



Azkoitia Plant

## MILL TEST CERTIFICATE

ISO 9001 - ISO/TS 16949

EA-TIDE  
QC1

Product Made in Spain

CUSTOMER: ENERGY ALLOYS HOUSTON	WORKS REFERENCE: 1760585
REFERENCE: 1054934 OP	SALES ORDER: 276734-2
PRODUCT NR: 959	HEAT NUMBER: 629928
	ROLLED: 07.11.2014
	MASTER REFERENCE: 186858

## REQUIRED PRODUCT

9%Cr 1%Mo ROUND BARS AS ROLLED Q+T+STRESS RELIEVED 2.25" ASTM A-29 (\*)  
3.000/8.000 mm RANDOM

EXPEDITION DELIVERY: 0080486315 WEIGHT (KG): 4.925 BUNDLES: 2 UNITS: 35

## MADE ACCORDING TO

ASTM A370 13 15.11.2013 ; 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

## CHEMICAL ANALYSIS OF HEAT

U: % HEAT NUMBER: 629928

	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.	0,106	0,426	0,707	0,011	0,006	8,602	0,236	0,955	0,118

## MECHANICAL PROPERTIES AS SUPPLIED (CONDITIONS)

Temperature of: (1): Austenitizing 1.796 °F ; Time: (1): 120 Minutes ; Cooling: (1): OIL 78°F  
Temperature of: (2): Tempering 1.310 °F ; Time: (2): 120 Minutes ; Cooling: (2): Air  
Temperature of: (3): Stress Relieved 1.220 °F ; Time: (3): 360 Minutes

## MECHANICAL PROPERTIES AS SUPPLIED (TEST)

Specimen Test location: At 1/2 radius ; Standard (ASTM A3701315.11.2013)  
Ts (>= 100 KSI): 108 KSI  
Ys(1) (Rp(0,2%) 80/95 KSI): Rp(0,2%) 85 KSI ; Ys(2) ((0,5%) 80/95 KSI): (0,5%) 88 KSI  
El. (2 " >= 20 %) : 2 " 25,2 % ; Z (>= 40 %) : 68 %  
Observations: Re(0,2%) metodo "OFFSET" y Re(0,5%) metodo "EUL" ; 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): 111 Ft.Lb ; K(2): 110 Ft.Lb ; K(3): 112 Ft.Lb ; K (average) (>= 40 Ft.Lb): 111 Ft.Lb  
Lateral expansion: 1.61-1.63-1.60 mm ; Shear value: 70-70-70 % ; Standard (ASTM E18-2008B)  
Surface hardness (HB): 238 HB ; Hardness at 1/2 radius(1) (16/22 HRC): 20,5 HRC  
Hardness at 1/2 radius(2) (207/235 HB): 230 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): 75 Ft.Lb ; K(2): 76 Ft.Lb ; K(3): 73 Ft.Lb ; K (average) (>= 29 Ft.Lb): 74,67 Ft.Lb  
Lateral expansion: 0.98-0.99-0.97 mm ; Shear value: 60-60-60 %

## ADDITIONAL TESTS

Standard (ASTM E112-01.10.2013) ; Grain size: Austenitic 6/7

## NON DESTRUCTIVE TESTS

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)  
ULTRASONIC INSPECTION 100% : O.K.

## ADDITIONAL INFORMATION

Reduction ratio: 82,9 ; MADE IN ELECTRIC FURNACE AND VACUUM DEGASSED. ; Energy Alloys EAGL-600 REV5

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

APPROVED BY: ANGEL FUNES EXPOSITO

SIGN:

DATE: 02.12.2014

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REF.: 2000820050000

Analyst of Quality certificates





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"Cold rotary straightening" ; FURNACE CALIBRATION ACCORDING TO AMS-MIL-H-6875, AMS-2750  
TREATMENT OF THE MATERIAL IN CONVENTIONAL FURNACE

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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