

ThyssenKrupp PO# 80021 Wgt 6501 CWT 12 F0E40 5 Pcs - P16.00 X 2.150 4/16



CARRS STAINLESS STEELS

A Division of ELG Haniel Metals Ltd.
Wadsley Bridge, Sheffield, S6 1LL, England

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Purchaser - Besteller - Acheteur ESP Specialty Steel Products 7700A Fallhead Lane Houston TX 77035 USA		Inspection Certificate: Abnahmegenehmigung: Certificat de reception: No. de Commande Client:		DIN 50049 3.1 EN 10204		Gait No: Zertifikat No: 145767		Date: Datum: 29/03/16			
Customer Order No: Kundenbestellnummer: No. de Commande Client:		P04297		Product Description - Beschreibung des Erzeugnisses - Description du Produit: 16.125h Dia. x 10000lbs Electric Melt & Vacuum Degassed Stainless Steel Solution Annealed Forged SS1 REV 5.316/316L/F316/F316L ASTM A276-316, A479-14, A182-44, A484-14a, A193-14 B8M CL1 ASME SA193 B8M CL1, SAE AMS-DQ-S-7638 ASME SA192, ASME SA479, SAE AMS-DQ-S-7638 AMS 5653, AMS 5648, NACE MR0175, ISO 15156-3, NACE MR0103		Gait No: Urtum Auftr.-Nr: mose Comm. No:		55098 W14843300		Weight: 8256 LB 3745 Kgs.	

Chemical Analysis - Chemische Analyse - Analyse Chimique	C	SI	Mn	P	S	Cr	Mo	Ni	Cu	N	Co
CD25645	0.15	0.36	1.48	0.39	0.23	16.79	2.06	10.08	0.36	0.50	0.20

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

Mechanical Properties - Mechanische Eigenschaften - Caractéristiques Mécaniques											
Test No Prüfung No. de Essai	Test designation Prüfung Beschreibung	Proof Stress Streckgrenze Limite d'élasticité 0.2%	Rp 100%	Tensile strength Zugfestigkeit Résistance à la traction	Rm 4D	Elong % Bruchdehnung % Allongement % Le BD - 4D	A 50%	Z Bruchdehnung % Streck %	Impact Kerbschlaghärte Résistance	Hardness Härte Dureté	
MR4781	16.125"	L	264 MPa	308 MPa	552 MPa	55 %	50 %	76 %		131 HB	1

Remarks - Bemerkungen - Remarques

Ultrasonically tested to ASTM A488 and found satisfactory
Inter-crystalline corrosion test to ASTM A262E satisfactory
Inter-crystalline corrosion test to ASTM A262A 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.

gcl/le VERIFIED BY: [Signature]

Signed: [Signature]
Carrs Steel - Quality Manager

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.

Approved signatory for ELG Carrs Stainless Steels





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

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

[Signature]

Sep 28/16 l.c

	TECHNICAL REPORT No. 195588	 0983
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	

Post 80021
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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

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Part 80021 with 6901

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