

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-0526-40:2006/03

Submitted by: **Notified Body 0526**

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EAM – 0526-40-Rev2-EN

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Designation

EAM-NiCr22Mo9Nb-gr.1

Type of material

Nickel-Chromium- Molybdenum alloy – Flat products

1	Material Designation	1.1 Classification: 0526-40:2006/03 1.2 Name: NiCr22Mo9Nb-gr.1 1.3 Material Ref. No.: 2.4856 (Werkstoffnummer) 1.4 UNS Ref. No.: N06625 1.5 ISO/TR 15608:2000 Group 43
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> 2.1 VdTÜV 499 – 09/2002 (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 ISO 6506-1:1999 2.7 EN ISO 6507-1:1998 2.8 EN ISO 3651-2:1998, Method C 2.9 ASTM G28 B:1997

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3	Limiting Dimensions	Form	Dimensions													
		Flat products	Thickness (mm)					Diameter (mm)								
			Up to and including 30 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 Cold Rolled														
		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	% Composition by Weight														
			Ni	Cr	Fe	C	Mn	Si	Co	Mo	Ti	Al	Nb + Ta	P	S	
		Ladle	Min.	58.0	21.0	-	-	-	-	-	8.0	-	-	3.2	-	-
			Max.	Rest	23.0	5.0	0.030	0.50	0.40	1.0	10.0	0.40	0.40	3.8	0.010	0.010
		Product	Min.	58.0	20.8	-	-	-	-	-	7.8	-	-	3.0	-	-
			Max.	Rest	23.2	5.1	0.033	0.55	0.45	1.1	10.2	0.45	0.45	4.0	0.015	0.015
8	Mechanical and Technological requirements	8.1 Minimum Tensile Properties at Room Temperature (RT)														
		Rp0.2 (MPa)			Rm (MPa)				A (%) (both 5d and 5.65√So)							
		e ≤ 3 mm	3 < e ≤ 30 mm		e ≤ 3 mm		3 < e ≤ 30 mm		e ≤ 3 mm		3 < e ≤ 30 mm					
		400	380		830 - 1000		760 - 1000		30 *		35					
		* Elongation on 80mm reference length														
	Tensile Properties	8.2 Minimum Tensile Properties at Elevated Temperature (°C) ¹⁾														
		100			200			300			400			450		
		Requirement (MPa)														
		Rp0.2			320			300			280			270		
		Rm			700			685			670			660		
		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 499														
Verification Test Direction	8.3 Transverse or 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 = 100 Joules ▪ at -196 °C: KVmin = 64 Joules 			
		8.5 Modulus of Elasticity (kN/mm ²)			
		Temperature (°C)	20	200	400
		E-Modulus	209	195	185
		8.6 Intergranular corrosion properties EN ISO 3651 Method C or if specified, ASTM G28 B			
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	
		Plate e ≤ 30 mm	Length ≤ 5 m: 1 Transverse test at one end.	Section 8.1 and EN 10002-1	
			Length > 5 m: 1 Transverse test per plate at each end.		
		Coil Strip e ≤ 3 mm	1 Transverse test at each end of the coil, longitudinal for coil width < 200 mm		
		9.3 Elevated Temperature Tensile Tests			
		Product Form	Frequency	Reference	
		All product forms with operating temperatures > 50 °C	One Transverse test per cast from the product with the largest thickness, longitudinal for coil width < 200 mm	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
		Sheet / plate	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	950 to 1050	e ≤ 3 mm: 1 to 15 min	Water For product thickness up to 1.5 mm, rapid air cooling should be acceptable
				3mm < e ≤ 30 mm: 5 to 90 min depending of thickness shall be agreed with the material manufacturer	
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 SG-NiCr21Mo9Nb (No. 2.4831*). The MMA (111) welding process with coated electrodes using appropriate filler material, e.g. Typ E-NiCr20Mo9Nb (No. 2.4621*) 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>Preheating and post-heating are not accepted for this alloy. Stress relief annealing is not required after welding.</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>					
* Werkstoffnummer					

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 900 °C to 1150 °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="456 250 906 280">14.2 Content of inspection documents</p> <ol data-bbox="531 322 1501 1084" style="list-style-type: none"><li data-bbox="531 322 927 351">1) Details of the manufacturer<li data-bbox="531 383 1034 412">2) Details of the purchaser (if required)<li data-bbox="531 443 1107 472">3) Description and dimensions of the product<li data-bbox="531 504 815 533">4) Supply conditions<li data-bbox="531 564 775 593">5) Ladle analysis<li data-bbox="531 624 948 654">6) Product analysis (if required)<li data-bbox="531 685 1098 714">7) Results from mechanical verification tests<li data-bbox="531 745 876 775">8) Heat treatment applied<li data-bbox="531 806 1142 835">9) Results from other applicable tests (e.g. PMI)<li data-bbox="531 866 911 896">10) Marking and identification<li data-bbox="531 927 1075 956">11) Affirmation of compliance with this EAM<li data-bbox="531 987 1501 1084">12) Declaration of the status of the manufacturers quality system (including the name of the competent body having certified the quality system, if applicable).
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