

PED- Pressure Equipment Directive 97/23/EC

- European Approval for Materials -

This data sheet has been raised in accordance with the requirements of Article 11 of the Pressure Equipment Directive (97/23/EC). The material described within is not included in a standard which has been harmonised to the afore mentioned directive.

EAM-0526-30-1:2006/03

Submitted by: **Notified Body 0526**

CETIM - BP. 80067 - 52 avenue Félix Louat
F-60304 SENLIS CEDEX – France.
Tel. +33.344673479 Fax. +33.344673427
e-mail chaieb.jarboui@cetim.fr

EAM – 0526-30-1-Rev2 - EN

Date: **15 March 2006**

Designation

EAM-NiCr23Mo16Cu

Type of material

Nickel-chromium- Molybdenum alloy – Bars and rods

1	Material Designation	<table border="0"> <tr> <td>1.1</td> <td>Classification:</td> <td>0526-30-1:2006/03</td> </tr> <tr> <td>1.2</td> <td>Name:</td> <td>NiCr23Mo16Cu</td> </tr> <tr> <td>1.3</td> <td>Material Ref. No.:</td> <td>2.4675 (Werkstoffnummer)</td> </tr> <tr> <td>1.4</td> <td>UNS Ref. No.:</td> <td>N06200</td> </tr> <tr> <td>1.5</td> <td>ISO/TR 15608:2000</td> <td>Group 44</td> </tr> </table>	1.1	Classification:	0526-30-1:2006/03	1.2	Name:	NiCr23Mo16Cu	1.3	Material Ref. No.:	2.4675 (Werkstoffnummer)	1.4	UNS Ref. No.:	N06200	1.5	ISO/TR 15608:2000	Group 44
1.1	Classification:	0526-30-1:2006/03															
1.2	Name:	NiCr23Mo16Cu															
1.3	Material Ref. No.:	2.4675 (Werkstoffnummer)															
1.4	UNS Ref. No.:	N06200															
1.5	ISO/TR 15608:2000	Group 44															
2	Standards to which consideration and or reference has been given.	<p>This EAM incorporates by dated reference provisions from other publications. These references are cited in the text and in the following list. Subsequent amendments to, or revisions of any of these publications apply to this EAM only when incorporated in an amendment or revision to this EAM.</p> <table border="0"> <tr> <td>2.1</td> <td>VdTÜV 539 – 06/2003 (Origin) modified to reflect the actual material deliveries.</td> </tr> <tr> <td>2.2</td> <td>EN 10002-1:2001</td> </tr> <tr> <td>2.3</td> <td>EN 10002-5:1992</td> </tr> <tr> <td>2.4</td> <td>EN 10045-1:1990</td> </tr> <tr> <td>2.5</td> <td>EN 10204:2004</td> </tr> <tr> <td>2.6</td> <td>EN 910:1996</td> </tr> <tr> <td>2.7</td> <td>EN ISO 3651-2:1998, Method C</td> </tr> </table>	2.1	VdTÜV 539 – 06/2003 (Origin) modified to reflect the actual material deliveries.	2.2	EN 10002-1:2001	2.3	EN 10002-5:1992	2.4	EN 10045-1:1990	2.5	EN 10204:2004	2.6	EN 910:1996	2.7	EN ISO 3651-2:1998, Method C	
2.1	VdTÜV 539 – 06/2003 (Origin) modified to reflect the actual material deliveries.																
2.2	EN 10002-1:2001																
2.3	EN 10002-5:1992																
2.4	EN 10045-1:1990																
2.5	EN 10204:2004																
2.6	EN 910:1996																
2.7	EN ISO 3651-2:1998, Method C																

Copyright: No copying without CETIM permission except as permitted by copyright law.

Original copies of this European Approval for Materials may be obtained from CETIM at the address detailed above, an administration charge of 20 € is payable with the order. This EAM can be free downloaded on the Commission web site

http://europa.eu.int/comm/enterprise/pressure_equipment/eam_published.htm.

This document has unrestricted use by public administration and other Notified Bodies within the context of PED 97/23/EC.

3	Limiting Dimensions	Form	Dimensions												
		Bars	Thickness (mm)							Diameter (mm)					
			Up to and including 90 mm							-					
4	Melting Method	4.1 Electric Arc Process and vacuum or argon process													
		4.2 Induction Furnace Process and vacuum or argon process													
5	Production Method / Delivery Condition	5.1 Hot Rolled } Solution annealing (see section 10)													
		5.2 Forged }													
		The products shall be free from surface and internal defects which might impair their usability.													
6	Application Temperatures	6.1 -196 °C to 450 °C													
		6.2 The material is suitable for use down to -196 °C. For use below -10 °C, impact energy values and verification procedures shall be agreed at the time of ordering.													
7	Chemical Composition Ladle and Product	% Composition by Weight													
			Ni	C	Si	Mn	S	P	Fe	Cr	Mo	Cu	Co	Al	
		Minimum	Rest	-	-	-	-	-	-	22,0	15,0	1,30	-	-	
	Maximum		0,01	0,08	0,50	0,010	0,010	3,0	24,0	17,0	1,90	2,0	0,50		
8	Mechanical and Technological requirements	8.1 Minimum Tensile Properties at Room Temperature (RT)													
		Rp0.2 (MPa)			Rp1.0 (MPa)			Rm (MPa)			A (%) (both 5d and 5.65√So)				
		280			300			690 - 950			45				
	Tensile Properties	8.2 Minimum proof strength values at Elevated Temperature (°C) ¹⁾													
		100		200		300		400		450					
		Requirement (MPa)													
		Rp1.0		265		225		200		185		180			
		Rp0.2		250		215		190		165		155			
		¹⁾ For design calculations no interpolation between stated values is permitted (unless the design code explicitly provides for it). The values at the higher temperature shall be used. These property values are taken from VdTÜV 539													
	Verification Test Direction	8.3 Longitudinal (see section 9).													

 N.B. 1 MPa = 1 N/mm²

8	Other Properties	8.4 Minimum Impact Properties, Transverse direction (Charpy ISO - V) EN 10045-1			
		<ul style="list-style-type: none"> ▪ at RT: KVmin = 120 Joules ▪ at -196 °C: KVmin = 96 Joules 			
		8.5 Modulus of Elasticity (kN/mm ²)			
		Temperature (°C)	20	200	400
		E-Modulus	206	197	185
		8.6 Intergranular corrosion properties EN ISO 3651 Method C.			
9	Testing	9.1 Type of Inspection and Test			
		Test / Inspection	Frequency	Reference	
		Cast Analysis	One per cast	Section 7	
		Product Analysis	One per cast (if required and agreed at the time of ordering by the purchaser).	Section 7	
		Positive Material identification	All Items	Section 7	
		9.2 Tensile Test at RT			
		Product form	Frequency	Reference	
		Bars	One longitudinal test at one end per 500 kg per cast per heat treatment for comparable dimensions. Maximum 4 samples per cast and 1 sample per part.	Section 8.1 and EN 10002-1	
		9.3 Elevated Temperature Tensile Tests			
		Product Form	Frequency	Reference	
		All product forms with operating temperatures > 50 °C	One longitudinal test per cast from the product with the largest thickness at specified temperature (or 450 °C if not specified).	Section 8.3 and EN 10002-5	

9	Testing	9.4 Impact Testing			
		Verification of impact properties is only required when specified by the purchaser at the time of ordering.			Reference
		The values stated in section 8.4 shall be the minimum average of 3 specimens, with only one individual specimen value allowed up to a maximum of 30 % lower.			Section 8.4 and EN 10045-1
		9.5 Corrosion test			
		Product Form	Frequency		Reference
		All	First finished worked product made from the relevant cast		Section 8.6
		9.6 Visual Inspection ¹⁾			
		Product Form	Frequency		Reference
		All	All items		
		9.7 Dimensional Inspection ¹⁾			
		Product Form	Frequency		Reference
All	All items				
¹⁾ 100 % inspection of all products by the manufacturer. Dimensional tolerances for all product forms shall be agreed between the manufacturer and purchaser at the time of ordering.					
10	Heat Treatment	Method	Temperature (°C)	Holding Time (min)	Cooling
		Solution Annealing	1120 to 1149	Depending of thickness, shall be agreed with the material manufacturer	Water, compressed air, shielding gas
11	Joining	11.1 Welding			
		<p>This material has, historically, proven suitable for fusion welding by the TIG (141) and MIG (131) welding process using appropriate filler material, e.g. Typ NiCr23Mo16Cu (No. 2.4698*). The MMA (111) welding process with coated electrodes using appropriate filler material, e.g. Typ NiCr23Mo16Cu (No. 2.4699*) may also be applied, but it is important to consult material manufacturer and other interested parties to insure that appropriate precaution are implemented.</p> <p>The use of submerged arc welding for this alloy is not recommended.</p> <p>Information supplied by the consumable manufacturer on the filler wires suitability must be considered, especially with regard to sulphur sensitivity and both low and elevated temperature properties.</p> <p>The material does not normally require preheat neither post-welded heat treatment.</p> <p>Welding operations, however, must be carried out at a temperature of more than 5 °C. The temperature between passes must be keep relatively low i.e. less than 150 °C.</p> <p>Where cold forming exceeds 15 %, solution annealing shall be performed prior to welding.</p> <p>Consultation with the material manufacturer's technical department is recommended when choosing a filler wire or welding process.</p> <p>* Werkstoffnummer</p>			
		11.2 Bend properties on welded joint: (on production test coupon)			
		<p>Bending test at room temperature on welded joint shall be carried out on mandrel with diameter, D = 3.a (a: specimen thickness) according to EN 910;</p> <p>Bending angle: 180 °.</p>			

12	Forming	<p>12.1 Hot and Cold forming</p> <p>This material is suitable for both hot and cold forming subject to the following provisions:</p> <ol style="list-style-type: none"> 1) Hot forming shall occur at between 950 °C to 1235 °C followed by solution annealing (see section 10). 2) Where cold forming deformation exceeds 15 % a solution annealing shall be performed (see section 10). 3) The material is sensitive to sulphur above 400 °C, therefore the surface should be carefully cleaned before heating: hot forming, welding or heat treatment.
13	Marking	<p>Material shall be marked with the following information:</p> <ol style="list-style-type: none"> 1) Manufacturers identification mark 2) Cast/melt number 3) Test or manufacturing batch number 4) Material grade 5) EAM reference No. <p>Markings shall normally be by permanent ink marking or vibro-etching.</p>
14	Inspection documents	<p>14.1 Document type</p> <ol style="list-style-type: none"> 1) Material manufacturers shall supply documentation affirming compliance with this EAM. This documentation shall normally be in the form of an inspection certificate in accordance with EN 10204 - 3.1. <i>Note: Where a material manufacturer has an appropriate quality assurance system, certified by a competent body, established within the community and having undergone a specific assessment for materials, certificates issued by the manufacturer are presumed to certify conformity with the requirements of section 4.3 of Annex I of the PED.</i> 2) If an inspection report in accordance with EN 10204 - 3.2 is specified, the purchaser shall notify the manufacturer of the name and address of the organisation or person who is to carry out the inspection and produce the inspection document. In the case of the inspection report 3.2 it shall be agreed which party shall issue the certificate. <i>Note: The affirmation of the compliance of the delivery with this EAM is not a mandatory requirement of the previous edition of EN 10204:1991. Such affirmation – as it is required by PED, 97/23/EC, in Annex I 4.3 first paragraph – can be added into the text of the inspection certificate 3.1 B, 3.1 C or Inspection Report 3.2, when it is signed by the material manufacturer. It could also be provided in a separate document. In the case the inspection certificate is signed by a third party, the affirmation shall be contained in a document which is (also) signed by the manufacturer.</i>

14	Inspection documents	<p data-bbox="456 248 906 277">14.2 Content of inspection documents</p> <ol data-bbox="531 322 1501 1084" style="list-style-type: none">1) Details of the manufacturer2) Details of the purchaser (if required)3) Description and dimensions of the product4) Supply conditions5) Ladle analysis6) Product analysis (if required)7) Results from mechanical verification tests8) Heat treatment applied9) Results from other applicable tests (e.g. PMI)10) Marking and identification11) Affirmation of compliance with this EAM12) Declaration of the status of the manufacturers quality system (including the name of the competent body having certified the quality system, if applicable).
----	----------------------	--