DEKRA Rail

Beoordeling verklaring van gelijkheid

Las toevoegmateriaal Phoenix SH Ni 2 K 130 versus Böhler FOX EV 105

15 februari 2022

Beoordeling verklaring van gelijkheid

Las toevoegmateriaal Phoenix SH Ni 2 K 130 versus Böhler FOX EV 105

Opdrachtgever	:	ProRail assetmanagement, de heer J. Smulders
Adres	:	Postbus 2038
	:	3500 GA Utrecht
Uw kenmerk	:	4044795 d.d.: 12-02-2021
Ons kenmerk	:	DR/22/200432/006
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Onderzoek	:	John Jansen
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Vrijgave	:	J.G.M. Jansen Beng, IWE
Datum	:	15 februari 2022
Versie	:	1.0 definitief

Managementsamenvatting

Voestalpine Böhler Welding Group GmbH heeft in 2020 las-toevoegmateriaal Phoenix SN Ni K 130 vervangen door Böhler FOX EV 105.

ProRail heeft DEKRA Rail gevraagd om te beoordelen of deze vervanging gelijkwaardig is.
Op basis van de beschikbare documenten is gebleken dat de nieuwe Böhler FOX EV 105 gelijkwaardig is aan de oude Phoenix SN Ni K 130.

Inhoudsopgave

1 Inleiding

In november 2021 is door Strukton en VolkerRail aangegeven dat de toegepaste elektrode voor certificaat PK OP 004 (oplassen MHH), PK OP 005 (oplasssen S1100, R320Cr en 51CrV4) en SP OP 011 (oplassen 370LHT/R370CrHT en MHH) is aangepast. Fabrikant Voestalpine Böhler Welding Group GmbH heeft op juni 2020 lastoevoegmateriaal.Phoenix SN Ni K 130 vervangen door Böhler FOX EV 105. ProRail heeft DEKRA Rail gevraagd om te beoordelen of deze vervanging gelijkwaardig is.

2 Vraagstelling

Komt toevoegmateriaal Phoenix SN Ni K 130 overeen met de Böhler FOX EV 105?

3 Methode

Gekeken is of er een “Declaration of Equality” beschikbaar is en of de “Product Data Sheets” overeenkomen met elkaar.

4 Resultaten

Voor de “Declaration of Equality”: zie Bijlage 1.
Voor de “Product Data Sheets” (PDS) Phoenix SN Ni K 130: zie Bijlage 2.
Voor de “Product Data Sheets” (PDS) Böhler FOX EV 105: zie Bijlage 3.
Voor de “Safety Data Sheet” (SDS) van de Böhler FOX EV 105: zie Bijlage 4.

5 Conclusie

In de “Declaration of Equality” is een duidelijke gelijkwaardigheidsverklaring weergegeven.
De “Product Data Sheets” zijn gelijkwaardig op het gebied van codering, chemische samenstelling en lasbaarheid met de volgende opmerkingen.

De Böhler FOX EV 105 heeft ten opzichten van de Phoenix SN Ni K 130, in gelaste conditie:

- een iets hogeren minimaal gegarandeerde vloeigrens (5,6%) en treksterkte (8,7%); en
- een iets lagere minimaal gegarandeerde rekgrens (5,8%).

Daarnaast heeft de Böhler FOX EV 105 (nog) geen DB nr. en is er een extra elektrode lengte toegevoegd voor de ø 4,0 mm, met lengte 350 mm.

Eindconclusie
De nieuwe Böhler FOX EV 105 is voldoende gelijkwaardig aan de oude Phoenix SN Ni K 130.

Bijlage 1 - Declaration of Equality

voestalpine Böhler Welding Group GmbH

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40468 Düsseldorf, Germany
T. +49 211 580660-0
F. +49 211 580660-911
www.voestalpine.com/welding

Declaration of equality
Product name change

voestalpine Böhler Welding Group GmbH hereby confirms that the following stick electrodes are equal according to EN ISO 18275-A: E 89 4 Mn2Ni1CrMo B 4 2 H5 and AWS A5.5: E12018-G

Previous name	New name
Phoenix SH Ni 2 K 130	BÖHLER FOX EV 105

They are produced according to the same manufacturing instructions using the same raw material base.

Übereinstimmungserklärung
Produktnamensänderung

voestalpine Böhler Welding Group GmbH bestätigt hiermit, dass die folgenden Stabelektroden nach EN ISO 18275-A: E 89 4 Mn2Ni1CrMo B 4 2 H5 und AWS A5.5: E12018-G übereinstimmen:

Bisheriger Name	Neuer Name
Phoenix SH Ni 2 K 130	BÖHLER FOX EV 105

Sie werden nach denselben Fertigungsvorschriften hergestellt auf derselben Rohmaterial Basis.

voestalpine Böhler Welding Group GmbH

Robin Götschl

Düsseldorf, 19.06.2020

Global Product Management
Un- and low alloyed stick electrodes

Bijlage 2 – PDS Phoenix SN Ni K 130

Phoenix SH Ni 2 K 130

Stick electrode, low-alloyed, basic

Classifications		
EN ISO 18275-A	AWS A5.5	AWS A5.5M
E 89 4 Mn2Ni1CrMo B 4 2 H5	E12018-G (E12018M mod.)	E8318-G (E8318M mod.)

Characteristics and typical fields of application

Basic covered NiCrMo alloyed electrode.
Low H_2-content ≤5 ml/100 g (HD) in the weld metal. For high strength fine grained structural steels.
Suitable for bridge building, steel and crane construction; the weld metal is insensitive to cold cracking.

Base materials

Quenched and tempered high strength fine grained structural steels, such as X-ABO 90 (S890QL)

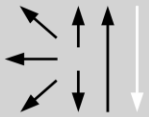
Typical analysis of all-weld metal (wt.-%)

	C	Si	Mn	Cr	Mo	Ni
wt-%	0.08	0.40	1.45	0.80	0.50	2.20

Mechanical properties of all-weld metal

Heat-treatment	Yield strength $R_{p0.2}$	Tensile strength R_m	Elongation A (L_0=5d_0)	Impact work ISO-V KV J	
	MPa	MPa	%	+20 °C	–45 °C
aw	880	920	18	90	47

Operating data



Polarity:	Redrying:	ø (mm)	L mm	Amps A
DC (+)	300 – 350 °C / 2 h (572 – 662 °F)	3.2 4.0 5.0	350 450 450	90 – 140 140 – 190 170 – 240

Approvals

DB (10.132.46), CE

05/2014
www.voestalpine.com/welding

Bijlage 3 – PDS Böhler FOX EV 105

BÖHLER FOX EV 105

Stick electrode, low-alloyed, basic coated, high-strength

Classifications

EN ISO 18275-A	AWS A5.5 / SFA-5.5	AWS A5.5M
E 89 4 Mn2Ni1CrMo B 4 2 H5	E12018-G	E8318-G
	(E12018M mod.)	(E8318M mod.)

Characteristics and typical fields of application

Basic coated NiCrMo alloyed electrode for welding of high strength steels (typical yield strength 890 MPa)
Low hydrogen content <5 ml/100 g (HD) in the weld metal. For high strength fine grained structural steels.
Suitable for bridge building, steel and crane construction; the weld metal is insensitive to cold cracking.

Base materials

Quenched and tempered fine grained structural steels up to 890 MPa yield strength.
High strength fine grained structural steels S890Q, S890QL, aldur 900 Q, aldur 900 QL, HY 130

Typical analysis

	C	Si	Mn	Cr	Ni	Mo
wt.-%	0.08	0.40	1.45	0.80	2.20	0.50

Mechanical properties of all-weld metal - typical values (min. values)

Condition	Yield strength $R_{p0.2}$	Tensile strength R_m	Elongation A (L_0=5d_0)	Impact energy ISO-V KV J	
	MPa	MPa	%	20°C	-40°C
u	930 (≥ 890)	1000 (980 - 1180)	17	90	47

u untreated, as welded

Operating data

Polarity	DC+
Electrode identification	FOX EV 105 / E 12018-G/MIL 12018-M2

Dimension mm	Current A
3.2 × 350	90 – 140
4.0 × 350	140 – 190
4.0 × 450	140 – 190
5.0 × 450	170 – 240

Approvals

CE

1 / 1 08/2020
www.voestalpine.com/welding

Bijlage 4 - SDS van de Böhler FOX EV 105

voestalpine Böhler Welding

Safety data sheet

according to 1907/2006/EC, Article 31

Printing date 30.04.2021 *Version number 16* *Revision: 16.09.2020*

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

· **1.1 Product identifier**

· **Trade name: BÖHLER FOX EV 105**
· **CAS Number:** -
· **EINECS Number:** -
· **1.2 Relevant identified uses of the substance or mixture and uses advised against**
No further relevant information available.
· **Application of the substance / the mixture**
Shielded Metal Arc Welding Electrode
The product is a manufactured article in the sense of Article 3 No. 3, 1907/2006/EC (REACh). The purpose of the present safety data sheet is therefore to provide instruction on safe usage of the product.

· **1.3 Details of the supplier of the safety data sheet**
· **Manufacturer/Supplier:**
voestalpine Böhler Welding Austria GmbH
Böhler-Welding-St. 1
8605 Kapfenberg

Tel.: +43/50304/31-0
Fax: +43/50304/71-95193
www.voestalpine.com/welding

· **Further information obtainable from:**

Research and Development
Deniece Fiedler

+43/50304/31-28299;
Deniece.Fiedler@voestalpine.com
-
· **1.4 Emergency telephone number:**

NCEC

+44 1235 239670
-

*

SECTION 2: Hazards identification

· **2.1 Classification of the substance or mixture**
· **Classification according to Regulation (EC) No 1272/2008**
The Product does not meet the criteria for classification in any hazard class according to Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures.

· **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.

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Safety data sheet

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Printing date 30.04.2021 *Version number 16* *Revision: 16.09.2020*

Trade name: BÖHLER FOX EV 105

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SECTION 3: Composition/information on ingredients

· **3.2 Chemical characterisation: Mixtures**
· **Description:** Mixture of substances listed below with nonhazardous additions.

· **Dangerous components:**

CAS: 7440-02-0 EINECS: 231-111-4 Index number: 028-002-00-7 Reg.nr.: 01-2119438727-29-XXXX	nickel Carc. 2, H351; STOT RE 1, H372 Skin Sens. 1, H317	0.1-2.5%
CAS: 7439-96-5 EINECS: 231-105-1 Reg.nr.: 01-2119449803-34-XXXX	manganese substance with a Community workplace exposure limit	0.1-2.5%

· **Additional information:** For the wording of the listed hazard phrases refer to section 16.

SECTION 4: First aid measures

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

SECTION 5: Firefighting measures

· **5.1 Extinguishing media**
· **Suitable extinguishing agents:** Suitable to surrounding conditions.
· **5.2 Special hazards arising from the substance or mixture** No further relevant information available.
· **5.3 Advice for firefighters**
For deletion of fire just use dry powders. Don't use any water or halogenated containing extinguishing agents
· **Protective equipment:** No special measures required.

SECTION 6: Accidental release measures

· **6.1 Personal precautions, protective equipment and emergency procedures**
Ensure adequate ventilation
Use respiratory protective device against the effects of fumes/dust/aerosol.
· **6.2 Environmental precautions:** Do not allow to enter sewers/ surface or ground water.
· **6.3 Methods and material for containment and cleaning up:** Pick up mechanically.
· **6.4 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.

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SECTION 7: Handling and storage

· **7.1 Precautions for safe handling** Ensure that suitable extractors are available on processing machines
· **Information about fire - and explosion protection:** 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.
· **7.3 Specific end use(s)** No further relevant information available.

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SECTION 8: Exposure controls/personal protection

· **8.1 Control parameters**

· **Ingredients with limit values that require monitoring at the workplace:**	
7439-96-5 manganese	
IOELV	Long-term value: 0.2* 0.05** mg/m³ as Mn; *inhalable, **respirable fraction

· **Additional information:** The lists valid during the making were used as basis.

· **8.2 Exposure controls**
· **Personal protective equipment:**
· **General protective and hygienic measures:** Wash hands before breaks and at the end of work.
· **Respiratory protection:** Filter P2
· **Protection of hands:**
EN 12477
Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation
· **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

SECTION 9: Physical and chemical properties

· **9.1 Information on basic physical and chemical properties**	
· **General Information**	
· **Appearance:**	
Form:	Solid
Colour:	According to product specification
· **Odour:**	Odourless
· **Odour threshold:**	Not determined.
· **pH-value:**	Not applicable.
· **Flash point:**	Not applicable.
· **Flammability (solid, gas):**	Not determined.
· **Decomposition temperature:**	Not determined.
· **Auto-ignition temperature:**	Product is not selfigniting.

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Trade name: BÖHLER FOX EV 105

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· **Explosive properties:**	Product does not present an explosion hazard.
· **Explosion limits:**	
Lower:	Not determined.
Upper:	Not determined.
· **Density:**	Not determined.
· **Relative density**	Not determined.
· **Vapour density**	Not applicable.
· **Evaporation rate**	Not applicable.
· **water:**	Insoluble.
· **Partition coefficient: n-octanol/water:**	Not determined.
· **Dynamic:**	Not applicable.
· **Kinematic:**	Not applicable.
· **9.2 Other information**	No further relevant information available.

SECTION 10: Stability and reactivity

· **10.1 Reactivity** No further relevant information available.
· **10.2 Chemical stability**
· **Thermal decomposition / conditions to be avoided:**
No decomposition if used and stored according to specifications.
· **10.3 Possibility of hazardous reactions** Attacks materials containing glass and silicate.
· **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.

SECTION 11: Toxicological information

· **11.1 Information on toxicological effects**
· **Acute toxicity** Based on available data, the classification criteria are not met.
· **Primary irritant effect:**
· **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 or skin sensitisation** Based on available data, the classification criteria are not met.
· **Additional toxicological information:**
· **Repeated dose toxicity**
· **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.

SECTION 12: Ecological information

· **12.1 Toxicity**
· **Aquatic toxicity:** No further relevant information available.
· **12.2 Persistence and degradability** No further relevant information available.

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Trade name: BÖHLER FOX EV 105

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· ***12.3 Bioaccumulative potential*** *No further relevant information available.*
· ***12.4 Mobility in soil*** *No further relevant information available.*
· ***Additional ecological information:***
· ***General notes:*** *Water hazard class 1 (German Regulation) (Self-assessment): slightly hazardous for 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.*

SECTION 13: Disposal considerations

· ***13.1 Waste treatment methods***
· ***Recommendation*** *Must be specially treated adhering to official regulations.*

· ***European waste catalogue***	
12 01 13	*welding wastes*

· ***Uncleaned packaging:***
· ***Recommendation:*** *Disposal must be made according to official regulations.*

SECTION 14: Transport information

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

SECTION 15: Regulatory information

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

· ***Directive 2012/18/EU***
· ***Named dangerous substances - ANNEX I*** *None of the ingredients is listed.*

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· ***REGULATION (EC) No 1907/2006 ANNEX XVII*** *Conditions of restriction: 27*

· ***DIRECTIVE 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment – Annex II***

None of the ingredients is listed.

· ***REGULATION (EU) 2019/1148***

· ***Annex I - RESTRICTED EXPLOSIVES PRECURSORS (Upper limit value for the purpose of licensing under Article 5(3))***

None of the ingredients is listed.

· ***Annex II - REPORTABLE EXPLOSIVES PRECURSORS***

None of the ingredients is listed.

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

SECTION 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).

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Welding Exposure Scenario WES - ENGL **EWA2011**

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 produces 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, galvanizing or plating, oil 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 ancillary 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, whenever possible.
2- Set welding process with the lowest emission parameter.
3- Apply the relevant collective protective measure 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 welders 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 4063	Welding process Reference Numbers according to ISO 4063
EN ISO 15012-1:2004	Health and safety in welding and allied processes - Requirements testing and marking of equipment or air filtration - Part 1: Testing of the separation efficiency for welding fume
EN ISO 15012-2:2008	Health and safety in welding and allied processes - Requirements, testing and marking of equipment for air filtration - Part 2: Determination of the minimum air volume flow rate of captor hoods and nozzles
EN 149:2001	Respiratory protective devices - Filtering half masks to protect against particles - Requirements, testing, marking (FFP1 - FFP2 - FFP3)
EN 1835:2000	Respiratory protective devices. Light duty construction compressed air line breathing apparatus incorporating a helmet or a hood. Requirements, testing, marking (LDH1 - LDH2 - LDH3).
EN 12941:1998	Respiratory protective devices. Powered filtering devices incorporating a helmet or a hood. Requirements, testing, marking (TH1 - TH2 - TH3).
EN 143:2000	Respiratory protective devices — Particle filters — Requirements, testing, marking (P1, P2, P3)
Directive 1998/24/EC	Article 6.2 on the protection of the health and safety of workers from the risks related to chemical agents at work
BGR 190	Benutzung von Atemschutzgeräten (Berufsgenossenschaftliche Regel für Sicherheit und Gesundheit bei der Arbeit)
TRGS 528	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 these footnotes:

[1] Class: approximate ranking to mitigate risk by selecting process/material combinations with the lowest value. Identified collective and individual risk management measures shall be applied
[2] Personal Protective Equipment (PPE) required avoiding exceeding the National Exposure Limit Value (DC: Duty cycle expressed on 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 1/5 of the original requirement.
[4] General Ventilation (GV) Medium (double compared to Low)
[5] Filtrating half mask (FFP2)
[6] When an alloyed consumable is used, measures from "Class V" are required
[7] General Ventilation (GV) Low. When no Local Exhaust Ventilation, the ventilation requirement is 5-fold
[8] Filtrating half mask (FFP3), helmet with powered filters (TH2/P2), or helmet with external air supply (LDH2)
[9] Reduced (negative) pressured Area: A separate, ventilated area where reduced (negative) pressure, compared to the surrounded area, is maintained
[10] Local Exhaust Ventilation (LEV) High, extraction at source (includes table, hood, arm or torch extraction)
[11] Helmet with powered filters (TH3/P3), or helmet with external air supply (LDH3)
[12] Local Exhaust Ventilation (LEV) Low, extraction at source (includes table, hood, arm or torch extraction)
[13] Local Exhaust Ventilation (LEV) Medium, extraction at source (includes table, hood, arm or torch extraction)
[14] Recommended measures to comply with national maximum allowable limits. Extracted fumes, for all materials except unalloyed steel and aluminium, shall be filtered before release in the outside environment.
[15] A confined space, despite its name, is not necessarily small. Examples of confined spaces include ship, silos, vats, utility vaults, tanks, etc.
[16] Improved helmet, designed to avoid direct flow of welding fumes inside
n.a. Not applicable
n.r. Not recommended

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Safety data sheet

according to 1907/2006/EC, Article 31

Printing date 30.04.2021 *Version number 16* *Revision: 16.09.2020*

Trade name: BÖHLER FOX EV 105

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Welding Exposure Scenario WES - ENGL **EWA2011**

Risk Management Measures for individual process / base material combinations

Class[1]	Process (according to ISO 4063)	Base Materials	Remarks	Ventilation / Extraction / Filtration[14]	PPE[2] DC<15%	PPE[2] DC>15%
Non-confined space[15]						
I	GTAW 141 SAW 12 Autogeneous 3 PAW 15 ESW/EGW 72/73 Resistance 2 Stud welding 78 Solid state 521	All	Except Aluminium	GV low[3]	n.r.	n.r.
	Gases Brazing 9	All	Except Cd- alloys	GV low[3]	n.r.	n.r.
II	GTAW 141	Aluminium	n.a.	GV medium[4]	n.a.	FFP2[8]
III	MMAW 111	All	Except Be-, V- , Mn-, Ni- alloys and Stainless[5]	GV low[7] LEV low[12]	Improved helmet[16]	FFP2[8]
	FCAW 136/137	All	Except Stainless and Ni- alloys[6]			
	GMAW 131/135	All	Except Cu-, Be-, V-alloys[6]			
	Powder Plasma Arc 152	All	Except Be-, V-, Cu- , Mn-, Ni-alloys and Stainless[6]			
IV	All processes class I	Painted / primed / oiled	No Pb containing primer	GV low[3]	FFP2[8]	FFP3, TH2/P2, or LDH2[8]
	All processes class III	Painted / primed / oiled	No Pb containing primer	GV low[7] LEV low[12]		
V	MMAW 111	Stainless, Ni-, Be-, and V-alloys	n.a.	LEV high[10]	TH3/P3, LDH3[11]	TH3/P3, LDH3[11]
	FCAW 136/137	Stainless, Mn- and Ni-alloys				
	GMAW 131	Cu-alloys				
	Powder Plasma Arc 152	Stainless, Mn-, Ni-, and Cu- alloys				
VI	GMAW 131	Be-, and V-alloys	n.a.	Reduced (negative) pressured area[9] LEV low[12]	TH3/P3, LDH3[11]	TH3/P3, LDH3[11]
	Powder Plasma Arc 152					
VII	Self shielded FCAW 114	Un-, high alloyed steel	Cored wire, not containing Ba	Reduced (negative) pressured area[9] LEV medium[13]		
	Self shielded FCAW 114	Un-, high alloyed steel	Cored wire, containing Ba	Reduced (negative) pressured area[9] LEV high[10]	TH3/P3, LDH3[11]	TH3/P3, LDH3[11]
	All	Painted / primed	Paint / Primer containing Pb			
	Arc Gouging and Cutting 8	All	n.a.			
	Thermal Spray	All	n.a.			
	Gases Brazing 9	Cd- alloys	n.a.			
Closed system or Confined space[15]						
I	Laser Welding 52 Laser Cutting 84 Electron Beam 51	All	Closed system	GV medium[4]	n.a.	n.a.
VIII	All	All	Confined space	LEV high[10] External air supply	LDH3[11]	LDH3[11]

· ***Relevant phrases***
H317 May cause an allergic skin reaction.
H351 Suspected of causing cancer.
H372 Causes damage to organs through prolonged or repeated exposure.

· ***Department issuing SDS:*** *Research and Development*
· ***Contact:*** *Deniece Fiedler*
· ***Abbreviations and acronyms:***
NCEC - National Chemical Emergency Centre (=Carechem24)
ADR: Accord relatif au transport international des marchandises dangereuses par route (European Agreement Concerning the International Carriage of Dangerous Goods by Road)

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Safety data sheet

according to 1907/2006/EC, Article 31

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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
ELINCS: European List of Notified Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
TRGS: Technische Regeln für Gefahrstoffe (Technical Rules for Dangerous Substances, BAuA, Germany)
PBT: Persistent, Bioaccumulative and Toxic
vPvB: very Persistent and very Bioaccumulative
Skin Sens. 1: Skin sensitisation – Category 1
Carc. 2: Carcinogenicity – Category 2
STOT RE 1: Specific target organ toxicity (repeated exposure) – Category 1

· **** Data compared to the previous version altered.***