



Basauri Plant

## MILL TEST CERTIFICATE

ISO 9001 - ISO/TS 16949



Product Made in Spain

CUSTOMER: ENERGY ALLOYS HOUSTON	WORKS REFERENCE: 1762640
REFERENCE: 1053196 OP	SALES ORDER: 276009-2
PRODUCT NR: 1667528	HEAT NUMBER: 629109
MASTER REFERENCE: 196140	ROLLED: 14.10.2014

## REQUIRED PRODUCT

9%Cr 1%Mo ROUND BARS AS ROLLED Q+T+STRESS RELIEVED 1.500" ASTM A-29 (")  
 <= 10.000 mm RANDOM

EXPEDITION DELIVERY: 0080489193 WEIGHT (KG): 2.848 BUNDLES: 1 UNITS: 45

## MADE ACCORDING TO

ASTM E18 - 2008B ; ASTM E23 07-AE1 2007 ; ASTM A370 13 15.11.2013  
 ASME SA388-SA388M - 2001 ; ASTM E112 2013 01.10.2013 ; ASTM A388-A388M - ...2011  
 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 15156-2 2\*EDICION 15.10.2009  
 NACE MR0175/ISO 15156-1 2\*EDICION 15.10.2009 ; EN 10204 :2004 OCT. 2004 3.1

## CHEMICAL ANALYSIS OF HEAT

U: % HEAT NUMBER: 629109

	C	Mn	Si	P	S	Cr	Ni	Mo	Cu
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
cer.	0,100	0,421	0,629	0,010	0,001	8,559	0,175	0,971	0,108

## MECHANICAL PROPERTIES AS SUPPLIED (CONDITIONS)

Temperature of: (1): Austenitizing 1.796 °F ; Time: (1): 90 Minutes ; Cooling: (1): Water 77 °F  
 Temperature of: (2): Tempering 1.319 °F ; Time: (2): 90 Minutes ; Cooling: (2): Air  
 Temperature of: (3): Stress Relieved 1.219 °F ; Time: (3): 360 Minutes

## MECHANICAL PROPERTIES AS SUPPLIED (TEST)

Sample: Supply section (bar prolongation) ; Specimen Test location: At 1/2 radius  
 Specimen Test: 0,5" X 2 1/4" ; Standard (ASTM A370 13 15.11.2013)  
 Tensile test specimen direction: Longitudinal  
 Ts (>= 100 KSI): 107 KSI  
 Ys(1) ((0,2%) 80/95 KSI): (0,2%) 82 KSI ; Ys(2) ((0,5%) 80/95 KSI): (0,5%) 88 KSI  
 EL (2" >= 20 %) : 2" 29 % ; Z (>= 40 %) : 73,8 %  
 Observations: Re(0,2%) metodo "OFFSET" y Re(0,5%) metodo "RUL" ; Standard (ASTM E23-01AE1 2007)  
 Notch impact sample direction (Longitudinal): Longitudinal  
 Notch Impact sample type (CHARPY-V): CHARPY-V ; Notch Impact test Temperature (75 °F): 75 °F  
 K(1): 145 Ft.Lb ; K(2): 143 Ft.Lb ; K(3): 141 Ft.Lb ; K (average) (>= 40 Ft.Lb): 143 Ft.Lb  
 Lateral expansion: 1.78-1.76-1.74 mm ; Shear value: 80-80-80 % ; Standard (ASTM E18-2008B)  
 Surface hardness (HB): 230-232 HB ; Hardness at 1/2 radius (1) (16/22 HRC): 20-20 HRC  
 Hardness at 1/2 radius (2) (207/235 HB): 226-226 HB  
 Notch impact sample direction (Longitudinal): Longitudinal  
 Notch Impact sample type (CHARPY-V): CHARPY-V ; Notch Impact test Temperature (14 °F): 14 °F  
 X(1): 87 Ft.Lb ; K(2): 88 Ft.Lb ; K(3): 86 Ft.Lb ; K (average) (>= 29 Ft.Lb): 87 Ft.Lb  
 Lateral expansion: 1.15-1.17-1.14 mm ; Shear value: 70-70-70 %

## ADDITIONAL TESTS

Standard (ASTM E112 2013 01.10.2013) ; Grain size: Austenitic 7

## NON DESTRUCTIVE TESTS

Internal defects standard (1) (ASTM A388-A388M-...2011)  
 Internal defects standard (2) (API SPEC 6A 20\*ED.+ER1&2+AD12.3 . . .03.2013)

TECHNOLOGY &amp; QUALITY CERTIFIES THAT THE PRODUCT FULL FILLS THE ORDER

APPROVED BY: MARCELINO GARCIA ZAYAS

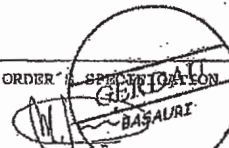
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DATE: 28.01.2015

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Analyst of Quality certificates





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Internal defects type/method (PSL3) ; Criterio de aceptación API 6A/ISO-10423-PSL 3.  
ULTRASONIC INSPECTION 100% : O.K. (1) ; ULTRASONIC INSPECTION 100% : O.K. (2)  
CRACKS CONTROL 100% : O.K.

## ADDITIONAL INFORMATION

Reduction ratio: 188,8 ; " MATERIAL ACCORDING TO : Energy Alloys EAGL-600 REV5  
"Cold rotary straightening" ; FURNACE CALIBRATION ACCORDING TO: S/AMS-MIL-H-6875, AMS-2750  
TREATMENT OF THE MATERIAL IN CONVENTIONAL FURNACE  
MECHANICAL PROPERTIES OBTAINED FROM PROLONGATION OF THE BAR AFTER HEAT TREATMENT ACC. TO ASTM A370. ; .

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.

TECHNOLOGY & QUALITY CERTIFIES THAT THE PRODUCT FULL FILLS THE ORDER'S SPECIFICATION		
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DATE: 28.01.2015	Page 2 of 2	
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