if swallowed.
  H317 May cause an allergic skin reaction.
  H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled.
  H350 May cause cancer. Route of exposure: Inhalative.
  H361 Suspected of damaging fertility or the unborn child.
  R22 Harmful if swallowed.
  R42/43 May cause sensitization by inhalation and skin contact.
  R49 May cause cancer by inhalation.
  R53 May cause long-term adverse effects in the aquatic environment.
  R62 Possible risk of impaired fertility

- Department issuing MSDS:
  Department HT-F
  Tel. 06181/38-2045

- Contact:
  Environmental Protection Department
  Tel. 06181/38-2359

- Date of preparation / last revision: 01/29/2015 / -

- Abbreviations and acronyms:
  IMDG: International Maritime Code for Dangerous Goods
  DOT: US Department of Transportation
  IATA: International Air Transport Association
  ACGIH: American Conference of Governmental Industrial Hygienists
  EINECS: European Inventory of Existing Commercial Chemical Substances
  ELINCS: European List of Notified Chemical Substances
  CAS: Chemical Abstracts Service (division of the American Chemical Society)
  LC50: Lethal concentration, 50 percent
  LD50: Lethal dose, 50 percent
  Acute Tox. 4: Acute toxicity, Hazard Category 4
  Resp. Sens. 1: Sensitisation - Respirat., Hazard Category 1
  Skin Sens. 1: Sensitisation - Skin, Hazard Category 1
  Carc. 1B: Carcinogenicity, Hazard Category 1B
  Repr. 2: Reproductive toxicity, Hazard Category 2

- Sources
  - KÜHN-BIRETT-Merkblätter gefährlicher Arbeitsstoffe
  - Technische Regeln für Gefahrstoffe