

ThyssenKrupp

PO# 80021

Wgt 6901

CPA 12 F0E40

5 pcs - 816.00

x 2.150" Hk



CARRS STAINLESS STEELS

A Division of ELG Haniel Metals Ltd.

Wadsley Bridge, Sheffield, S6 1LL, England

Telephone: 0114 285 6866
 Fax No.: 0114 285 4962
 Website: http://www.elgcarrs.co.uk
 e-mail: info@elgcarrs.co.uk

Handwritten signature

Purchase - Acheteur ESP Specialty Steel Products 7404 Railhead Lane Houston TX 77086 USA	Inspection Certificate: Abnahmeprüfzeugnis: Certificat de reception:	DIN 50049 3.1 EN 10204	Cert No: Zeugnis Nr: Cert No:	145767	Date: Datum: Date:	29/03/16
	Customer Order No: Kundenbestellnummer: No. de Commande Client:	P04297		Product Description - Beschreibung des Erzeugnisses - Description du Produit:		
	Our Order No: Unsere Auftr.-Nr: notre Comm. No:	55098 W148433/00		16.125in Dia. x 10000lbs Electric Melt & Vacuum Degassed Stainless Steel Solution Annealed Forged SS1 REV 5.316/3.16L/F316/F316L ASTM A276-13a, A479-14, A182-14b, A484-14a, A193-14 B8M CL1 ASME SA182, ASME SA479, ASME SA193 B8M CL1, SAE AMS-QQ-S-763B AMS 5653, AMS 5648, NACE MR0175, ISO 15156-3, NACE MR0103		

Chemical Analysis - Chemische Analyse - Analyse Chimique												
Cast No Schmelznummer No. de Cotelee	C	Si	Mn	P	S	Cr	Mo	Ni	Cu	N	Co	
CD25645	.015	.36	1.48	.039	.023	16.79	2.06	10.08	.36	.050	.20	

Heat Treatment - Wärmebehandlung - Traitement Thermique: Solution annealed @ 1940 F for 4 hours & Water Quenched

Mechanical Properties - Mechanische Eigenschaften - Caracteristiques Mechanique										
Test No Probe Nr No. d'essai	Test dimension Probaßmessung Dimension	Proof Stress Streckgrenze Limite d'Elasticite 0.2%	Rp 1.0%	Tensile strength Zugfestigkeit Resistance a la traction	Elong % A Bruchdehnung % Allongement % Lo.5D 4D	Red of Area % Bruchsehnung % Striction %	Z	Impact Kerbschlagzähigkeit Resilience	Hardness Härte Durete	
MR4781	16.125" L	264 MPa	308 MPa	552 MPa	55 %	58 %	76 %		131 HB	1

Remarks - Bemerkungen - Remarques

Ultrasonically tested to ASTM A388 and found satisfactory
 Intercrystalline corrosion test to ASTM A262:E satisfactory
 Intercrystalline corrosion test to ASTM A262:A satisfactory
 Grain size to ASTM E112 - 00
 Microstructure and macrostructure see attached sheet.
 No welding performed
 No contact with Mercury or radioactive elements
 Nominal Size = 16" dia
 Material produced by ELG Carrs Stainless Steels in the United Kingdom
 Hot Working Reduction - 3.2:1

This report is a copy of original mill certificate and verifies that the product meets the requirements as originally ordered by Energy Steel Products.

9/6/16 VERIFIED BY: [Signature]

The material detailed has been manufactured and tested in accordance with the Quality Assurance system ISO 9001:2008 and the requirements of the specification/ order.



Signed: [Signature]
 Chris Ryall - Quality Manager

Approved signatory for ELG Carrs Stainless Steels

Del.: 2404786842
 Cstor 80021
 Date 09/27/2016

From: TK Materials CA, Ltd.
 Cust. NEXXA INDUSTRIES LTD.
 CstAr
 Wgt.: 620 LB

Sep 28/16
 i-c

	TECHNICAL REPORT No. 195588	
Metals Technology (Testing) Ltd 6 Finchwell Close Handsworth Sheffield S13 9DF	Tel: 0114 243 7271 Fax: 0114 243 7288 office@metalstechnology.co.uk	Page 1 of 2 Our Ref: CB/GT Date 26/03/2015
<u>METALLURGICAL ASSESSMENT OF 316L MATERIAL</u>		
<p><u>Introduction</u></p> <p>A sample of a 16.125" Diameter Segment, 316L (Energy Prod SS1 Rev 5) material, was received for metallurgical assessment. The sample was identified as cast number CD25645 and supplied under covering order 033688 W148433/00</p> <p><u>Work Carried Out</u></p> <ol style="list-style-type: none"> 1. Microexamination 2. Microexamination in accordance with ASTM A262-13 Practice A 3. Grain Size Assessment to ASTM E112-12 (Comparison Method) 4. Macroexamination <p><u>Results</u></p> <ol style="list-style-type: none"> 1. <u>Microexamination</u> <p>A longitudinal sample was prepared to a 1µm finish using standard metallographic techniques and then etched in Kalling's No. 2 and examined at a magnification of X500.</p> <p>The sample exhibited a structure of twinned equi-axed austenite grains with occasional evidence of delta ferrite stringers. There was no evidence of any grain boundary carbides or intermetallic phases.</p> 2. <u>Microexamination in accordance with ASTM A262-13 Practice A</u> <p>Prior to testing, a longitudinal sample was heat treated to 675°C for 1 hour then air cooled.</p> <p>The sample was prepared to a 1µm finish using standard metallographic techniques and then etched electrolytically in 10% oxalic acid and examined at a magnification of X500.</p> <p>The sample exhibited a microstructure similar to fig 6. End grain pitting 1 (A few deep end grain pits and shallow etch pits..</p> 		
Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.		
Circulation:	Mr. D. Greaves & M.T.T. Archive	
Address:	Carrs Stainless Steels, Wadsley Bridge, SHEFFIELD, S6 1LL	
Steel Grade:	316L	
	P:\Documents\Test Reports\Microexaminations\195588 Carrs march 2016.doc QCD8/1	

Ref 80021
 Ref 6901

From: TK Materials CA, Ltd.
 Cust. NEXXA INDUSTRIES LTD.
 CstAr
 Wgt.: 620 LB

Del.: 2404786842
 CstOr 80021
 Date 09/27/2016





TECHNICAL REPORT
No. 195588



Results Contd...

3. Grain Size Assessment to ASTM E112-12 (Comparison Method)

The specimen prepared in the microexamination section was examined at a magnification of X100.

The average grain size was determined in accordance with ASTM E112-12. The result is shown below:-

Grain Size – ASTM No. 00

4. Macroexamination

A transverse full cross section slice was prepared to 60 grit finish and was then hot etched in HCl/H₂O₂ solution.

The sample examined appeared homogenous and defect free.

Reported By:-

Mr. G Tinker

Opinions and Interpretations expressed herein are outside the scope of UKAS accreditation.

P:\Documents\Test Reports\Microexaminations\195588 Carrs march 2016.doc QCD8/1

Part 80021 with 6901

From: TK Materials CA, Ltd.
Cust. NEXXA INDUSTRIES LTD.
CstAr
Wgt.: 620 LB

Del.: 2404786842
CstOr 80021
Date 09/27/2016