

## MILL TEST CERTIFICATE

Basauri Plant

ISO 9001 - ISO/TS 16949



2-1/2" G MANDREL 9 CHROME

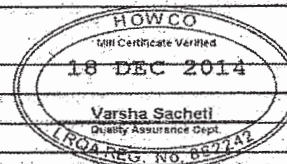
Product Made in Spain

CUSTOMER: HOWCO METALS MANAGEMENT PTE LTD	WORKS REFERENCE: 1740628
REFERENCE: HOU-111769	SALES ORDER: 273719-7
PRODUCT NR:	HEAT NUMBER: 629109
MASTER REFERENCE: 192526	ROLLED: 03.07.2014

REQUIRED PRODUCT			
9%Cr 1%Mo ROUND BARS TURNED Q+T+STRESS RELIEVED 1.5" SPECIFICATION'S TOLERANCE			
3.000/8.000 mm RANDOM			
EXPEDITION	DELIVERY: 0080480201	WEIGHT (KG): 5.392	BUNDLES: 2
			UNITS: 81

MADE ACCORDING TO			
SAE-AMS 2301 K 08.2010 ; HOWCO HG001 2.20.02.2014 ; HOWCO HG 9CR BAR 3.18.06.2012			
EN ISO 9001 2008/AC:2009 29.07.2009 ; NACE MR0175/ISO 15156-2 2ª EDICION 15.10.2009			
NACE MR0175/ISO 15156-1 2ª 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	Ti	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	0,250		
Cer.	0,100	0,421	0,629	0,010	0,001	8,559	0,175	0,971	0,108	0,0010	0,0013
Nb											
Min.											
Max.											
Cer.	0,0010										



INCLUSIONS (MICROINCLUSIONS)											
Standard (ASTM E452013. . . 2013) ; Type/method (D Tabla I-r) ; A(t):0,5 ; A(h):0 ; B(t):1 ; B(h):0											
C(t):0 ; C(h):0 ; D(t):0,5 ; D(h):0											
INCLUSIONS (MACROINCLUSIONS)											
Standard (SAE-AMS 2301K08.2010) ; Severity(1):Mean value 0 ; Severity(2):Individual value 0,1											
Frequency(1):Mean value 0 ; Frequency(2):Individual value 0,1											

MECHANICAL PROPERTIES AS SUPPLIED (CONDITIONS)											
Specimen Test location: At 1/2 radius ; Temperature of: (1): Austenitizing 1.796 °F ; Time: (1): 120 Minutes											
Cooling: (1): Oil 78/88 °F ; Temperature of: (2): Tempering 1.328 °F ; Time: (2): 120 Minutes											
Cooling: (2): Air ; Temperature of: (3): Stress Relieved 1.228 °F ; Time: (3): 360 Minutes											
MECHANICAL PROPERTIES AS SUPPLIED (TEST)											
Standard(1) (ASTM A3702012A15.10.2012) ; Standard(2) (ASTM E8/E8M2013A01.07.2013)											
Tensile test specimen direction (Longitudinal): Longitudinal ; Ts (95/120 KSI): 108 KSI											
Ys (Rp(0,2%) 80/95 KSI): Rp(0,2%) 82 KSI ; El. ((4d) >= 20 %) : (4d) 26,8 % ; Z (>= 40 %) : 71,5 %											
Standard (ASTM E23-01AE12007) ; Notch impact sample direction (Longitudinal): Longitudinal											
Notch Impact sample type (CHARPY-V): CHARPY-V ; Notch Impact test Temperature (14 °F): 14 °F											
K(1): 103 Ft.Lb ; K(2): 102 Ft.Lb ; K(3): 100 Ft.Lb ; K (average) (>= 30 Ft.Lb): 102 Ft.Lb											
K (single) (>= 25 Ft.Lb): 100 Ft.Lb ; Lateral expansion: 1.41-1.39-1.36 mm ; Shear value: 70-70-70 %											
Surface hardness (217/237 HBW): 226-230 HBW											

ADDITIONAL TESTS											
Structure: Ferrite Delta < 5% ; Standard (ASTM E112201301.10.2013) ; Grain size: 6											
radioactivity: FREE Bq/gr											

NON DESTRUCTIVE TESTS											
Surface defects standard (API SPEC 6A20°ED. +ER1&2+AD12.3. .03.2013)											
Internal defects standard(1) (ASTM A388-A388M-. . .2011)											

TECHNOLOGY & QUALITY CERTIFIES THAT THE PRODUCT FULL FILLS THE ORDER'S SPECIFICATION											
APPROVED BY: MARCELINO GARCIA ZAYAS						SIGN:					
DATE: 28.10.2014						Analyst of Quality certificates					
REF.: 1002137540000											

Customer PO#	Sales Order#	Howco Disp Cert#	Date	Authorized by	Page No.	Total Pages
203298	2063728-1	2063728-1	Jun 06 2017	Megan McKeever	1	2

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Internal defects standard(2) (API SPEC 6A20\*ED.+ER1&2+AD12.3. .03.2013)  
 Internal defects type/method(1) (FBH) ; Internal defects type/method(2) (PSL3) ; 1/8" (1)  
 S/API 6A(según cláusulas 7.4.2.3.15 y 7.4.2.4.11) (2) ; ULTRASONIC INSPECTION 100% : O.K. (1)  
 ULTRASONIC INSPECTION 100% : O.K. (2) ; CRACKS CONTROL 100%:OK

## ADDITIONAL INFORMATION

Reduction ratio:163,1 ; MADE IN ELECTRIC ARC FURNACE AND VACUUM DEGASSED.INGOT CAST 464 X 464 MM AVERAGE  
 TREATMENT TEMPERATURE MEASURED WITH ATMOSPHERIC THERMOCOUPLE  
 FURNACE CALIBRATION ACCORDING TO "API 6A appendix M" - AMS H-6875, AMS 2750  
 " NO WELD REPAIR PERFORMED " ; COUNTRY OF ORIGIN : SPAIN ; MATERIAL IS FREE OF MERCURY CONTAMINATION  
 TREATMENT OF THE MATERIAL IN CONVENTIONAL FURNACE  
 MECHANICAL PROPERTIES OBTAINED FROM PROLONGATION OF THE BAR AFTER HEAT TREATMENT ; ACC. TO ASTM A370.  
 . . . .  
 The mill supply chain controls have taken into account Dodd Frank Act requirements regarding conflict minerals.

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

APPROVED BY:MARCELINO GARCIA ZAYAS

SIGN:

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Page 2 of 2

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