

4<sup>th</sup> 9Cr1Mo

## MILL TEST CERTIFICATE

Azkoitia Plant

ISO 9001 - ISO/TS 16949



Product Made in Spain

CUSTOMER:ENERGY ALLOYS HOUSTON	WORKS REFERENCE:1788681
REFERENCE:1054945 OP	SALES ORDER:280525-1
PRODUCT NR:2604	HEAT NUMBER:630688
	ROLLED:25.03.2015

<b>REQUIRED PRODUCT</b>			
9%Cr 1%Mo ROUND BARS AS ROLLED Q+T+STRESS RELIEVED 4" ASTM A-29 (") 3.000/8.000 mm			
RANDOM			
<b>EXPEDITION</b>	<b>DELIVERY:0080502713</b>	<b>WEIGHT (KG):3.110</b>	<b>BUNDLES:1</b>
			<b>UNITS:9</b>

<b>MADE ACCORDING TO</b>			
ASTM A370 2014 15.05.2014 ; ASTM A29-A29M E1 . . .2012			
ENERGY ALLOYS EAGL-600 05 06.04.2013 ; API SPEC 6A 20*ED.+ER1&2+AD12.3 . .03.2013			
NACE MR0175/ISO 15156-1 2*EDICION 15.10.2009			
NACE MR0175/ISO 15156-2 2*EDICION 15.10.2009 ; EN 10204 :2004 OCT. 2004 3.1			


<b>CHEMICAL ANALYSIS OF HEAT</b>								<b>U:% HEAT NUMBER:630688</b>	
	<b>C</b>	<b>Mn</b>	<b>Si</b>	<b>P</b>	<b>S</b>	<b>Cr</b>	<b>Ni</b>	<b>Mo</b>	<b>Cu</b>
Min.	0,090	0,300	0,250			8,000		0,900	
Max.	0,150	0,600	1,000	0,020	0,010	10,000	0,500	1,100	0,300
Cor.	0,109	0,420	0,643	0,014	0,004	8,544	0,114	0,983	0,099

<b>MECHANICAL PROPERTIES AS SUPPLIED (CONDITIONS)</b>			
Temperature of: (1):Austenitizing 1.656 °F ; Time: (1):181 Minutes ; Cooling: (1):Oil 84 °F			
Temperature of: (2):Tempering 1.292 °F ; Time: (2):241 Minutes ; Cooling: (2):Air			
Temperature of: (3):Stress Relieved 1.192 °F ; Time: (3):300 Minutes			
<b>MECHANICAL PROPERTIES AS SUPPLIED (TEST)</b>			
Specimen Test location:At 1/2 radius ; Standard (ASTM A370201415.05.2014)			
Ts (>= 100 KSI):106 KSI ; Ys(1) (Rp(0,2%) 80/95 KSI):Rp(0,2%) 83 KSI			
Ys(2) ((0,5%) 80/95 KSI):(0,5%) 86 KSI ; El. (2 " >= 20 %):2 " 26,8 % ; Z (>= 40 %):70 %			
Observations:.. ; Standard (ASTM E23-01AE12007)			
Notch impact sample direction (Longitudinal):Longitudinal			
Notch Impact sample type (CHARPY-V):CHARPY-V ; Notch Impact test Temperature (75 °F):75 °F			
K(1):101 Ft.Lb ; K(2):99 Ft.Lb ; K(3):99 Ft.Lb ; K (average) (>= 40 Ft.Lb):99,67 Ft.Lb			
Lateral expansion:0,73-0,72-0,72 mm ; Shear value:79-76-76 %			
Hardness Standard (API SPEC.5CT9ED.+ERR. SEPT 2012...09.2012) ; Surface hardness (HB):221/230 HB			
Hardness at 1/2 radius(1) (16/22 HRC):18/20 HRC ; Hardness at 1/2 radius(2) (207/235 HB):215/226 HB			
Notch impact sample direction (Longitudinal):Longitudinal			
Notch Impact sample type (CHARPY-V):CHARPY-V ; Notch Impact test Temperature (14 °F):14 °F			
K(1):83 Ft.Lb ; K(2):87 Ft.Lb ; K(3):87 Ft.Lb ; K (average) (>= 29 Ft.Lb):85,67 Ft.Lb			
Lateral expansion:0,68-0,70-0,70 mm ; Shear value:74-75-75 %			

<b>ADDITIONAL TESTS</b>			
Standard (ASTM E112-01.10.2013) ; Grain size:Austenitic 6			

<b>NON DESTRUCTIVE TESTS</b>			
Internal defects standard(1) (ASTM A388-A388M-...2011) ; Internal defects type/method (PSL3)			
Internal defects standard(2) (API SPEC 6A20*ED.+ER1&2+AD12.3. .03.2013) ; CRACKS CONTROL 100%:OK			
ULTRASONIC INSPECTION 100% : O.K. ; ULTRASONIC INSPECCION 100% O.K.			

<b>ADDITIONAL INFORMATION</b>			
Reduction ratio:26,3 ; MADE IN ELECTRIC FURNACE AND VACUUM DEGASSED. ; Energy Alloys EAGL-600 REV 5			
TREATMENT OF THE MATERIAL IN CONVENTIONAL FOURNACE ; "Cold rotary straightening"			

TECHNOLOGY & QUALITY CERTIFIES THAT THE PRODUCT FULL FILLS THE ORDER'S SPECIFICATION			
APPROVED BY:ISABEL UZKIANO INURRATEGI	SIGN:		
DATE:14.04.2015	Page 1 of 2		
REF.:2000879370000	Analyst of Quality certificates		

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PRODUCT NR:2604	MASTER REFERENCE:188594	ROLLED:25.03.2015

FURNACE CALIBRATION ACCORDING TO AMS-MIL-H-6875, AMS-2750
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Material melted and manufactured 100% in Spain through the Electric Arc Furnace and Vacuum Degassing route.  
 Steel not exposed to Mercury, or to any other metal alloy that is liquid, at ambient temperatures during processing or while in Gerdau's possession.  
 Steel is free from Uranium or any other harmful radioactive contamination.  
 Steel products were not repaired by welding.  
 100% anti mix test performed by spectrometry.

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