

2 1/4" 9 Cr Mo



## MILL TEST CERTIFICATE

Basauri Plant

ISO 9001; ISO-TS 16949; ISO 14001 Y OHSAS 18001



Product Made in Spain

CUSTOMER:HOWCO METALS MANAGEMENT PTE LTD	WORKS REFERENCE:1772205
REFERENCE:HOU-115006	SALES ORDER:276696-13
PRODUCT NR:	HEAT NUMBER:630108
	ROLLED:10.12.2014
	MASTER REFERENCE:197943

REQUIRED PRODUCT			
9%Cr 1%Mo ROUND BARS TURNED Q+T+STRESS RELIEVED 2.25" SPECIFICATION'S TOLERANCE			
3.000/8.000 mm NORMAL			
EXPEDITION	DELIVERY:0080492077	WEIGHT (KG):5.688	BUNDLES:2
			UNITS:38

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 ; API SPEC 6A 20 <sup>th</sup> ED.+ER1&2+AD12.3 . .03.2013			
NACE MR0175/ISO 15156-1 2 <sup>a</sup> EDICION 15.10.2009			
NACE MR0175/ISO 15156-2 2 <sup>a</sup> EDICION 15.10.2009 ; EN 10204 :2004 OCT. 2004 3.1			

CHEMICAL ANALYSIS OF HEAT										U: % HEAT NUMBER:630108	
	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.	0,105	0,475	0,628	0,012	0,005	8,573	0,159	0,977	0,135	0,0010	0,0013
Nb											
Min.											
Max.											
Cer.	0,0010										

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

MECHANICAL PROPERTIES AS SUPPLIED (CONDITIONS)											
Temperature of: (1):Austenitizing 1.796 °F; Time: (1):180 Minutes; Cooling: (1):Oil											
Temperature media at the start: (1):78 °F; Temperature media at the finish: (1):95 °F											
Temperature of: (2):Tempering 1.319 °F; Time: (2):180 Minutes; Cooling: (2):Air											
Temperature of: (3):Stress Relieved 1.220 °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(1) (ASTM A370201415.05.2014)											
Standard(2) (ASTM E8/E8M2013A01.07.2013); Tensile direction (Longitudinal):Longitudinal											
Ts (95/120 KSI):106 KSI; Ys (Rp(0,2%) 80/95 KSI):Rp(0,2%) 82 KSI; El. (4d >= 20 %):4d 29,7 %											
Z (>= 40 %):71 %; Standard (ASTM E2307-AE12007)											
Notch impact direction (Longitudinal):Longitudinal; Notch Impact sample type (CHARPY-V):CHARPY-V											
Notch Impact Temp. (14 °F):14 °F; K(1):84 Ft.Lb; K(2):85 Ft.Lb; K(3):86 Ft.Lb											
K (average) (>= 30 Ft.Lb):85 Ft.Lb; K (single) (>= 25 Ft.Lb):84 Ft.Lb											
Lateral expansion:1.10-1.11-1.09 mm; Shear value:70-70-70 %											
Surface hardness (217/237 HBW):231-236 HBW											
Hardness at (at 1/2 radius of the bar HBW):at 1/2 radius of the bar 225-230 HBW											

ADDITIONAL TESTS											
Structure:DELTA FERRITE < 5%; Standard (ASTM E112201301.10.2013); Grain size:7											

TECHNOLOGY & QUALITY CERTIFIES THAT THE PRODUCT FULL FILLS THE ORDER'S SPECIFICATIONS											
APPROVED BY:ALBERTO CUBERO ZABALA										SIGN:.	
DATE:16.11.2016										Page 1 of 2	



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Radiactivity:FREE <= 0,1 Bq/gr

## NON DESTRUCTIVE TESTS

Surface defects standard (API SPEC 6A20\*ED.+ER1&2+AD12.3. .03.2013)

U.T. standard(1) (ASTM A388-A388M-...2011); U.T. type/method(1) (FBH); 1/8"

U.T. standard(2) (API SPEC 6A20\*ED.+ER1&2+AD12.3. .03.2013); U.T. type/method(2) (FBH)

U.T. standard(3) (API SPEC 6A20\*ED.+ER1&2+AD12.3. .03.2013); U.T. type/method(3) (PSL3)

ULTRASONIC INSPECTION 100% : O.K.; ULTRASONIC INSPECTION 100% : O.K.

ULTRASONIC INSPECTION 100% : O.K.; CRACKS CONTROL 100%:OK

## ADDITIONAL INFORMATION

Reduction ratio:76,1; INGOT CAST 465 X 465 mm.

THERMAL TREATMENT TEMPERATURE CONTROL IN ACCORDANCE WITH "API 6A appendix M"

TREATMENT TEMPERATURE MEASURED WITH ATMOSPHERIC THERMOCOUPLE

TREATMENT OF THE MATERIAL IN CONVENTIONAL FURNACE

MATERIAL ACCORDING TO NACE MR0175/ISO 15156 & "80 Ksi/HT 22"; .; .; .; .

The mill supply chain controls have taken into account Dodd Frank Act requirements regarding conflict minerals.

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 Sidenor'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 SPECIFICATIONS

APPROVED BY:ALBERTO CUBERO ZABALA

SIGN:.

DATE:16.11.2016

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