

## MILL TEST CERTIFICATE

Azkoitia Plant

ISO 9001 - ISO/TS 16949



Product Made in Spain

CUSTOMER: ENERGY ALLOYS HOUSTON	WORKS REFERENCE: 1735449
REFERENCE: 1031473 OP	SALES ORDER: 268380-3
PRODUCT NR: 959	HEAT NUMBER: 628324
	ROLLED: 06.06.2014

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: 0080472882	WEIGHT (KG): 2.060	BUNDLES: 1
			UNITS: 15

MADE ACCORDING TO	
ASTM A370 2012A 15.10.2012 ; 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: 628324
	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.	0,090	0,418	0,647	0,010	0,003	8,612	0,230	0,967	0,141

MECHANICAL PROPERTIES AS SUPPLIED (CONDITIONS)	
Specimen Test location: At 1/2 radius ; Temperature of: (1): Austenitizing 1.652 °F ; Time: (1): 101 Minutes	
Cooling: (1): Oil 82/99 °F ; Temperature of: (2): Tempering 1.328 °F ; Time: (2): 135 Minutes	
Cooling: (2): Air ; Temperature of: (3): STRESS RELIEVED 1.228 °F ; Time: (3): 200 Minutes	

MECHANICAL PROPERTIES AS SUPPLIED (TEST)	
Standard (ASTM A370-15.10.2012) ; Tensile Strength (>= 100 KSI): 103 KSI	
Yield Strength(1) (Rp(0,2%) 80/95 KSI): Rp(0,2%) 83 KSI	
Yield Strength(2) ((0,5%) 80/95 KSI): (0,5%) 84 KSI ; Elongation (2 " >= 20 %) : 2 " 27,1 %	
Reduction of Area (>= 40 %) : 74,4 % ; 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): 152 Ft.Lb ; K(2): 160 Ft.Lb ; K(3): 171 Ft.Lb ; K (average) (>= 40 Ft.Lb): 161 Ft.Lb	
lateral expansion: 0,62-0,65-0,69 mm ; Brittle fracture: 22-25-26 % ; Standard (ASTM E18-2008B)	
Surface hardness (HB): 218/230 HB ; Hardness at 1/2 radius (1) (16/22 HRC): 18/20 HRC	
Hardness at 1/2 radius (2) (207/235 HB): 215/223 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): 118 Ft.Lb ; K(2): 125 Ft.Lb ; K(3): 132 Ft.Lb ; K (average) (>= 29 Ft.Lb): 125 Ft.Lb	
lateral expansion: 0,60-0,630,66 mm ; Brittle fracture: 20-21-22 %	

ADDITIONAL TESTS	
Standard (ASTM E112- . . .2010) ; Grain size: Austenitic 7	

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

ADDITIONAL INFORMATION	
Reduction ratio: 82,9 ; MADE IN ELECTRIC FURNACE AND VACUUM DEGASSED. ; Energy Alloys EAGL-600 REV5	
"Cold rotary straightening" ; FURNACE CALIBRATION ACCORDING TO AMS-MIL-H-6875, AMS-2750	

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

APPROVED BY: ISABEL UZKIANO INURRATEGI

SIGN:

DATE: 25.06.2014

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REF.: 2000756160000

Analyst of Quality certificates



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Product Made in Spain

CUSTOMER:ENERGY ALLOYS HOUSTON		WORKS REFERENCE:1735449
REFERENCE:1031473 OP	SALES ORDER:268380-3	HEAT NUMBER:628324
PRODUCT NR:959	MASTER REFERENCE:186858	ROLLED:06.06.2014
TREATMENT OF THE MATERIAL IN CONVENTIONAL FURNACE		

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

APPROVED BY:ISABEL UZKIANO INURRATEGI

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