1 Identification

- Product identifier
  - Trade name: Böhler EMK 6
  - Application of the substance / the mixture: Rods and Wires for Welding

- Details of the supplier of the safety data sheet
  - Manufacturer/Supplier:
    voestalpine Böhler Welding Germany GmbH
    Unionstraße 1
    D-59067 Hamm
    phone +49 2381 271 - 02
    fax +49 2381 271 - 750
    www.voestalpine.com/welding

  - Information department:
    Research and Development
    Helena Stabel
    +49 2381 271 - 578;
    Helena.Stabel@voestalpine.com

  - Emergency telephone number:
    voestalpine Böhler Welding Germany GmbH
    +49 2381 271 - 578 (Germany: Mo - Th from 8am to 4pm; Fr from 8am to 1pm)

2 Hazard(s) identification

- Classification of the substance or mixture
  The product is not classified according to the Globally Harmonized System (GHS).

- Label elements
  - GHS label elements: Void
  - Hazard pictograms: Void
  - Signal word: Void
  - Hazard statements: Void
  - NFPA ratings (scale 0 - 4)
    Health = 0
    Fire = 0
    Reactivity = 0

- HMIS-ratings (scale 0 - 4)
  - HEALTH: Health = 0
  - FIRE: Fire = 0
  - REACTIVITY: Reactivity = 0

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

3 Composition/information on ingredients

- Chemical characterization: Mixtures
- Description: Mixture of the substances listed below with nonhazardous additions.
4 First-aid measures

- **Description of first aid measures**
  - **General information:** No special measures required.
  - **After inhalation:** Supply fresh air; consult doctor in case of complaints.
  - **After skin contact:** Generally the product does not irritate the skin.
  - **After eye contact:** Rinse opened eye for several minutes under running water.
  - **After swallowing:** Seek medical treatment.

- **Most important symptoms and effects, both acute and delayed** No further relevant information available.
- **Indication of any immediate medical attention and special treatment needed** No further relevant information available.

5 Fire-fighting measures

- **Extinguishing media**
  - Suitable extinguishing agents: Suitable to surrounding conditions

- **Special hazards arising from the substance or mixture** No further relevant information available.
- **Advice for firefighters**
  - Protective equipment: No special measures required.

6 Accidental release measures

- **Personal precautions, protective equipment and emergency procedures**
  - Ensure adequate ventilation
  - Use respiratory protective device against the effects of fumes/dust/aerosol.

- **Environmental precautions:** No special measures required.
- **Methods and material for containment and cleaning up:** Pick up mechanically.
- **Reference to other sections**
  - See Section 7 for information on safe handling.
  - See Section 8 for information on personal protection equipment.
  - See Section 13 for disposal information.

7 Handling and storage

- **Handling**
  - Precautions for safe handling: Ensure that suitable extractors are available on processing machines
  - Information about protection against explosions and fires: No special measures required.

- **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.

(Contd. on page 3)
Trade name: Böhler EMK 6

8 Exposure controls/personal protection

- Control parameters

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

<table>
<thead>
<tr>
<th>Component</th>
<th>PEL Ceiling limit value: 5 mg/m³ as Mn</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>REL Short-term value: 3 mg/m³ fume, as Mn</td>
</tr>
<tr>
<td></td>
<td>Long-term value: 1 mg/m³ fume, as Mn</td>
</tr>
<tr>
<td></td>
<td>TLV Long-term value: 0.02* 0.1† mg/m³ as Mn; *respirable **inhalable fraction</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Component</th>
<th>PEL Long-term value: 15* 5** mg/m³ total dust **respirable fraction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>REL Long-term value: 10* 5** mg/m³ total dust **respirable fraction</td>
</tr>
<tr>
<td></td>
<td>TLV TLV withdrawn</td>
</tr>
</tbody>
</table>

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

- Exposure controls
- Personal protective equipment:

  - General protective and hygienic measures:
    Wash hands before breaks and at the end of work.
    The usual precautionary measures for handling chemicals should be followed.
  
  - Breathing equipment: Filter P2
  
  - Protection of hands:
    Heat protection gloves (non-combustible)
    The glove material has to be impermeable and resistant to the product/ the substance/ the preparation.
    Due to missing tests no recommendation to the glove material can be given for the product/ the preparation/ the chemical mixture.
    Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation
    Rubber gloves
    Acid resistant gloves

  - Penetration time of glove material
    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
  
  - Body protection:
    Protective work clothing
    Wear hand, head, and body protection which help to prevent injury from radiation, sparks, and electrical shock. See ANSI Z49.1. At a minimum this includes welder’s gloves and a protective face shield, and may include arm protectors, aprons, hats, shoulder protection, and well as dark substantial clothing. Train the welder not to touch live electrical parts and to insulate himself from work and ground.

(Contd. on page 4)
9 Physical and chemical properties

- Information on basic physical and chemical properties
  - General Information
    - Appearance:
      - Form: Solid
      - Color: Not determined.
      - Odor: Odorless
      - Odor threshold: Not determined.
    - pH-value: Not applicable.
    - Flash point: Not applicable.
  - Flammability (solid, gaseous):
    - Not determined.
  - Decomposition temperature:
    - Not determined.
  - Auto igniting:
    - Product is not selfigniting.
  - Danger of explosion:
    - Product does not present an explosion hazard.
  - Explosion limits:
    - Lower: Not determined.
    - Upper: Not determined.
    - Relative density: Not determined.
    - Vapor density: Not applicable.
    - Evaporation rate: Not applicable.
    - Water: Insoluble.
- Partition coefficient (n-octanol/water): Not determined.
- Dynamic: Not applicable.
- Kinematic: Not applicable.
- Organic solvents: 0.0 %
- VOC content: 0.0 g/l / 0.00 lb/gl
- Other information: No further relevant information available.

10 Stability and reactivity

- Reactivity: No further relevant information available.
- Chemical stability
- Thermal decomposition / conditions to be avoided:
  - No decomposition if used and stored according to specifications.
- Possibility of hazardous reactions: No dangerous reactions known.
- Conditions to avoid: No further relevant information available.
- Incompatible materials: No further relevant information available.
- Hazardous decomposition products:
  - Reasonably expected fume constituents of this product would include:
    - Copper oxide.
    - Copper oxide.
    - Chromoxide.
    - Nickel oxide.
  - The present OSHA PEL (Permissible Exposure Limit) - published in the U.S. Federal Register 71, pages: 10099-10385 - for hexavalent Chromium (Cr +6) is 0.005 mg/m3 which will result in a significant reduction from the 5 mg/m3 general welding fume (NOC) level. It applies to soluble chromates of the types found in covered stainless electrode fumes.
  - Reasonably expected gaseous constituents would include Carbon monoxide and Carbon dioxide. Ozone and nitrogen oxides may be formed by the radiation from the arc. One recommended way to determine the composition...
and quantity of fumes and gases to which workers are exposed is to take an air sample from inside the welder's helmet if worn or in the worker's breathing zone. See ANSI/AWS F1.1 and ANSI/AWS F1.2-1992. In order to determine and evaluation of the existing problem areas, the standards EN ISO15011 –parts 1,4 can also be applied.

11 Toxicological information

Information on toxicological effects

Additional toxicological information:
The product is not subject to classification according to internally approved calculation methods for preparations: 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.

Workers exposed to hexavalent chrome (CrVI) are at an increased risk of developing lung cancer. It also possible that occupational exposure to (CrVI) may result in asthma, and damage to the nasal epithelia and skin. To avoid any risk follow the requirements of the OSHA rule for hexavalent chromium published on February 28, 2006 in the U.S. Federal Register, pages:10099-10385 which established an 8-hour time-weighted average (TWA) exposure limit of 5 micrograms of hexavalent chrome per cubic meter of air (5 µg/m³). This is a considerable reduction from the previous PEL of 1 milligram per 10 cubic meters of air (1 mg/10 m³, or 100 µg/m³) reported as Probably Chromium(VI)oxide, which is equivalent to a limit of 52 µg/m³ as (Cr+6)). This rule also contains ancillary provisions for worker protection such as requirements for exposure determination, preferred exposure control methods, including a compliance alternative for a small sector for which the new PEL is infeasible, respiratory protection, protective clothing and equipment, hygiene areas and practices, medical surveillance, recordkeeping, and start-up dates that include four years for the implementation of engineering controls to meet the PEL.

Carcinogenic categories

- IARC (International Agency for Research on Cancer)
  None of the ingredients is listed.

- 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

Toxicity

- Aquatic toxicity: No further relevant information available.
- Persistence and degradability: No further relevant information available.
- Behavior in environmental systems:
- Bioaccumulative potential: No further relevant information available.
- Mobility in soil: No further relevant information available.
- Additional ecological information:
- General notes: Generally not hazardous for water
- Results of PBT and vPvB assessment
- PBT: Not applicable.
- vPvB: Not applicable.
- Other adverse effects: No further relevant information available.
13 Disposal considerations

- Waste treatment methods
  - Recommendation: Must be specially treated adhering to official regulations.

- Uncleaned packagings:
  - Recommendation: Disposal must be made according to official regulations.

14 Transport information

- UN-Number
- Void

- DOT, ADR, ADN, IMDG, IATA
- Void

- UN proper shipping name
- DOT, ADR, ADN, IMDG, IATA
- Void

- Transport hazard class(es)
- DOT, ADR, ADN, IMDG
- Class
- Void

- IATA
- Class
- Void

- Packing group
- DOT, ADR, IMDG, IATA
- Void

- Environmental hazards:
  - Marine pollutant:
  - No

- Special precautions for user
  - Not applicable.

- 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":
  - Void

15 Regulatory information

- Safety, health and environmental regulations/legislation specific for the substance or mixture
  - No further relevant information available.

- Sara

- Section 355 (extremely hazardous substances):
  - None of the ingredient is listed

- Section 313 (Specific toxic chemical listings):
  - 7439-96-5 manganese

- TSCA (Toxic Substances Control Act):
  - All ingredients are listed.

- Proposition 65

- Chemicals known to cause cancer:
  - None of the ingredients is listed.
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- 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) 7439-96-5 manganese D
  - TLV (Threshold Limit Value established by ACGIH)
    None of the ingredients is listed.
  - NIOSH-Ca (National Institute for Occupational Safety and Health)
    None of the ingredients is listed.

- GHS label elements Void
- Hazard pictograms Void
- Signal word Void
- Hazard statements Void
- Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

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.

- Additional information:
  Recommendations for exposure scenarios, measures for risk management and identification of working conditions under which metals, metal alloys and products made of metal can be safely worked can be found attached.
  Detailed information can be found on our webpage www.voestalpine.com (Environment, REACH at voestalpine).
Recommendations for Exposure Scenarios, Risk Management Measures and to identify Operational Conditions under which metals, alloys and metallic articles may be safely welded

Welding/Brazing involves fumes which can affect human health and the environment. Fumes are a varying mixture of airborne gases and fine particles which, if inhaled or swallowed, constitute a health hazard. The degree of risk will depend on the composition of the fume, concentration of the fume and duration of exposure. The fume composition is dependent upon the material being worked, the process and consumables being used, coatings on the work such as paint, galvanising or plating, or contaminants from cleaning and degreasing activities. A systematic approach to the assessment of exposure is necessary, taking into account the particular circumstances for the operator and auxiliary worker that can be exposed.

Considering the emission of fumes when welding, brazing or cutting of metals, it is recommended to (1) arrange risk management measures through applying general information and guidelines provided by this exposure scenario and (2) using the information provided by the Safety Data Sheet, issued in accordance with REACH, by the welding consumable manufacturer.

The employer shall ensure that the risk from welding fumes to the safety and health of workers is eliminated or reduced to a minimum. The following principle shall be applied:

1. Select the applicable process/material combinations with the lowest class, wherever possible.
2. Set welding process with the lowest emission parameter.
3. Use appropriate ventilation measures in accordance with class number. In general, the use of PPE is taken into account after all other measures is applied.
4. Wear the relevant personal protective equipment in accordance with the duty cycle.

In addition, compliance with the National Regulations regarding the exposure to welding fumes of workers and related personnel shall be verified.

In the table “Risk Management Measures for individual process/material combinations” below, reference is made to the following standards for collective and personal protection measures:

- ISO 4965: Welding processes. Reference Numbers according to ISO 4962
- EN ISO 15012: Health and safety in welding and allied processes - Requirements for the use of welding and allied processes.
- EN 1533: Respiratory protective device for welding.
- EN 1234: Respiratory protective devices - Respiratory protective devices for welding.
- EN 182: Respiratory protective devices - Respiratory protective devices for welding.
- EN 1832: Respiratory protective devices - Respiratory protective devices for welding.
- BGR 190: Berufsgenossenschaftliche Regel: Sicherheit und Gesundheit bei der Arbeit.
- TRGS 526: Schweißtechnische Arbeiten (Technische Regeln für Gefahrstoffe).

Also in the table “Risk Management Measures for individual process/material combinations”, reference is made to footnotes.

The description of the following footnotes:

1. Class: approximate ranking to mitigate risk by selecting process/material combinations with the lowest value.
2. Personal Protective Equipment (PPE): required to avoid exceeding the National Exposure Limit Value (NC: duty cycle expressed in 8 hours).
3. General Ventilation (GV): Low. With additional Local Exhaust Ventilation (LEV) and extracted air to the outside, the GV or LEV capacity may be reduced to 1/3 of the original requirement.
4. General Ventilation (GV): Medium (doubled compared to Low).
5. Respiratory protection requirements for welding.
6. Filtering half mask (FFPM).
7. When an alloy consumable is used, measures from “Class V” are required.
8. Local Exhaust Ventilation (LEV) Low, extraction at source (includes table, hood, arm or torch extraction) orHelmet with powered filter (THS/PS), or helmet with external air supply (LHDS).
9. Local Exhaust Ventilation (LEV) High, extraction at source (includes table, hood, arm or torch extraction).
10. Local Exhaust Ventilation (LEV) Medium, extraction at source (includes table, hood, arm or torch extraction).
11. Not applicable.
12. Improved helmet, designed to avoid direct flow of welding fumes inside.
Risk Management Measures for individual process / base material combinations

<table>
<thead>
<tr>
<th>Class</th>
<th>Process</th>
<th>Base Materials</th>
<th>Remarks</th>
<th>Ventilation / Extraction / Filtration*</th>
<th>PPE**</th>
<th>PPE***</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>GTAW</td>
<td>All</td>
<td>Except Aluminum</td>
<td>GV low¹</td>
<td>n.r.</td>
<td>n.r.</td>
</tr>
<tr>
<td></td>
<td>SAW</td>
<td>All</td>
<td>Except Ni- and Mn-alloys</td>
<td>GV low¹</td>
<td>n.r.</td>
<td>n.r.</td>
</tr>
<tr>
<td></td>
<td>Submerged</td>
<td>All</td>
<td>Except Ni- and Mn-alloys</td>
<td>GV low¹</td>
<td>n.r.</td>
<td>n.r.</td>
</tr>
<tr>
<td></td>
<td>FCAW</td>
<td>All</td>
<td>Except stainless and Nb-alloys ¹</td>
<td>GV low¹</td>
<td>Improved heat¹</td>
<td>THSP³</td>
</tr>
<tr>
<td></td>
<td>GMAW</td>
<td>All</td>
<td>Except Cu, Ni- and Mn-alloys</td>
<td>GV low¹</td>
<td>THSP³</td>
<td>THSP³</td>
</tr>
<tr>
<td></td>
<td>Powder Plasma Arc</td>
<td>All</td>
<td>Except Cu, Ni- and Mn-alloys</td>
<td>GV low¹</td>
<td>THSP³</td>
<td>THSP³</td>
</tr>
<tr>
<td>IV</td>
<td>All processes class I</td>
<td>Painted / primed / coated</td>
<td>No Fl containing primer</td>
<td>GV low²</td>
<td>THSP⁴</td>
<td>THSP⁵</td>
</tr>
<tr>
<td></td>
<td>All processes class II</td>
<td>Painted / primed / coated</td>
<td>No Fl containing primer</td>
<td>GV low²</td>
<td>THSP⁴</td>
<td>THSP⁵</td>
</tr>
<tr>
<td>V</td>
<td>MMAW</td>
<td>Stainless, Mo- and Ni- alloys</td>
<td>n.a.</td>
<td>LEV High¹</td>
<td>ThSP¹, LDH³</td>
<td>ThSP³, LDH³</td>
</tr>
<tr>
<td></td>
<td>FCAW</td>
<td>Stainless, Mo- and Ni- alloys</td>
<td>n.a.</td>
<td>Reduced (negative) pressured area²</td>
<td>ThSP¹, LDH³</td>
<td>ThSP³, LDH³</td>
</tr>
<tr>
<td></td>
<td>GMAW</td>
<td>Co-alloys</td>
<td>n.a.</td>
<td>Reduced (negative) pressured area²</td>
<td>ThSP¹, LDH³</td>
<td>ThSP³, LDH³</td>
</tr>
<tr>
<td>VI</td>
<td>GMAW</td>
<td>Steel, Ni- and V- alloys</td>
<td>n.a.</td>
<td>Reduced (negative) pressured area²</td>
<td>ThSP¹, LDH³</td>
<td>ThSP³, LDH³</td>
</tr>
<tr>
<td></td>
<td>Argon Gas Tungsten Arc</td>
<td>All</td>
<td>n.a.</td>
<td>Reduced (negative) pressured area²</td>
<td>ThSP¹, LDH³</td>
<td>ThSP³, LDH³</td>
</tr>
<tr>
<td>VII</td>
<td>Self shielded FCAW</td>
<td>Un- Ni- high alloy steel</td>
<td>Closed wire, containing Ba</td>
<td>Reduced (negative) pressured area²</td>
<td>LEV Low¹</td>
<td>ThSP¹, LDH³</td>
</tr>
<tr>
<td></td>
<td>Self shielded FCAW</td>
<td>Un- Ni- high alloy steel</td>
<td>Closed wire, containing Ba</td>
<td>Reduced (negative) pressured area²</td>
<td>LEV Low¹</td>
<td>ThSP¹, LDH³</td>
</tr>
<tr>
<td></td>
<td>All</td>
<td>Painted / primed</td>
<td>Paint / Primer containing Ca²</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td></td>
<td>All</td>
<td>Thermal Spray</td>
<td>All</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td></td>
<td>All</td>
<td>Painted / primed / coated</td>
<td>All</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td></td>
<td>All</td>
<td>Closed system or Confined space</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
</tbody>
</table>

- Department issuing SDS: R&D
- Contact: Helena Stabel
- Date of preparation / last revision 07/25/2016 / 11

Abbreviations and acronyms:
- 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
- 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

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Trade name: Böhler EMK 6

ELINCS: European List of Notified Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)
TRGS: Technische Regeln für Gefahrstoffe (Technical Rules for Dangerous Substances, BAuA, Germany)
VOC: Volatile Organic Compounds (USA, EU)
PBT: Persistent, Bioaccumulative and Toxic
vPvB: very Persistent and very Bioaccumulative
NIOSH: National Institute for Occupational Safety
OSHA: Occupational Safety & Health
TLV: Threshold Limit Value
PEL: Permissible Exposure Limit
REL: Recommended Exposure Limit
Flam. Sol. 2: Flammable solids – Category 2

* Data compared to the previous version altered.