

Sidenor

## 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:1775075
REFERENCE:HOU-115006	SALES ORDER:276696-11
PRODUCT NR:	HEAT NUMBER:628358
	ROLLED:21.11.2014
MASTER REFERENCE:197939	

## REQUIRED PRODUCT

9%Cr 1%Mo ROUND BARS TURNED Q+T+STRESS RELIEVED 1.75" SPECIFICATION'S TOLERANCE  
3.000/8.000 mm NORMAL

EXPEDITION DELIVERY:0080492077 WEIGHT (KG):1.616 BUNDLES:1 UNITS:18

## 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\*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:628358

	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.	0,134	0,415	0,659	0,010	0,010	8,582	0,180	0,975	0,102	0,0010	0,0015
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 0,15  
Frequency(1):Mean value 0,1 ; Frequency(2):Individual value 0,1

## MECHANICAL PROPERTIES AS SUPPLIED (CONDITIONS)

Temperature of: (1):Austenitizing 1.796 °F ; Time:(1):120 Minutes ; Cooling:(1):Oil  
Temperature media at the start:(1):86 °F ; Temperature media at the finish:(1):96 °F  
Temperature of: (2):Tempering 1.346 °F ; Time:(2):120 Minutes ; Cooling:(2):Air  
Temperature of: (3):Stress Relieved 1.256 °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):111 KSI ; Ys (Rp(0,2%) 80/95 KSI):Rp(0,2%) 86 KSI ; El. (4d >= 20 %) :4d 24,3 %  
Z (>= 40 %) :65,9 % ; 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):69 Ft.Lb ; K(2):71 Ft.Lb ; K(3):70 Ft.Lb  
K (average) (>= 30 Ft.Lb):70 Ft.Lb ; K (single) (>= 25 Ft.Lb):69 Ft.Lb  
Lateral expansion:1.19-1.18-1.21 mm ; Shear value:70-70-70 % ; Hardness:230 HB  
Surface hardness (217/237 HBW):230-235 HBW  
Hardness at (at 1/2 radius of the bar HBW):at 1/2 radius of the bar 227-232 HBW

## ADDITIONAL TESTS

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

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

APPROVED BY:Miren Begoña Hernandez

SIGN:

DATE:09.11.2016

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**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:124,1 ; 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.

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