



Azkoitia Plant

MILL TEST CERTIFICATE

ISO 9001 - ISO/TS 16949



Product Made in Spain

CUSTOMER: ENERGY ALLOYS HOUSTON	WORKS REFERENCE: 1708892
REFERENCE: 1031455 OP	SALES ORDER: 268382-3
PRODUCT NR: 684	HEAT NUMBER: 628055
	ROLLED: 07.03.2014
MASTER REFERENCE: 186859	

REQUIRED PRODUCT

9%Cr 1%Mo ROUND BARS AS ROLLED Q+T+STRESS RELIEVED 1.75" ASTM A-29 (")
3.000/8.000 mm RANDOM

EXPEDITION DELIVERY: 0080459366 WEIGHT (KG): 2.085 BUNDLES: 1 UNITS: 25

MADE ACCORDING TO

ASTM A29-A29M - ...2011 ; ASTM A370 11A 15.11.2011
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: 628055

	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.	0,098	0,454	0,667	0,011	0,005	8,595	0,247	0,975	0,173

MECHANICAL PROPERTIES AS SUPPLIED (CONDITIONS)

Specimen Test location: At 1/2 radius ; Temperature of: (1): Austenitizing 1.652 °F ; Time: (1): 78 Minutes
Cooling: (1): Oil 84 °F ; Temperature of: (2): Tempering 1.310 °F ; Time: (2): 104 Minutes
Cooling: (2): Air ; Temperature of: (3): STRESS RELIEVED 1.210 °F ; Time: (3): 180 Minutes

MECHANICAL PROPERTIES AS SUPPLIED (TEST)

Standard (ASTM A370 11A 15.11.2011) ; Tensile Strength (≥ 100 KSI): 115 KSI
Yield Strength(1) (Rp(0,2%) 80/95 KSI): Rp(0,2%) 93 KSI
Yield Strength(2) ((0,5%) 80/95 KSI): (0,5%) 95 KSI ; Elongation (2 " ≥ 20 %): 2 " 25,9 %
Reduction of Area (≥ 40 %): 70,05 % ; 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): 125 Ft.Lb ; K(2): 125 Ft.Lb ; K(3): 128 Ft.Lb ; K (average) (≥ 40 Ft.Lb): 126 Ft.Lb
lateral expansion: 0,61-0,61-0,63 mm ; Brittle fracture: 21-21-22 % ; Standard (ASTM E18-2008B)
Surface hardness (HB): 226/237 HB ; Hardness at 1/2 radius(1) (16/22 HRC): 19/21 HRC
Hardness at 1/2 radius(2) (207/235 HB): 222/232 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): 119 Ft.Lb ; K(2): 123 Ft.Lb ; K(3): 123 Ft.Lb ; K (average) (≥ 29 Ft.Lb): 121,67 Ft.Lb
lateral expansion: 0,60-0,62-0,62 mm ; Brittle fracture: 20-22-22 %

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: 141,6 ; 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 & QUALITY CERTIFIES THAT THE PRODUCT FULL FILLS THE ORDER'S SPECIFICATION

APPROVED BY: ISABEL UZKIANO INURRATEGI

DATE: 25.03.2014

REF.: 2000715640000

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SIGN:

Analyst of Quality certificates



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TREATMENT OF THE MATERIAL IN CONVENTIONAL FURNACE ; "COUNTRY OF MELT AND MANUFACTURE: SPAIN"
NO WELD REPAIR PERFORMED ; MATERIAL IS FREE OF MERCURY CONTAMINATION